SIEMENS

Industrial Edge

App
Energy Manager for Industrial Edge V1.4

Application Manual

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04/2022
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Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Introduction 1

1.1 Security information

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement - and continuously maintain - a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit:

https://www.siemens.com/industrialsecurity (https://new.siemens.com/global/en/company/topic-areas/future-of-manufacturing/industrial-security.html)

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under:

https://www.siemens.com/industrialsecurity (https://new.siemens.com/global/en/company/topic-areas/future-of-manufacturing/industrial-security.html)

1.2 Note on EU General Data Protection Regulation

Data protection

Siemens observes the principles of data protection, in particular the principle of data minimization (privacy by design). For the Energy Manager for Industrial Edge product, this means: the product processes / stores the following personal data: User name (first name and last name), email address, user role and app usage data (number of users; number of KPI instances; number of assets showing a media analysis).

No private or intimate data is processed or stored.

The above data are required for the login, the billing function and for the internal user administration (administrator can see the role and the status of other users). The storage of data

is appropriate and limited to what is necessary, as it is essential to identify the authorized operators. The data needs to be maintained manually by you and if necessary, these can also be deleted. If you need support, please contact customer support.

The above data will not be stored anonymously or pseudonymized, because the purpose (identification of the operating personnel) cannot be achieved otherwise.

The above data is protected against loss of integrity and confidentiality by state-of-the-art security measures.

1.3 Security Information for Industrial Edge Apps

Security information (assumptions/constraints) for Industrial Edge Apps is as follows:

- Only authorized internal operators will have access to Industrial Edge Device within a secure network using VPN connection.
- Perimeter firewall configuration responsibility lies with the end customer.
- The security guidelines for usage of USB Flash Drives in the shop floor area are applied accordingly.
- Creating users with appropriate access rights upon commissioning is the responsibility of the operator.
- The customer is responsible for configuring the application on the basis of the system requirements and technical capabilities of the documented App according to the Installation / User Manual such that the automation system performance is not impacted.
- The system is installed in an environment ensuring that physical access is limited to authorized maintenance personnel only. Managing unauthorized attachment of removable devices is the responsibility of the operator.
- The platform including hardware, firmware and operating system is securely configured and maintained by the operator.
- The operator is capable of protecting the environment from malware infection.
- Centralized IT security components (Active Directory, Centralized IT Logging Server) are provided and well secured by the operator and are trustworthy.
- The operator personnel accessing the system is well trained in the usage of the system and general information security aspects like password handling, removable media, etc.
- The operator is responsible for the CIA (Confidentiality, Integrity and Availability) of data stored outside the Industrial Edge Device.
- The operator is responsible for configuring the CPUs with appropriate read/write access levels (legitimization), and for configuring the Industrial Edge Apps using appropriate passwords for data collection from CPUs.
- The customer takes care about the time synchronization of Industrial Edge Management and Industrial Edge Device.

1.4 Overview of Industrial Edge

Siemens Industrial Edge is the next generation of digital automation. With Industrial Edge, you use intelligence and scalability of the cloud directly in your manufacturing - in a simple, high-performance manner and without your data leaving the manufacturing process. Industrial Edge combines local and high-performance data processing directly in automation with the advantages of the cloud: app-based data analysis, data processing and Infrastructure-as-a-Service concepts with central update functionality. In this way, you can quickly integrate apps into manufacturing and manage them with a high degree of automation.

Industrial Edge gives you the opportunity to continuously make changes to your automation components and plants, analyze large volumes of automation data to implement innovative functions, such as preventive maintenance, and to obtain maximum flexibility and thus productivity over the entire machine lifecycle.

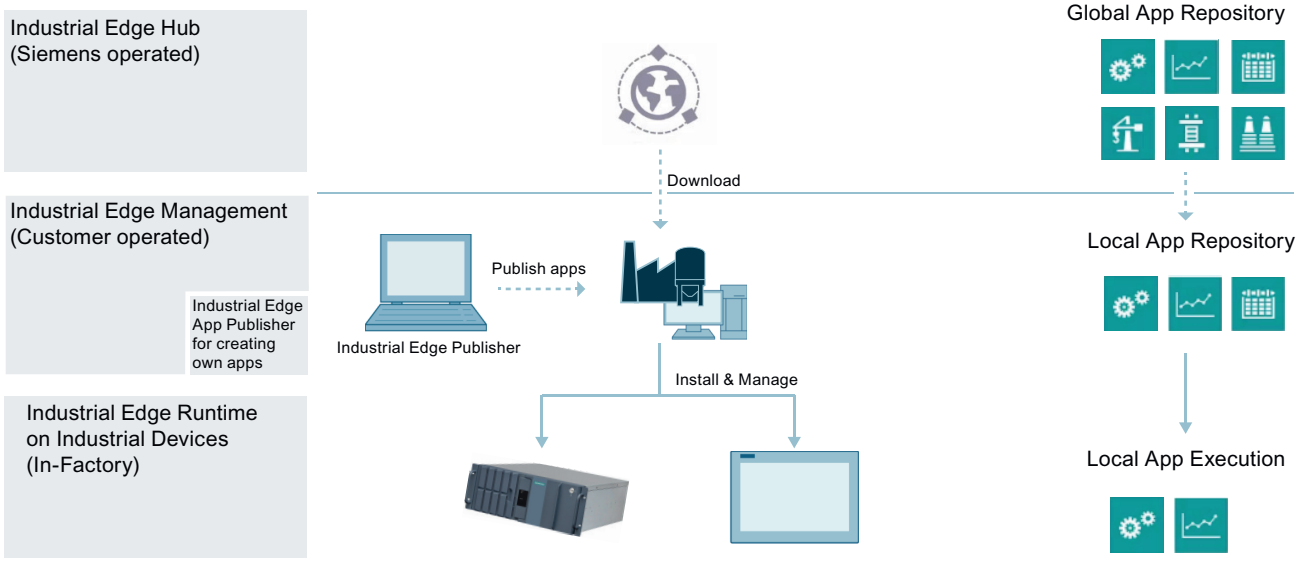
With the Industrial Edge Hub, an App Store is available to you where you can find all Siemens apps and 3rd-party apps. From here, you can manage all licenses for your apps and devices centrally and install updates for security issues, device firmware, apps and Industrial Edge Management.

You can monitor and manage distributed Edge devices centrally in the Industrial Edge Management. In this way, new apps and software functions, for example, can be installed on all connected Edge devices company-wide. Central software management thus minimizes the workload for performing maintenance and updates on individual devices.

On the individual Industrial Edge devices, you can start and run apps and keep statistics on an Edge device, for example.

With the Industrial Edge Publisher, you can develop your own Edge apps and make them available to other users in Industrial Edge Management.

Another component of the Industrial Edge ecosystem is Industrial Edge Runtime, which is installed on Edge Devices (IED) or Unified Comfort Panels (UCP) and on which the system, including all applications, ultimately runs.



Industrial Hub	Industrial Edge Management	Industrial Edge Runtime on Industrial Devices
Platform for purchasing apps and software, and for monitoring management systems • Central management location for apps, contributing to corporate standardization • Management of all licenses in use and thus easy cost estimates • Overview of all management system instances that are in use worldwide	Centralized control level for managing devices, apps, and store floor users. • Assignment of apps to the matching Edge devices (worldwide) • Specification of user rights (e.g. app installations) • Just a few clicks for app setup and security update cycles • Supervision of all operations using the centralized Admin view • Excellent usability for IT and OT users, helping to promote user adaptation and self-service	Software level for app container • Installation of scalable apps on many different Edge devices • Supports use in industrial environments by – ensuring security and reliability – Providing comprehensive user management to meet the requirements of machine manufacturers and plant operators alike – Adhering to Company Policy Compliance, e.g. user management integration or IT/firewall specifications • Integrating device connectivity to cloud and automation systems

1.5 Function overview

Introduction

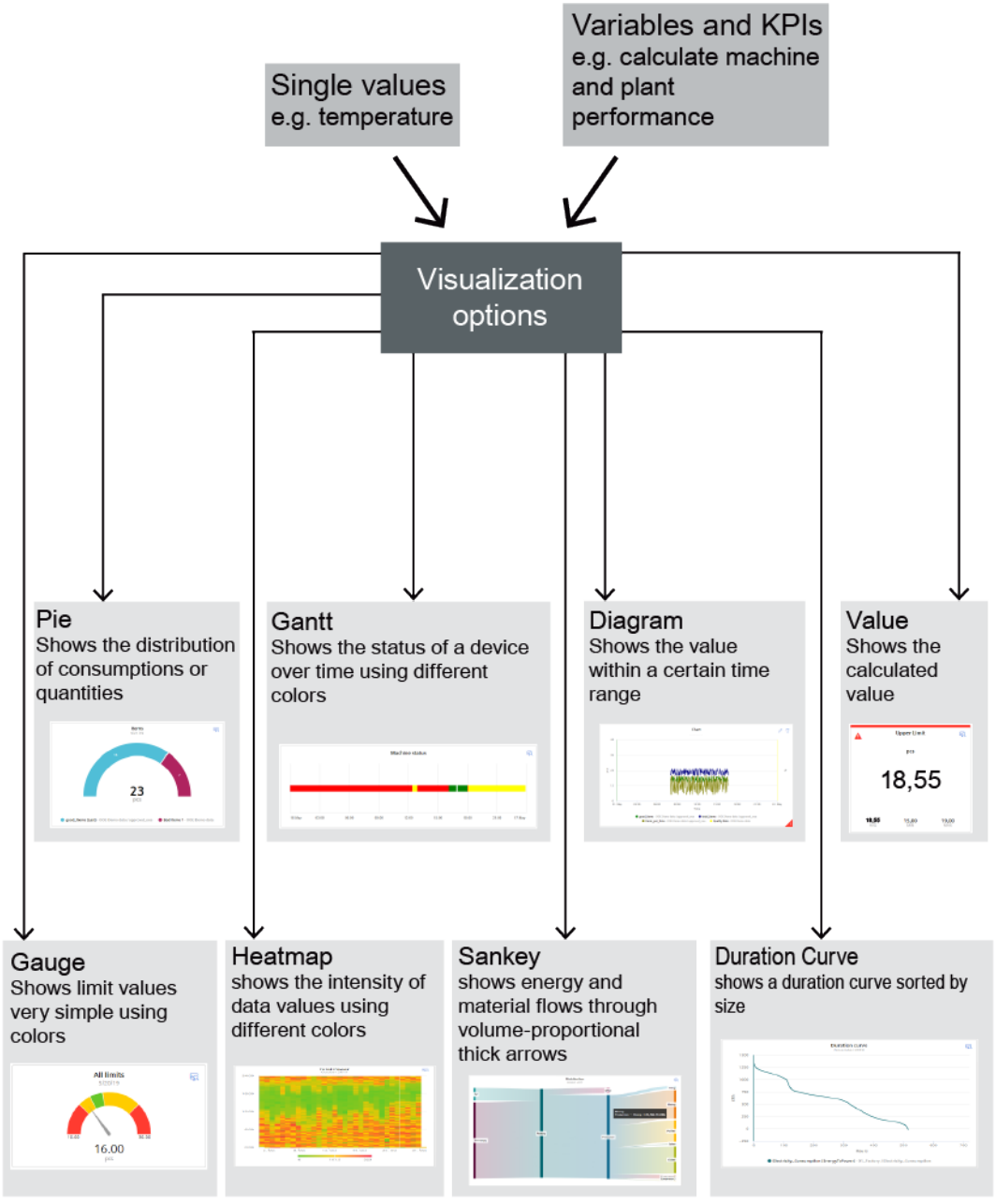
The App Energy Manager for Industrial Edge provides you with information about how much energy has been consumed at any time online:

- You have access to the consumption data of machines and plants worldwide.
- Transparent energy management data to ISO 50001
- With individual KPI types and user-specific dashboards, you are creating a complete overview of the energy consumption of your machines, plants or entire production facilities from which you can subsequently derive measures for energy efficiency.
- In addition to the KPI type and KPI instance application in combination, you can also create a KPI instance directly at the asset in the Energy Manager without having defined a KPI type beforehand.
- In the detail view of the widgets, you can create quick media analyses.
- Transparent listing of energy costs, energy consumption and CO_2 emissions of individual machines and all your production facilities around the globe. (Energy media analysis)
- You obtain valuable information on peaks in energy consumption, for example, to make informed decisions regarding optimization of energy efficiency and reducing energy costs.

The Energy Manager will help you make the transition from energy transparency to energy efficiency. The recorded energy data will provide you with more planning reliability. You optimize processes and plants by analyzing and documenting the energy consumption together with the process data, such as temperatures, pressures, etc. Use the collected energy data to make your procurement process even more precise.

If your plant is already energy-efficient, you can use the Energy Manager to ensure that it will stay this way. For example, you can quickly detect whether a filter is contaminated and replace it.

A dashboard is available for data and energy media analysis. Depending on your needs, you can use a variety of widget types on the dashboard:



Browser recommendation

You require an HTML5-capable Internet browser to run the app.

The Google Chrome and Microsoft Edge browsers are supported. We recommend the Google Chrome web browser. You should preferably use 1920x1080 resolution.

Internet Explorer is no longer supported as of version 11.

The app can run on any mobile device with an HTML5-enabled browser. Tablets are recommended.

Expiration date of the trial version for the Panel

The trial version of the Energy Manager app is free of charge and expires on January 1, 2023. If you want to continue using the app, please order the appropriate license.

1.6 Getting Started

Description

You can find a Getting Started for using the Edge App Energy Manager here: Getting Started - Energy Manager (https://github.com/industrial-edge/energy-manager-getting-started)

1.7 Abbreviations and acronyms

IED	Industrial Edge Device	
IEM	Industrial Edge Management	
KPI	Key Performance Indicator	Key performance indicator
MTBF	Mean Time Between Failures	Mean time between failures
MTTR	Mean Time To Repair	Average repair time
MVR	Multivariable Regression	Description of a parameter using other parameters
OEE	Overall Equipment Effectiveness	Overall equipment effectiveness
TEEP	Total Effective Equipment Performance	Medium for the performance metrics

Installation

2

2.1 Validity of the documentation

Description

The "Energy Manager for Industrial Edge" documentation is valid for the installation of the app on an Edge device as well as on a Unified Comfort Panel (UCP).

The differences are highlighted in the respective sections.

2.2 Overview of additional documentation

Overview

The following table lists additional documents that supplement this description, some of which are available on the Internet.

Documentation	Main contents
Industrial Edge Hub (https://iehub.eu1.edge.siemens.cloud)	This page describes the functions of the Siemens Industrial Edge platform and the functionalities of the Edge management system.
System overview (https://new.siemens.com/global/en/products/automation/topic-areas/industrial-edge/simatic-edge.html)	This page provides an overview of all Edge solutions.

2.3 System requirements

Note the following system requirements for the installation of the Edge Apps.

Software requirements

The following Internet browsers are required:

- Google Chrome, Version ≥ 72
- Firefox Version ≥ 62
- Data Service
  The Data Service app is available in the Industrial Edge Hub in the "Library" area. From there you can transfer the app to your Industrial Edge Management (IEM) and from there install it on your Industrial Edge Device (IED).
  With the Data Service app you model the structure of your industrial process using the assets and aspects that you then need for the plant structure of the Edge apps.

Note

Installing the app

All apps must be installed on the same IED.

Hardware requirements

- A device on which the Industrial Edge Management (IEM) is running (VM - ISO: Version 1.0.8)
- An Edge device (IED) that is compatible with Industrial Edge Management:
  - IED Model: e.g. SIMATIC IPC 227E Nanobox, SIMATIC IPC 427E, IPC127E and IPC827E or Unified Comfort Panel (UCP)
  - Hard disk: At least 10 GB available
  - RAM: 2 GB available RAM
- The Edge device must be on board the Industrial Edge Management.

IEM, IED, and web browsers must be synchronous in the UTC time zone.

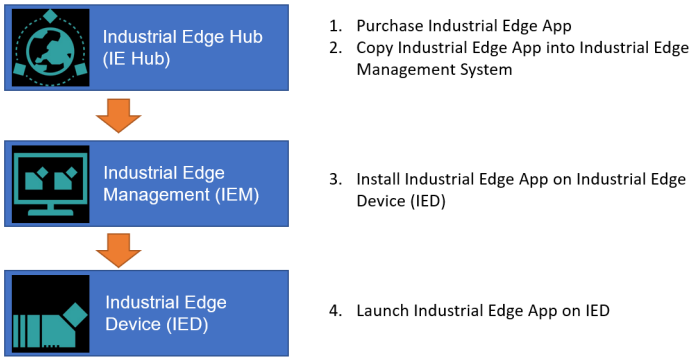
2.4 Installing the Energy Manager app on an IED

2.4.1 Overview of the installation process

Description

In the graphic below you can see the steps involved in the installation of an Industrial Edge app on an Industrial Edge device:

Installation process of an Industrial Edge App via Industrial Edge Hub



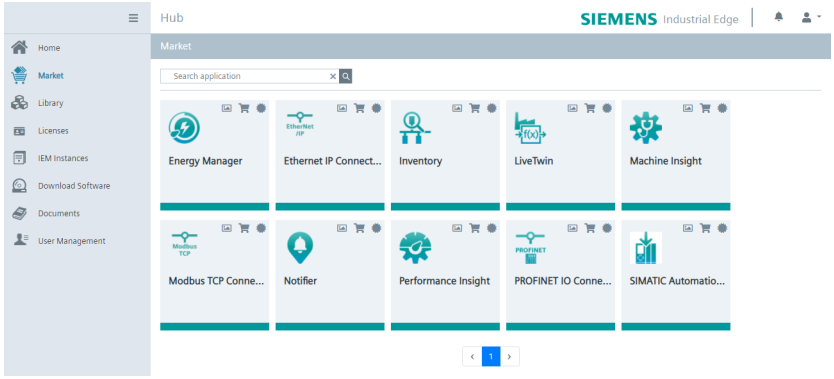
Additional information is available here:

1. Purchasing the Energy Manager app in the Industrial Edge Hub (Page 15)
2. Copying the Energy Manager app from the IE Hub to the IEM catalog (Page 16)
3. Installing the Energy Manager app on the IED (Page 17)
4. Starting the Energy Manager app on the IED (Page 19)

2.4.2 Purchasing the Energy Manager app in the Industrial Edge Hub

Description

The "Market" tab in the Industrial Edge Hub (IE Hub) contains the global app catalog via which you can buy the license for the Energy Manager in the Siemens Industry Mall.



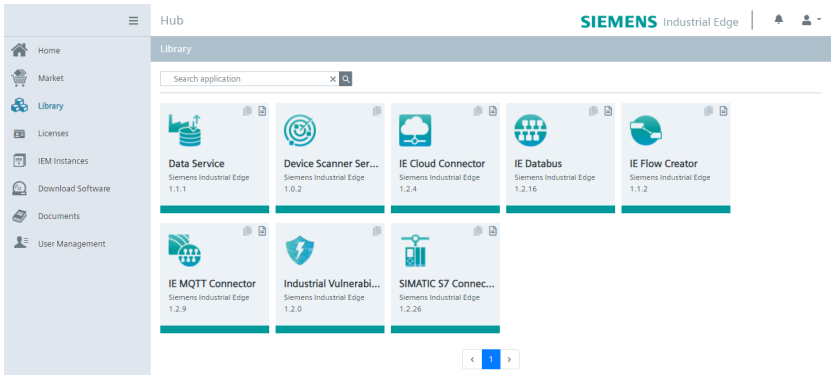
Procedure

To buy the license, follow these steps:

1. Click on the icon in the Energy Manager tile.
   The Siemens Industry Mall website is loaded.
2. Purchase the license for the app.
3. As soon as you have purchased the license, the icon for the license status turns green and the Energy Manager app is displayed in the "Library" tab of the IE Hub.

Result

You can see all apps for which you have purchased licenses in the "Library" tab:



From the "Library" tab, you can now transfer the Energy Manager app to your Industrial Edge Management (IEM) instance.

2.4.3 Copying the Energy Manager app from the IE Hub to the IEM catalog

Description

An IEM instance and an Internet connection are required to copy an app to the Industrial Edge Management catalog. With this functionality, you can copy the app directly into a catalog of one of your IEM instances.

Procedure

To copy an app into the IEM catalog, follow these steps:

1. Open the "Library" tab in the Industrial Edge Hub.
2. Click the icon in the desired app tile.
   The "Copy Application to IEM catalog" window opens. The layout of the window depends on whether the app contains links for open source software (OSS) and for the readme. The relevant file is downloaded when you click on one of the links. If the app does not support these links, the screen is shown without links.
3. In the selection list, select the IEM instance to which you want to copy the app.
4. Click "Copy".
   The app is copied, and a corresponding job is created. You can follow the status of the job in the status window of the corresponding IEM instance.

2.4.4 Installing the Energy Manager app on the IED

Description

You can install and start the Energy Manager app in the catalog of the Industrial Edge Management (IEM) instance. To be able to use the Energy Manager app on your corresponding Industrial Edge Device (IED), you must install the following apps on this IED:

- Data Service app
  With the Data Service app, you model the structure of your industrial process using assets and aspects and create the database for the Energy Manager app.
- Energy Manager app

Note

Industrial Edge Device (IED)

Both apps must be installed on the same IED.

Requirement

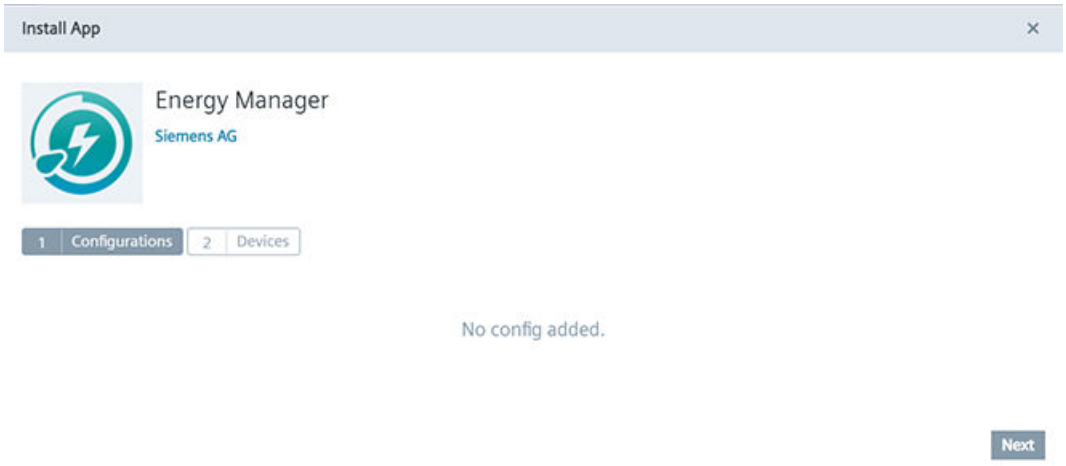
- You must be logged onto the Industrial Edge Management (IEM).
- The two apps (Energy Manager and Data Service) have been copied into the catalog. You can find additional information here: Copying the Energy Manager app from the IE Hub to the IEM catalog (Page 16)

Procedure

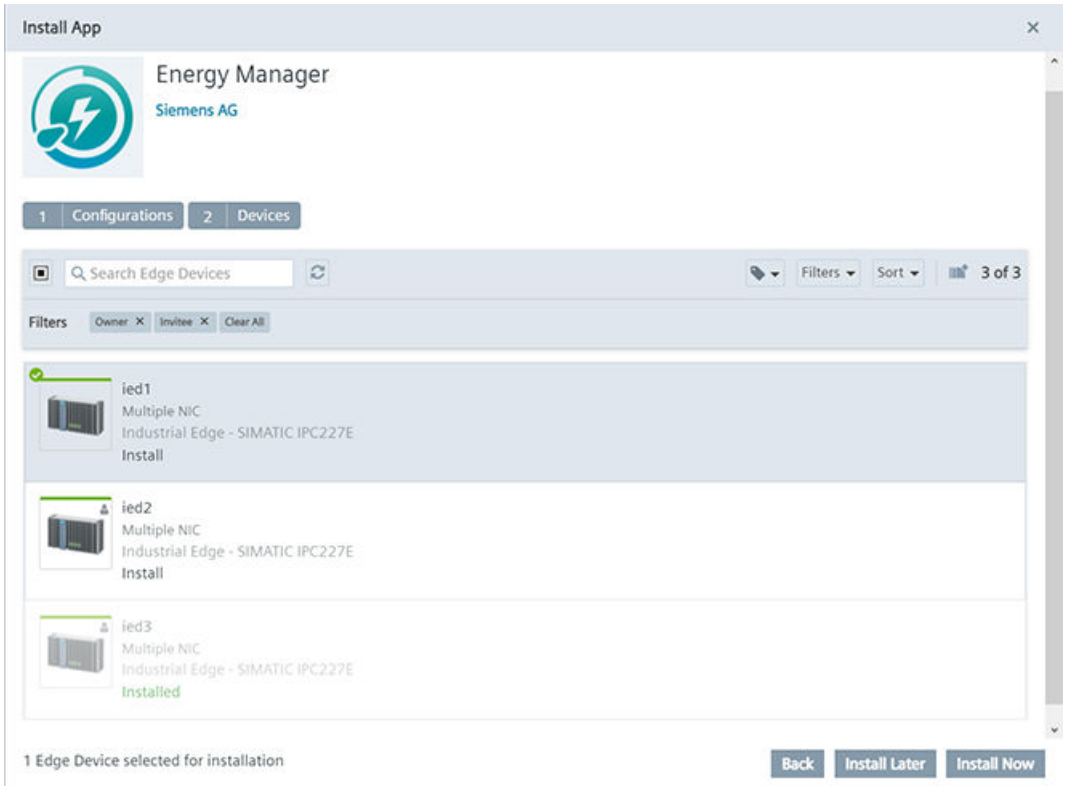
To install the Energy Manager app, follow these steps:

1. Open the "Catalog" tab.
2. Click on the "Energy Manager" tile.
   The following dialog box opens:

3. Click "Install".
   The "Install App" dialog window is displayed.

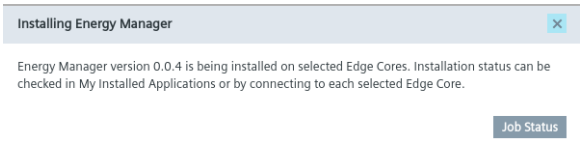


4. You can see a table with all associated IEDs. Select one or more IEDs on which you want to install the app:



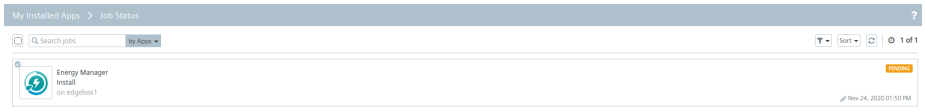
5. You have two options to continue:
   – Click "Install Later" to schedule the date and time of the installation.
   – Click "Install Now" to install the app immediately.
   When you click "Install Now", you will receive the following message:

6. Click "Allow".
   App installation is started on the selected IEDs.



Result

The Energy Manager app is listed in the "My Installed Apps" tab:



2.4.5 Starting the Energy Manager app on the IED

After you have installed the Energy Manager app and the Data Service app on the IED, the apps are displayed in the "Industrial Edge Management" in the "My Installed Apps" view.

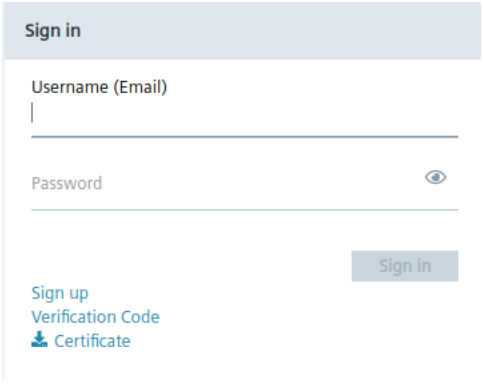
Requirement

All apps must be installed on the same Industrial Edge Device (IED).

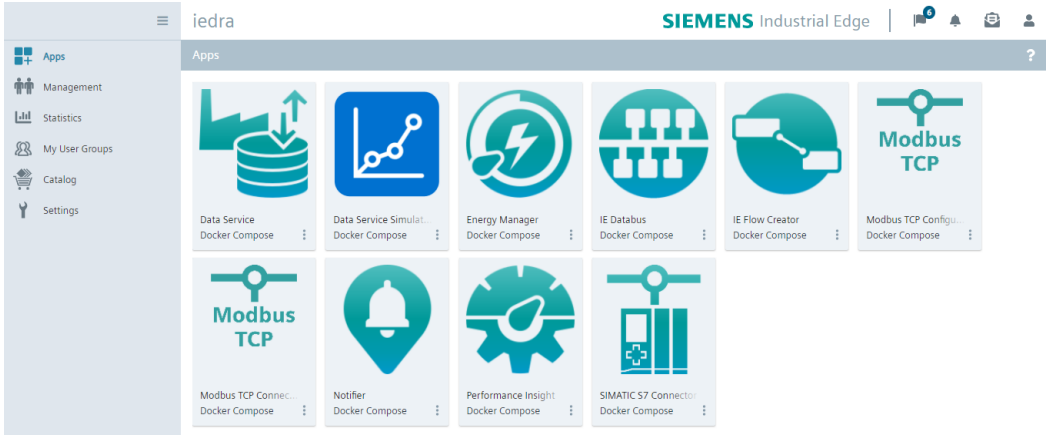
Procedure

To start the Energy Manager app, follow these steps:

1. Open the start page of the IED by entering the following URL address: "https:\\[IP address of the IED]"
2. Log in with "Email" and "Password":



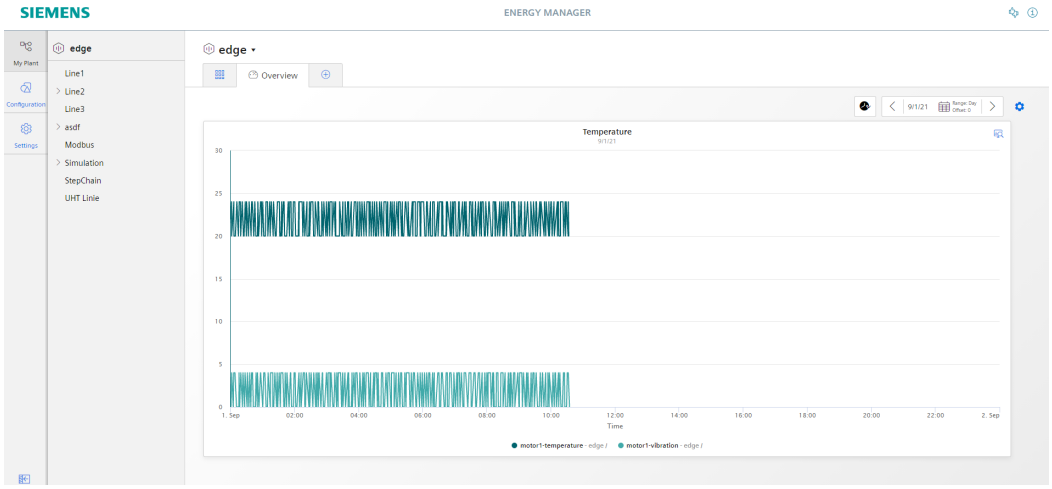
3. Open the "Apps" tab:



4. Click the Energy Manager tile to open the app in a new tab.

Result

The Energy Manager app is opened in a new tab sheet:



2.5 Installing the Energy Manager app on a Panel

2.5.1 Downloading and installing the Energy Manager app

Description

You can install and start the Energy Manager app on your Unified Comfort Panel (UCP) by downloading the APP files from the Siemens Industry Mall and transferring them to your Panel.

Requirement

- You need the APP files of the Data Service app.
  With the Data Service app, you model the structure of your industrial process using assets and aspects and create the database for the Energy Manager app.
- You need the APP files of the Energy Manager app.

Note

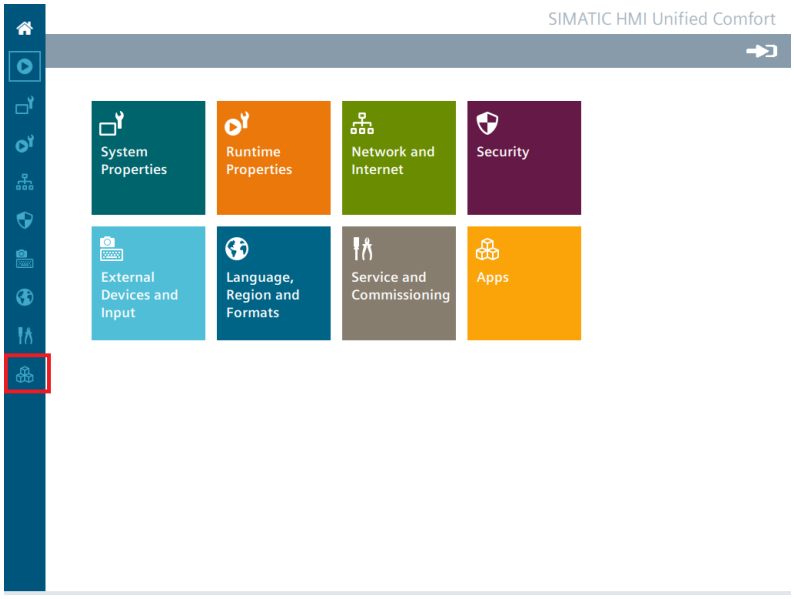
Installation of the apps

The Data Service app must be installed on the same Panel as the Energy Manager app.

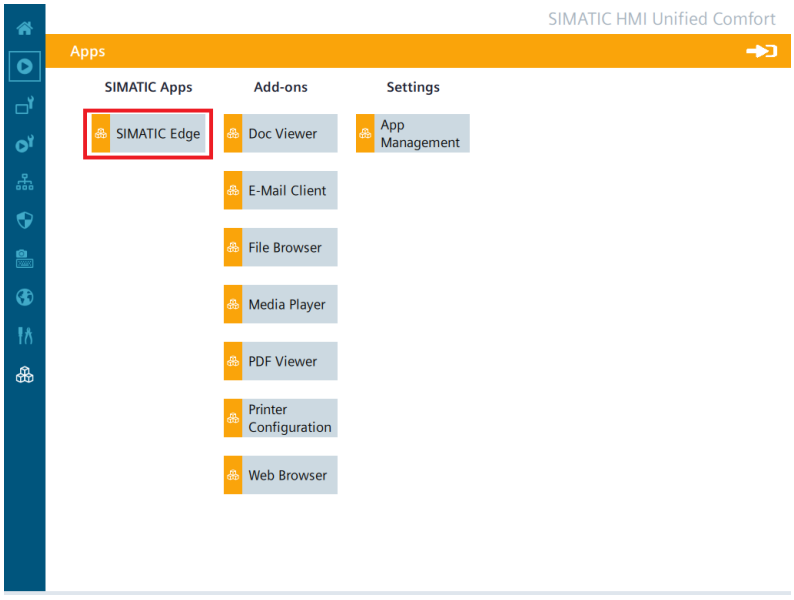
Procedure

To install the Energy Manager app and the Data Service app on your Panel, follow these steps:

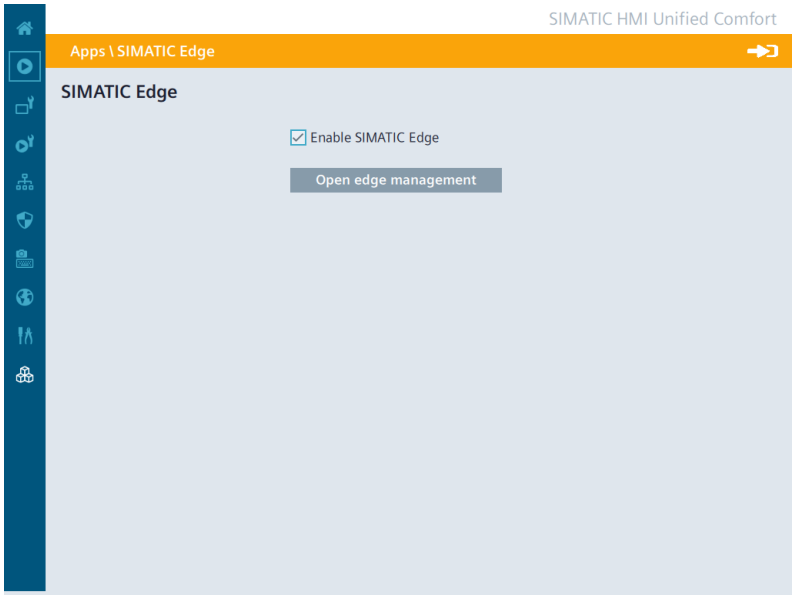
1. Download the app files from the Siemens Industry Online Support (SIOS).
2. Unzip the downloaded ZIP package.
3. Transfer the "DataServicex.x.app" and "EnergyManagerx.x.app" files to your Panel, using a USB stick, for example.
4. Click the "Apps" tab or tile on your panel:



5. Click "SIMATIC Edge" under "SIMATIC Apps":

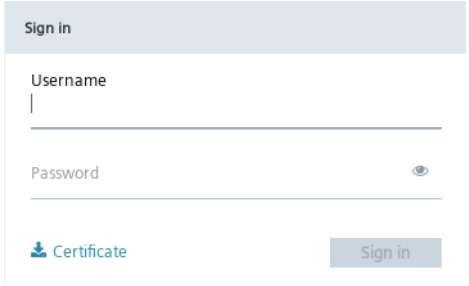


6. Select the "Enable SIMATIC Edge" option and click on "Open edge management":

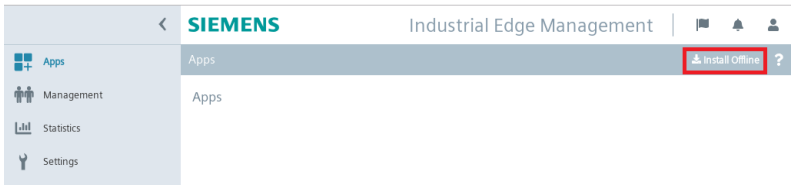


7. Log in to the Industrial Edge Management by clicking "Sign in":

8. Log in with "Username" and "Password":



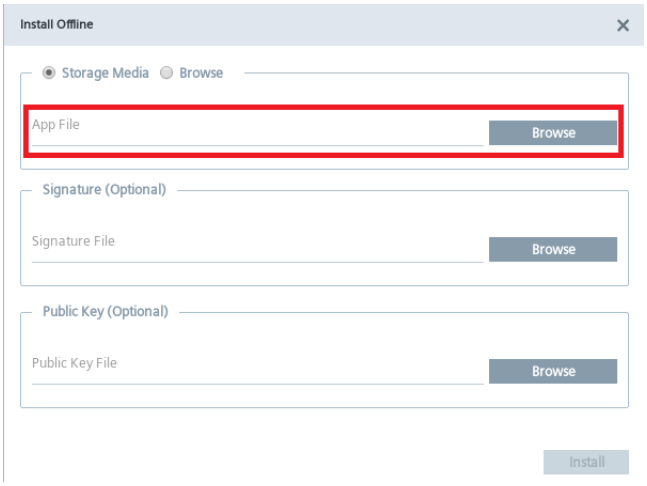
9. Click "Install Offline":



The "Install Offline" window opens.

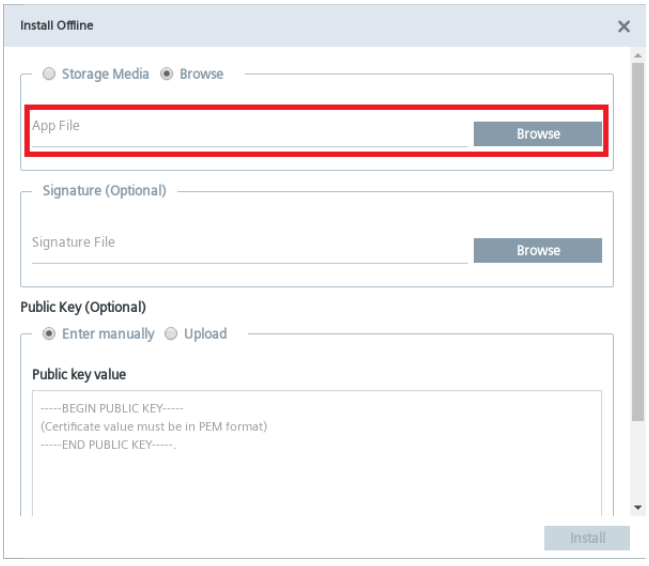
10. You have the following two options for selecting the APP files:

– If the files are on the storage medium, for example, a USB stick, then select "Storage Media" and click "Browse" in the "App File" area:



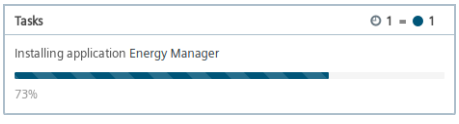
The storage area on the storage medium opens and you can select the required APP file.

– If you have copied the files from the storage medium, for example, a USB stick, to the system storage on the Panel, then select "Browse" and click "Browse" in the "App File" area:



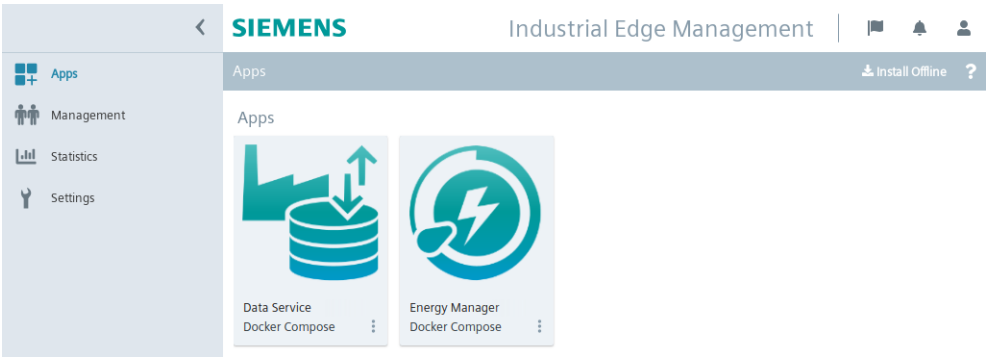
The system storage of the panel opens and you can select the required APP file.

11. Click "Install".



Result

The Energy Manager app is installed on the Panel:

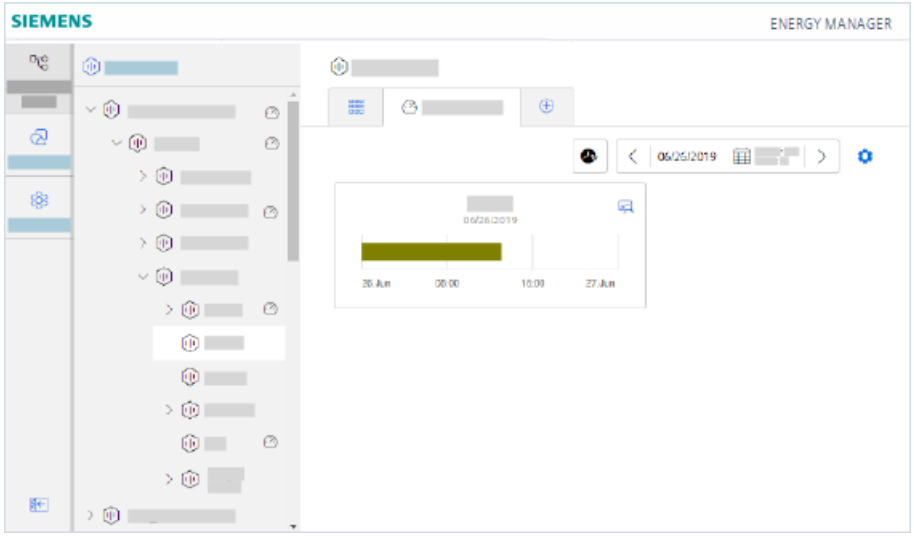


Structure of the app

3

Views in the app

The Energy Manager for Industrial Edge app shows the following tabs in the side navigation control:



	My Plant	My Plant is imported from the Data Service. • Here you manage the dashboard configuration of the plants. • Here you create the KPI instances. • You can create dashboards and widgets for individual elements of My Plant. • Energy media assignments, costs and the CO_2 equivalent of an energy medium can be configured in the Asset configuration.	
			Indicates that there is at least one dashboard within the asset.

	Configuration	• Here you access the table with the status mappings. • Here you manage the KPI types. • Here you can view the list of configured periods and create additional periods. • Here you manage the energy media. The actual status mapping to a variable or a KPI type takes place during configuration of the Gantt widget.
	Settings	Here you manage • User information (including the language region and the user roles) • Usage information (including the number of users and KPI instances) • User list You can find more information on user and usage information here: Show user profile (Page 29)

Show user profile

4

User information

To show the user profile of the logged-in user, open "Settings" > "User information".

Here you can change the language and language region in which the app is displayed.

The selection of the language region affects the display of numbers in the dashboards and widgets, such as decimal separators and dates. The language region can be selected independently of the user interface language.

User roles and authorizations

You have the following authorizations in line with your user role:

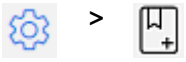
Activities	Users	Administrator
Create and instantiate KPI types (typed)	-	x
Create KPI instances (typeless)	-	x
Create, edit and delete dashboards	-	x
Create, edit and delete widgets	-	x
Display dashboards	x	x
Display widgets	x	x
Create, edit and delete status mappings	-	x
Define limit values for variables and KPI instances and enable the "Activate notifications" function	-	x
Define a time model (time categories)	-	x
Define OEE settings for OEE analysis	-	x
Create multivariable regression	-	x
Create reports	-	x
Define your own time ranges	-	x

Note

User roles on Unified Comfort Panels (UCP)

The only user role on the Unified Comfort Panel is the administrator user role.

Usage information

 >

In the usage information, you can view the number of assets at which dashboards were configured or KPI instances were created on a monthly basis.

When the maximum number of assets (3) has been reached, you must purchase an additional license. For licensing, only the assets at which dashboards were configured or KPI instances were created are counted.

Note

Automatically created KPI instances

Automatically created KPI instances are not included in the number of assets because they do not result in additional costs.

Note

Unified Comfort Panel (UCP)

You can currently not display any usage information on the Unified Comfort Panel because it is a test version.

Deleting users

To free up a user license, you can deregister yourself as a user from the Energy Manager app:

1. Open the "Settings" tab.
2. Under "User information > User account", click on the "Deregister" button.

Quality codes

5

Description

The quality code measures the quality of a value when it is transferred from a CPU via the connector to the Data Service and Energy Manager.

There are three different types of qualities:

- GOOD
- UNCERTAIN
- BAD

The Data Service saves all values, regardless of the type of quality, and forwards them to the Energy Manager. In the Energy Manager, the values are then taken into account or ignored according to their quality.

If the quality is GOOD or UNCERTAIN, the values are taken fully into account in the app.

What does it mean if the value has the quality BAD:

- This value is not taken into account when calculating KPIs.
- The value is also saved when the raw data is saved.

You can find additional information on the topic of quality code in the documentation of the Data Service: Data Service at Siemens Industry Online Support (https://support.industry.siemens.com/cs/document/109781417/data-service-for-industrial-edge?dti=0&lc=en-WW)

Variable declarations

6

6.1 Introduction to variable declarations

Description

The variables that are available on each asset were transferred from the plant using the Data Service. In the Energy Manager, My Plant with all existing variables is mapped on this basis.

From the Data Service, the name, unit, data type, connector and the tags are transferred via the corresponding S7 connector for each variable.

See also

Variable declarations on the asset (Page 34)

Variable declaration in the widget (Page 40)

6.2 Variable declarations on the asset

Description

You can extend the declaration of each variable directly on the asset in the "Parameter" area by the following properties:

- Unit: You can either apply the unit transferred from the Data Service Configurator or specify your own unit.
- Acquisition category:
  You use the acquisition category to determine how the value was acquired. In addition, the acquisition category is linked directly to an aggregation function. As soon as you use the variable in a widget, the respective aggregation function is automatically selected:
  - Process value (ProcessValue) ⇒ aggregation function: Average
  - Power value (Power) ⇒ aggregation function: Average
  - Consumption value (Energy) ⇒ aggregation function: Sum
  - Flow value (Flow) ⇒ aggregation function: Average
  - Quantity value (Amount) ⇒ aggregation function: Sum
  - Count value (Counter) ⇒ aggregation function: Counter
    When you select the acquisition category "Counter", you can define additional settings for each counter used.
    Additional information on the counting method of the individual counters can be found here: Introduction to the "Counter" acquisition category (Page 40)
  - Status value (State)
- Activate the "The value is aggregated" function:
  If the value is not aggregated, the values are continuously (actual values) transferred when the value changes. The currently transferred value is valid until the next value is transferred. When the value is aggregated, the value is always valid for the last cycle, e.g. 15 minutes. We recommend that you activate the function for the energy media analysis.
  You can find additional information on the aggregation functions here: Introduction to the aggregation functions (Page 43)

Note

Data gaps

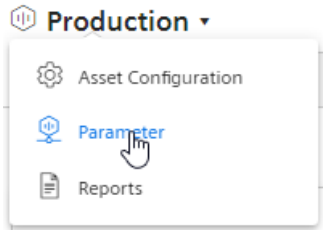
Data gaps occur, for example, when the connection to the network is interrupted. No data from the plant is transferred during the interruption.

When you have activated the "The value is aggregated" function and are using an acquisition category with the "Sum" aggregation function, data gaps will distort the final result.

Procedure

To extend the declaration of a variable on the asset, follow these steps:

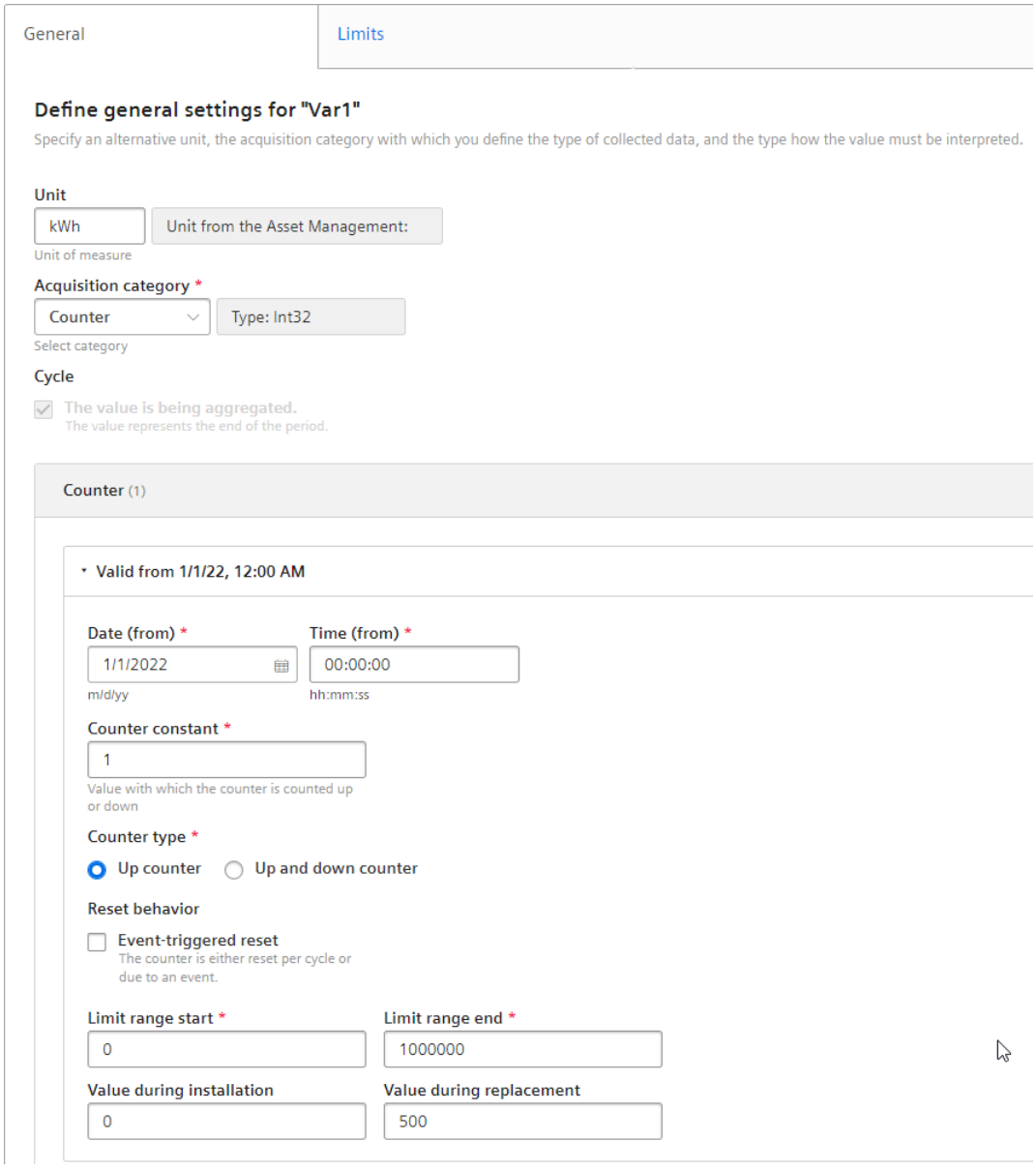
1. Select an asset in My Plant.
2. Open the "Parameter" view by clicking on the arrow next to the asset name:



3. Filter the view so that only variables are displayed:

4. Next to the variable, click on the "Edit" icon:

5. Select the desired properties.
   In addition to the acquisition category, the data type of the variable that is transferred from the Data Service is displayed:



6.3 "Activate notifications" for variables of the data type "Integer" and KPI instances

Description

For each tag of the "Integer" data type and for KPI instances (user-defined and automatically created), you can define high and low limits that trigger a notification when these high or low limits are violated. This notification is displayed in the Notifier for Industrial Edge app and sent directly to the desired mobile device.

Note

Notifier for Industrial Edge

The Notifier must also be installed on the same Industrial Edge Device (IED) so that you can activate the "Activate notifications" function.

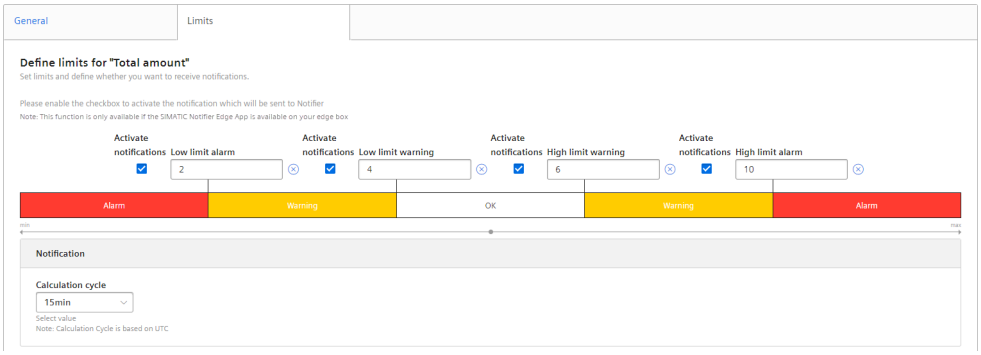
The limits defined here for the tag or user-defined KPI instance are applied by default in the widget as soon as the tag or KPI instance is used. You can adapt the limits in the widget if necessary. This does not apply to automatically created KPI instances.

Procedure

To enable the "Activate notifications" function, proceed as follows:

1. Click on the required asset and open the "Parameter" area.
2. Click the "Edit" icon next to the desired variable or KPI instance, or create a new KPI instance.

3. Click on the "Limits" tab.
   You can select the check box for the respective notification next to the fields "Low limit alarm/ warning" and "High limit alarm/warning". As soon as the function is activated and the specified high or low limit has been violated, a notification is triggered and sent to the mobile device.
4. You can also select the following settings in the "Notification" section:
   - For tags:
     Select whether the raw data or the aggregated data should be validated.
     If you want to validate the raw data, a fixed calculation cycle of 10 seconds is used.
     If you want to validate the aggregated data, you need to select a calculation cycle and an aggregate function. The following calculation cycles are available:
     1 min, 10 min, 15 min, 30 min, 1 hr, 2 hr, 8 hr, 1 day
     The calculation cycle always starts at 00:00 UTC time (Universal Time Coordinated), e.g. 00:00:00; 00:15:00; ...
     For example, if you define a calculation cycle of 15 minutes, the system checks every 15 minutes whether or not a high or low limit has been violated and sends a notification if necessary.
     The following aggregation functions are available: Introduction to the aggregation functions (Page 43)
   - For KPI instances:
     Select a calculation cycle:
     1 min, 10 min, 15 min, 30 min, 1 hr, 2 hr, 8 hr, 1 day
     The calculation cycle always starts at 00:00 UTC time (Universal Time Coordinated), e.g. 00:00:00; 00:15:00; ...
     For example, if you define a calculation cycle of 15 minutes, the system checks every 15 minutes whether or not a high or low limit has been violated and sends a notification if necessary.



6.4 "Activate notifications" for variables of the data type "Bool" and "String"

Description

For each variable of the "Bool" or "String" data type, you can define conditions that trigger a notification. This notification is displayed in the Notifier for Industrial Edge app and sent directly to the desired mobile device.

Note

Variables of the data type "Bool" or "String"

You can activate notifications for these tags.

- You cannot use a tag of the data type "String" as a parameter in a widget or a KPI instance.
- You cannot use a tag of the data type "Bool" as a parameter in a widget or a KPI instance.

Limits can also be defined, but these limits are not transferred to the widget.

Note

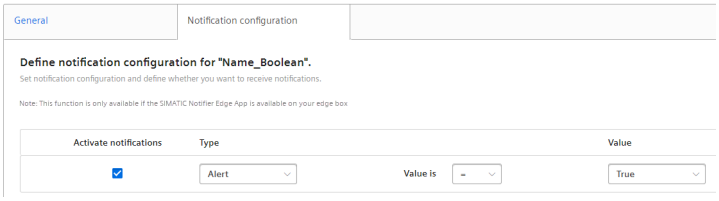
Notifier for Industrial Edge

The Notifier must also be installed on the same Industrial Edge Device (IED) so that you can activate the "Activate notifications" function.

Procedure

To enable the "Activate notifications" function, proceed as follows:

1. Click on the required asset and open the "Parameter" area.
2. Click the "Edit" icon next to the desired variable (Bool or String).
3. Click on the "Notification configuration" tab.



4. Select the check box under "Activate notifications".
5. Select a notification type:
   - Alert
   - Warning
6. Select "=" or "<>" as operator and enter a value:
   - For the data type "Bool": "True" or "False"
   - For the data type "String": Enter a value.
7. Click "Save".

Result

A green check mark appears in the parameter list next to the desired variable in the "Notification activated" column.

6.5 Variable declaration in the widget

Description

When you create a widget, you can select one of the following aggregation functions for a variable in step 3 "Parameter":

- None (Only with diagram)
- Average
- Min
- Max
- Sum
- Last
- Counter
- Timer
- EnergyToPower
- PowerToEnergy
- AmountToFlow
- FlowToAmount

You can find additional information on the individual aggregation functions here: Introduction to the aggregation functions (Page 43)

6.6 "Counter" acquisition category

6.6.1 Introduction to the "Counter" acquisition category

Description

You can define properties for each counter:

- Installation date
- Installation time
- Counter constant (value by which the counter is counted up or down, e.g. 1 kWh.)

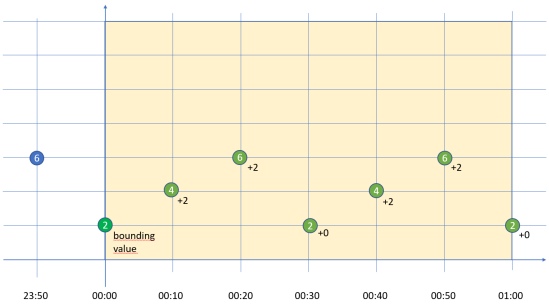
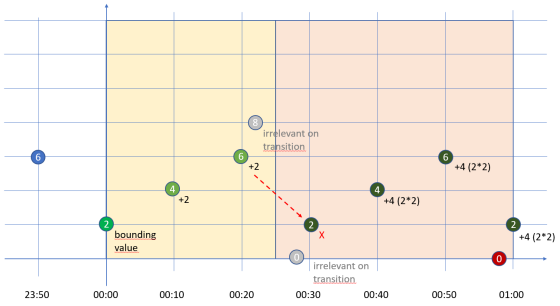
- Counter types
  - Up counter = The counter can only count up. As soon as a subsequent counter value is less than the current one, it is treated as an overflow and the counter is restarted.
  - Up & Down counter = The counter can count up and down. You can not only calculate the energy consumption of an energy medium, for example, but you can also detect when energy is fed back.
- Reset behavior (Only for an Up counter: You can specify whether the counter is reset daily or by an event, such as a defined overflow limit.)
- Overflow limit (If you have not activated the reset behavior, the counter is automatically reset when it reaches the specified count limit.)
- Value at installation (Here you can specify the actual value at which the counter is to start. If the counter is not to start with the start value of the limit range.)
- Value at replacement of the counter

6.6.2 Counting method of the "Up" counter

Description

Only positive changes in value are recorded. The sum of the positive value changes between two points in time is output in each case. If the value remains the same between two points in time or is reduced, the value is not counted.

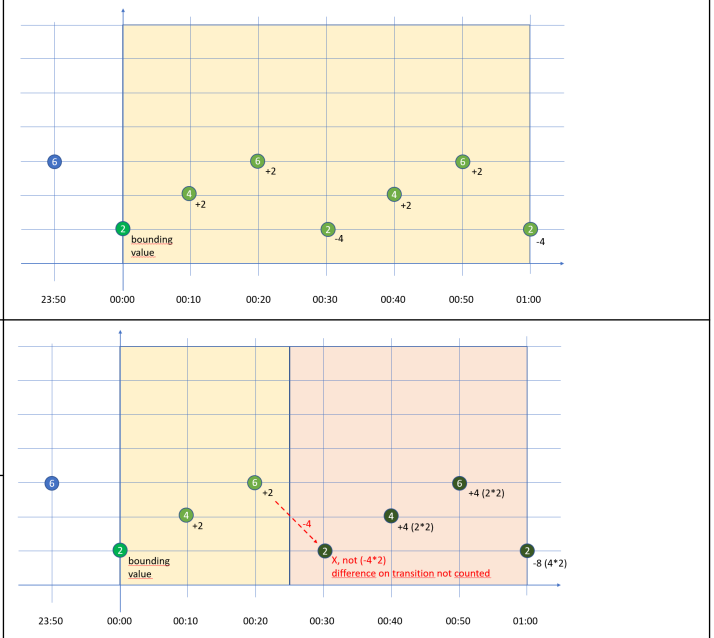
Depending on the settings you select for a counter, you will see different counter values as a result. By default, the "The value is aggregated" function is activated:

<table>
<tr><th>Settings</th><th>Explanation</th></tr>
<tr><td>Start and end of the limit range is not defined.
Result: + 2 + 2 + 0 + 2 + 2 + 0 = 8</td><td> 
</td></tr>
<tr><td colspan="2">When you change the counter, you can define different settings for each counter. This example shows the transition from one counter to the next:
<table><tr><td>Counter for the year 2018
00:00 - 00:25
Counter constant: 1
End of the limit range: 8
Result: + 2 + 2 = 4</td><td>Counter for the year 2019
00:25 - 01:00
Counter constant: 2
Start of the limit range: 0
Result: + 4 + 4 + 0 + 4 = 12</td></tr></table></td><td rowspan="2"> 
</td></tr>
<tr><td colspan="2">Final result: 4 + 12 = 16</td></tr>
</table>

6.6.3 "Up & Down" counting method of the counter

Description

Depending on the settings you select for a counter, you will see different counter values as a result. By default, the "The value is aggregated" function is activated. You cannot define any limit ranges for the "Up & Down" counter.

<table>
<tr><th>Settings</th><th>Explanation</th></tr>
<tr><td>Result: + 2 + 2 - 4 + 2 + 2 - 4 = 0</td><td rowspan="3"> 
</td></tr>
<tr><td>When you change the counter, you can define different settings for each counter. This example shows the transition from one counter to the next:
<table><tr><td>Counter for the year 2018
00:00 - 00:25
Counter constant: 1
Result: + 2 + 2 = 4</td><td>Counter for the year 2019
00:25 - 01:00
Counter constant: 2
Result: + 4 + 4 - 8 = 0</td></tr></table></td></tr>
<tr><td>Final result: 4 + 0 = 4</td></tr>
</table>

6.7 Aggregation functions

6.7.1 Introduction to the aggregation functions

Description

You use an aggregation function to select which value is to be output for a variable.

- Output the last read value with "Last".
- Use the other functions to gather summary information from the read values, for example, the sum of all read values.

The following aggregation functions are available:

Function	Meaning
Average	Calculates the time-weighted average value of the read values.
Min	Outputs the smallest read value.
Max	Outputs the largest read value.
Sum	Adds all read values.
Last	Outputs the last read value.
Counter	The sum of the positive value changes between two points in time is output in each case.
Timer	The Timer calculates the time interval in which the variable was not 0. Unit = milliseconds.
EnergyToPower	A consumption value can be converted into power. This aggregation function can only be selected in combination with the acquisition category consumption value (Energy) and Counter.
PowerToEnergy	Power can be converted into a consumption value. This aggregation function can only be selected in combination with the acquisition category power value (Power).
AmountToFlow	An amount (per hour) can be converted directly into a flow value. This aggregation function can only be selected in combination with the acquisition category amount value (Amount) and Counter.
FlowToAmount	A flow value (amount/h) can be converted directly into an amount value. This aggregation function can only be selected in combination with the acquisition category flow value (Flow).

Note

Activating the interval in the first step of the Widget wizard

For this function to be executed, the aggregation function of the variable must not be set to "None" because the values are displayed directly in the widget without further processing in this case.

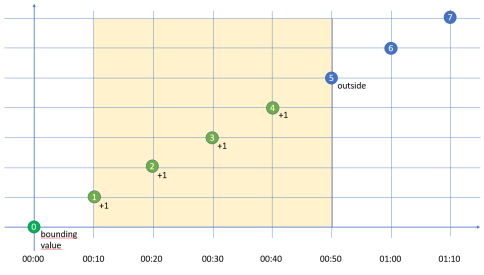
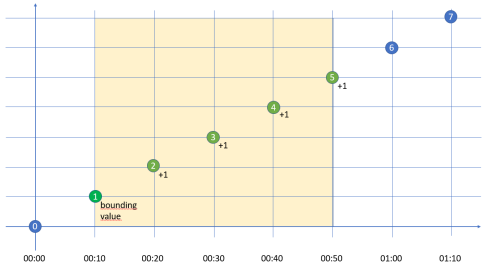
6.7.2 Aggregation functions in combination with the "The value is aggregated" function:

Description

For each variable and thus for each aggregation function, you can activate the "The value is aggregated" function:

"The value is aggregated" = not activated	"The value is aggregated" = activated
When the "The value is aggregated" function is not activated, actual values are transferred every 10 minutes, for example. The respective actual value is valid for 10 minutes until the next actual value is transferred. If the time of the last reading operation is identical to the end of the specified period, the last value is not read.	When the "The value is aggregated" function is activated, no actual values are transferred, but the value that has already been calculated or processed in the last 10 minutes is transferred. Application example: A temperature measured value is recorded in the plant every minute, and an average value of the recorded values is then transferred every 10 minutes.
Result: Different results are calculated for the same time range, depending on the initial situation of how you want to collect data. Only the values marked in green are taken into account for the calculation of the result.	

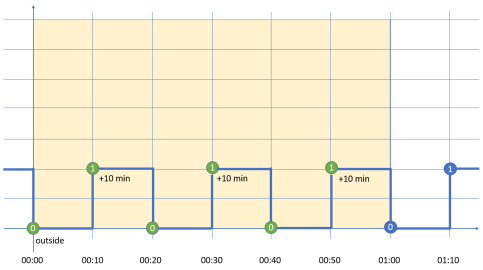
"Counter" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
	
Calculation example: The calculation period is from 00:10 to 00:50. Result: 1 + 1 + 1 + 1 = 4	Calculation example: The calculation period is from 00:10 to 00:50. Result: 1 + 1 + 1 + 1 = 4

"Timer" aggregation function

The timer calculates the time interval in which the variable was not "0". Unit = milliseconds.

For the timer, the "The value is aggregated" function is always = False.

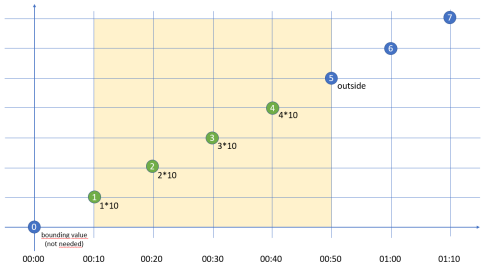
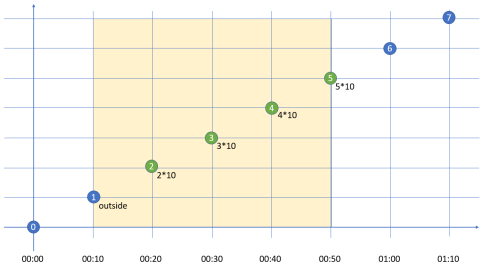


Calculation example:

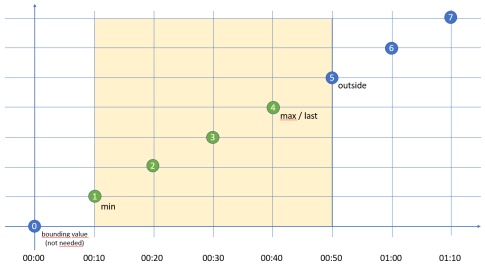
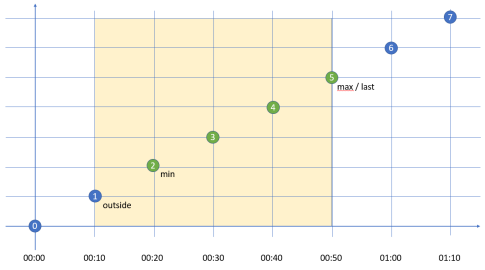
The calculation period is from 00:00 to 01:00.

Result: 10 Min + 10 Min + 10 Min = 30 Min => 30 * 60 * 1000 ms => 1,800,000 ms

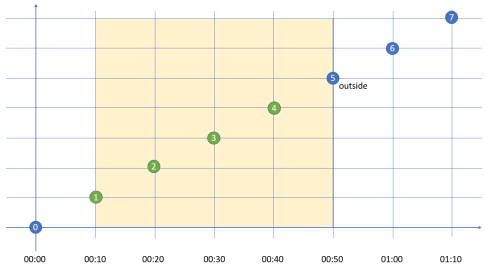
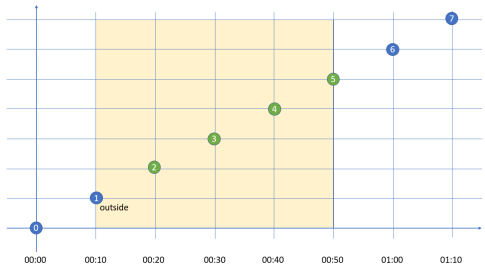
"Average" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
	
Calculation example: The calculation period is from 00:10 to 00:50. (10 + 20 + 30 + 40) / 40 = 2.5 (average value across the calculation period)	Calculation example: The calculation period is from 00:10 to 00:50. (20 + 30 + 40 + 50) / 40 = 3.5 (average value across the calculation period)
The aggregation function determines the weighted average depending on the time interval (every 10 minutes). If the time interval changes within a period, e.g. from 10 minutes to 12 minutes, then the values with the time interval 10 minutes are first added and divided by the number of read values. The values are then added together with the time interval 12 minutes and divided by the number of values read. The weighted average is formed from the two results of the two time intervals (result1 + result2)/ 2=x.	

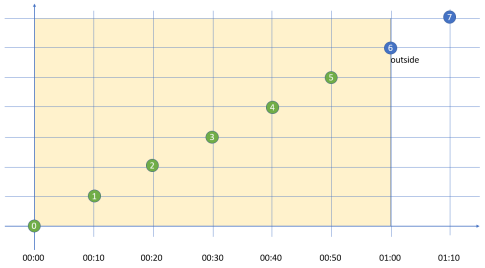
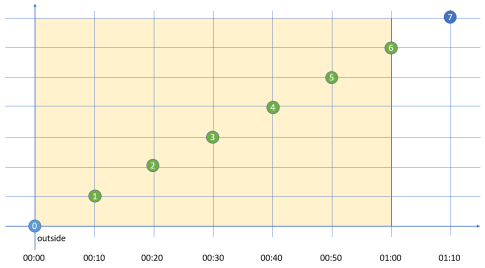
"Min", "Max" and "Last" aggregation functions

"The value is aggregated" = not activated	"The value is aggregated" = activated
	
Calculation example: The calculation period is from 00:10 to 00:50. Min: 1 Max: 4 Load: 4	Calculation example: The calculation period is from 00:10 to 00:50. Min: 2 Max: 5 Load: 5

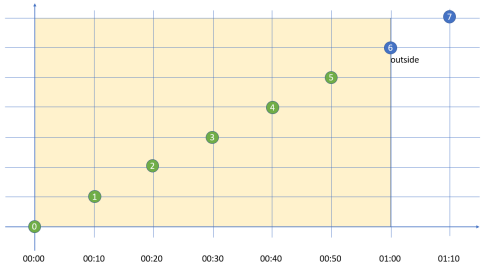
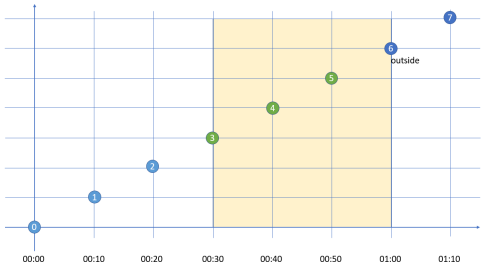
"Sum" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
	
Calculation example: The calculation period is from 00:10 to 00:50. 1 + 2 + 3 + 4 = 10	Calculation example: The calculation period is from 00:10 to 00:50. 2 + 3 + 4 + 5 = 14

"AmountToFlow" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
	
Calculation example: The calculation period is from 00:00 to 01:00. Sum: 0 + 1 + 2 + 3 + 4 + 5 = 15 AmountToFlow: Sum / time in hours = 15 / 1 = 15	Calculation example: The calculation period is from 00:00 to 01:00. Sum: 1 + 2 + 3 + 4 + 5 + 6 = 21 AmountToFlow: Sum / time in hours = 21 / 1 = 21

"EnergyToPower" aggregation function

"The value is aggregated" = not activated	"The value is aggregated" = activated
	
Calculation example: The calculation period is from 00:00 to 01:00. Sum: 0 + 1 + 2 + 3 + 4 + 5 = 15 AmountToFlow: Sum / time in hours = 15 / 1 = 15	Calculation example: The calculation period is from 00:30 to 01:00. Sum: 3 + 4 + 5 = 12 AmountToFlow: Sum / time in hours = 12 / 0.5 = 24

Example of process tags of BOOL data type

This example only applies when the "The value is aggregated" function is not activated:

- Only the values = "1" are added.
- Time intervals are only recorded when the new value = "1" (Timer).
- One value is read every 10 minutes between 10:00 a.m. and 11:00 a.m., i.e. six in total. One value is read every 12 minutes between 11:00 a.m. and 12:00 a.m., i.e. five in total. Because the last reading operation takes place at 12:00 a.m. and the evaluation period also ends at 12:00 a.m, the last value is not read. To evaluate the last value at 12:00 a.m., you must set the end of the evaluation period to at least 12:01 a.m.

Time	Sum (BOOL)	INT	Timer (BOOL)	In minutes
10:00	1	1	1	+ 10
10:10	1	2	1	+ 10
10:20	1	3	1	+ 10
10:30	1	4	1	+ 10
10:40	1	1	1	+ 10
10:50	1	2	1	+ 10
11:00	0	0	0	
11:12	1	3	1	+ 12
11:24	1	4	1	+ 12
11:36	1	5	1	+ 12
11:48	1	2	1	+ 12
12:00	1	0	1	+ 12
Result	10	27		108 (1 h 48 min)
Aggregation function	Sum	Sum	Timer	Timer

Evaluation:

- The "Sum" aggregation function returns the result = 10
  All values = "1" between 10:00 a.m. and 11:48 a.m. are added.
- The "Timer" aggregation function returns the result = 108 minutes (1 hour 48 minutes)
  The sum of all time intervals with the state "1" is recorded. The value "1" is read six times between 10:00 and 10:50, with 10-minute intervals between each read. This results in a sum of 60 minutes. No value is read at 11:00. The value "1" is read four times between 11:12 and 12:00. The time interval is 12 minutes each. This results in a sum of 48 minutes. The total is a sum of 108 minutes or 1 hour 48 minutes or 6,480,000 milliseconds.

6.7.3 Calculation example for the aggregation function EnergyToPower

Description

In the source system, the energy consumption is measured for a 15-minute period in kWh. For a detailed analysis, you want to display the power in the dashboard in a 2-hour interval. In this case you can use the variable with the consumption values (Var1) directly and select "EnergyToPower" as the aggregation function. In the dashboard, you configure the calculation period of two hours in the widget configuration.

Calculation: In the first step, the function calculates the energy consumption for the 2-hour period and then converts it into power.

Calculation example: Consumption 120 kWh for 2 hours = results in a power of 120 kWh/2 h = 60 kW.

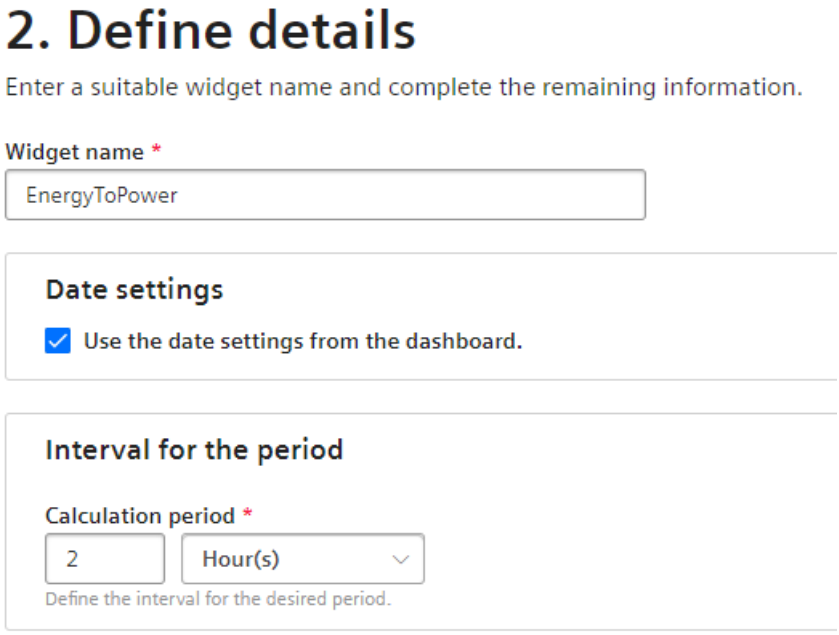
Requirement

You have declared a variable with the unit "kWh" and the acquisition category "Energy" (consumption value).

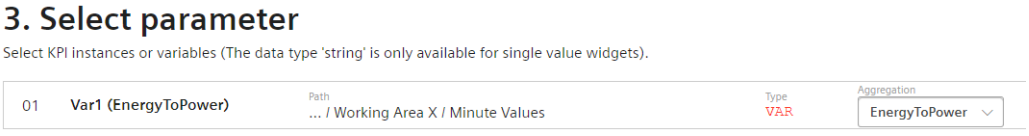
Procedure

To calculate the example in a widget, follow these steps:

1. Create the "Diagram" widget at an asset.
2. Enter 2 hours as the calculation period:



3. Select the previously declared variable and set "EnergyToPower" as the aggregation function:



Result

The value 60 is displayed in the dashboard for this 2-hour period.

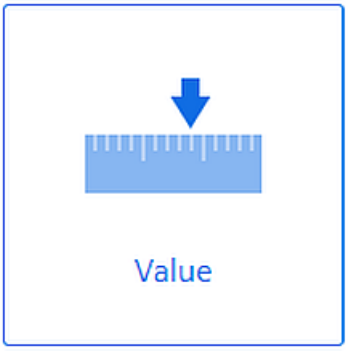
Data analysis

7

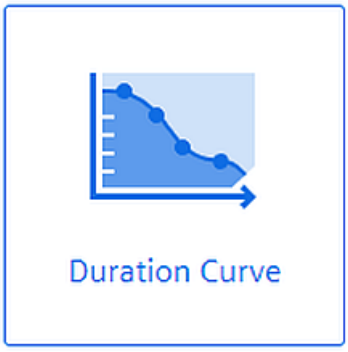
7.1 Introduction to data analysis (widgets)

Description

The following widget are available for data analysis:

Widget type	Description
	Displays the value of variables or KPI calculations as a diagram over time. You can find additional information here: Visualizing correlations in the diagram (Diagram) (Page 59)
	Displays the current value of a variable or a KPI. You can find additional information here: Visualizing individual values (Value) (Page 61)
	The Gantt widget shows you the status of a device at a glance using different color codes. For example, the status can represent the current state or the state within a specific time range. This allows you to see at a glance, for example: • When the device started up and how long it was in the "RUN" operating state. • When it switched to the "STOP" operating state and how long it remained in this state. You can find additional information here: Visualizing machine statuses (Gantt) (Page 63)

Widget type	Description
	Using the gauge, you can display limit values very simply using colors and thus recognize at a glance whether limit values are exceeded. You can find additional information here: Visualizing the violation of limit values (gauge) (Page 65)
	Using the pie chart, you can display the distribution of consumption or quantities very simply. Clicking on a segment highlights the segment and displays the corresponding value. You can find additional information here: Visualizing the distribution of consumptions or quantities (Pie chart) (Page 67)
	Using the Heatmap, you can visualize the intensity of data values. You can, for example, display the energy consumption (green = low consumption; red = high consumption). You can find additional information here: Visualizing the intensity of data values (Heatmap) (Page 69)

Widget type	Description
	In the Sankey diagram, energy and material flows can be displayed as arrows whose width is proportional to the flow rate. This makes it easy for you to recognize, for example, how energy is flowing through your plant. You can find additional information here: Visualizing energy flows (Sankey) (Page 71)
	By using the duration curve, you can visualize a chart sorted by size. You can find additional information here: Visualizing a chart sorted by size (Duration curve) (Page 72)

Error display in the widget

If a network error occurs or an operand required to display the widget has been deleted, for example, the error symbol is shown in the bottom right corner of the widget.

7.2 Creating a widget

Requirement

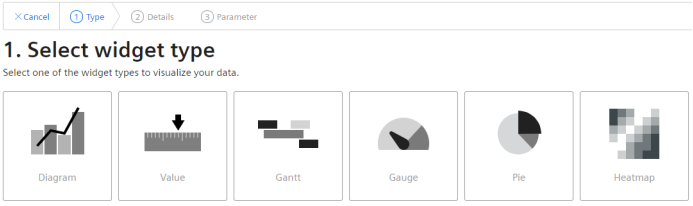
To visualize and calculate the data from the plant, such as production figures, machine operating times or water consumption, using KPIs, these figures must be transferred from the plant using the Data Service. The data structure of your plant is then automatically displayed in the app.

At least one dashboard is created on the desired asset.

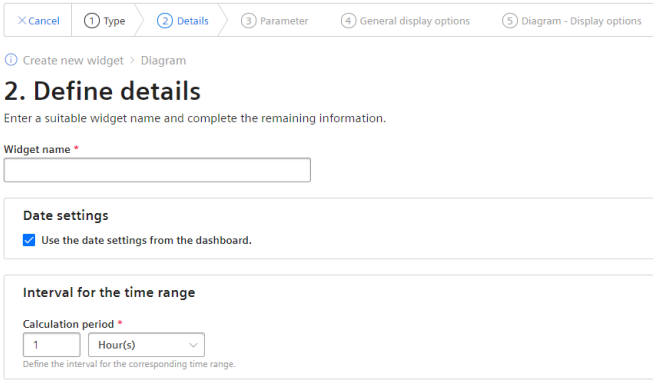
Widget configuration

A wizard will guide you through the individual steps when creating a widget. However, the first four steps are identical for all widget types:

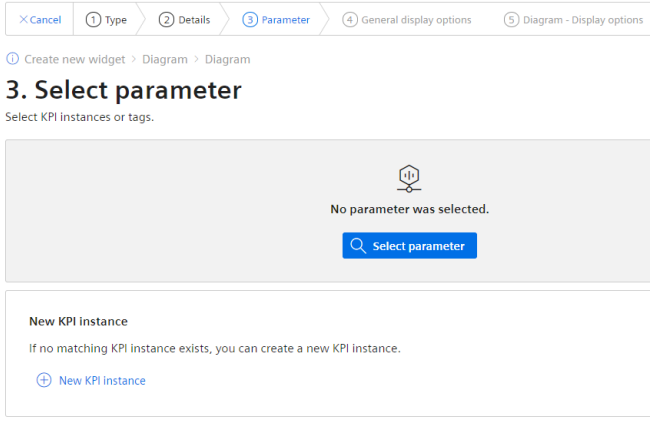
- Step 1: Select the widget type



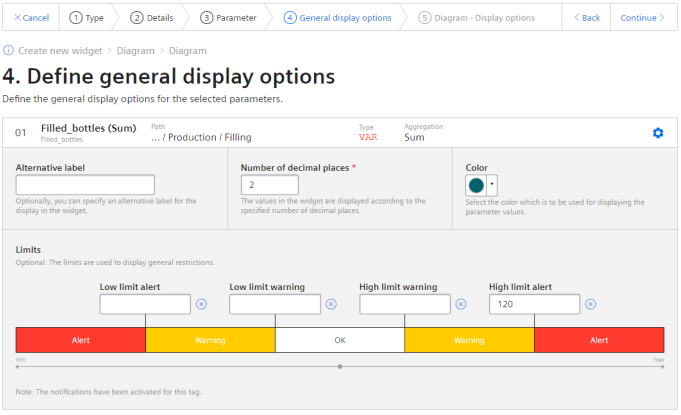
- Step 2: Define details



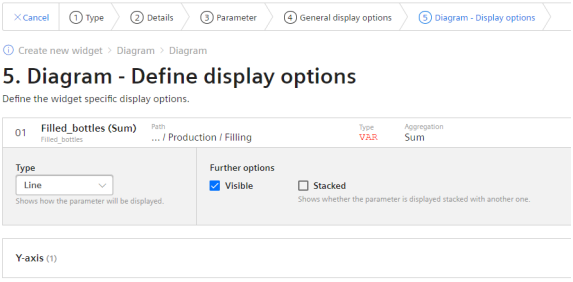
- Step 3: Select parameters



- Step 4: Define general display options



- Step 5: Define widget-specific display options



Procedure for creating the general steps of a widget

To create a widget, follow these steps:

1. Either click "Create first widget" or click and "New widget" and select a widget type.
2. Assign a name and define the date settings:
   Define date settings:
   With the date settings you define the time range from which the values are to be visualized. You can apply the dashboard date settings to a widget or define your own date settings for this widget.
   The following variants are available for setting your own date:
   - Default: "Use the date settings from the dashboard" to use the time range that is defined in the dashboard.
   - You disable "Use the date settings from the dashboard" to define a specific time range. You have the following options to do this:
     Default: "Use current date" and enter the duration (e.g. week) under "Time range". The start and end time are given by the predefined time ranges (day, week, month, year, etc.). If you prefer, you can also disable "Use current date" and enter the start date and start time manually. The end time is calculated based on the duration under "Time range". Under "Offset", you can enter the number of days, weeks, months or years by which the start time should be postponed. The start time can be either in the future or in the past.

   If you use the dashboard date settings for the widget, all changes to the date settings are displayed directly in all widgets of the dashboard.
   Define interval:
   You can also specify an interval at which the values are to be displayed, for example, every 5 minutes, every 2 hours, etc.
3. You can select either a variable or a KPI type as parameter. Up to 10 parameters can be defined.
   For each variable you can select one of the aggregation functions (Average, Min, Max, Sum, Last, Counter, Timer, EnergyToPower, PowerToEnergy, AmountToFlow, FlowToAmount).
   You can find additional information on the aggregation functions here: Introduction to the aggregation functions (Page 43)
   In this step, you can also directly create KPI instances and link the operands with the desired parameters.
   You can find additional information on KPI instances here: Introduction to KPI calculations (Page 77)

4. In the general display options, you can assign an alternative label for the variable or KPI type. This label is then displayed in the legend in the detail view instead of the asset and the aspect name of a parameter.
   In this step, you can also enter the limit values for warnings and alerts.
   - Red = the alert limit was violated
   - Yellow = the warning limit was violated

   The limit values are also displayed in the detail view as dashed lines.
   You can also specify the number of decimal places and a color for each parameter in which the graph is displayed in the detail view.
   If you have already defined limits for the variable or KPI used, these are displayed in the widget as pre-setting. However, these limits can be overwritten at any time.
5. In this last tab, you define all the widget-specific details. You can find additional information on the respective details of the widgets here:
   - Visualizing correlations in the diagram (Diagram) (Page 59)
   - Visualizing individual values (Value) (Page 61)
   - Visualizing machine statuses (Gantt) (Page 63)
   - Visualizing the violation of limit values (gauge) (Page 65)
   - Visualizing the distribution of consumptions or quantities (Pie chart) (Page 67)
   - Visualizing the intensity of data values (Heatmap) (Page 69)
   - Visualizing energy flows (Sankey) (Page 71)
   - Visualizing a chart sorted by size (Duration curve) (Page 72)

7.3 Visualizing correlations in the diagram (Diagram)

Description

Displays the value of variables or KPI calculations as a diagram over time. The following diagram types are available:

- Line graph (Line)
- Bar graph (Bar)
  The columns of several parameters can be stacked.
- Area graph (Area)
- Spline curve
- Scatter diagram (Scatter)

The following views are available for the diagram type:

- Detail view
- Histogram
- Regression

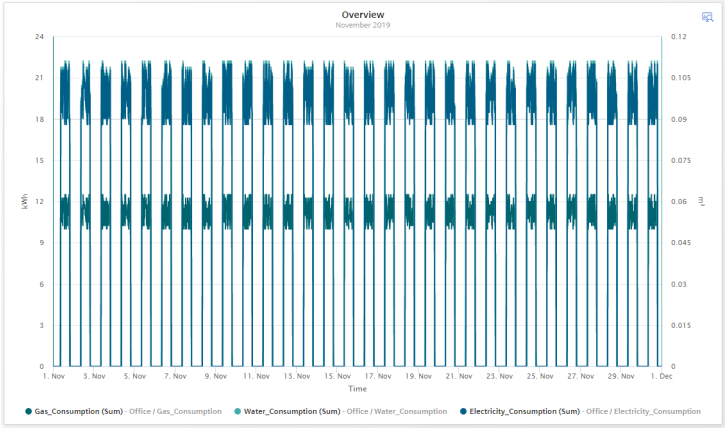
Procedure

To define widget-specific display options for a bar graph, follow these steps:

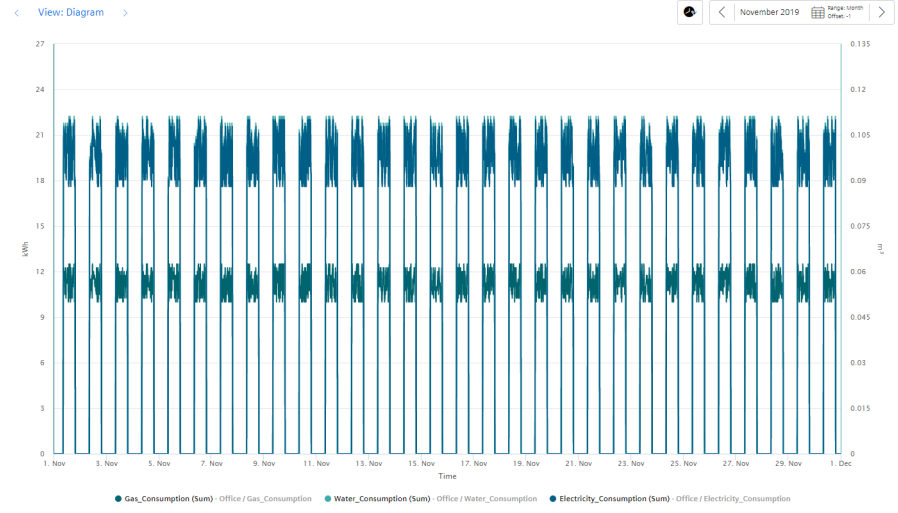
1. You select the diagram type in step 5 when creating a widget of the type "Diagram". You can specify whether the value should be visible and/or stacked in the case of a bar graph.
2. A Y-axis is created for each unit that a parameter provides. A maximum of 5 Y-axes can be defined per widget.
   Each parameter is automatically assigned to a Y-axis. However, you can also manually assign the parameters to a different Y-axis.
   You can define a low and high limit for each Y-axis. This means that you can only display a section between specific values in the widget.

Result

As a result, you see a line graph:

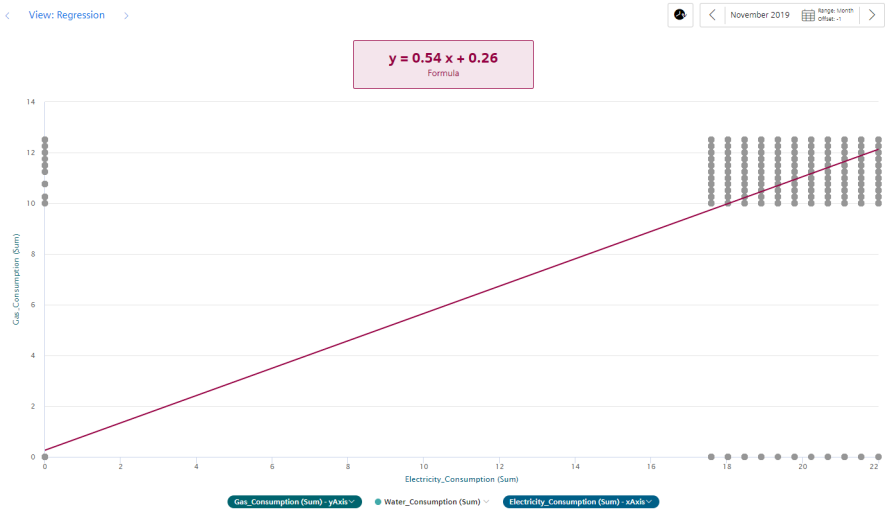


In the detail view of the example, you can see the graphs of the parameters "Gas_Consumption", "Water_Consumption" and "Electricity_Consumption" in the colors that you have defined in the display options:



In the histogram of the example, you can see the frequency distribution of the parameter "Electricity_Consumption":

In the regression analysis of the example, you can see the correlation between the two parameters "Gas_Consumption" and "Electricity_Consumption":



7.4 Visualizing individual values (Value)

Description

Displays the aggregated value of a specific time range. The value is derived either from a variable with a corresponding aggregation function or from a KPI result.

The following views are available for Value:

- Detail view
- Histogram

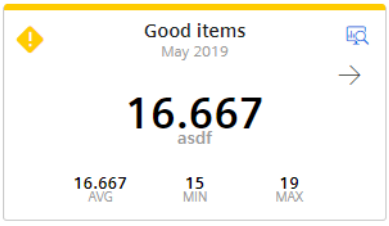
Procedure

To define widget-specific display options, follow these steps:

1. In step 5 when creating a widget of the type "Value", you select whether the statistics (average, minimum, maximum) should be displayed.

Result

The result in the example shows an individual value that violated the warning limit. A yellow bar and the warning symbol are therefore displayed.



The arrow visualizes the tendency of the displayed value.

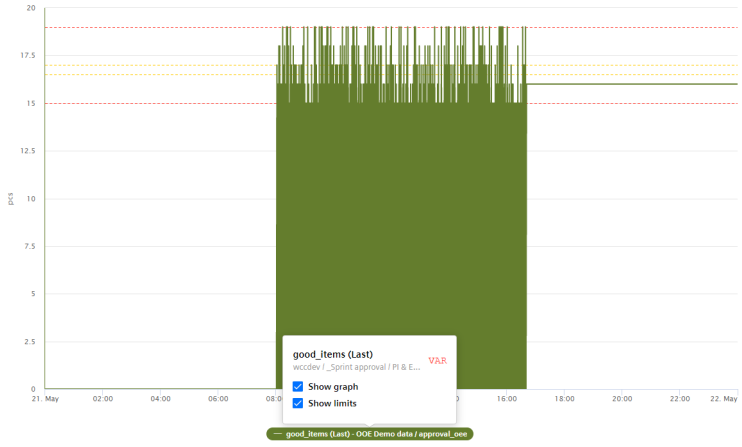
The statistical data of average (AVG), minimum (MIN) and maximum (MAX) are displayed in the bottom line if they were activated in the last step.

Note

Values of the statistical data

The displayed statistics is calculated from the calculated values in the cycle that is specified in the widget configuration.

View of the detail view with activated limit values:



7.5 Visualizing machine statuses (Gantt)

Description

The Gantt widget shows the status of a machine at a glance using different color codes. The status can represent the current state or the state within a specific time range.

This will help you recognize:

- When the machine started
- How long it was in "RUN" mode
- When it changed to the "STOP" mode
- How long it remained in this state

In the detail view, you can see all status displays broken down individually.

Procedure

To define widget-specific display options, follow these steps:

1. In step 4 when creating a widget of the type "Gantt", you select a status mapping from the drop-down list. If no status mapping exists yet, you create one with "Create new status mapping".

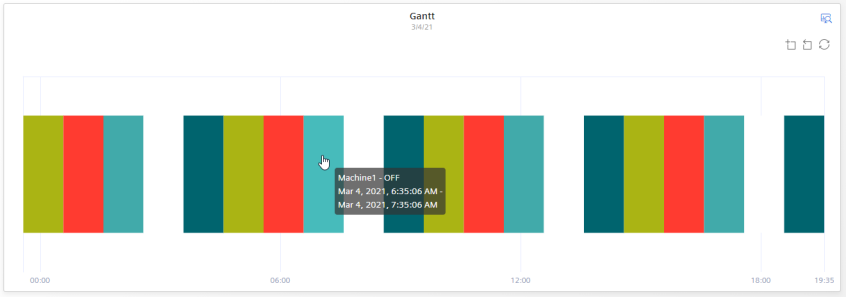
Result

The result in the example shows the machine status:

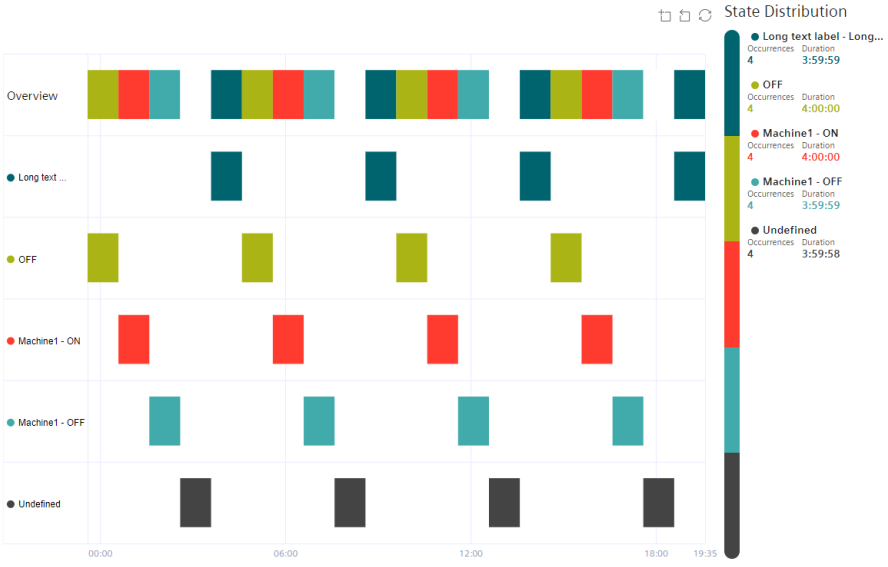
- Red: Machine 1 in RUN mode
- Blue: Machine 1 in OFF mode

The tooltip offers more information extending beyond the selected time range of the widget. In the figure below, you can see that the machine status with the color "Blue" was present on March 4, 2021, from 6:35 AM to 7:35 AM. Using the tooltip for each machine state you can see exactly

when this operating state occurred. In the case of the blue machine state, this is of particular importance, for example, to determine immediately when the machine stopped.



The individual values are displayed itemized in the detail view:



7.6 Creating status mappings for the "Gantt" widget

Description

Using a status mapping, you can display changes in the value of a variable at a glance in the "Gantt" widget.

You can assign a color, a label and a description to a value (machine status).

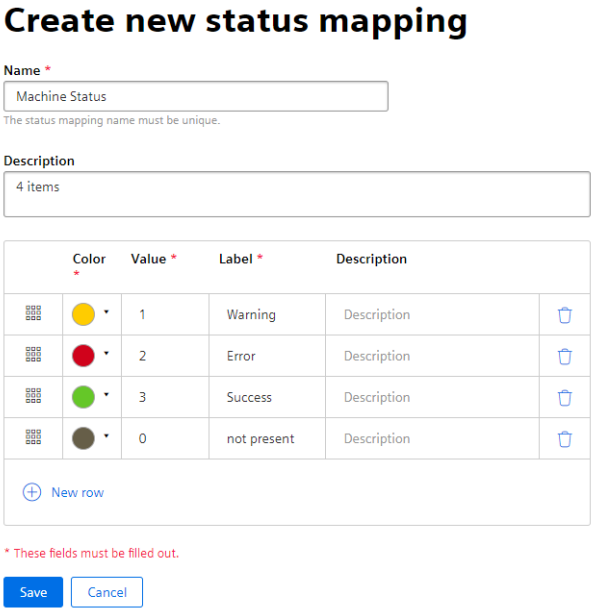
Status mappings

You can either create status mappings directly when creating a Gantt widget or you can create a new status mapping in the "Configuration" tab. This tab also shows you a list of the existing status mappings.

Creating and editing a status mapping

To create a status mapping, follow these steps:

1. Open "Configuration" > "Status mapping".
2. Click on "New status mapping".
3. Assign a unique name and a description.
4. You can assign a color, a label and a description for each value that a variable can assume. If a value that is not defined in the status mapping table occurs in the variable, it is displayed with the status "not defined" and the color white in the Gantt widget.



You use the created status mapping in connection with the "Gantt" widget. The order of each state mapping is reflected in the Gantt widget in the same way as shown in the table. You can change the order using drag-and-drop.

7.7 Visualizing the violation of limit values (gauge)

Description

You can use the gauge to represent limits according to colors. The gauge helps you recognize at a glance whether or not limits are being exceeded.

The following views are available for the gauge:

- Detail view
- Histogram

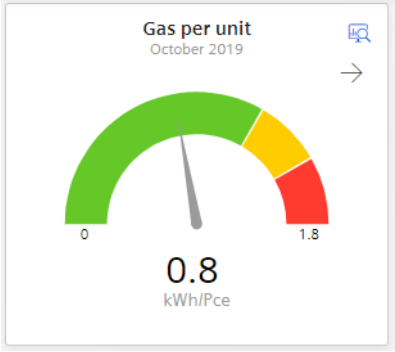
Procedure

To define widget-specific display options, follow these steps:

1. In step 5 when creating a widget of the type "Gauge", the limit values from the general display options are applied if you have already defined them there.
2. Specify the value with which the gauge scale starts and ends.

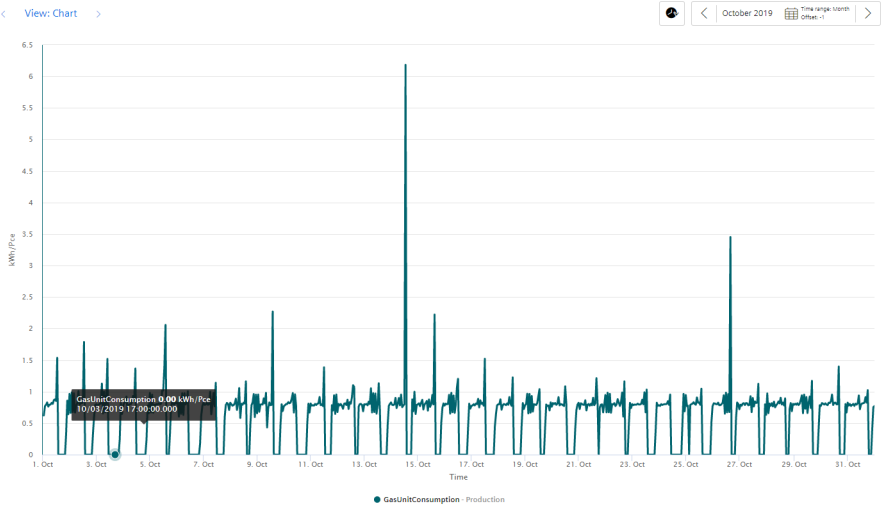
Result

The gauge in the example shows you that the gas consumption per unit is in the acceptable range (green):

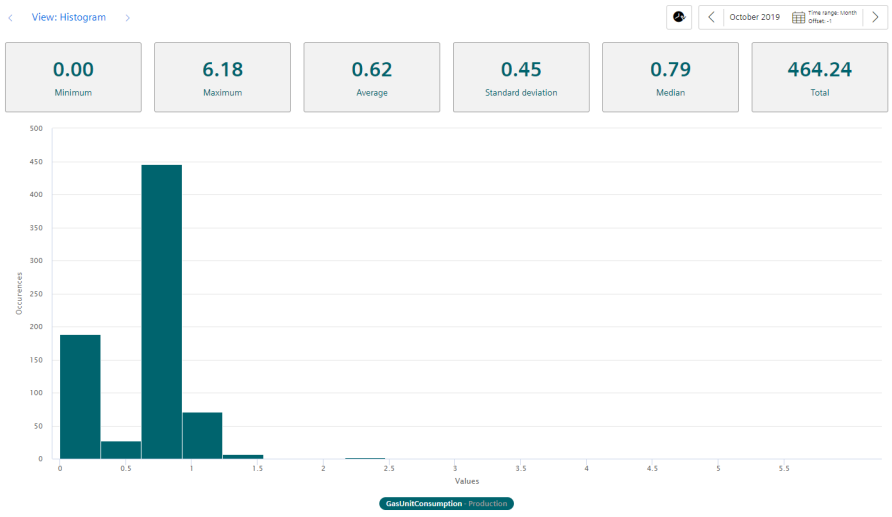


The arrow at the top right shows the tendency of the displayed value.

In the detail view, you see the graph of the KPI instance "GasUnitConsumption" in the color that you have defined in the display options:



The histogram in the example shows the frequency distribution of the KPI instance "GasUnitConsumption":



7.8 Visualizing the distribution of consumptions or quantities (Pie chart)

Description

Using the pie chart, you can represent the distribution of consumptions or quantities. Clicking on a segment highlights the segment and displays the corresponding value.

The following views are available for the pie chart:

- Detail view
- Histogram
- Regression

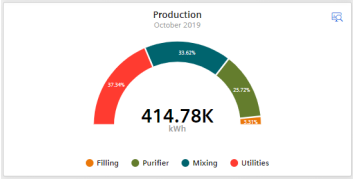
Procedure

To define widget-specific display options, follow these steps:

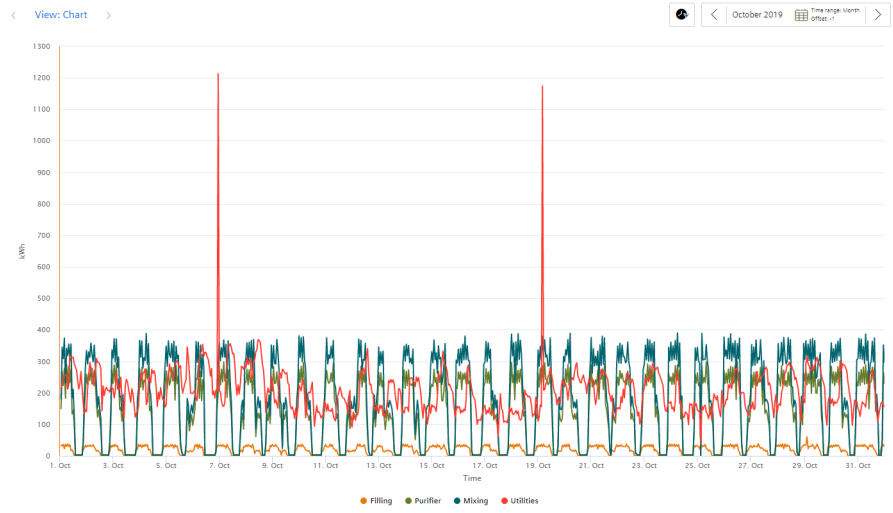
1. In step 5 when creating a widget of the type "Pie chart", you specify whether the values are to be displayed as absolute or percentage values.

Result

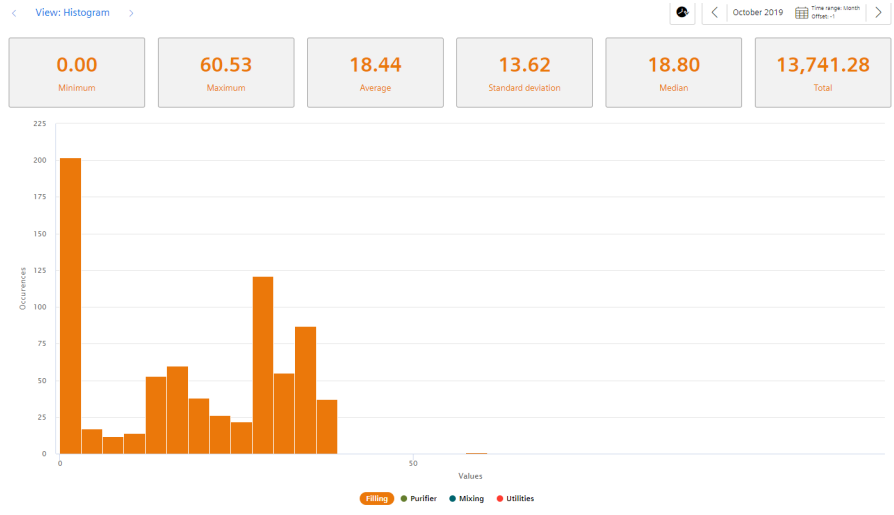
The pie chart in the example shows you the percentage values of the parameters "Filling", "Purifier", "Mixing" and "Utilities":



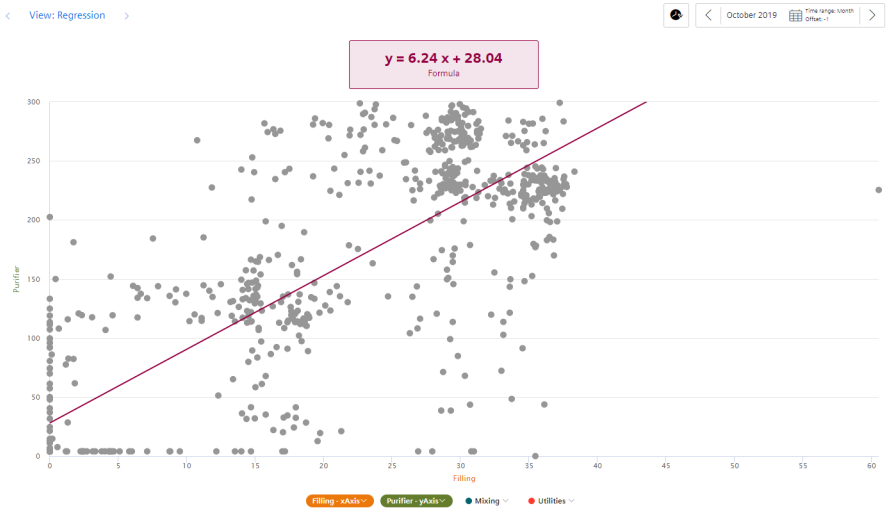
In the detail view, you can see the graphs of all four parameters in the colors that you have defined in the display options:



The histogram shows the frequency distribution of the "Filling" parameter:



In the regression analysis, you can see the correlation between the two parameters "Filling" and "Purifier":



7.9 Visualizing the intensity of data values (Heatmap)

Description

Using the Heatmap, you can visualize the intensity of data values over time. You can, for example, display the energy consumption (red = high energy consumption; green = low energy consumption), temperatures or production quantities in a specific time range.

The following views are available for the Heatmap:

- Detail view
- Histogram

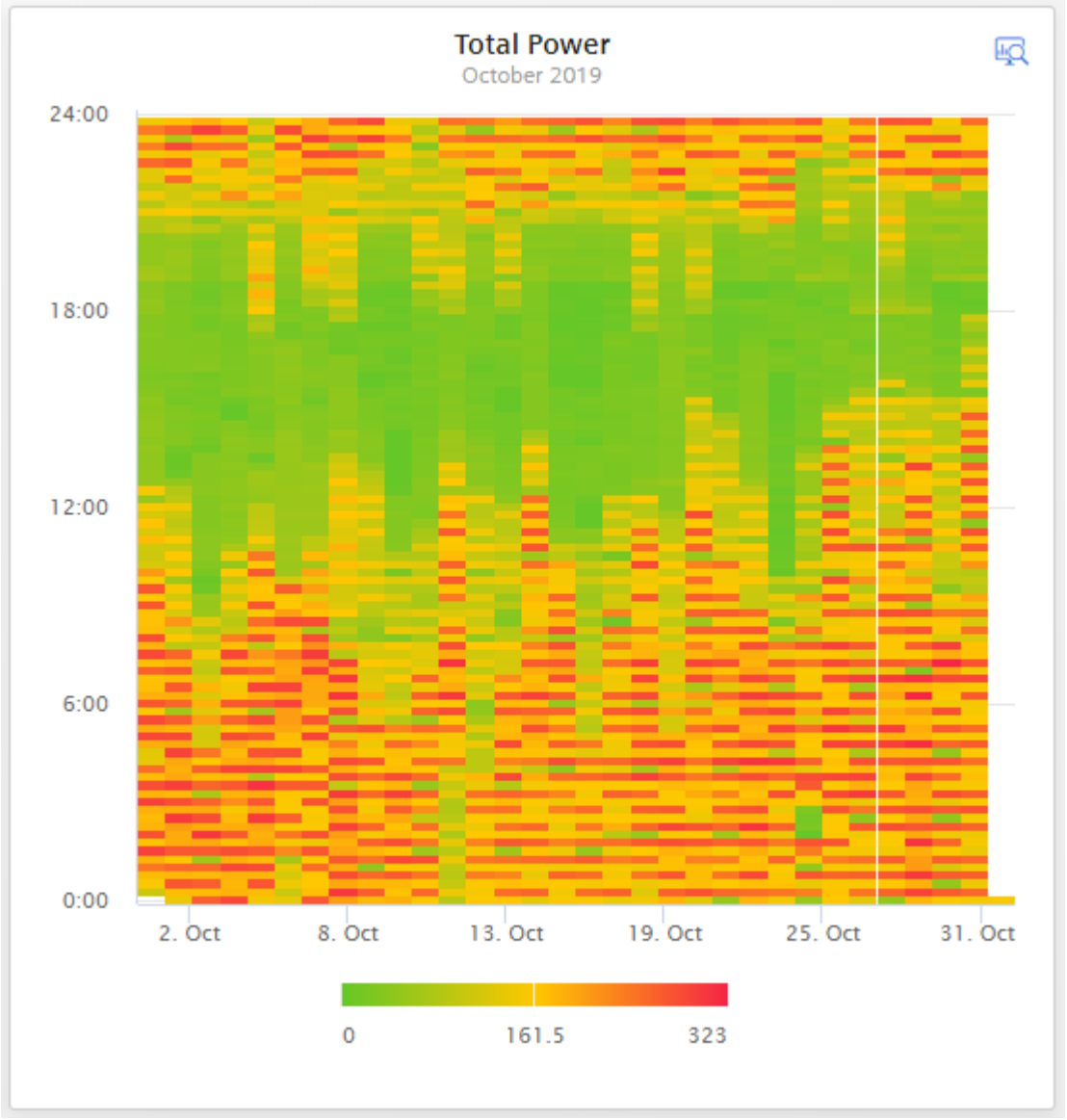
Procedure

To define widget-specific display options, follow these steps:

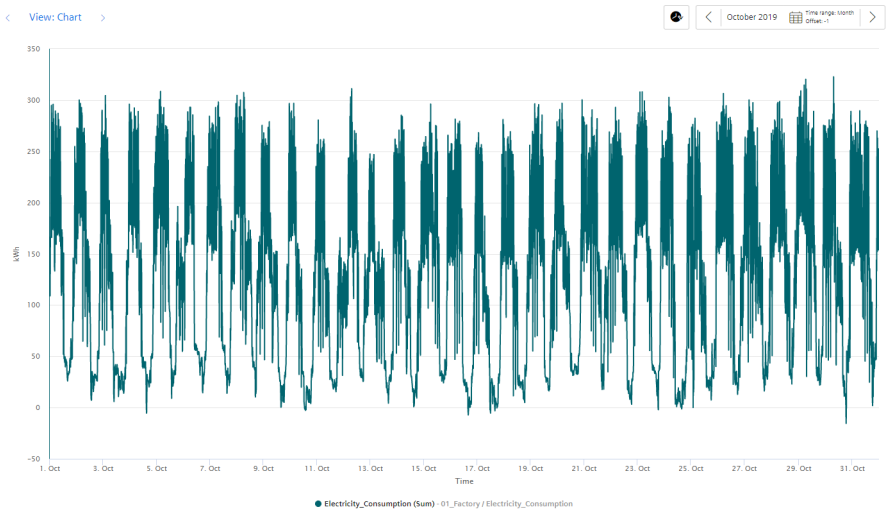
1. In step 5 of creating a widget of the type "Heatmap", you specify:
   - Whether the data is displayed in the day view or the week view.
   - The color in which the different intensities are going to be displayed.
   - You can enter a fixed range for the color scaling.
     If you do not define fixed values, the lowest and the highest measured value is used for the color scale. If there is an extreme peak, this can cause the heatmap to give a distorted picture.

Result

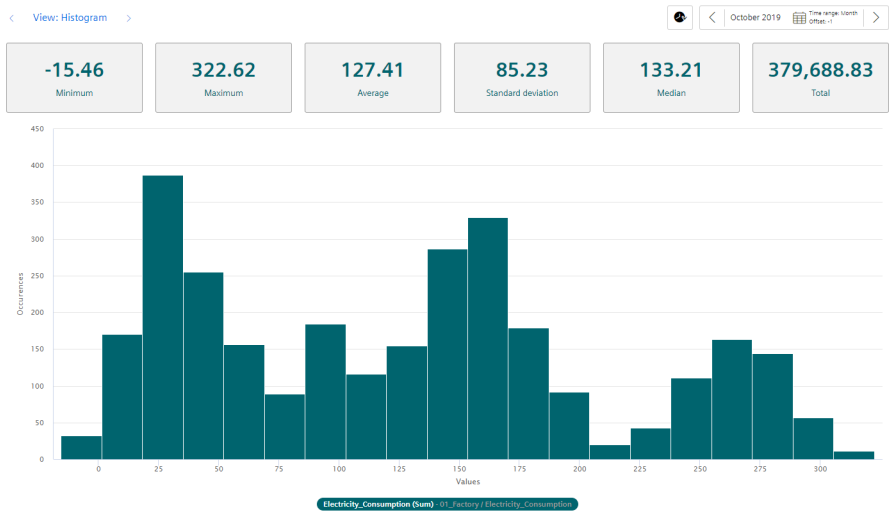
The Heatmap in the example shows the energy consumptions for the entire month of October (y-axis), broken down for each day (x-axis). You can see at a glance that frequent energy peaks occurred between 0:00 and 12:00 o'clock and that energy consumption was lower in the afternoon and evening.



In the detail view, you can see the graph of the "Electricity_Consumption" parameter in the color that you have defined in the display options:



The histogram in the example shows the frequency distribution of the "Electricity_Consumption" parameter:



7.10 Visualizing energy flows (Sankey)

Description

Using the Sankey diagram, energy flows can be displayed as arrows whose width is proportional to the flow rate. This makes it easy for you to recognize, for example, how energy is flowing through your plant.

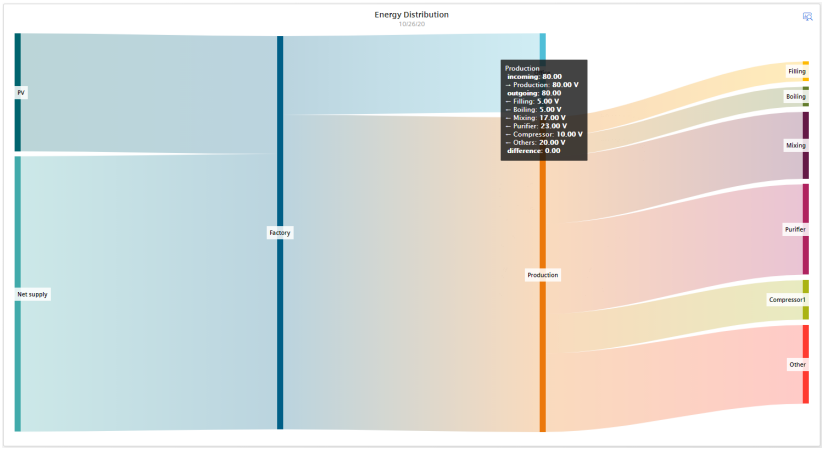
Procedure

To define widget-specific display options, follow these steps:

1. In the last step, you define the required nodes in the "Nodes" tab. You assign a node name and select a color for the node.
   In the "Links" tab, you specify the links for each parameter from source node to destination node. This defines the volume flows.
   You can also scale each link so that you can still show the proportions of the arrows correctly even with different units, such as kilowatts or liters.

Result

The Sankey diagram shows you how the energy is flowing through your plant:



7.11 Visualizing a chart sorted by size (Duration curve)

Description

By using the duration curve, you can display a chart sorted by size.

In the duration curve, the measured values of a specific time range are displayed collected and sorted. The highest value is displayed on the far left, and the lowest value on the far right.

This way you can see, for example, how high the highest value was and how long this value was present. If you want to reduce the highest value to a lower value, you can easily see in the duration curve how often you have to switch off the supply object every month for 15 minutes (active load management), for example, to achieve the lower value and thus conserve energy.

The following additional views are also available in the duration curve:

- Detail view
- Histogram

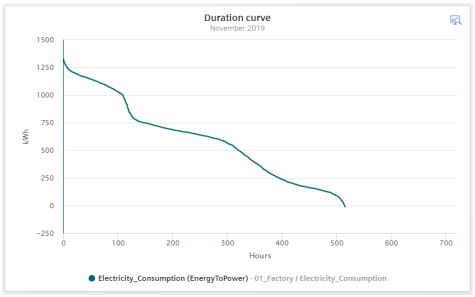
Procedure

To define widget-specific display options, follow these steps:

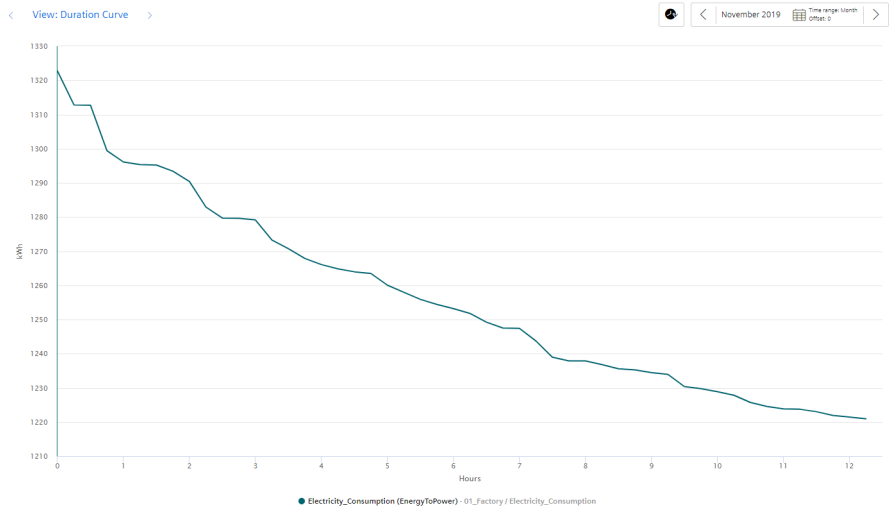
1. In the last step, you define the following settings:
   – The maximum number of values to be displayed.

Result

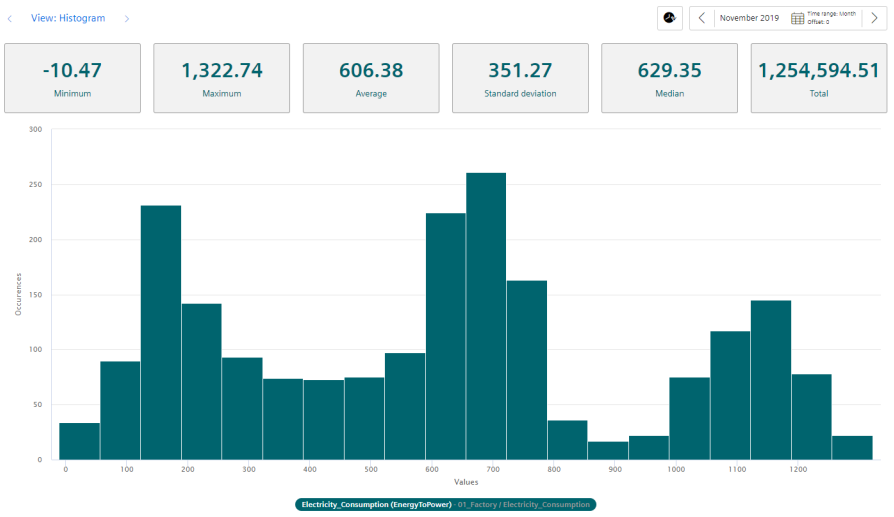
The duration curve shows the values of the "Electricity_Consumption" parameter for the last 700 hours:



In the detail view, you can see the graph of the "Electricity_Consumption" parameter in the color that you have defined in the display options. The 50 highest values are displayed:



In the histogram, you can see the frequency distribution of the parameter "Electricity_Consumption":



7.12 Editing widgets

Description

If you have already created a widget, you can also change it later.

Procedure

To change an existing widget, follow these steps:

1. Click the symbol on the dashboard.
   The dashboard is now in edit mode.
2. Click the icon in the desired widget.
   The widget wizard opens.
3. You can switch freely between steps 2 and 5 and change the details accordingly.
4. When you are finished, click "Finish" in the wizard and on "Exit" in the dashboard.

Result

All changes have been applied to the widget and are displayed directly.

7.13 Copying widgets

Description

You can copy a widget and paste it to a dashboard.

Note

Widgets on the automatically created OEE dashboard cannot be copied.

Procedure

To copy a widget, do the following:

1. Click the icon in the dashboard.
   The dashboard is in edit mode.
2. Click the icon in the widget.
   The widget is copied to the clipboard and can be pasted to any dashboard.
3. If there is sufficient space available in the desired dashboard, you can paste the widget using the icon.
   The widget wizard opens.
4. You can switch freely between steps 2 and 5 and change the details.
5. Select the last step and click "Finish".
6. Click "Finish" in the dashboard.

Result

The copied widget is displayed in the dashboard.

7.14 Export widget data

Description

You can export the parameter data visualized in a widget as a csv file.

You can do this with the following widgets:

- Diagram
- Gantt
- Heatmap

Procedure

To export the widget data, follow the steps below:

1. In the dashboard, click the icon in the widget.
   Or
2. Open the details view of the widget and click Export widget data.

Result

A .csv file is created that contains, for example, information about local_time, UTC_time and the parameters used.

KPI calculations (key figures) 8

8.1 Introduction to KPI calculations

Description

The acronym KPI stands for Key Performance Indicator. KPI types are formulas made up of operands, constants, and operators. The definition and calculation of KPI types are plant-specific. An example of a KPI type could be:

- Quality rate = Good Items / Total Items * 100

The KPI instance can be created either during the widget configuration in the "Parameter" step or in the parameter list on the asset. The KPI instance can

- be derived from a KPI type (typed)
- or can be created typeless.

The KPI types can be instantiated multiple times. When you make changes to the KPI type, these changes are also implemented in all KPI instances.

Note

Data in the buffer

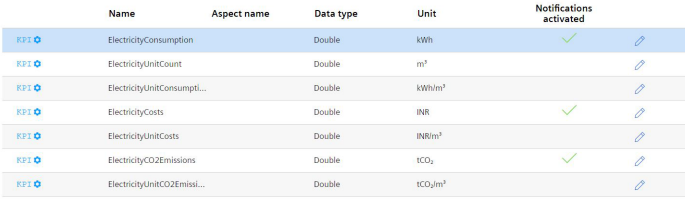
The KPIs are saved in a buffer (cache). If values were overwritten in the past (except for the current and last hour), it may take up to one hour before you will be able to see the data or KPIs and aggregations based on them.

Automatically created KPI instances in the Energy Manager

Energy Manager also includes automatically created KPI instances. These KPI instances are created based on contract information for the individual energy media, the assigned variables, and KPI types as well as the reference mappings.

For automatically created KPI instances, you can define limits that trigger a notification when these limits are exceeded or not reached. The green check mark in the "Notifications activated" column shows that a notification has already been configured. Additional information on the configuration of notifications can be found here: "Activate notifications" for variables of the data type "Integer" and KPI instances (Page 37)

In the parameter list, you can identify the automatically created KPI instances by the blue icon:



	Name	Aspect name	Data type	Unit	Notifications activated	
KPI	ElectricityConsumption		Double	kWh	✓	
KPI	ElectricityUnitCount		Double	m³		
KPI	ElectricityUnitConsumpti...		Double	kWh/m³		
KPI	ElectricityCosts		Double	INR	✓	
KPI	ElectricityUnitCosts		Double	INR/m³		
KPI	ElectricityCO2Emissions		Double	tCO_2	✓	
KPI	ElectricityUnitCO2Emissi...		Double	tCO_2/m^3		

The automatically created KPI instances do not generate any additional costs.

Operands

Operands serve as placeholders that are later filled with actual values from the variables. They are created directly when creating a KPI type and defined more precisely during the instantiation of the KPI type. Operands may contain no space, mathematical symbols or numbers at the beginning of the operand name. They can be moved and copied.

Structure of a KPI instance

The KPI instance is created as follows:

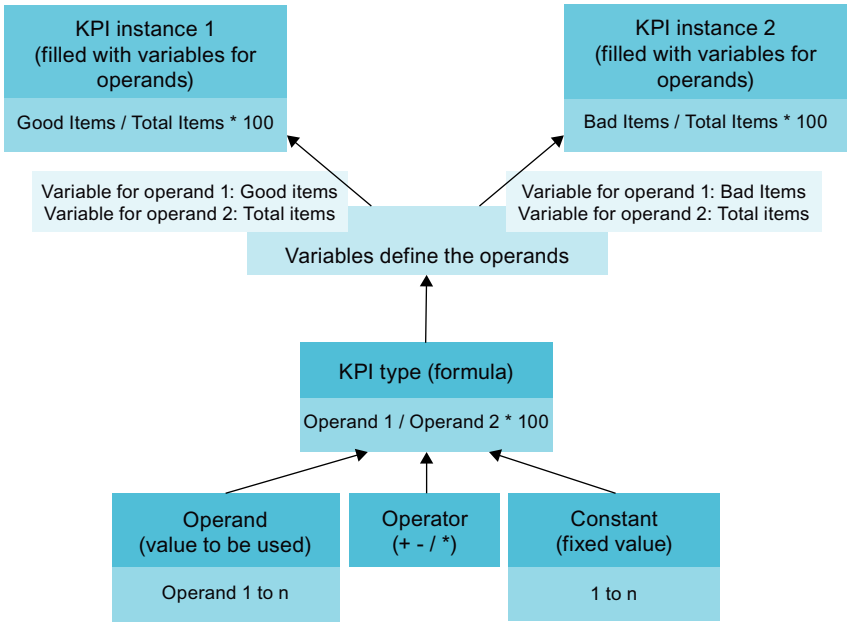
- You either instantiate a KPI type including linked variables or KPI instances (typed; multiple use is possible) or
- You create a KPI instance directly and link it to variables or KPI instances (typeless).

Each KPI instance must be assigned to an asset, but variables from other assets can also be linked to the KPI instance.

The following figure shows the individual components that make up a KPI instance.

- Operands serve as placeholders that are later filled with actual values from the variables or KPI instances.
- Constants can only contain numerical values
- Operators

The following diagram shows the structure of the KPI type/instance concept:



8.2 Creating KPI types

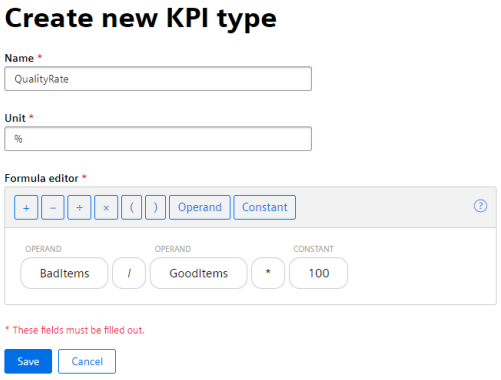
Description

In the "Configuration" tab, you can create new KPI types and a list of existing KPI types is displayed.

Procedure

Follow these steps to create a KPI type:

1. Click on "New KPI type".
2. Assign a unique name and a unit.
3. In the Formula editor, you use operands, constants and operators to compose the formula used to calculate the KPI. You can create operands and constants directly for this purpose. An operand is a placeholder that is later filled with actual values from the variables or KPI instances.



Connect the operands with the variables or KPI instances transferred from the Data Service Configurator.

8.3 Creating and deleting KPI instances

KPI instances

KPI instances can be created either in the parameter list of the respective dashboard or in the 3rd step when a widget is created. You can create the KPI instance either directly when creating a widget or later by editing the widget again.

Automatic KPI instances are created additionally when you create energy media and assign contract information.

You have several options to create a KPI instance:

- You create a KPI type in the configuration and instantiate it either directly in the widget or in the parameter list. (typed)
- You create a new KPI instance directly in the widget or the parameter list. (typeless)

In the preview, you can see the formula it contains and which operand is linked to which variable.

New KPI instances cause costs. The number of currently used KPI instances is displayed in the "Settings" menu under "Usage information".

If all KPI instances are occupied, order additional KPI instances or delete a KPI instance that is no longer needed.

Note

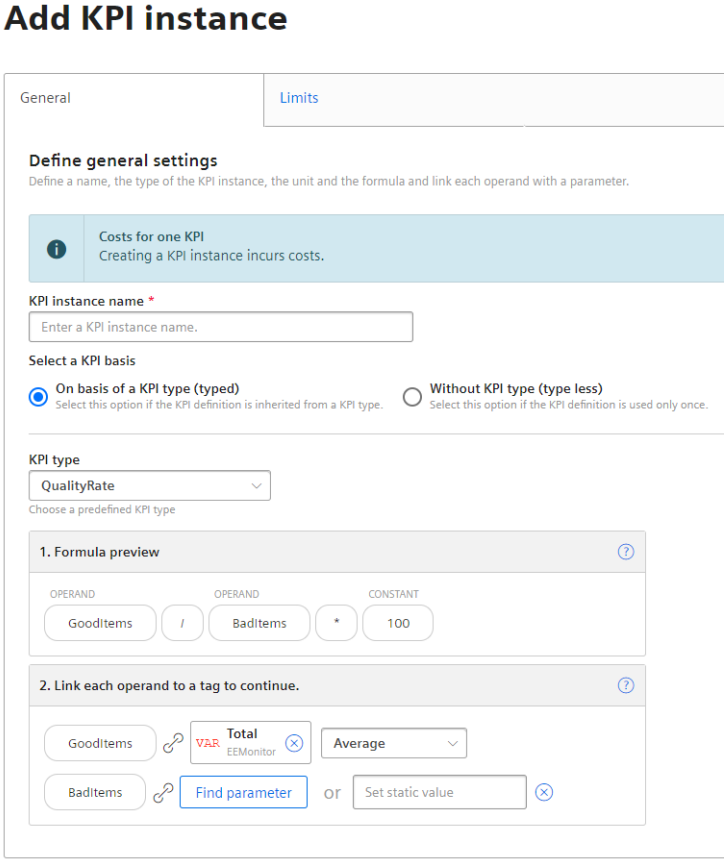
Unified Comfort Panel (UCP)

There are currently no costs on a UCP because the trial version of the Energy Manager app is available until March 31, 2021.

Creating KPI instances based on a KPI type (typed)

Follow these steps to create a KPI instance:

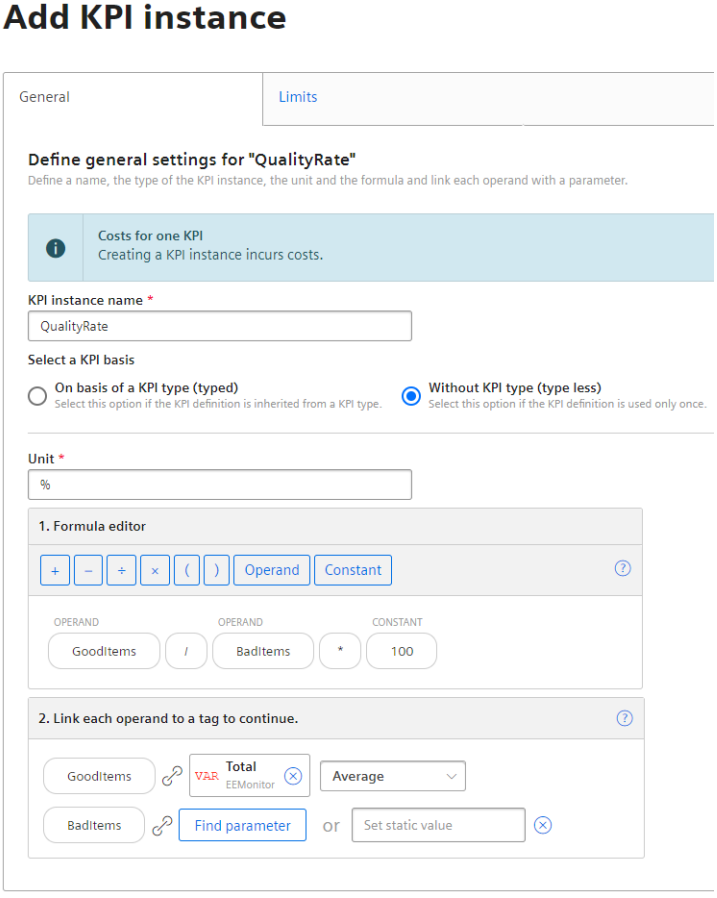
1. Click "Create a new KPI instance".
2. Click the "General" tab.
3. Assign a unique KPI instance name per plant object.
4. Select "On basis of a KPI type (typed)".
5. Select the desired KPI type. The preview shows the formula it contains.
6. Link all operands contained therein to a variable or a KPI type. If you assign a variable to the operand, you also need to select an aggregation function.



Creating KPI instances without KPI type (typeless)

Follow these steps to create a KPI instance:

1. Click "Create a new KPI instance".
2. Click the "General" tab.
3. Assign a unique KPI instance name per plant object.
4. Select "Without KPI type (typeless)".
5. Enter a unit.
6. Create the desired formula from constants, operands, and operators.
7. Link all operands contained therein to a variable or a KPI type. If you assign a variable to the operand, you also need to select an aggregation function.



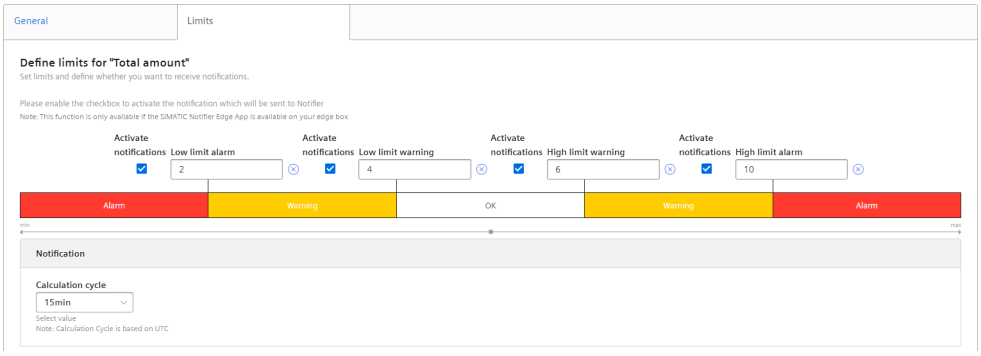
Defining limits

You can define limits for typed, typeless as well as for automatically created KPI instances.

To define the limits, follow these steps:

1. Click the "Edit" icon next to the KPI instance.
2. Click the "Limits" tab.

3. Enable the "Activate notifications" function for the desired limit area, e.g. low limit alarm.
4. Enter a limit.



You can find additional information on the "Activate notifications" function here: "Activate notifications" for variables of the data type "Integer" and KPI instances (Page 37)

Deleting KPI instances

You can delete KPI instances in the parameter list on the asset.

Follow these steps to delete a KPI instance:

1. Under "My Plant", open the dashboard in which the KPI instance is used.
2. Next to the plant object, click the downward arrow and select the "Parameter" view.
   A list with all variables and KPI instances used is displayed.
3. Click on the delete icon next to the KPI instance.

Energy media analysis

9

9.1 Introduction to the energy media analysis

Description

You use the energy media analysis to manage and calculate energy data, such as power and gas from the machines and plants. In the configuration, you create all required energy media and can then define for each asset which energy data it requires. Using the stored contract information, you can then convert the consumption of the individual energy media directly into the resulting costs and CO_2 consumption.

Requirement

To visualize and calculate the data from the plant, such as production figures, machine operating times or water consumption, using KPIs, these figures must be transferred from the plant using the Data Service Configurator. The data structure of your plant is then automatically displayed in the app.

At least one dashboard is created on the desired asset.

Widget configuration

A wizard will guide you through the individual steps when creating a widget. However, the first four steps are identical for all widget types:

- Step 1: Select the widget type
- Step 2: Define details
- Step 3: Select parameters
- Step 4: Define general display options
- Step 5: Define widget-specific display options

Procedure for creating the general steps of a widget

To create a widget, follow these steps:

1. Either click "Create first widget" or click and "New widget" and select a widget type.
2. Assign a name and define the date settings:
   Define date settings:
   You can apply the dashboard date settings to a widget or define your own date settings for this widget.
   The following variants are available for setting your own date:
   - Default: "Use the date settings from the dashboard" to use the time range that is defined in the dashboard.
   - You disable "Use the date settings from the dashboard" to define a specific time range. You have the following options to do this:
     Default: "Use current date" and enter the duration (e.g. week) under "Time range". The start and end time are given by the predefined time ranges (day, week, month, year, etc.). If you prefer, you can also disable "Use current date" and enter the start date and start time manually. The end time is calculated based on the duration under "Time range". Under "Offset", you can enter the number of days, weeks, months or years by which the start time should be postponed. The start time can be either in the future or in the past.

   If you use the dashboard date settings for the widget, all changes to the date settings are displayed directly in all widgets of the dashboard.
   Define interval:
   You can also specify an interval at which the values are to be displayed, for example, every 5 minutes, every 2 hours, etc.
3. You can select either a variable or a KPI type as parameter. Up to 10 parameters can be defined.
   For each variable you can select one of the aggregation functions (Average, Min, Max, Sum, Last, Counter, Timer, EnergyToPower, PowerToEnergy, AmountToFlow, FlowToAmount).
   You can find additional information on the aggregation functions here: Introduction to the aggregation functions (Page 43)
   In this step, you can also directly create KPI instances and link the operands with the desired parameters.
   You can find additional information on KPI instances here: Introduction to KPI calculations (Page 77)
4. In the general display options, you can assign an alternative label for the variable or KPI type. This label is then displayed in the legend in the detail view instead of the asset and the aspect name of a parameter.
   In this step, you can also enter the limit values for warnings and alerts.
   - Red = the alert limit was violated
   - Yellow = the warning limit was violated

   The limit values are also displayed in the detail view as dashed lines.
   You can also specify the number of decimal places and a color for each parameter in which the graph is displayed in the detail view.

Editing widgets and adding more widgets

To edit existing widgets or add more widgets in a dashboard, click .

Error display in the widget

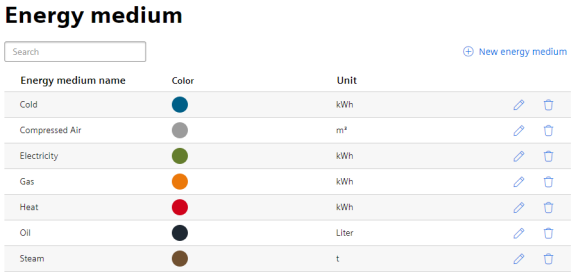
If a network error occurs or an operand required to display the widget has been deleted, for example, the error symbol is shown in the bottom right corner of the widget.

9.2 Configuration of the energy media analysis

Description

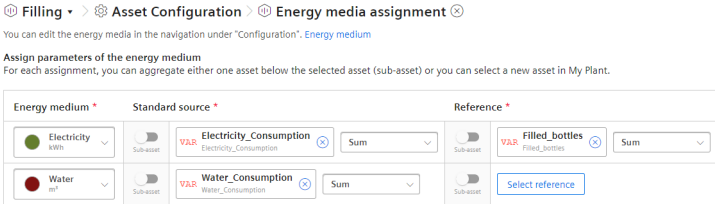
The energy media analysis is made up of several steps:

1. Some energy media are already included when you purchase the Energy Manager app:



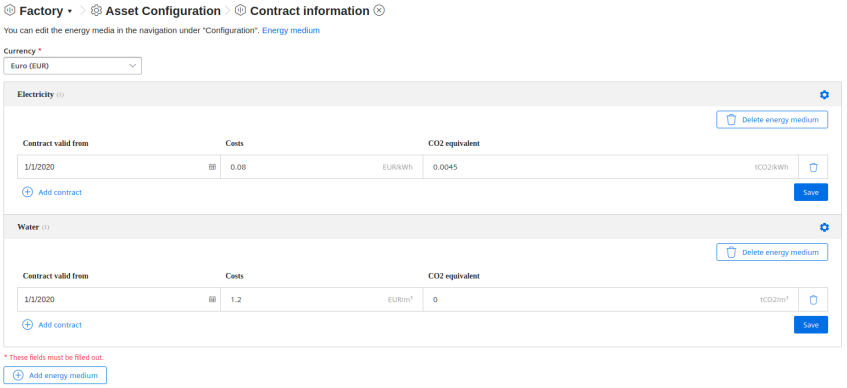
   You can also create additional energy media in the configuration of the Energy Manager app or change existing energy media.
   As soon as a created energy medium is used, it can no longer be deleted.
   You can find additional information here: Creating energy media (Page 89)

2. Next, you define for each asset which of the created energy media is required. You can define, for example, that electricity, gas, and oil are consumed on the "Filling station" (Filling) asset. You can then assign the variables from the Data Service Configurator to the energy media. You can also assign a reference value to the energy medium, for example, so that you can create a relationship between production quantities and energy consumption.



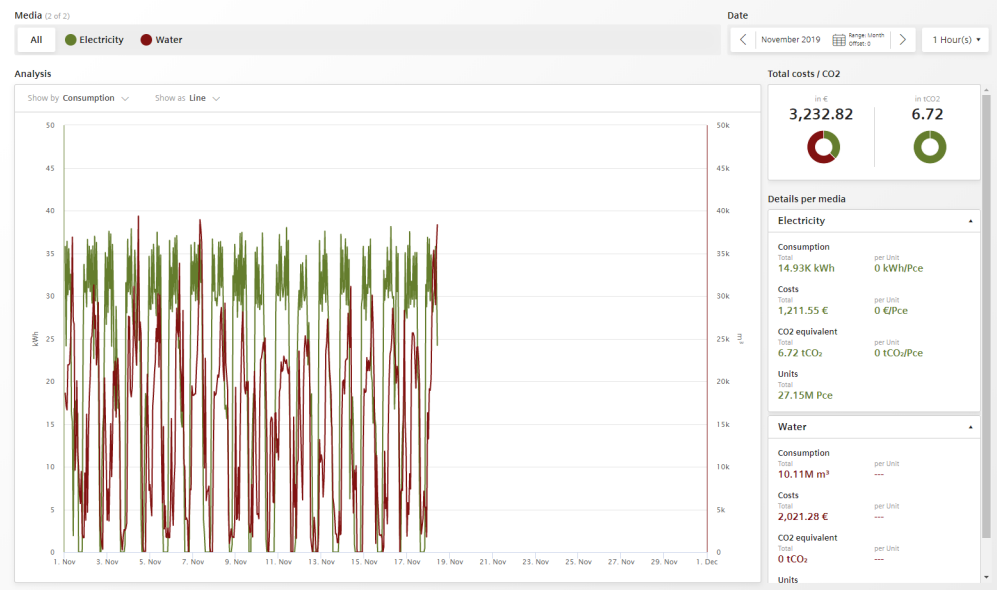
   You can find additional information here: Defining energy media for an asset (Page 89)

3. In addition, prices and additional contract information, such as CO_2 consumption, can be stored for each energy medium:



You can find additional information here: Defining contract information for energy media (Page 91)

4. Next, you can display the energy media analysis directly in the energy media dashboard. The dashboard is displayed automatically:



In addition to the graphs of the two energy media "Electricity" and "Water", you can also see the costs in € and the CO_2 consumption.
You can find additional information here: Displaying the energy media analysis (Page 92)

9.3 Creating energy media

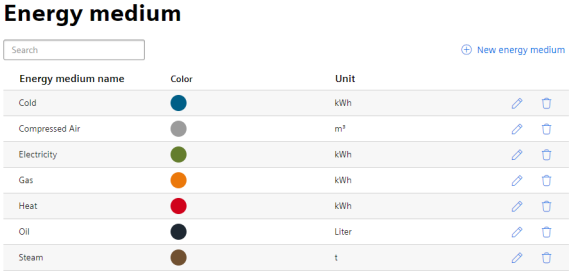
Creating and editing an energy medium

To create an energy medium, follow these steps:

1. Open "Configuration" > "Energy medium".
2. Click "New energy medium".
3. Assign a unique name and a description.
4. Assign a color to each energy medium.

Result

All energy media you have created are displayed in the list:



9.4 Defining energy media for an asset

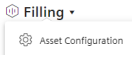
Description

You specify for each asset which energy media created in the configuration are required.

Procedure

To define energy media, follow these steps:

1. Click on the desired asset in My Plant.
2. Open the "Asset Configuration" by clicking on the arrow next to the asset name.



3. Click on "Assignment of energy media".

4. Specify all energy media you need and assign a parameter to each energy medium. You can assign either an individual parameter that represents the respective energy medium or you can enable the "Sub-asset" button.

   Note

   Sub-asset

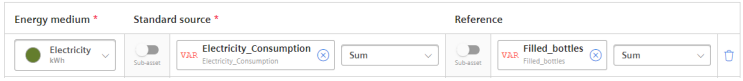
   We recommend that you enable the "Sub-asset" button when you have selected an energy medium in a higher-level asset of My Plant and want to show, for example, the energy consumption not only with the value of a single variable but the entire energy consumption of all lower-level assets.

   Note

   Energy media analysis

   As soon as you have created an energy medium, the corresponding energy media dashboard with energy media analysis is automatically created. This results in costs. The six KPI instances that are necessary for calculations of the energy media analysis do not incur any additional costs.

5. In addition, you can also assign a reference value to each energy medium/parameter pair:



   By assigning a reference, you can define the energy medium in more detail. You can define, for example, that an asset consumes electricity. To do so, you assign the variable for electricity consumption "Electricity_Consumption" to the energy medium "Electricity" on the asset. You can also assign the variable for bottling "Filled_bottles" as a reference, for example, and calculate how much electricity was consumed per filled bottle (UnitConsumption = energy consumption per unit).

Result

By assigning parameters that represent the energy medium and references (xxxUnitxxx), all KPI instances required for the energy media analysis are automatically created in the parameter list:

KPI	ElectricityConsumption	kWh
KPI	ElectricityUnitCount	Pce
KPI	ElectricityUnitConsumption	kWh/Pce
KPI	ElectricityCosts	€
KPI	ElectricityUnitCosts	€/Pce
KPI	ElectricityCO2Emissions	tCO_2
KPI	ElectricityUnitCO2Emissions	tCO_2/Pce

9.5 Defining contract information for energy media

Description

You can store the following contract information for each energy medium:

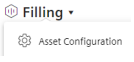
- Contract valid from
- Currency
- Costs
- CO_2 equivalent

We recommend defining the contract information per energy medium directly on the top-level asset. This ensures that all contract information for a new energy medium as well as all changes are transferred to the lower-level assets.

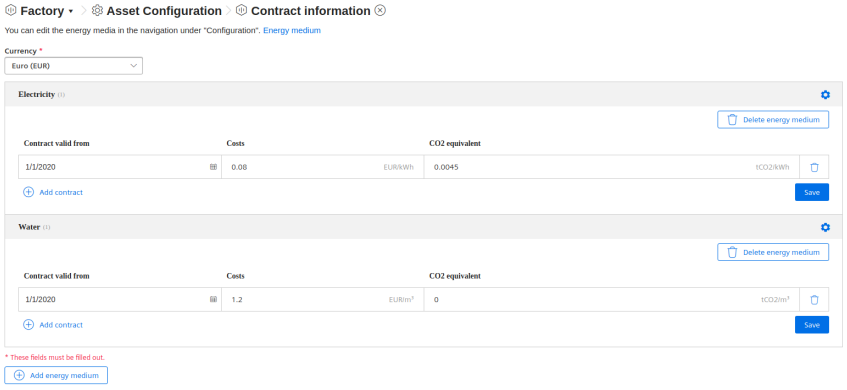
Procedure

To define contract information, follow these steps:

1. Click on the desired asset in My Plant.
2. Open the "Asset Configuration" by clicking on the arrow next to the asset name.



3. Click on "Contract information".
4. If contract information is already available from the higher-level asset, it can be applied. However, you can also separate the linking and create your own contract information.



Note

Selecting currency

The currency is defined uniformly for all contracts in the contract definition.

9.6 Deleting contract information for energy media

Description

You can delete a created energy medium.

Procedure

To delete an energy medium, follow these steps:

1. Click on the desired asset in My Plant.
2. Open the "Asset Configuration" by clicking on the arrow next to the asset name.
3. Click on "Contract information".
4. Click on the icon next to the desired energy medium that you want to delete.
5. Click "Delete energy medium".

Note

Energy medium is inherited from higher-level asset

When the energy medium is inherited from a higher-level asset, you cannot delete it directly. You must first revoke the connection to the higher-level asset by clicking on "Disconnect connection of ...".

9.7 Displaying the energy media analysis

Description

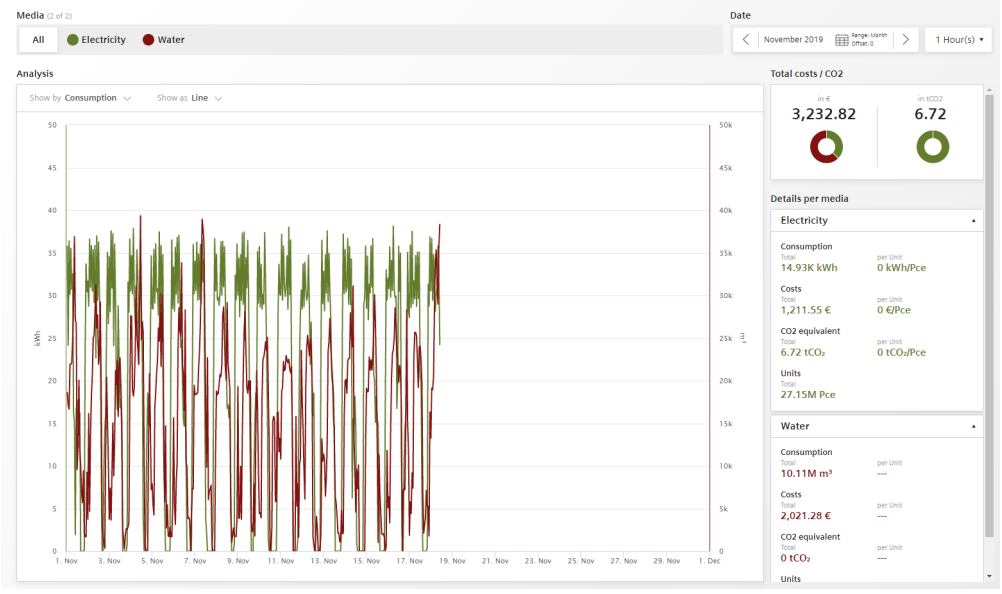
The energy media analysis is automatically displayed in the energy media dashboard.

As soon as you have assigned a reference value to an energy medium, you will not only see the total for consumption, costs and CO_2 consumption but also the amount per unit, for example, per filled bottle.

Procedure

To display the energy media analysis, follow these steps:

1. Click on the energy media dashboard.
2. In the energy media analysis, you can display either the collective information for all energy media or for each energy medium:
   - Display of individual energy media: You can display the costs, for example, as line, bar or pie chart or as a histogram.
   - Total costs
   - Total CO_2 consumption
   - Total consumption of the individual energy medium
   - Consumption per unit
   - CO_2 consumption per unit



Creating multivariable regression 10

10.1 Introduction to multivariable regression

Description

Multivariable regression puts a parameter (KPI, variable) in the context of other parameters and maps it as a linear regression model. This means the value of the output parameter can be determined using the input parameters and the regression model. (model result)

The energy consumption of a plant is influenced by certain factors, such as ambient temperature, produced quantity and filled quantity. When the regression model and the input variables are known, you can determine the theoretical energy consumption.

In addition to the model, parameters are exported that determine the quality of the model. It could be that you used an input variable that stands in no relation to the output variable. In this case the correlation coefficient would be 0, which means that the model is not trustworthy.

Different models can be calculated and saved for each asset and parameter. Users can access the saved models in a predefined MVR dashboard; here, the result of the model can be compared with the actual value. To better recognize the deviation, the deviation and the cumulative deviation are displayed in addition to the model result and the actual measured values.

After the KPIs, the model result and the deviation have been created for each model, a limit can be defined by means of a standard function. The limit determines when the user will receive a notification, for example, from the Notifier.

You can create multiple models for each output parameter.

10.2 Creating a model

Description

As soon as you have created a model, an MVR dashboard is automatically created for the asset. The available models are grouped and visualized by parameter in this dashboard.

Note

Same time stamp required for variables

All variables in use must have synchronous time stamps for the values. The same type of aggregation must be selected for each variable to ensure synchronicity of the time stamps.

Note

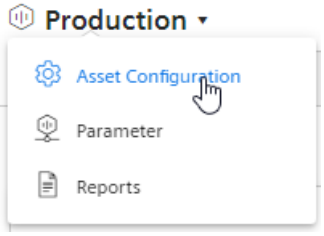
Only use parameters with numerical data types

Multivariable regression is expressed through a mathematical formula. This means only variables with numerical values (Int32, Double, etc.) are permitted as parameters.

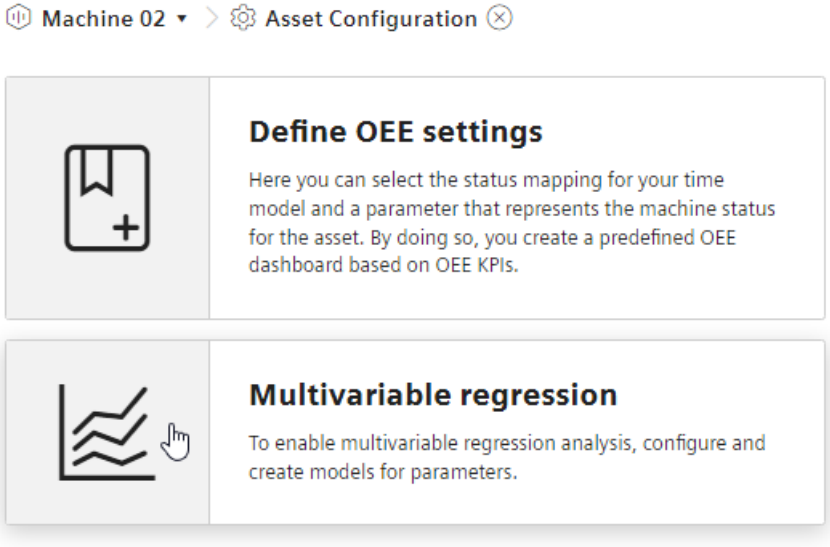
Procedure

To create a model, follow these steps:

1. Open the "Asset Configuration" of the asset.



2. Select "Multivariable regression".



If models have already been created, you will see an overview. One output parameter can be described by multiple, different models. For each output parameter, one model is selected as "Standard". The standard model is displayed when you open the MVR dashboard.

3. To create a new model, click "New model" ⊕.
   To edit an existing model, click "Edit" ✎.
4. Give the model a descriptive name.
   Based on the name, the model is selected for visualization from the existing models on the MVR dashboard.
5. Define the calculation time range.
   The calculation time range is applied as default in the visualization. The user can adjust the calculation time range on the dashboard.
6. Select the output parameter.
   This is the parameter whose dependency is represented by the values of the input parameters.
   The output parameter can be a parameter or a KPI.
7. Select the input parameters.
   You can select up to five input parameters. These are the parameters for which you want to show how they influence the value of the output parameter.
8. Select a type of aggregation for each parameter.
   The time stamps of the aggregated values are to be identical.
9. Select the period for which the data will be analyzed.
   For more information, refer to: "AUTOHOTSPOT".
10. To ignore outliers in the analysis, enter a value for "Spike correction".
    The greater this value, the smoother the considered value chart.
    Values from 1% through 100% are permitted.
    If you do not specify a value, the value chart is not corrected.

11. Click "Calculate".

Note

No formula and no model without values

If no data is available for the selected analysis period, no formula can be calculated. You cannot save the model without a formula.

A warning shows the parameter for which there is no data.

Note

Variables with linear dependency

Variables are linearly dependent when the values are the same or a multiple of each other at all times.

No resources can be calculated for linearly dependent variables.

An error message is displayed when you select linearly dependent variables.

The formula that describes the interaction of the selected parameters during the selected period is calculated.
The preview of the visualization for the calculation time range is displayed.
If necessary, you can optimize the model.

12. Save the model.

Result

You have created a model for the visualization of the multivariable regression.

After creating the first model for an asset, the MVR dashboard is created automatically.

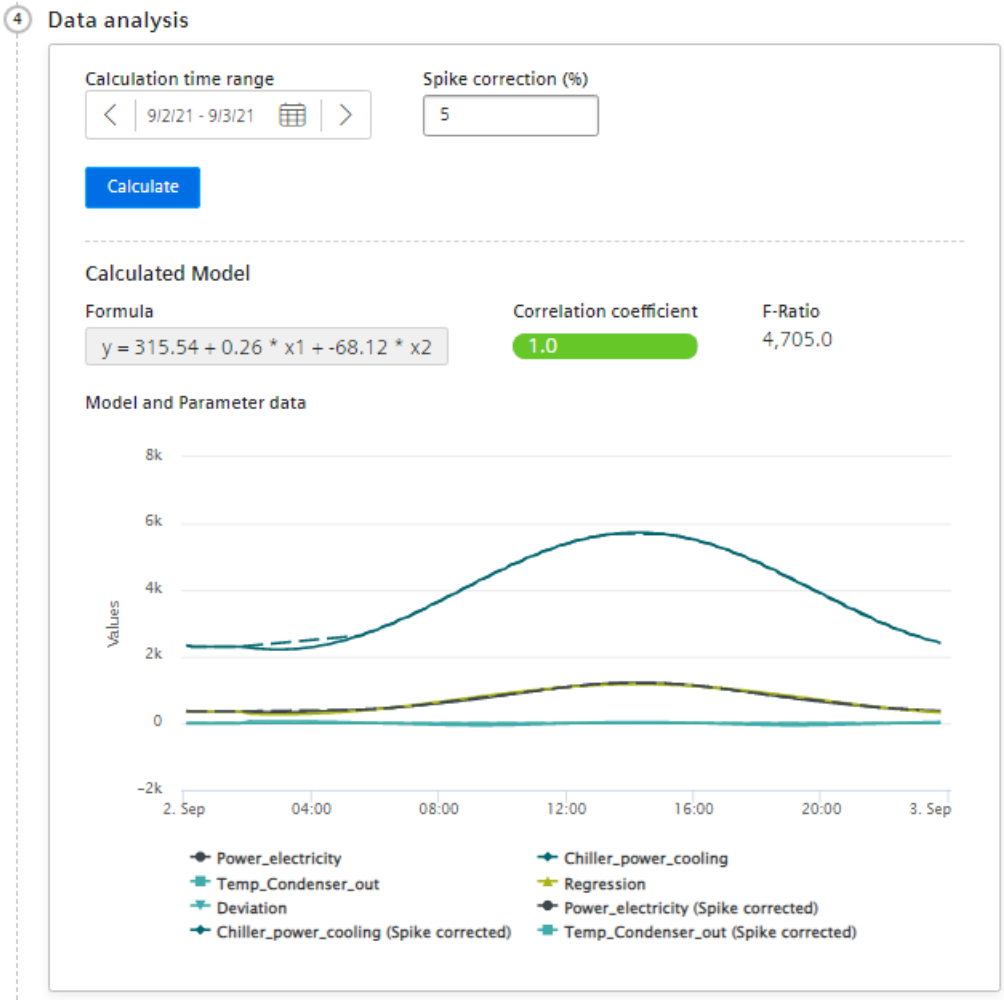
A model can be used on the MVR dashboard for any other period to analyze the parameters.

Two new, fee-based KPI instances are created.

10.3 Optimizing the model

Description

Optimize the model before you save it in case of insufficient data, an inadequate calculation time range or results that are not satisfactory for other reasons. You can edit a saved model.



The following is displayed in addition to the visualization preview:

- Formula
  The formula describes the relationship of the output parameter y to the input parameters x1, x2, etc.
  The formula cannot be edited.
- Correlation coefficient
  Quality measure for the model
  The color background explains the value:
  - Green: Model can be used for its intended purpose
  - Yellow: Model should be optimized
  - Red: Underlying data is insufficient
- F-Ratio
  Indicates the significance of the model.
  The greater the value, the better the model.

When you move the mouse pointer over the graphic, the details of individual data points are displayed in the tooltip.

To zoom in on the time range, move the mouse pointer above the desired area of the graphic while pressing the left mouse button.

Click on "Zoom out" to gradually show the view for a longer time range.

Click on "Reset zoom" to restore the original display.

Procedure

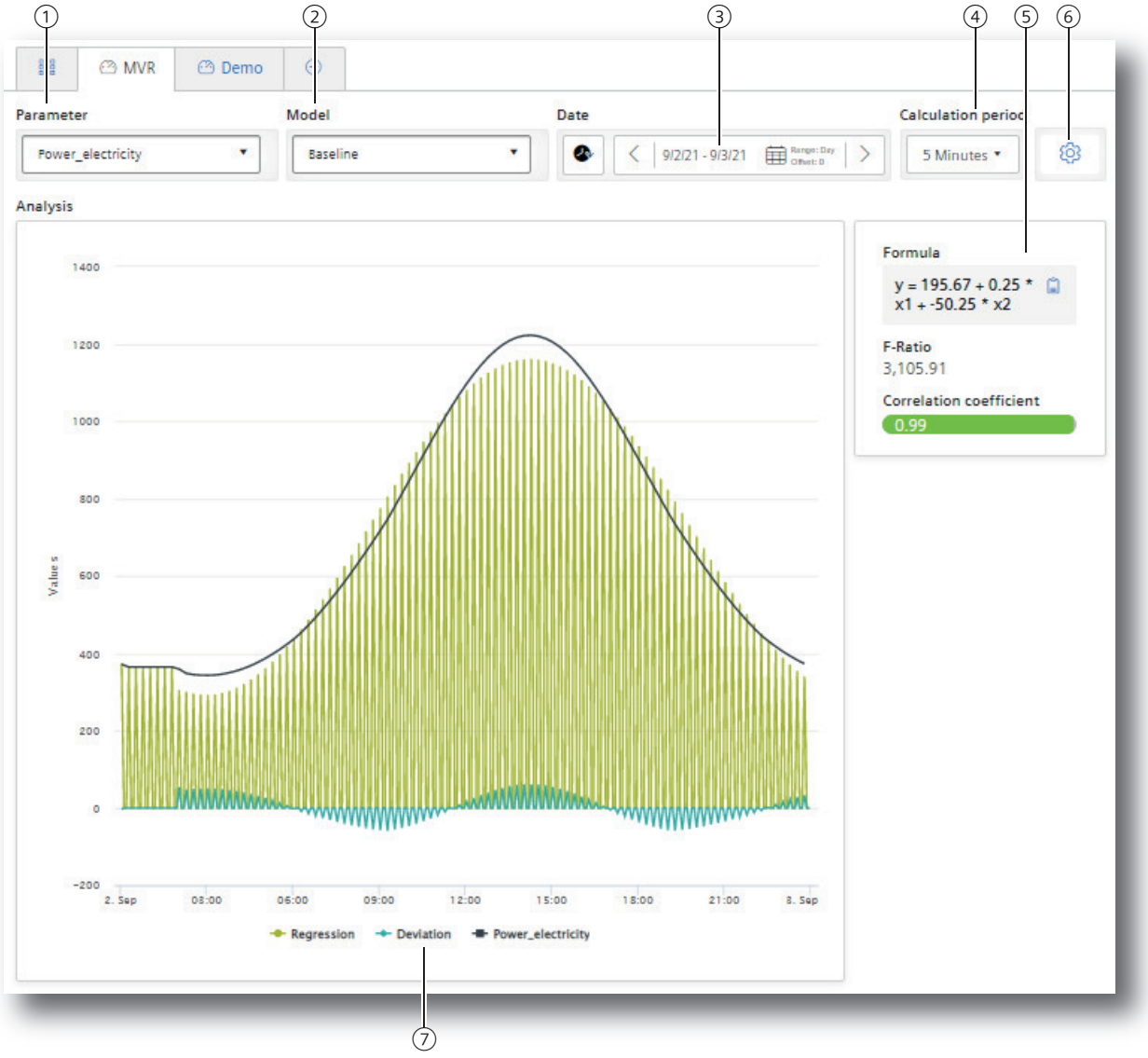
To optimize a model, follow these steps:

1. Use variables or KPIs as output parameter and input parameters for which data is available without gaps in the calculation time range.
2. Remove any input parameters with inadequate data quality.
3. Select a calculation time range during which the data quality is better.
4. Change the spike correction to mitigate the effect of extreme variable values.
5. Recalculate the formula after each change.
6. When you have achieved an acceptable result, save the model.

10.4 Visualizing on the dashboard

MVR dashboard

The MVR dashboard is available when at least one model has been created for the asset.



① Selection of the output parameter
② Selection of a model that describes the output parameter
③ Selection of the time range for the analysis
④ Selection of the calculation interval
⑤ Characteristics of the model: Formula, F-Ratio, Correlation coefficient
⑥ Switching to model overview
⑦ Showing and hiding the individual parameters

Procedure

To visualize the multivariable regression in the dashboard, follow these steps:

1. Select the parameter ①.
2. Select a model ② that describes this parameter.
3. Select the time range ③ for which the multivariable regression is visualized.
   You can apply the model to any time range in the past.
   See also: AUTOHOTSPOT.
4. Select the calculation interval ④.
   With the calculation interval you determine the granularity of the visualization. You determine, for example, whether data values of each minute or of each hour are considered.
5. Select which trends you want to show or hide ⑦.
   The following trends are offered:
   - the value trend of the output parameter
   - the regression
   - the deviation of the actual values from the model

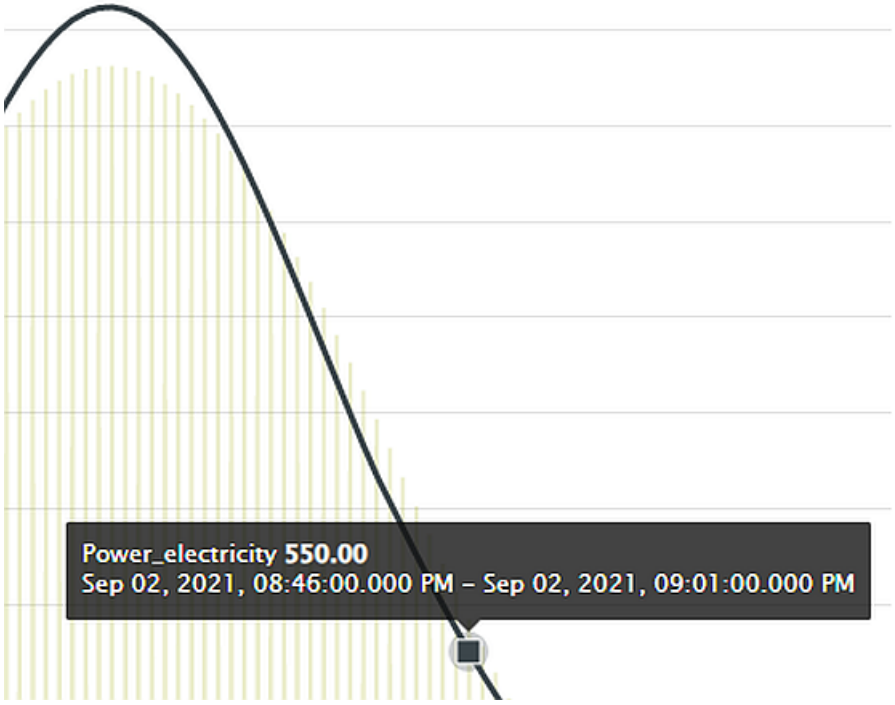
Dashboard features

- Display of the existing models

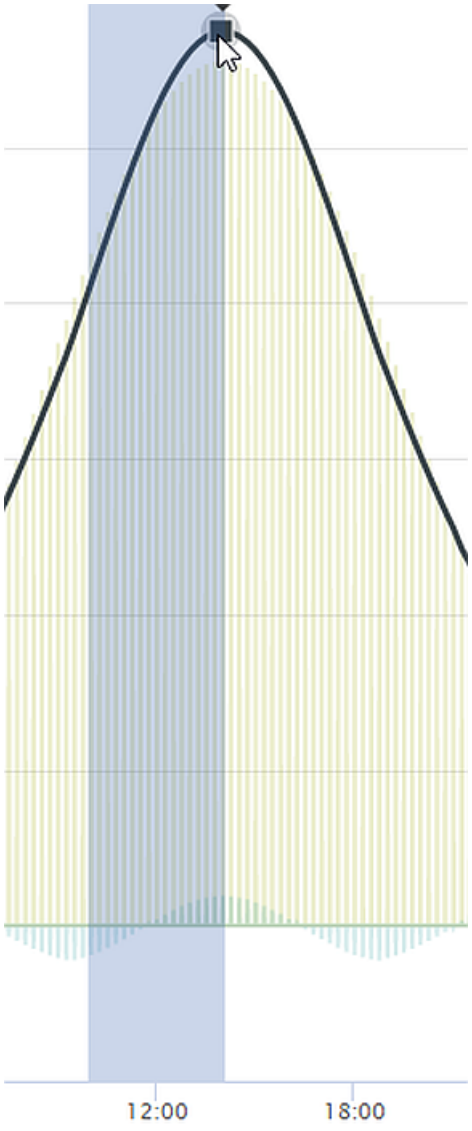
  To display the overview of the existing models and potentially create a new model, click on "Settings" ⑥.
- Description of the model
  The characteristics that describe the model are displayed ⑤:
  - Formula
  - F-Ratio
  - Correlation coefficient

  You can copy the formula to the clipboard.

- Detail view with mouseover
  When you move the mouse pointer over the graphic, the details of individual data points are displayed in the tooltip.



- Zoom view
  To zoom in on the time range, move the mouse pointer above the desired area of the graphic while pressing the left mouse button.



After you have released the mouse button, the selected area is shown in detail (zoomed in).

Click on "Zoom out" to gradually show the view for a longer time range.

Click on "Reset zoom" to restore the original display.

Creating reports

11

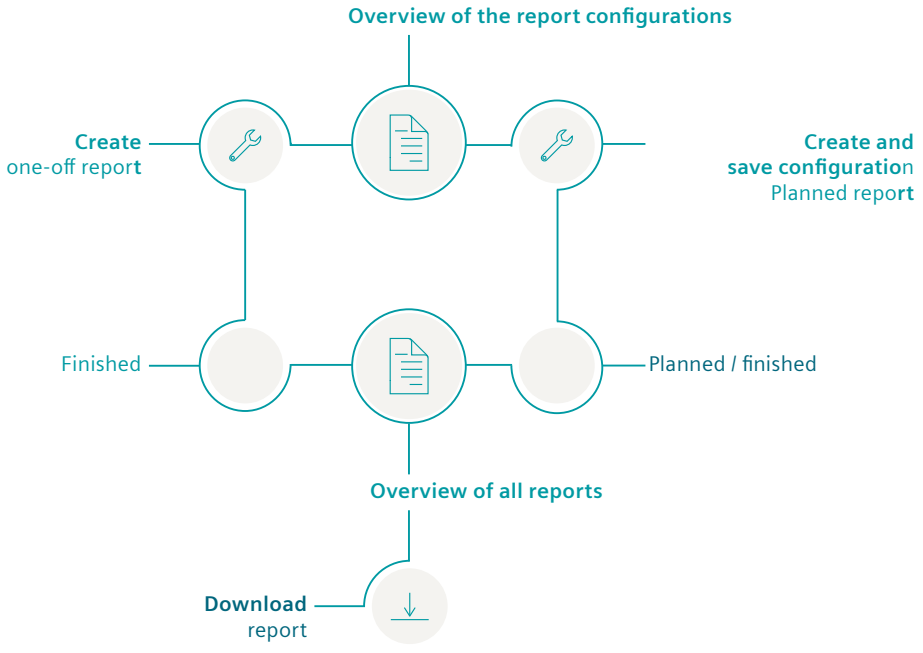
11.1 Introduction to Reporting

Description

Reports are a central component of the app. Reports are generated to complement the visualization of KPIs and variables on the dashboards. Reports provide selected information on productivity, effectivity, machine utilization and more at regular intervals without the recipient of the reports needing to have access to the app. You can also generate a one-off immediate report whose configuration is not saved.

Reports are configured individually. Reports are generated as an Excel spreadsheet. You can use a self-designed template.

Reports can be downloaded.



Procedure

To configure and generate reports, proceed as follows:

1. Configure a report.
2. View generated reports and download them.
3. Use the overview of the report configurations.

11.2 Overview of the report configurations

Introduction

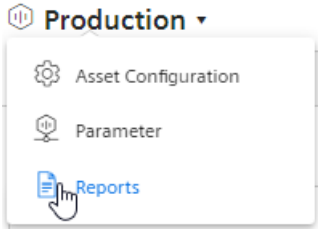
Reports are based on a configuration. This is saved and displayed in the "Overview of all reports".

Here, you can create a new configuration. Configurations can be edited and deleted.

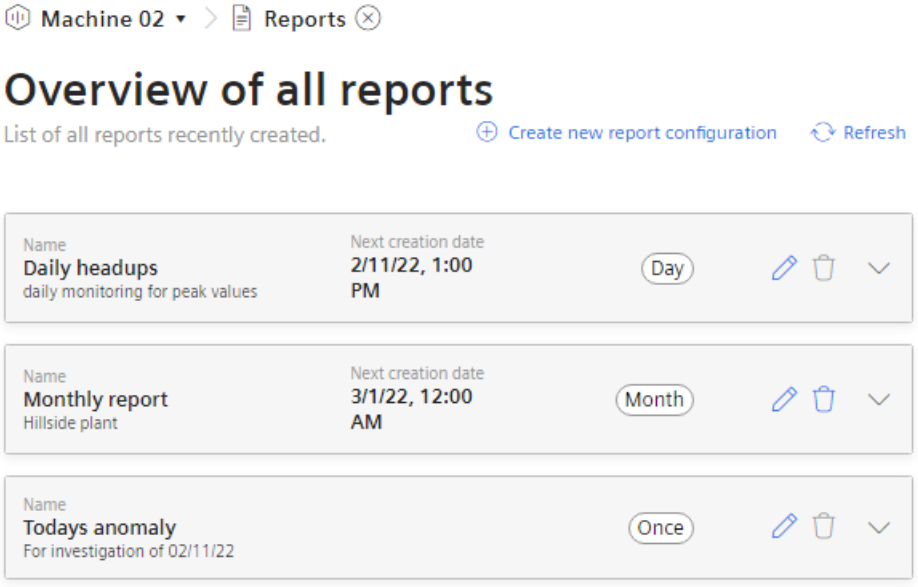
Procedure

To display an overview of the report configurations, follow these steps:

1. Open the "Reports" of the asset.



The overview of configurations is displayed.



2. To create a new configuration, select ⊕ "Create new report configuration".
3. To edit a configuration, select "Edit" ✎.
4. To delete a configuration, select "Delete" 🗑.
   A configuration for which reports are available cannot be deleted.
5. To view the reports based on a configuration, click ⌄ in the configuration display.
   The view is expanded.

11.3 Configuring reports

Description

A report is configured either for a planned periodical or a one-off generation.

The configuration for a report is saved.

You define the following for a report:

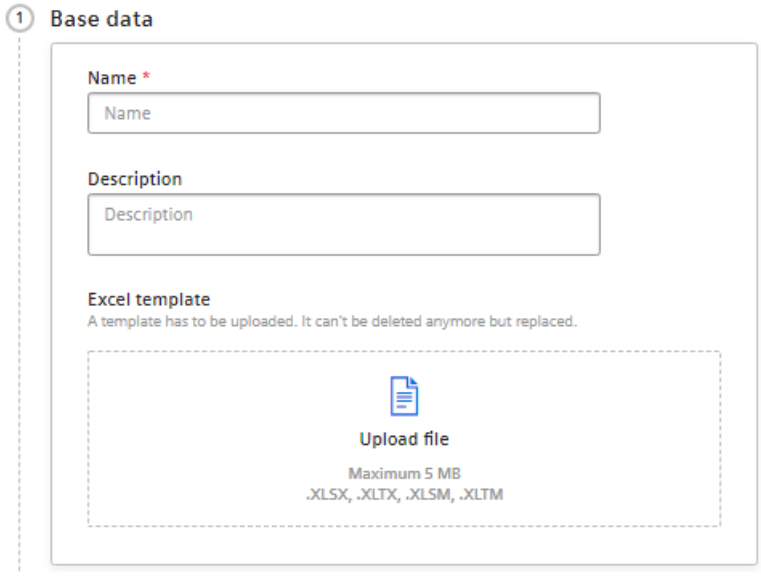
- Report interval: One-off or planned
- KPIs and variables that are reported
- Type of aggregation: Balance value or process values
- Placement of the values in a sheet of an Excel file

A report consists of one or multiple areas. For example, the values of a year can be shown in one area, while the daily values of the last month are shown in an additional area.

Procedure

To configure a report, follow these steps:

1. Open the "Reports" of the asset.
   If a configuration has already been created, the overview is displayed.
2. Select "Create new report configuration".
3. The "Create report configuration" editor opens.



4. Enter the name of the report.
   The name is mentioned in the overview of all reports.
5. Enter a description for the report.
   The description makes it easier to assign the report.

6. Upload an Excel file as report template.
   The template can be an empty file. The template can, for example, already be structured as filled cells that are pre-formatted by headlines. The template can, for example, contain a letter head or recurring information on the location of the plant for each report.
   If you do not upload a template, a blank Excel file is used as the basis for the report. When editing the configuration for a regularly generated report again, you see a note that an automatically generated Excel file is being used. You can replace the automatically generated template with your own template.

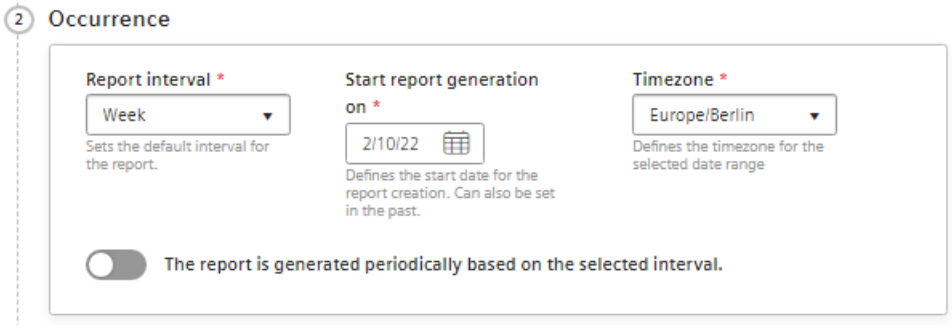
Note

Excel template

An Excel file is required to create the report.

- Permitted data formats XLSX, XLTX, XLSM and XLTM
- Minimum file size: 1 KB
- Maximum file size: 5 MB

7. Select the "Report interval".
8. Select the date on which you want the report generation to start.
   The report is generated for the first time when the interval after the start date is reached.



   Example: The start date is 1/1/22. The interval is one week. The report is generated on 1/7/22.

9. Select a time zone.
   The time zone is added as an offset to the start date.
10. To create a configuration for a report that is generated regularly based on the selected interval, activate the switch.

   To generate a one-off report, deactivate the switch.

Note

One-off reports

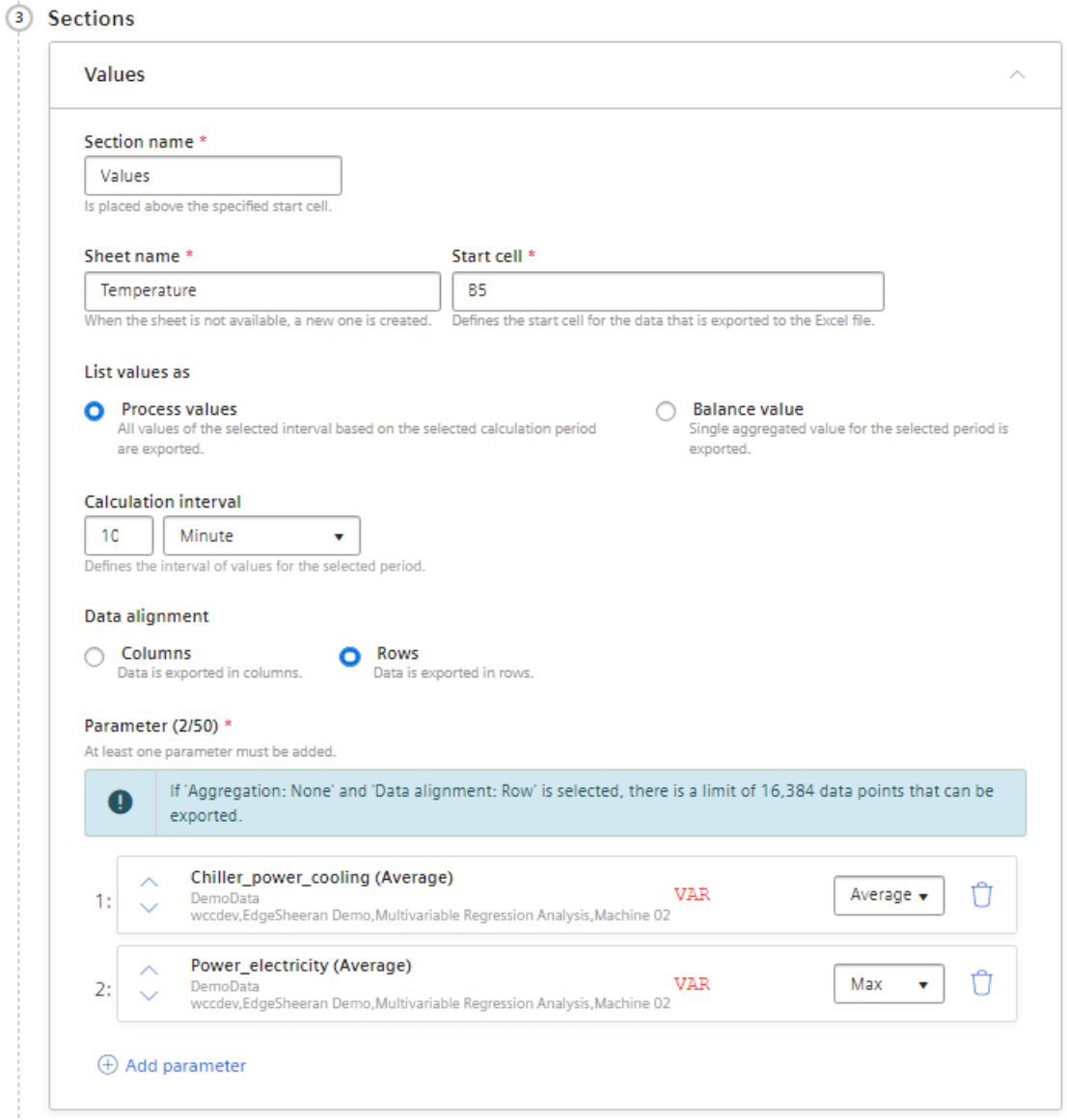
The configuration for one-off reports is not saved.

11. Enter the name of the first section.

Note

Creating sections

You can create up to 20 sections with different configurations. The sections can be exported in different sheets of the Excel workbook.



The name is specified together with the report interval in the start cell of the report. The values are listed below.

12. Select a time zone.
The time zone is added as an offset to the start date.

13. Specify the name of the Excel workbook sheet in which the section is exported.
If a sheet with that name does not exist in the template, it is created.

14. Enter the start cell as of which the values are exported.

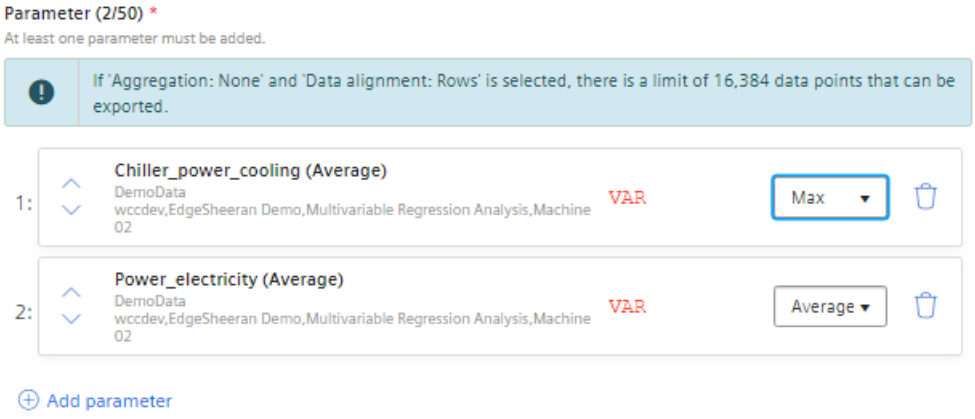
    Note

    No check of the cell sections

    There is no check as to whether the exported values will overwrite existing content.

15. Select whether a balance value or process values is to be exported in this section.
    - Balance value: Single value that results from the aggregation of the interval values.
      Example: The average value for one month.
    - Process values: All values that are available during the selected interval.
      Example: A value is exported for each day of a month.
16. For process values only: Select the interval for the calculation.
    Specifies how often a process value is output within the reporting period.
    Example: For the reporting period of one month, values are output every hour.
17. For process values only: Select whether the display is in columns or rows.

18. Select the parameters that are exported in the section.



Note

Parameter selection

Maximum number per section: 50 parameters.

Parameters of the type String are not permitted.

Note

Limited export to Excel

In a report you can export a maximum of 500000 cells to Excel.

- To add a parameter to the report, select ⊕ "Parameter".
- Select the type of the parameter aggregation.

  Note

  Too many process values through "None" aggregation

  If "Aggregation: None" and "Data alignment: Rows" is selected, there is a limit of 16,384 data points that can be exported.

- To change the order of the parameters, click on the arrows in front of the parameter name.

19. To create an additional section, select ⊕ "Add section".
20. To save the configuration, select "Save".

Result

- The configuration for a report has been created and saved.
- The "Overview of all reports" is displayed.
- The report is generated as of the start date with the selected interval.
  - or -
  The report is generated once on the start date.

11.4 View report

Description

The planned and generated reports are shown in the "Overview of all reports". Periodically generated and one-off reports are shown here.

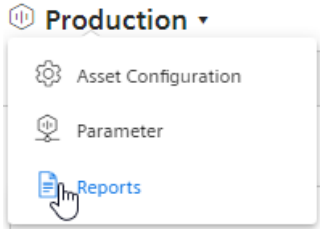
The reports can be downloaded.

If there are more than 500 reports in the app, the oldest reports are deleted.

Procedure

To display the overview of all reports, proceed as follows:

1. Open the "Reports" of the asset.



The overview of all reports is displayed.

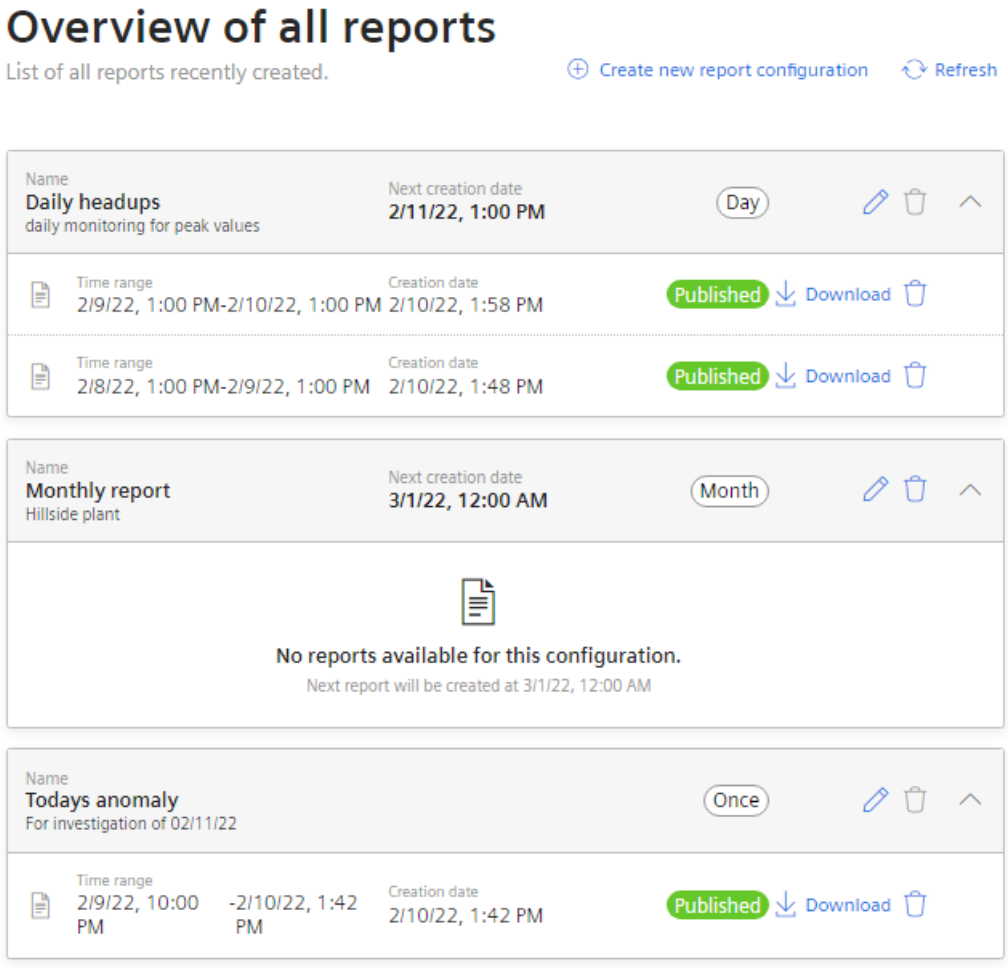


Figure 11-1 Overview

The overview is also displayed after you have created and saved a configuration. The reports are shown grouped by report configurations.

2. To view the reports based on a configuration, click ∨ in the configuration display. The view is expanded.

3. To download a report, select "Download" .
4. To create a report again after an error has occurred, select "Refresh" in the row of the report.
5. To delete a report, select "Delete" .
   This way you delete the report and not the configuration.
6. To create a new configuration, select "Create new report configuration".
7. To load the view again, select "Refresh" .

Creating dashboards

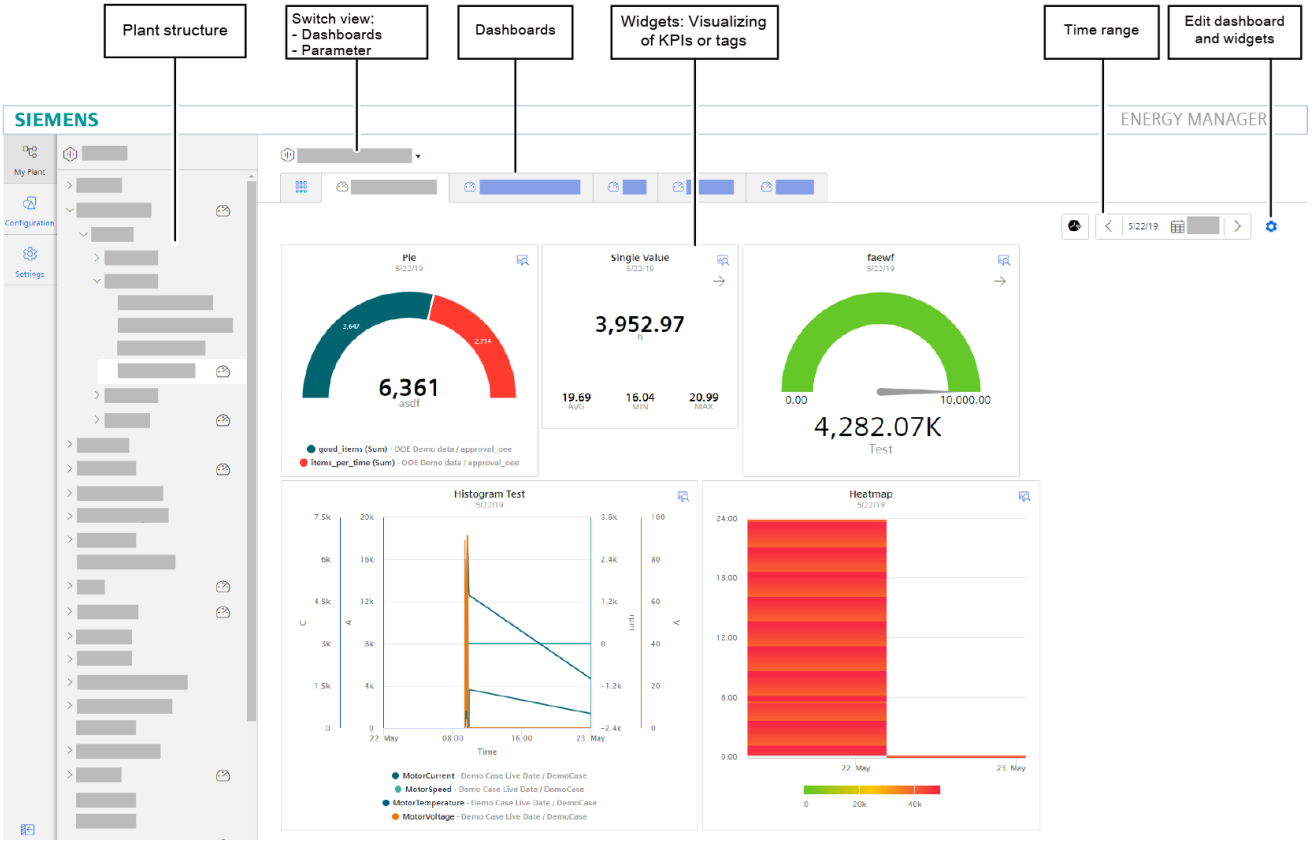
12

12.1 Structure of the dashboards

Overview

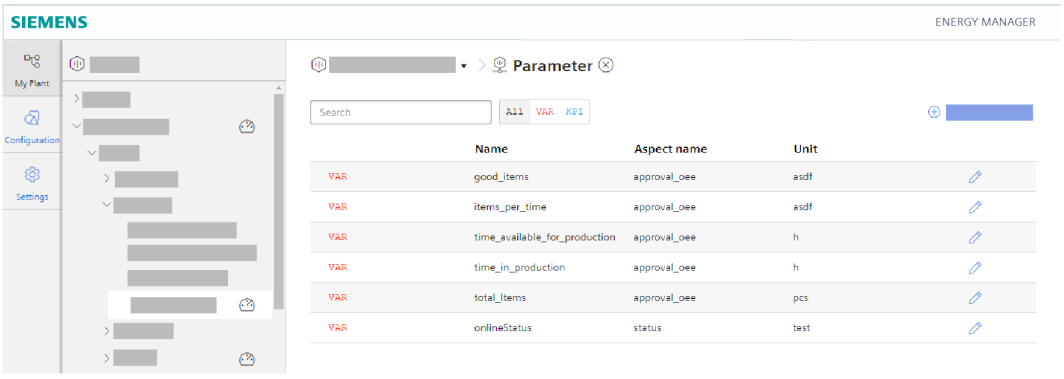
The dashboards contain a graphical representation of variables or KPI types. Widgets are used for the graphical representation. A maximum of 5 dashboards can be created per asset object within My Plant.

The figure below provides an overview of the structure of a dashboard:



Parameter overview

You can switch the view of the parameters using the drop-down list of the plant object. Here you can create additional KPI instances. Below this is the list of the existing KPI instances and variables that were created for the selected plant object or a lower-level plant object:



12.2 Working with periods

12.2.1 Setting the period in dashboards and widgets

Description

For each dashboard and each individual widget, you can define a specific period for which the values of all parameters are to be read and displayed in the widgets.

You can either use predefined periods (day, week, month, year, etc.) or define your own periods. You can find additional information here: Defining your own periods (Page 119)

The values of the current date are always displayed by default. You can use the left ‹ and right › arrows to jump forward or backward day by day. As soon as you deviate from the current day, -1 (one day back) or 1 (one day forward) is displayed accordingly as offset.

The current date is displayed again when you click on the symbol .

If you select "The last 3 hours" as the period, for example, then you can specify an exact time from which the last three hours are to be displayed.

Result

The values of the parameters for the period from 14.10.2019 to 21.10.2019 are displayed in all widgets of the dashboard.

12.2.2 Defining your own periods

Description

You can define your own periods and use them in the settings for periods. You define these periods in the configuration. A preview shows you how the values selected affect the period you want to define.

Procedure

To define your own period, follow these steps:

1. Open the configuration.
2. Click "Periods > New period".
   The detail window for creating a period is displayed.
3. Assign a name to the period in the "General" area. If necessary, you can add a description.
4. Define the period under "Configuration". The following options are available:
   - **Duration**
     Enter a value for the duration of the period or select a value by clicking on the arrows in the input field.
     Select the unit of the period: Minute, hour, day, week, month or year.
   - **Start time (relative to the current/defined time)**
     Define the starting point of the period relative to the current date by specifying the unit of the distance to the current time: Minute, hour, day, week, month or year.
     Specify whether the starting point is in the past or the future starting from the current date. With a negative value you specify a start time in the future, with a positive value a start time in the past.
   - **Offset**
     Enter a value or select a value by clicking on the arrows in the input field by which you want to offset the calculated period.
     Select the unit for the offset: Minute, hour, day, week, month or year.
   - **Next period**
     Specify the start time of the next period.
     "Starts at the beginning of the selected start time" starts the next period when the defined start time has been reached.
     "Starts immediately after the last period (e.g., with shift operation)" starts the next period at the end of the previous period.
5. Click "Save".

Result

You have defined your own period that you can now use when selecting a period, for example, in a widget.

Widget views

13

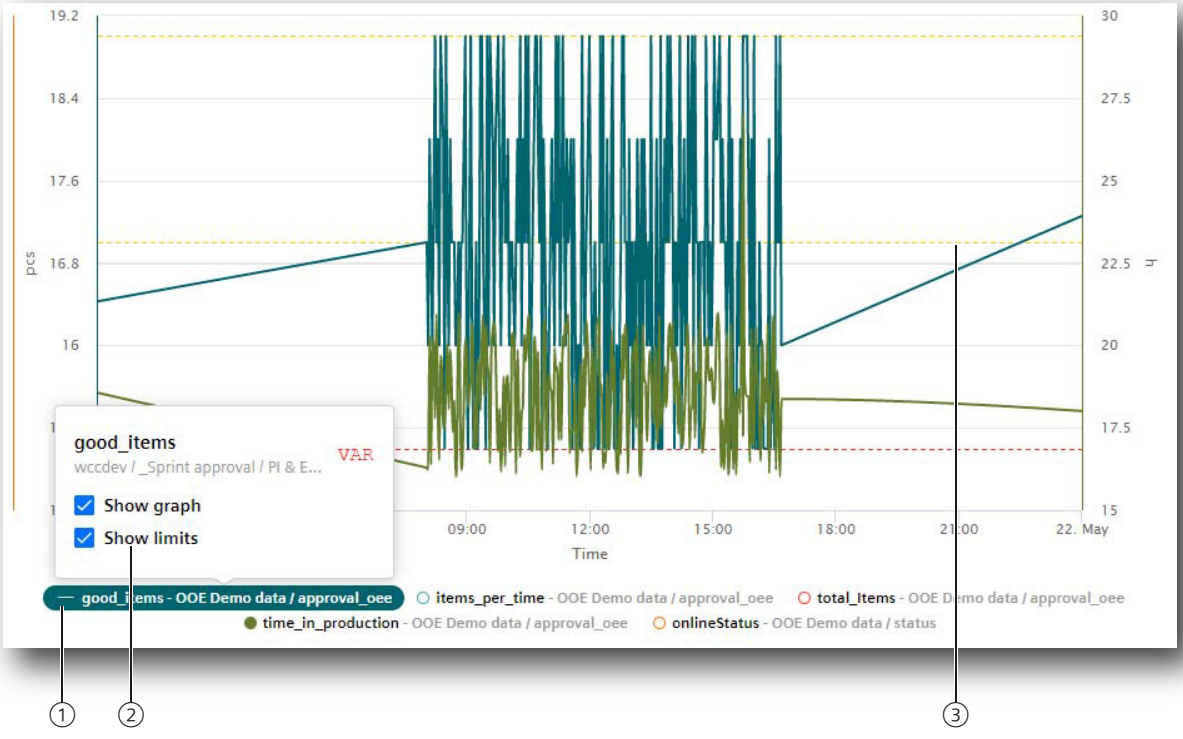
13.1 Detail view

Description

In the detail view, you can display the load profile of the parameters, for example, or an enlarged view of the widget. To open the detail view, click in the widget. The functions of the detail view depend on the widget type.

For a widget of the "Diagram" type, the detail view contains the following functions, for example:

- Showing and hiding individual lines
- Showing and hiding limits
- Output of detailed values when you move over the line with the mouse
- Zooming in on the diagram

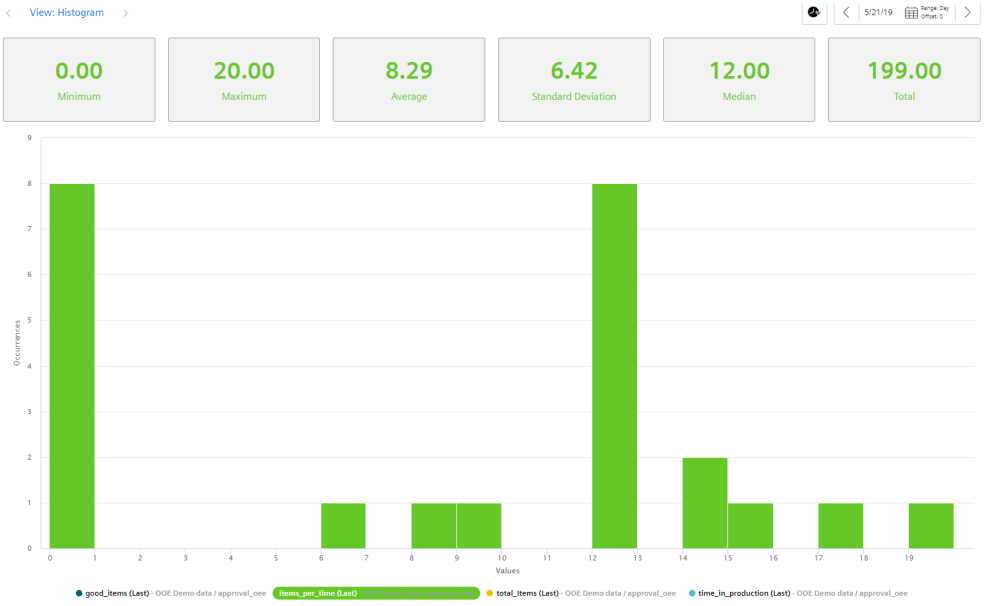


13.2 Histogram

Description

In addition to the detail view, you can also display the Histogram if you want to see the curve of the frequency distribution. A variety of statistic KPIs are available for this:

- Minimum
- Maximum
- Average
- Standard deviation
- Median (central value)
- Total

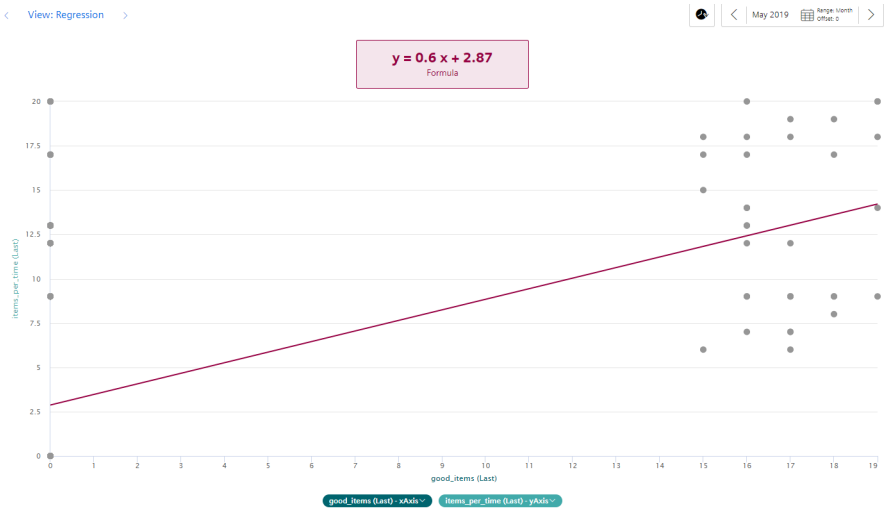


13.3 Regression analysis

Description

In the x-y display, the production amount is mapped on the x-axis and the energy consumption is mapped on the y-axis. By using the regression line, you can determine, for example, whether too much energy is being consumed for a specific production amount. This is the case when the dot is above the regression line.

The regression analysis is available for the widgets "Pie chart" and "Diagram":


View: Regression
May 2019
y = 0.6 x + 2.87
Formula
items_per_time (Last)
good_items (Last)
good_items (Last) - xAxis
items_per_time (Last) - yAxis