SIEMENS

SIMATIC HMI

WinCC/SES V7.5 SP1
WinCC/SES SequenceExecutionSystem

System Manual

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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.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

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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WinCC/SES Sequence ExecutionSystem - Documentation

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- Working with the Sequence Execution System

WinCC/SES SequenceExecutionSystem - Installation Notes

2

2.1 System requirements

System requirements for the configuration and operation of WinCC/SES

- Successful and complete installation of the following components including all necessary licenses:
  - STEP 7 V5.6
  - WinCC V7.5 SP1
  - SIMATIC Net V16
- The control range covers S7-400 and all S7-300, for example, S7-315 PN/DP
- The general requirements of WinCC V7.5 SP1 apply to productive operation of the WinCC server and the clients

Software requirements for the configuration of WinCC/SES

Operating system	Configuration	Remarks
Windows Server 2012 R2	Standard Datacenter	32-bit
Windows Server 2016	Standard Datacenter	64-bit

Software requirements for the operation of WinCC/SES

Operating system	Configuration	Remarks
Windows 10	Pro Enterprise	Standard installation 64-bit
Windows 10	Enterprise LTSB (Long-Term Servicing Branch)	Standard installation 64-bit
Windows Server 2012 R2	Standard Datacenter	64-bit
Windows Server 2016	Standard Datacenter	64-bit

Licensing

WinCC SES offers two licenses which must be available on the server:

- One basic license for up to two units (Basic Pack)
- The basic license can be extended by five units each with an extension license (Extension 5 Units)

2.2 How to install WinCC SES

Procedure

1. Start the WinCC SES DVD.
   The DVD starts automatically if Autorun is enabled in the operating system. If the Autorun function is not activated, start the "setup.exe" program on the DVD.

2. Select the installation language. Follow the instructions on the screen.
   Pay attention to the license agreement and confirm that you have read the security instructions.

3. Select the languages you want to install.
   You can also install languages at a later time.

4. Start installation.
   You can track the status of the installation in the displayed dialog. Select "Cancel" to cancel the installation of the current component.

Result

- Setup installs WinCC SES in the "SES" subfolder in the WinCC installation path.

- The library with the SES-specific blocks is installed in the STEP 7 library folder "SES_LIB".

WinCC/SES SequenceExecutionSystem - Release Notes

3

3.1 Information on Sequence Execution System

Introduction

These release notes contain important information.

The statements in these release notes take precedence over information provided in the manuals and in the online help.

Read these release notes carefully as they contain useful information.

Use the input "L_FCT_SET" in the "SES_PHC" for a conditional jump

You can also trigger a conditional jump via the input "L_FCT_SET" in the function block "SES_PHC" if you do not want to use the block "SES_JUMP", for example, with a small controller. The input "L_FCT_SET" is only enabled when the input "DBNO_JUMP" = 0 is active.

No longer required data block for step sequencers

If you no longer require a data block for the step sequencers you must enter a "0" in the function block "SES_PHC" at the input "DBNO_Rx".

See also

http://www.industry.siemens.com/topics/global/de/industrial-security/konzept/Seiten/defense-in-depth.aspx (http://www.industry.siemens.com/topics/global/en/industrial-security/concept/Pages/defense-in-depth.aspx)

3.2 Service and Support

3.2.1 Warnings

Security information

Warning notice system

This manual contains notices you must observe to ensure your personal safety and to prevent damage to property. Notices referring to your personal safety are highlighted in the manual by a safety alert symbol; notices referring to property damage only have no safety alert symbol. The warning notices shown below are graded according to the degree of danger.

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

> **NOTICE**
>
> indicates that property damage may result if proper precautions are not taken.

Note

indicates important information about the product and its use or a specific section of the documentation to which you should pay particular attention.

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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://www.siemens.com/industrialsecurity)

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 the 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://www.siemens.com/industrialsecurity)

Disclaimer of liability

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

Information in the online documentation is more binding than that in the manuals and PDF files.

Observe the Release Notes and Installation Notes. Information in the Release Notes and Installation Notes is more binding than that in the manuals and online help.

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See also

https://www.siemens.com/industrialsecurity (https://www.siemens.com/industrialsecurity)

3.2.2 GDPR - General Data Protection Regulations

Siemens takes data privacy principles, such as the privacy by design and default principle, into account when developing its products and services.

For this product SIMATIC WinCC V7.5 incl. Options this means the following:

Personal data processed by the Application

This product collects and processes the following personal data:

- User names, i. e. Login, which may directly contain or establish a reference to the family name and/or first name

- Timestamps: date / time of login, logoff and access
  In the WinCC "Option for Process Control" application "Split Screen Manager", the login timestamp and user name are saved without encryption with the picture management data. In the WinCC/WebNavigator diagnostic page, logged in users and timestamps are saved without encryption.

- Location data (time zone)

- Computer name

- IP addresses

- MAC addresses

- E-mail addresses (WinCC Options)

- In case of using UMC, additional personal data can be added in the tool, e. g. telephone numbers or addresses.
  This data is not needed for the product functionality and should not be stored on the same medium.

If the user links the above mentioned data with other data, e. g. shift plans, or stores personal data on the same medium, e. g. hard disk, and thus establishes a personal reference, the user must ensure compliance with data protection regulations.

Purposes

The above data is required for the following purposes:

- Access protection and security measures (e. g. Login, IP address)

- Process synchronization and integrity (e. g. time zone information, IP addresses)

- Archiving system for traceability and verification of processes (e. g. access timestamps)

- Message system for traceability and availability (e. g. e-mail notification)

The storage of data is appropriate and limited to what is necessary, as it is essential to identify the authorized operators and process events.

Data configuration

The customer may configure the data collected via the product as follows:

- Display data in process pictures

- Data output in form of reports, e. g. for printing or display as electronic file

- Data collection and evaluation in form of graphics, e. g. for KPI analysis

Deletion policy

The product does not provide an automatic deletion of the above data.

If necessary, these can be deleted manually if desired. To do this, please refer to the product documentation or contact customer support.

Securing of data

The above data will not be stored anonymously or pseudonymized, because the purpose of access and event identification cannot be achieved otherwise.

The above data is secured by adequate technical measures, such as:

- Encryption of log data

- Storing the process data in access-protected SQL databases
  The user must ensure the access protection as part of their process configuration.

3.2.3   Customer support

Customer Support, Technical Support

You can reach the SIMATIC hotlines at the times specified in the following table. The SIMATIC hotline employees speak German and English. The Authorization hotline offers French, Italian or Spanish customer support in addition to German and English.

Technical support

Technical support is available by telephone around the clock from Monday to Friday.

The current contact data and an overview of the Technical Support is available at the following URL:

- https://support.industry.siemens.com/cs/ww/en/sc/4868 (https://support.industry.siemens.com/cs/ww/en/sc/4868)

Siemens Industry Service Card

The "Siemens Industry Service Card" enables an additional Technical Support, such as fast response via "Priority Call-Back". You can find additional information at the following URL:

- https://support.industry.siemens.com/cs/ww/en/sc/4869 (https://support.industry.siemens.com/cs/ww/en/sc/4869)

SIMATIC Customer Online Support

Service and Support

An overview of the support offering for our products is available at the following URL:

- https://support.industry.siemens.com/ (https://support.industry.siemens.com/cs/ww/en/)

- https://support.industry.siemens.com/cs/ww/en/view/93906404 (https://support.industry.siemens.com/cs/ww/en/view/93906404)

In Product Support, for example, you will find downloads of firmware updates, service packs and useful applications.

Online Help is available so that you can successfully use the Support offering. Open the Online Help using the button on the Internet page or using the following URL:

- https://support.industry.siemens.com/cs/helpcenter/en/index.htm (https:// support.industry.siemens.com/cs/helpcenter/en/index.htm)

The app is available for mobile Siemens Support:

- https://support.industry.siemens.com/cs/sc/2067 (https:// support.industry.siemens.com/cs/ww/en/sc/2067)

WinCC FAQs

WinCC Online Support with information on FAQs (Frequently Asked Questions) may also be found at the following URL:

- https://support.industry.siemens.com/cs/ww/en/ps/14866/faq (https:// support.industry.siemens.com/cs/ww/en/ps/14866/faq)

Technical Forum

The Technical Forum supports exchange with other SIMATIC users. It is available at the following URL:

- https://support.industry.siemens.com/tf/ (https://support.industry.siemens.com/tf/ww/en/)

Technical documentation for SIMATIC products

You can find a guide to the technical documentation provided for individual SIMATIC products and systems at the following URL:

- http://www.siemens.com/simatic-tech-doku-portal (http://www.siemens.com/simatic-tech-doku-portal)

Local partners database

To contact your local partner, search our local partners database at the following URL:

- http://w3.siemens.com/aspa_app/ (http://w3.siemens.com/aspa_app/?lang=en)

Product Information

SIMATIC WinCC

Go to the following URL for general information about WinCC:

- http://www.siemens.com/wincc (http://www.siemens.com/wincc)

SIMATIC Products

Go to the following URL for general information about SIMATIC products:

- http://www.siemens.com/simatic (http://www.siemens.com/simatic)

See also

Internet: Error Report (https://support.industry.siemens.com/My/ww/en/requests)

Internet: Technical support (https://support.industry.siemens.com/cs/ww/en/sc/4868)

Internet: Siemens Industry Service Card (https://support.industry.siemens.com/cs/ww/en/sc/4869)

Internet: Service and Support (https://support.industry.siemens.com/cs/ww/en/)

Internet: SIMATIC WinCC in Online Support (https://support.industry.siemens.com/cs/ww/en/view/93906404)

Internet: Support Online Help (https://support.industry.siemens.com/cs/helpcenter/en/index.htm)

Internet: Mobile use via support app (https://support.industry.siemens.com/cs/ww/en/sc/2067)

Internet: WinCC FAQs (https://support.industry.siemens.com/cs/ww/en/ps/14866/faq)

Internet: Support Technical Forum (https://support.industry.siemens.com/tf/ww/en/)

Internet: Technical documentation for SIMATIC products (http://www.siemens.com/simatic-tech-doku-portal)

Internet: Contact person database (http://w3.siemens.com/aspa_app/?lang=en)

Internet: Information about WinCC (http://www.siemens.com/wincc)

Internet: SIMATIC Products (http://www.siemens.com/simatic)

3.2.4 Support request

Dear customer

In order to provide you with fast and effective support, please complete the "Support Request" form online on the Internet. Describe the problem in as much detail as possible. We would appreciate if you would provide us with all project data so that we can reproduce the error situation or shorten the turn-around time.

Before filling out the support request, check whether your configured quantity structure is within the range of tested quantity structures (see topic "Performance Data").

Support Request form

The Support Request form is available at the following URL:

- https://support.industry.siemens.com/my/WW/en/requests (https://support.industry.siemens.com/My/ww/en/requests)

When filling out the report, you will be guided through several steps. The data required by the Technical Support are described in the FAQ 16607894:

- https://support.industry.siemens.com/cs/ww/en/view/16607894 (https://support.industry.siemens.com/cs/ww/en/view/16607894)

A detailed description of the Support Request can be found at the following URL:

- https://support.industry.siemens.com/cs/ww/en/sc/2100 (https://support.industry.siemens.com/cs/ww/en/sc/2100)

Procedure

1. Open the "Support Request" form using the link on the Internet. Step 1 "Select product" is displayed:

2. Enter the project name in the "Product/Order number" box. Upper/lower case is not relevant. Search for parts of the product name or enter the full product name in the correct order. You can e. g. search for the following terms:
   - "WinCC Runtime V7"
   - "wincc editor"
   - "WinCC DataMonitor"
   - "wincc webnav"
   - "Connectivity"

   The found products are offered in the "Product selection" field.
   If you have questions about licensing, activate the "Problem with SIMATIC authorization/license" in the product selection field.

3. Select the desired product and click on "Next" to switch to step 2 "Select your situation". Select a use case.

4. Press "Next" to switch to step 3 "Our solutions".
   Suggested solutions and FAQs for the selected key words are listed.
   Once you have found a suggested solution for your problem, you can close the form in the browser.
   If you did not find any applicable suggested solutions, press "Next" to switch to step 4 "Describe a problem".

5. Formulate a short description of the problem in the "Topic" field.

6. Describe your problem as exactly as possible in the "Details" field. Pay particular attention to the following questions and comments.
Please also check the WinCC installation and configuration with regard to the following references.
If you have any idea what has caused the error, please let us know. No detail should be omitted, even if you consider it unimportant.

   – Was the configuration data created with older WinCC versions?

   – How can the error be reproduced?

   – Are other programs running simultaneously with WinCC?

   – Have you deactivated the screen saver, virus checker and power management function?

   – Search your computer for log files (WinCC\Diagnose*.log, drwatson.log, drwtsn32.log). The log files are needed for error analysis. Thus, be sure to send the log files as well.

   – To assemble diagnostic and system information from computers and other devices, use the "SIMATIC Assessment Suite - Data Collector" (SAS-DC) diagnostics tool.
   Additional information is available in the Support entry 65976201 (https://support.industry.siemens.com/cs/ww/en/view/65976201).

7. Use the "Search" button to upload your affected project and the log files (e. g. as a Zip file) to the Support Request.
Press "Next" to switch to step 5 "Specify contact data".

8. Enter your contact information.
Press "Next" to switch to step 6 "Summary & Send".

9. Press the "Print" button if you would like to print the support request ▤.
To receive a copy of your request as email, activate this option in the summary.
You close the support request by clicking the "Send" button.
Your data will be transmitted to Customer Support and processed there.

Thank you for your cooperation. We hope that we can be of assistance in solving your problems.

Your WinCC Team

See also

Internet: Error Report (https://support.industry.siemens.com/My/ww/en/requests)

Internet: Specifications for the Technical Support (https://support.industry.siemens.com/cs/ww/en/view/16607894)

Internet: Overview of Support Request (https://support.industry.siemens.com/cs/ww/en/sc/2100)

Internet: SIMATIC Assessment Suite - Data Collector (SAS-DC) (https://support.industry.siemens.com/cs/ww/en/view/65976201)

WinCC/SES SequenceExecutionSystem - Documentation

4

4.1 Overview of the Sequence Execution System

4.1.1 Basics of SES

Introduction

The WinCC option "WinCC/SequenceExecutionSystem" enables sequence-controlled automation of production in units.

The term "WinCC SES" or "SES" is used for "WinCC/SequenceExecutionSystem" in the following documentation.

Benefits of WinCC SES

- Easy configuration of all production steps
- Visualization of manufacturing steps and current states
- Easy changing of production parameters and production processes in Runtime
- Clearly structured comparison of actual values with setpoints for each individual step
- Single step mode in which the operator can switch to the next step independently
- Option to intervene in the running process with manual jumps to a specific step or with automatic jumps when a configured event occurs
- You can also trigger functions that do not originate in the SES

Working with WinCC SES

Configuring WinCC SES

- In SIMATIC Manager, a function block is inserted for each unit. Additional information such as data blocks for sequence data, batch data and jump information is linked to this block.
- Units are configured in the WinCC Configuration Studio and connected to the S7 blocks with tags. For each unit, you can assign the actuators and sensors to the configured steps and combine the steps into sequences.
- In WinCC, you configure in the Graphics Designer an SES control for operating and configuring the sequences in Runtime. You write the configured sequences to the controller via the SES control. You can configure a separate SES control for each unit. Or you dynamize the SES control to access different units in Runtime.

Operating WinCC SES in Runtime via the SES control

- Depending on the configuration, up to 5 sequences can be located on the PLC simultaneously.

- The unit can be started manually or it automatically receives a start signal from a different source, for example, a previous unit or a higher-level system.

- The current state of the unit and the actuators and sensors is displayed in the control. In single-step mode, you can monitor the execution of the sequence step-by-step.

- The production parameters are displayed for each batch. You can save the batch data, for example to generate a report.

- You can also configure steps and sequences in Runtime in the SES control.

Supported project types

Configuration and Runtime are supported in the **single-user system**.

The following is supported in the **multi-user system**:

Project type	Configuration	Runtime
Server	Yes	Yes
Client without project	No	Yes
Client with project	No	Yes
Engineering System	Yes	Yes
Redundant server	No	No
Web client	No	No

4.1.2 Technical specifications

Configuration limits

The following configuration limits are available in the WinCC/SES Sequence Execution System:

Component/sub-quantity	Quantity	Description
Maximum number of units	xxx	The number is only limited by the memory capacity of the PLC used.
Sequences that are stored in the PLC per unit	5	A sequence is a sequence of steps with parameters and control modules. The sequence describes the cycle of a unit.
Steps per sequence	50 - 200	A step sets the control and feedback of a control module, for example. Depending on the data blocks used for the sequence data, 50, 100 or 200 steps are available per sequence.
Control modules per unit[*)]	160	Each unit can control up to 160 control modules, for example, valves and motors, in the sequences.
Parameter types per unit[*)]	60	A parameter type describes the use of the parameter, e.g. minimum, hysteresis, timer, counter, setpoint-actual value comparison.
Parameters per step[*)]	60	For each step a different setpoint can be specified for each parameter type.
Parameters per unit	500 - 1000	Depending on the data blocks used for the sequence data, 500 or 1000 parameters are available per unit. Up to 60 parameters can be used per step.

*) A total of 160 control modules and parameter (types) can be configured per unit. Because the parameter (types) are a subset of the up to 160 control modules, you must decide how you want to distribute the control modules and parameters to the total amount. For example, 100 control modules and 60 parameters.

Overview of the SES blocks and functions

Object name	Symbolic name	Description
FB 2101	SES_PHC	SES function block for the sequential control
FB 2102	SES_JUMP	SES function block for the jump organization
FB 2103	SES_BAID	SES function block for the Batch ID generator
UDT 1112	SES_RECIPE_DB_UDT1	User-defined data type (UDT) for a data block of the sequence data with up to 200 steps and 1000 parameters
UDT 1113	SES_BADAT_DB_UDT	User-defined data type (UDT) for a data block of the batch data
UDT 1114	SES_RECIPE_DB_UDT2	User-defined data type (UDT) for a data block of the sequence data with up to 100 steps and 500 parameters
UDT 1115	SES_RECIPE_DB_UDT3	User-defined data type (UDT) for a data block of the sequence data with up to 50 steps and 500 parameters

Remarks

- You must copy the function blocks from the SES library to the SES project.

- You can use the functions from the standard library. Always use the latest blocks.

- FB 5, FC 21, FC 26, FC 28, FC 29, FC 34 and FC 38 are standard function blocks and functions. The versions of these functions can be different depending on the PLC and the software version used.

- You have to use the user-defined data types UDT 1112, 1113, 1114 and 1115 to create data blocks for the sequence data and batch data. Depending on the PLC used and the required scope of the sequences, three different data blocks are available for the sequence data.

4.1.3   Configuration overview

Initial situation

In an SES project the control modules of a plant are defined in order to automate it. The project contains multiple steps that can be combined into sequences. The connection data of the control modules are configured in the steps.

The following procedure is recommended to configure the sequential control:

- The processing of the information of the control modules is already configured in the SIMATIC Manager.

- You map the components of the sequence control, e.g. the control modules, in the WinCC Configuration Studio. WinCC SES generates the structure tags for the control. You configure the steps and sequences for the unit(s). The configuration data are saved automatically in the database. You write the configured sequences via the SES control to the configured data blocks of the sequences in the controller.

Only one step after another can take place in a unit. Therefore, parallel processing is not possible but several units can run at the same time.

Configuration requirements

- Proficiency in SIMATIC STEP 7 and WinCC

- The STEP 7 basic package is installed.

- The control range covers S7-400 and all S7-300, for example, S7-315 PN/DP

- The SIMATIC S7 hardware configuration is configured, compiled and loaded.

- In case of an integrated project, the SIMATIC S7 Netpro configuration is configured, compiled and loaded. In a project that is not integrated, you have set up an S7 connection in which the connection resource has the same value for the partners and active connection setup must be deactivated.

- Every controller that communicates with WinCC via a connection and has SES blocks has to be configured with its own "TSAP ID". The "TSAP ID" is configured at the same time as the connection in WinCC.

- The time response of the automation systems is set to "UTC". You have to correctly configure the time difference between AS and the partners via the SIMATIC Manager.

- The project structure in SIMATIC Manager has been created.

- The parameters and tags for the control modules used in the SES project, such as motors and valves, are created in the S7 program.

- You may also have provided external programs or other complex units which you want to connect to the block.

- WinCC is installed

- WinCC/SES Sequence Execution System is installed

- You have configured a connection in the WinCC tag management. The "Send / receive raw data block" option is activated in the connection parameters, and the value of the connection resource matches the value of the connection in SIMATIC Manager.

- In SIMATIC Manager, you have integrated the SES library in the project via "Seek library".

Configuration overview

You can configure the control modules and parameters for SES in the PLC program as well as after PLC programming in the Configuration Studio. It is important that the connector numbers (the port IDs 1-160 at the "SES-PHC" block) in the Configuration Studio match those in the PLC program.

Configuration in SIMATIC Manager

The blocks supplied by the WinCC SES are configured with STEP 7 for each unit used, for example, via FBD. The "SES_PHC" function block is the central element for sequential control of the sequence and for the connection of the control modules. The "SES_BAID" function block is used where necessary as Batch ID generator to generate unique batch numbers across all connected units.

The basic procedure in SIMATIC Manager is shown below:

1. You insert up to five data blocks for the sequences, which are derived from one of the three user-defined data types "UDT1112", "UDT1114" or "UDT1115". The three data types define different sizes of sequences and differ in the number of configurable steps and parameters. For each unit, you can use only one of the three data types for the data blocks of the sequences.

2. You insert a data block for the batch data, which is derived from the user-defined data type "UDT1113".

3. For each unit you insert an instance data block which is assigned to the "SES_PHC" function block. You can also generate the instance data blocks directly in the OB when calling the blocks.

4. In the main program "OB1", you call for each unit the instance data blocks of "SES_PHC" in which you specify the IDs of the units and the connections. The input "ID" corresponds to the local ID of the S7 connection. "R_ID" corresponds to the communication ID for the BSEND/BRCV connection.

5. You interconnect the data block inputs of the instance data blocks of "SES_PHC" with the generated data blocks for the sequences and batch data.

6. If necessary, insert an instance data block from "SES_BAID" and interconnect the "SES_BAID" block with the instance data blocks of "SES_PHC".

7. You can already configure the required control modules and parameters with the connection numbers in the program.

8. If you want to use conditional jumps, also insert the "SES_JUMP" block.

The sections under "SES blocks" provide you with an overview of the mode of operation and properties of the SES blocks.

Configuration in WinCC in the Configuration Studio

1. You create virtual units in the Configuration Studio which represent the function blocks. In each case you connect the created units with the "SES-PHC" instance data block of the unit.

2. WinCC SES then automatically creates the structure tags for control of the units and the raw data tags for communication with the controller in the tag management.

3. For each unit, you configure:

– The required control modules and the associated parameters with the connection numbers;

– The steps with the commands for the control modules and parameters. For example, the start step controls the motor with the command "Set to 1" and checks the "Speed" with the command "Check for 1".

– If necessary, enter notes for the individual steps for operator input request.

– If necessary, synchronize steps with other units.

– If necessary, conditional jumps to already configured steps.

– The sequences with the step assignments and setpoints.

– If necessary, the special sequences with the step assignments.

4. The configured sequences, control modules and parameters are written via the SES control to the blocks of the sequential control.

For details about configuring in the SES Configuration Studio refer tot he sections under "Creating a unit (Page 57)".

Configuring in SES Runtime

Alternatively, only create the units with their components in the Configuration Studio. You can then specify the following in the SES control in Runtime:

● Assign the control modules and their parameters to the steps

● The control of the control modules and their parameters

● Assign the steps to the sequences

● The setpoints of the parameters

● Conditional jumps

● Special sequences

Configuration in WinCC in the Graphics Designer

You integrate the SES control included in WinCC SES in your plant pictures in the WinCC Graphics Designer. You can configure and dynamize the object properties.

In the SES control you can either select the name of unit with the "UnitName" property or set it dynamically in Runtime.

You can also operate and monitor various units simultaneously via two SES controls.

See also

How to configure an SES control (Page 68)

The SES blocks (Page 27)

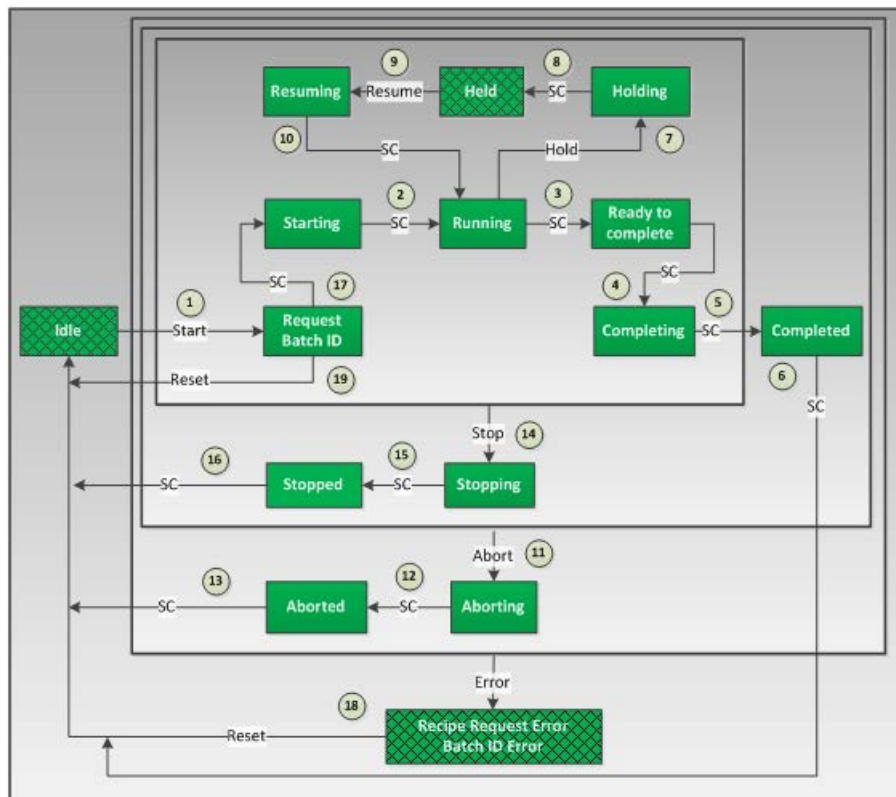# 4.2 The SES blocks

4.2.1 Sequential control in the SES

Introduction

The sequential control cyclically monitors the status changes within SES. The user can set up a timer for a minimum step time at each step.

The sequential control is controlled in the PLC with the "BA_CTRL" structure tag of the "SES_PHC" block.

Overview of the status transitions

The "Idle" status is the initial status of each sequence of a unit.

1 "Idle" ⇒ "Request BatchID"

Requirement:

- The enabling signal for using the batch at the input of the "SES_PHC" block (BA_EN = 1)

The transition takes place via:

- The operating dialog when the operator clicks "Start" (si_ICTRL = 1)
- The application when the automatic start command is given (BA_CTRL.BA_START = TRUE)

Before the unit goes from "Idle" to "Request BatchID", the batch ID and the parameters are read.

2 "Starting" ⇒ "Running"

In "Starting" status, the sequence for "Starting" is run.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Starting" sequence has completed the last step.

3 "Running" ⇒ "Ready to complete"

The sequence is run in "Running" status.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Running" sequence has completed the last step.

4 "Ready to complete" ⇒ "Completing"

The status "Ready to complete" is only pending for one cycle.

The transition takes place automatically by means of the WinCC SES blocks.

5 "Completing" ⇒ "Completed"

In "Completing" status, the sequence for "Completing" is run.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Completing" sequence has completed the last step.

6 "Completed" ⇒ "Idle"

The status "Completed" is only pending for one cycle.

The transition takes place automatically by means of the WinCC SES blocks.

7 "Running" ⇒ "Holding"

The transition takes place via:

- The operating dialog when the operator clicks "Hold" (si_ICTRL = 2)
- The application when the automatic command to hold is given (BA_CTRL.BA_HOLD = TRUE)

The current status is secured before the unit switches from the "Running" to the "Holding" status.

8 "Holding" ⇒ "Held"

In "Holding" status, the sequence for "Holding" is run.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Holding" sequence has completed the last step.

9 "Held" ⇒ "Resuming"

The transition takes place via:

● The operating dialog when the operator clicks "Resume" (si_ICTRL = 3)

● The application when the automatic command to resume is given (BA_CTRL.RESUME = TRUE)

10 "Resuming" ⇒ "Running"

In "Resuming" status, the sequence for "Resuming" is run.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Resuming" sequence has completed the last step.

11 "Request BatchID" ⇒ "Aborting"

The transition takes place via:

● The operator when the command for aborting is given (si_ICTRL = 4)

● The application when the automatic command for aborting is given (BA_CTRL.ABORT = TRUE)

The "ABORT" signal is only used during the BATCH ID generation.

12 "Aborting" ⇒ "Aborted"

In "Aborting" status, the sequence for "Aborting" is run.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Aborting" sequence has completed the last step.

13 "Aborted" ⇒ "Idle"

The status "Aborted" is only pending for one cycle.

The transition takes place automatically by means of the WinCC SES blocks.

14 ... ⇒ "Stopping"

The transition takes place via:

● The operating dialog when the operator clicks "Stop" (si_ICTRL = 64)

● The application when the automatic command to stop is given (BA_CTRL.STOP = TRUE)

15 "Stopping" ⇒ "Stopped"

In "Stopping" status, the sequence for "Stopping" is run.

The transition takes place automatically by means of the WinCC SES blocks as soon as the "Stopping" sequence has completed the last step.

16 "Stopped" ⇒ "Idle"

The status "Stopped" is only pending for one cycle.

The transition takes place automatically by means of the WinCC SES blocks.

17 "Request BatchID" ⇒ "Starting"

The transition takes place automatically by means of the WinCC SES blocks.

18 "Recipe Request Error" / "BatchID Error" ⇒ "Idle"

The transition takes place via:

● The operator when the command for resetting is given (si_ICTRL = 8)

● The application when the automatic command for resetting is given (BA_CTRL.RESET = TRUE)

19 "Request BatchID" ⇒ "Idle"

The transition takes place via:

● The operator when the command for resetting is given (si_ICTRL = 8)

● The application when the automatic command for resetting is given (BA_CTRL.RESET = TRUE)

4.2.2 The OS interface

Introduction

The OS interface passes the commands and the properties for the sequential control to the sequence via the structure type "SES_UNIT". Raw data tags are used for communication between OS and PLC.

WinCC SES automatically creates the structure type "SES_UNIT" and the required raw data tags for communication after you have configured a unit in the Configuration Studio.

Commands for sequential control

The structure type "SES_UNIT" contains all elements that are required to control the unit. For example:

● The sequential control is controlled by the OS via the structure type element "si_ICTRL".

● The sequence is started by the OS with the ID of the sequence via the "si_StartRecID" element.

● The data block of the sequence is selected via "si_ReadDBNo".

The description of additional structure type elements is available on page The "SES_PHC" function block (Page 32) and Changing the properties of the sequence (Page 45).

Structure element	Type	Value	Command
si_ICTRL	INT	0	No command; default value
		1	Start
		2	Hold

Structure element	Type	Value	Command
		3	Resume
		4	Abort
		5	Continue
		6	Complete
		8	Reset
		64	Stop
		65	Ready to complete
si_StartRecID	INT		ID of the sequence that is to be started
		0	No sequence selected
		x	Selected sequence
si_ReadDBNo	INT		Number of the data block in which the data received from the OS is stored
		0	No data block selected
		x	Selected data block of the sequence

Starting unit manually

1. First the ID of the sequence must be set in "SES_UNIT.si_StartRecID".

2. When the unit is in "Idle" status, this ID is compared with the IDs in the five data blocks of the sequence in the PLC.

3. When the ID is found, the "sb_REQ_OK" tag is set to "TRUE".

4. The unit can start when the "SES_UNIT.si_ICTRL" tag is set to "1".

Transferring data from the operator station to the PLC

The sequence data and batch data is transferred between the OS and AS via WinCC raw data tags with the function "BSEND/BRCV". This means transfer is similar to the communication between AS and WinCC User Archive or for alarm blocks in the AS with AlarmLogging.

The raw data tags are created automatically in the WinCC tag management. Information on the structure of the raw data tags for sequence data and batch data is available in the descriptions of the data blocks.

The sequence data for a unit which you have created or modified on the OS in the Configuration Studio or in Runtime, are mapped in the raw data tags. To transfer the data from the OS to the AS the number of the data block must be set in the "SES_UNIT.si_ReadDBNo" tag.

As active partner the PLC checks cyclically whether the number of the "si_ReadDBNo" tag has changed and is not equal to "0". When a change has occurred the PLC initiates data transfer via the raw data tags. The received data are stored directly in the assigned data block of the sequence.

Information on the data block of the sequence in the PLC

Five data blocks are available for sequences and one data block is available for jumps for each unit. The PLC cyclically provides information on the current contents of these data blocks.

In the structure tag "sRecDatas", the positions "1"-"5" in an array are used for the data blocks of the sequence. Position "6" is always used for the jump data block.

Element	Type	Value	Description
ARRAY[1..6] of STRUCT			
DBNo	INT	0	Number of the data block
VersionType	DWORD	16#0	Version type of the data block
NoOfStep	INT	0	Number of steps
NoOfParaTypes	INT	0	Number of parameter types
NoOfParameters	INT	0	Number of parameters
RecID	INT	0	Sequence ID
DBLength	WORD	16#0	Length of the data block

4.2.3   The "SES_PHC" function block

Introduction

The function block is the central element for sequential control of the sequence and for connection of the control modules.

Multiple data blocks are used in the block:

- DBNO_RD: Instance data block from UDT for the batch data for up to 30 steps

- DBNO_R1 ... DBNO_R5: Five data blocks for the sequences which you can use flexibly

- DBNO_JUMP: Data block for the jump table

Up to 160 control modules and parameters are interconnected at the following inputs and outputs of the block:

- FB_IN: Feedback of the control modules and parameters to the sequence

- FB_AUTO: Feedback regarding "Manual/Automatic" mode

- FB_LOCK: Feedback regarding the interlock

- Q_CMD: Activation of the control modules and the lower-level parameters. The parameters are only transferred after the associated control module has been activated.

- Q_FCT: Activates the Force for the duration of a step for the specified connection number of "Q_CMD".

When you use a Batch ID generator, it is triggered at the start of the sequence by the respective unit at the "QREQBAID" output. The batch number is made available at the "BAID_ST.BA_ID" input.

Inputs and outputs of the block

Name	Input / Output	Type	Start value	Description
EQM_ID	Input	INT	0	Unit ID The ID has to be unique for the various controllers across the entire SES project.
ID	Input	INT	0	ID of the S7 connection (local ID). The connection ID is also displayed in the NetPro connection settings.
R_ID	Input	INT	0	ID of the "BSEND/BRCV" connection. The ID has to be the same in the SPS program at "BSEND/RECV" and in the tags. You have to assign this ID when you create the unit tag. You can change the ID later.
DBNO_RD	Input	INT	0	Number of the data block for the batch data
DBNO_R1	Input	INT	0	Number of the data block of the first sequence
DBNO_R2	Input	INT	0	Number of the data block of the second sequence
DBNO_R3	Input	INT	0	Number of the data block of the third sequence
DBNO_R4	Input	INT	0	Number of the data block of the fourth sequence
DBNO_R5	Input	INT	0	Number of the data block of the fifth sequence
DBNO_JUMP	Input	INT	0	Number of the data block for jump organization
BA_CTRL.BA_START	Input	BOOL	FALSE	Start
BA_CTRL.BA_HOLD	Input	BOOL	FALSE	Hold
BA_CTRL.BA_RESUME	Input	BOOL	FALSE	Resume
BA_CTRL.BA_ABORT	Input	BOOL	FALSE	Abort
BA_CTRL.BA_CONTINUE	Input	BOOL	FALSE	Continue
BA_CTRL.BA_COMPLETE	Input	BOOL	FALSE	Complete
BA_CTRL.BA_RESET	Input	BOOL	FALSE	Reset
BA_CTRL.BA_STOP	Input	BOOL	FALSE	Stop
BA_CTRL.BA_RTC	Input	BOOL	FALSE	Ready to complete
BA_EN	Input	BOOL	TRUE	Enable to use the batches
BAID_ST.ID	Input	INT	0	Feedback from batch ID generator
BAID_ST.NEW_DATA	Input	BOOL	FALSE	New data available
BAID_ST.BA_ID	Input	DWORD	16#0	Batch ID
BAID_ST.ERR	Input	BOOL	FALSE	BATCH ID generator error
BA_DAT.BATCHID	Input	DINT	L#0	Batch data of the previous unit - batch ID
BA_DAT.RECID	Input	INT	0	Batch data of the previous unit - ID of the sequence
AV	Input	ARRAY [1..60] OF REAL	0.000000e +000	Current values 1 - 60
FB_IN	Input	ARRAY [1..160] OF BOOL	FALSE	Feedback "ON / OFF" from the control modules and parameters
FB_AUTO	Input	ARRAY [1..160] OF BOOL	FALSE	Feedback "Manual/Automatic" from the control modules and parameters

4.2 The SES blocks

Name	Input / Output	Type	Start value	Description
FB_LOCK	Input	ARRAY [1..160] OF BOOL	FALSE	Feedback "Interlock" from the control modules and parameters
SYNC_POINT	Input	INT	0	Number of the "Synchronization Line"; synchronization for multiple units
IREQ_OP	Input	BOOL	FALSE	Request for execution of command in regard to the operator input request for a step
L_FCT_SET	Input	INT	0	Index of the jump function 0: No jump x: Jump to step x
RE_HOLD	Input	BOOL	TRUE	Restart of the running unit with "HOLD" after power failure of AS
MON_TIME	Input	REAL	3.000000e +002	Step monitoring time for the entire sequence [s]
MIN_FCTT	Input	REAL	1.000000e +000	Minimum step time before the step is started [s]
RUNUPCYC	Input	INT	3	Number of the AS startup cycle
Q_ACTIVE	Output	BOOL	FALSE	Data block is active
QSTATUS	Output	INT	0	Status in the sequential control system See below for listing of the statuses.
QUSTAT_L	Output	DWORD	16#0	Status of the sequential control system See below for listing of the statuses.
QSTATBRS	Output	DWORD	16#0	Status of BSEND
QSTATRCV	Output	DWORD	16#0	Status of BRCV
QAUTMAN	Output	BOOL	FALSE	Status of the operating mode is "Automatic"
Q_CMD	Output	ARRAY [1..160] OF BOOL	FALSE	Array of connection numbers (ports) with activation of the linked control modules and the lower-level parameters
Q_FCT	Output	INT	0	Activates the force with the connection number from "Q_CMD"
Q_FCT_IND	Output	INT	0	Index of the current function of the active control strategy
Q_CS_ACT	Output	STRING[64]	"	Active sequence
QSYNC_POINT	Output	INT	0	Number of the "Synchronization Line"; synchronization for multiple units
QSP	Output	ARRAY [1..60] OF REAL	0.000000e +000	Array for the setpoints of the parameters
QRESULT	Output	ARRAY [1..60] OF BOOL	FALSE	Array for the results of the parameters
QMON_TIME	Output	REAL	0.000000e +000	Currently elapsed step monitoring time
QTIME_VAL	Output	REAL	0.000000e +000	Currently elapsed total time
QRUNUPCO	Output	INT	0	Startup cycle at start of the PLC
QVBA_ID	Output	DINT	L#0	Batch ID

Name	Input / Output	Type	Start value	Description
QREQBAID.ID	Output	INT	0	ID of the requested function
QREQBAID.REQ	Output	BOOL	FALSE	Request for a batch
QBA_DAT.BATCHID	Output	DINT	L#0	Batch data of the subsequent unit - batch ID
QBA_DAT.RECID	Output	INT	0	Batch data of the subsequent unit - ID of the sequence
Q_AUTO_OK	Output	BOOL	FALSE	Check for "Automatic" mode
QCHK_OK	Output	BOOL	FALSE	Check for active control modules in the controller
QREQ_OP	Output	BOOL	FALSE	Signal of the operator acknowledgment to the OS
QACK_OP	Output	BOOL	FALSE	Signal of the operator acknowledgment from the OS
I_AUTMAN	Input - Output	BOOL	FALSE	OS operating mode (set by OS) FALSE: Manual TRUE: Automatic
I_RESMODE	Input - Output	BOOL	TRUE	"Resume" mode FALSE: The sequence begins from the start TRUE: It resumes with the preceding function
I_TRNSMODE	Input - Output	BOOL	TRUE	"Reset" mode FALSE: When a step change occurs, all control modules remain in the status of the preceding step TRUE: All control modules are reset when a step change occurs
I_ARCONDEMAND	Input - Output	BOOL	TRUE	Archiving of the batch data FALSE: Not active TRUE: Active
IACK_OP	Input - Output	BOOL	FALSE	Acknowledgment of execution
RESET	Input - Output	BOOL	FALSE	Reset in case of emergency

States of "QSTATUS"

Value of "QSTATUS"	Description
20	Idle
21	Wait for a batch ID
22	ReqRecipe
30	Starting
40	Running
50	Ready to complete
60	Completing
70	Completed
80	Continuous
90	Aborted
100	Aborting
110	Stopped
120	Stopping
130	Held

Value of "QSTATUS"	Description
140	Holding
150	Resuming
200	Ready to complete
210	Wait for Idle Reset
220	BatchID request error
230	recipe request error
240	Batch not enabled

States of "QUSTAT_L"

AS address	Tag	Type	Description
0.0	boBRSErr	BOOL	WinCC Bit 24; Error Bit from BRSEND
0.1	boBRSDone	BOOL	WinCC Bit 25; Done Bit from BRSEND
0.2	boRCVErr	BOOL	WinCC Bit 26; Error Bit from BRCV
0.3	boRCVDone	BOOL	WinCC Bit 27; Done Bit from BRCV
0.4	boFctJmpError	BOOL	WinCC Bit 28; Function not part of active control string
0.5	boArcDBError	BOOL	WinCC Bit 29; Archiving Data Block not available
0.6	boRecDBError	BOOL	WinCC Bit 30; Recipe Data Block not available
0.7	boParaError	BOOL	WinCC Bit 31; Wrong Parameter configuration
1.0	boState2xx	BOOL	WinCC Bit 16; State 200, 210, 220, 230, 240
1.1	boQCMod	BOOL	WinCC Bit 17; 1: Auto 0: Manual
1.2	boBA_EN	BOOL	WinCC Bit 18; 1: Batch enabled
1.3	boStepTEx	BOOL	WinCC Bit 19; Step time exceeded
1.4	boMonTEx	BOOL	WinCC Bit 20; Monitoring time exceeded
1.5	boRes21	BOOL	WinCC Bit 21
1.6	boLock	BOOL	WinCC Bit 22; State 40, 50
1.7	boCont	BOOL	WinCC Bit 23; Continues mode active
2.0	boReqRec	BOOL	WinCC Bit 8; Recipe request active
2.1	boStarting	BOOL	WinCC Bit 9; Starting
2.2	boResuming	BOOL	WinCC Bit 10; Resuming
2.3	boCompleting	BOOL	WinCC Bit 11; Completing
2.4	boHolding	BOOL	WinCC Bit 12; Holding
2.5	boAborting	BOOL	WinCC Bit 13; Aborting
2.6	boStopping	BOOL	WinCC Bit 14; Stopping
2.7	boFree15	BOOL	WinCC Bit 15
3.0	boIdle	BOOL	WinCC Bit 0; Idle
3.1	boRunning	BOOL	WinCC Bit 1; Running
3.2	boCompleted	BOOL	WinCC Bit 2; Completed
3.3	boHeld	BOOL	WinCC Bit 3; Held
3.4	boAborted	BOOL	WinCC Bit 4; Aborted
3.5	boReady	BOOL	WinCC Bit 5; Ready

AS address	Tag	Type	Description
3.6	boStopped	BOOL	WinCC Bit 6; Stopped
3.7	boReqBAID	BOOL	WinCC Bit 7; Request Batch ID

See also

The OS interface (Page 30)

4.2.4 The data block of the sequence

Introduction

Each sequence is stored with its data in a data block. You can connect five data blocks for the sequences in the instance block of "SES_PHC"; these blocks are used dynamically and memory-saving.

As a result, WinCC SES can control a variety of sequences in a unit. The number of sequences is only limited by the memory of the PLC used.

Addressing the data blocks of a sequence

You have to set the number of the first data block of the sequence at the "DBNO_R1" input.

The other data blocks of the unit must have ascending addresses starting with the first data block. The addressed data block is calculated with the number of the first data block and the selected number of the sequence: "(DBNO_R1 + si_U_RECID) -1". For example, the "DBNO_R1" input of the block is set to "500" in unit "1". The first sequence is stored in "DB500", the second sequence in "DB501", etc. Before a sequence can start, the data blocks must be available in the PLC.

Data of the sequence

The data of the sequence for a unit and the telegram data for data transfer are mapped in the following three subareas:

Telegram data

Name	Type	Start value	Comment
TelegramLength_01	BYTE	16#0	
TelegramLength_02	BYTE	16#0	
TelegramLength_03	BYTE	16#0	
TelegramLength_04	BYTE	16#0	
TransferType	BYTE	16#0	
Reserved_01	BYTE	16#0	
ErrorCode	BYTE	16#0	
JobType	BYTE	16#0	
Reserved_02	BYTE	16#0	

Name	Type	Start value	Comment
Reserved_03	BYTE	16#0	
FieldNumber	BYTE	16#0	
Recordnumber	BYTE	16#0	
PLCID	ARRAY[1..8] of CHAR	'x', 'x', 'x', 'x', 'x', 'x', 'x', 'x'	Is "SES" and "R" (sequence) and "EQM_ID", for example "SESR0001"

Header data

Name	Type	Start value	Comment
VersionType	DWORD	16#53455301	In ASCII: SES01
NoOfStep	INT	200	Maximum number of steps
NoOfParaTypes	INT	60	Maximum number of parameter types
NoOfParameters	INT	1000	Maximum number of parameters, depending on the data block used
RecID	INT	0	Sequence ID

Data

Name		Type	Start value	Comment
CS_01		STRING [200]	' '	Control strategy for "RUNNING" of steps 1-200
STARTING		STRING [200]	' '	Control strategy of steps 1-200
HOLDING		STRING [200]	' '	Control strategy of steps 1-200
RESUMING		STRING [200]	' '	Control strategy of steps 1-200
COMPLETING		STRING [200]	' '	Control strategy of steps 1-200
STOPPING		STRING [200]	' '	Control strategy of steps 1-200
ABORTING		STRING [200]	' '	Control strategy of steps 1-200
Step		ARRAY[1..200]		Step
	ParaStart	INT	1	Number of the first parameter
	ParaEnd	INT	24	Number of the last parameter
	MonTime	REAL	60.0	Step monitoring time
	SyncPoint	INT	0	Synchronization point for the synchronization of multiple units
	CMD_BOOL	ARRAY [1…160] of BOOL	FALSE	Array of CMD signals
	FRC_BOOL	ARRAY [1…160] of BOOL	FALSE	Array of force signals
	CHK_BOOL	ARRAY [1…160] of BOOL	FALSE	Array of check signals
	OR_BOOL	ARRAY [1…160] of BOOL	FALSE	Array of Or signals
PARA_ DEF_ARRAY		ARRAY [1…60] of STRUCT		Parameter
	ParaType	INT	0	The function assigned to the parameter type (see section "Parameters and parameter types")

Name		Type	Start value	Comment
	ParaHL	REAL	1.0	High limit
	ParaLL	REAL	0.0	Low limit
	ParaHYS	REAL	1.0	Hysteresis
	ParaINC	REAL	1.0	Increment value for the parameter
	ParaCM	BYTE	16#0	Connection number (port) of "Q_CMD" of the "SES_PHC" that is used for this parameter type
	ParaTPos	BYTE	16#0	Number of the addressed current value for this parameter type
PARA_ARRAY		ARRAY [1…1000] of REAL	0.0	Setpoints for up to 1000 parameters

4.2.5 Parameters and parameter types

Introduction

The parameters in the sequence are specified as setpoints. With each AS cycle from the data block of the sequence, the values are written to the "QRESULT" output of the "SES_PHC" function block. You can use up to 1000 parameters per unit, depending on the data block of the sequence that is used.

You can assign specific functions to the setpoints in combination with parameter types, for example, setpoint/actual value comparison or connection of units. You can combine the parameter types with various parameters in each step. You can use a maximum of 60 parameter types per unit.

Definitions of tags for parameter types

The tags that you can configure for each parameter type are defined in "PARA_ DEF_ARRAY" in the data block of the sequence. You can only use the "ParaHYS" tag for the "Hysterese" parameter type.

Tag	Data type	Start value	Comment
ParaType	INT	0	ID of the parameter type (see below)
ParaHL	REAL	1.0	High limit
ParaLL	REAL	0.0	Low limit
ParaHYS	REAL	1.0	Hysteresis
ParaINC	REAL	1.0	Increment value for the parameter
ParaCM	BYTE	16#0	Connection number of the control module that is used for this parameter type
ParaTPos	BYTE	16#0	Number of the addressed current value for this parameter type

The parameter types and their use

ID	Function	Use
0	Function off	The parameter is not used or is not assigned to any function. "FB_IN[x]" in the "SES_PHC" block must be set externally. "QRESULT[x]" is set to "FB_IN[x]".
1	Count up	Increases the current value "sprActV[x]" by the increment value in "ParaINC" for each falling edge of "AV[x]" in the "SES_PHC" block. "AV[x]" is interpreted as BOOL count command. "sprActV[x]" is set = 0 when a step change occurs. "QRESULT[x]" is "TRUE" when current value >= setpoint
2	Integrator	Increases the current value "sprActV[x]" by the increment value in "ParaINC" every second. "sprActV[x]" is set = 0 when a step change occurs. "QRESULT[x]" is "TRUE" when current value >= setpoint "AV[ParaTPos]" must be set to "1.0".
3	Count down	Decreases the current value "sprActV[x]" by the increment value in "ParaINC" for each falling edge of "AV[x]". "AV[x]" is interpreted as BOOL count command. Current value is set to setpoint when a step change occurs. "QRESULT[x]" is "TRUE" when current value <= 0
4	Up timer	Increases the current value "sprActV[x]" by "SAMPLE_T" (Time forward). "sprActV[x]" is set = 0 when a step change occurs. "QRESULT[x]" is "TRUE" when current value >= setpoint
5	Down timer	Decreases the current value "sprActV[x]" by "SAMPLE_T" (Time backward) in each cycle. Current value is set to setpoint when a step change occurs. "QRESULT[x]" is "TRUE" when current value <= 0
6	Hysterese	Checks if the "current value sprActV[x]" is within the low and high hysteresis of the setpoint.
7	Actual value >= Setpoint	Compares if the current value is greater than the setpoint. "QRESULT[x]" is "TRUE" when current value >= setpoint
8	Actual value <= Setpoint	Compares if the current value is less than the setpoint. "QRESULT[x]" is "TRUE" when current value <= setpoint
9	Integrator with hold	Same functionality as "Integrator", however, the value in the cycle "Hold" -> "Held" -> "Resume" is retained. As a result the parameter has the same value when exiting and re-entering the "Running" status.
10	Sequence	Connects the unit to a selected unit

"x" is the addressed number in the assigned Array

Example of use of parameters in the controller

Configuration data of parameters

Three parameters are defined for the sequence:

- Parameter 1:
  - Is addressed via the control module "Mixing Time" with the connection number "10"
  - Is used to increase the current value by "2" every second
  - Addresses the analog value "1"
  - Has the setpoint "30" in step "1" and "1" in step "3"
- Parameter 2:
  - Is addressed via the control module "Dosing Time" with the connection number "38"
  - Is used to increase the current value by "5" every second
  - Addresses the analog value "2"
  - Has the setpoint "50" in step "1", "12" in step "2", and "3" in step "3"
- Parameter 1:
  - Is addressed via the control module "Amount" with the connection number "158"
  - Is used to increase the current value by "8" every second
  - Addresses the analog value "3"
  - Has the setpoint "60" in step "1" and "18" in step "2"
- The high limit is specified at "1000" for the three parameters.

Connec-tion	Name	Parameter type	Step 1	Step 2	Step 3	...	Step X
10	Mixing Time	Integrator	30		1		
...							
38	Dosing Time	Integrator	50	12	3		
...							
158	Amount	Integrator	60	18			

Saving the parameters in the data block in "PARA_ARRAY[x]":

PARA_ARRAY	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[x]
Value	30	50	60	12	18	1	3			

The setpoints must not start with the position "1" in "PARA_ARRAY[x]". Only requirement is that all parameters that are used in a step are saved directly one after the other.

Assignment in the data block of the sequence

Only control strategy "CS_01" is used for this example, in which the steps "1", "2" und "3" are run directly one after the other.

Name		Value	Comment
CS_01			Order for "Running"
	[1]	1	Step 1
	[2]	2	Step 2
	[3]	3	Step 3

PARA_DEF_ARRAY[x]:

Name		Value	Comment
PARA_ DEF_ARRAY[1]			
	ParaType	2	The parameter is used as "Integrator"
	ParaHL	1000	High limit for "Integrator"
	ParaLL	0	Low limit for "Integrator"
	ParaHYS	1.0	Hysteresis (default value: not used for "Integrator")
	ParaINC	2.0	Increment value
	ParaCM	16#0A	Connection number (port) of the control module that is used for this parameter type; the result of "ActV" >= setpoint is written directly to the array "FB_IN"
	ParaTPos	16#01	Number of the addressed current value for this parameter type
PARA_ DEF_ARRAY[2]			
	ParaType	2	The parameter is used as "Integrator"
	ParaHL	1000	High limit for "Integrator"
	ParaLL	0	Low limit for "Integrator"
	ParaHYS	1.0	Hysteresis (default value: not used for "Integrator")
	ParaINC	5.0	Increment value
	ParaCM	16#26	Connection number (port) of the control module that is used for this parameter type; the result of "ActV" >= setpoint is written directly to the array "FB_IN"
	ParaTPos	16#02	Number of the addressed current value for this parameter type
PARA_ DEF_ARRAY[3]			
	ParaType	2	The parameter is used as "Integrator"
	ParaHL	1000	High limit for "Integrator"
	ParaLL	0	Low limit for "Integrator"
	ParaHYS	1.0	Hysteresis (default value: not used for "Integrator")
	ParaINC	8.0	Increment value
	ParaCM	16#09E	Connection number (port) of the control module that is used for this parameter type; the result of "ActV" >= setpoint is written directly to the array "FB_IN"
	ParaTPos	16#03	Number of the addressed current value for this parameter type

In this example, each control module is set to "Force & Check" with "1".

Name		Value	Comment
Step [1]			
	ParaStart	1	Number of the first parameter in the data memory
	ParaEnd	3	Number of the last parameter in the data memory
	CMD_BOOL [10]	1	Bit in array of the "CMD" signal
	FRC_BOOL [10]	1	Bit in array of the "FRC" signal
	CHK_BOOL [10]	1	Bit in array of the "CHK" signal
	CMD_BOOL [38]	1	Bit in array of the "CMD" signal
	FRC_BOOL [38]	1	Bit in array of the "FRC" signal
	CHK_BOOL [38]	1	Bit in array of the "CHK" signal
	CMD_BOOL [158]	1	Bit in array of the "CMD" signal
	FRC_BOOL [158]	1	Bit in array of the "FRC" signal
	CHK_BOOL [158]	1	Bit in array of the "CHK" signal
	CMD_BOOL	FALSE	Array of CMD signals
	FRC_BOOL	FALSE	Array of force signals
	CHK_BOOL	FALSE	Array of check signals
	OR_BOOL	FALSE	Array of Or signals
Step [2]			
	ParaStart	4	Number of the first parameter in the data memory
	ParaEnd	5	Number of the last parameter in the data memory
	CMD_BOOL [38]	1	Bit in array of the "CMD" signal
	FRC_BOOL [38]	1	Bit in array of the "FRC" signal
	CHK_BOOL [38]	1	Bit in array of the "CHK" signal
	CMD_BOOL [158]	1	Bit in array of the "CMD" signal
	FRC_BOOL [158]	1	Bit in array of the "FRC" signal
	CHK_BOOL [158]	1	Bit in array of the "CHK" signal
Step [3]			
	ParaStart	6	Number of the first parameter in the data memory
	ParaEnd	7	Number of the last parameter in the data memory
	CMD_BOOL [10]	1	Bit in array of the "CMD" signal
	FRC_BOOL [10]	1	Bit in array of the "FRC" signal
	CHK_BOOL [10]	1	Bit in array of the "CHK" signal
	CMD_BOOL [38]	1	Bit in array of the "CMD" signal
	FRC_BOOL [38]	1	Bit in array of the "FRC" signal
	CHK_BOOL [38]	1	Bit in array of the "CHK" signal

4.2.6 The data block of the batch data

Overview

As soon as a DB number is set at the "DBNO_RD" input of the instance block of "SES_PHC", the archiving of the batch data is enabled. The archiving is disabled when the "DBNO_RD" input is set to "0".

Each unit writes the batch data of a step to the same data block. The data block is designed so that the batch data with the current values and setpoints can be saved there for 30 steps.

The entire data block with the batch data is sent to the OS with "BSEND":

- As soon as a unit determines that the "Write-Pointer" of the PLC has reached 90% of the array size in the data block. The size of the array in the data block is specified in the header of the data block via the "NOL" tag.

- When an "Archive on Demand" is triggered manually via the "I_ARCONDEMAND" input.

The "Write-Pointer" is reset to position "1" when the entire data block has been sent to the OS. The "Write-Pointer" is not modified when the call of the "BSEND" returns an error for archiving.

Structure of the batch data

The batch data and the telegram data for the data transfer is mapped in the raw data tags in the following three subareas:

Telegram data

Name	Type	Start value	Comment
TelegramLength_01	BYTE	16#6C	15212 bytes: 3B6C; switch bytes for WinCC
TelegramLength_02	BYTE	16#3B	
TelegramLength_03	BYTE	16#0	
TelegramLength_04	BYTE	16#0	
TransferType	BYTE	16#2	Transfer type: 2 PLC --> WinCC
Reserved_01	BYTE	16#0	
NumberOfJobs_01	BYTE	16#1	Number of jobs: 1
NumberOfJobs_02	BYTE	16#0	
PLCID	ARRAY[1..8] of CHAR	'S', 'E', 'S', 'B', 'A', 'D', 'A', 'T'	
JobLength_01	BYTE	16#50	15184 bytes: 3B50; switch bytes for WinCC
JobLength_02	BYTE	16#3B	
JobType	BYTE	16#7	Job type: 7 PLC --> HMI
Reserved_02	BYTE	16#0	
FieldNumber	WORD	16#0	
Recordnumber	DWORD	DW#16#1000000	Record number:1; switch bytes for WinCC
Selection	WORD	16#0	

Header data

Name	Type	Start value	Comment
VersionType	DWORD	16#53455301	In ASCII: SES01
P_WR	INT	1	Write pointer of the AS
NOL	INT	30	Maximum size of the array in the data block

Data

Name			Type	Start value	Comment
Step			ARRAY[1..30]		Step
	StepRopId		INT	1	Rop ID of the step
	BatchId		DINT	L#0	Batch ID
	StepStartTime		DATE_AND_TIME	DT#90-1-1-0:0:0.000	Start time of the step
	StepEndTime		DATE_AND_TIME	DT#90-1-1-0:0:0.000	End time of the step
	RecNumber		INT	0	Sequence number
	EQM_ID		INT	0	Unit number
	Parameter		ARRAY[1..60]		
		SpVal	REAL	0.0	Setpoint
		ActVal	REAL	0.0	Current value

4.2.7 Changing the properties of the sequence

Step change alternatives

When the criteria of a step are met, two options are available via the BOOL tag "sbENSAC" to determine the type of the step change:

- Automatic step change: The sequence control automatically increases the step number ("sbENSAC" = "FALSE").

- Separate trigger for the step change: The sequence control does not automatically increase the step number ("sbENSAC" = "TRUE"). A separate signal initiates the step change.

Manual ending of a step

Regardless of whether a step has already fulfilled its criteria, you can exit the current step via the BOOL tag "sbEndFct" = "TRUE".

Changing the operating mode

A unit can be operated automatically or manually. You can change the operating mode via the BOOL tag "I_AUTMAN". The mode is switched each time the tag is set to "TRUE". The block automatically resets the tag to "FALSE".

Response to resuming the sequence

When a unit is in the "Hold" status, the BOOL tag "I_RESMODE" provides you with two alternatives to continue the sequence:

- The sequence starts from the beginning ("I_RESMODE" = "FALSE")

- The sequence resumes with the previous function or with the last active step ("I_RESMODE" = "TRUE")

Reset of control modules with step change

The sequence control of a unit can reset the control modules in two different ways. The selection of the mode has a big impact on how the sequence runs. You can use the BOOL tag "I_TRNSMODE" to specify the reset response.

- During the step change all control modules of the unit are left in the status of the previous step ("I_TRNSMODE" = "FALSE"). If, for example, the output of the control module "1" is set to the value "1" in the first step, the output remains at value "1" during the entire step provided the output is not set to value "0" in a specific stop.
  All outputs of the up to 160 control modules are automatically reset when the unit is not active.

- During the step change all control modules of the unit are reset automatically ("I_TRNSMODE" = "TRUE").

Jump to a selected step

You can jump to a specific step in a unit without using the "SES_JUMP" function block. To do so, use the manual jump button in the SES control in Runtime.

The "L_FCT_SET" input of the "SES_PHC" block receives the jump to the destination step. The jump is executed as soon as a valid value of "1" to "200" is set at the "L_FCT_SET" input. No additional trigger is required After the jump has been completed the input is reset to "0" at the "L_FCT_SET" input. Otherwise the jump would be executed in every cycle, the function is repeated even if the criteria of the step area fulfilled.

For information on how to use the "SES_JUMP" block, refer to the section "The "SES_JUMP" function block".

See also

The OS interface (Page 30)

4.2.8　　Shared use of units

A unit is connected to the following units

When a unit is connected to one or more successor units, the batch data and the sequence data of the leading unit must be transferred to the successors. This allows you start the successor units with a selected sequence and the same batch ID after starting a sequence on one unit.
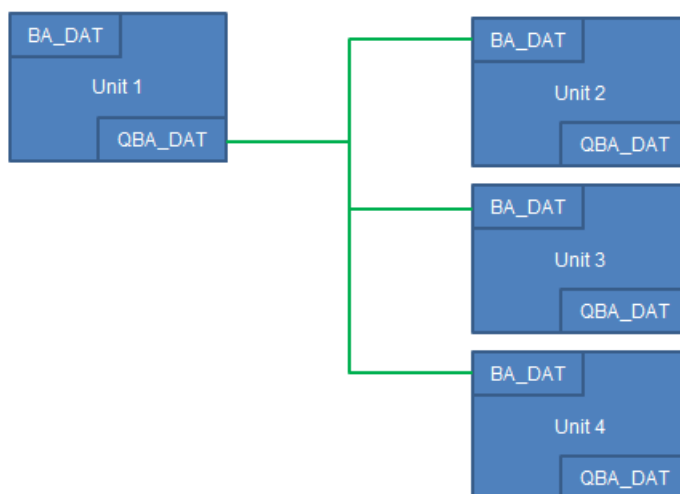
The "QBA_DAT" output of the leading unit is interconnected with the "BA_DAT" inputs of each successor unit. The start of the respective unit at the "BA_CTRL.BA_START" input is connected with the "Q_CMD" output. The sequence ID is transferred as setpoint to the successor unit. It is used to configure the start of the successor unit as well as the command of a control module in the sequence. Only a start without waiting for feedback is possible.

Configuration in SES Configuration Studio

1. Create a control module in a configured unit.

2. Create a parameter in the control module. Select "Sequence" as parameter type and specify the destination unit.

3. Create a step and configure the commands for the created control module and parameter for the step.

4. Assign the step to a sequence that you want to connect to a successor unit. Select a sequence of the destination unit as setpoint.

You can determine whether two units are running synchronously, which means both units are active and running the same batch ID, by checking the feedback of the two units regarding the same batch ID.

A unit is connected to the predecessor unit

When a unit is connected to one or more predecessor units, the batch data of the predecessor units must be transferred to the successor units. This allows a sequence to be started on a unit that receives the ID of the sequence and the batch ID from the predecessor unit.
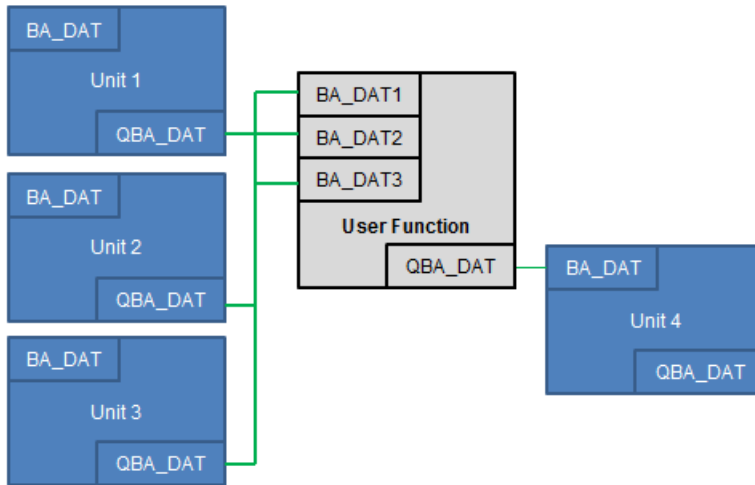
When the "BA_CTRL.BA_START" input is set in the unit that is to be started, the unit starts with the batch information and the transferred sequence. The batch ID and the sequence ID are made available at the "BA_DAT.BATCHID" or "BA_DAT.RECID" input.

Synchronization of multiple units with one "Synchronization Line"

Multiple units may have to be synchronized from the Batch view, depending on where the various batches pass through the plant.
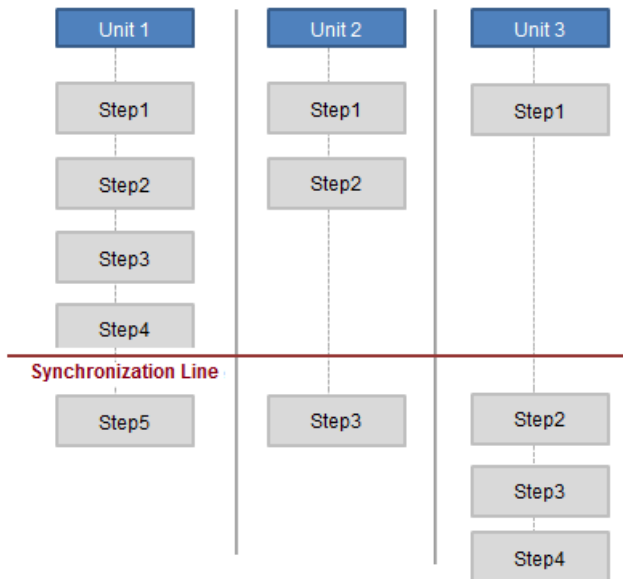
In the "SES_PHC" function block, the synchronization is executed via the "SYNC_POINT" input and the "QSYNC_POINT" output.

A value for the "Synchronization Line" can be specified for each step via the "SyncPoint" tag in the data block of the sequence.

When a "SyncPoint" has occurred in the sequence data of a specific step, the assigned unit waits in the step until the value of the "SYNC_POINT" input matches the value in the sequence. The value in the sequence is also written in the "QSYNC_POINT" output for further use.

See also

How to create a unit (Page 57)

4.2.9 The "SES_JUMP" function block

Introduction

You can use an instance block of "SES_JUMP" for each unit. The block provides a jump table for the unit, in which you can assign an event-driven jump destination for each step.

Inputs and outputs of the block

Tag	Input / output	Type	Default value	Description
PRC_ACT	Input	BOOL	FALSE	TRUE = sequence active
CUR_FCT	Input	INT	0	Currently executed step
EVENT_01	Input	BOOL	FALSE	Event 01 for the jump to the destination step
EVENT_02	Input	BOOL	FALSE	Event 02 for the jump to the destination step
EVENT_03	Input	BOOL	FALSE	Event 03 for the jump to the destination step
EVENT_04	Input	BOOL	FALSE	Event 04 for the jump to the destination step
EVENT_05	Input	BOOL	FALSE	Event 05 for the jump to the destination step
EVENT_06	Input	BOOL	FALSE	Event 06 for the jump to the destination step
EVENT_07	Input	BOOL	FALSE	Event 07 for the jump to the destination step
EVENT_08	Input	BOOL	FALSE	Event 08 for the jump to the destination step
EVENT_09	Input	BOOL	FALSE	Event 09 for the jump to the destination step
EVENT_RB1	Input	BOOL	FALSE	Event for return jump 1
EVENT_RB2	Input	BOOL	FALSE	Event for return jump 2
EVENT_EXT	Input	BOOL	FALSE	Event of an external function for the jump to the destination step
FCT_EXT	Input	INT	0	Input for the external function triggered by "EVENT_EXT"
RUNUPCYC	Input	INT	3	Number of the AS startup cycle
RESET	Input-output	BOOL	FALSE	Reset
Q_FCT_SET	Output	INT	0	Set new index of function

The binary inputs of all "Event_xx" events respond to a signal change with a positive edge from "FALSE" to "TRUE".

- "Event_01" - "Event_09": A typical signal/event which is connected to one of these inputs is, for example, pressing an emergency pushbutton.

- "Event_RB1" - "Event_RB2": A typical signal which is connected to one of the two inputs is a process-related signal, for example, a run signal of a filter.

- The jump destination from the "FCT_EXT" input is used when "Event_EXT" is triggered.

Overview of the jump table

The following section shows an example of the jump table of a unit with an assignment of "Event_01" for steps "1" to "4" to the destination step "5". When the event "Event_01" occurs at step "1", a jump is made to step "5". After the completion of step "5" a return jump is made from step "1" to step "2", because step "2" is set for "Event_RB1".

Event	Jump destination for step 1	Jump destination for step 2	Jump destination for step 3	Jump destination for step 4	...	Jump destination for step 200
Event_01	5	5	5	5		0
Event_02	0	0	0	0		0
Event_03	0	0	0	0		0
Event_04	0	0	0	0		0
Event_05	0	0	0	0		0
Event_06	0	0	0	0		0
Event_07	0	0	0	0		0
Event_08	0	0	0	0		0
Event_09	0	0	0	0		0
Event_RB1	2	3	4	5		0
Event_RB2	0	0	0	0		0
Event_EXT	0	0	0	0		0

The priority in the jump table starts with the lowest priority at event "Event_01" and increases up the event "Event_EXT" with the highest priority.

How the jump table works

The assigned jump table of the block is used when a sequence runs in a unit (PRC_ACT=TRUE).

When an event at the inputs "Event_01" - "Event_09" contains a signal change, the block transfers the respective jump destination of the current step to the output "Q_FCT_SET", for example, "5". When the "Q_FCT_SET" output is connected to the "L_FCT_SET" input of the "SES_PHC" block, the currently running sequence exits the currently running step and jumps to the jump destination at the "L_FCT_SET" input.

When each of the "Event_01" - "Event_09" inputs is triggered, the jump destinations of "Event_RB1" and "Event_RB2" are also stored in the internal tags "sbyFCT_RB1" and "sbyFCT_RB2" when the values are greater than "0". When an event at the inputs "Event_RB1" or "Event_RB2" contain a signal change, the block transfers the value of the assigned internal

tags "sbyFCT_RB1" or "sbyFCT_RB2" to the output "Q_FCT_SET". The running sequence exits the currently running step and jumps to the new step number.

When an event at the "Event_EXT" input contains a signal change, the block transfers the value from the "Event_EXT" input to the "Q_FCT_SET" output. The running sequence exits the currently running step and jumps to the new step number. The jump destinations from "Event_RB1" and "Event_RB2" are not stored in the internal tags "sbyFCT_RB1" and "sbyFCT_RB2".

Telegram data

Name	Type	Default value	Comment
TelegramLength_01	BYTE	16#0	
TelegramLength_02	BYTE	16#0	
TelegramLength_03	BYTE	16#0	
TelegramLength_04	BYTE	16#0	
TransferType	BYTE	16#0	
Reserved_01	BYTE	16#0	
ErrorCode	BYTE	16#0	
JobType	BYTE	16#0	
Reserved_02	BYTE	16#0	
Reserved_03	BYTE	16#0	
FieldNumber	BYTE	16#0	
Recordnumber	BYTE	16#0	
PLCID	AR-RAY[1..8] of CHAR	'x', 'x', 'x', 'x', 'x', 'x', 'x', 'x'	Is "SES" and "J" (Jump) and "EQM_ID", for example "SESJ0001"

4.3 Working with the Sequence Execution System

4.3.1 Working with the Configuration Studio

4.3.1.1 The "Sequence Execution System" Configuration Studio

Introduction

The steps and sequences, the control modules and the parameters for the unit are configured in the "Sequence Execution System" editor.

Alternatively, you can use the editor only for basic configuration steps. To do so, you must create at least all components of the sequence control with names and properties in the editor. You can then specify the following in the SES control in Runtime:

- the control of the control modules, parameters and links
- the order of the steps
- the setpoints of the parameters
- the jump destinations for conditional jumps

Structure of the "Sequence Execution System" editor

You start the editor with a double-click on the "Sequence Execution System" item in WinCC Explorer.
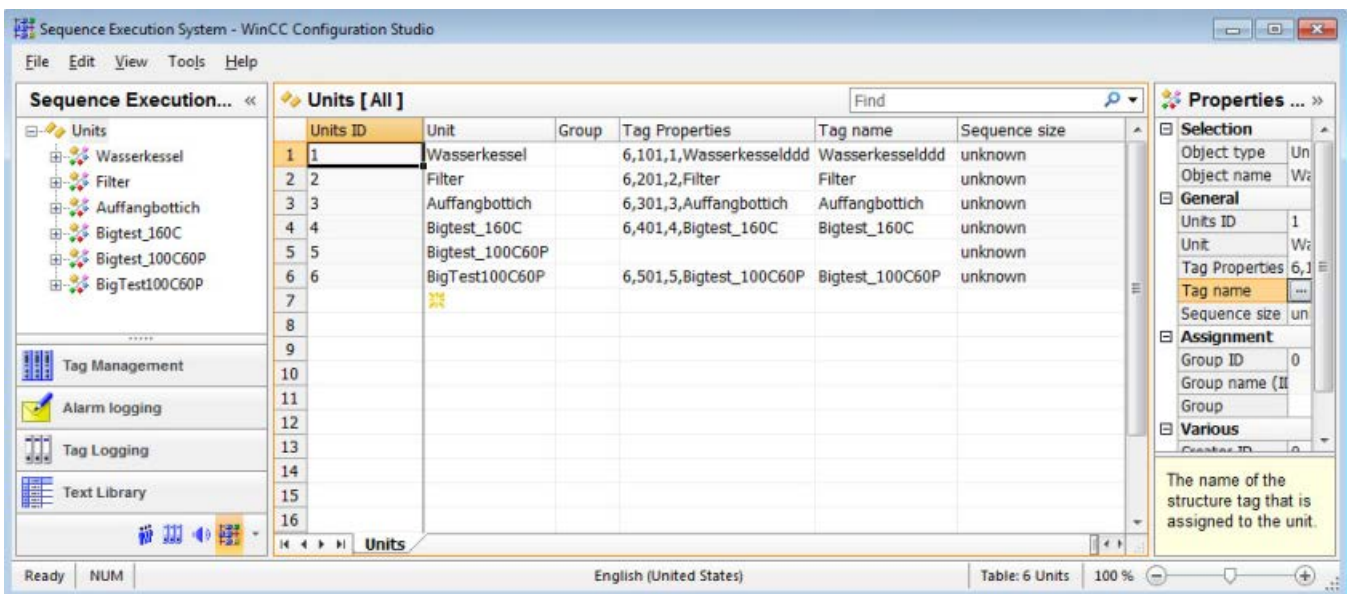
The "Sequence Execution System" editor is divided into three workspaces:

Navigation area

- The configured units and assigned elements, such as control modules, are displayed in the tree topology.

- The navigation bar is displayed in the area below the tree view. It permits access to additional WinCC editors, for example, tag management. You can adapt the display of the navigation bar.

Table area

The table displays the elements which are assigned to the selected folder in the tree view:

- The configured units for the sequence control

- The parameters and control modules of the unit

- The configured steps of the unit

- The configured sequences of the unit

- The configured special sequences of the unit

Additional functions are available in the table area via the shortcut menu of the column headers:

- Sort

- Filter

- Hide column, show additional columns

Note

Inconsistent entries have a colored background in the table window. In the event of inconsistent configuration, a note is displayed which describes the incorrect configuration.

Tabs are displayed below the table depending on the selected folder. You can use these tabs to display the lower-level elements in table format.

Navigation keys allow you to scroll through tabs. You select a tab by clicking on it or from the shortcut menu of the navigation keys.

Properties

Here, the properties of a selected object are displayed and can be edited.

An explanation of the selected property is displayed below the properties. You can drag this area to zoom in and out.

Status bar

At the bottom edge of the editor is the status bar.

Here, you will find the following information:

- Status of the system (ready, etc.), status of Caps Lock key, NUM Lock key, etc.

- Current input language

- Number of objects in the selected folder, e.g., control modules.

- Number of selected objects if this is more than one.

- Display of the zoom status, slider for zooming in and out of the display
Alternatively, you can change the size of the display by pressing the <Ctrl> key while moving the mouse wheel.

4.3.1.2 Working in the areas of the Configuration Studio

Working in the "Sequence Execution System" editor

You work and navigate in the "Sequence Execution System" editor as you would in the overall Configuration Studio. Configuration is user-friendly and supports the configuration engineer during editing. The handling is similar to that for a spreadsheet program.

Working with the navigation area

Individual folders of the tree view are expanded or collapsed by clicking the ⊞⊟ buttons.

Shortcut menus with additional functions are offered for individual folders, for example, Exporting.

You can show or hide the navigation area by clicking the « » buttons.

Working with the table area

Creating a new object

You create the SES components for a unit in the table area.

To create a new object, you edit the cell identified by a yellow icon.

Enter a text, for example, name of the step or select a name from the selection dialog in line with the property.

Input and editing

Properties of an object, for example, setpoints or controls, can be edited in the table area.

The following options are available:

- Option:
Click in the field to set the check mark or to remove the check mark.
☑ Option activated
☐ Option deactivated

- Text input:
The text cursor is displayed after you have clicked in the box. Enter the text. Press the ENTER key or click anywhere. The text cursor is no longer visible and the text is saved.

- Selection from a drop-down list:
  Click the button to select from a list of specified properties.

  Make a selection.

- Open another dialog:
  Click the button. A dialog with additional selection options is displayed. The input is not accepted by the system until you close this dialog.

  You can make entries in these fields directly above the keyboard. An invalid input is rejected.

Editing several objects

You enter recurring texts by selecting an entry and dragging down the bottom right corner of the selection while keeping the left mouse button pressed.

The cells are automatically filled with the respective entry:

- Numerical entries are automatically incremented.

- A numerical suffix which is automatically incremented is appended to text entries.

Option boxes apply the selected option of the marked cell.

When you select an area in the table area which only contains check boxes, the commands "Select all" and "Deselect all" are available from the shortcut menu. This also applies if you select multiple rows or the complete table and the first column contains check boxes.

Filtering entries with the "Find" search field

Use the "Find" search field to filter entries according to the specifications in a column. The first column is selected by default. You can select any other column.

You make the settings for the search in the menu of the search field.

Delete the filter by clicking the button .

Use the "Search in" command to select the properties to which the filter is applied.

Shortcut menu of the column header

The shortcut menu of the column header includes these options:
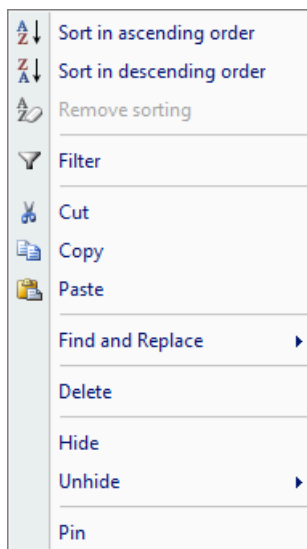
- Sort: The table can be sorted according to the selected column.

- Filter: To filter the table for entries of a property, select the "Filter" command.

- Cut, Copy, Paste: These functions can be applied to all information of the selected column. If you cannot paste the copied information to a column, you will be notified by a message.

- Find and replace: Function within the selected column.

- Delete: All entries in the column are deleted. This is not available for all properties.

- Hide, Show: The selected column can be hidden in the table area. Currently hidden columns can be shown.

- Pin / Unpin: To always show columns when scrolling horizontally, select a column and select the command "Pin". The column and all columns shown to the left remain visible while scrolling. To scroll the pinned columns horizontally, select "Unpin".

Inconsistent entries

If an entered value is faulty or inconsistent, you will see a corresponding note, for example:

- Invalid entries are created when you edit several entries by dragging a cell.

Undoing and restoring

Press <Ctrl+Z> to undo the last input or action.

Press <Ctrl+Y> to restore a previously undone setting.

These commands are also available in the main menu of the WinCC Configuration Studio.

Missing translations

If you change the input language during configuration, the entries for the texts already configured may not be available in the new input language. The translations are not available for the current input language here.

Working with the "Properties" area

The properties of the selected object are displayed in the "Properties" area.

You can edit the properties here just as you would in the table area.

To display the properties of a sequence, a step in the sequence, etc., select this entry in the respective tree view or in the table area.

You can show or hide groups of properties by clicking the ⊞⊟ buttons to get a better overview.

You show or hide the "Properties" area by clicking the « » buttons.

4.3.2 Creating a unit

4.3.2.1 How to create a unit

Introduction

You must create the units in the Configuration Studio that you want to use for the sequence control and for which you have inserted a block in the PLC program.

You configure the control modules and parameters of the unit that you need for the sequence control. These include control modules of the real unit, for example motor and control modules that are assigned a specific function, such as establishing the connection of unit to a successor unit.

If the structure tags for control and the raw data tags for communication with the controller have not been created yet, create the tags in the tag management with the help of the Configuration Studio.

You can create group directories to get a better overview of the variety of control modules and parameters of the unit. The group directories with the assigned control modules and parameters are also displayed in Runtime in the SES control. This means the groups only serve to provide a better overview.

Note

Units have to be linked before the start of WinCC Runtime with a valid tag.

Units you want to use in runtime have to be linked before the start of WinCC Runtime with a valid tag. These units will not function if you create additional units and link them with valid tags in runtime.

Requirement

- You have opened the Configuration Studio in WinCC Explorer.
- You have created a connection to the PLC via a channel unit.

Length conventions of names

For the sequence control to be correctly displayed in Runtime, the names must meet the following conventions. The lengths are based on average texts. Names with a high percentage of long letters, such as "M", "W", "m", "w", may not be displayed completely in Runtime. In the case of texts with a high percentage of short letters, such as "e", "t", "i", "l", it may be possible to display longer texts.

Object	Recommended maximum character length
Unit name	24
Sequence name	24
Step name	40
Parameter name	20
Control module name	40

Creating new units and configuring the unit tags

1. Click "Units" in the navigation area.

2. Enter the name of the unit in the "Unit" column in the table area.

3. Configure the unit tags for the connection to the controller via the "Tag properties" column.

4. Select the configured connection to the controller. Enter the corresponding numbers from the instance data block of "SES_PHC" in "DB No." and "R_ID". In "Tag name of the structure instance", enter the name that is to be used for the assigned structure tags with regard to the unit.

5. Click "OK". The structure tags for the control and the raw data tags for communication to the controller are created in the tag management. The name of the tag of the structure instance is entered in the "Tag name" column.

Note

Manual removal of raw data tags

If you want to remove the unit tag and the associated raw data tags, you have to remove the raw data tags manually. Deleting structure tags is not enough to remove all tags connected with them.

6. The "Sequence size" column shows which data block of the sequence belongs to which size type. The assignment to the "Small", "Medium" and "Large" categories is indicated by the user-defined data type of the sequence data block that is used. If the sequence data of the unit was not downloaded to the PLC via the SES control, "Unknown" is displayed in the column.

You can also create a unit by selecting the shortcut menu "New unit" of the "Units" item in the navigation area.

Note

When you modify the STEP 7 program name, you must also adapt all tag connections in the properties of the unit.

Creating the control modules of the unit

1. Click "Control elements" in the navigation area below the created unit.

	Control module	Unit	Group	Port Number	Visibility
1	Door	Filter		1	☑
2	Wagon	Filter		2	☑
3	Valve1	Filter		3	☑
4	Valve2	Filter		4	☑
5	Valve3	Filter		5	☑
6	Sync_Cup	Filter		9	☑
7	ControlModule_1	Filter	Group_1	0	☑
8					

2. Enter the names of the control modules used in the real unit, for example, motor 1 and valve 1, in the "Control element" column of the table area. Or create a control module, for example, that you want to use for a connection to another unit.

3. In each case specify a PortID in the "Connection number" column. If you have already configured the control modules in the instance data block of "SES_PHC", apply these numbers. Otherwise you can freely assign the numbers.

4. For those control modules that you do not want to display in the SES control, disable the "Visibility" option. You see the visible control modules in the lines of the Runtime view and in the Step view.

Creating parameters of control modules

1. Click "Control elements" in the navigation area below the created unit. Select the control module for which you want to configure parameters.

2. In the "Parameter" column in the table area, enter the names of the parameters that are to be used for the control module, for example, speed, temperature.

3. In each case specify a PortID in the "Connection number" column. If you have already configured the parameters at the instance data block of "SES_PHC", apply these numbers. Otherwise you can freely assign the numbers. You can configure a total of 160 control modules and parameters per unit.

4. Enter the position that the parameter occupies in the array for the setpoints at the "QSP" output of the block.

5. Enter the unit of measurement of the parameters, if necessary.

6. Select a parameter type that is to be used for the parameter:

   – If the parameter is only to have the function of a setpoint, select "Function off".

   – Specify an increment value for the "Count up" and "Count down" functions.

   – Specify an increment value and a low and/or high limit for the "Integrator" and "Integrator with hold" functions.

   – Specify a value for the "Hysterese" function in the "Hysterese" column.

   – Select the "Sequence" function if you want to connect the unit to another unit. Select a configured unit in the "Unit" column.

Function	Use
Function off	No function is assigned to the parameter.
Count up	Increases the current value by the increment value at each negative edge.
Integrator	Increases the current value by the increment value every second.
Count down	Reduces the current value by the increment value at each negative edge.
Up timer	Increases the current value by the timer in each cycle.
Down timer	Reduces the current value by the timer in each cycle.
Hysterese	Checks if the current value is within the low and high value of the hysteresis of the setpoint.
Actual value >= Setpoint	Compares if the current value is greater than the setpoint.
Actual value <= Setpoint	Compares if the current value is smaller than the setpoint.
Integrator with hold	Same functionality as "Integrator", however, the value in the cycle "Hold" -> "Held" -> "Resume" is retained. As a result the parameter has the same value when exiting and re-entering the "Running" status.
Sequence	Connects the unit to a selected unit

You can find more information and an example on page Parameters and parameter types (Page 39).

7. For those parameters that you do not want to display in the SES control, disable the "Visibility" option. You see the visible parameters below the associated control modules in the Runtime view and in the Step view.

Result

You have mapped the components of the unit in the WinCC SES Configuration Studio. You can now use the components to configure the steps and sequences.

The configuration data are saved in the database.

See also

4.3.2.2   How to configure the steps

Introduction

To configure sequences, you first have to create steps. The individual steps include the control commands of the control modules and parameters that are used.

For the steps, you can configure conditional jumps to selected steps that are executed for specific prioritized events. When the event occurs, the sequence that is running exits the step that is running and jumps to the step that was specified as jump destination. When jump destinations are configured for multiple events for the step and several events occur simultaneously in Runtime, the jump destination of the event with the higher priority is used. The program then jumps back to a specified step via a configured return jump.

Requirement

- You have opened the Configuration Studio in WinCC Explorer.
- You have created a unit in the Configuration Studio.
- You have configured the control modules and the parameters for the unit.

Creating steps

1. Click "Steps" in the navigation area below the created unit. The "Steps" tab is selected in the table area.

Steps [Steps]

	Step ID	Step name (ID)	Step	Unit	Visibility	Position	Timeout interval	Request for Oper
1	1	105	Open_Door	Filter	✓	1	0	
2	12	142	Close_Door	Filter	✓	2	0	
3	13	143	Empty_Wagon	Filter	✓	3	0	
4	14	144	Open_Valve1	Filter	✓	4	0	
5	15	145	Open_Valve2	Filter	✓	5	0	

2. Enter the names of the individual steps one below the other in the "Step" column in the table area.

3. For those steps that you do not want to display in the SES control, disable the "Visibility" option. You see the visible steps in the columns of the "Runtime", "Sequence configuration" and "Step" views.

4. In the "Position" column, specify the sequence of the steps that are displayed in the "Step configuration" and "Step" views. When you select a number which has already been assigned to another step, the two steps swap their positions.

5. If you want to monitor the step time, enter the time in seconds in the "Monitoring time" column. The step is then displayed in red or in the set color when the monitoring time is exceeded in the SES control in the Runtime view.

6. If necessary, you may also enter notes for operator input request for the steps in the "Operator input request" column. For configuration of an operator input, read the instruction in the section "How to configure an operator input for a step".

You can also create steps by selecting the shortcut menu "New step" of the "Steps" item in the navigation area.

Configuring the commands of the individual steps

You specify controlling and checking of control modules and parameters with commands that you assign in the steps.

You can define the following commands:

Command	Description using "Control module" as example
Check for 1	The condition for the control module has been met when a "1" is pending at the input "FB_IN". "Feedback OK" is displayed in the SES control. There is no activation.
Check for 0	The condition for the control module has been met when a "0" is pending at the input "FB_IN". "Feedback OK" is displayed in the SES control. There is no activation.
Set to 1	The control module is set to "1" and the feedback is not checked.
Set to 0	The control module is set to "0" and the feedback is not checked.
Set to 1 and check	The control module is set to "1" and the feedback is checked. "1" is set at the output "Q_CMD" and input "FB_IN" is checked to see if this "1" is pending. "Feedback OK" is displayed in the SES control.
Set to 0 and check	The control module is set to "1" and the feedback is checked. "0" is set at the output "Q_CMD" and input "FB_IN" is checked to see if this "0" is pending. "Feedback OK" is displayed in the SES control.
Check for 1 (OR)	In case of a logic OR operation, at least one control module must meet this condition to continue with the next step. There is no activation.
Check for 0 (OR)	In case of a logic OR operation, at least one control module must meet this condition to continue with the next step. There is no activation.
Set to 1 and check (OR)	In case of a logic OR operation, at least one control module must meet this condition to continue with the next step.
Set to 0 and check (OR)	In case of a logic OR operation, at least one control module must meet this condition to continue with the next step.

1. Click on a created step in the navigation area below the "Steps" item.

2. Click the "Control module commands" tab.

3. Select one of the commands from the drop-down list in the "Command" column for each control module that you want to control or check in the selected step.

4. You configure the parameters in the "Parameter commands" tab in the same way.

Configuring conditional jumps for a step

1. In the navigation area below the configured steps, click the step for which you want to specify conditional jumps.

2. Click the "Conditional jumps" tab in the table area.

3. In the "Jump destination" column, select a configured step for the events of the step that you want to connect to a jump.

4. In the "Jump destination" column, select a configured step for the return jump.

See also

How to create a unit (Page 57)

How to configure the sequences (Page 63)

4.3.2.3   How to configure the sequences

Introduction

You configure sequences for the unit to which you assign individual steps and an order in the sequence.

You assign setpoints to the steps in the sequence. You can use them to synchronize units with the sequences of the units querying the parameter values.

You can configure special sequences for specific state transitions. These sequences are run when changes in state occur.

Requirement

- You have opened the Configuration Studio in WinCC Explorer.

- You have created a unit in the Configuration Studio.

- You have configured the steps for the unit.

Creating sequences

1. Click "Sequences" in the navigation area below the created unit.

	Sequence	Unit	Visibility	Position
1	Empty_Filter	Filter	☑	1
2	Fill_Arabica	Filter	☑	2
3	Fill_Liberica	Filter	☑	3
4	Fill_Robusta	Filter	☑	4

2. Enter the names of the sequences you want to use for the unit one below the other in the "Sequence" column in the table area.

3. Disable the "Visibility" option for those sequences that you do not want to display in the SES control. You see the visible sequences in the lines of the sequence configuration view.

4. In the "Position" column, specify the sequence of the steps that are displayed in the "Step configuration" view. When you select a number which has already been assigned to another sequence, the two sequences swap their positions.

Specifying the order of steps in the sequence

1. Click on a created sequence in the navigation area below the "Sequences" item.

	Unit	Sequence	Step	Position
1	Filter	Empty_Filter	Empty_Wagon	1
2			❄	
3				
4				
5				
6				
7				
8				

2. In the "Step assignments" tab in the "Step" column select, one below the other from the drop-down list, the configured steps you want to use for the sequence.

3. Specify the position in the sequence for each step. The steps are displayed in the order in the columns of the views in the SES control.

Specifying the setpoints of the steps

1. Click the "Setpoints" tab. All parameters configured in the step are displayed in the "Parameters" column. You specify a setpoint for each step in the sequence.

2. Enter a setpoint in the "Setpoint" column. When a parameter was configured with the "Sequence" parameter type, select a sequence from the connected unit here.

See also

4.3.2.4 How to configure an operator input for a step

Introduction

You can use operator inputs for steps in the sequence. In Runtime, the sequence stops at the step with the operator input. The SES control displays a message with a specified text. A button is displayed next to the text and the sequence continues once it has been acknowledged by the operator.

In Configuration Studio, you must create a control module used as request for operator input. Enter a text for the message in the steps in which you want to use the operator input request. Then configure the control for the control module used as operator input request.

Requirement

- You have connected a control module to the "IREQ_OP" input of the "SES-PHC" block in the SIMATIC Manager.

- You have connected the "QACK_OP" output to the feedback block of the control module in the "SES-PHC" block.

Procedure

1. Click "Control modules" in the navigation area of the unit.

2. Enter the name of the control module, for example, "operator_request_01", in the "Control module" column in the table area.

3. In the "Connection number" column, specify the number with which the control module is to be interconnected at the "SES_PHC" block at the array of the "Q_CMD" output.

4. Click "Steps" in the navigation area. Click the "Steps" tab in the table area.

5. In the steps in which you want to use the operator input request, enter a text in the "Operator input request" column. An operator input request ID is generated once you have acknowledged the input.

	Step ID	Step	Unit	Visibility	Position	Timeout interval	Request for Operator Input (ID	Request for Operator Input
1	1	Tor_Auf	Filter	☑	1	0	128	Filtering ok?
2	2	Tor_Zu	Filter	☑	2	0	129	Filtering ok?

6. Click the "Control module commands" tab. You configure the control in the table rows in which the control module used as operator input is entered and the steps for which you want to use the operator input.

	Command	Unit	Step	Control module	Port Number	Command
1	13	Filter	Filtering	operator_request_01	7	Set to 1 and check
2			✳			

7. Select the command "Set to 1 and check" from the drop-down list in the "Command" column.

Result

The sequences which include steps with operator input will stop at these steps during execution. The SES control displays the text of the operator input request. Once the operator has clicked "Acknowledge", the sequence continues.

4.3.2.5   How to configure special sequences

Overview

You can use special sequences for specific status transitions for each unit. For example, when a plant is started the special sequence "Starting" is run with the "Cleaning" step. Another example: When a sequence pauses, you need to execute other intermediate steps to achieve a defined status.

The following six status transitions are part of the special sequences:

- Starting
- Completing
- Holding
- Aborting
- Stopping
- Resuming

Assign the configured steps to the special sequences. In the SES control, the special sequences are displayed below the configured sequences in the sequence configuration view. The progress of the special sequences is not displayed in the Runtime view.

Requirements

- You have configured steps in the SES Configuration Studio.
- You have specified the activations of the available control modules for the steps of the special sequences.

Procedure

1. Click "Special sequences" in the navigation area below the created unit.
2. In the navigation area, click the status transition for which you want to use a sequence (for example, "Starting").
3. Click the "Step assignments" tab.
4. Select the steps one below the other you want to use for the special sequence from the drop-down list in the "Step" column.
5. Specify the position in the sequence for each step.
6. Click the "Setpoints" tab. All configured parameters of the unit are displayed in the "Parameters" column.
7. Enter a setpoint in the "Setpoint" column for each step.

4.3.3 Language support in WinCC SES

Introduction

WinCC SES offers the following language support:

- Setting different languages for the configuration user interface and configuring with different input languages
- Creating projects that run in multiple languages in Runtime

You can enter the texts directly in the SES Configuration Studio or edit them in the "TextLibrary" editor.

Refer to the documentation on language support in WinCC in the section "Structure of multilingual projects" in the WinCC Information System.

Supported Languages

WinCC SES offers the following languages in which you can create texts:

- German
- English
- Spanish
- Italian
- French
- Japanese
- Chinese (Simplified, PR China)

You can set up any number of languages as Runtime language in the text library of the current project. The new language is then also available in SES and can be filled with texts.

In addition, once a language has been installed, all SES standard texts are available in this language during configuration and in Runtime.

Procedure

1. Configure the SES project in the preferred input language in the SES Configuration Studio.
2. The bottom part of the properties includes the display of the texts in the available languages. You can edit the text here.
3. Alternatively, you can also edit the texts that are not available in the input language in the "Text Library" editor.

Note

No translation

When you change the input language during configuration, the entries for the texts already configured may not be available in the new input language. This is indicated by the "Empty text" note in the corresponding properties fields. This information reminds you that translations are not available for the current input language. The "Empty text" message only appears in the editor and not in Runtime.

4.3.4　How to configure an SES control

Introduction

The process picture contains one or more units with the control modules and other modules. To integrate the sequence control of a unit into the process picture, you must insert the process picture into an SES control.

After installation of WinCC SES, you must register the SES control in the Graphics Designer prior to its initial use. In the "Controls" tab, select the entry "Add/Remove" in the shortcut menu of the "ActiveX Controls" folder. Activate the "WinCC SES Control" in the "Available OCX Controls" area and click "OK".

Requirement

- You have placed and interconnected the control module(s) of the unit in the process picture.
- You have created the visualization of the plant with operator functions and plant pictures with OS Engineering.
- You have configured the unit(s) for the sequence control in the WinCC Configuration Studio.
- You have opened the Graphics Designer with the process picture in WinCC.
- You have displayed the "Controls" selection window with "View > Toolbars" in the Graphics Designer.
- You have registered the SES control so that the control is included in the "Controls" selection window.

Procedure

1. Select the SES control in the "Controls" selection window.
2. Place the mouse pointer at the position in the picture where you want to insert the control. The mouse pointer changes into a crosshair with an object symbol attached.
3. Drag the control to the desired size with the mouse. The Properties dialog box opens.
4. You configure the general properties of the SES control in the "General" tab. You can specify the width and height of specific textboxes for displaying the texts.

5. Select the configured unit to which you want to connect the SES control. You can also set the names of the unit dynamically in Runtime.

6. Select the authorization level for operator control and configuration of the SES control. "Administrator" is set as default. The following authorization levels are available:

Authorization level	Scope of the authorization
Administrator	No restriction for operator control and configuring
Operator	No restriction for operator control and configuring
Operator online	Operator control and the following authorizations for configuring in Runtime: • Changing the setpoints • Manual jump
Observer	Operator control only. No configuration possible

7. If necessary, you can configure the colors of some modules in the views of the SES control in the "Colors" tab.

8. If necessary, you can adapt some properties of the SES control in the "Object properties" window.

4.3.5 Operating and configuring in runtime

4.3.5.1 Elements of the SES control

Introduction

The SES control is the central element for controlling and monitoring the sequences in Runtime in the process picture. You use the SES control to operate and monitor the sequences and parameters. You can also configure the sequence control.

Buttons of the SES control

The buttons for operating and configuring SES in Runtime are available in the top area:

	Runtime view: The currently running sequence with the control modules and the current parameters is displayed.
	View of the sequence configuration: Overview of the sequences of a unit with the number and order of steps. Here you can specify the order of the steps in the sequences.
	Step view of control modules of a sequence: Here you can specify the control and the feedback of the control modules for each step.
	View of the jump table: Overview of the jumps to steps of a sequence triggered by events. You can specify the sequence for the conditional jumps here.

▷		Start the sequence
❚❚		Hold the sequence
▪		Stop the sequence
✋		Change the operating mode: Manual or Automatic
		Activate single step mode
		Resume in single-step mode
		Display sequence parameters
🔍 🔍		Zoom in or out of the sequence control display
		Manual jump in Runtime
		Write sequence data and conditional jumps to the controller
		Hide all steps in the step view of the control modules that are not used in the selected sequence

Views of the sequence control

A matrix is displayed in the left half that is represented differently with the selected view:

- Runtime view (RT):
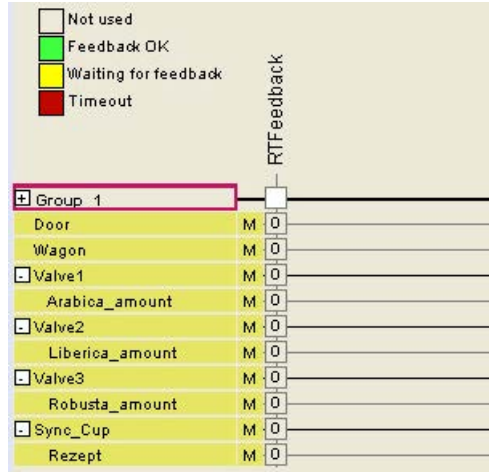
  – The configured control modules and the associated parameters are displayed, sorted by connection number in the rows one below the other. Only the components of the unit that are configured as "visible" are displayed. Under certain circumstances, the letter "L" or "M" may be displayed behind a control module. "L"(Interlock): The control module is locked. "M"(Manual): The control module is not in "Automatic" mode.

  – The steps are displayed in the columns one after the other in the order that you have configured via the "Position" with the step assignment of the sequence that is currently running. Only the steps that are configured as "visible" are displayed.
    If you have specified a step monitoring time for a step, the step is displayed in red when the monitoring time is exceeded.
    The "RTFeedback" column shows the interconnection of the feedback. If "1" is entered for a control module, for example, and there is a "0" in the step that is currently running, there is a wait for the feedback.

The status display shows status changes that can be caused by the following:

  – By the user in the operating dialog of the SES control

  – By the application

  – Automatically through the SES blocks

- View of the sequence configuration:
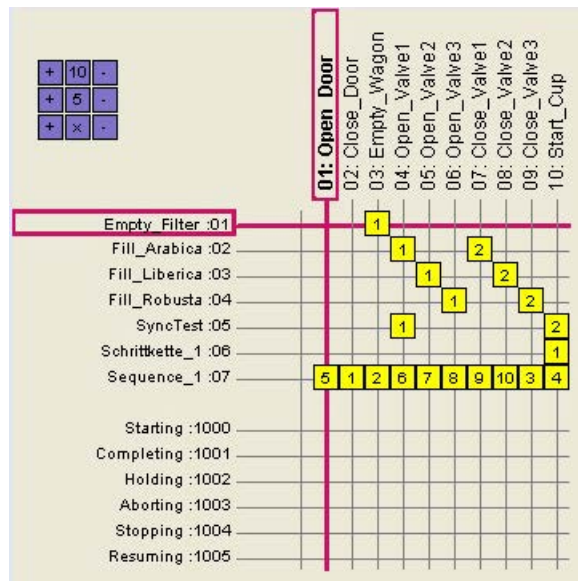
– The configured sequences with name and ID are displayed in the lines in the order that you defined with "Position" in the SES configuration. Only the sequences that are configured as "visible" are displayed. All special sequences with their fixed ID are always displayed below this. The sequences have a background color which indicates if the sequence is identical in the controller and in the control. Because up to five sequences can be written to the controller, five sequences are also identified as valid.

– The steps sorted by the configured step number are displayed in the columns one after the other. Only the steps that are configured as "visible" are displayed.

- Step view
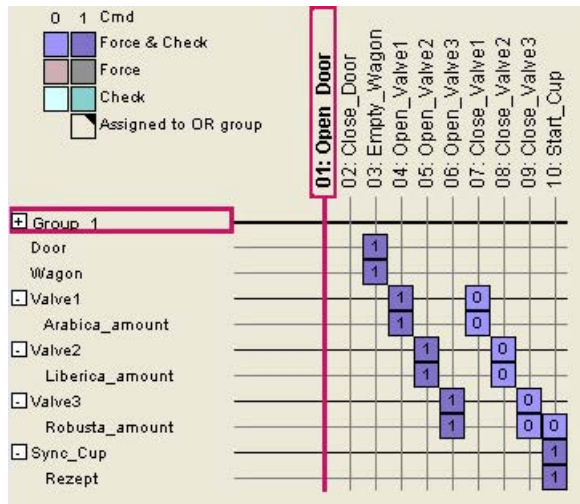
- The configured control modules and the associated parameters are displayed, sorted by connection number, in the rows one below the other. Only the components of the unit that are configured as "visible" are displayed. If more than 32 control modules are configured, these control modules are displayed below.

- The steps sorted by the configured step number are displayed in the columns one after the other. Only the steps that are configured as "visible" are displayed.

- View of the jump table:
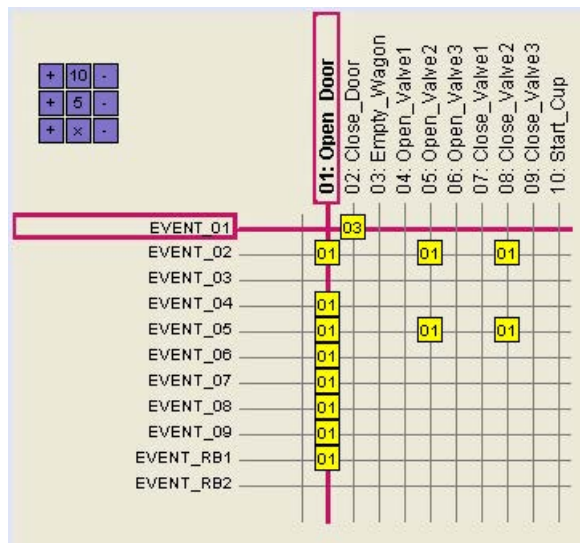
- The configured events for which you have specified jump destinations to specific steps are displayed below one another in the lines. Only the events that are configured as "Visible" are displayed.

- The steps sorted by the configured step number are displayed in the columns one after the other. Only the steps that are configured as "visible" are displayed. You can specify the sequence for the conditional jumps here.

Parameter view

The parameter view of a selected sequence opens in the right half of the SES control after a click on .

The parameters of the step are displayed with a mouse click on a column of the matrix with a step.

Use the navigation buttons to click through the steps of the selected sequence:

● When Runtime view is selected, the setpoints and current values with their unit of measure are displayed:
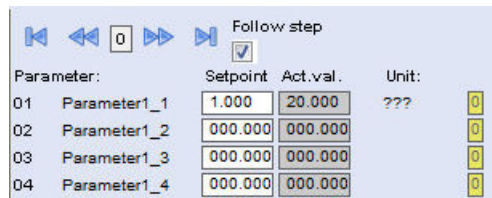
When the "Follow step" check box is selected, the parameters are updated according to the current step. When the option is not selected, you can navigate between the parameters regardless of the sequence order.

● If the sequence configuration view or the step view is selected, the archived values and/or offline parameters are displayed:
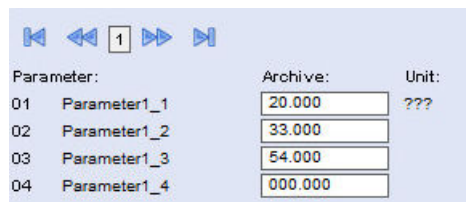
4.3.5.2 How to operate the SES in runtime

Introduction

You operate and monitor the sequences and parameters in Runtime with the SES control in a process picture with the aggregates of the unit.

Requirement

● You configured at least one unit with sequences and steps in the SES Configuration Studio.

● You have configured at least one process picture with an SES control in WinCC.

● You have opened the OS project in WinCC.

● You have started "OS Runtime" in WinCC Explorer with "Activate".

Operating the SES control in the process picture

1. Click the SES control in the process picture. The SES control opens. The Runtime data is displayed when the sequence is running.
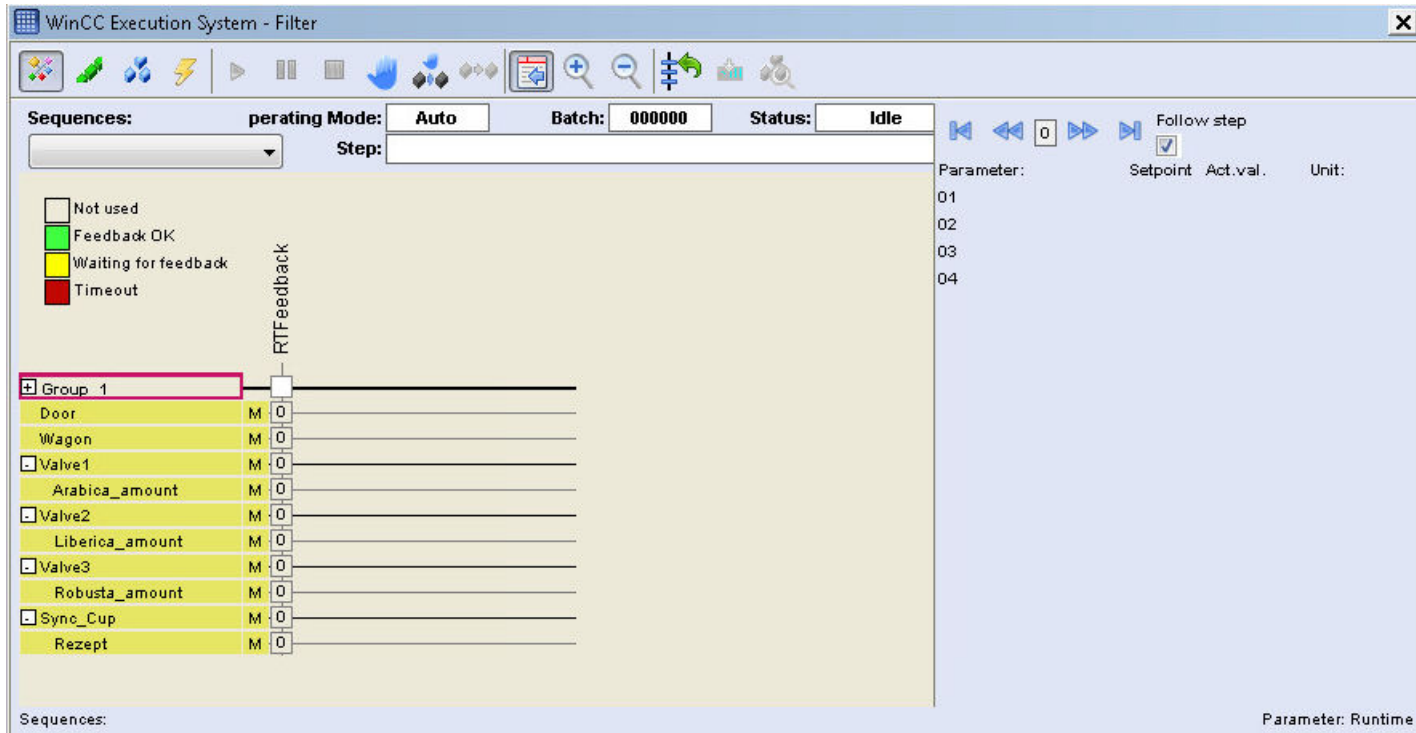
1. When "Manual" mode is set, select a sequence from the drop-down list below "Sequence".

2. For the sequence to be run, click

Executing a manual jump to a step

When manual mode is set, you can jump to a selected step in Runtime during a running sequence.

1. Select a column with a step in the matrix.

2. Click

3. The sequence jumps to the selected step.

Using single step mode

When manual mode is set, you can use single step mode in Runtime during a running sequence.

1. To initiate the sequence in single step mode, click

2. To get to the next step of the running sequence, click

See also

How to configure sequences of a unit in Runtime (Page 76)

4.3.5.3   How to configure sequences of a unit in Runtime

Introduction

You can configure the sequence control in a process picture in Runtime with the SES control.

You can edit up to 32 sequences per unit.

After the configuration of the sequences, you can download up to five sequences to the configured data blocks for sequences in the controller.

Requirement

- You configured at least one unit with sequences and steps in the SES Configuration Studio.
- You have configured at least one process picture with an SES control in WinCC.
- You have opened the OS project in WinCC.
- You have started "OS Runtime" in WinCC Explorer with "Activate".
- You have the authorization "Administrator" or "Operator".

Changing the sequence

1. Click the SES control in the process picture.
2. To switch to the sequence configuration view, click

   The configuration data of the sequences is displayed.

3. Click one of the created sequences on the left. The configured, visible steps are displayed at the top.
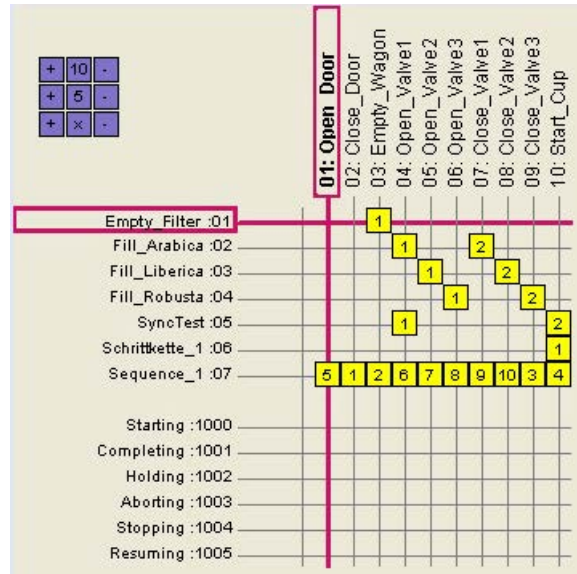
4. You specify the order in the sequence by clicking the intersection points of sequence and step. The step counter is automatically incremented with each click.

5. Click one of the quadrants in the top left corner to delete (x), increment (+) or reduce (-) a position of the sequence. When you click "+" or "-" next to the number "5" or "10", the position is increased or reduced by "5" or "10".

6. The special sequences are listed below the configured sequences. If necessary, you can specify the sequence order for the special sequences.

Download sequence data to the controller

1. Select the line with the sequence you want to download to the controller.

2. Click

3. Select the position of the configured data blocks for sequences in which the sequence data is written. You can download up to five sequences to the controller.

4. The data are then stored in the data block for sequences. The sequences that were downloaded to the controller are identified with the background color for valid sequences in the sequence configuration view.

Specifying activation in the steps

1. To switch to the step view, click

2. Click one of the available control modules or parameters on the left. The configured, visible steps are displayed at the top.
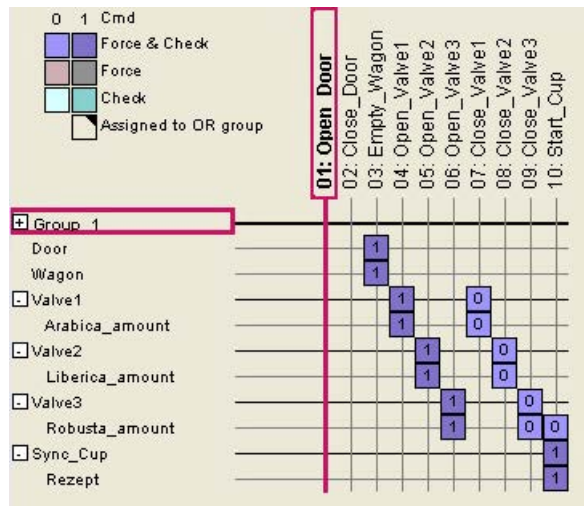
3. By clicking the intersection points of control modules or parameters and the selected step, you specify the commands for control and the feedback in the sequence. You define the type of activation with repeated left-clicks. You use the right click to define whether an activation takes place ("1") or not ("0"). The table below describes the symbols:

Symbol	Command	Description
■	Set to 1 and check	The control module is started or opened and the feedback is checked.
■	Set to 0 and check	The control module is stopped or closed and the feedback is checked.
■	Set to 1	The control module is started or opened and the feedback is not checked.
■	Set to 0	The control module is stopped or closed and the feedback is not checked.
■	Check for 1	The feedback is checked for "started", "opened" or "met". There is no activation.
■	Check for 0	The feedback is checked for "stopped" or "closed". There is no activation.
■	OR group assigned	OR logic operation of at least two control modules or parameters with one of the above described commands with feedback

4. Download the modified step data to the controller as described above.

Specify conditional jumps

1. To switch to the jump table view, click

2. On the left, click the "EVENT_xx" events for which you want to define jumps. The configured, visible steps are displayed at the top.
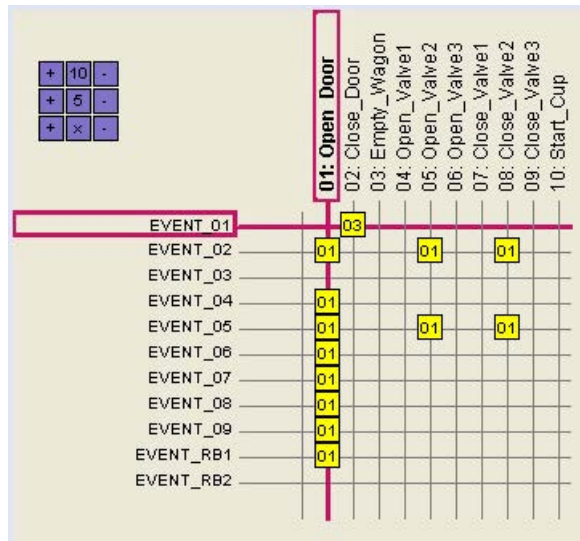
3. You specify the step for the jump clicking in the intersection point of "EVENT_xx" and a selected step. For example, if "Event_01" occurs at step "2", a jump is made to destination step "1".

4. With "Event_RB1" you determine the return jump to the sequence step that is to be run next.

5. Download the configuration of the conditional jumps to the controller using the button

Analysis of the runtime behavior

WinCC provides tools to analyze the runtime behavior, for example in the case of an error. The diagnostic windows "GSC Runtime" and "GSC Diagnostics" support you during troubleshooting in scripts. Additional information is available in the WinCC Information System in the chapter "Runtime behavior of actions".

See also

How to operate the SES in runtime (Page 74)

How to configure special sequences (Page 66)

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