

SIEMENS

SIMATIC

Industrial Software
SIMATIC S7 F Systems
Engineering V6.4 Upd1

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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 Aktiengesellschaft. 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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Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity 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 cybersecurity 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 cybersecurity measures that may be implemented, please visit
<https://www.siemens.com/cybersecurity-industry>.

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 Cybersecurity RSS Feed under
<https://new.siemens.com/cert>.

Introduction

Read the following instructions carefully because they contain important information for the installation and operation of the SIMATIC S7 F Systems V6.4 Upd 1 option package that you must observe.

Note

The following information is identical to the information for SIMATIC S7 F Systems.

Therefore, we use the term "SIMATIC S7 F Systems" in the description below.

Installation instructions

3.1 Installing the SIMATIC S7 F Systems optional package

Software requirements

Operating systems

The following operating systems are supported on the ES and OS:

- MS Windows 10 Enterprise 2015 LTSC (64-bit)
- MS Windows 10 Enterprise 2019 LTSC (64-bit)
- MS Windows Server 2016 Standard Edition (64-bit)
- MS Windows Server 2016 Datacenter Edition (64-bit)
- MS Windows Server 2019 Standard Edition (64-bit)
- MS Windows Server 2019 Datacenter Edition (64-bit)

Note

Release for Windows Server 2016 or 2019 Datacenter Edition

Windows Server 2016 or 2019 Datacenter Edition (64-bit) is only supported in connection with the SIMATIC Virtualization as a Service (SIVaaS) service contract.

You can find additional information in the Industry Online Support under entry ID 109762004.

- Internet link (<https://support.industry.siemens.com/cs/ww/en/view/109762004>)

Note

Microsoft updates for the operating systems

Before you start with the installation/upgrade of your computers to SIMATIC S7 F Systems 6.4 Upd 1, ensure that the currently released updates for the respective operating system are installed.

You can find information on the use of the latest Microsoft security updates in the Industry Online Support under entry ID 18490004.

- Internet link (<https://support.industry.siemens.com/cs/ww/en/view/18490004>)

To ensure secure and stable operation of the operating system, we recommend the installation of the mentioned updates.

3.1 Installing the SIMATIC S7 F Systems optional package

Software packages

To operate SIMATIC S7 F Systems V6.4 Upd1, the following software packages must be installed:

- On the ES:
 - Automation License Manager V6.0 SP5 Upd1 or higher
 - PCS 7 V9.0 SP3 or higher
 - Or
 - STEP 7 V5.6 SP2 or higher and CFC V9.0 SP4 or higher
From V5.7 the option package "S7-PM V5.7" including license is additionally required
 - STEP 7 V5.6 SP2 or higher and CFC V9.0 SP4 or higher

Note

For STEP 7 V5.7 SP1 and higher, please install "Microsoft Visual C++ 2010 Redistributable".

You can find the necessary exe file on the installation storage medium of S7 F Systems in the following folder: "Microsoft\VCRedist\2010X86\vc_redist_x86.exe".

- On the OS (for SIMATIC S7 F Systems HMI)
 - PCS 7 V9.0 SP3 or higher
 - Optional: WinCC V7.4 SP1 Upd14 or higher
- For offline testing
 - S7-PLCSIM V5.4 or higher
 - SIMATIC Manager V10.2 or higher

Available installation units

SIMATIC S7 F Systems comprises the following installation units:

- Engineering:
 - SIMATIC S7 F Systems Engineering Tool V6.4
 - SIMATIC S7 F Systems HMI V6.4
 - SIMATIC S7 F Systems Library V1.3 SP4 Upd1
 - SIMATIC S7 F Device Integration Pack V6.4 incl. Upd2
 - SIMATIC S7 F Configuration Pack V5.5 SP13 (for STEP 7 version from V5.6.2.0 to before V5.7)
 - SIMATIC S7 F Configuration Pack V5.5 SP13 Upd1 (for STEP 7 version V5.7 or higher)
- Runtime:
 - SIMATIC S7 F Systems HMI V6.4

Installation options

The following options are available in the setup:

- **Engineering AS and OS**
This option is used to install all S7 F Systems components on the ES, i.e. when the computer is used for AS and OS engineering.
This option is used for the installation under SIMATIC PCS 7.
- **Engineering AS**
This option is used to install the S7 F Systems components on the ES, i.e. when the computer is used for engineering the AS.
This option is used:
 - For installation under SIMATIC STEP 7.
 - For updating S7 F Systems Engineering including S7 F Systems Library, S7 F Device Integration Pack, S7 F Configuration Pack under PCS 7.
- **Engineering OS**
This option is used for installation of OS components on the ES, i.e. when the computer is used for the configuration of AS and OS and only the OS is to be updated.
This option is used for the installation of the OS component S7 F Systems HMI under SIMATIC PCS 7.
- **Runtime**
This option is used to install the OS components S7 F Systems HMI:
 - On the OS when the computer is only used as OS, for example, in OS Single Station system, OS Server, or OS with Web server.

Installation via SIMATIC Management Console

The optional packages from S7 F Systems can also be installed via SIMATIC Management Console.

Note

Version of the SIMATIC S7 F Configuration Pack for installation via SIMATIC Management Console

For installation of S7 F Systems via the SIMATIC Management Console, the version of the SIMATIC S7 F Configuration Pack must be selected depending on the STEP 7 version. You can find additional information on this above under "Available installation units".

Installing S7 F Systems on the ES

1. Start the engineering station.
2. Save your changes in the "S7 F Systems Library" before installation.
3. Ensure that no STEP 7 applications are open.

3.2 Example projects

4. Start the SETUP.EXE program on the installation storage medium.
5. Follow the instructions of the setup program.
Select a program package with the engineering components of SIMATIC S7 F Systems in the setup.
 - "Engineering AS and OS"
 - "Engineering OS"
 - "Engineering AS"Detailed information on the options/program packages is available in the "Installation options" table above.

Installing S7 F Systems on the OS

1. Start your OS. Ensure that no SIMATIC applications are open.
2. Start the SETUP.EXE program on the installation storage medium.
3. Follow the instructions of the setup program.
Select a program package with S7 F Systems HMI in the setup.
 - "Runtime"Detailed information on the options/program packages is available in the "Installation options" table above.

License key (usage authorization)

A license key is required for the S7 F Systems optional package. This license key is installed in the same way as for STEP 7 and the optional packages. For information on installing and working with the license key, refer to the readme file and the STEP 7 basic help.

Removing S7 F Systems

It is recommended not to uninstall the SIMATIC S7 F Systems components as this can lead to problems with your configuration.

If you want to remove SIMATIC S7 F Systems or one of the components, place it on a basic image of your system and reinstall the required components.

3.2 Example projects

There are four example projects in the "SIEMENS\STEP7\Examples" directory.

- ZEN32_01 F-project - for a fail-safe system (English)
- ZEN32_02 FH-project - for a fail-safe and fault-tolerant system (English)
- ZDT32_01 F-project - for a fail-safe system (German)
- ZDT32_02 FH-project - for a fail-safe and fault-tolerant system (German)

To use these example projects, you must first install S7 F Systems Library V1.3 SP2 (or higher).

The passwords for the supplied projects are:

- CPU password: **F_cpu123**
- Password for the safety program: **Fsys_v62**

The example projects are configured for non-redundant fail-safe input/output modules. Each example project was created with a module of the type F-DI, F-AI and F-DQ.

Notes on use

4.1 Notes on the optional package

Information regarding the use of Control Module Types (CMT) with F-blocks

The use of Control Module Types (CMT) with F-devices is approved for the following software:

- SIMATIC S7 F Systems as of V6.4
- SIMATIC PCS 7 as of V9.1.2
- SIMATIC PCS 7 as of V9.0.3 UC05

Notes on "Increased password security"

Use of the "Increased password security" option in the "Create password for safety program" dialog is enabled by default starting with V6.3.

For projects with Safety Matrix prior to V6.3, this option must be deactivated unless otherwise described in the Safety Matrix product. See the documentation of the respective version of Safety Matrix for more information.

Supported versions of Safety Matrix

S7 F Systems V6.4 is compatible with Safety Matrix V6.2 SP2 Upd2 and V6.3 Upd2 or higher.

Please heed the note above on "Increased password security" for version 6.2 SP2 Upd2.

The "Safety Data Write" functionality is no longer supported

The "Safety Data Write" functionality for safety-related modification of F-parameters in the safety program of an F-CPU from an operator station (OS) is no longer supported from S7 F Systems V6.4.

Migration to the "Secure Write Command" (SWC) function is recommended.

You can find more information in the *SIMATIC S7 F/FH Systems - Configuring and Programming* Programming and Operating Manual.

Password of the S7 F Systems Library

The password for the included S7 F Systems Library is:

- Fsys_v63

4.2 Notes on the documentation

Manuals are copied to the ES/OS during the installation process. You can find the installed manuals in the Windows Start menu in the subdirectory "Siemens Automation > Documentation > Manuals".

You can find the manuals on the installation storage medium in the directory "_Manuals\\English".

You can find the current versions of the manuals on the Internet at:
<http://www.siemens.com/simatic-tech-doku-portal>

4.3 Notes on the "S7 F / FH Systems" Programming and Operating Manual

In this section you will find corrections and additions to the "S7 F/FH Systems - Configuring and Programming" Programming and Operating Manual. The section number and correction is specified for each correction. Corrections relating to blocks/F-blocks also apply to the online help for the blocks/F-blocks.

Addition to the section 12.10 "Acceptance test following system upgrade"

The following table applies in addition.

Upgrading from S7 F Systems Library V1.3 SP4 to V1.3 SP4 Upd1	Change of signature	STOP of F-CPU required	New acceptance required
With use of the modified F-block F_CH_AI	Yes	No	Changes

Corrections to section A.2.6.2 "F_CH_QBI: F-channel driver for inputs of data type BOOL (with value status) of fail-safe DP standard slaves and fail-safe standard I/O devices"

Substitute value section

The section is replaced by the following entry:

Substitute value

The substitute value 0 is output at the Q output in the following cases:

- The digital input value is invalid due to a communication error (PROFIsafe).
- The digital input value is invalid due to a module or channel fault (e.g. wire break) or a substitute value is received from the module.
- A passivation with PASS_ON = 1 is present.
- An F-Startup is present.
- FV_ACTIVATED is signaled by the module.

The quality code (QUALITY) is set to 16#48 and QBAD = 1 is set.

When the substitute value is output, PASS_OUT = 1 is additionally set for passivation of other channels. An exception is passivation (with PASS_ON = 1) or channel faults (e.g. wire break). PASS_OUT is not set in this case.

"Reintegration after troubleshooting" section

The second paragraph is replaced by the following entry:

The effect of the ACK_NEC parameter is directly dependent on the hardware configuration of the module.

- With the parameter assignment "Channel failure acknowledge = Manual" in the hardware configuration, user acknowledgment at the ACK_REI input is required after elimination of the error when parameter ACK_NEC = 1 is set. With parameter assignment ACK_NEC = 0, reintegration occurs automatically.
- With the parameter assignment "Channel failure acknowledge = Automatic" in the hardware configuration, the parameter assignment for ACK_NEC has no effect, and automatic reintegration takes place.

Corrections to section A.2.6.4 "F_CH_QBO: F-channel driver for outputs of the data type BOOL (with value status) of fail-safe DP standard slaves and fail-safe I/O standard devices"

"Simulation" section

The following note has been removed without replacement:

Note

If you have placed more than one F-channel driver for outputs for a fail-safe DP standard slave or I/O standard device, a simulation value is not written if the PASS_ON input of another F-channel driver for outputs of the fail-safe DP standard slave or I/O standard device is "1" and the SIM_ON input is 0.

Substitute value section

The section is replaced by the following entry:

Substitute value

The substitute value 0 is written to the fail-safe DP standard slave or I/O standard device in the following cases:

- A communication error (PROFIsafe)
- A module fault or a channel fault (such as wire break)
- F-Startup
- Passivation with PASS_ON = 1

The quality code (QUALITY) is set to 16#48 and QBAD = 1 is set.

When the substitute value is output, PASS_OUT = 1 is additionally set for passivation of other channels. An exception is passivation (with PASS_ON = 1) or channel faults (e.g. wire break). PASS_OUT is not set in this case.

"Reintegration after troubleshooting" section

The first paragraph is replaced by the following entry:

After elimination of an error, the fail-safe DP standard slave or I/O standard device can be reintegrated automatically or only after user acknowledgment.

The effect of the ACK_NEC parameter is directly dependent on the hardware configuration of the module.

- With the parameter assignment "Channel failure acknowledge = Manual" in the hardware configuration, user acknowledgment at the ACK_REI input is required after elimination of the error when parameter ACK_NEC = 1 is set. With parameter assignment ACK_NEC = 0, reintegration occurs automatically.
- With the parameter assignment "Channel failure acknowledge = Automatic" in the hardware configuration, the parameter assignment for ACK_NEC has no effect, and automatic reintegration takes place.

Corrections to section A.2.6.11 "F_CH_QII: F-channel driver for inputs of data type INT type (with value status) of fail-safe DP standard devices and fail-safe I/O standard devices"

Substitute value section

The section is replaced by the following entry:

Substitute value

When input SUBS_ON = 1, the substitute value SUBS_V is output at the V and V_INT output in the following cases:

- The input value is invalid due to a communication error (PROFIsafe).
- The input value is invalid due to a module or channel fault (e.g. wire break) or a substitute value is received from the module.
- A passivation with PASS_ON = 1 is present.
- An F-Startup is present.
- FV_ACTIVATED is reported by the module.

The quality code (QUALITY) is set to 16#48 and QSUBS = 1 and QBAD = 1 are set.

When the substitute value is output, PASS_OUT = 1 is additionally set for passivation of other channels. An exception is passivation (with PASS_ON = 1) or channel faults (e.g. wire break). PASS_OUT is not set in this case.

"Keep last value" section

The section is replaced by the following entry:

Keep last value

When input SUBS_ON = 0, the last valid value of V is output at the V and V_INT output in the following cases:

- The input value is invalid due to a communication error (PROFIsafe).
- The input value is invalid due to a module or channel fault (e.g. wire break) or a substitute value is received from the module.
- A passivation with PASS_ON = 1 is present.
- An F-Startup is present.
- FV_ACTIVATED is reported by the module.

The quality code (QUALITY) is set to 16#44 and QSUBS = 1 and QBAD = 1 are set.

When the last valid value is output, PASS_OUT = 1 is additionally set for passivation of other channels. An exception is passivation (with PASS_ON = 1) or channel faults (e.g. wire break). PASS_OUT is not set in this case.

"Reintegration after troubleshooting" section

The second section is replaced by the following entry:

The effect of the ACK_NEC parameter is directly dependent on the hardware configuration of the module.

- With the parameter assignment "Channel failure acknowledge = Manual" in the hardware configuration, user acknowledgment at the ACK_REI input is required after elimination of the error when parameter ACK_NEC = 1 is set. With parameter assignment ACK_NEC = 0, reintegration occurs automatically.
- With the parameter assignment "Channel failure acknowledge = Automatic" in the hardware configuration, the parameter assignment for ACK_NEC has no effect, and automatic reintegration takes place.

Corrections to section A.2.6.13 "F_CH_QIO: F-channel driver for outputs of data type INT (with value status) of fail-safe DP standard devices and fail-safe I/O standard devices"

"Simulation" section

The following note has been removed without replacement:

Note

If you have placed more than one F-channel driver for outputs for a fail-safe DP standard slave or I/O standard device, a simulation value is not written if the PASS_ON input of another F-channel driver for outputs of the fail-safe DP standard slave or I/O standard device is "1" and the SIM_ON input is 0.

Substitute value section

The section is replaced by the following entry:

Substitute value

4.3 Notes on the "S7 F / FH Systems" Programming and Operating Manual

The substitute value 0 is written to the fail-safe DP standard slave or I/O standard device in the following cases:

- A communication error (PROFIsafe)
- A module fault or a channel fault (such as wire break)
- F-Startup
- Passivation with PASS_ON = 1

The quality code (QUALITY) is set to 16#48 and QBAD = 1 is set.

When the substitute value is output, PASS_OUT = 1 is additionally set for passivation of other channels. An exception is passivation (with PASS_ON = 1) or channel faults (e.g. wire break). PASS_OUT is not set in this case.

"Reintegration after troubleshooting" section

The second section is replaced by the following entry:

With parameter assignment ACK_NEC = 1, a user acknowledgment is required at the ACK_REI input after error elimination. With parameter assignment ACK_NEC = 0, reintegration occurs automatically.

The effect of the ACK_NEC parameter is directly dependent on the hardware configuration of the module.

- With the parameter assignment "Channel failure acknowledge = Manual" in the hardware configuration, user acknowledgment at the ACK_REI input is required after elimination of the error when parameter ACK_NEC = 1 is set. With parameter assignment ACK_NEC = 0, reintegration occurs automatically.
- With the parameter assignment "Channel failure acknowledge = Automatic" in the hardware configuration, the parameter assignment for ACK_NEC has no effect, and automatic reintegration takes place.

Addition to Appendix A.4 "Differences between the F-Libraries S7 F Systems Library"

New section A.4.4 "Differences between the F-Libraries S7 F Systems Library V1.3 SP4 and V1.3 SP4 Upd1":

The following description points out the differences between the F-Library S7 F Systems Library V1.3 SP4 and V1.3 SP4 Upd1.

F-blocks	Delta download-capable	Change of S7 F Systems Library V1.3 SP4 to V1.3 SP4 Upd1
F_CH_AI	Yes	Troubleshooting - Simulation possible in the event of a channel fault

4.4 Notes on the blocks of the F-library

Note on the block description of the F-channel driver F_CH_AI:

With enabled simulation, the simulation value is output at the output V even in case of a channel fault. This means the simulation has the highest priority in this case. This corresponds to the behavior described in the "S7 F/FH Systems Configuring and Programming" Programming and Operating Manual V6.4.

In case of a module redundancy, a discrepancy fault remains in effect at the F-channel block despite a simulation (DISCF=TRUE).

Note on the block description of the F-channel driver F_CH_RI:

The read value of the connected channel is output directly at the output V. With the F-block F_LIM_R, you can check the result of a floating-point operation for overflow ($\pm$ infinity) and invalid floating-point number (NaN). You can find more information in the section A.1.4 "Behavior of F-blocks with floating-point operations in the event of a number range overflow" in the "S7 F/FH Systems - Configuring and Programming" Programming and Operating Manual.

Extended note on error handling for the F_2oo3_R, F_2oo3AI, F_MAX3_R, F_MID3_R blocks

If, as a result of calculations on the F_2oo3_R, F_2oo3AI, F_MAX3_R or F_MID3_R F-blocks, the real values "+0.0" and "-0.0" are present at the same time, this can lead to an error in the safety data format and cause an F-STOP.

The following diagnostics event is then received in the diagnostic buffer of the F-CPU:

"Safety program: Error in safety data format in DB" (Event ID 16#75DA)

The following 2 examples result in a real value of "-0.0" in the user program:

1. Multiplication of a negative real value by "0.0"
Block F_MUL_R
IN1 = -50.0 (process value)
IN2 = 0.0 (fixed value)
OUT = -0.0
2. A small negative real value is divided by a very large real value (or vice versa). The result is "-0.0" because the system no longer allows the result to be displayed as a floating-point number
Block F_DIV_R
IN1 = -5.0e-15
IN2 = 9.0e+35
OUT = -0.0

Note

If you cannot rule out the occurrence of this result in your safety program, then use the F_ADD_R F-block to forward the real values to the above-mentioned F-blocks.

Example for F_ADD_R:

4.4 Notes on the blocks of the F-library

IN1 = -0.0 (process value)

IN2 = 0.0 (fixed value)

OUT = 0.0 (interconnection to the inputs of the affected F-blocks, e.g. F_2oo3_R)

The original process value is retained by adding "0.0". For the process value "-0.0", an addition with "0.0" results in OUT = "0.0".