



Migrating a Safety Program to TIA Portal

With optional Migration from 300F to 1500F

<https://support.industry.siemens.com/cs/ww/de/view/109475826>

Siemens
Industry
Online
Support



Warranty and Liability

Note

The application examples are not binding and do not claim to be complete with regard to configuration, equipment or any contingencies. The application examples do not represent customer-specific solutions. They are only intended to provide support for typical applications. You are responsible for the correct operation of the described products. These application examples do not relieve you of the responsibility of safely and professionally using, installing, operating and servicing equipment. When using these Application Examples, you recognize that we cannot be made liable for any damage/claims beyond the liability clause described. We reserve the right to make changes to these Application Examples at any time and without prior notice. If there are any deviations between the recommendations provided in this Application Example and other Siemens publications – e.g. catalogs – the contents of the other documents have priority.

We do not accept any liability for the information contained in this document.

Any claims against us – based on whatever legal reason – resulting from the use of the examples, information, programs, engineering and performance data etc., described in this application example will be excluded. Such an exclusion will not apply in the case of mandatory liability, e.g. under the German Product Liability Act ("Produkthaftungsgesetz"), in case of intent, gross negligence, or injury of life, body or health, guarantee for the quality of a product, fraudulent concealment of a deficiency or breach of a condition which goes to the root of the contract ("wesentliche Vertragspflichten"). The compensation for damages due to a breach of a fundamental contractual obligation is, however, limited to the foreseeable damage, typical for the type of contract, except in the event of intent or gross negligence or injury to life, body or health. The above provisions do not imply a change of the burden of proof to your detriment.

Any form of duplication or distribution of these Application Examples or excerpts hereof is prohibited without the expressed consent of Siemens Industry Sector.

Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit <http://www.siemens.com/industrialsecurity>.

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit <https://support.industry.siemens.com>.

Table of Contents

Warranty and Liability	2
1 Introduction	4
1.1 Overview.....	4
1.2 Requirements	5
2 Migration to TIA Portal STEP 7 V15.1	6
2.1 Migration steps	6
2.2 Compiling and loading the project.....	8
2.2.1 Signature of the safety program	8
2.2.2 Compiling and loading without changing the safety program	8
2.2.3 Compiling and loading with changes on the safety program	10
3 Migration to S7-1500.....	12
3.1 Hardware components	12
3.2 Migration steps	12
3.3 Project adaptation	16
3.3.1 Error list	16
3.3.2 Devices & networks.....	17
3.3.3 Protection	18
3.3.4 F-runtime group.....	18
3.3.5 Update of the elements of the system library.....	19
3.3.6 Value status.....	21
3.4 Compiling and loading a project into TIA Portal	23
3.5 Function test.....	25
4 Possible Errors during Migration.....	26
4.1 Project is inconsistent.....	26
4.2 Missing options packages	26
4.3 Hardware configuration of fail-safe modules is not migrated completely	27
4.4 Hardware cannot be migrated.....	27
5 Links & Literature	28
6 History.....	28

1 Introduction

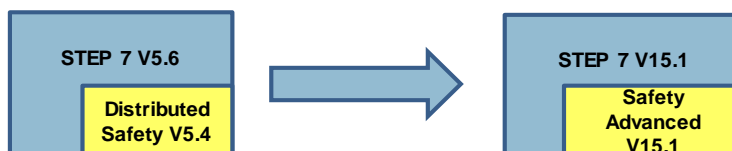
1.1 Overview

This application example shows the migration of a safety program using a sample project. You can use this migration instruction for your own project.

This application example consists of two migration steps:

1. Migration of the STEP 7 project from STEP 7 Professional V5.6 SP1 with Distributed Safety V5.4 to STEP 7 Professional V15.1 with STEP 7 Safety Advanced V15.1.

Figure 1-1



2. Migration from S7-300F to S7-1500F

Figure 1-2

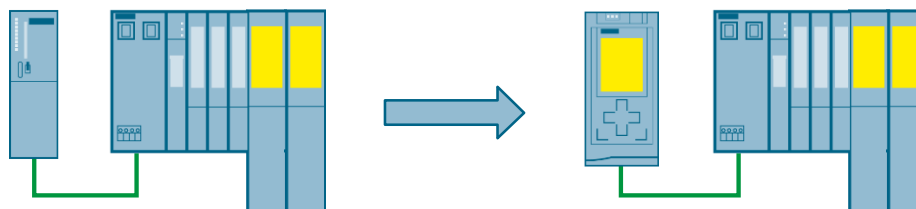


Table 1-1

	Source project	Target project
1.	STEP 7 project V5.x with CPU S7-300F and ET 200S	STEP 7 project V15.1 with CPU S7-300F and ET 200S (target project 1)
2.	STEP 7 project V15.1 with CPU S7-300F and ET 200S (target project 1)	STEP 7 project V15.1 with CPU S7-1500F and ET 200S (target project 2)

1.2 Requirements

To be able to use the migration function integrated in TIA Portal, the software mentioned below must be located on one computer even if the source project was created on a different computer.

Requirements for STEP 7 V5.x

The following software must be installed:

- STEP 7 from V5.4 SP5
- Distributed Safety from V5.4 SP5

Requirements for STEP 7 V15.1

The following software must be installed:

- STEP 7 Professional V15.1
- STEP 7 Safety Advanced V15.1

Note

In the case of the required project being located on a different computer than the one it was created on, the migration process might terminate with the information that the option packages on STEP 7 V5.x are missing. Then, perform the steps described in Chapter [4.1](#) before proceeding.

Hardware to be migrated

To migrate your project to STEP 7 V15.1, the used hardware components must be supported by STEP 7 V15.1. This applies to most hardware components actively marketed on **Oct 1st, 2007**. Use the Readiness Check Tool to check if your hardware can be migrated, see [\6\](#).

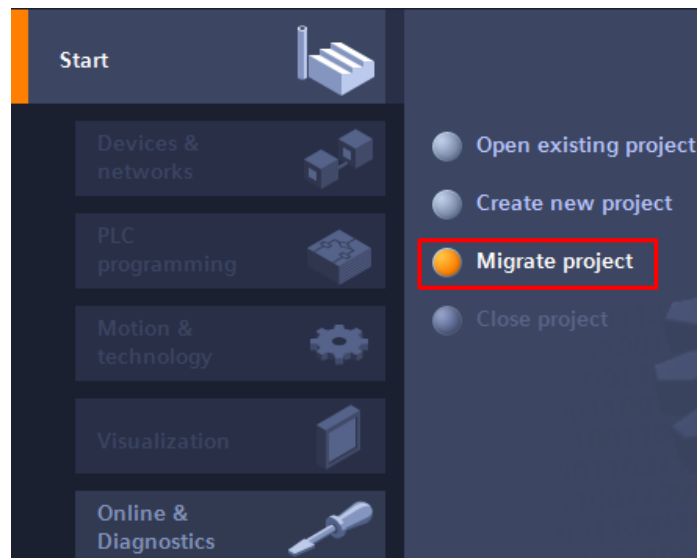
2 Migration to TIA Portal STEP 7 V15.1

Note The password for editing the safety program is **siemens**.

2.1 Migration steps

1. Unzip the enclosed file "Migration300F_V56.zip" if you would like to migrate the sample project.
2. Open TIA Portal V15.1 and click on "Migrate Project".

Figure 2-1 Start page of the TIA Portal



3. Under "Source", select the unzipped STEP 7 project with the extension "s7p".
4. Enter the desired project name and the path under "Target".

5. Set the checkmark at "Include hardware configuration" and click on "Migrate".

Figure 2-2 Source and target project in TIA Portal

Migrate project

Select project to be migrated.

Project name: Migration_F-Program_300F_V56

Source path: C:\Users\Siemens\Desktop\Migration_F_Program\Migration300F_V56\Migration300F_V56\Migration_F...

☒ Include hardware configuration

Target

Project name: Migration_F-Program_300F_V15_1

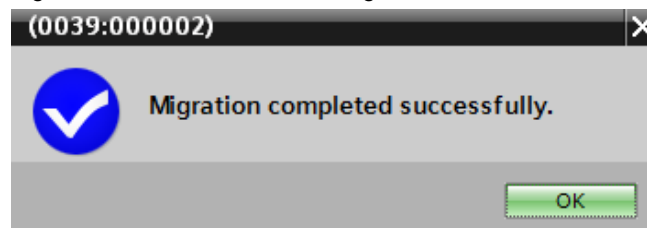
Target path: C:\Users\Siemens\Desktop\Migration_F_Program\Migration300F_V56\Migration300F_V56_V15_1_6...

Author: Siemens

Comment:

Migrate

Figure 2-3 Note on successful migration



The project on hand now is the target project 1 (see [Figure 1-1](#)).

If you would like to migrate the CPU as well, you can proceed directly with [chapter 3](#).

2.2 Compiling and loading the project

2.2.1 Signature of the safety program

When migrating to STEP 7 V15.1, the signature of the safety program will be maintained and a new approval of your safety program is not required if you do not change anything nor compile the program.

The signature can be found in STEP 7 V15.1 under "Safety Administration".

Figure 2-4 Signature in STEP 7 V5.6



Figure 2-5 Signature in STEP 7 V15.1

F-signatures		
Description	Offline signature	Time stamp
Collective F-signature	CBDD22A6	1/16/2019 2:44:22 PM (UTC +1:00)

NOTICE

As a result of compilation of the migrated project with STEP 7 Safety Advanced, the existing program structure (with F-CALL) is transformed into the new program structure of STEP 7 Safety Advanced (with main safety block). This changes the collective F-signature and a new acceptance of the safety program has to be performed.

See also [V7](#).

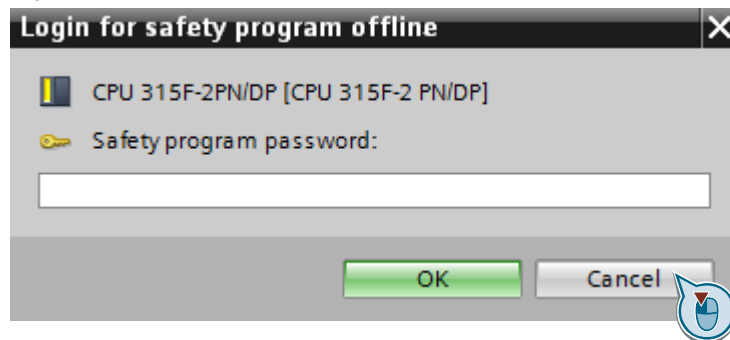
2.2.2 Compiling and loading without changing the safety program

If you do not want to change the safety program and do not want to migrate the F-CPU, you can exclude the safety program when compiling and loading the project, which will maintain its signature.

To do this, proceed as follows:

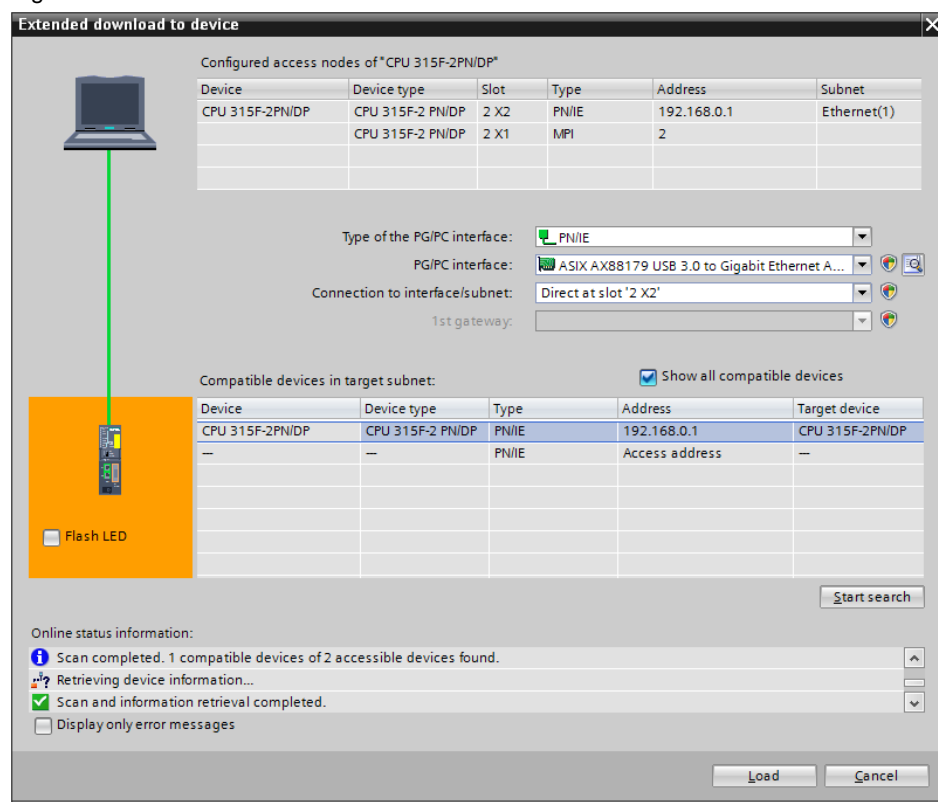
1. Set the CPU to STOP.
2. Right click the "CPU 315F-2PN/DP" in the project navigation and select "Compile > Software (rebuild all blocks)".
3. When prompted for the password for the safety program, do **not** enter the password and click **Cancel**:

Figure 2-6



4. Right click the "CPU 315F-2PN/DP" in the project navigation and select "Download to device > Hardware and software (only changes)".
5. When prompted for the password for the safety program, do **not** enter the password and click **Cancel**.
6. Select the respective interface and click "Start search".

Figure 2-7



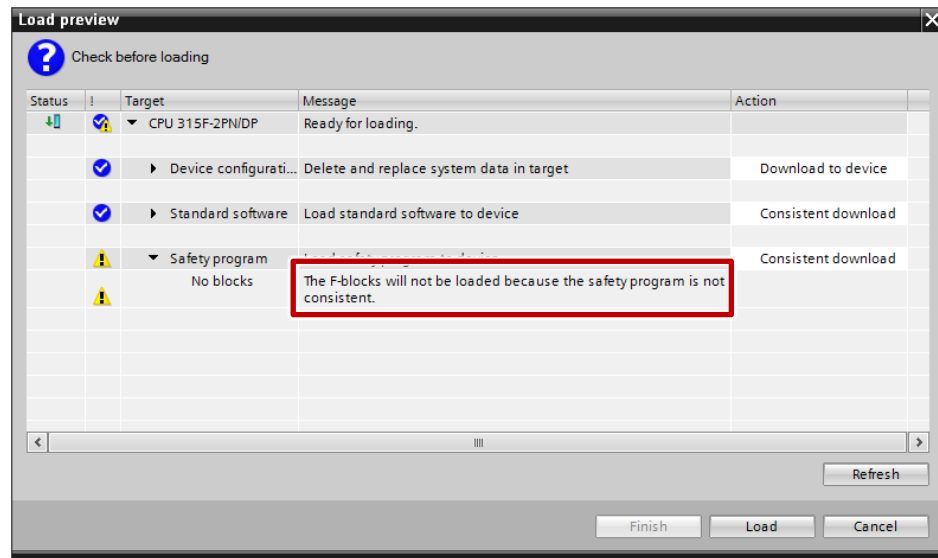
7. Select the CPU based on the address and then click "Load".

Note

The IP address and the device name are automatically assigned when downloading the project into the CPU.

8. Confirm the dialog by clicking "Load".

Figure 2-8



9. Click "Finish" when the loading process is complete.

The project will now be loaded into the F-CPU without changing the safety program signature.

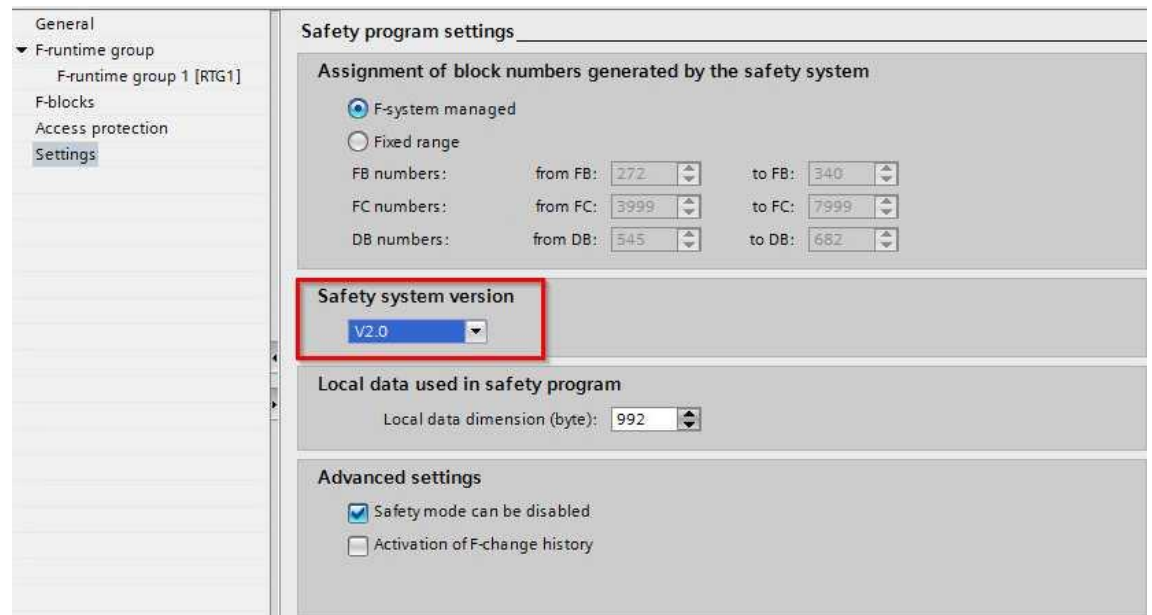
2.2.3 Compiling and loading with changes on the safety program

If you perform modifications on the safety program, the password for the safety program will be requested upon the first modification and then the signature of the safety program will be changed.

Migrating to STEP 7 V15.1 also makes a new version of system library elements available. If you are applying modifications to the safety program, it is advisable to update the elements to the latest versions.

This option can be found in the project navigation under "Safety Administration > Settings".

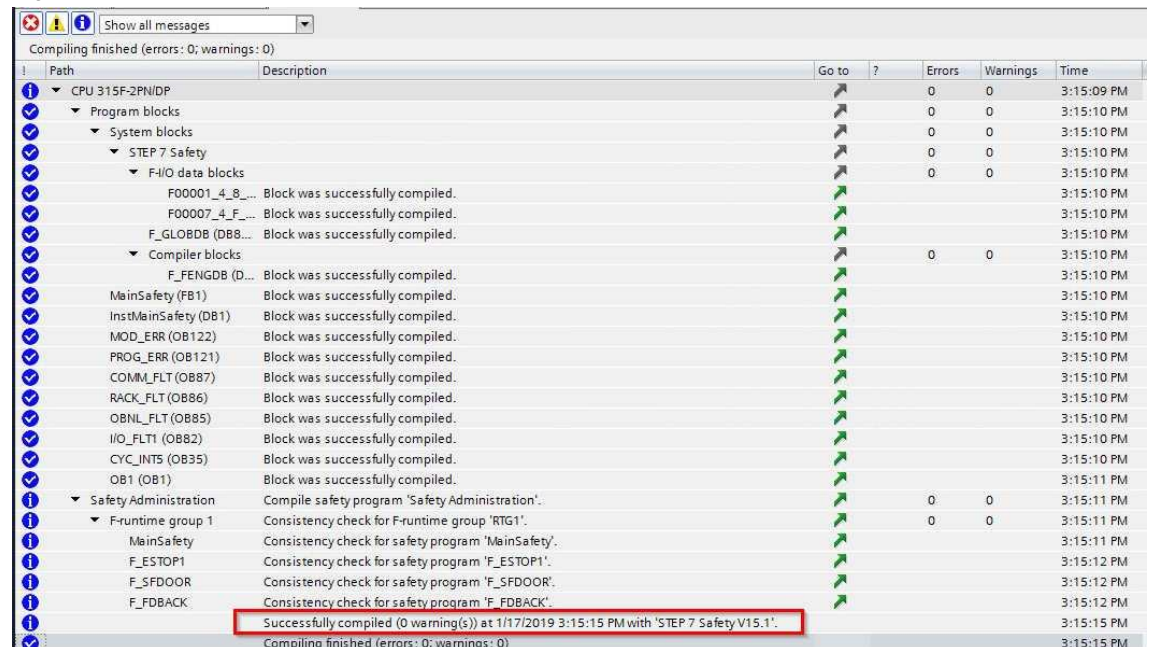
Figure 2-9



You can then compile and load the program like described above. The password will not be requested again in this case.

After compiling you get the hint that the safety program was compiled with TIA Safety V15.1. This includes a new f-signature.

Figure 2-10



3 Migration to S7-1500

Prerequisite

Your source project is available in STEP 7 Professional V15.1.

Objective

This chapter illustrates the steps necessary for migrating from an S7-300F to an S7-1500 F.

The migrated project with S7-1500F (target project 2) is also available for download at [\2\](#).

3.1 Hardware components

The following table shows which components are exchanged during migration.

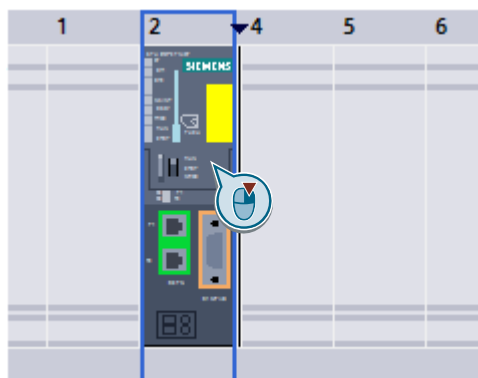
Table 3-1

Components of target project 1		Components of target project 2	
Designation	Article number	Type	Article number
CPU 315F-2PN/DP	6ES7315-2FJ14-0AB0	CPU 1516F-3 PN/DP	6ES7516-3FN01-0AB0
MMC 512 KB	6ES7953-8LJ30-0AA0	SMC 24MB	6ES7954-8LF01-0AA0
S7-300 mounting rail	6ES7390-1AE80-0AA0	S7-1500 mounting rail	6ES7590-1AE80-0AA0

3.2 Migration steps

1. Save your source project under another name: Menu "File > Save as".
2. Open "CPU 315F-2DP > Device configuration" in the project navigation with a double click.
3. Right click on the CPU and select "Migrate to S7-1500".

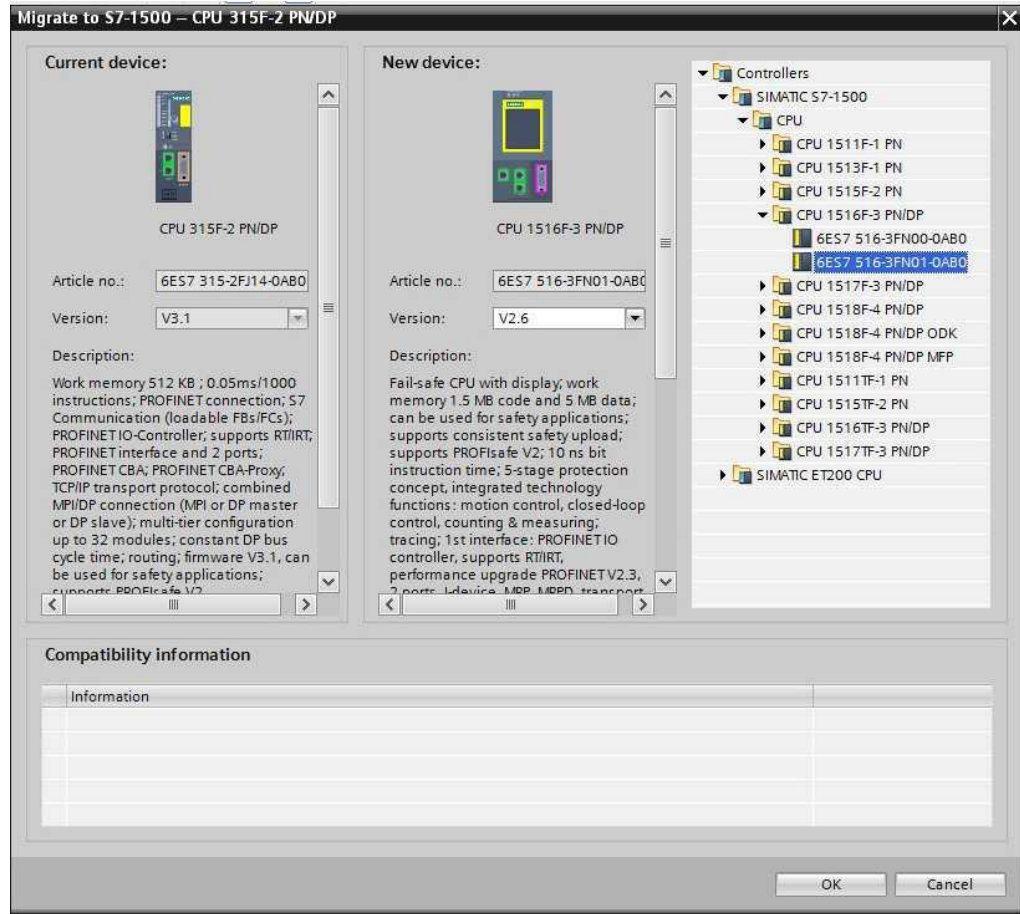
Figure 3-1



4. Select the respective CPU (in this case CPU 1516F-3PN/DP) and confirm with "OK".

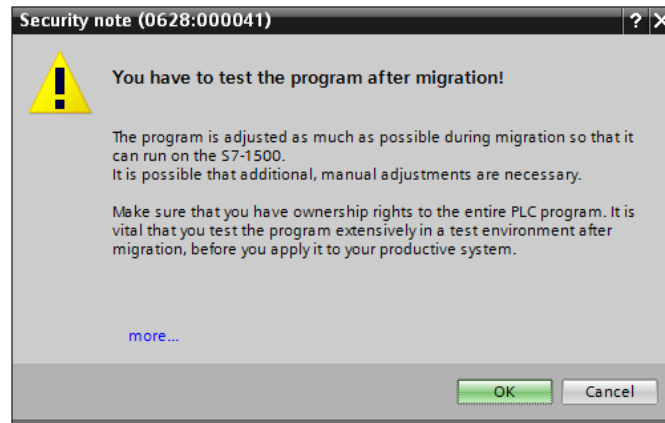
Be sure to select the correct CPU version.

Figure 3-2



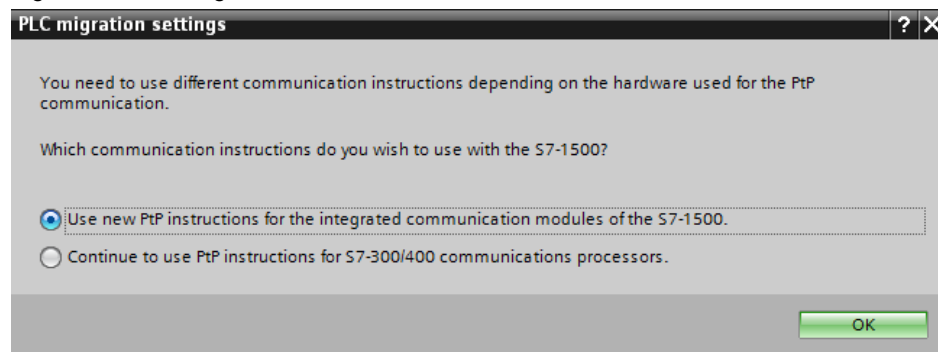
At the beginning of the migration, the following note will appear:

Figure 3-3



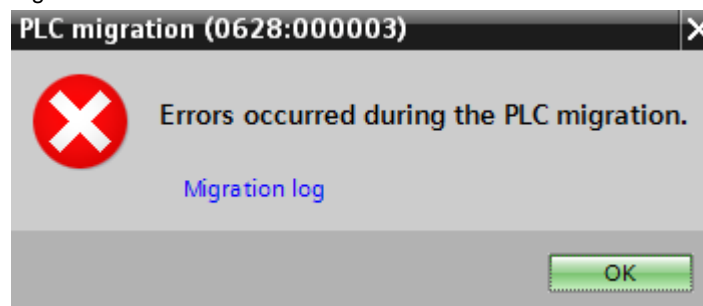
5. Now specify how PtP instructions from the ET 200S will be handled.
If there are no PtP instructions in the program, the selection will not impact the migration. If your program does contain these instructions, you have two options. In this example, the new instructions are selected.

Figure 3-4 Selecting the communication module



With the sample project the migration is carried out. However, there are error messages:

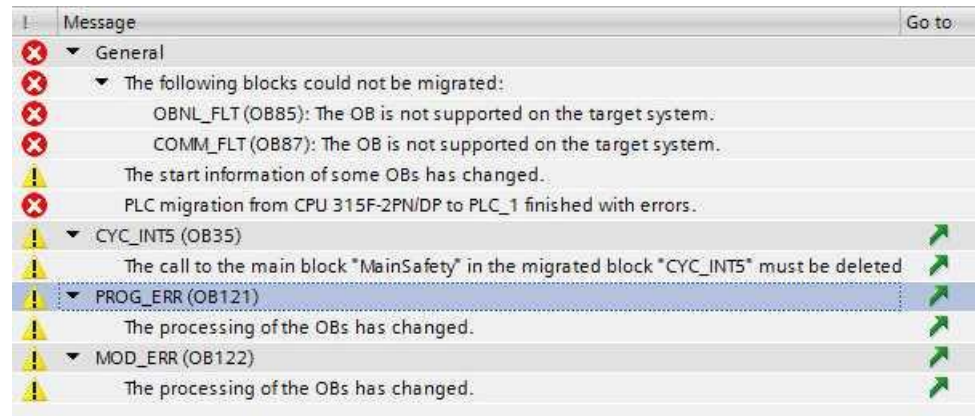
Figure 3-5



6. Click on "Migration log" and then "OK".

7. Unfold the error messages. You will receive the following error messages in the sample project:

Figure 3-6



Despite the errors, the migration was performed. Now, both controls are in your project.

Note

The error OBs OB85 and OB87 are not supported in the S7-1500 anymore, because the controller would not go into STOP mode due to the errors caught by them.

These function blocks are not migrated, but are still available in the "CPU 315F-2PN/DP" folder in case they need to be accessed.

The next chapter describes the steps for rectifying these errors.

3.3 Project adaptation

3.3.1 Error list

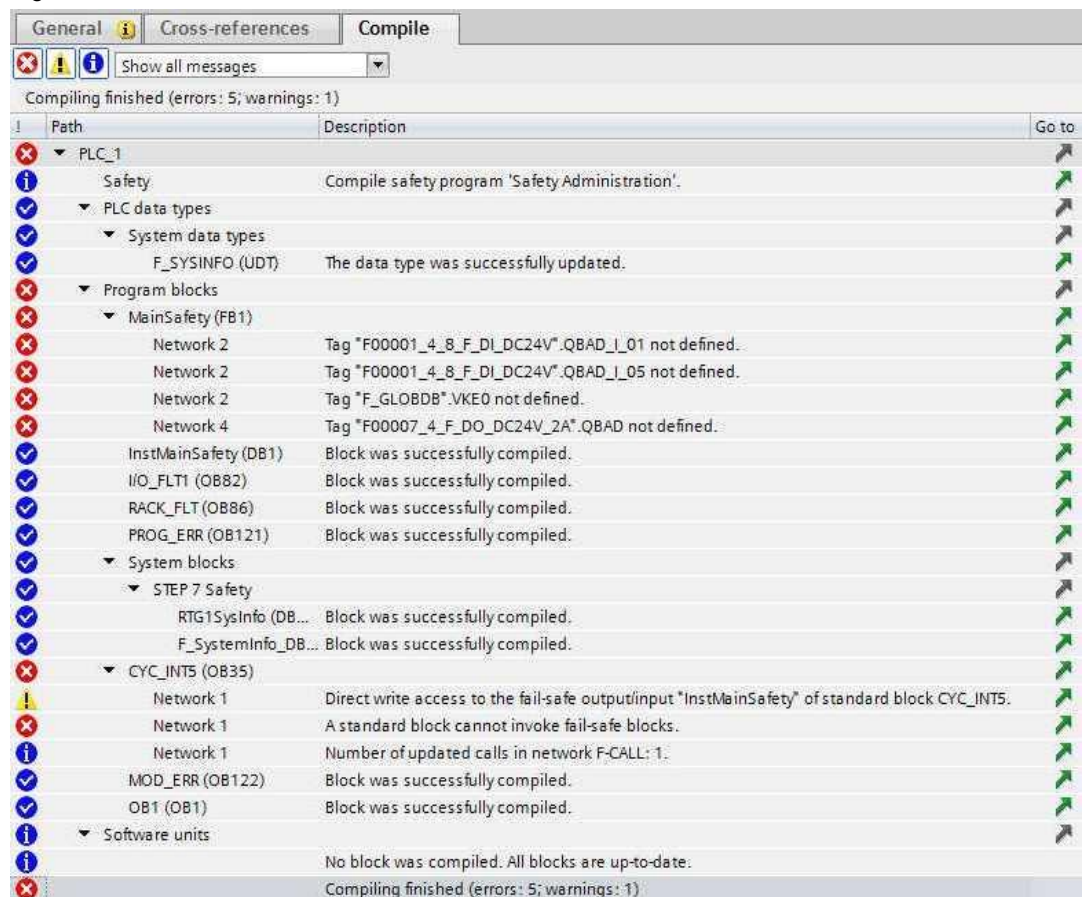
In order to find and rectify the errors as fast as possible, the project of the migrated S7-1500F will be compiled. This makes a complete error list available and you can simply jump directly to the error.

To do this, proceed as follows:

1. Right click "PLC_1" in the project navigation and select "Compile > Software (rebuild all)".

You will receive the following error message in the sample project:

Figure 3-7



Note

You can return to the error messages by clicking "Info" on the bottom of the screen and select the "Compile" tab.

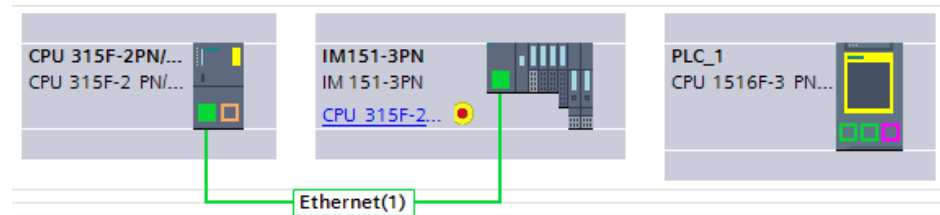
Process the displayed error messages. For the sample project, proceed as follows:

3.3.2 Devices & networks

1. Open "Devices & Networks" in the project navigation.
2. Delete the connection between CPU 315F and IM151-3PN and confirm with the safety program password.

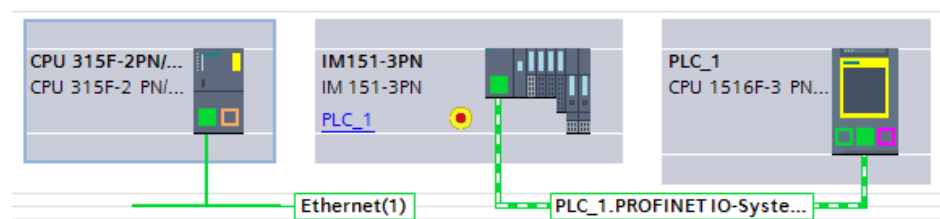
Note The password for editing the safety program is **siemens**.

Figure 3-8



3. Click on "Not assigned" and select "PLC_1" to connect the ET 200S to the S7-1500F.

Figure 3-9



3.3.3 Protection

1. Double-click on the "PLC_1" icon to open the station.
2. In the next window, again double-click on the "PLC_1" icon to open the CPU properties.
3. Select "Protection" from the menu in the "General" tab and set the desired protection level and a password, if needed.

Figure 3-10

Access level

Select the access level for the PLC.

Access level	Access				Access per...
	HMI	Read	Write	Fail-safe	
<input type="radio"/> Full access incl. fail-safe (no protection)	✓	✓	✓	✓	***** ...
<input checked="" type="radio"/> Full access (no protection)	✓	✓	✓		
<input type="radio"/> Read access	✓	✓			
<input type="radio"/> HMI access	✓				
<input type="radio"/> No access (complete protection)					

4. Click "PLC_1" with the right mouse button in the project navigation and select "Compile > Hardware (rebuild all)".

3.3.4 F-runtime group

In STEP 7 Safety Advanced, the call of the F-runtime group is configured via "Safety Administration". A new, fail-safe organization block is created to call the F-runtime group, which can be configured as desired. The safety program call in OB35 must therefore be deleted.

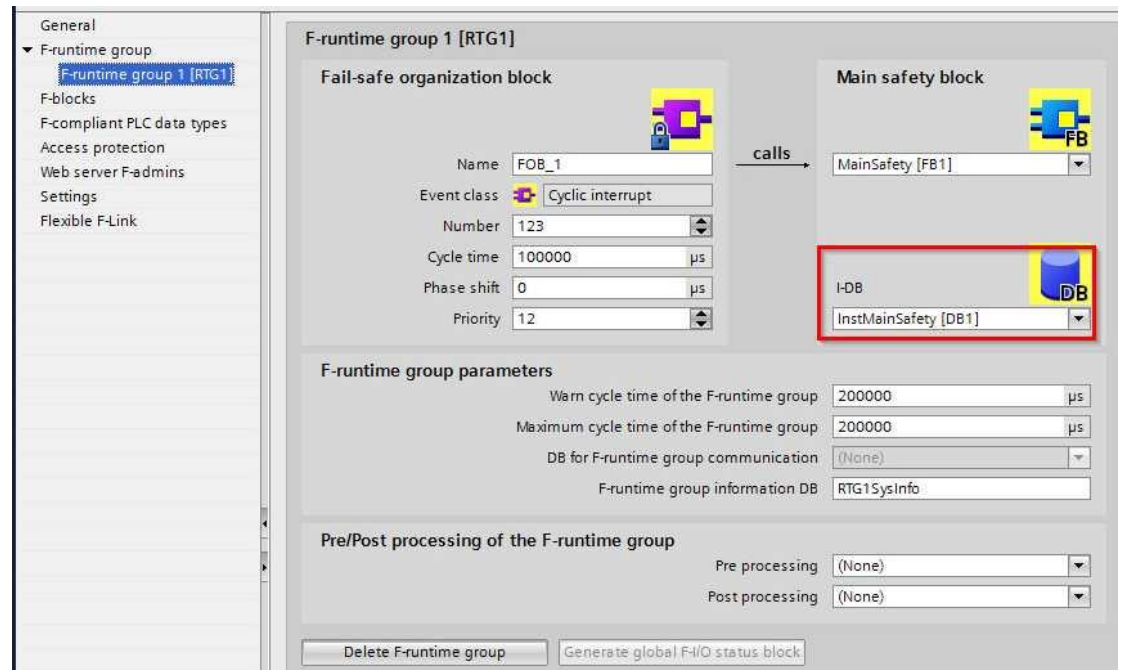
To do this, proceed as follows:

Figure 3-11

✗	▼ CYC_INT5 (OB35)		↗
⚠	Network 1	Direct write access to the fail-safe output/input "InstMainSafety" of standard block CYC_INT5.	↗
✗	Network 1	A standard block cannot invoke fail-safe blocks.	↗

1. Open "PLC_1 > Safety Administration->F-runtime group 1" in the project navigation.
2. Check the settings and select the migrated instance data block.

Figure 3-12



3. Open the block which was called from your safety program until now and delete the call of FC "F-CALL". In this application example, this is done in OB35, which can be deleted completely.

3.3.5 Update of the elements of the system library

Migrating to STEP 7 V15.1 also makes a new version of system library elements available. If you have not done this in a previous step, it is advisable to update the elements to the latest versions now.

This option can be found in the project navigation under "Safety Administration > Settings".

Figure 3-13

Safety program settings

Assignment of block numbers generated by the safety system

☒ F-system managed
☐ Fixed range

FB numbers: from FB: 32767 to FB: 65535
FC numbers: from FC: 32767 to FC: 65535
DB numbers: from DB: 30000 to DB: 59999

Safety system version

V2.2

Advanced settings

☐ Safety mode can be disabled
☐ Activation of F-change history
☐ Enable consistent upload from the F-CPU
☐ Enable variable F-communication IDs

System generated objects

☐ Create driver instance data blocks without prefix.

Clean up

3.3.6 Value status

In the newer controllers S7-1200 and S7-1500, the channel granular QBAD bit is replaced by the value status. The following rules apply for the value status:

FALSE: Substitute values are output.

TRUE: Process values are output.

The value status behaves inversely to the QBAD bit and is entered into the process image of the inputs (PII).

For more information on the value status, please refer to [\3\](#).

As this QBAD bit cannot be accessed anymore, the compiler reports the following error:

Figure 3-14

Icon	Object	Message	Action
✖	MainSafety (FB1)		➡
✖	Network 2	Tag "F00001_4_8_F_DI_DC24V".QBAD_I_01 not defined.	➡
✖	Network 2	Tag "F00001_4_8_F_DI_DC24V".QBAD_I_05 not defined.	➡
✖	Network 2	Tag "F_GLOBDB".VKE0 not defined.	➡
✖	Network 4	Tag "F00007_4_F_DO_DC24V_2A".QBAD not defined.	➡

Use the following steps to replace the QBAD bit by the value status:

1. Open "PLC_1 > PLC tags > Show all tags" in the project navigation.
2. Create the following new tags for the value status bits of the respective channels:

Table 3-2

Name	Address
posSwitch1VS	%I2.1
posSwitch2VS	%I2.5
contactorsVS	%I7.0

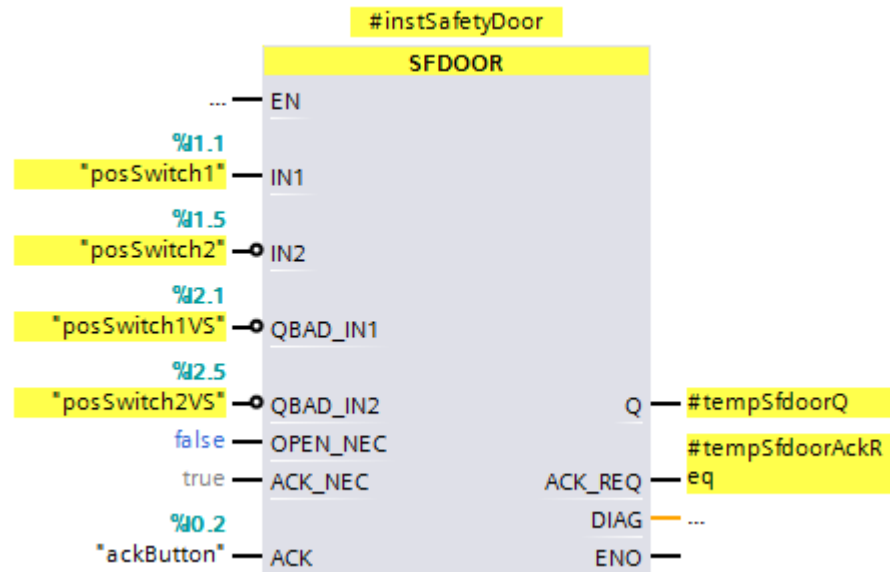
Figure 3-15

Name	Tag table	Data type	Address	Retain	Access...	Write...	Visibl...
contactors	STEP7 classic symb...	Bool	%Q7.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
estopButton	STEP7 classic symb...	Bool	%I1.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
indAck	STEP7 classic symb...	Bool	%Q0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
posSwitch2	STEP7 classic symb...	Bool	%I1.5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
posSwitch1	STEP7 classic symb...	Bool	%I1.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
indFault	STEP7 classic symb...	Bool	%Q0.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
ackButton	STEP7 classic symb...	Bool	%I0.2	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
fdbackContactors	STEP7 classic symb...	Bool	%I0.3	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
stopButton	STEP7 classic symb...	Bool	%I0.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
startButton	STEP7 classic symb...	Bool	%I0.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
posSwitch1VS	Default tag table	Bool	%I2.1	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
posSwitch2VS	Default tag table	Bool	%I2.5	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
contactorsVS	Default tag table	Bool	%I7.0	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

3. Open the "MainSafety" function block.

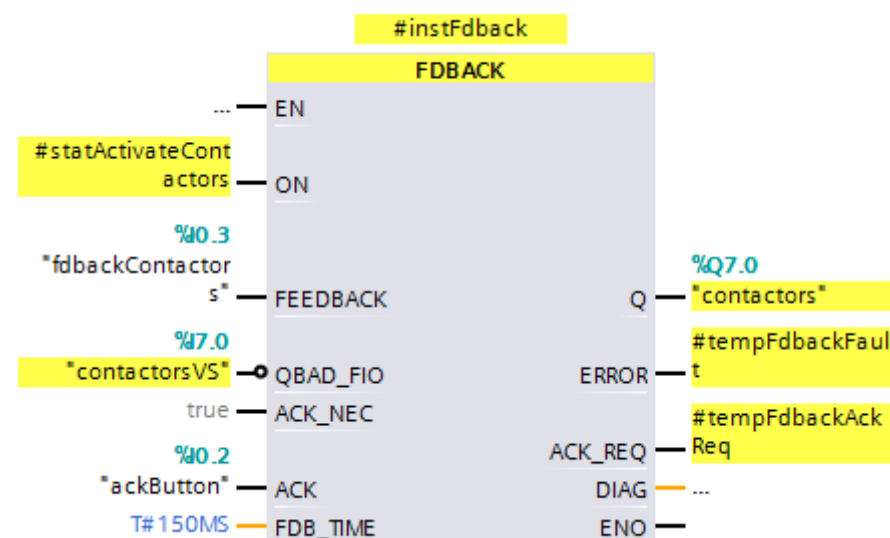
4. Interconnect the two inputs "QBAD_IN1" and "QBAD_IN2" of the SFDOOR block with the newly created tags "posSwitch1VS" and "posSwitch2VS" and negate both inputs, as the value status is inverse to the channel granular QBAD bit.
5. Interconnect the "OPEN_NEC" input with "false". For S7-1500F controllers, "true" and "false" can now also be used in the safety program. An F_GLOBDB does not exist anymore.

Figure 3-16



6. Interconnect the "QBAD_FIO" input of the FDBACK block with the newly created tag "contactorsVS" and negate the input, as the value status is inverse to the channel granular QBAD bit.

Figure 3-17



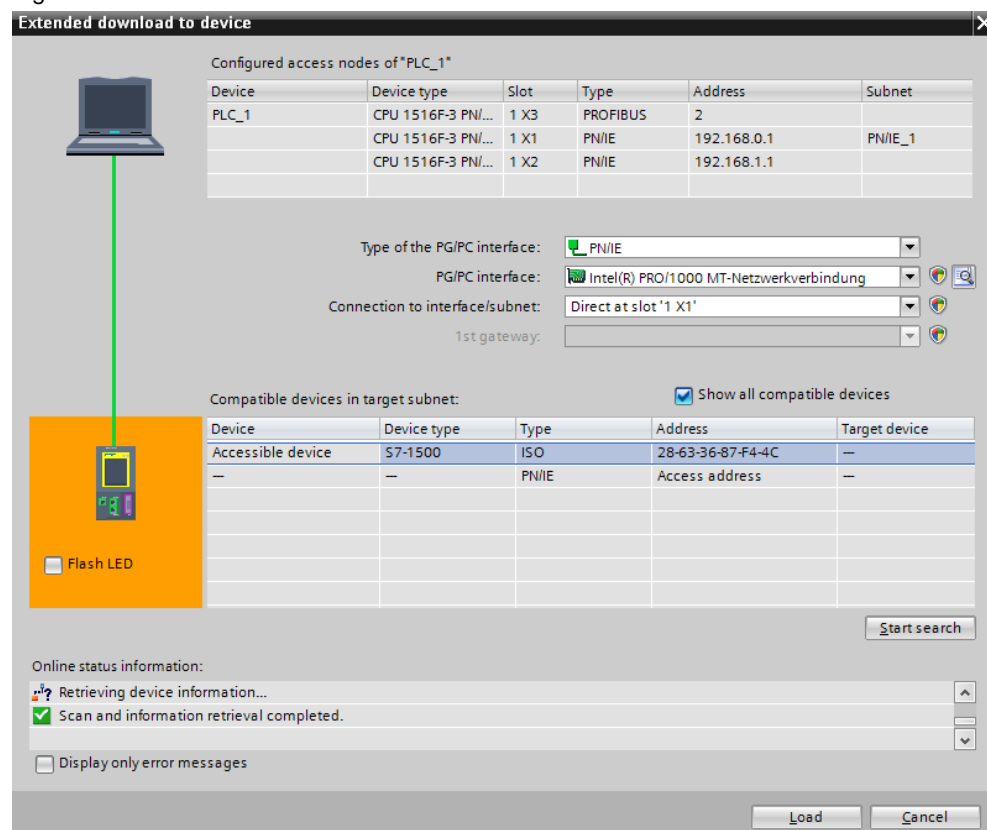
7. Save the project.

The project on hand now is the target project 2.

3.4 Compiling and loading a project into TIA Portal

1. Set the CPU to STOP.
2. Right click "PLC_1" in the project navigation and select "Compile > Software (rebuild all blocks)". The project is now being successfully compiled.
3. Right click the "PLC_1" in the project navigation and select "Download to device > Hardware and software (only changes)".
4. Select the respective interface and click "Start search".

Figure 3-18



5. Select the CPU based on the address and then click "Load".

Note

The IP address and the device name are automatically assigned when downloading the project into the CPU.

6. Confirm the dialog by clicking "Load".

Figure 3-19



7. Click "Finish" when the loading process is complete.
8. You can then delete the object "CPU 315F-2PN/DP" from the project navigation.
9. Save the project.

3.5 Function test

After migration, the safety program must be tested. The inputs and outputs used can be checked with regard to their functionality if the following conditions are met:

- The hardware components are wired.
- The STEP 7 project has been loaded into the S7-CPU.

Table 3-3 Testing the inputs and outputs

	Action	Result
1.	Press the acknowledgement button	Acknowledgment and fault indicators are switched off
2.	Press the start button	Contactors are switched on
3.	Press the emergency stop	Contactors are switched off, fault indicator is switched on
4.	Unlock the emergency stop	Acknowledgment indicator is switched on
5.	Press the start button	
6.	Press the acknowledgement button	Acknowledgment and fault indicators are switched off
7.	Press the start button	Contactors are switched on
8.	Open the safety door	Contactors are switched off, fault indicator is switched on
9.	Shut safety door	Acknowledgment indicator is switched on
10.	Press the acknowledgement button	Acknowledgment and fault indicators are switched off
11.	Press the start button	Contactors are switched on



WARNING

The necessary exchange of safety-certified hardware components would make a new generation of the safety program necessary. This changes the collective F-signature and a new acceptance of the safety program has to be performed.

The application of a safety program which has not been approved may lead to personal or machine damage, as well as legal disadvantages.

See also [\8\](#).

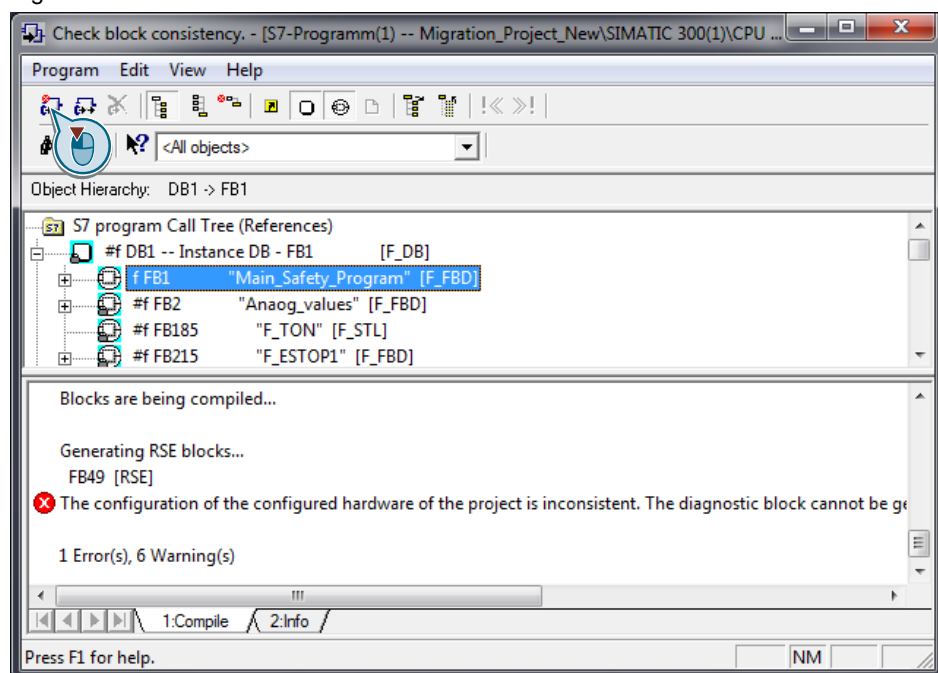
4 Possible Errors during Migration

4.1 Project is inconsistent

Proceed as follows, if you receive the error message "The conventional project is inconsistent":

1. Open the source project in STEP 7 V5.x.
2. In the Project tree, right-click on "Blocks" and select "Check block consistency".
3. Click on "Compile".

Figure 4-1



4. Close STEP 7 V5.x and start the migration in STEP 7 V15.1 again.

4.2 Missing options packages

In case the migration is aborted with the message that the options packages of STEP 7 V5.x are missing, perform the following steps.

Proceed as follows to rectify the error:

1. Open the source project in STEP 7 V5.x.
2. Save your source project under another name: Menu "File > Save as".
3. Activate the checkbox at "Reorganization (slow)" and enter a new name. Complete with "OK".

4. Due to the missing option packages you receive the information that the project cannot be filed entirely under the new name. Click "Yes" to create it anyway.
5. Start the migration again.

4.3 Hardware configuration of fail-safe modules is not migrated completely

If Distributed Safety is not installed, the hardware configuration of fail-safe modules in the target project will not be identical with the configuration of the source project after the migration to STEP 7 V15.1.

Install Distributed Safety on the computer performing the migration and start it again.

4.4 Hardware cannot be migrated

To migrate your project to TIA Portal, the used hardware components must be supported by TIA Portal. This applies to most hardware components actively marketed on **Oct 1st, 2007**. Use the Readiness Check Tool to check if your hardware can be migrated, see [\6\](#).

If you would like to change a device in addition to migrating to TIA Portal, you can migrate your project even if it contains hardware which is not supported by excluding the hardware configuration from the migration, see [Figure 2-2](#).

5 Links & Literature

Table 5-1

	Topic	Title
\1\	Siemens Industry Online Support	https://support.industry.siemens.com
\2\	Download page of the entry	https://support.industry.siemens.com/cs/ww/en/view/109475826
\3\	SIMATIC Safety - Configuring and Programming	https://support.industry.siemens.com/cs/ww/en/view/54110126
\4\	Application example "Emergency stop up to SIL 3 / PL e on a fail-safe controller"	https://support.industry.siemens.com/cs/ww/en/view/21064024
\5\	FAQ on preconditions for a migration	https://support.industry.siemens.com/cs/ww/en/view/62100731
\6\	Readiness Check Tool	https://support.industry.siemens.com/cs/ww/en/view/60162195
\7\	SIMATIC Safety - Configuring and Programming: Chapter "Migrating an S7-300/400 F-CPU"	https://support.industry.siemens.com/cs/ww/en/view/54110126/70372998539
\8\	SIMATIC Safety - Configuring and Programming: Chapter "Migrating an S7-300/400 F-CPU"	https://support.industry.siemens.com/cs/ww/en/view/54110126/72015573387

6 History

Table 6-1

Version	Date	Modification
V1.0	11/2015	First version
V1.1	02/2019	Redesign for TIA V15.1