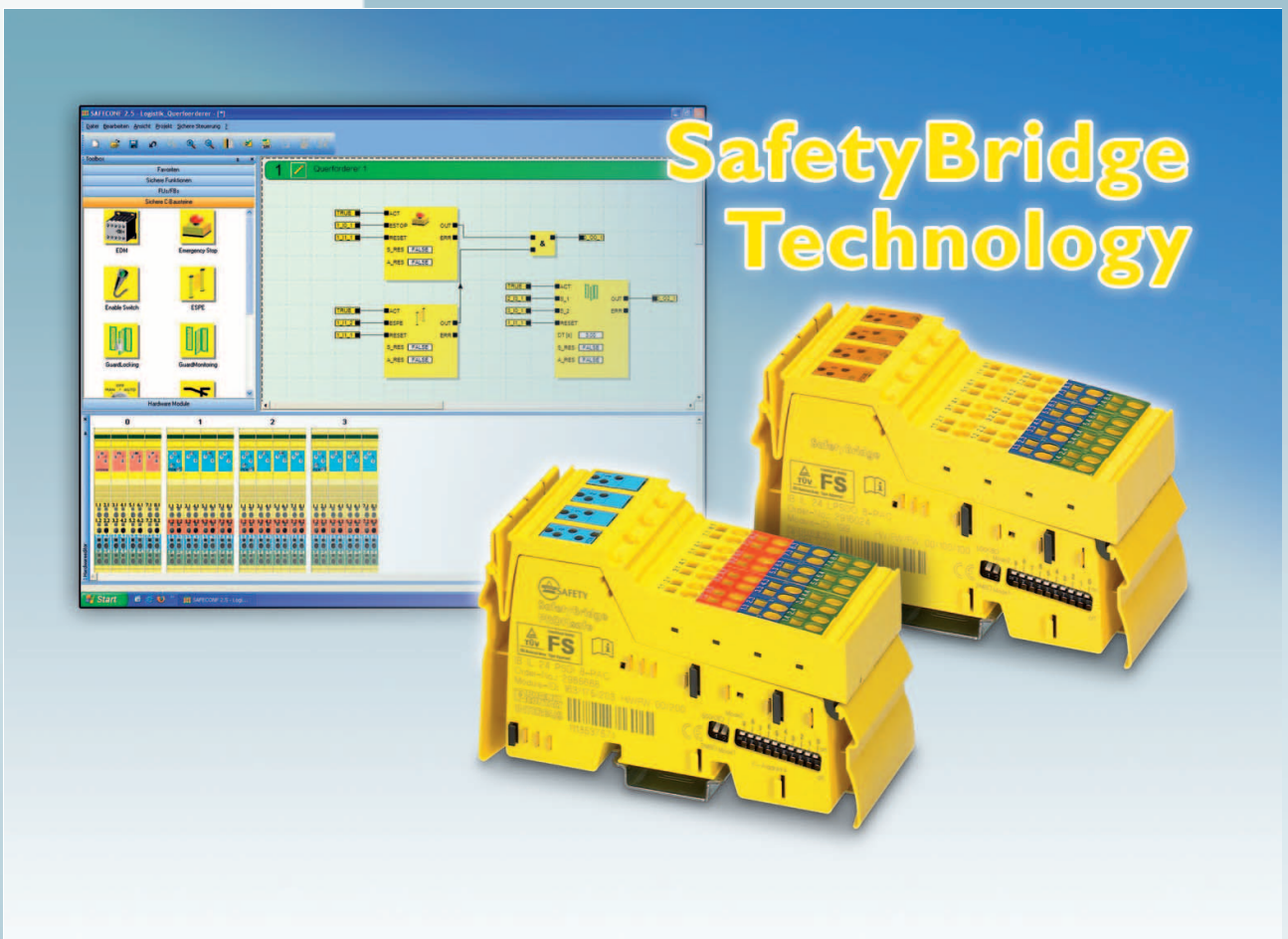
AUTOMATION



Quick start guide

UM QS EN SAFETYBRIDGE - PC WORX

Order No.: —

Configuring a SafetyBridge system on a Phoenix Contact controller using PC WORX

PHOENIX CONTACT
INSPIRING INNOVATIONS

DOWNLOADED FROM WWW.SCATTS.CO.UK

AUTOMATION

Quick start guide

Configuring a SafetyBridge system on a Phoenix Contact controller using PC WORX

2010-07-15

Designation: UM QS EN SAFETYBRIDGE - PC WORX

Revision: 00

Order No.: –

This user manual is valid for:

Designation	Order No.
IB IL 24 LPSDO 8-PAC	2916024
IB IL 24 PSDI 8-PAC	2985688

Please observe the following notes

In order to ensure the safe use of the product described, you have to read and understand this manual. The following notes provide information on how to use this manual.

User group of this manual

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable national standards and other regulations regarding electrical engineering and, in particular, the relevant safety concepts.

Phoenix Contact accepts no liability for erroneous handling or damage to products from Phoenix Contact or third-party products resulting from disregard of information contained in this manual.

Explanation of symbols used and signal words

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety measures that follow this symbol to avoid possible injury or death.

DANGER
This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

WARNING
This indicates a hazardous situation which, if not avoided, will result in death or serious injury.

CAUTION
This indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

The following types of messages provide information about possible property damage and general information concerning proper operation and ease-of-use.

NOTE
This symbol and the accompanying text alerts the reader to a situation which may cause damage or malfunction to the device, either hardware or software, or surrounding property.

This symbol and the accompanying text provides additional information to the reader. It is also used as a reference to other sources of information (manuals, data sheets, literature) on the subject matter, product, etc.

General terms and conditions of use for technical documentation

Phoenix Contact reserves the right to alter, correct, and/or improve the technical documentation and the products described in the technical documentation at its own discretion and without giving prior notice, insofar as this is reasonable for the user. The same applies to any technical changes that serve the purpose of technical progress.

The receipt of technical documentation (in particular data sheets, installation instructions, manuals, etc.) does not constitute any further duty on the part of Phoenix Contact to furnish information on alterations to products and/or technical documentation. Any other agreement shall only apply if expressly confirmed in writing by Phoenix Contact. Please note that the supplied documentation is product-specific documentation only and that you are responsible for checking the suitability and intended use of the products in your specific application, in particular with regard to observing the applicable standards and regulations. Although Phoenix Contact makes every effort to ensure that the information content is accurate, up-to-date, and state-of-the-art, technical inaccuracies and/or printing errors in the information cannot be ruled out. Phoenix Contact does not offer any guarantees as to the reliability, accuracy or completeness of the information. All information made available in the technical data is supplied without any accompanying guarantee, whether expressly mentioned, implied or tacitly assumed. This information does not include any guarantees regarding quality, does not describe any fair marketable quality, and does not make any claims as to quality guarantees or guarantees regarding the suitability for a special purpose.

Phoenix Contact accepts no liability or responsibility for errors or omissions in the content of the technical documentation (in particular data sheets, installation instructions, manuals, etc.).

The aforementioned limitations of liability and exemptions from liability do not apply, in so far as liability must be assumed, e.g., according to product liability law, in cases of premeditation, gross negligence, on account of loss of life, physical injury or damage to health or on account of the violation of important contractual obligations. Claims for damages for the violation of important contractual obligations are, however, limited to contract-typical, predictable damages, provided there is no premeditation or gross negligence, or that liability is assumed on account of loss of life, physical injury or damage to health. This ruling does not imply a change in the burden of proof to the detriment of the user.

Statement of legal authority

How to contact us

Internet

Up-to-date information on Phoenix Contact products and our Terms and Conditions can be found on the Internet at:
www.phoenixcontact.com

Make sure you always use the latest documentation.
It can be downloaded at:

www.phoenixcontact.net/catalog

Subsidiaries

If there are any problems that cannot be solved using the documentation, please contact your Phoenix Contact subsidiary.
Subsidiary contact information is available at www.phoenixcontact.com.

Published by

PHOENIX CONTACT GmbH & Co. KG
Flachsmarktstraße 8
32825 Blomberg
Germany
Phone +49 - (0) 52 35 - 3-00
Fax +49 - (0) 52 35 - 3-4 12 00

PHOENIX CONTACT
P.O. Box 4100
Harrisburg, PA 17111-0100
USA
Phone +1-717-944-1300

Should you have any suggestions or recommendations for improvement of the contents and layout of our manuals, please send your comments to
tecdoc@phoenixcontact.com

Table of contents

1 Introduction

1.1 Purpose of this manual

This quick start guide uses an example to describe how you integrate SafetyBridge modules in a PROFINET or INTERBUS system to a Phoenix Contact controller.

The document does not describe the complete configuration of a system or how to create a project under PC WORX. It only describes what has to be observed with regard to SafetyBridge.

For additional information, please refer to the documents listed in Section 1.3, "Additional documentation".

1.2 Requirements

Knowledge

Knowledge of the following is required:

- The target system (PROFINET or INTERBUS)
- The components used in your application
- The PC WORX software used,
- The Microsoft Windows operating system

In order to start up the example system, the following hardware and software are required:

Hardware

In order to start up the example system, the following hardware is required:

- Programming device/PC
- The controller used in the example project (ILC...)
  (see Section "Example of a bus configuration" on page 3-1)
- Bus coupler and I/O devices used in the example project
  (see Section "Example of a bus configuration" on page 3-1)

Software

In order to start up the example system, the following software is required:

- Microsoft Windows
- PC WORX Version 5 or later (part of the Software Suite 1.4 Service Pack 3.44)
- FDCML files from Phoenix Contact for the bus coupler used.
  It can be found on the Internet at www.phoenixcontact.net/catalog.
- Library files from Phoenix Contact for SafetyBridge
  They can be found on the Internet at www.phoenixcontact.net/catalog.
- SAFECONF from Phoenix Contact (software for configuration of the safety logic and for parameterization of the channels)
  It can be found on the Internet at www.phoenixcontact.net/catalog.

1.3 Additional documentation

Comprehensive information about PROFINET is available on the Internet at www.profibus.com.

Please refer to the documentation for the PC WORX software.

Please refer to the documentation for the components used in your application.

Please refer to the documentation of the function blocks used.

The documentation of the SafetyBridge modules must be used.

Description	Type	Order No.
Inline module with integrated safety logic and safe digital outputs	UM EN IB IL 24 LPSDO 8-PAC	2910790
Inline module with safe digital inputs	UM EN IB IL 24 PSDI 8-PAC	2910457

The documentation for Phoenix Contact devices is available on the Internet at www.phoenixcontact.net/catalog.

1.4 Safety hotline

Should you have any technical questions, please contact our 24-hour hotline.

Phone: +49 5281 9462777

E-mail: safety-service@phoenixcontact.com

2 Integrating a SafetyBridge system in three steps

2.1 Safety with the SafetyBridge system

Within a SafetyBridge system, safety is achieved only through the modules of this system (IB IL 24 LPSDO 8-PAC and 1 to 3 IB IL 24 PSDI 8-PAC). All other components of the entire system are not safety-related components. Errors at not safety-related components or errors during integration of the SafetyBridge system are reliably detected by the SafetyBridge system components. These errors only reduce the system availability but not the system safety.

No safety controllers are required for the implementation of safety functions.

2.2 Integration of a SafetyBridge system

A SafetyBridge system can be integrated into an existing system in three steps.

Table 2-1 describes the steps for integrating a SafetyBridge island.

Table 2-1 Integration of a SafetyBridge island

Step	Process	Safety-related	See ...
1	**Configuring the safety logic (SAFECONF)**		
	– Configure the safety island (island number, number of PSDI)	Yes	page 3-6
	– Parameterize I/O channels of a safety island		page 3-8
	– Configure the safety function		page 3-12
	– Export the configuration and parameter data record		page 3-14
2	**Integrating SafetyBridge module into the controller (PC WORX)**		
		No	Documentation on the controllers and PC WORX
	– Create a project		page 3-3
	– As required: Import FDCML files		page 3-15
	– Insert SafetyBridge modules into the bus configuration		page 3-17
	– Import the library		page 3-18
	– Add SafetyBridge operation to the standard application program		page 3-20
	– Load the configuration and parameter data record (BIN file) into the standard controller		page 3-28
	– Load the standard application program into the standard controller		page 3-28
3	**Installing SafetyBridge modules**		
	Install SafetyBridge modules (hardware) (including island and satellite number settings)	No	page 3-29 and user manuals for the modules used
	Overall safety validation	Yes	

Figure 2-1 shows the hardware and software components used and the steps for integration of a SafetyBridge system.

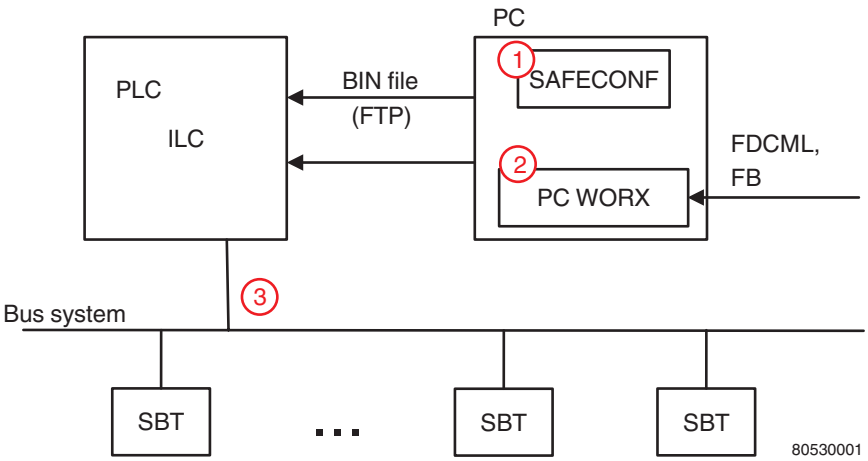


Figure 2-1 Components and steps for integration of a SafetyBridge systems

Key:

1	Step 1: Configuring the safety logic
2	Step 2: Integrating SafetyBridge modules into the controller
3	Step 3: Installing SafetyBridge modules
PC	PC with SAFECONF and PC WORX
SAFECONF	Software for configuration of the safety logic (configuration of the safety function and parameterization of the channels)
PC WORX	Engineering Software
BIN file	Configuration and parameter data record that is generated with SAFECONF; it must be copied into the standard controller via FTP
ILC	Controller ILC ...
FDCML	FDCML files of the modules used The relevant FDCML files must be imported if the modules are not included in the device catalog.
FB	Phoenix Contact function blocks – Download of the configuration and parameter data record from the standard controller to the IB IL 24 LPSDO 8-PAC – Cyclic routing of the SafetyBridge data flow
Bus system	PROFINET or INTERBUS
SBT	Modules of the SafetyBridge system

3 Example

This section describes the use of SafetyBridge modules on INTERBUS. Only the safety modules will be described. You can use standard modules in the Inline station, but these will not be described here.

3.1 Example of a bus configuration

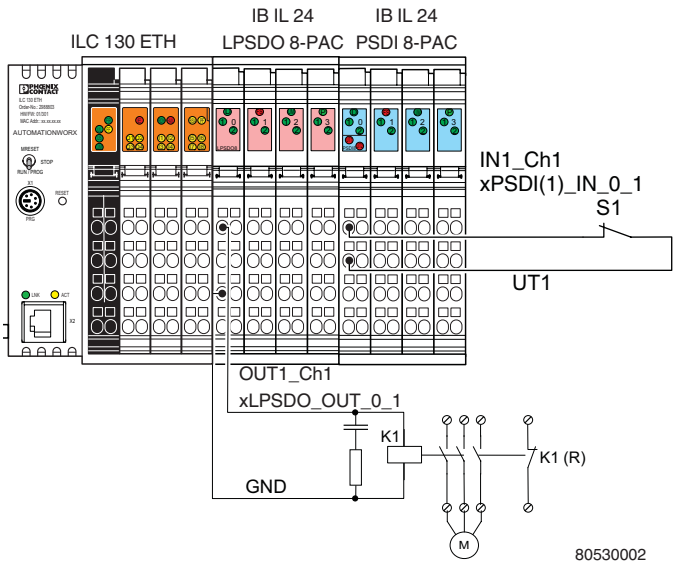


Figure 3-1 Example of a bus configuration

Key:

S1	Safety switch; emergency stop (EStop/Button S1)
K1 (R)	Positively driven N/C contact for monitoring the state of the relay (readback contact). The example does not describe this readback.

Devices used in the example bus configuration

Controller	
ILC 130 ETH	Controller
Safety modules	
IB IL 24 LPSDO 8-PAC	Inline module with integrated safety logic and safe digital outputs
IB IL 24 PSDI 8-PAC	Inline module with safe digital inputs

Devices that can be used as an alternative:

Controllers for PROFINET and INTERBUS

ILC 1xx, ILC 3xx	Inline controller
RFC 470 PN 3TX	Remote Field Controller

Bus couplers for PROFINET and INTERBUS

IBS IL 24 BK ...	Inline bus coupler for INTERBUS
IL PN BK DI8 DO4-2TX-PAC	Inline bus coupler for PROFINET
IL PN BK DI8 DO4-2SCRJ-PAC	Inline bus coupler for PROFINET

This and other example projects can be downloaded at www.phoenixcontact.net/catalog.

Please refer to Section "Example projects" on page A-1 for the file names and how to use the example projects.

3.2 Step 1: Configuring the safety logic (SAFECONF)

Only the steps essential for the SafetyBridge system will be shown in the following. Not all screens will be displayed. Should you have any questions regarding SAFECONF, please use the online help or the software documentation.

You can skip step 1 if you use the example project. The configuration and parameter data record to be created with this step is included as BINFILE.BIN file in the example project.

3.2.1 Creating a project

SAFECONF is used to configure and parameterize the SafetyBridge system. Finally a configuration and parameter data record is generated that is stored in a data block (DB) as BIN file for operation with an Phoenix Contact controller.

- Open the SAFECONF software.
- Create a new project with the help of the Project Wizard. Select "File... New Project".
- Define the name and where the project is to be stored.

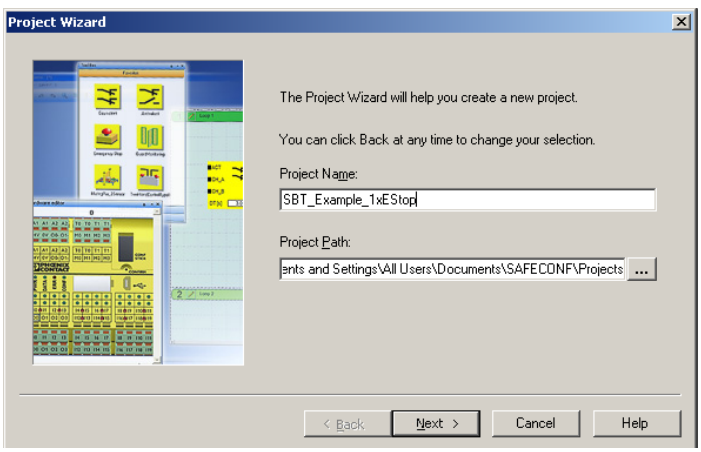


Figure 3-2 Creating project name and project path

- For working with the SafetyBridge system, select the IB IL 24 LPSDO 8-PAC master device.

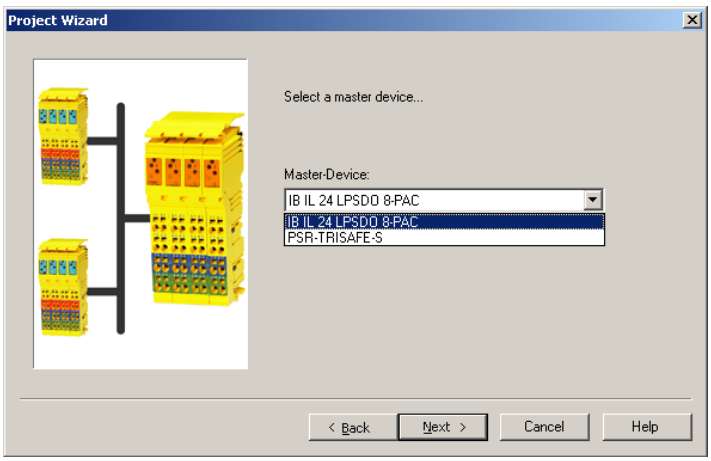


Figure 3-3 Selecting the IB IL 24 LPSDO 8-PAC

- Select the file format with which you will operate.
  When working with PC WORX you need the binary file output format.

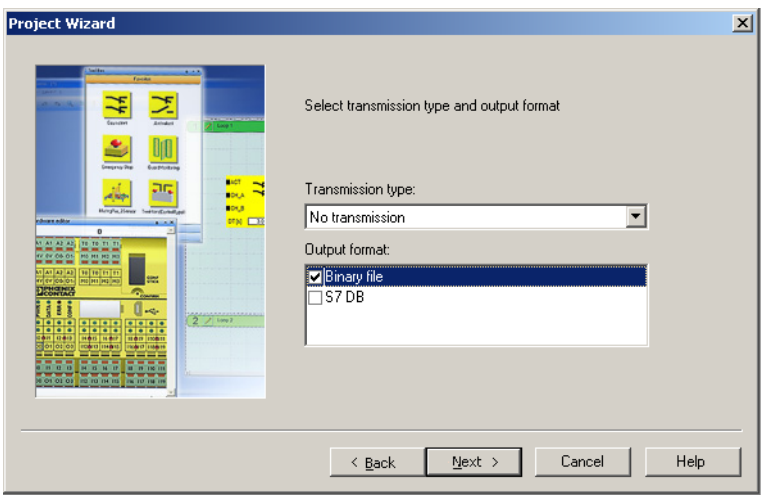


Figure 3-4 Selecting the binary file output format

- Describe the project completely.

Table 3-1 Describing the project

Field	Contents
Description	Maximum 4 characters
Version	Maximum 4 characters

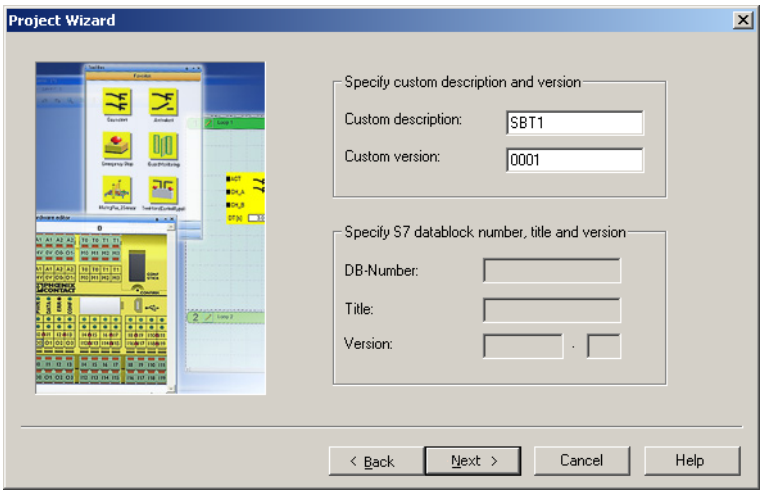


Figure 3-5 Describing the project

- Complete the project creation.

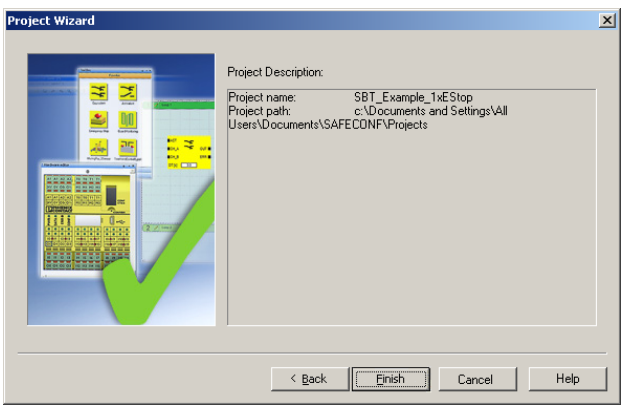


Figure 3-6 Completing the project creation

3.2.2 Configuring the safety island

Representation of the devices in SAFECONF is not a network view but a view to a safety island. The safety island configuration is independent of the distribution within an Inline station or in several Inline stations.

When the project has been completed, the window to specify the island number is opened.

- Enter an island number, 1 in the example.

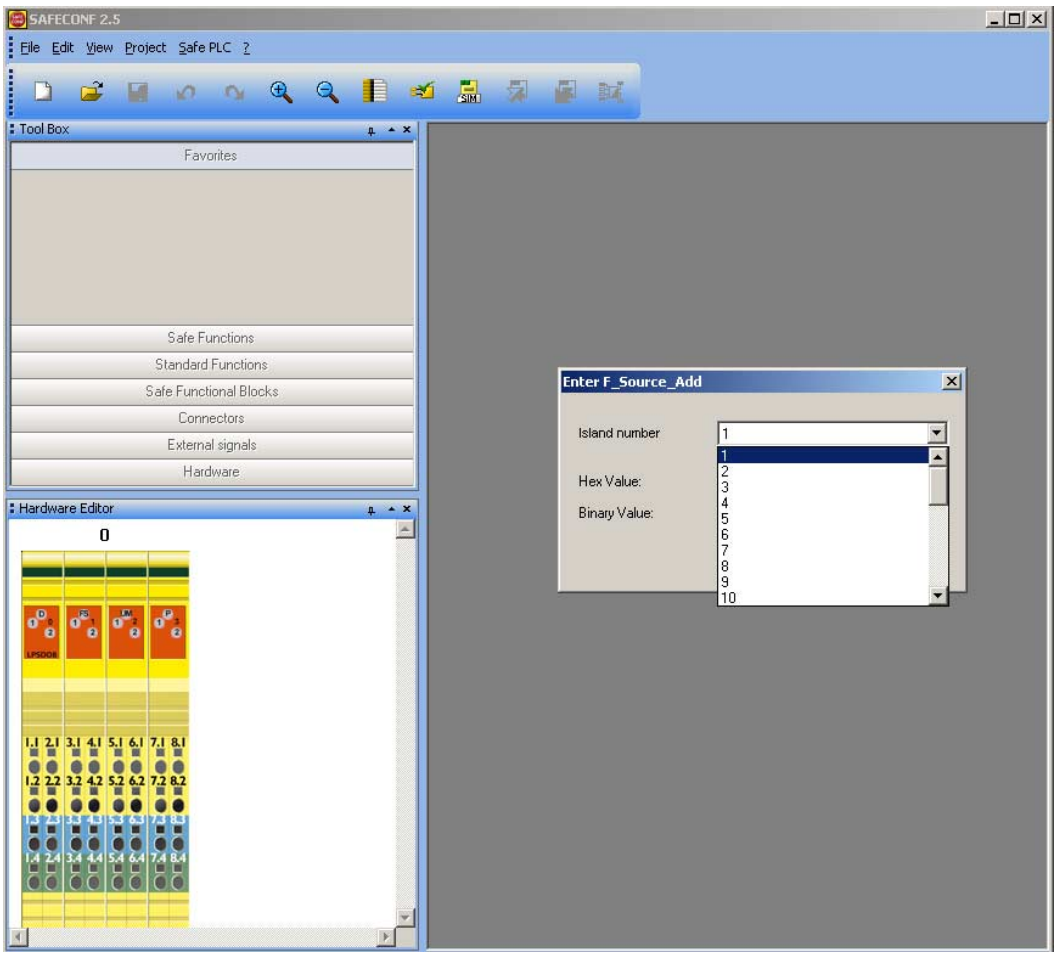


Figure 3-7 Specifying the island number

- Define a password with at least six digits for the project, 123456 in the example.

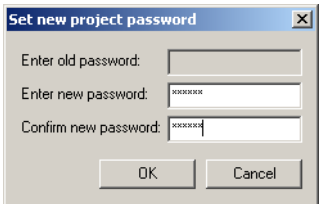


Figure 3-8 Defining the password

- Define the number of IB IL 24 PSDI 8-PAC modules that belong to the island. To do so, drag and drop the corresponding number of IB IL 24 PSDI 8-PAC modules from the "Hardware" toolbox into the hardware editor.

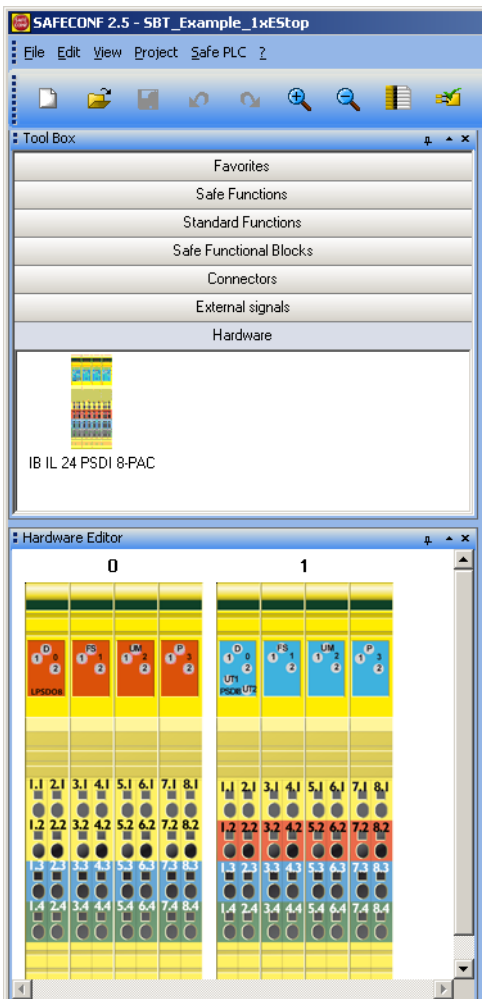


Figure 3-9 Defining the number of IB IL 24 PSDI 8-PAC modules

3.2.3 Parameterizing I/O channels of a safety island

NOTE:
With two-channel assignment, parameterize both channels in the same way.

Parameterize the I/O channels of the SafetyBridge modules. There are two options:

1 Double-click the module in the hardware editor. The window for parameterization of the entire module opens.

2 Double-click a terminal point in the hardware editor. The window for parameterization of the entire terminal point opens.

- Parameterize the output channels of the IB IL 24 LPSDO 8-PAC module.

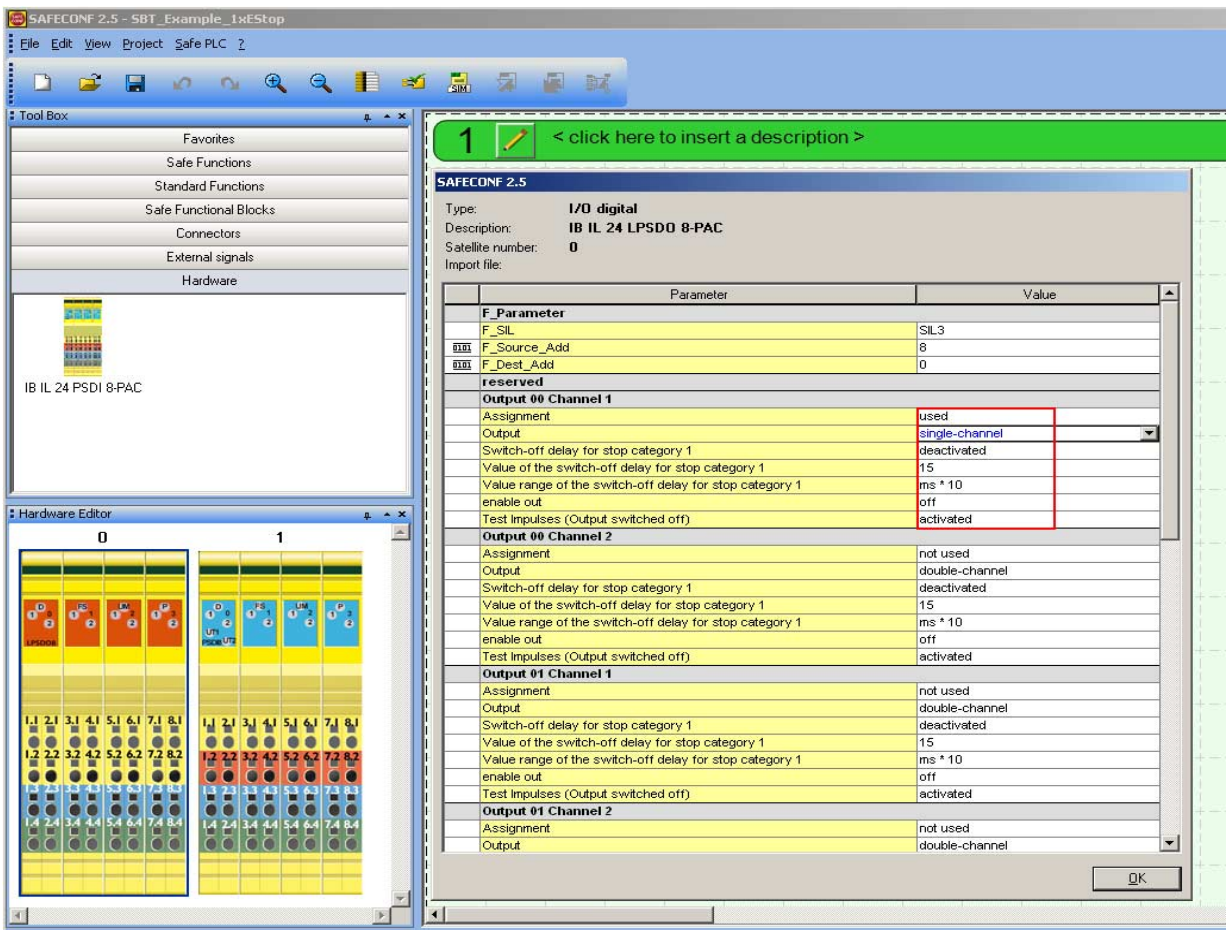


Figure 3-10 IB IL 24 LPSDO 8-PAC parameterization: Output 00 Channel 1 (here: parameterization by double-clicking the module)

The F_Source_Add and F_Dest_Add values are entered automatically. F_Source_Add results from the island number, F_Dest_Add from island and satellite number.

- Parameterize the input channels of the IB IL 24 PSDI 8-PAC module.

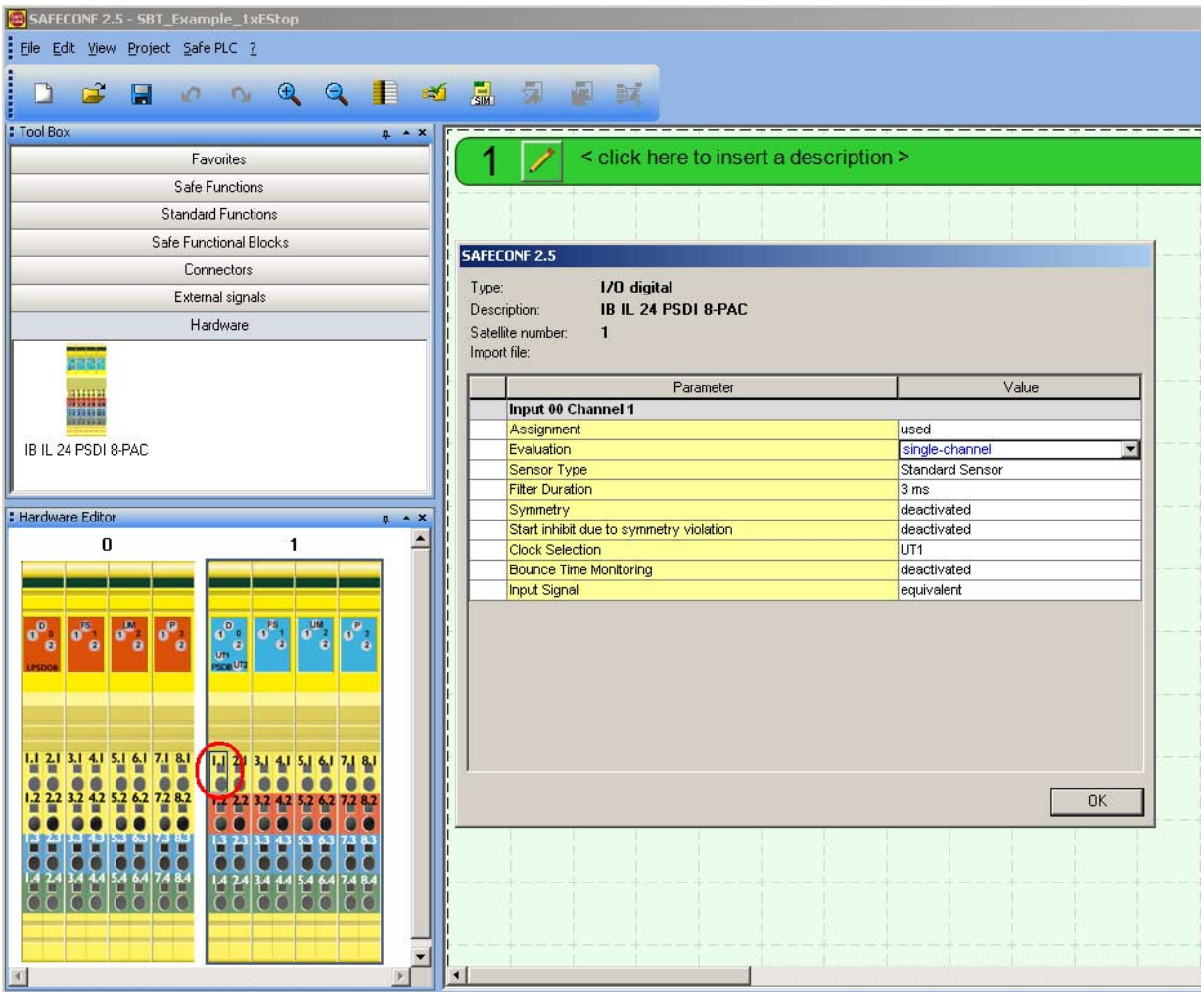


Figure 3-11 IB IL 24 PSDI 8-PAC parameterization: Input 00 Channel 1
(here: parameterization by double-clicking the input at terminal point 1.1)

The F_Source_Add and F_Dest_Add values are entered automatically. F_Source_Add results from the island number, F_Dest_Add from island and satellite number.

You can define the F_WD_Time (in ms) according to your application. The default value is 150 ms. Please take into account Section "Ensuring availability by selecting the correct transmission/watchdog time" on page A-8.

You can configure the clock for the channels only by clicking on the module.

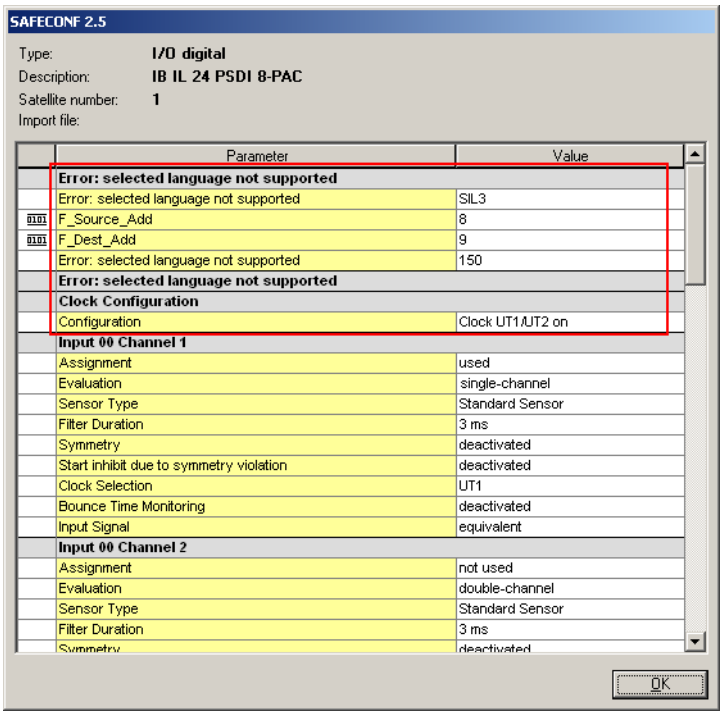


Figure 3-12 Data entered automatically and clock configuration

Relationship between island and satellite numbers, F_Source_Add and F_Dest_Add

Please refer to the documentation for the IB IL 24 LPSDO 8-PAC for additional information about island numbers and satellite numbers.

For further information on DIP switches please refer to Section "Step 3: Installing SafetyBridge modules" on page 3-29 or the documentation on the IB IL 24 LPSDO 8-PAC.

Table 3-1 SafetyBridge addresses used and switch positions in the example

	500KBD /2MBD	Mode			Island number					Satellite number		
DIP switches			9	8	7	6	5	4	3	2	1	0
IB IL 24 LPSDO 8-PAC	2 MBD	Mode 1	res.	res.	**1_{dec}**					**0_{dec}**		
	1	0	0	0	0	0	0	0	**1**	0	0	0
					SafetyBridge address: 8_{dec} (8_{hex})							
IB IL 24 PSDI 8-PAC	2 MBD	Mode 2	res.	res.	**1_{dec}**					**1_{dec}**		
	1	**1**	0	0	0	0	0	0	**1**	0	0	**1**
					SafetyBridge address: 9_{dec} (9_{hex})							

F_Source_Add = SafetyBridge address of the IB IL 24 LPSDO 8-PAC = 8

F_Dest_Add = F_Source_Add + satellite number

F_Dest_Add IB IL 24 LPSDO 8-PAC = 0

F_Dest_Add IB IL 24 PSDI 8-PAC = 1

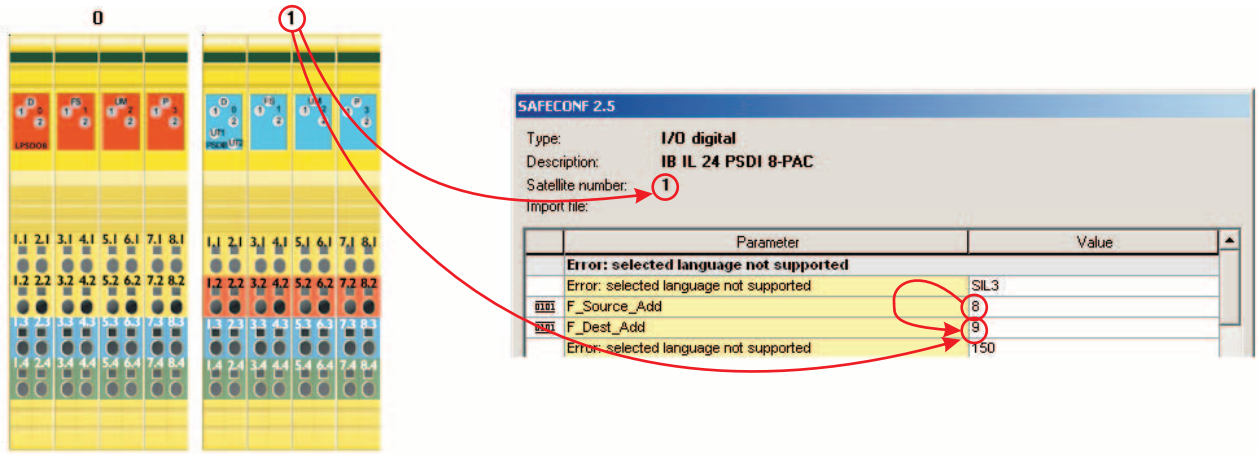


Figure 3-13 Relationship between island and satellite numbers, F_Source_Add and F_Dest_Add

3.2.4 Configuring the safety function

- Configure the safety function.

You configure the safety function by dragging and dropping the elements from the various toolbox areas into the workspace.

Different sources are available for safe and non-safe signals. For the example, these are the following sources:

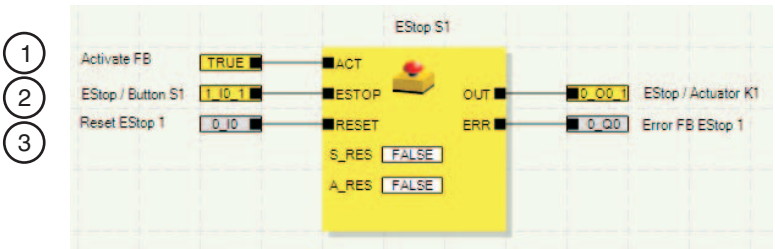


Table 3-2 Sources for safe signals

1 "Safe Functions" toolbox

2 IB IL 24 PSDI 8-PAC hardware editor

3 "External signals" toolbox; non-safe signals from the standard controller

4 IB IL 24 LPSDO 8-PAC hardware editor

5 "External signals" toolbox; non-safe signals to the standard controller

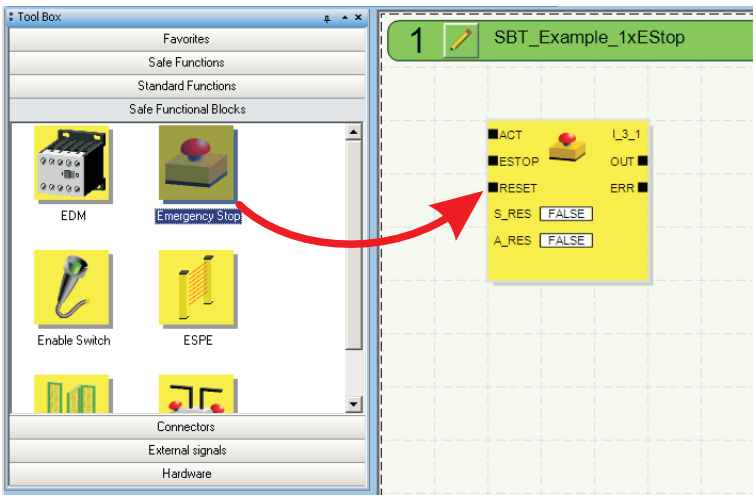


Figure 3-14 Inserting a function block from the "Safe Functional Blocks" toolbox

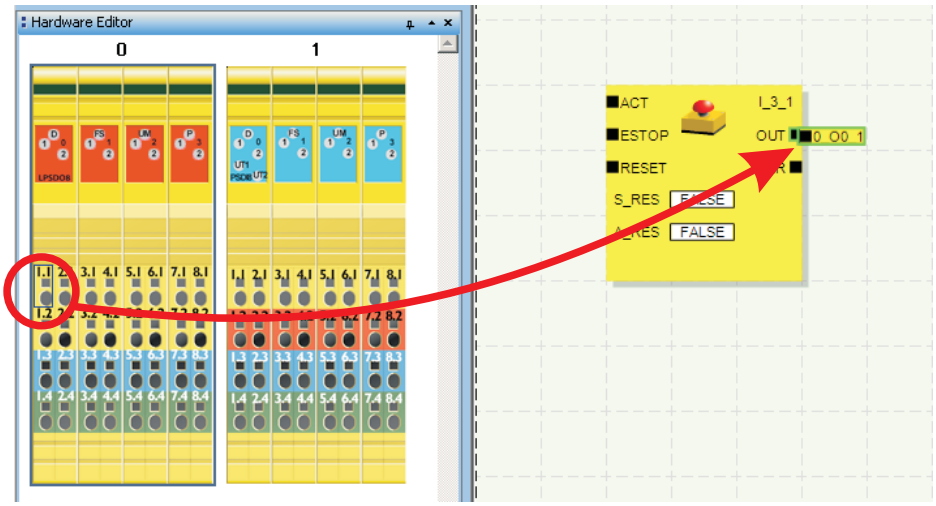


Figure 3-15 Inserting a safe output from the hardware editor using drag and drop

If you drag and drop the terminal point of a safety module directly to an input or output of the function block (as shown in Figure 3-15 for an output), the flow line is created automatically.

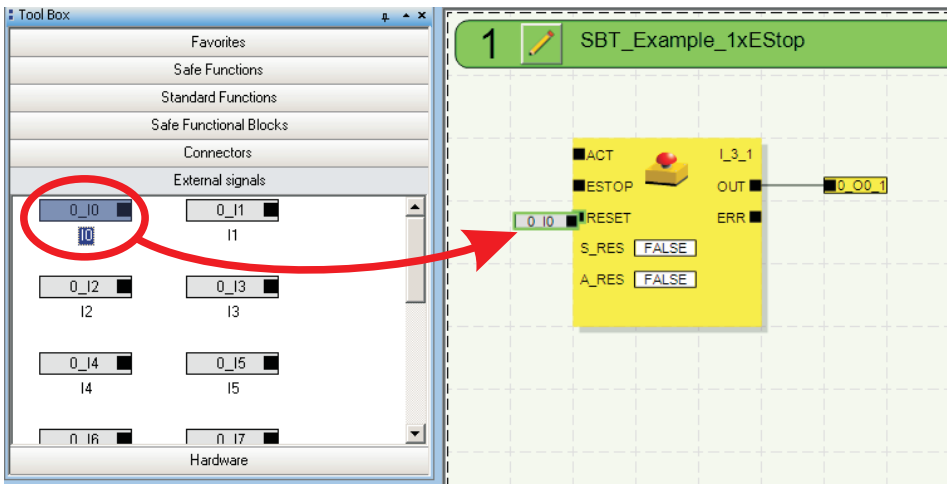


Figure 3-16 Inserting an external signal from the "External signals" toolbox

The complete safety function for this example is shown in Figure 3-17.

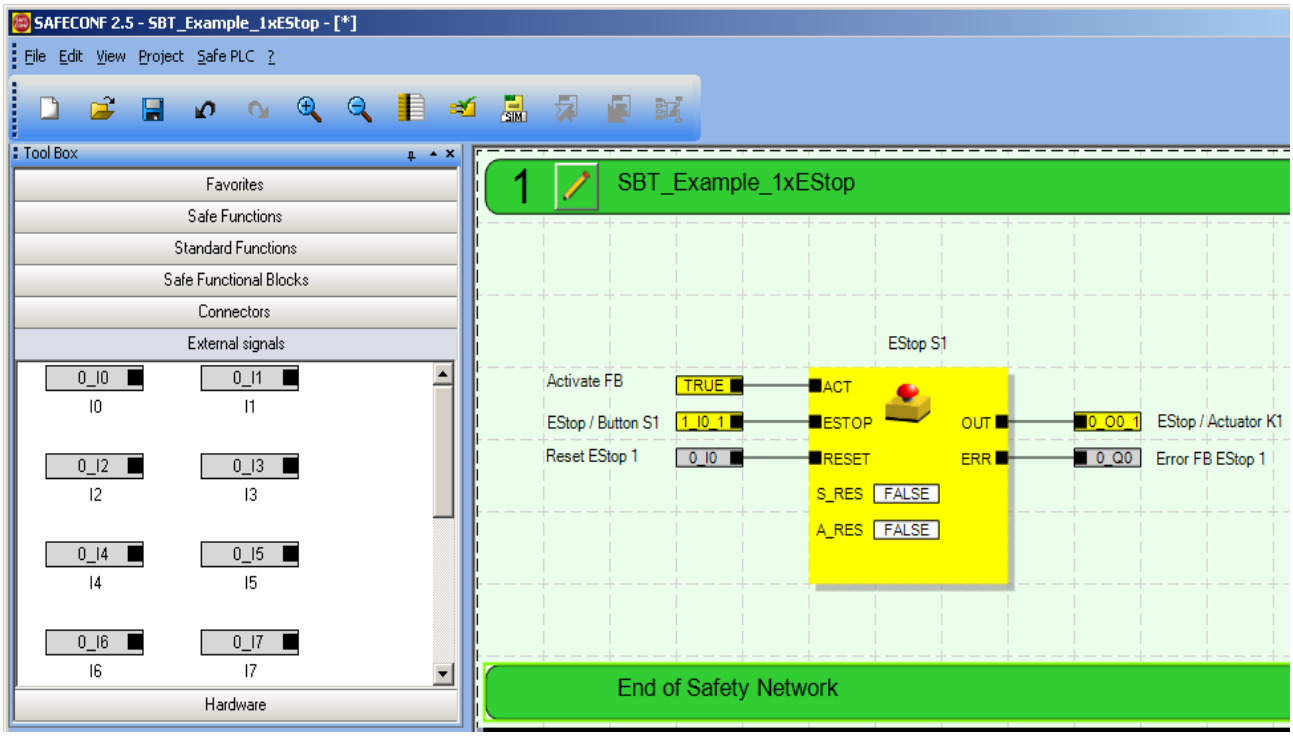


Figure 3-17 Configured safety function

3.2.5 Exporting the configuration and parameter data record

- Check the project. Select the "Project...Check project" command.

A message window opens showing the progress of the check. If the check has been completed without errors, the configuration and parameter data record will be created as *BINFILE.BIN* file. It is stored in the FileOutput folder in the path that you specified for the project (see Figure 3-2 on page 3-3). This file is loaded into the standard controller later (see Section "Loading the configuration and parameter data record into the standard controller" on page 3-28).

This completes step 1 "Configuring safety logic".

3.3 Step 2: Integrating SafetyBridge module into the controller (PC WORX)

To integrate the SafetyBridge modules into the network, proceed as described in the PC WORX documentation. This section only describes basic steps that are relevant in association with the SafetyBridge system.

3.3.1 Creating/opening a project

- Create a new project or open an existing project in PC WORX.
  For this example, generate the project with an ILC 130 ETH controller.

3.3.2 Importing FDCML files

Import the required FDCML files, if the devices that you use are not shown in the PC WORX device catalog.

Make sure you use the latest FDCML file. They can be found on the Internet at www.phoenixcontact.net/catalog.

- For a standard installation, copy the device-specific FDCML file into the directory C:\Program Files\Common Files\FDCML10\xxx\Phoenix Contact.
  xxx = System (e.g., INTERBUS, PROFINET).
- Select "Phoenix Contact" in the "Device Catalog" window in PC WORX.
- Open the context menu and select "Import Device...".
- Select the device description file.

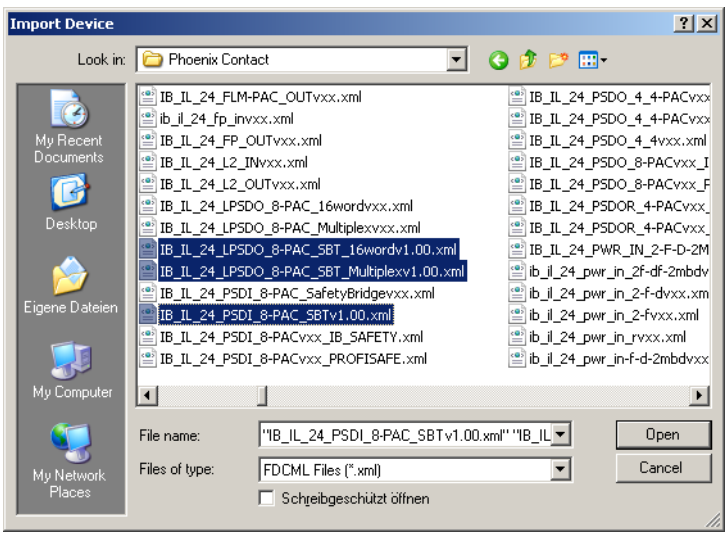


Figure 3-18 Importing the device description file

The message window indicates whether the device has been imported successfully.

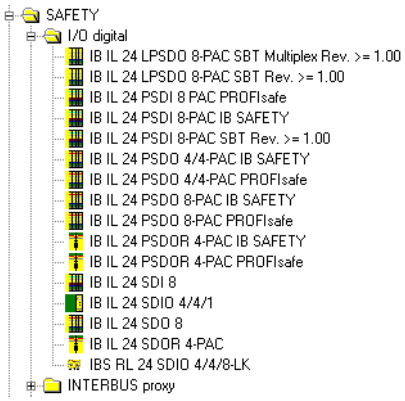


Figure 3-19 Device catalog with the devices required for SafetyBridge

3.3.3 Inserting SafetyBridge modules into the bus configuration

- Insert the required SafetyBridge modules (here: one IB IL 24 LPSDO 8-PAC module and one IB IL 24 PSDI 8-PAC module) according to the bus structure (see example station structure in Figure 3-1 on page 3-1).
  Select the appropriate device in the device catalog under
  "Phoenix Contact/SAFETY/I/O digital" and move it into the bus configuration below the INTERBUS node using drag and drop.

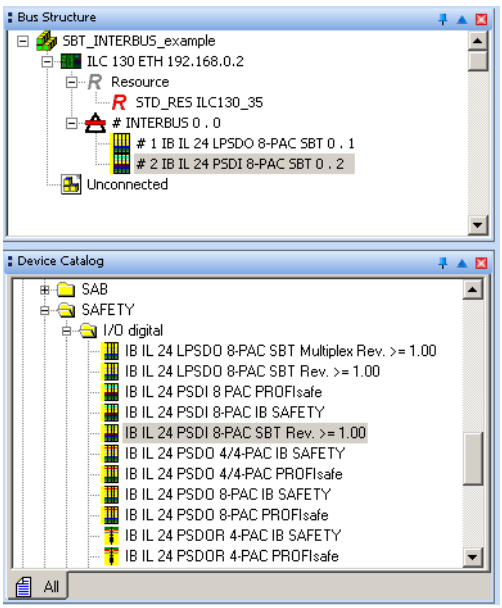


Figure 3-20 Inserting modules into the bus configuration

- Define the device properties.

Table 3-3 Required settings for the devices

Node	Tab	Setting	Example
Project	Project	First IP address	192.168.0.2
		Last IP address	192.168.0.254
ILC 130 ETH	IP Settings	IP Address	192.168.0.2
INTERBUS	INTERBUS Settings	Baud rate	500 kbaud
		Default cycle time (2000 µs, at least)	2000 µs

The complete bus configuration is illustrated in the following figure.

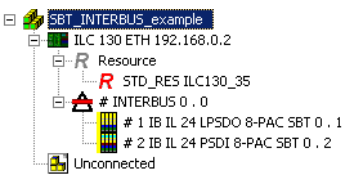


Figure 3-21 Complete bus configuration

3.3.4 Importing the library

In your program you need the function blocks SBT_IBS_Download (for downloading the program from the standard controller to the IB IL 24 LPSDO 8-PAC) and SBT_Operate (for cyclic routing of the SafetyBridge data flow).

- Insert the library in the Project Tree Window under "Libraries". In the "Libraries" context menu select the "Insert..." command.

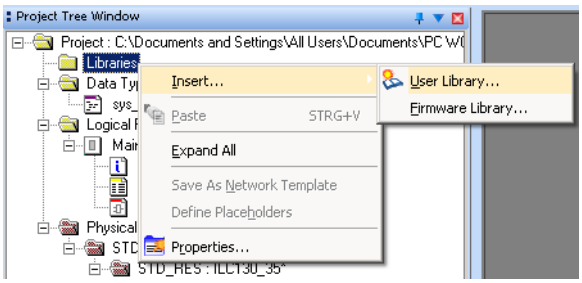


Figure 3-22 Inserting a library

- Select the "SBT_V1_04.mwt" library.

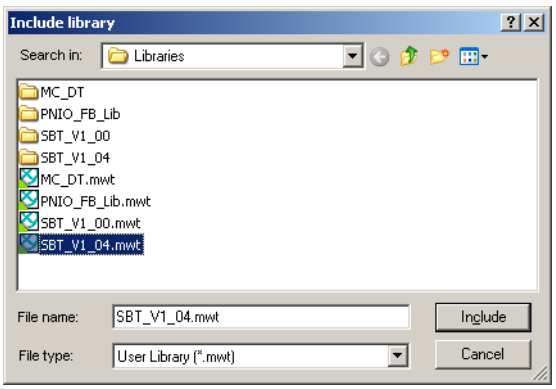


Figure 3-23 Inserting a library

Install the file, if it is not available. To do this, proceed as follows:

- Load the setup of the function block library pc_worx_5x_SafetyBridgeTechnology.exe from the Internet at www.phoenixcontact.net/catalog (in the download area of the IB IL 24 LPSDO 8-PAC).
- Execute the setup and store the library for a standard installation under the following path C:\Documents and Settings\All Users\Common Documents\PC Worx\Libraries.
- Open the installed SBT_V1_04.zwt file in PC WORX.
- Compile the file by clicking "Make".
- Close the file.
- Now add the library as described above.

When the library is linked the "Edit Wizard" window shows the corresponding function blocks.

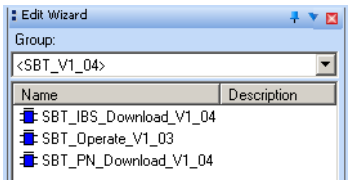


Figure 3-24 SafetyBridge function blocks

3.3.5 Adding SafetyBridge operation to the standard application program

Add SafetyBridge operation to your standard application program. The example shows the basic procedure.

Figure 3-25 shows an overview of the program structure.

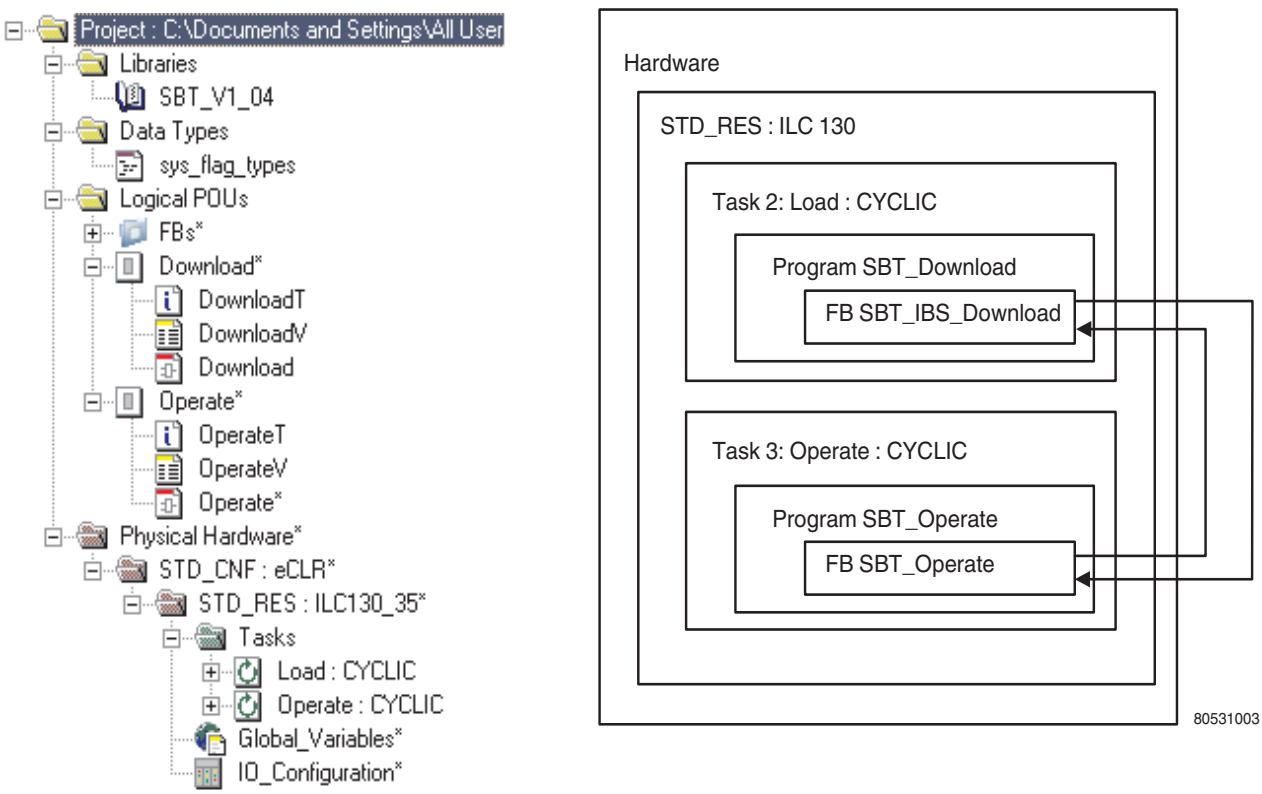


Figure 3-25 Program structure with additional SafetyBridge operation

Key:

Continuous line	Links between the blocks

FB SBT_IBS_Download

Download of the configuration and parameter data record from the standard controller to the IB IL 24 LPSDO 8-PAC

FB SBT_Operate

Cyclic routing of the SafetyBridge data flow

The standard program (Main) and the default task have been deleted in this example.

- Establish a link between the blocks in the various tasks using the variables according to Figure 3-26.

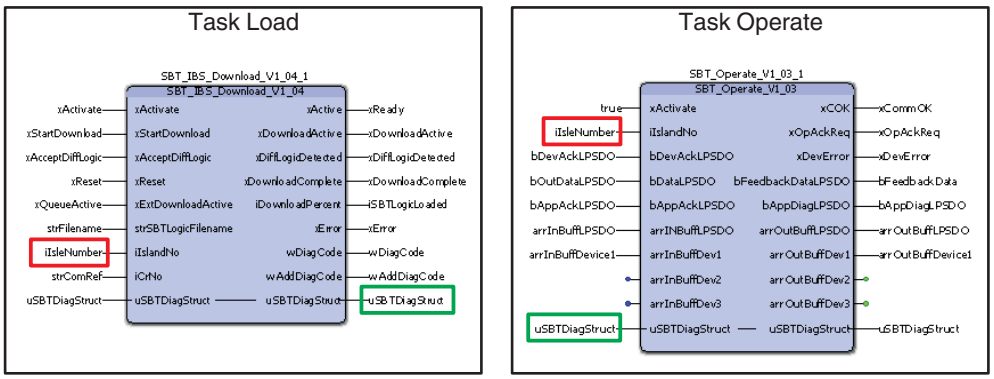


Figure 3-26 Links between the blocks

The uSBTDiagStruct structure variable is used to exchange data between the function blocks. The iIslandNo input defines how the function blocks belong to each other.

A pair of blocks is required for each island when there are several SafetyBridge islands.

3.3.5.1 Inserting a program

Without extensions the Project Tree Window shows the Main program. Main includes, for example, the standard application program and will not be considered in the following.

– Add the "Download" program under "Logical POU".
In the "Logical POU" context menu select "Insert... Program".

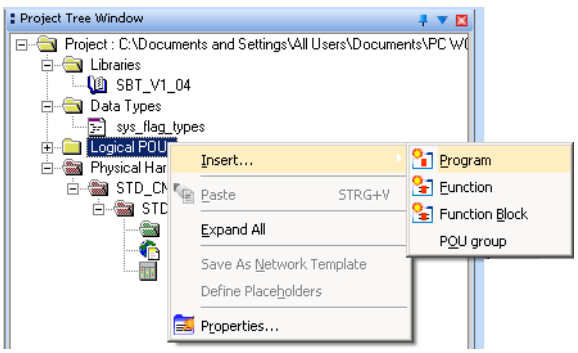


Figure 3-27 Inserting a program

- Assign a name (e.g., Download).

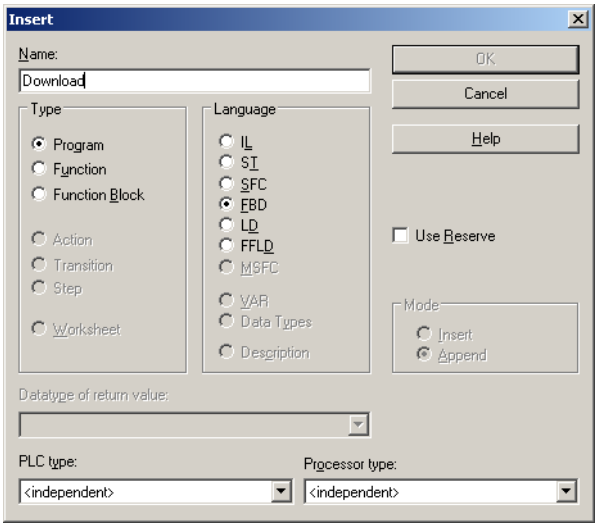


Figure 3-28 Inserting a program: Download

- Add the "Operate" program under "Logical POU". Proceed as described for the "Download" program.

The project tree has the following structure:

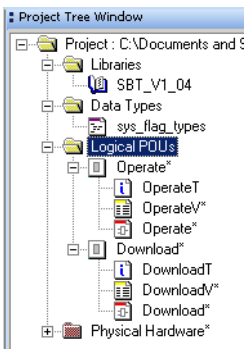


Figure 3-29 Project Tree Window

3.3.5.2 Creating the program structure and the tasks

Without extensions your program only contains the DEFAULT task. This task has been deleted in the example program.

Create two new tasks for the SafetyBridge operation.

- Select "Insert... Task" in the context menu for tasks.

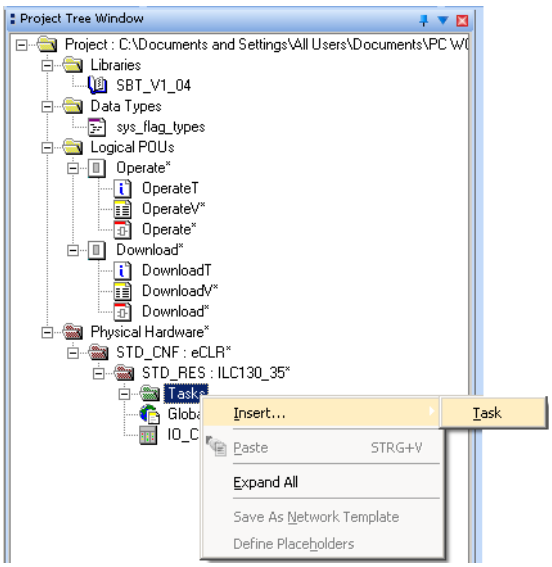


Figure 3-30 Inserting a task

- Assign a name for the task (e.g., Load) and select the task type "CYCLIC".

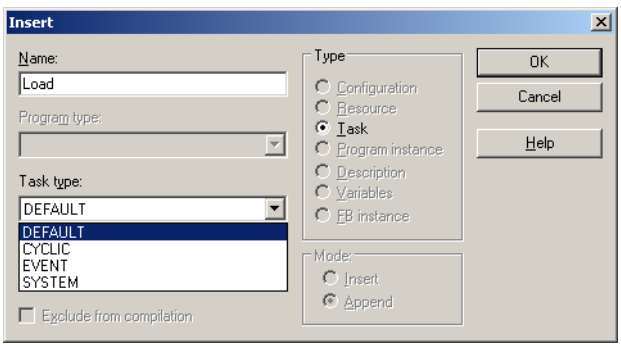


Figure 3-31 Defining a task

- Define the settings.

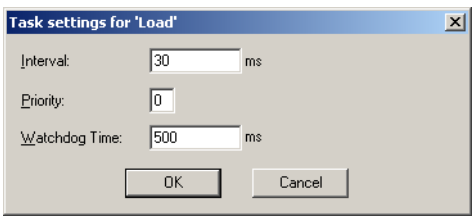


Figure 3-32 Defining the settings

- Insert a program instance in the task.
  In the context menu of the event task select "Insert... Program instance".

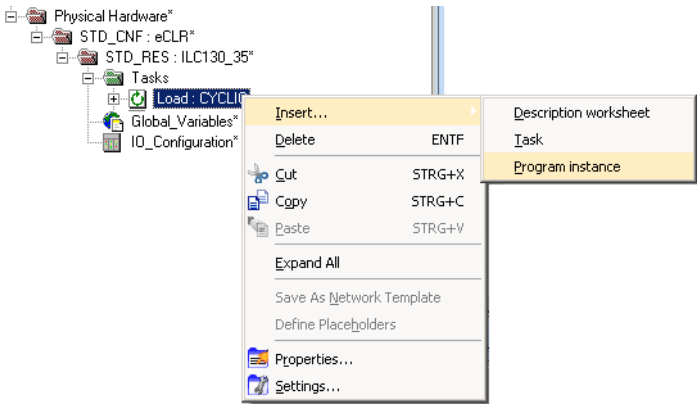


Figure 3-33 Inserting a program instance

- Enter a name for the program instance (e.g., SBT_Download) and select the "Download" program type.

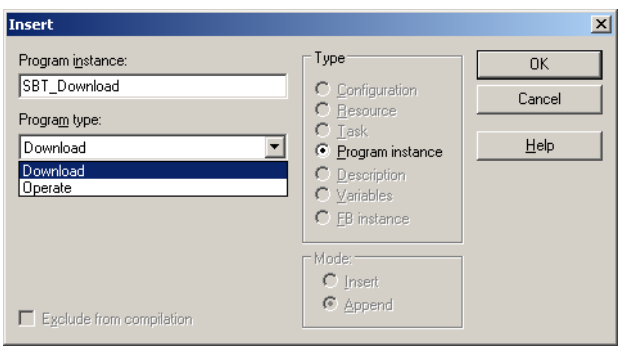


Figure 3-34 Inserting the program instance - Name and type

- Create another task (e.g., Operate, Cyclic). Proceed as described above.

- Define the following settings:

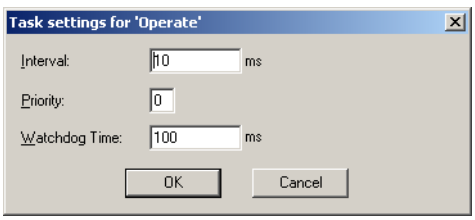


Figure 3-35 Defining the settings

- Add a program instance to the task (e.g., SBT_Operate, Program type: Operate). Proceed as described above.

The complete project tree has the following structure:

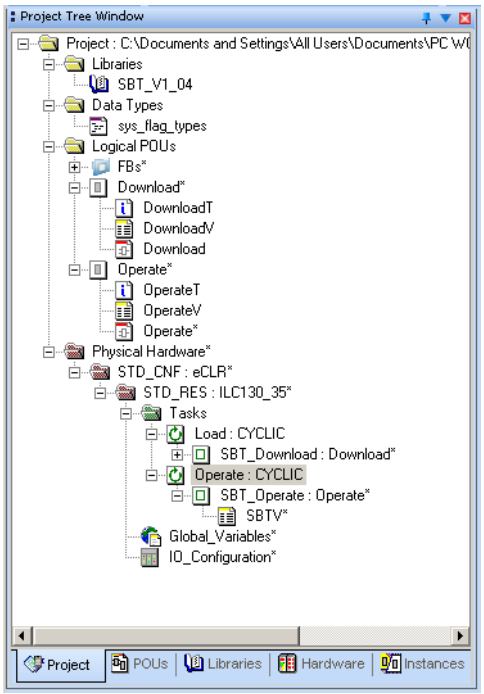


Figure 3-36 Project Tree Window

3.3.5.3 Adding to the program

"Download" program

- Select the "Download" program.
- Insert the "SBT_IBS_Download" function block.
- Create the variables.
  Define the uSBTDiagStruct variable as a global variable.

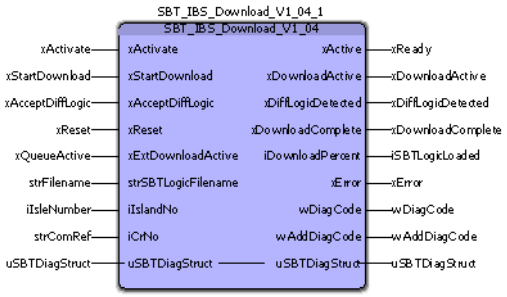


Figure 3-37 SBT_IBS_Download function block with all variables

"SBT_Operate" program

- Select the "Operate" program.
- Insert the "SBT_Operate" function block.
- Create the variables.
  - Select the uSBTDiagStruct variable from the global variable list.
  - Inputs and outputs with "arr..." are process data. VarExternalPG is used.

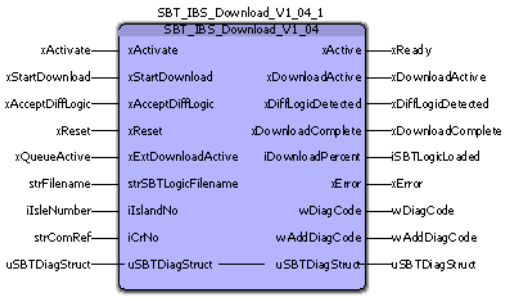


Figure 3-38 SBT_Operate function block with all variables

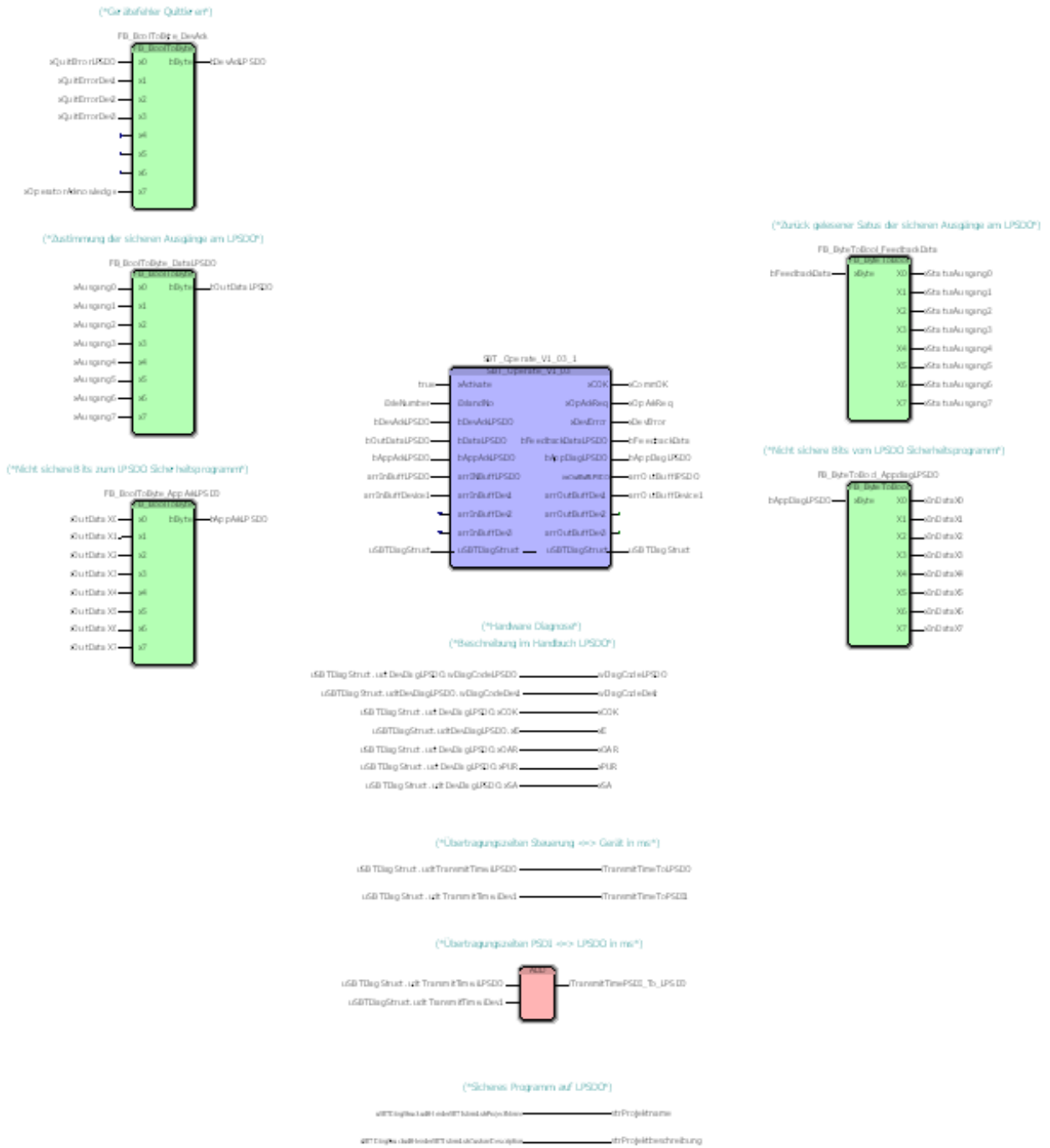


Figure 3-39 SBT_Operate program

Please take into account Section "Ensuring availability by selecting the correct transmission/watchdog time" on page A-8.

3.3.6 Loading the configuration and parameter data record into the standard controller

In step 1, the BINFILE.BIN file was generated and stored under FileOutput in the project path (see Figure 3-2 on page 3-3).

- Copy the BINFILE.BIN file.
- Use ftp in the Explorer to establish a connection to the controller.
  In the example: ftp://192.168.0.2.
- Copy the BINFILE.BIN file into the root directory of the controller.

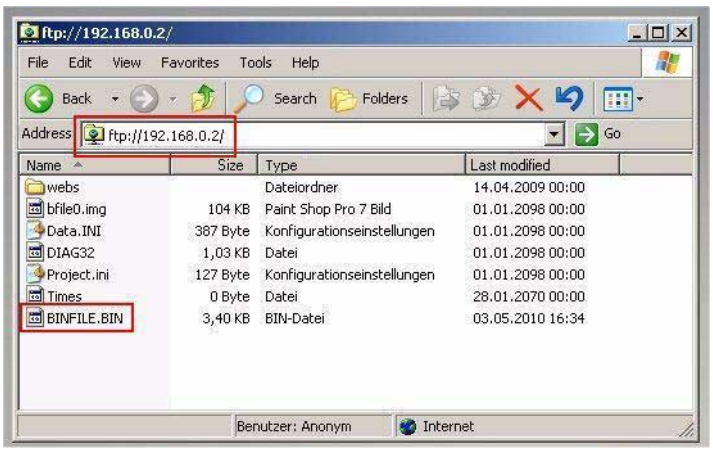


Figure 3-40 BINFILE.BIN copied via ftp to the controller

Make sure to copy the file into the folder shown in Figure 3-40. Repeat the selection if another folder is opened.

3.3.7 Loading the standard application program into the standard controller

- Compile the project by clicking "Make".
- Send the project to the controller (Project Control dialog Send and Cold Start).

This completes step 2 "Integrating SafetyBridge modules in the controller".

3.4 Step 3: Installing SafetyBridge modules

Install the SafetyBridge modules. Proceed as described in the user manuals for the modules used and the Inline installation manual (see Section "Additional documentation" on page 1-2).

Please note in particular:

Set the DIP switches **before** assembling the module in the Inline station. The switches cannot be accessed when the safety terminal is installed in the Inline station.

The DIP switches are located on the left-hand side of the safety module.

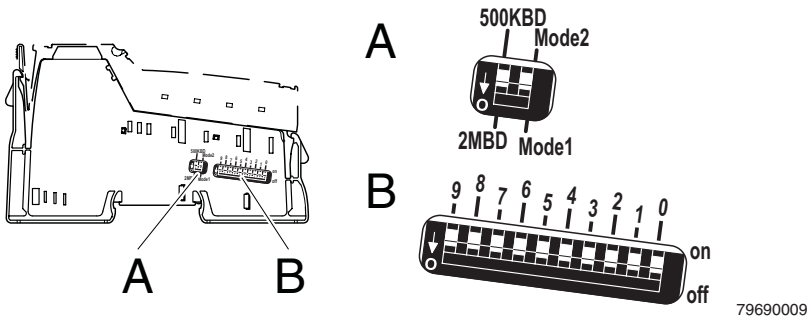


Figure 3-41 DIP switches on the IB IL 24 LPSDO 8-PAC

A Switch for setting the transmission speed and the operating mode

B Switch for setting the address

For comprehensive information on DIP switches please refer to the documentation on the IB IL 24 LPSDO 8-PAC and IB IL 24 PSDI 8-PAC.

Switch positions of the modules for the example

Table 3-2 Switch positions in the example

	500KBD /2MBD	Mode			Island number					Satellite number		
DIP switches			9	8	7	6	5	4	3	2	1	0
IB IL 24 LPSDO 8-PAC	2 MBD	Mode 1	res.	res.	**1_{dec}**					**0_{dec}**		
	1	0	0	0	0	0	0	0	**1**	0	0	0
					SafetyBridge address: 8_{dec} (8_{hex})							
IB IL 24 PSDI 8-PAC	2 MBD	Mode 2	res.	res.	**1_{dec}**					**1_{dec}**		
	1	1	0	0	0	0	0	0	**1**	0	0	**1**
					SafetyBridge address: 9_{dec} (9_{hex})							

Only use devices with a uniform transmission speed within an Inline station (a local bus). A mixture of devices with different transmission speeds cannot be operated.

Since the SafetyBridge modules of an island can be located in different Inline station, it is possible that different transmission speeds (500KBD/2MBD) are set for the modules.

This completes step 3 "Installing SafetyBridge modules" and you have integrated a SafetyBridge system into an existing system in three steps.

3.5 Overall safety validation

Perform an overall system validation before you start up your system.

Please proceed as described in Section "Flowchart for testing the example" on page A-4 to test the example.

A Appendix

A 1 Example projects

Table A-1 Overview of the examples

Example	Structure	Contents
1	Figure A-1	A SafetyBridge island; 1 emergency stop switch (EStop) This example is described in this document.
2	Figure A-2	Two SafetyBridge islands distributed in two Inline stations. The IB IL 24 LPSDO 8-PAC are located in different Inline stations. 4 emergency stop switches (EStop); 1 EStop in island 1
3	Figure A-3	Two SafetyBridge islands distributed in two Inline stations. The IB IL 24 LPSDO 8-PAC are located in one Inline station. 4 emergency stop switches (EStop)

The example projects can be downloaded as a setup at www.phoenixcontact.net/catalog (in the download area of the IB IL 24 LPSDO 8-PAC).

In SAFECONF each island is configured and parameterized separately. If you are working with island 1 only, you need one example file for SAFECONF, if you are working with two islands, you need both.

They are stored in the Download Center of the IB IL 24 LPSDO 8-PAC under the following file names.

Table A-2 Example files for SAFECONF

Example	Island	Example file
1, 2, 3	1	SBT_EXAMPLE_1xEStop.zcp
2, 3	2	SBT_EXAMPLE_3xEStop.zcp

You need an example file for every example in PC WORX.

Table A-3 Example files for PC WORX

Example	Network	Example file
1	INTERBUS	SBT_STARTERKIT_EN.zwt
1	PROFINET	SBT_PROFINET_EXAMPLE.zwt
2	INTERBUS	SBT_IBS_2ISLANDS_EXAMPLE.zwt
3	PROFINET/ INTERBUS	SBT_IBS_PN_EXAMPLE.zwt
4	PROFINET	SBT_PN_2ISLANDS_EXAMPLE.zwt
5	ETHERNET	SBT_ETH_PLC1_M_EXAMPLE.zwt SBT_ETH_PLC2_S_EXAMPLE.zwt

The setup files for PC WORX also include the BIN file that is created in step 1 (Configuring the safety logic (SAFECONF)). This means that when you are not working with SAFECONF, you need the example files for PC WORX only.

Key for the following diagrams:

IL ... BK ...	Bus coupler for PROFINET or INTERBUS; permitted bus couplers see page 3-1
I_x	Island number x
S_y	Satellite number y

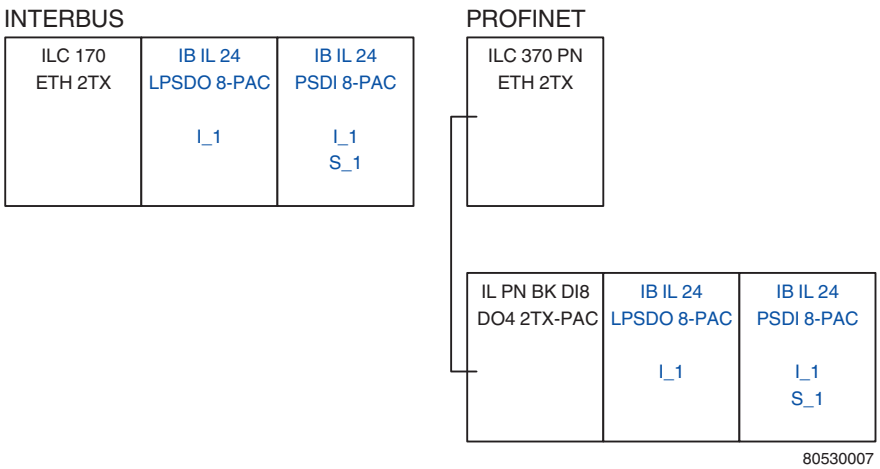


Figure A-1 Example 1: One SafetyBridge island

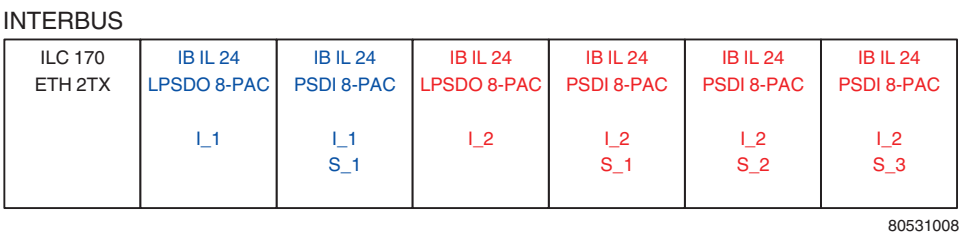


Figure A-2 Example 2: Two SafetyBridge island distributed in two Inline stations. The IB IL 24 LPSDO 8-PAC are located in different Inline stations.

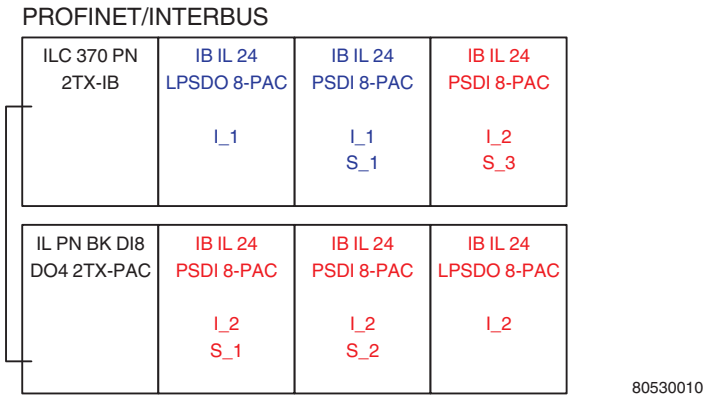


Figure A-3 Example 3: Two SafetyBridge island distributed in two Inline stations. The IB IL 24 LPSDO 8-PAC are located in one Inline station (on INTERBUS).

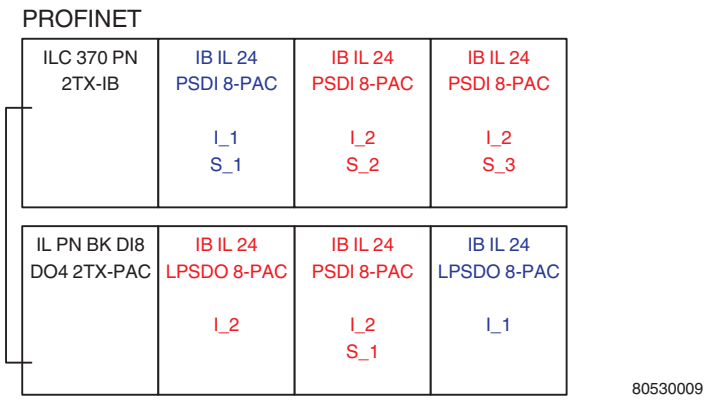


Figure A-4 Example 4: Two SafetyBridge island distributed in two Inline stations. The IB IL 24 LPSDO 8-PAC are located in one Inline station.

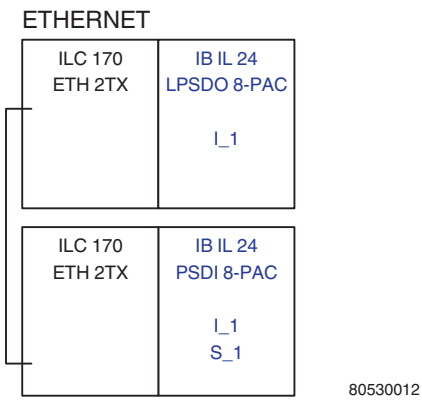
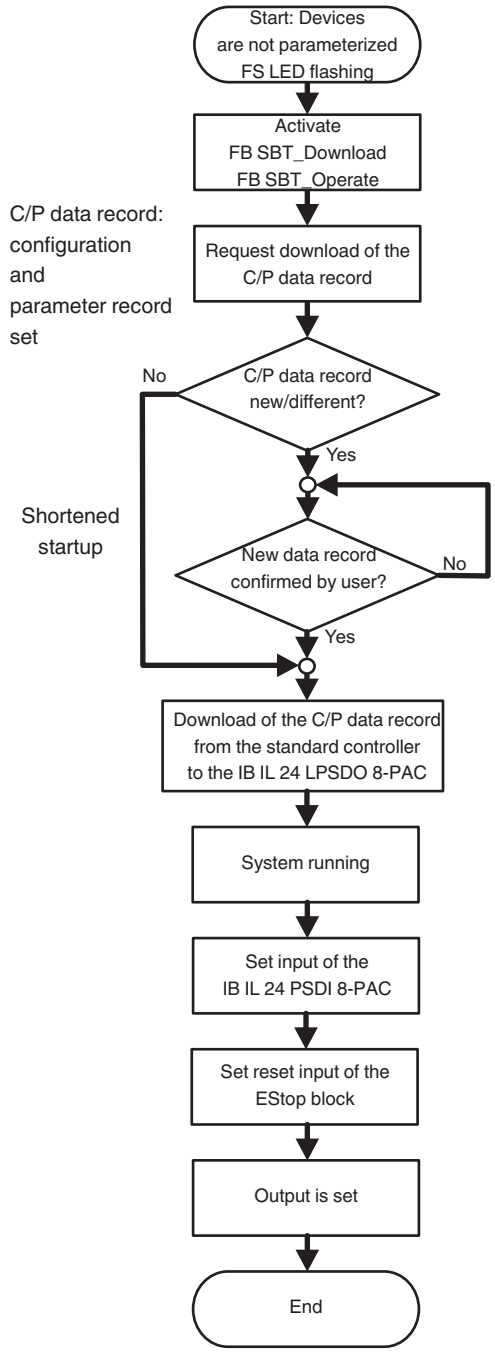


Figure A-5 Example 5: One SafetyBridge island distributed to two Inline controllers. Communication of the controllers over ETHERNET (different media are possible: copper, wireless (Bluetooth, WLAN))

A 2 Flowchart for testing the example

Please proceed as shown in the following flowchart to test the example after having the SafetyBridge system integrated completely.



Activity of/feedback from the system:

xDiffLogicDetect = TRUE ?

xAcceptDiffLogic = TRUE ?

iDownloadPercent
Value changes from 0% to 100% (progress of download)
100 % => xDownloadComplete = TRUE

FB SBT_Operate
xCOK = TRUE
uSBTDiagStruct.udtDevDiagLPSDO.wDiagCodeLPSDO = 8000_{hex}
uSBTDiagStruct.udtDevDiagLPSDO.wDiagCodeDev1 = 8000_{hex}

FB_BoolToByte_AppAckLPSDO
x0_I0 = TRUE

FB_ByteToBool_FeedbackData
xStateOutput0 = TRUE

To be set by the user to test the example:

FB SBT_Download:
xActivate = TRUE, wDiagCode = 8000_{hex}
FB SBT_IBS_Download:
xActivate = TRUE,
uSBTDiagStruct.udtDevDiagLPSDO.
wDiagCodeLPSDO = 4000_{hex}
xStartDownload = TRUE

80530006

Figure A-6 Flowchart for the initial startup as well as for startup after the configuration and parameter data record was modified

Shortened startup:
If the data record on the IB IL 24 LPSDO 8-PAC and the data record to be downloaded are identical, you need not to confirm the download.

A 3 Variables of external signals

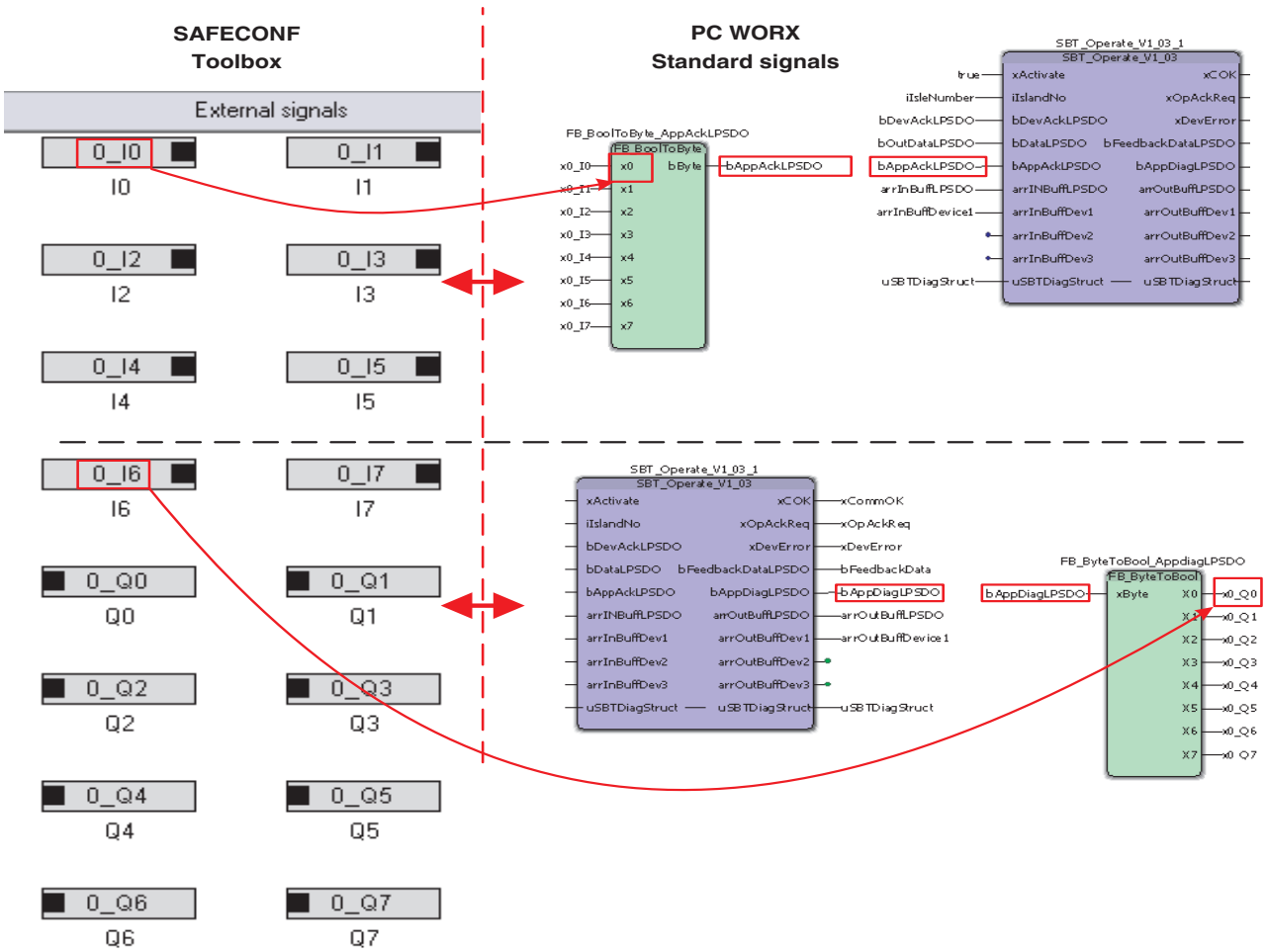
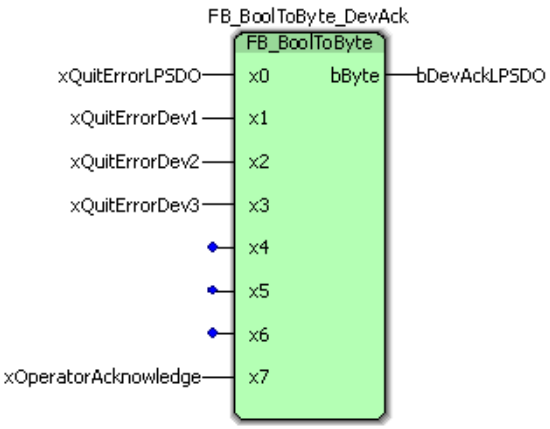


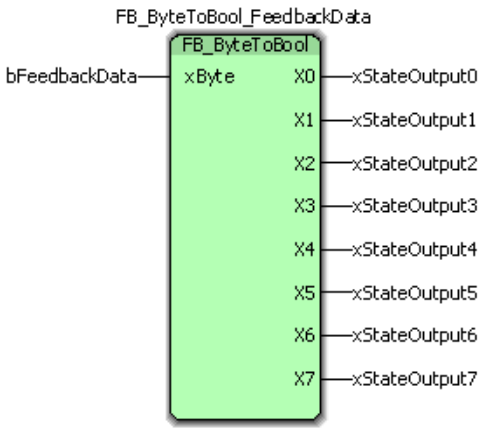
Table A-4 Relationship between the "External signals" toolbox in SAFECONF and the variables for the non-safe signals in PC WORX

A 4 Variables

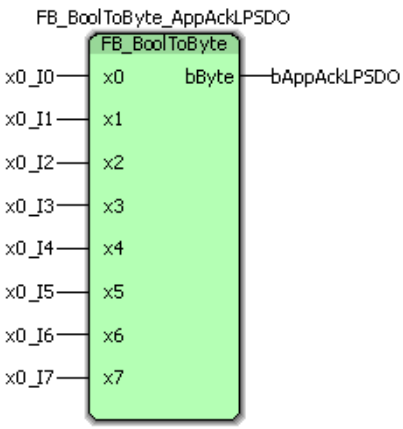
Acknowledging device errors:



Read status of the safe outputs at the IB IL 24 LPSDO 8-PAC:



Standard signals from the PLC to the IB IL 24 LPSDO 8-PAC:



Standard signals from the IB IL 24 LPSDO 8-PAC to the PLC:

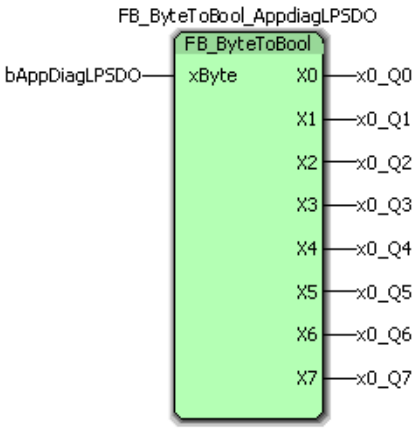
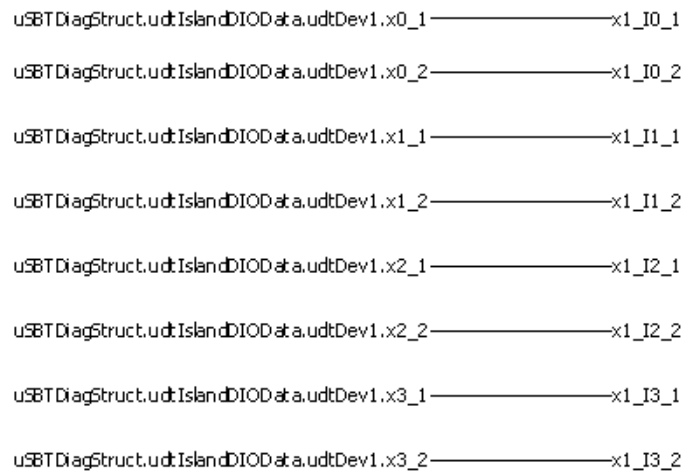
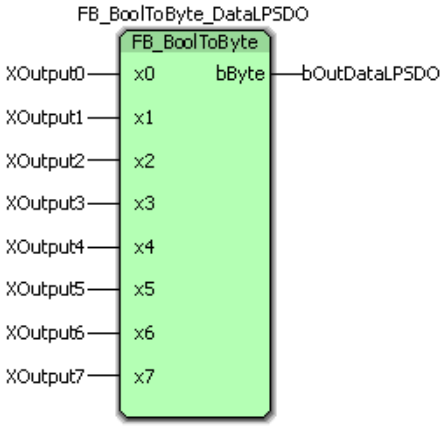


Figure A-7 Variables

Read status of the safe inputs at the IB IL 24 PSDI 8-PAC:



Enabling of the safe outputs at the IB IL 24 LPSDO 8-PAC:



Other:

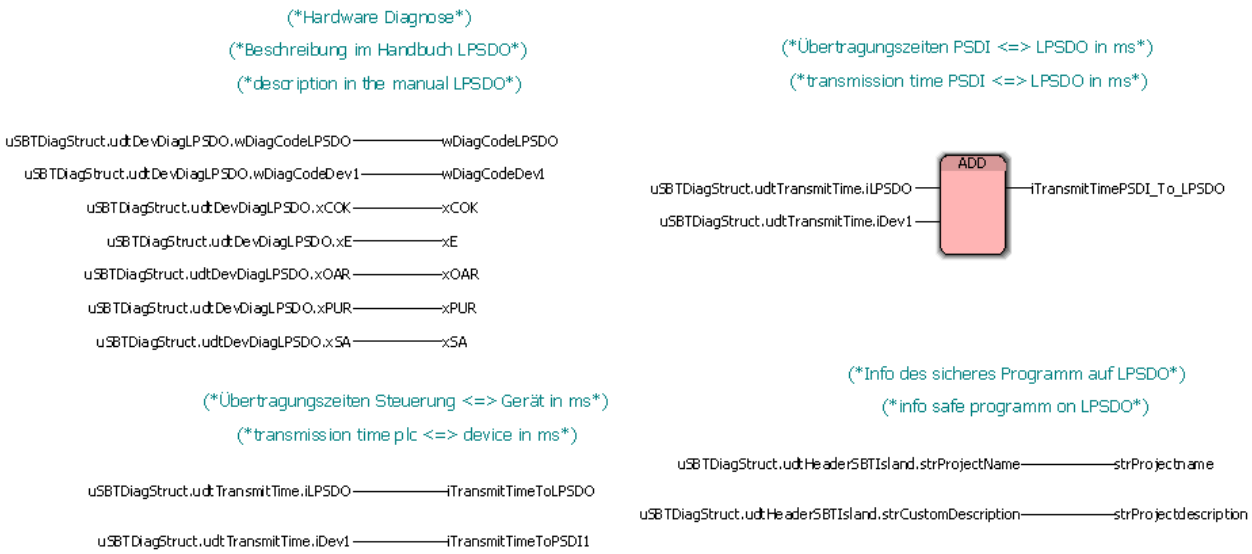


Figure A-8 Variables

A 5 Ensuring availability by selecting the correct transmission/watchdog time

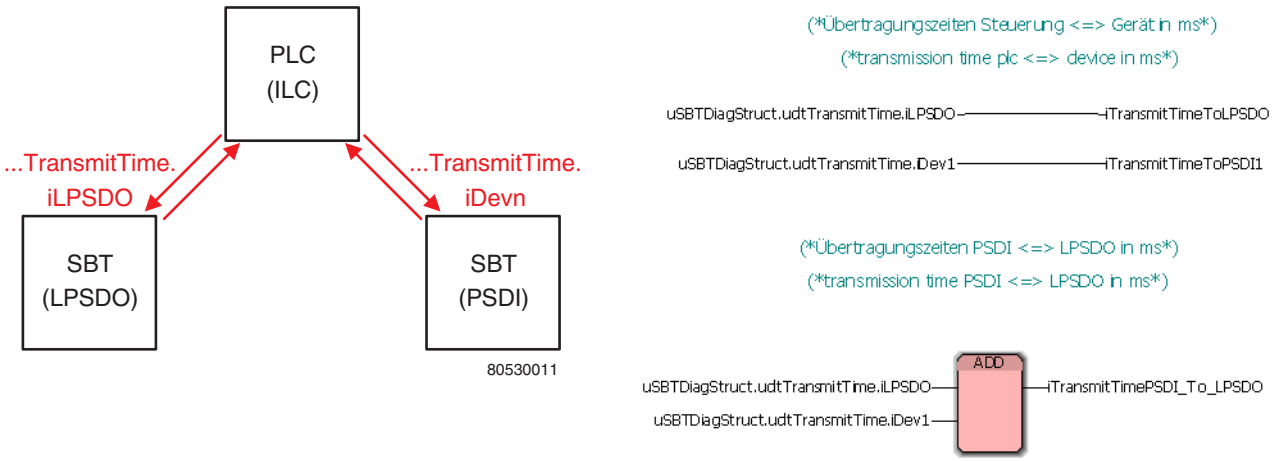


Figure A-9 Time to exchange process data between the controller and the devices of the SafetyBridge islands

Every device of the SafetyBridge island monitors the process data transmission time to ensure that the transmission is not disturbed. For this purpose the watchdog time (F_WD_Time) is set in SAFECONF on every device.

To ensure availability the watchdog time (F_WD_Time) set in SAFECONF must be larger than the sum of all transmission times

– Between controller and the IB IL 24 LPSDO 8-PAC (Variable ...TransmitTime.iLPSDO) and
– Between controller and the IB IL 24 PSDI 8-PAC (Variable ...TransmitTime.iDevn)

TransmitTime =	Cycle time (interval) of the "Operate" task (10 ms in the example) + processing time in the IB IL 24 LPSDO 8-PAC (8 ms, approximately)

...TransmitTime.iLPSDO	LPSDO transmission time in ms; controller <=> LPSDO Used to calculate the response time between the digital input PSDI and the digital output LPSDO
...TransmitTime.iDevn	Device transmission time in ms; controller <=> PSDI Used to calculate the response time between the digital input PSDI and the digital output LPSDO

In the program this sum is mapped to the iTransmitTimePSDI_To_LPSDO variable.

Set these times accordingly:

– F_WD_Time:
  See Section "Parameterizing I/O channels of a safety island" on page 3-8
– ...TrasmitTime.iLPSDO and ...TransmitTime.iDevn: See Figure A-9.

The times to be set depend on:

– The cycle time (interval) of the "Operate" task (see Figure A-10).
– The INTERBUS cycle time (default cycle time) in an INTERBUS system (see Figure A-11).
– The process data update time in a PROFINET system.

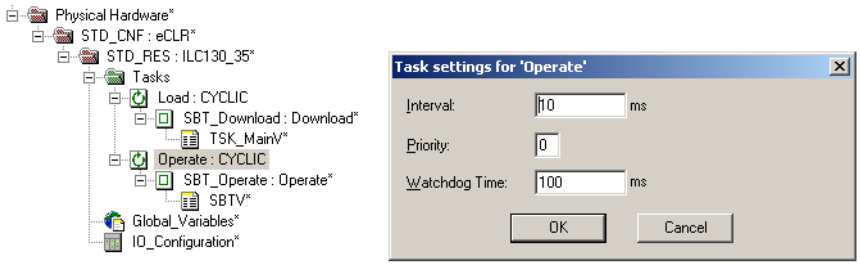


Figure A-10 The cycle time (interval) of the "Operate" task

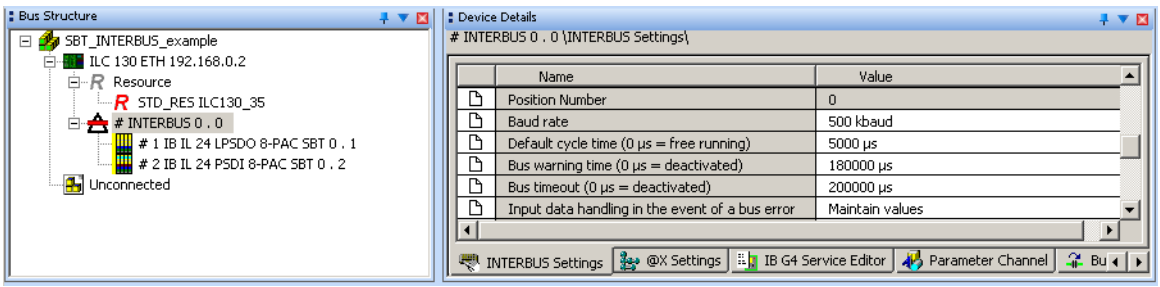


Figure A-11 Default cycle time for an INTERBUS system

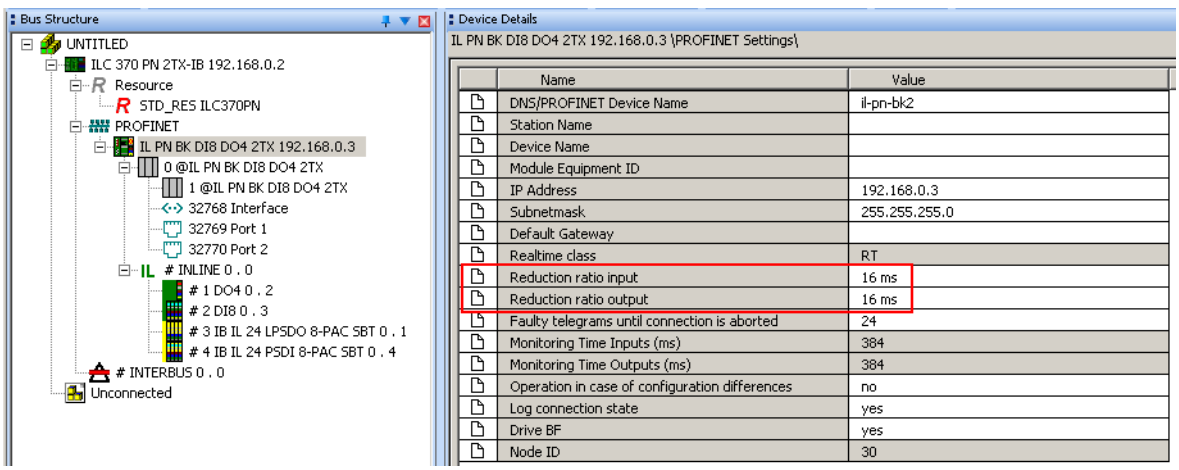


Figure A-12 The process data update time in a PROFINET system

A 6 Revision history

Revision	Date	Contents
00	07/2010	First publication

SCATTERGOOD & JOHNSON LTD
ELECTRICAL ENGINEERING & FLUID CONTROL DISTRIBUTORS
Est.1899

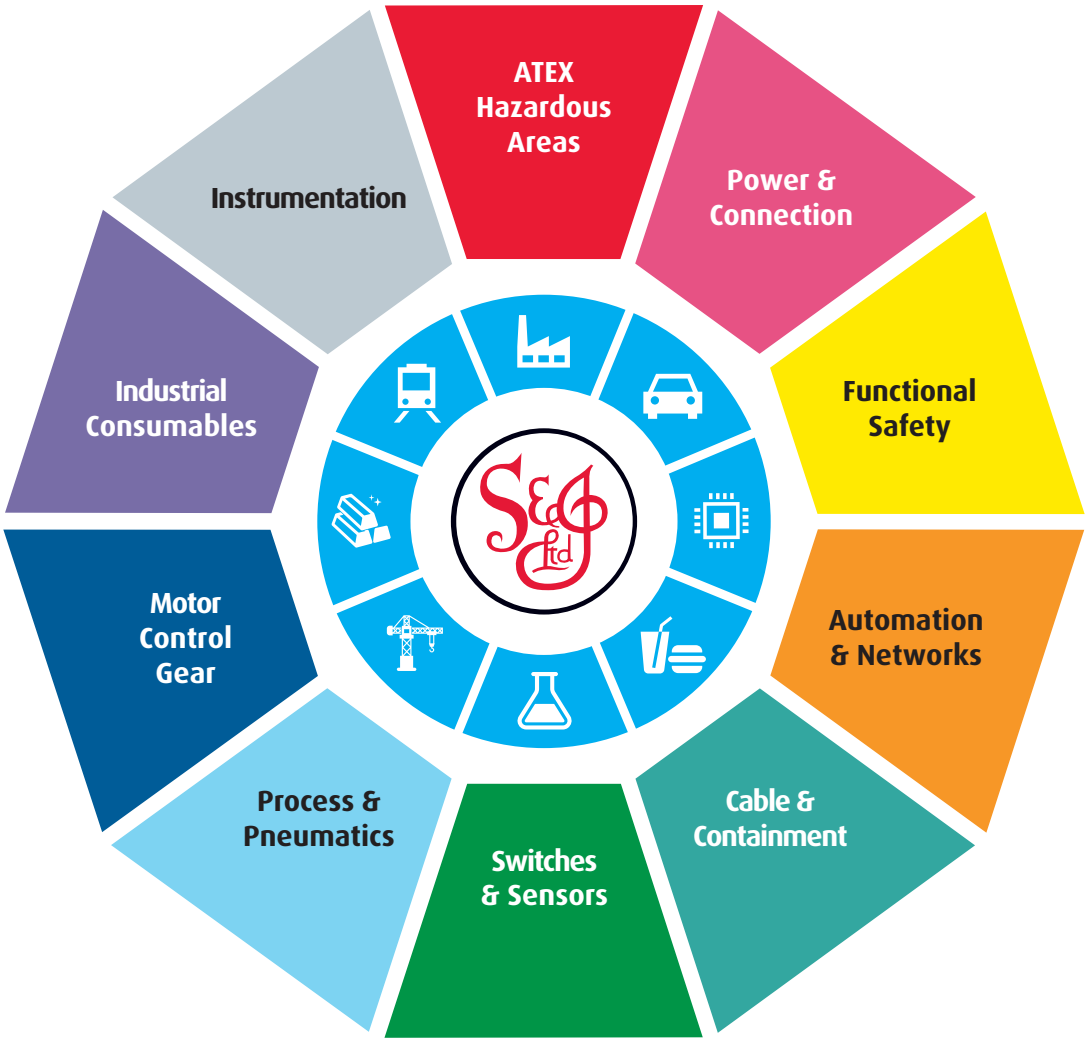
At Scattergood & Johnson Ltd, we pride ourselves on being a technical distributor to specialist industries.

Working with a range of quality product suppliers across a number of specialist markets, we are not your average 'box shifter' - we are your technical and supply chain partner.

We fully support every product we sell - for free! Our internal team and external sales engineers can answer any product or application question, no matter the complexity.

Backing up this technical ability is a range of 50,000+ products available from stock for nationwide next day delivery (same day if required!), or you can collect what you need from any of our trade counters around the UK.

Select your specialist interest below to learn more about how we can help.



Online, In Branch and On the Road - Scattergood & Johnson Ltd, there when you need us.

www.scatts.co.uk