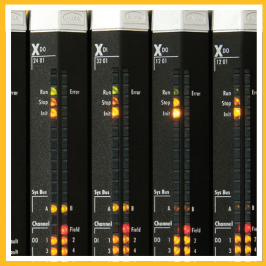
SILworX®

First Steps Manual

SAFETY
NONSTOP

HIMA

The efficient programming tool for HIMax and HIMatrix systems



SILworX by HIMA®

8

All HIMA products mentioned in this manual are protected by the HIMA trade-mark. Unless noted otherwise, this also applies to other manufacturers and their respective products referred to herein.

All of the instructions and technical specifications in this manual have been written with great care and effective quality assurance measures have been implemented to ensure their validity. For questions, please contact HIMA directly. HIMA appreciates any suggestion on which information should be included in the manual.

Equipment subject to change without notice. HIMA also reserves the right to modify the written material without prior notice.

For further information, refer to the DVD and our website at http://www.hima.com.

Contact

HIMA contact details:
HIMA Paul Hildebrandt GmbH + Co KG
P.O. Box 1261
68777 Brühl, Germany
Phone: +49 6202 709-0
Fax: +49 6202 709-107
E-mail: info@hima.com

Revision index	Revisions	Type of change	
		Technical	Editorial
4.01	Adjusted to SILworX V4	X	X

Table of Contents

1 Introduction

This manual provides all information required to familiarize with major SILworX features, either during a training course or self-study.

1.1 Scope of Delivery

The SILworX scope of delivery includes:

- This manual

First Steps provides a compact introduction to SILworX allowing users to quickly familiarize with the software. To this end, it offers an overview of SILworX functionalities, provides step-by-step instructions for creating a project and starting up a HIMax or HIMatrix system, and presents the major online features in more detail.

- A DVD

In addition to the SILworX software, the *Software Nonstop* DVD also contains some tools and the complete documentation for the programmable electronic system (PES).

- The software copy protection, either as a hardlock (dongle) or a license number (software license).

1.2 Structure of the Document

This manual describes SILworX version 4 and includes explanations and suggestions for previous operating system versions potentially loaded in the hardware.

- Chapter 2 describes how to install and uninstall SILworX.
- Chapter 3 describes the basic operations and functions of SILworX.
- Chapter 4 describes the most important steps for creating a new project..
- Chapter 5 describes in details how to start up a HIMax or HIMatrix system.
- Chapter 6 describes all online features and is primarily intended for operators working on-site.
- Chapter 7 describes how to create the project documentation.
- Chapter 8 describes the project file structure and project backup.
- The annex provides the glossary and indexes.

i This manual is part of the documentation used for the SILworX seminars at HIMA training centre. Due to the very large scope of SILworX, it only presents the most important software features. HIMA recommends attending a training course to deepen the required knowledge.

1.3 Additional Manuals

This manual describes the basic steps to be performed when programming or operating a HIMax or HIMatrix system with SILworX. For further information refer to the following manuals:

Safety	HIMax or HIMatrix safety manual
System structure	HIMax or HIMatrix system manual
Communication	Communication manual
Specifications	Module-specific manuals

1.4 Formatting Conventions

To ensure improved readability and comprehensibility, the following fonts are used in this document:

Bold:	To highlight important parts. Names of buttons, menu functions and tabs that can be clicked and used in the programming tool.
Italics:	Parameters, system variables and other references.
`Courier`	Literal user inputs.
RUN	Operating states are designated by capitals.
Chapter 1.2.3	Cross-references are integrated in this PDF edition of the manual as hyperlinks. Click the hyperlink to jump to the corresponding position in the document.

Safety notes and operating tips are particularly marked.

1.4.1 Safety Notes

Safety notes are marked in a special way. They must absolutely be observed to reduce the operating risk to a minimum. They could have the following structure:

- Signal word: either danger, warning, caution, or note.
- Type and source of danger.
- Consequences arising from the danger.
- Danger prevention.

The signal words have the following meanings:

- Danger indicates hazardous situation which, if not avoided, will result in death or serious injury.
- Warning indicates hazardous situation which, if not avoided, could result in death or serious injury.
- Warning indicates hazardous situation which, if not avoided, could result in minor or modest injury.
- Notice indicates a hazardous situation which, if not avoided, could result in property damage.

⚠ SIGNAL WORD

Type and source of danger!
Consequences arising from the danger
Danger prevention

NOTE

Type and source of damage!
Damage prevention

1.4.2 Operating Tips

Additional information is structured as presented in the following example:

i The text corresponding to the additional information is located here.

Useful tips and tricks appear as follows:

TIP The tip text is located here.

1.5 Support

Refer to the following table for any question, concern or suggestion related to SILworX.

Range	Website or telephone	Time parameters
News, Manuals	Our website: www.hima.com	
Questions and suggestions	E-mail: himax.support@hima.com Phone: +49 6202 709-261 Fax: +49 6202 709-199	Between 8:30 a.m. and 16:30 p.m.
Hotline	Phone: +49 6202 709-185	Between 8:30 a.m. and 16:30 p.m.

Table 1: Support and Hotline Addresses

2 Installation

The following section describes the system requirements for SILworX and the procedure for installing and uninstalling the software.

2.1 System Requirements

SILworX can be installed on a PC with Microsoft Windows operating system. The PC must satisfy the folloging minimum requirements:

Area	Minimum	Recommended
Processor	Intel Pentium IV®	State-of-the-art PC
Hard disc	500 MB	
RAM	250 MB	
Graphic card	1024x768	
Operating system	Windows® XP Professional (32-bit), Service Pack 2 Or Windows® 7 Professional/Ultimate (64-bit) (tested with Ultimate)	Windows® 7 Professional/Ultimate (64-bit) (tested with Ultimate)
Interface	Ethernet interface	Ethernet interface

Table 2.: Hardware Requirements

2.2 Installing SILworX

- Place the delivered DVD in the DVD drive.
  The software usually starts automatically. Otherwise, double-click *Index.html* in the DVD directory.
- Select **Product, SILworX**.
- In the list on the left-hand side, click **Installation, Install SILworX**.

2.3 Uninstalling SILworX

Select **Programs, HIMA, SILworX, Uninstall SILworX** from the Windows start menu.

2.4 License

SILworX is either activated through a USB stick (hardlock license) or a softlock license.

Insert the USB stick into one of the PC USB ports. No additional action is required. The USB stick automatically provides a valid SILworX license.

The USB stick is portable and can be used on any PC. In contrast to the softlock license which is permanently connected to an individual PC, the hardlock license is bound to the USB stick.

The softlock license is only valid for one individual PC with a specific Windows installation. It is stored on that given computer and contains its individual data.

The softlock license requires a valid license key. This license key is available via e-mail upon request.

2.4.1 Requesting and Activating the License or Upgrade

Perform the following steps to request and activate the HIMA softlock license or to upgrade the existing license. To upgrade the hardlock license, the corresponding USB stick must be in place.

- Click the question mark symbol located on the menu bar.
- Select **License Management, Request License**.

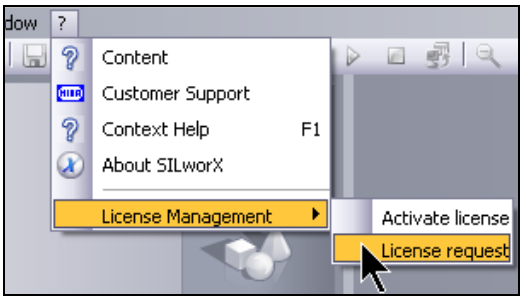


Figure 2-1: Requesting the License

- In the dialog box, specify the license number (noted in the confirmation of order and complete the remaining text fields.

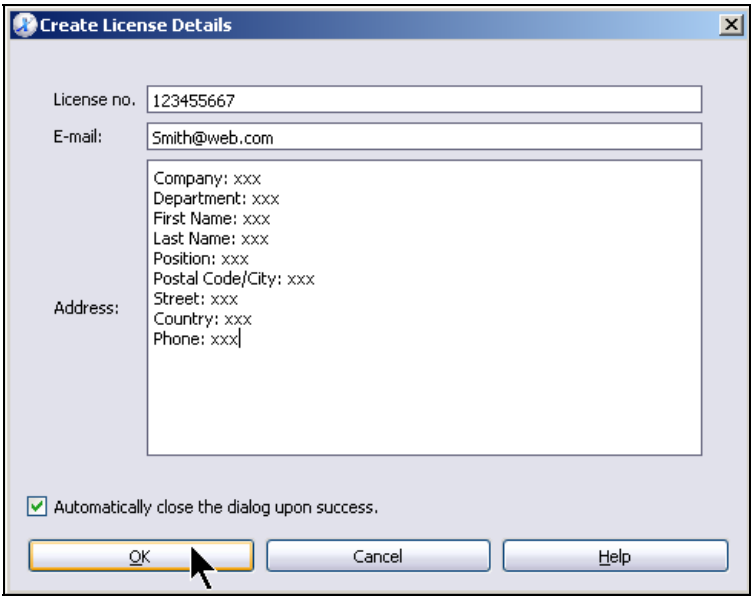


Figure 2-2: Specify the License Data

Click **OK** to confirm. A request file is created and must be sent per e-mail to the following address:

silworx.registration@hima.com

A release file is provided after commercial clarifications.
To upgrade the hardlock license, the file must be saved in the root directory or, if existing, in the **Olicense** directory of the hardlock.

To activate a softlock license, proceed as follows:

- Click the question mark symbol located on the menu bar.
- Select **License Management, Activate License**.

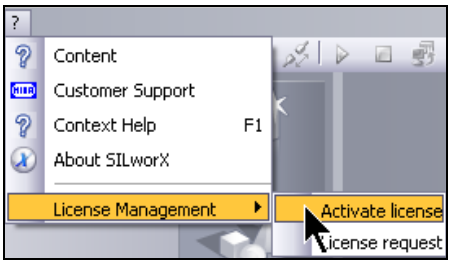


Figure 2-3: License Activation

- In the following window, select the license file received per e-mail and saved on the PC. Click **Open** to read and activate the file.

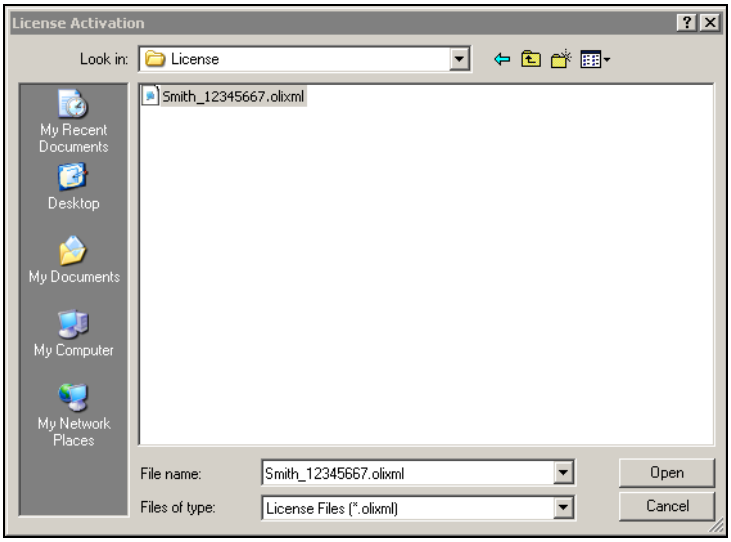


Figure 2-4: Reading-in the License File

The softlock license depends on the PC hardware and the Windows installation.

The softlock license is no longer valid after re-installing Windows. If necessary, please contact HIMA customer support to obtain a new license request file.

---

3 Introduction to the Operation of SILworX

Use the *X-Lib.E3* demo project available on the *Software.Nonstop* DVD to perform the following instructions.

In the DVD, select *Products* → *SILworX* → *X-Lib* to open the demo project. Save the project to the local PC.

- Select **Project** and click **Open.**
- In the *Open Project* dialog box, click the button on the right of the *Project File* field.
- Select the project and click **Open**.

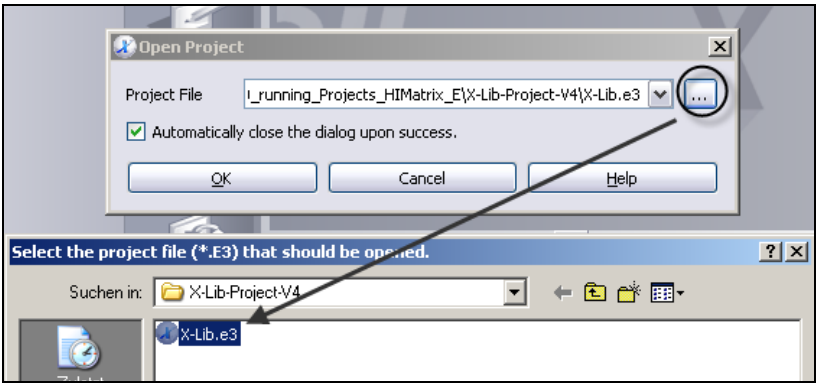
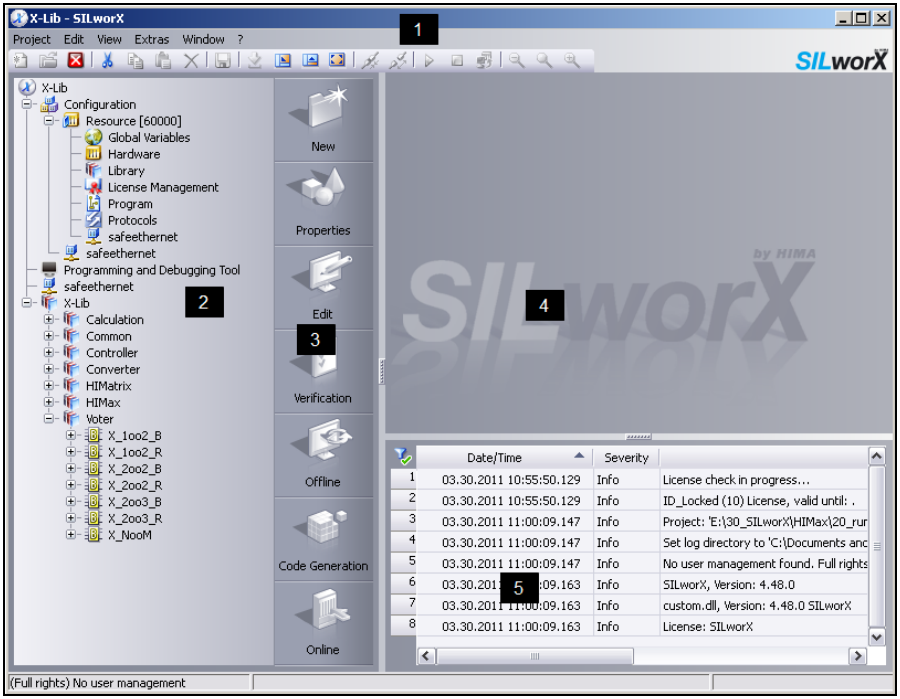


Figure 3-1: Opening a Project

3.1 Screen Layout and Operation



1 Menu and Symbol Bar
2 Structure Window
3 Action Bar
4 Workspace
5 Logbook

Figure 3-2: Screen Layout and Operation

Move the separator lines to modify the screen layout

Figure 3-3: Moving the Separator Line

TIP Double-click the separator line to maximize the workspace or the logbook. Double-click the separator line once again to return to the default screen layout.

3.1.1 Simple Operating Concept

HIMA realizes with SILworX a simple and intuitive operating concept.

- Select the element to be edited in the structure tree.
- Select the required action from the Action Bar.

  Example:

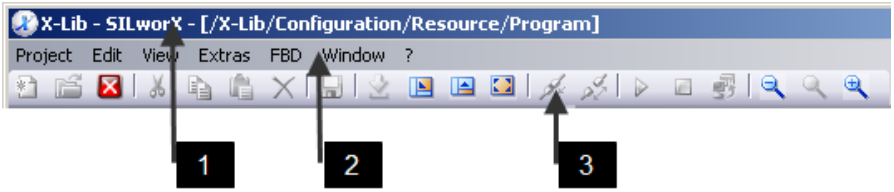
Program → **Edit**	To open the editor for the selected program.
Program → **Online**	To operate the selected program during operation.
Program → **Properties**	The program properties are displayed and can be edited.

The actions are listed top-down in the sequence order (New, Edit, Test, Document).

The result of the performed selection appears in the workspace.

All objects (variables, function blocks, connectors, etc.) are available in the Object Panel located in the workspace. The objects are easily copied in the drawing area by drag&drop.

3.1.2 Menu Bar, Symbol Bar



1 Project Name or Currently Opened Element

2 Menu Bar

3 Symbol Bar

Picture 3-4: Menu and Symbol Bar

Per default, the menus and buttons available for the selected object are enabled. If they are disabled, they are grayed out and cannot be accessed by the users.

To know more about a button or a column title, maintain the cursor pointed to the button until a tooltip appears.

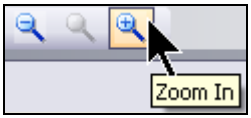


Figure 3-5: Tooltip for Symbols

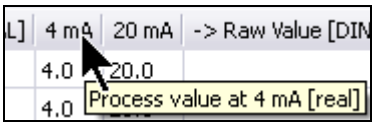


Figure 3-6: Tooltip for Shortened Column Titles

3.1.3 Structure Tree

The structure tree shows all elements of a SILworX project.

Click the [+] symbol next to the node to expand the tree like in Windows Explorer.

To choose the element for the next action, click the corresponding structure tree object.

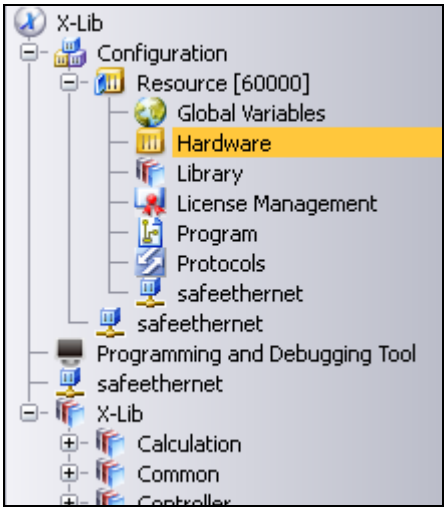
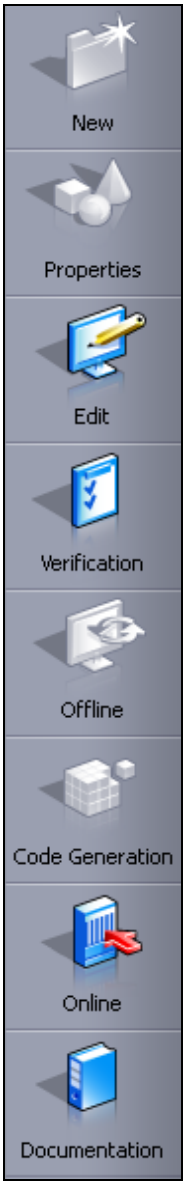


Figure 3-7: Structure Tree

Right-click the structure tree object to open the corresponding context menu and select functions such as copy, paste or delete.

Figure 3-8: Context Menu

3.1.4 Action Bar



To create new objects

To edit the object properties

To edit the objects

To test (verify) objects

To open objects in the offline simulation

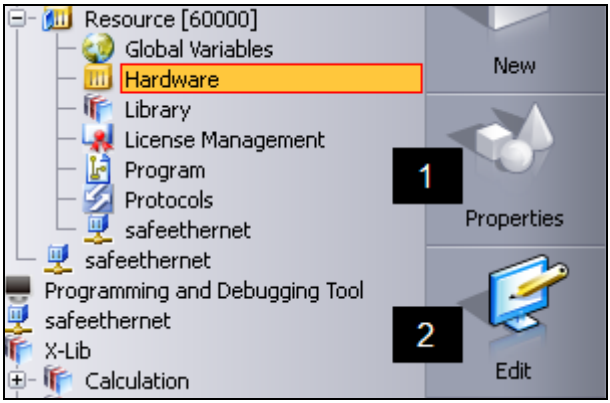
To generate the code for the resource

Establish the online connection to the PES or open the element in the online mode

Document and print out the element

Figure 3-9: Action Bar

The actions available for the selected structure tree object are enabled. Disabled functions are grayed out.



1 Not available! **2** Available

Figure 3-10: Availability of the Actions

All actions can also be performed using the context menu functions (accessible by right-clicking the object).

3.1.5 Workspace

In the workspace, the element logic is displayed in edit or online mode.

To open the element logic, click the required element in the structure tree, e.g., *X-LimH* in the *X-Lib,* and then click **Edit** on the Action Bar.

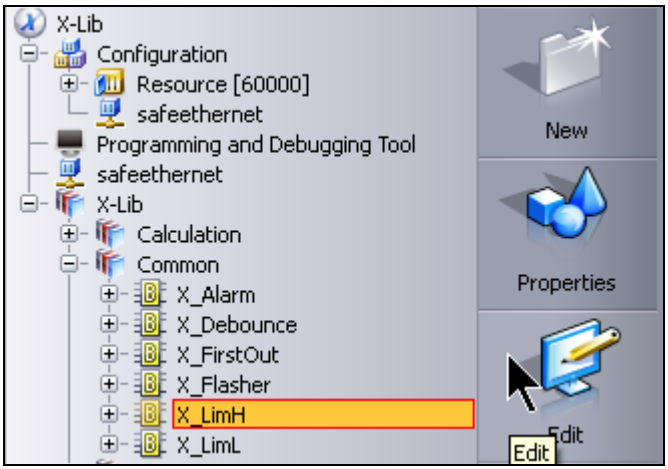
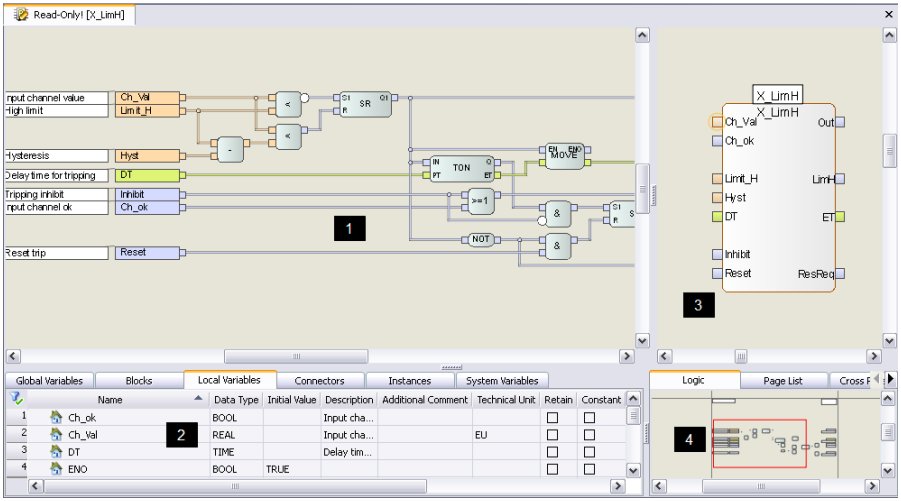


Figure 3-11: Opening the Element for Editing



1 Drawing Area
2 Object Panel
3 Depiction of a POU's Interfaces
4 Navigation

Figure 3-12: Workspace of an Open POU

All the objects available for the editor opened in the drawing area can be copied and modified after dragging them from the different tabs of the Object Panel onto the drawing area (refer to Chapter 4.5.6 and Chapter 4.7 for some examples). The objects may not be dragged directly from the structure tree onto the drawing area!

The tabs available in the Object Panel depend on the editor:

- The FBD Editor includes, for instance, *variables, blocks, connectors*.
- The Hardware Editor includes *racks*, *modules* and the *variables* to be connected.

3.1.6 Navigation

The Navigation panel is located on the right, next to the Object Panel and is used to quickly access the logic parts and the used variables.

For more practical details, refer to Chapter 6.4.3.

3.1.6.1 Overview of the Logic

Click the required logic page in the logic overview of the Navigation Panel to select it.

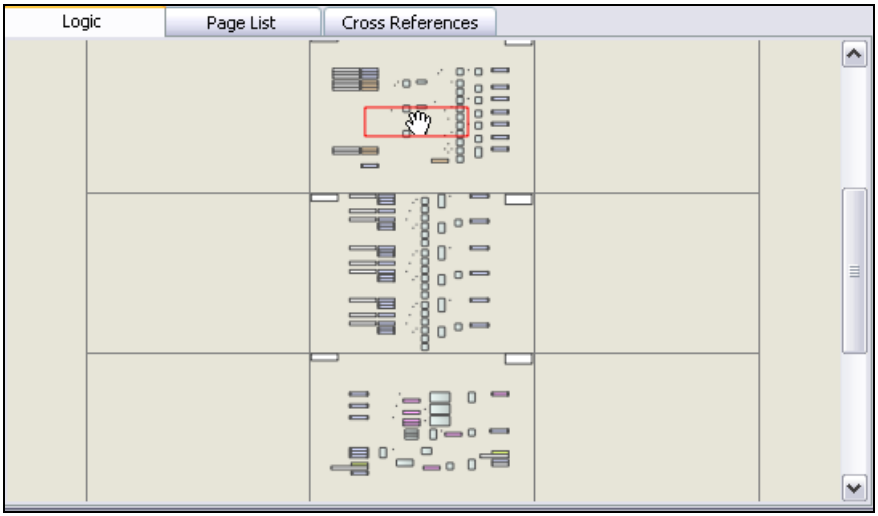


Figure 3-13: Logic tab in the Navigation Panel

3.1.6.2 Page List

The page list specifies all pages containing logic. Double-click a page position to align a page to the upper or left corner of the drawing area.

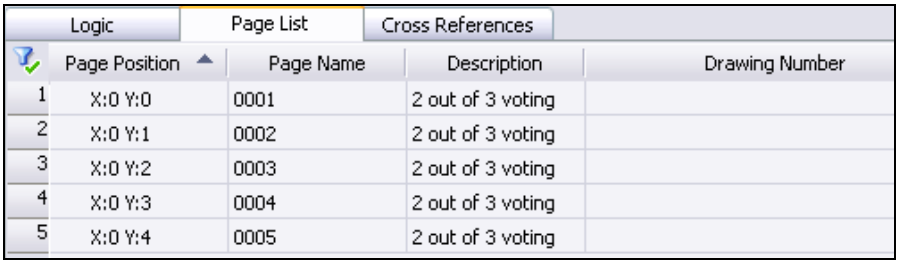


Figure 3-14: Page List

3.1.6.3 Cross References

If a variable (in the *Local Variable* tab), connector or instance is selected in the Object Panel, the *Cross References* tab specifies all its uses.

Select **Go To** from the context menu to center the object location in the drawing area.

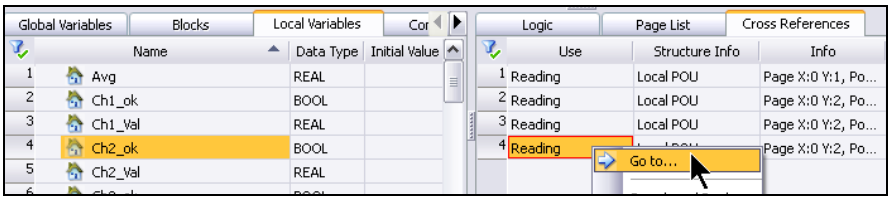
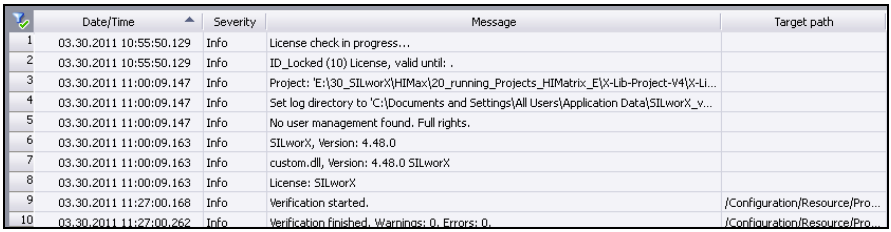


Figure 3-15: Cross-Reference List

3.1.7 Logbook

The logbook is located below the Object Panel and is used to report the following messages:

1. Tracing of important operating steps such as code generation, forcing or PES load.
2. Notes to operating errors.
3. Verification results.
4. Code generation results.



	Date/Time	Severity	Message	Target path
1	03.30.2011 10:55:50.129	Info	License check in progress...	
2	03.30.2011 10:55:50.129	Info	ID_Locked (10) License, valid until: .	
3	03.30.2011 11:00:09.147	Info	Project: 'E:\30_SILworX\HIMax\20_running_Projects_HIMatrix_E\X-Lib-Project-V4\X-Li...	
4	03.30.2011 11:00:09.147	Info	Set log directory to 'C:\Documents and Settings\All Users\Application Data\SILworX_v...	
5	03.30.2011 11:00:09.147	Info	No user management found. Full rights.	
6	03.30.2011 11:00:09.163	Info	SILworX, Version: 4.48.0	
7	03.30.2011 11:00:09.163	Info	custom.dll, Version: 4.48.0 SILworX	
8	03.30.2011 11:00:09.163	Info	License: SILworX	
9	03.30.2011 11:27:00.168	Info	Verification started.	/Configuration/Resource/Pro...
10	03.30.2011 11:27:00.262	Info	Verification finished. Warnings: 0, Errors: 0.	/Configuration/Resource/Pro...

Figure 3-16: Logbook

3.2 Table Handling

Multiple settings in SILworX are made in tables. The functions are described in the following chapters.

- For testing purposes, double-click the **Global Variables** structure tree element located below the resource to open the Global Variable Editor. Press the insert key multiple times to create various global variables.

3.2.1 Editing Cells

To edit the cell content, double-click the cell and overwrite the existing text.

Cells that are grayed out are disabled and cannot be edited.

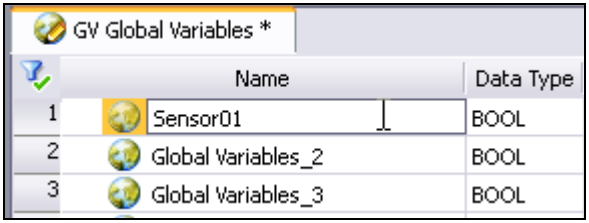


Figure 3-17: Overwriting the Cell Content

3.2.2 Selecting from Drop-Down Lists

Some data fields contain drop-down lists, from which an element can be selected. Double-click the drop-down list to activate it and click again to open it.

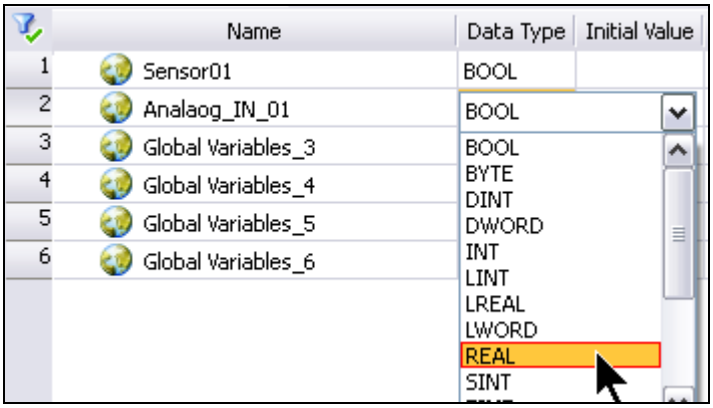


Figure 3-18: Drop-Down List

3.2.3 Selecting Checkboxes

Checkboxes are connected to conditions: TRUE (checkbox is ticked) or FALSE (checkbox is not ticked). Click the checkbox to change the condition.

Click a checkbox multiple times to toggle the setting.

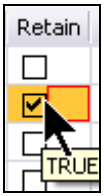


Figure 3-19: Activated Checkbox

3.2.4 Performing Context Menu Functions

Standard context menu functions such as **Copy** (CTRL+C) and **Paste** (CTRL+V) apply for a complete line or for individual cells.

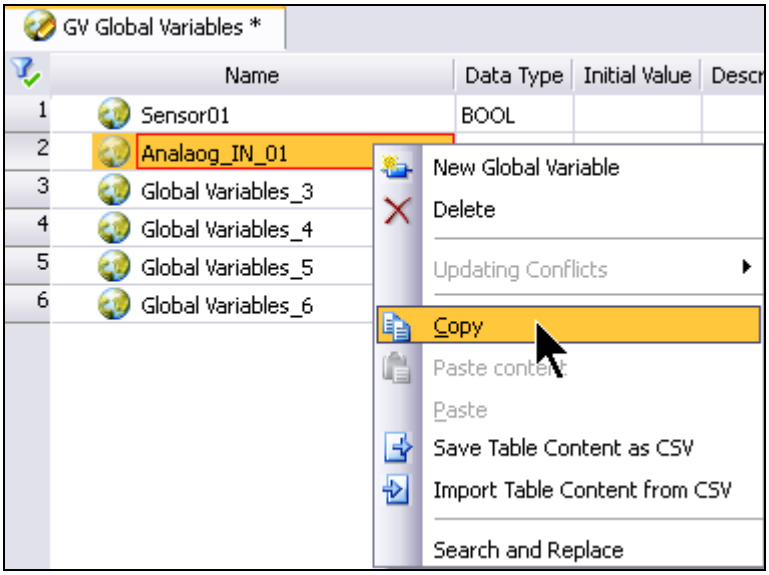


Figure 3-20: Context Menu

3.2.5 Filtering the Table Contents

Click the filter symbol located on the left upper side of the table to enable or disable the filter function.

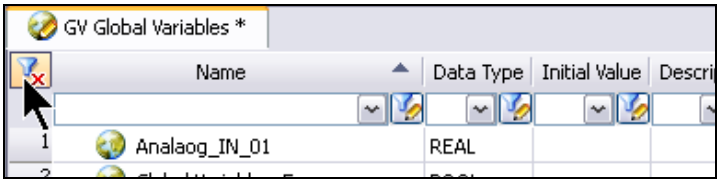


Figure 3-21: Setting Filters

Filters can be used and cascaded for each column in accordance with the user requirements.

Starting with SILworX version 4.x, the wildcard character located before and after the entry is automatically active.

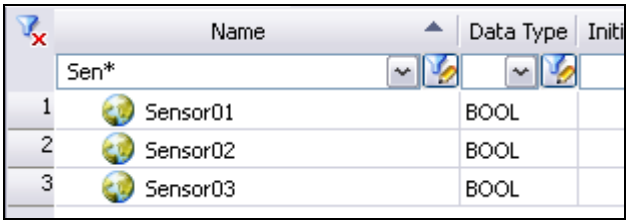


Figure 3-22: Active Filter Criterium

3.2.6 Sorting Columns

Click the column title to sort the entire table content alphabetically, in ascending or descending order. The sorting order is displayed by the arrow located on the right-hand side of the column header.

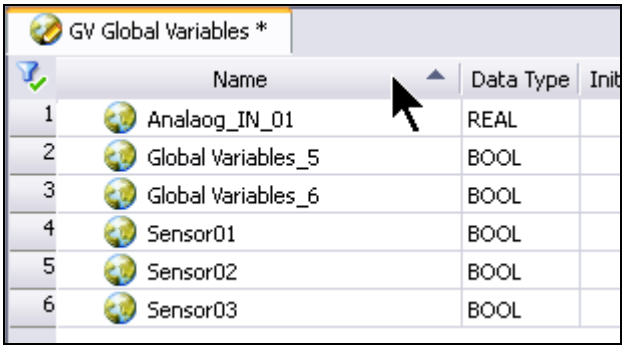


Figure 3-23: Sorting the Table by Columns

3.3 Variables

Variables are used to temporarily store data with different data types and to exchange data between program parts and controllers. SILworX uses global variables and local variables.

3.3.1 Global Variables

As soon as a new resource is created, a *Global Variables* element is added to the structure tree. Global variables can also be created within a *Configuration,* the higher-level structure tree element, and are then available in all resources of this configuration.

Global variables have the same value wherever they are used in the project and can be forced in all their uses.

Global variables are required for the following tasks:

- **HARDWARE:** to store the values of inputs and outputs.
- **COMMUNICATION:** to exchange data between controllers via different protocols, e.g., Modbus, OPC or safe**ethernet**. A safe**ethernet** connection must be configured between the resources to allow them to exchange variables.
- **SYSTEM VARIABLES:** to store and further process the value of system variables.
- **PROGRAMMING:** to exchange data between the function blocks contained in the user program.

3.3.2 Local Variables

Local variables are part of a POU (building block) and are only available within that POU. For this reason, they cannot be assigned to inputs and outputs (hardware), or used for communication.
Local variables can be forced in the Force Editor using the *Local Forcing* function.

---

i In the **Local Variables** tab of the FBD Editor, the global variables that are used locally within a POU, are displayed as VAR_EXTERNAL. VAR_EXTERNAL variables aren't local variables in the sense used in this chapter.

Local variables are only:
VAR, VAR_TEMP, VAR_INPUT and VAR_OUTPUT

3.3.2.1 Typical Uses of Local Variables

Local variables are used, e.g., as input and output variables for a POU interface.

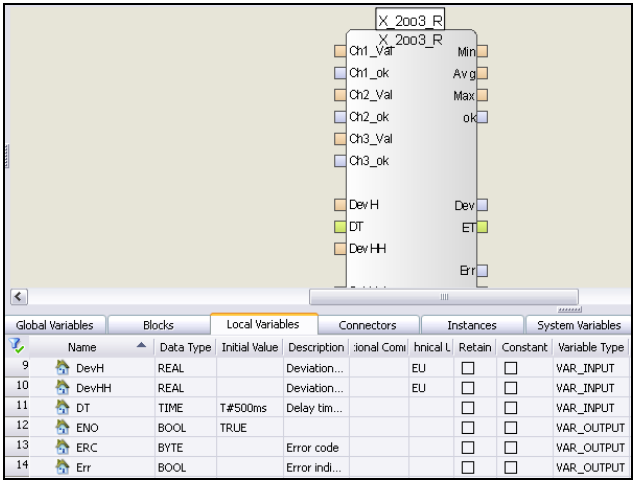


Fig. 3.24: Local Variables as Interface Variables (VAR_INPUT, VAR_OUTPUT)

Additionally, local variables can be used as preset value for timers or comparators. The preset is defined as the initial value.
In such a case, the *Constant* attribute should be set.

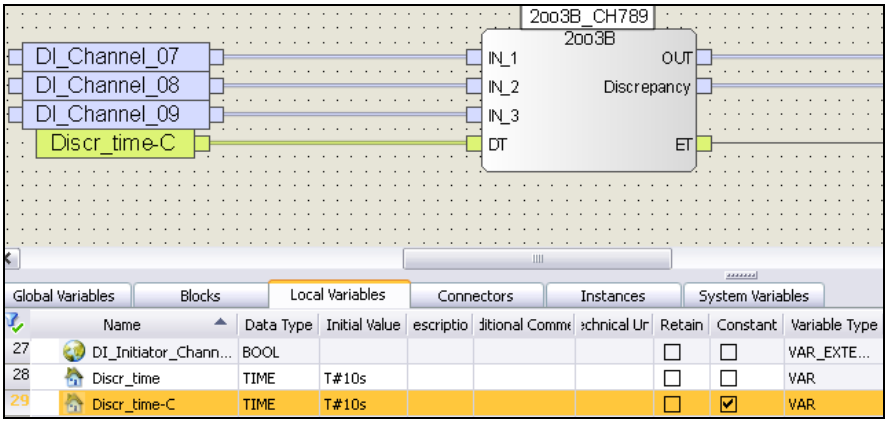


Figure 3-25: Variables with Initial Value as Parameter

In addition to connectors, also local variables can be used to connect different logic parts. This allows one to better structure complex logic programs and to restrain the network size. Clearly structured networks are easier to view and test.

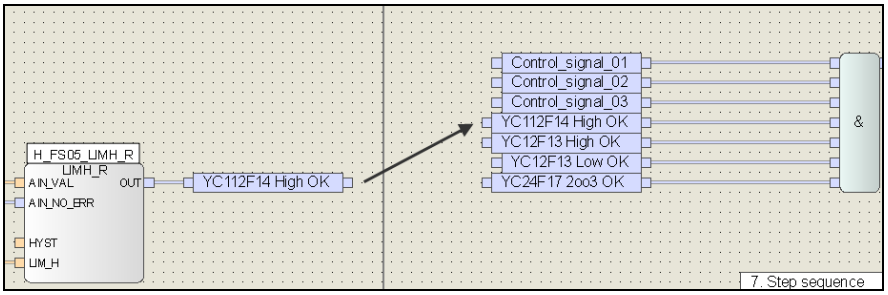


Figure 3-26: Logic Parts Connected to Local Variables

Observe the rules of the sequential processing when structuring the networks!

4 Creating a New Project

The following chapters explain all steps required for creating a new project. Prior to creating a new project, close all open projects or start another SILworX session.

4.1 Creating a New Project

Proceed as follows to create a new project:

- Select **Project** from the menu bar and click **Open**. Alternatively, click the **New** button on the Symbol Bar.

Figure 4-1: The **New** Button

- In the *Open Project* dialog box, click the button on the right of *Project File* to find the required directory.
- Enter a name in the *Project Name* field.
- Check the option **Automatically close the dialog upon success** to ensure that the dialog box will no longer appear if the action was successfully completed.
- Click **OK** to confirm the action.

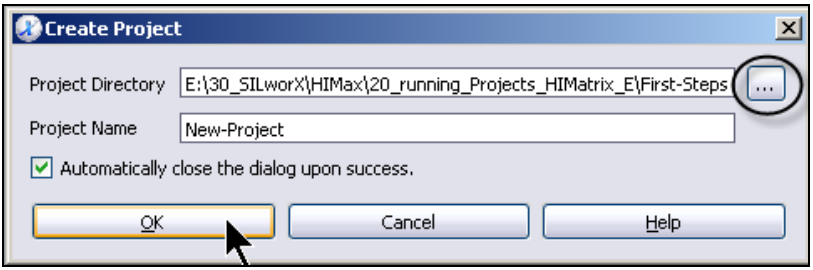


Figure 4-2: Creation of a New Project

The new project already contains all relevant objects and their default settings. The project name is displayed as the highest structure tree node.

Supplementary objects can now be added to the project and configured in accordance with the user requirements.

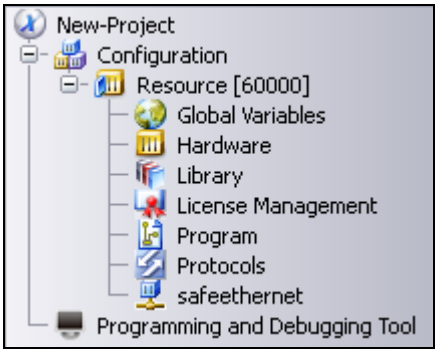


Figure 4-3: Structure of a New Project

4.2 Resource Properties

The *Resource* element represents the system in which one or multiple programs will be processed. The *Resource* contains all properties, programs, communication settings and hardware assignments.

In order to use an automatically or manually created resource in a project, adjust the default settings to the specific requirements.

Take the used resource type into account when setting the parameters. HIMatrix standard and HIMatrix with enhanced performance are available in addition to the HIMax system.

Perform the following steps to configure the resource properties.

- In structure tree, click *Resource* to select it.
- Click the **Properties** button from the Action Bar.

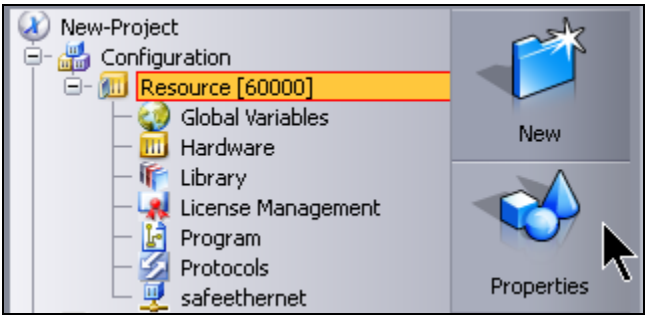


Figure 4-4: Opening the Resource Properties

A dialog box appears in which the resource can be configured in accordance with the user requirements.

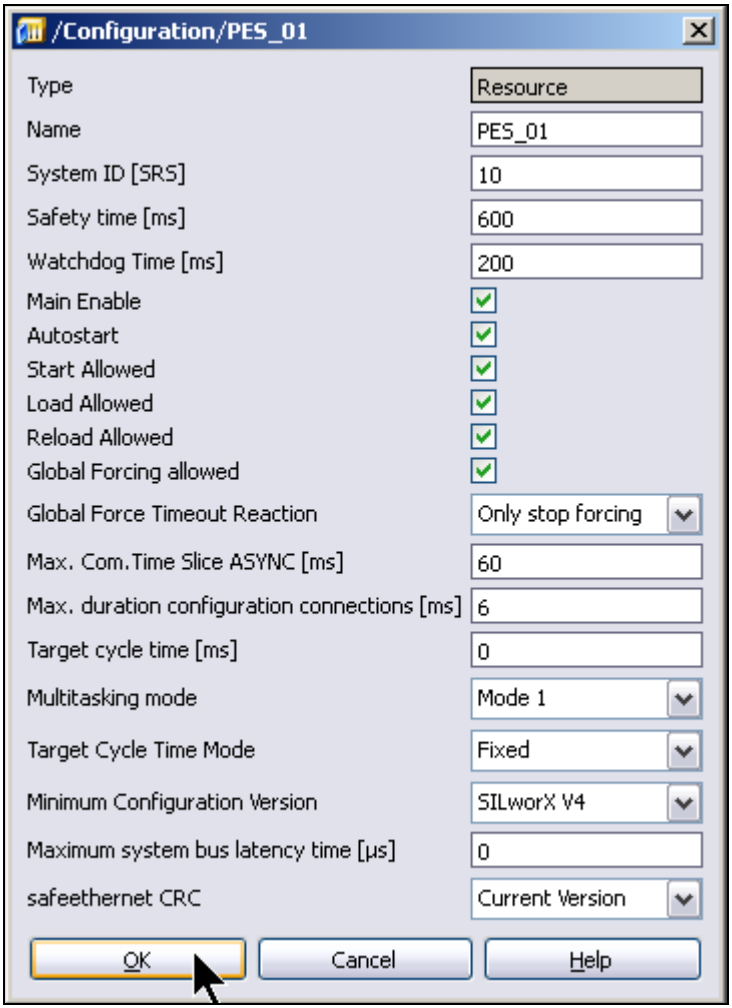


Figure 4-5: Resource Properties

Parameter	Description
Name	Enter a new name for the resource.
System ID [SRS]	The system ID is the unique number of a resource within one configuration. The default value 60000 must be changed!
Safety time [ms]	Set the values. Strictly observe the instructions specified in the HIMax or HIMatrix Safety Manual!
Watchdog time [ms]	
Main Enable	Set the parameters in accordance with the user requirements. Observe the instructions provided in the safety manual and the requirements specified by the responsible test authority. For HIMatrix standard systems **Reload Allowed** should be deactivated.
Autostart	
Start Allowed	
Load Allowed	
Reload Allowed	
Global Forcing Allowed	
Global Force Timeout Reaction	
Target Cycle Time [ms]	This value can be used, e.g., for a periodical processing in connection with *Target Cycle Time Mode Fixed (fixed-tolerant).* The value 0 deactivates this parameter.
Minimum Configuration Version	Set this parameter in accordance with the loaded operating system version. See also Table 4, below.
Multitasking Mode	For HIMatrix standard systems maintain the default settings.
Target Cycle Time Mode	
Max. Duration of Configuration Connections [ms]	
Max. System Bus Latency [µs]	

Table 3: Important Resource Parameters

TIP Use the default settings when performing a first test.

For standard applications (no multitasking, normal communication load, no conversion from previous versions), the remaining settings may retain the default values.

4.2.1 Overview of the Minimum Configuration Version

Overview of the available minimum configuration version and corresponding operating systems:

Minimum Configuration Version	HIMax CPU and COM	HIMatrix Standard		HIMatrix with enh. Performance	
		CPU	COM	CPU	COM
SILworX V2	2.x	7.x	12.x	-	-
SILworX V3	3.x	-	-	-	-
SILworX V4	4.x	-	-	8.x	13.x

Table 4: Operating Systems Required for SILworX Versions

4.3 Program Properties

Like the resource properties, also the program properties must be adjusted to the individual requirements. Perform the following steps:

- Click *Program* in the structure tree to select the program.
- Click the **Properties** button from the Action Bar.

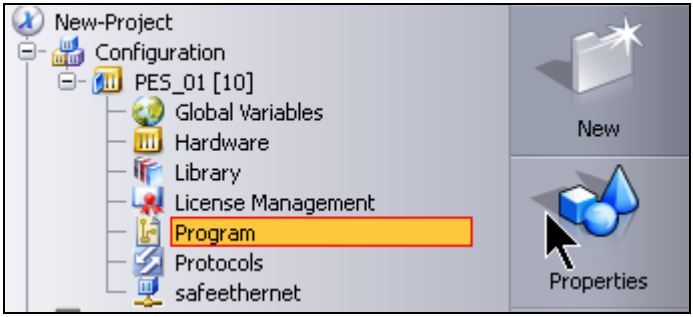


Figure 4-6: Opening the Program Properties

- A dialog box appears in which the program can be configured in accordance with the user requirements. Observe the instructions provided in the safety manual and the requirements specified by the responsible test authority.

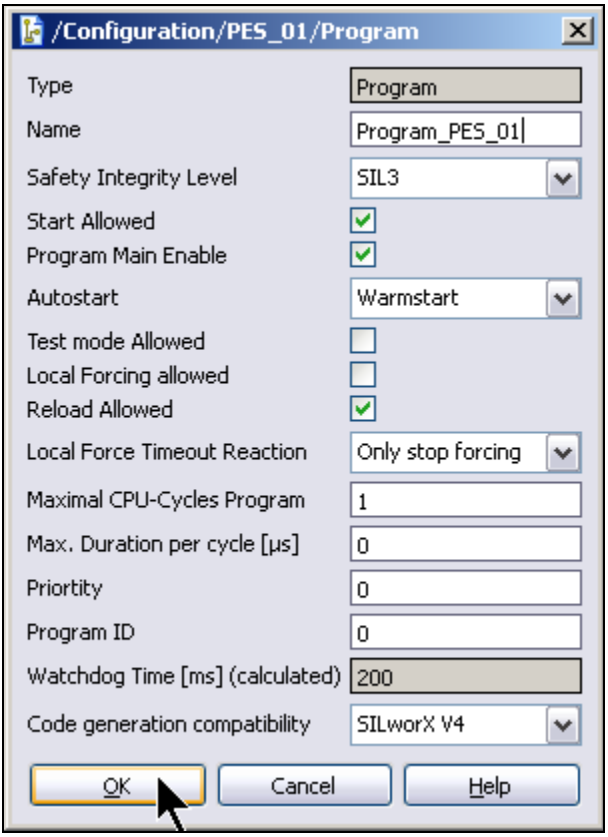


Figure 4-7: Program Properties

Parameter	Description
Name	Enter the program name.
Test Mode Allowed	This parameter should only be used under laboratory conditions, and not in a plant. In safety-related operation, this parameter must be deactivated!
Local Forcing Allowed	This parameter should only be activated to test the user program.
Reload Allowed	For HIMatrix standard systems **Reload Allowed** should be deactivated.
Max. CPU cycles	For HIMatrix standard systems maintain the default settings.
Max. Duration for Each Cycle [µs]	
Priority	
Program ID	The value must be set to 1 for code generation in accordance with SILworX V2.
Code Generation Compatibility	Set this parameter in accordance with the loaded operating system version. See also Table 4, above.

Table 5: Important Program Parameters

For a first test, the default settings may be used for the parameters specified here.

4.4 Creating Global Variables (GV)

The importance of global variables has already been described in Chapter 3.3.1.

Global variables are created in the Global Variable Editor, which is opened as follows:

- Click **Global Variables** in the structure tree to select the *Global Variables* element.
- Then, click **Edit** from the Action Bar.

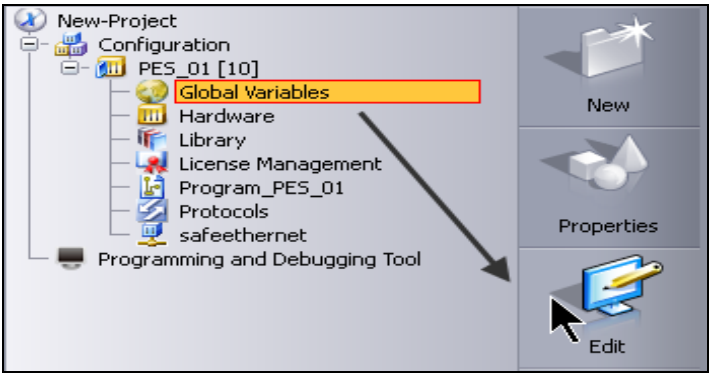


Figure 4-8: Opening Global Variables for Editing

The Global Variable Editor appears in the workspace, on the right-hand side of the Action Bar. The Global Variable Editor is structured as a table and is empty as long as no global variables have been created.

To create global variables proceed as follows:

- Right-click within the table, and select **New Global Variable** from the context menu.

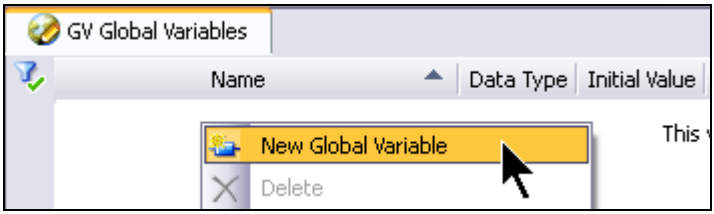


Figure 4-9: New Global Variable

A new global variable is created. The name is automatically assigned by SILworX. By default, the data type is set to BOOL.

TIP Use the Insert key to quickly create additional variables.

- To change the name of the variable, double-click the *Name* field and enter the new name.
- Double-click the *Data Type* field to activate the drop-down list. Click the drop-down list once again and select the data type.
- If required, double-click the *Initial Value* field and enter an initial value. Note that the initial value must match the data type. If the field contains no entry, the initial value 0 applies.

CAUTION

- **The initial value must be the variable's safe value!**

If a fault occurs, global variables physically connected to inputs or outputs are set to their initial value.
If communication fails, global variables used for communication are set to their initial value (mostly adjustable, see HI 801 101 E).

- Double-click *Description* and add a text, e.g., describing the function of the variable.

TIP In the FBD Editor, the description can be displayed in an *Attached Comment Field* located next to the variable.

Technical Unit can be used for representing the physical size in the OLT field such as [bar], [A] etc.

- If required, click the checkbox to set the **retain** or **constant** attribute.

  Retain: In case of a power outage the variable is buffered.

  Constant: The variable is read-only and cannot be written to. This setting is particularly useful for parameters.

Name	Data Type	Initial Value	Description	Additional Comment	Technical Unit	Retain	Constant
Test-variable01	REAL	100.0	variable for testing			☐	☑

Figure 4-10: Example of Variable Definition

The **CSV Export** and **CSV Import** context menu functions allow one to prepare a large number of variables in Microsoft Excel® and import them into SILworX.

- To continue practicing, create additional global variables and save them by clicking the floppy disk symbol. The asterisk * in the editor tab indicates unsaved contents!

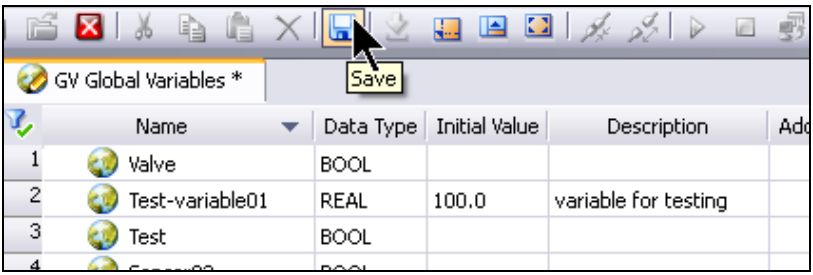


Figure 4-11: Saving Global Variables

4.4.1 Moving Global Variables to Another Scope

The following chapter describes how to move a global variable to a different level than it was original defined without losing its references.

Example: A global variable defined at resource level, is already in use in a program or is assigned to a hardware element. The scope of the variable is limited to the resource.
If during the project the global variable becomes necessary for communicating via safe**ethernet** or OPC, it must be moved at least to the configuration level, or the project level.

Proceed as follows to move a global variable to a higher scope without loosing the references defined so far:

- Copy the variable to be moved as complete record: Click the corresponding line number and select *Copy* from the context menu for the variable.
  Press and hold the Control key while clicking the variables to select individual variables or press and hold the Shift key while clicking a variable to select a group of variables.

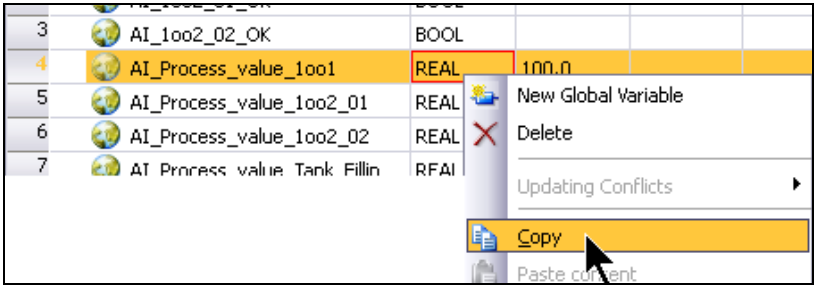


Figure 4-12: Copying the Entire Global Variable Record

- Select the *Global Variables* structure tree element below the required tree level (scope), in which the global variable is to be copied.
- Then, click **Edit** from the Action Bar. The Global Variable Editor appears.

- Right-click the Global Variable Editor and select *Paste* from the context menu.
- Save the change.
- Switch to the original editor and delete the copied variable.
- Save the change.
- In the structure tree, click the project name and select the **Extras, Connect References** menu function.
  If errors occur, the references are not connected. Note the messages in the logbook and correct the errors.
  Finally, reconnect the references.

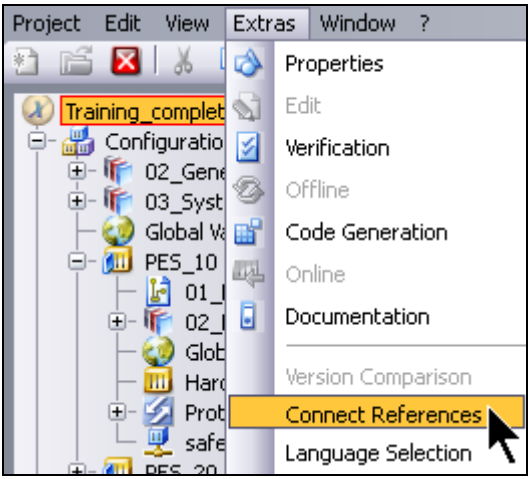


Figure 4-13: Connecting References

- In the new scope, verify the entry displayed in the *Cross-References* tab. It might be necessary to first remove the selection of the variable, and click the variable once again.

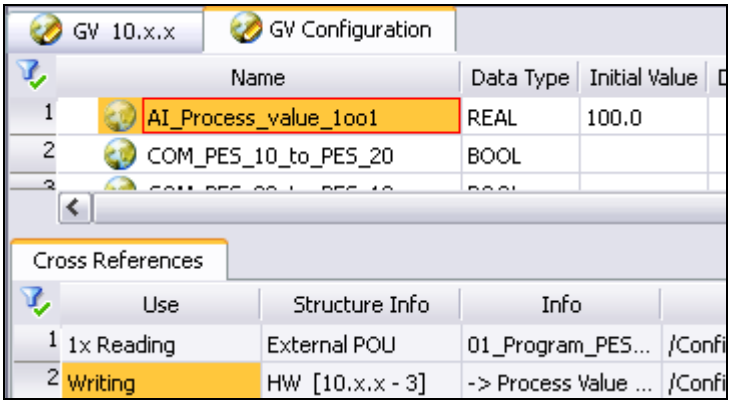


Figure 4-14: Cross-References of the Transferred Variables

4.5 HIMax Hardware

Resources automatically created by SILworX or manually added to the project are generic. This means that they are not assigned any resource type.

As soon as a new resource is created within a project, SILworX automatically adds a hardware object to the structure tree. The resource type used in the project must be assigned to the *Hardware* object.

Depending on the resource type, additional settings might be required.

The following chapters describe how to set up and configure a HIMax controller.

4.5.1 Resource Type, Racks and Modules

The *Hardware* structure tree element is used to assign the resource a resource type.

- Click **Hardware** in the structure tree to select the *hardware*.
- Then, click **Edit** from the Action Bar.

Figure 4-15: Starting the Hardware Editor

- In the *Resource Type Selection* dialog box, select *HIMax*. The Hardware Editor appears on the right-hand side, next to the Action Bar.

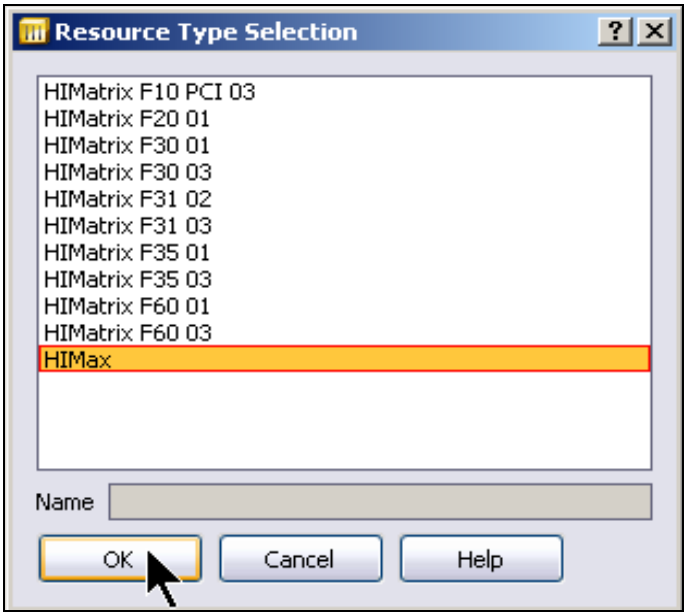


Figure 4-16: Defining the Resource Type

HIMax is a modular system that can be structured in accordance with the user requirements. The required components can be chosen in the Hardware Editor.

- In the Object Panel, open the **Base Plates** tab and select a base plate type. By default, rack 0 is equipped with a X-BASE PLATE 15.
- If the X-BASE PLATE 15 should be replaced, drag another X-BASE PLATE onto the Hardware Editor and drop it just below the rack ID.
- This action must be confirmed, since all previous settings get lost.

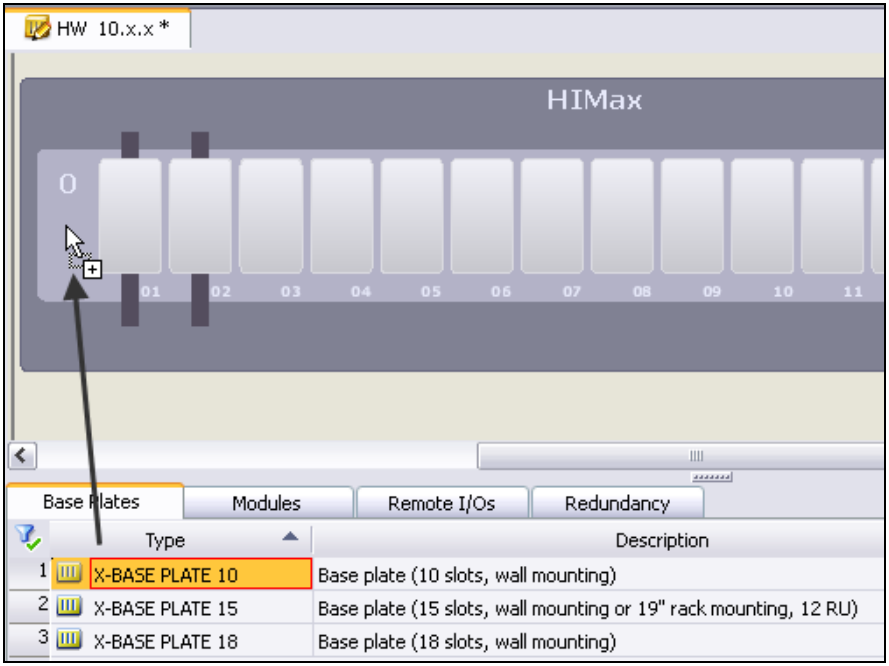


Figure 4-17: Replacing the X-BASE PLATE

- If required, extension racks can be added by dragging the individual racks (X-BASE PLATE) onto the dark-gray area above or below rack 0.

  Racks located above rack 0 are assigned odd numbers.
  Racks located below rack 0 are assigned even numbers.

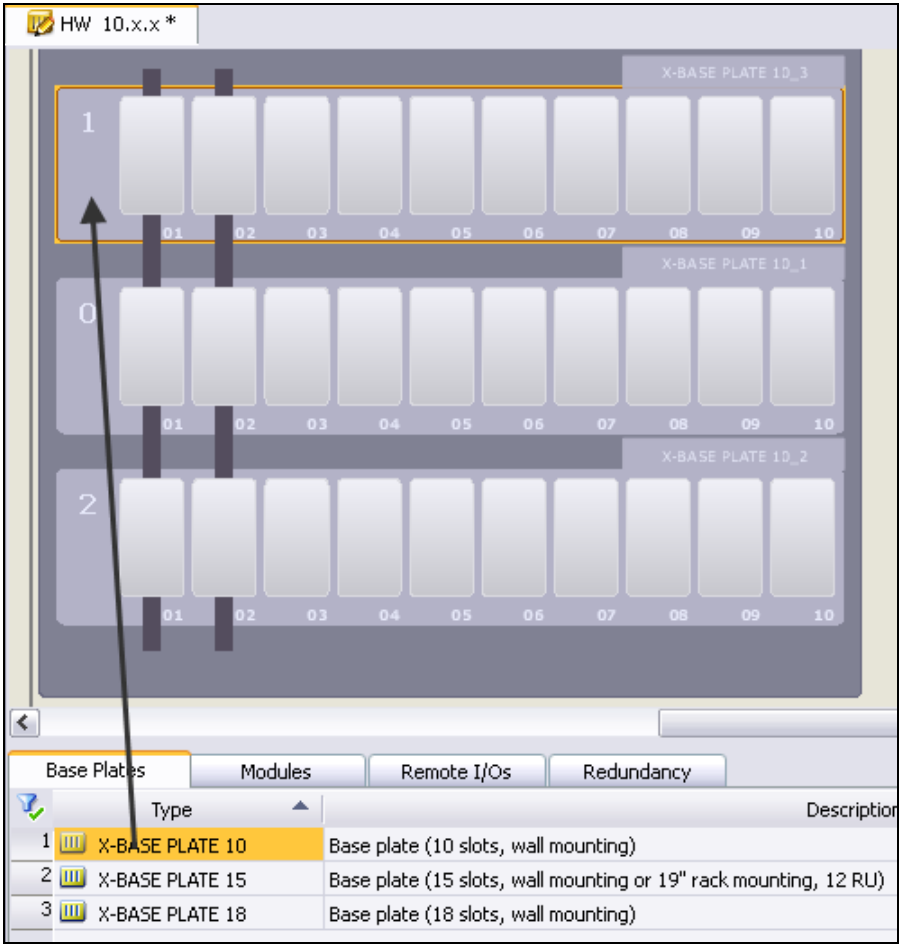


Figure 4-18: Adding Extension Racks

At a later point in time, the UP and DOWN ports of the system bus modules used in all base plates must be connected exactly as specified in the Hardware Editor (refer to the system manual for more details)!

Changing a base plate of a rack already equipped with modules results in the deletion of all modules and corresponding settings! If variables have already been assigned, or multiple parameters been changed, proceed as follows to maintain the defined settings:

- To create an extension rack, drag a X-BASE PLATE from the Object Panel onto the Hardware Editor, and drop it, e.g., above rack 0.
- Move the modules, e.g., from rack 0 to the extension rack.
- Replace the X-BASE PLATE of the empty rack. Finally, move the modules from the extension rack back to the replaced rack.
- Delete the empty extension rack.

4.5.2 Rack Settings:

For each rack, specific properties can be set in the corresponding detail view. To open the detail view:

- Right-click the light-gray area representing the rack and select **Detail View** from the context menu.
- Alternatively, double-click the light-gray area close to the rack ID.

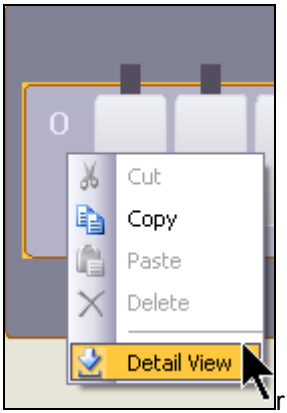


Figure 4-19: Opening the Rack Detail View

The *Rack* tab appears in the Hardware Editor, and can be used to set the following parameters:

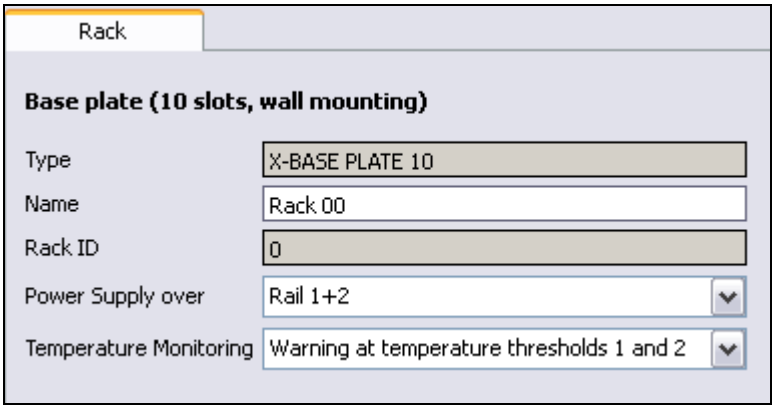


Figure 4-20: Rack Parameters

Parameter	Description
Name	Enter a new name for the rack. Choose a short and significant name and a rack number to facilitate the orientation!
Power Supply over	Set the rail for power supply: • Rail 1 • Rail 2 • Rail 1+2 (=redundant) For further information, refer to the *X-BASE PLATE* manual, section `power supply`.

Parameter	Description
Temperature Monitoring	Warning if the temperature thresholds are exceeded. Temperature threshold 1: > 40°C. Temperature threshold 2: > 60°C. If temperature monitoring is active and a module exceeds the temperature threshold, the ERR LED on the module starts blinking. The module in the online view of the Hardware Editor is displayed in yellow. For further information, refer to the HIMax System Manual, sections `Operating Requirements`, `Considerations about Heat` and `Temperature State`.

Table 6: Rack Properties

4.5.3 Inserting Modules

If the Hardware Editor is opened for the first time, an existing X-BASE PLATE is replaced, or a new rack is added, this rack is empty.

To add modules to the base plate, proceed as follows:

- Open the **Modules** tab located in the Object Panel.
- Drag the module onto the required slot.

  Observe the assignment rules specified in the system manual.

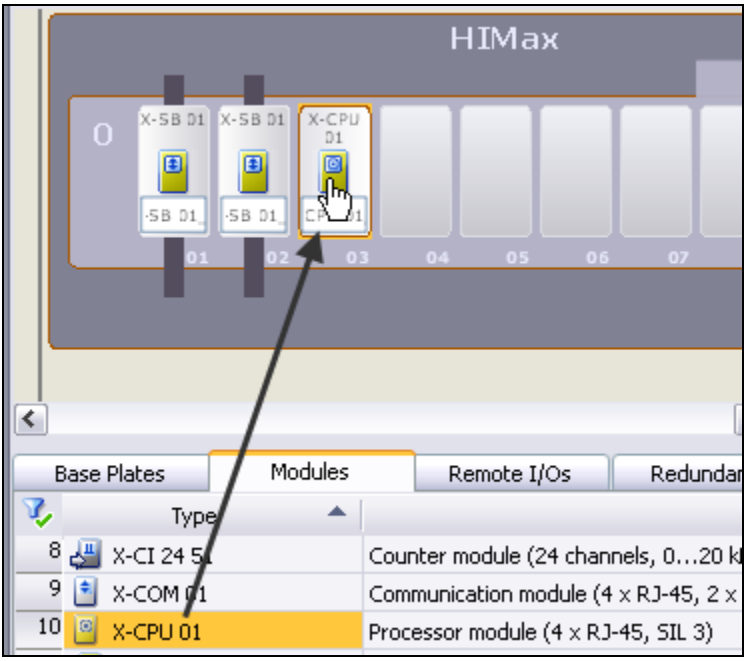


Figure 4-21: Inserting Modules

Basic rules for the assignment:

- Slot 1 - 2: For system bus modules only
- Slot 3 - 6: In rack 0, for processor modules
- Slot 3 - 18: For I/O modules and COM modules

4.5.4 Configuring Redundant I/O Modules

In a HIMax controller, the I/O modules can be connected redundantly. To this end, mono, dual redundant or triple redundant connector board are available which allow connection to the field zone.

Observe the assignment rules when placing mono connector boards in physically separated slots. Redundant connector boards group up to three I/O modules of the same type to form a redundancy group for which no additional wiring is required.

Dual redundant I/O modules are automatically managed in SILworX. No logic must be programmed for these modules. In the Hardware Editor, it is sufficient to aggregate two modules of the same type to form a redundancy group.

In contrast, the evaluation for triple redundant I/O modules must be performed through the user program. Triple redundant connector boards, however, are not the object of this description.

Dual redundant field termination assemblies (FTAs) from HIMA can be used to minimize the wiring effort for a redundancy group composed of two mono connector boards.

If redundant I/O modules are used in the system, the redundancy group must be defined in the SILworX Hardware Editor. If limited to two-fold redundancy, no additional measures need be taken in the user program for selecting the valid data. If one of the redundant I/O modules fails, safe operation is automatically ensured by the second I/O module.

To define and configure a redundancy group, proceed as follows:

- At first, drag the left I/O module from the Object Panel onto the required slot. Observe the assignment rules specified in the system manual.

- Right-click the new I/O module and select **Associate redundancy group** from the context menu. The *Create Redundancy Group* dialog box appears.

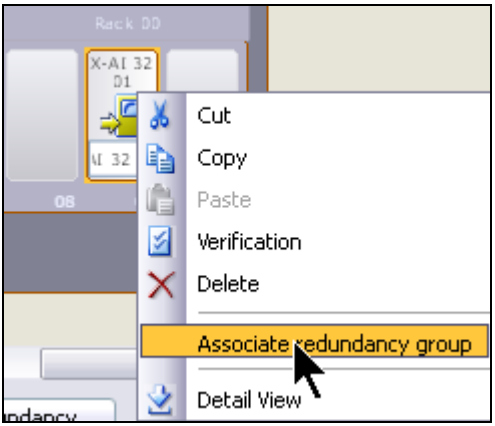


Figure 4-22: Creating the Redundancy Group

- Select a slot for the redundant I/O module from the drop-down list. The default setting is the slot located directly on the right-hand side of the I/O module clicked. This setting can also be modified in a second step by dragging the I/O modules within the Hardware Editor.

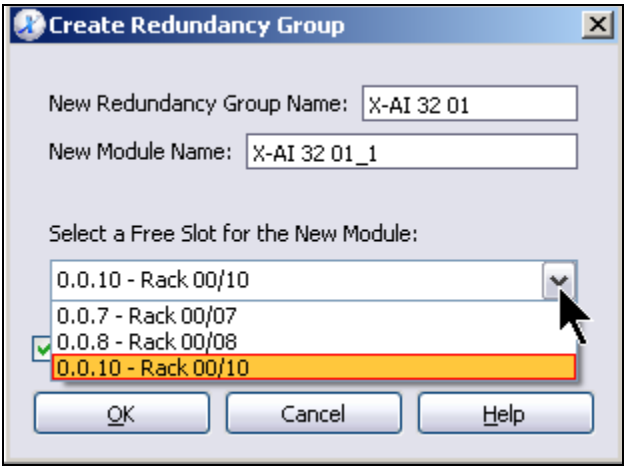


Figure 4-23: Slot Selection

- Click the **Redundancy** tab located in the Object Panel. The redundancy group just created appears.
- Right-click the new redundancy group and select **Detail View**.

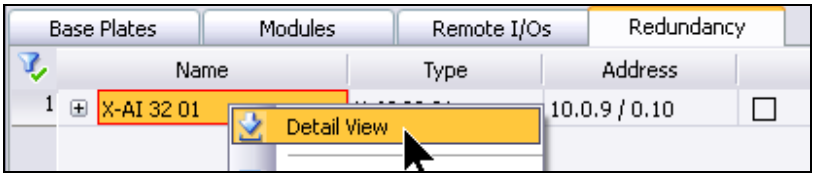


Figure 4-24: Opening the Detail View

- Alternatively, double-click the redundancy group. The detail view can be used to configure additional settings and to assign the variables.
- Assign a useful name to the redundancy group, e.g., `rackNo._SlotNo. 1st Module_SlotNo. 2nd Module`.

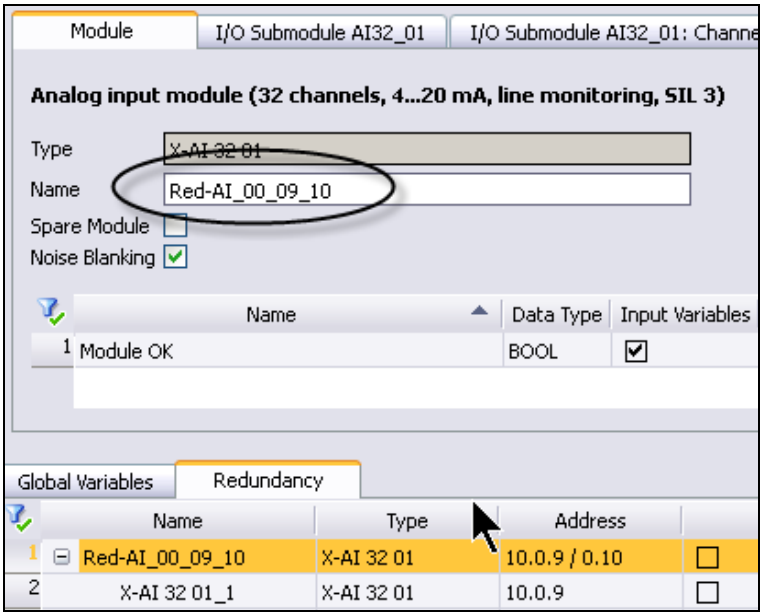


Figure 4-25: Defining the Name for a Redundancy Group

If mono connector boards are used, the I/O modules of a redundancy group can be placed in any position. They may also be separated onto two racks. If the two modules are located in different racks, also use the second rack number for the name.

If a redundant connector board is used, the I/O modules of a redundancy group must be arranged side by side.

All variables assigned to the redundancy group automatically include the redundancy result (in accordance with the setting defined in the last channel column). See also Chapter 4.5.6.

4.5.5 Module Settings

SILworX can be used to configure all settings allowed for the HIMax system. This manual, however, only outlines the most important settings.

Refer to the system manual and the module-specific manuals for more information on settings, system variables and further options.

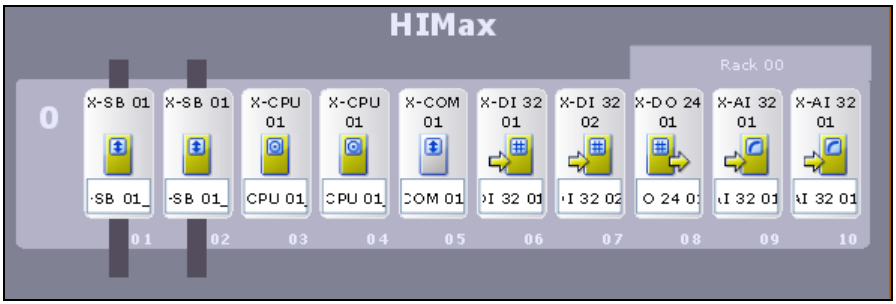


Figure 4-26: Configuration (Example)

4.5.5.1 Setting the IP Address for SB and CPU

The PADT can be connected to any arbitrary Ethernet interface of the processor modules (CPU) or communication modules (COM). While starting up, the PC is also temporary connected to the interfaces of the system bus modules (SB) labeled with *PADT*.

In the network, a unique IP address must be assigned to all processor and communication modules to enable communication with the PADT (programming and debugging tool), other resources or RIOs.

For a first test, use the following IP addresses:

Module	Slot	Description
SB	1	IP: 192.168.0.99 (standard address).
SB	2	IP: 192.168.0.99 (standard address).
CPU	3	192.168.0.11
CPU	4	192.168.0.12

Table 7: IP Addresses

To define the IP address for the processor module in slot 03, proceed as follows:

- Right-click the processor module symbol and select **Detail View** from the context menu.
  Alternatively, double-click the symbol.
  The *Module* tab appears.
- Click the *IP Address* field and enter the IP address: `192.168.0.11`.
- Activate the **Standard Interface** option for the current CPU. In doing so, this IP address is displayed as the favorite during the login procedure.

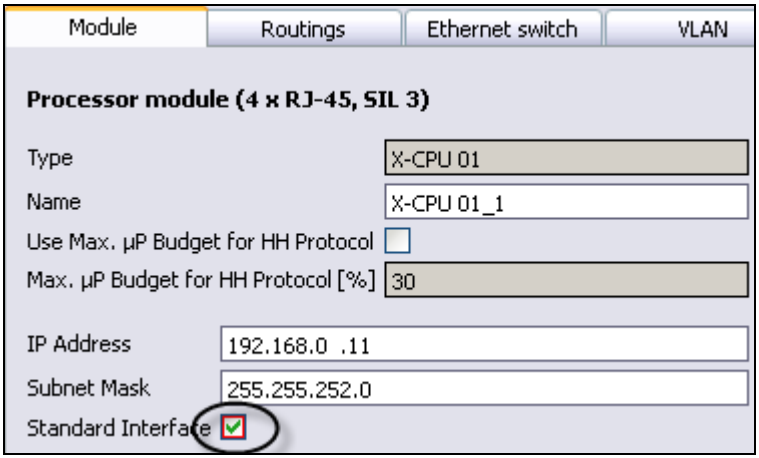


Figure 4-27: Setting the IP Address

Keep the default settings of the other parameters. The default settings were configured to suit most applications and should only be modified by users with good knowledge of network engineering.

- Use the same procedure to set the IP address of the CPU in slot 04 to `192.168.0.12`.
- Use the same procedure to set the IP address of the COM in slot 05 to `192.168.0.13`.

The *Standard Interface* property should only be set in one module.

4.5.6 Assigning Variables to the Hardware

To be able to use a physical input value in the logic, the input must be connected to a global variable with the matching data type.

Create the required global variables in the Global Variable Editor such as described in Chapter 4.4.

4.5.6.1 Settings for HIMax X-AI 32 01

This chapter uses the example of the HIMax analog input module X-AI 32 01 to exemplify how to assign global variables to the inputs and set the ranges of values.

- In the first instance, create multiple global variables of REAL data type, if not done so far (see Chapter 4.4).
- Insert an analog input module X-AI 32 01 to the rack, if not done so far (see Chapter 4.5.3).
- Double-click the X-AI 32 01 module in the rack to open the detail view.

---

i If you have created a redundancy group, composed of two X-AI 32 01 modules, the detail view can also be opened by double-clicking the redundancy group located in the *Redundancy* tab (see Chapter 4.5.4).

- Click the **I/O Submodule AI32_01: Channels** tab. The list of inputs (channels) appears.
- For each input, drag a global variable of REAL data type from the *Global Variables* tab of the Object Panel onto the *-> Process Value [REAL]* column.

- The assignment can be deleted by clicking a table cell and deleting the name of the corresponding variable.

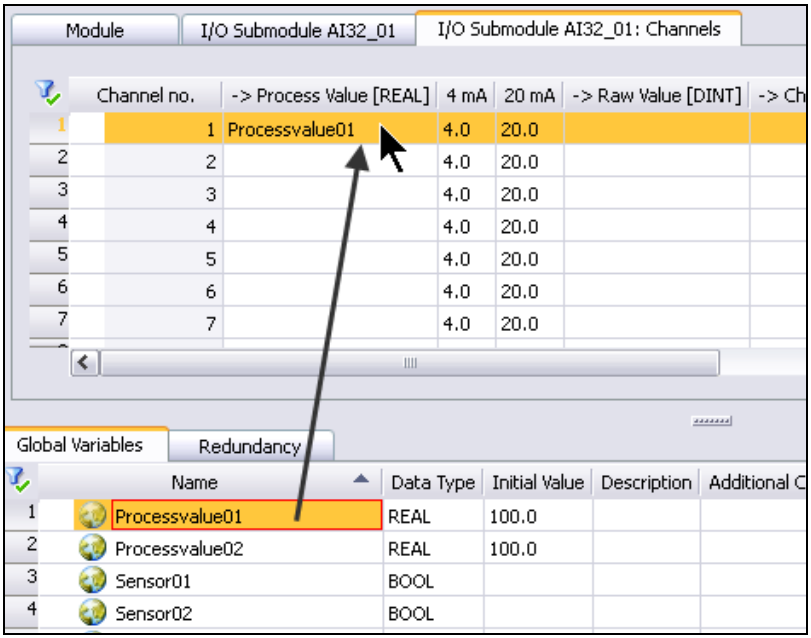


Figure 4-28: Variable Assignment

The process value can automatically be scaled with the parameters *4 mA* (process value at 4 mA) and *20 mA* (process value at 20 mA). Additionally, monitoring for open-circuits and short-circuits is also performed in accordance with the NAMUR thresholds.

-> Process Value [REAL]	4 mA	20 mA
Processvalue01	0.0	100.0

Figure 4-29: Process Value Scaling

If a fault occurs, the initial value of the assigned variable is used as substitute value.

Alternatively, the Raw Value (1 mA = 10000) can be used. In this case, however, the thresholds and *Channel OK* used in the logic must be evaluated by the users themselves.

- For practicing, assign additional global variables. Note that clicking **Close** closes the module's detail view.
- Prior to closing the Hardware Editor, click the **Save** button to save the current changes.

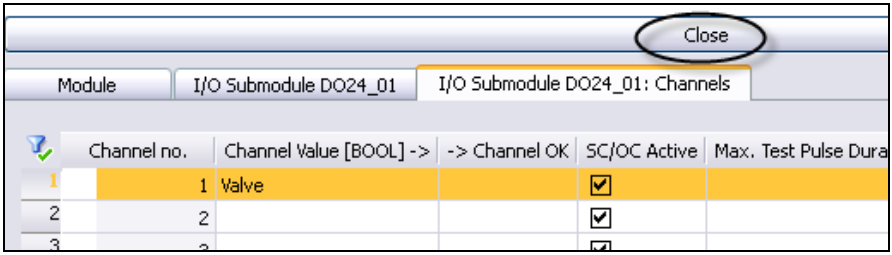


Figure 4-30: Assignment of Variables for a DO 24 01

The examples presented above are only used for demonstration purposes.

For real projects, observe the instructions provided in the manuals specific to the modules in use. The manuals also provide notes on the electrical connection and descriptions of the individual settings and parameters.

4.5.7 Creating Additional Resources

If multiple controllers should be used in the project, further resources can be added to the configuration. In this case, proceed as follows:

- In the structure tree, select **Configuration,** then, click **New** from the Action Bar.
  Alternatively, **New** can also be selected from the context menu of the configuration.

  The *New Object* dialog box appears.
- Select *Resource* and enter a resource name in the *Name* field. The resource name can also be modified subsequently.
- Click **OK** and a new resource with default settings is added to the structure tree.
- Follow the steps described in Chapter 4.2 to configure the resource.

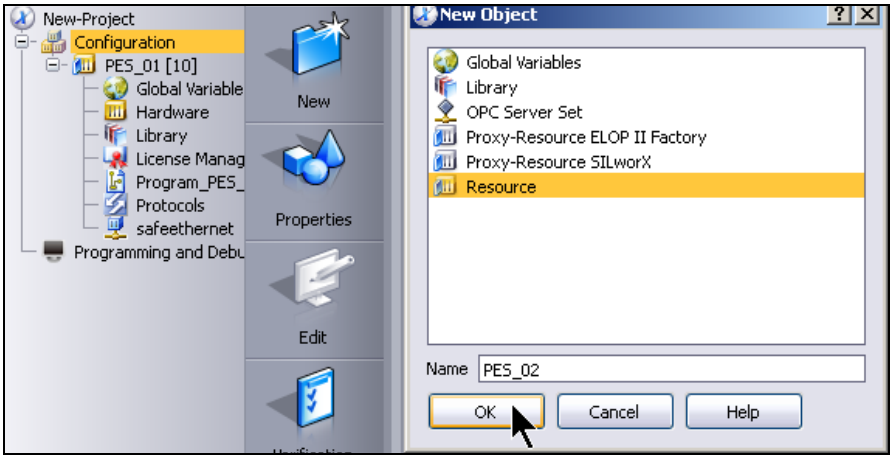


Figure 4-31: Creating a new Resource

i HIMatrix remote I/Os (RIOs) can also be used in a HIMax system, if the application needs more I/O channels than available on the chosen HIMax system (see Chapter 4.6.2).

4.6 HIMatrix Hardware

Resources automatically created by SILworX or manually added to the project are generic. This means that they have not yet been assigned a resource type.

As soon as a new resource is created within a project, SILworX automatically adds a hardware object to the structure tree. You must assign the controller type (resource type) used in the project to the *hardware* object.

Depending on the resource type, additional settings are required. There are different settings for the HIMatrix standard and HIMatrix with enhanced performance systems.

The following chapters describe how to set up and configure a HIMatrix controller.

4.6.1 Resource Type, Remote I/Os and Modules

The *Hardware* structure tree element is used to assign the resource a resource type.

- Follow the steps described in Chapter 4.5.7 to create a resource.
- Follow the steps described in Chapter 4.2 to configure the resource.
- Follow the steps described in Chapter 4.3 to configure the properties of the program.
- Follow the steps described in Chapter 4.4 to create global variables.

Proceed as follows to assign the resource a resource type from the HIMatrix product family:

- Click the **Hardware** structure tree object to select the hardware.
- Then, click **Edit** from the Action Bar.
- In the *Resource Type Selection* dialog box, select `HIMatrix F35 03`.
  The HIMatrix F35 is not a modular, but a compact system and already includes all required components.

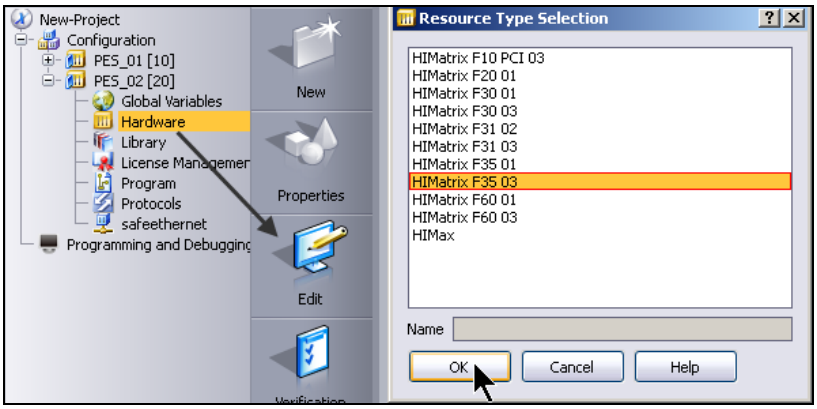


Figure 4-32: Defining the Resource Type

- The Hardware Editor with the selected resource type appears on the right-hand side, next to the Action Bar.

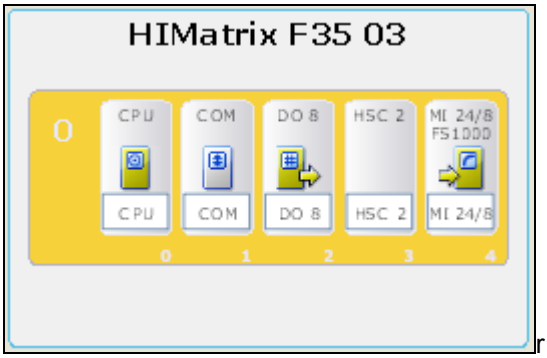


Figure 4-33: Representation in the Hardware Editor

4.6.2 Adding Remote I/Os

If the application needs more I/O channels than available on the chosen system, the system can be extended using so-called remote I/Os (RIOs), which are similar to the extension racks offered in a HIMax system. Remote I/Os can also be used with the HIMax system.

Proceed as follows to add remote I/Os to a system:

- Copy the required remote I/Os from the *Remote I/Os* tab of the Object Panel to the light-gray area of the Hardware Editor.
- Objects can be placed in any position and moved at a later point in time.

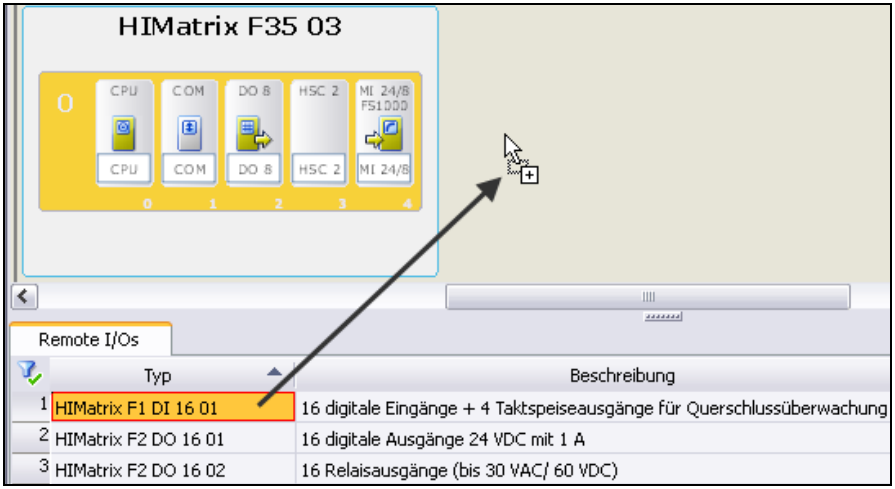


Figure 4-34: Adding a Remote I/O

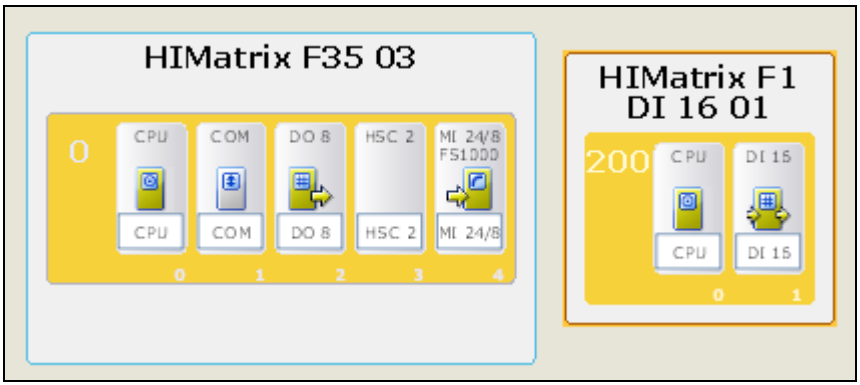


Figure 4-35: Added Remote I/O

If multiple remote I/Os have been added, use the *Navigation* panel on the right-hand side, next to the Object Panel. The *Navigation* panel provides an overview of the hardware of the entire system.

4.6.2.1 Setting the Rack ID

Rack ID 0 always represents the parent resource, which can be a controller from the HIMax or HIMatrix system family.

By default, the rack ID of all remote I/Os is set to 200. If multiple remote I/Os are used, ensure that the rack IDs in use are unique.

The permissible range of values for the rack IDs is 200...1023.

- Double-click the rack ID of a remote I/O. An input field for specifying the rack ID appears.

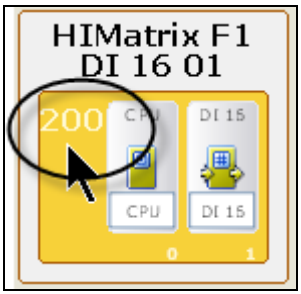


Figure 4-36: Editing the Rack ID

- Enter the desired rack ID. This value must be unique within the resource.

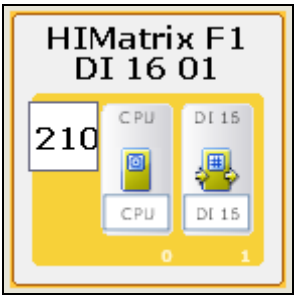


Figure 4-37: The new Rack ID

If four-digit rack IDs are used, the left digit 1 is shifted outside the numeric field during the input.

Once the number is completely entered, the font size is adjusted to ensure that all digits can be read.

4.6.3 Equipping the HIMatrix F60 with Modules

If the modular HIMatrix system F60 is chosen as resource type (see Chapter 4.6.1), the system can be equipped with F60 modules and extended with remote I/Os.

Refer to Chapter 4.5.3 and Chapter 4.6.2 for the corresponding procedures.

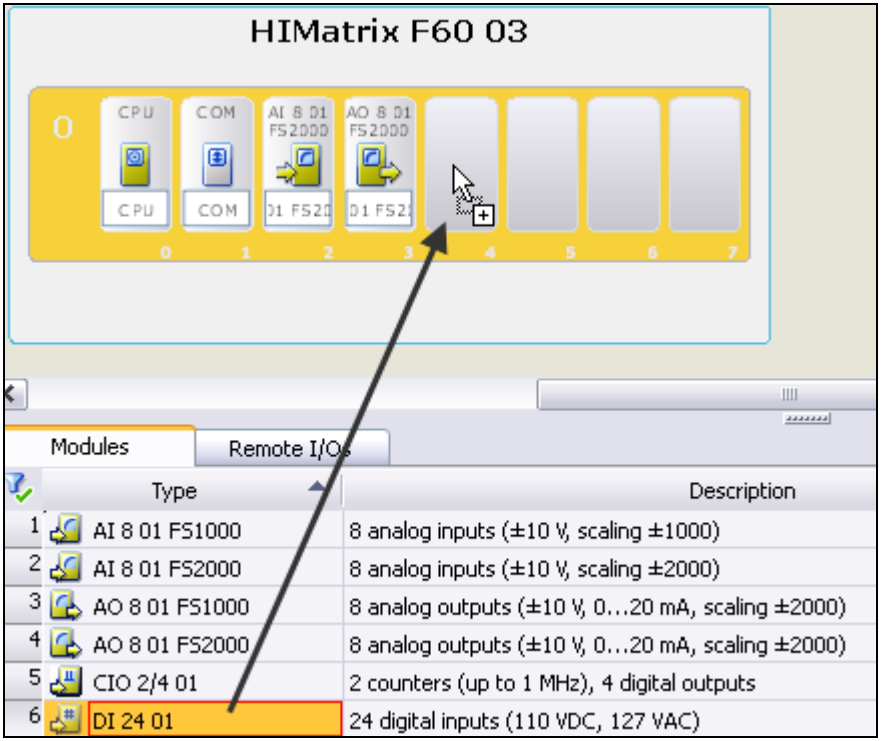


Figure 4-38: Adding Modules to an F60

Refer to the module-specific manuals for technical details on the modules. For example, the notations *FS1000* and *FS2000* refer to the implemented scaling (FS = Full Scale).

4.6.4 Module Settings

SILworX can be used to configure all settings allowed for the HIMatrix system. This manual, however, only outlines the most important settings.

Refer to the system manual and the manuals for the individual modules or compact devices, for further information on settings, system variables and further options.

4.6.4.1 Setting the IP address

A unique IP address must be assigned to all the network's processor and communication modules to ensure communication with the PADT (programming and debugging tool), other resources or RIOs.

i For HIMatrix standard systems, an IP address can only be defined for the COM module.

To define the IP address for the CPU or the COM module, proceed as follows:

- Right-click the CPU module symbol and select **Detail View** from the context menu.
- Alternatively, double-click the module symbol.

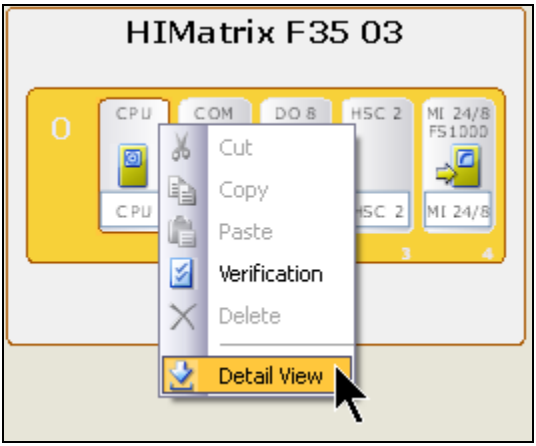


Figure 4-39: Opening the CPU Detail View

The *Module* tab appears.

- Click the *IP Address* field and enter the IP address, e.g. `192.168.0.20`.
- Activate the **Standard Interface** option. In doing so, this IP address is displayed as the favorite during the login procedure.

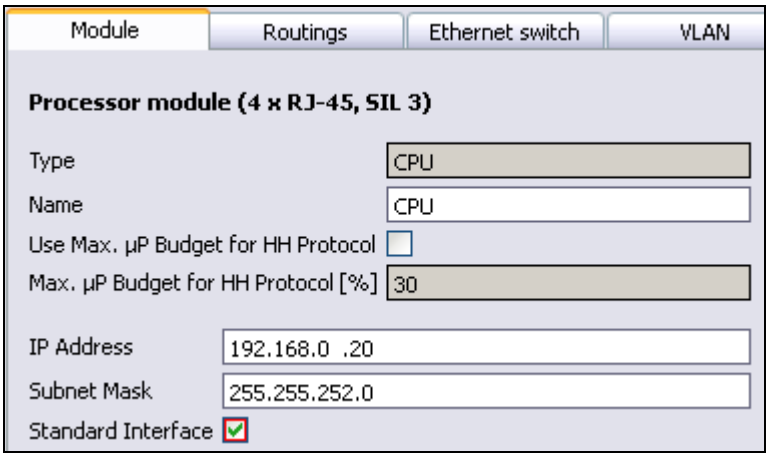


Figure 4-40: Defining the IP Address

Keep the default settings of the other parameters. The default settings were configured to suit most applications and should only be modified by users with good knowledge of network engineering.

---

i For configuring networks in real projects, observe the general rules for IP addressing and the requirements specified in the system manual!

- Repeat the steps described above for the communication module, e.g., with the IP address `192.168.0.21`.
  The *Standard Interface* property should only be set in one module.
- If remote I/Os are used, the IP addresses of the CPUs must be defined in the remote I/Os.

4.6.5 Assigning Variables to the Hardware

To be able to use a physical input value in the logic, the input must be connected to a global variable with the matching data type.

Create the required global variables in the Global Variable Editor such as described in Chapter 4.4.

4.6.5.1 Settings for the HIMatrix F35 (Mixed Input)

This chapter presents the example of the mixed inputs of the HIMatrix F35 to explain how to assign global variables to the inputs and to configure the ranges of values.

- In the first instance, create two global variables for each of the data types BOOL, INT and BYTE, if not done so far (see Chapter 4.4).
- Double-click the MI 24/8 FS... module in the rack to open the detail view.
- Define in the *Module* tab which scaling should be used for the analog inputs. Select the required parameter from the *FS 1000 / FS 2000* field. This setting has no effect on digital inputs. Refer to the HIMatrix F35 manual for more details.

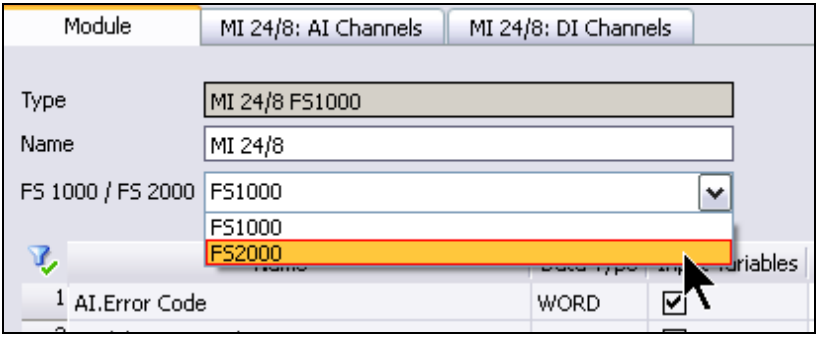


Figure 4-41: Setting the Full Scale

- Click the **MI 24/8 AI Channels** tab. The list of analog inputs (= channels) appears.

The list includes eight analog input channels. For each channel, the parameters *Error Code*, *Value* and *Channel Used* can be connected to a global variable and evaluated in the user program.

- For each channel, drag a global variable of matching data type from the *Global Variables* tab of the Object Panel onto the table columns.

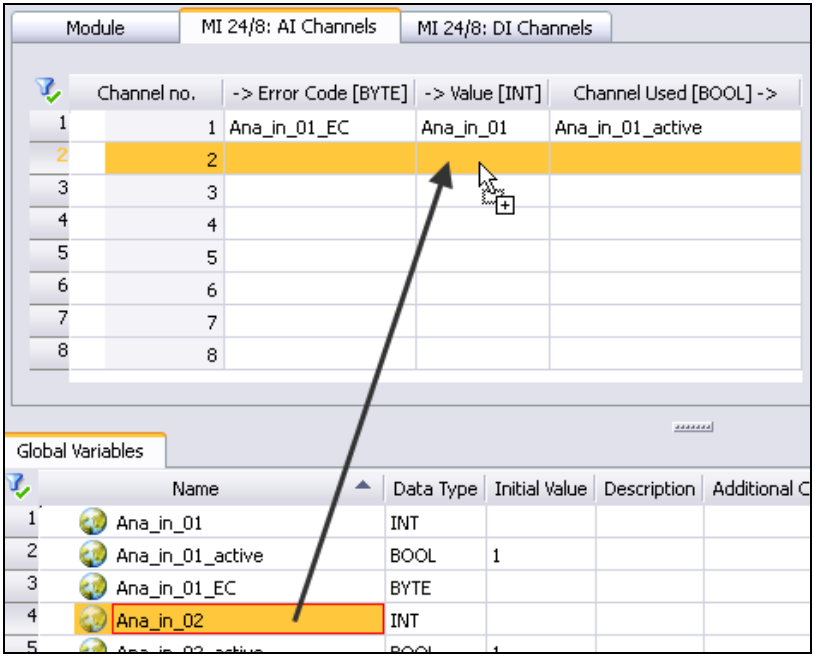


Figure 4-42: Assigning Variables and Channels

- Activate the analog channels that should be used. To this end, connect the *Channel used [BOOL] -> parameter to a* global variable with the initial value TRUE.

i In particular for analog values the *->Error Code [BYTE]* data are used in addition to the *->Value [INT]* data.

All channels that have an analog basis must be activated explicitly. For this reason, **Channel Used -> [BOOL]** must be assigned a variable with the initial value TRUE.

- The assignment can be deleted by double-clicking a table cell and deleting the name of the corresponding variable.

4.6.6 Creating Additional Resources

If multiple controllers should be used in the project, further resources can be added to the configuration. Refer to Chapter 4.5.7 for the corresponding procedure.

4.7 Creating the Program (Logic)

The program (also user program) contains the logic required to control a process in connection with one or multiple programmable electronic systems (PES).

Function block diagrams (FBD) and sequential function charts (SFC) in accordance with IEC 61131-3 can be used to program systems in SILworX. The actual programming is done in the Function Block Diagram Editor.

This chapter describes some basic actions in the FBD Editor. To this end, open a program.

- In the structure tree, select the *Program* object subordinated to the resource that should be programmed and click **Edit** from the Action Bar. The FBD Editor appears.

Figure 4-43: Editing the Program

Alternatively, the FBD Editor can also be opened by double-clicking the *Program* structure tree element.

The FBD Editor is basically divided into the following areas: Drawing Area, Object Panel, and Navigation. Refer to Chapter 3.1.5 and Chapter 3.1.6 for a short introduction.

4.7.1 Selecting Standard Functions and Function Blocks

SILworX offers numerous standard functions and standard function blocks that can be used to create programs.

Group complex program segments to user-defined function blocks and use them multiple times in the projects.

Proceed as follows to use the functions and function blocks:

- Click the **Blocks** tab located in the Object Panel.
- Click the column title to sort the table content by *Library Type*.

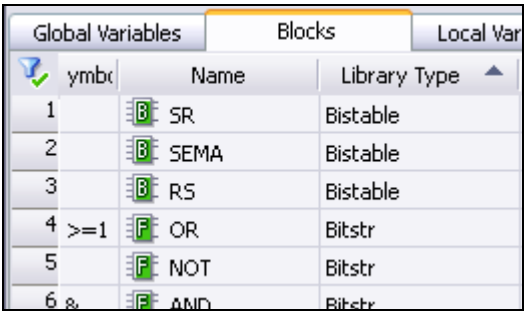


Figure 4-44: Sorting the Columns

Use the filter function or the following strategy to accelerate the search of functions and function blocks:

- Click anywhere within the *Library Type* column.
- Enter the first letter of the required library, e.g., B for *Bitstr*. The selection jumps to the first function block of the first library beginning with B.
- Press B until the first object of *Bitstr* appears.
- Select the first object located in the *Name* column of this library.
- Enter the first letter of the required function or function block, e.g. N for *NOT*.
- Press N multiple times. *NE* and *NOT* are alternatively selected since no other objects beginning with N exist.
- User-defined functions and function blocks are available in the *Function and Function Block* library type.

4.7.2 Copying Objects in the Drawing Area

- To practice, drag some objects from the Object Panel onto the drawing area.

  From **Bitstr**: 1x AND

  From **Compare**: 1x GE

  From **Timer**: 1x TON

  From **Convert** 1x AtoINT

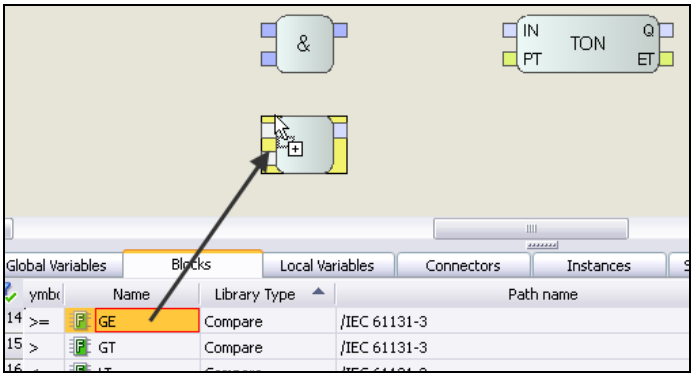


Figure 4-45: Copying POUs in the Logic

- Click the **Global Variables** tab and drag the *Sensor1* variable onto the drawing area:

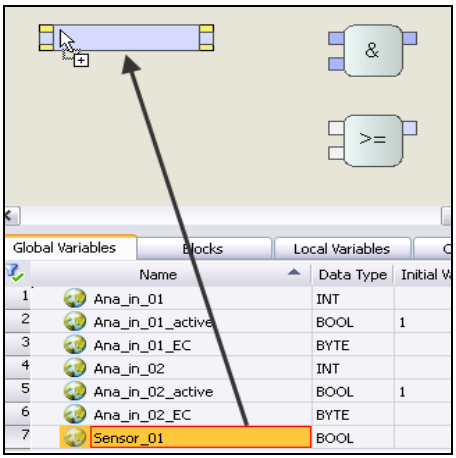


Figure 4-46: Copying Variables in the Logic

4.7.3 Connecting Objects in the Drawing Area

- If required, zoom the drawing area in to perform the following steps more easily:

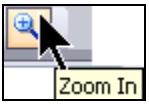


Figure 4-47: Zooming In

- Connect the output of the *Sensor_01* variable to an input of the AND function.
- Click the output **1**, hold the mouse button and drag a line to the input **2** of the AND function. Then, release the mouse button.
- Drag the *Sensor_02* variable onto the drawing area and connect the *Sensor_02* output to the available input **3** of the AND function.

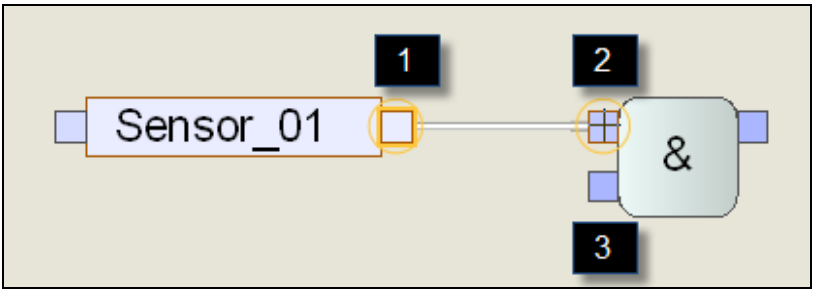


Figure 4-48: Drawing Lines

4.7.4 Extending Function Blocks and Functions

- If a function or function block with more than two inputs is required, position the cursor on the lower border of the POU. If the mouse pointer changes its form to a double arrow, the POU can be extended.
- In the example: Press the left mouse button and hold it while dragging the AND function border downward. The function can be extended up to a maximum of 16 inputs.

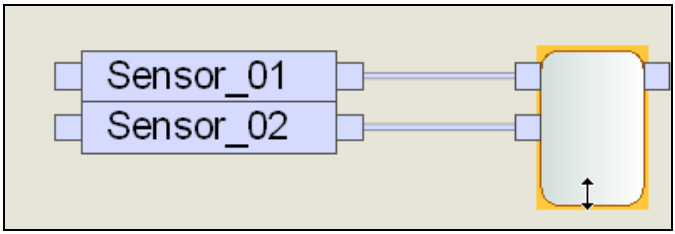


Figure 4-49: Enlarging Function Blcoks

4.7.4.1 Creating Value Fields

Create one value field of REAL data type and one value field of TIME data type. To do this, proceed as follows:

- Right-click anywhere in the drawing area and select **Create Value Field** from the context menu.

Figure 4-50: Creating Value Field

- Left-click to position the value field at the required location. The new value field is of BOOL data type.

---

i The color of the value field corresponds to the assigned data type (see the online help).

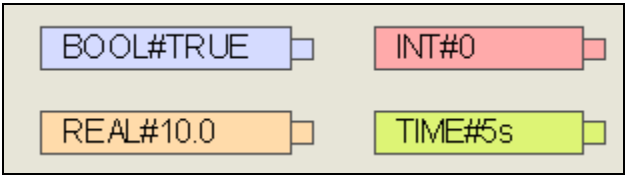


Figure 4-51: Various Data Types

- Double-click the value field and enter the real value `800.0`. SILworX recognizes the data type and changes the color of the value field.
- In previous SILworX versions, an error is displayed.
  In the first instance, this error can be ignored.
- Connect the value field to the required input.
- If the conflict is still reported, proceed as described in Chapter 4.7.5.

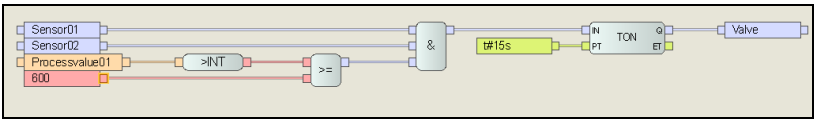


Figure 4-52: Logic Completed

- Create another value field and enter the value `t#5s`. The data type of the value field is automatically adjusted.
- Position the value field such as represented above.
- Copy the *Process Value* and *Valve1* variables from the *Global Variables* tab to the drawing area and complete the network.
- Assign a page name in **Page List**.

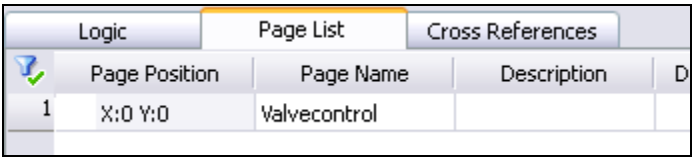


Figure 4-53: Specify the Page Number

- Save the program.

4.7.5 Updating Conflicts

In previous SILworX versions, an unconnected value field is marked as faulty if the value specified in the field does not allowed to uniquely indicate the data type, e.g., 800.0 can be REAL or LREAL. After the value field is connected, the conflict must be refreshed.

- Right-click the drawing area and select **Update Conflicts, All Value Fields with Conflicts** from the context menu.

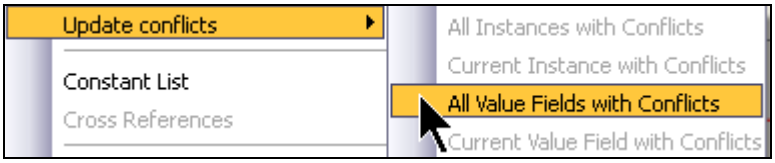


Figure 4-54: Refreshing Value Fields

4.7.6 Selecting Polylines

The following options are available for selecting lines:

Individual segment	Mouse click
Intersection point to intersection point	Double-click
Entire polyline	Shift key+double-click

4.7.7 Moving Lines

The following options are available for moving lines:

Line end	Shift key + drag&drop with the line end
Line segment	Shift key + drag&drop with the line segment

4.7.8 Locking Line Segments

The position of line segments can be locked and thus excluded from the graphical autorouting.

- Right-click the segment and select **Fix Element** from the context menu.

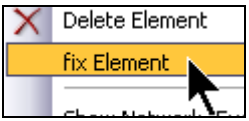


Figure 4-55: Locking Elements

- Repeat the step described above to undo the locking procedure.

4.8 Offline Simulation

During the offline simulation, SILworX only simulates the processing of the user program, at which the logic displayed is basically identical to that of the online test (see Chapter 6.4).

The offline simulation is operated like forcing.

4.8.1 Preparing the Offline Simulation.

- In the structure tree, select the program for which the offline simulation should be started, e.g., *Program* 1.
- Click **Offline** 2, from the Action Bar, or right-click the program and select **Offline** from the context menu.

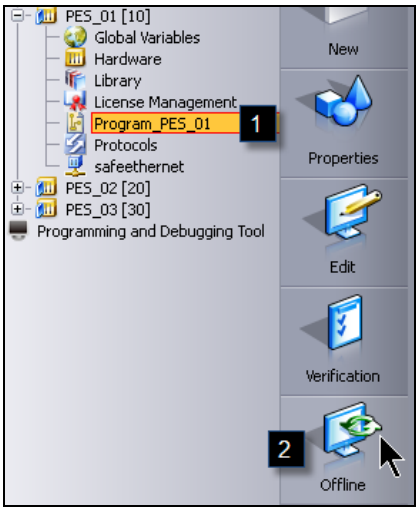


Figure 4-56: Starting the Offline Simulation

- Click **OK** to confirm *The offline simulation is being prepared...* dialog box. The code generator is being started without the need of additional settings.
- If warnings or error messages are displayed in the logbook, refer to Chapter 4.9.1 for details on how to perform the fault analysis!

4.8.2 Starting the Offline Simulation Processing

If code was generated with no errors, the program logic is opened as offline simulation.

- Select **Online, Programs, Program Cold Start…** to start processing the offline simulation. The *Start Program...* dialog box appears.

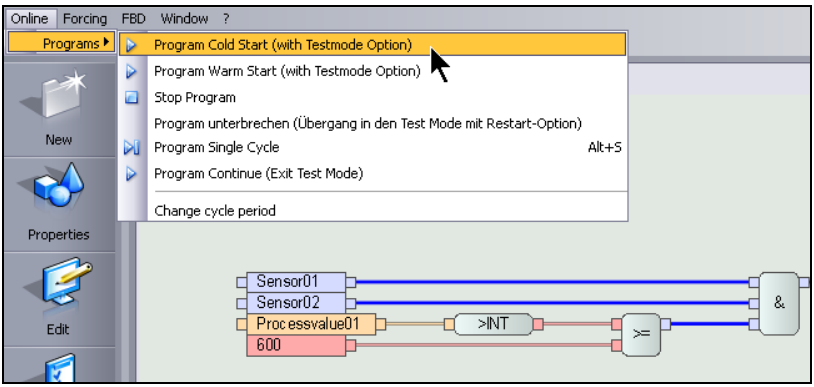


Figure 4-57: Starting the Offline Simulation Processing

- Keep the default settings for all options and click **OK**.

4.8.3 Manipulating Variable Values in the Offline Simulation

If the variable values should be manipulated, this can be done directly in the space where the logic is displayed (drawing area), or in the Object Panel. The values are set using forcing.

4.8.3.1 Setting Values in the Drawing Area

- Right-click the variable of which the value should be modified, and then select **Edit Global (Local) Force Data** from the context menu.
- To select a group of variables, press the Ctrl key and simultaneously click the required variables.
  Make sure to select either global or local variables. If both variable types are selected, the menu function is not available.

- Right-click a selected variable and choose **Edit Global (Local) Force Data** from the context menu. The *Edit Global (Local) Force Data* dialog box appears.

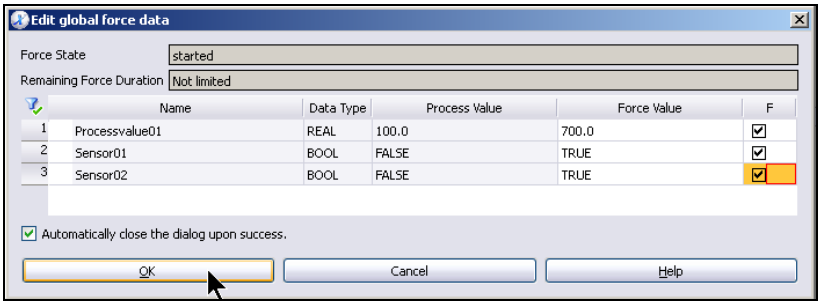


Figure 4-58: Entering Values in the Offline Simulation

- Enter the required force value in the *Force Value* column. The data format and range of values must be consistent with the data type. Instead of TRUE and FALSE, also 1 and 0 can be entered.
- Activate the individual force switch in column *F*.
- Click **OK** to confirm the action: the process value is replaced by the force value.

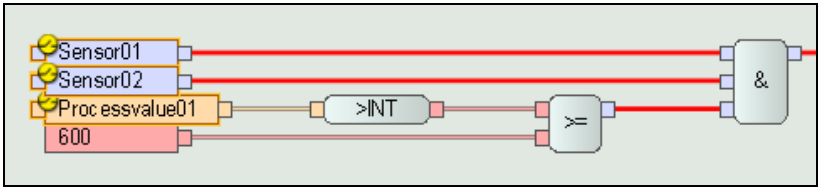


Figure 4-59: Representation of Manipulated Variables

Manipulated variables are specially marked:

1. A yellow switch icon is displayed on the left-hand side, above the variable.
2. In the OLT field of a forced variable the letter F appears left of the force value. The color of the OLT field changes from gray to yellow.

4.8.3.2 Manipulating Variable Values in the Object Panel

The procedure is basically identical to that previously described.

The advantage of manipulating in the Object Panel is that one cannot accidentally select both global and local variables simultaneously. The menu function is then not enabled.

- In the Object Panel, select the **Global Variables** or **Local Variables**.
- Select the variables to be manipulated.

  All variables:
  Press Ctrl+A.

  Continuous groups of variables:
  Click the first variable, press and hold the shift key while clicking the last variable of the block.

  Multiple individual variables:
  Press the Ctrl key and simultaneously click the required variables.
- Right-click one of the selected variables and select **Edit Global (Local) Force Data**. The *Edit Global (Local) Force Data* dialog box appears with the selected variables.
- Change the variables such as described in the previous chapter.

4.9 Code Generation

Prior to loading a program into the controller, code must be generated. The code generation verifies the configuration settings and the syntax of the logic, and converts the SILworX data into machine-readable code.

If faults are detected in the project, code generation is aborted and messages reporting potential fault causes are output. These faults must be removed manually.

Proceed as follows to perform the code generation:

- Right-click the Resource structure tree element for which code should be generated and select **Code Generation** from the context menu. The *Start Code Generation* dialog box appears.

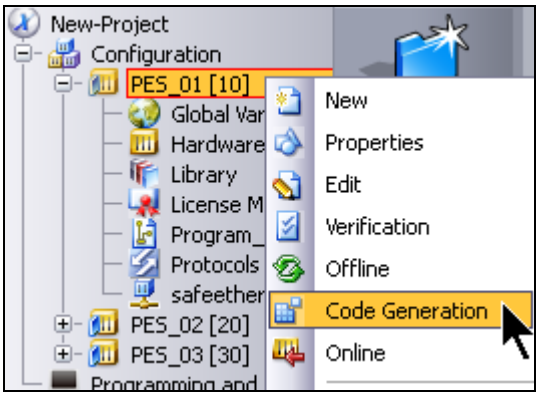


Figure 4-60: Starting the Code Generation

- Activate the option **Automatically close the dialog upon success** and click **OK**.

Alternatively, select the *Resource* structure tree element and click the **Code Generation** button located on the Action Bar.

Set the following parameters in the *Start Code Generation* dialog box:

Parameter	Description
Prepare Reload	The code generated by the code generator can be loaded into the controller by performing a reload. Certain conditions must be met for reload. HIMatrix standard systems cannot be loaded by a reload. HIMatrix with enhanced performance systems require a license to enable the reload function. Also observe the instructions specified in the Safety Manual and in the System Manual.
Simulate Only	All code-relevant checks are performed, but no code file is generated.
Automatically close the dialog upon success.	The window is automatically closed if the code generator did not detect any errors.

Table 8: Code Generation Parameters

4.9.1 The Code Generator Reports Warnings and Errors

If the code generator detects inconsistencies and errors, they are reported in the logbook.

If warnings were reported during code generation, it is possible to load the code, but the warnings should be addressed to for industrial applications. They usually report incomplete parameter setting and tasks.

Errors must be removed!

Right-click the logbook and use the **Go to** context menu function to locate the warning and error causes more rapidly.
Click the (+) sign located left of the code generator message list to open the list. Right-click a text line and select **Go to...**

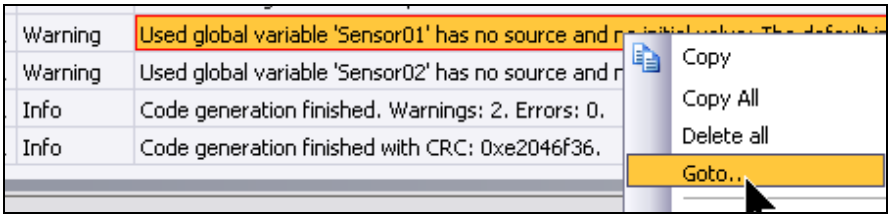


Figure 4-61: Localizing Warnings and Erros

4.9.2 After a Successful Code Generation

The code generation result is a configuration file containing all programs and resource settings.

This file is therefore called resource configuration.

The detailed code generation report is located in the logbook. Click the + sign on the left-hand side of the row to open the detail view.

20/04/2011 12:52:17.749	Info	Code generation finished. Warnings: 0. Errors: 0. CRC: 0x0327eb4a-V4.
20/04/2011 12:52:05...	Info	Source code generation started.
20/04/2011 12:52:05...	Info	Source code generation completed.
20/04/2011 12:52:14...	Info	Code generation finished. Warnings: 0. Errors: 0.
20/04/2011 12:52:17...	Info	Code generation finished with CRC: 0x0327eb4a.

Figure 4-62: Messages of the Code Generator

One of the most important information is the code version generated by the code generator; in the previous figure, CRC： 0x 0327eb4a .

⚠ CAUTION

To ensure the safety-related operation of the PES, code generation must be carried out twice! This action must always be started manually.

The code is only valid if both code generations result in identical code versions. This ensures the detection of potential errors (bit errors) that could result from the non-safe PC during code generation.

To do so observe the instructions specified in the Safety Manual.

5 Start-up

This chapter first provides an explanation of the fundamental terms and then describes the start-up procedure for distinguished hardware types.

5.1 Basic Knowledge

5.1.1 SRS

An important setting for the HIMax or HIMatrix controllers is the so-called SRS. It is composed of the system ID, the rack ID and the slot ID.

System ID: The system ID is a resource property and indicates the system, e.g., when resources are communicating via safe**ethernet**.

Rack ID: Each rack is assigned an own ID, in accordance with the specifications made in the Hardware Editor. The rack 0 of a HIMax system is always composed of one or multiple CPU modules. The extension racks (rack 1 ...) usually only contain I/O modules and COM modules.

In the HIMax system, all the racks are interconnected via system bus modules. Each rack ID must be unique within a system bus.

In the HIMatrix system, the remote I/Os are organized like extension racks and are connected via safe**ethernet**.

Slot ID: Slot of a module. The slot depends on the hardware configuration.

5.1.2 Responsible Attribute for SB (HIMax only)

Another important property is the *Responsible* attribute for system bus modules (SB). In each system bus (left: bus A, right: bus B), the access of the CPU modules to the system bus is controlled by the responsible system bus module.

For system bus A, the *Responsible* attribute is reserved for the left system bus module (bus A) in rack 0 (fixed assignment).

In most standard configurations of system bus B, the *Responsible* attribute is assigned to the right system bus module (bus B) located in rack 0.
If CPU modules are contained in rack 1, however, the assignment can also be performed in rack 1.

The SRS and the *Responsible* setting are stored to a non-volatile memory of the connector boards for system bus and CPU modules. This important information is thus maintained even if modules are replaced.

5.1.3 MAC Address

Each HIMax and HIMatrix module has at least one hardware address defined during its production and referred to as MAC address. It is specified on a label on the module. The MAC address can be used to start communication with a module even without knowing the IP address and SRS.

HIMatrix systems with extended performance are equipped with up to eight MAC addresses. The first MAC address is documented on a label:

- The CPU MAC address is printed on the label.
- The COM MAC address is the CPU MAC address + 1.
- For F10 PCI 03: The MAC address of the PC internal port is the CPU MAC address + 8.

5.1.4 IP Address

IP addresses can be defined for system bus modules, processor and communication modules.

An IP address is composed of the network ID (net ID), subnet ID and host ID. In the subnet mask, one can define which portion of the IP address should contain the network and subnet IDs.

Example:

IP address	Decimal	192	168	0	20
	32-bit	11000000	10101000	00000000	00010100
Subnet mask	Decimal	255	255	252	0
	32-bit	11111111	11111111	11111100	00000000

Table 9: Subnet Mask and IP Address Relation

All the bits of the IP address which are masked with [1] in the Subnet mask belong to the network ID plus subnet ID.

i The network address of all network participants must be identical if no gateway or router is used. If required, contact the network administrator.

All the bits of the IP address which are masked with [0] in the Subnet mask belong to the node ID.

5.1.5 Login

A normal login usually requires the suitable target IP address. However, the IP address is not important for system operation. System operation is explained in details in Chapter 5.2 and Chapter 5.3.

A module's IP address is stored to a non-volatile memory within the module.

The IP address is selected in accordance with the following priorities:

- If a valid SILworX configuration is loaded, the IP addresses are taken from this configuration.
- If no valid configuration is available, the last valid IP address of the module is used. Take this into account if modules are used which have previously been used in another application.
- HIMax factory setting:

  Brand-new system bus modules or CPU modules that are booted with the *Mode* switch set to INIT receive the standard IP address 192.168.0.99.
- HIMatrix factory setting:

  After restoring the factory settings, a HIMatrix receives the standard IP address 192.168.0.99. Refer to Chapter 5.3.4 for details.

To ensure that a unique IP address is defined for the current module, we recommend to read out the IP address through the *Search via MAC* dialog box and use it for the first login.

The IP address of the PC must match the subnet mask and be located in the same network as the IP address of the module to be connected. It is possible that the IP address of the PC needs to be modified.

Example of a functioning connection:

- HIMax module data:
  IP address: 192.168.0.xxx (not 215),
  Subnet mask: 255.255.252.0
- PC data:
  IP address: 192.168.0.215),
  Subnet mask: 255.255.252.0

5.1.5.1 Erasing the ARP Cache

When starting up a HIMA system for the first time, the PADT must be connected multiple times with various modules, which may have identical IP addresses (factory settings). This can cause the ARP cache of the PADT to still be holding a previous MAC address for the current IP address. In such a case, no IP communication can be started. If the ARP cache is erased, the cache data are refreshed.

- Erase the ARP cache using the following DOS command:
  `arp -d`

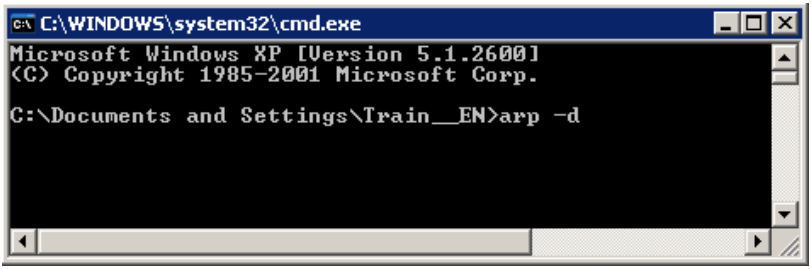


Figure 5-1: Erasing the ARP Cache

To avoid the problem of obsolete data in the ARP cache, HIMA recommends to establish direct 1 to 1 connections between PADT and module during start-up and avoid the use of installed networks (switches).

5.1.6 Setting the IP Address of the PADT

The following example shows how to set the IP Address of the PADT. If the PADT is equipped with multiple network cards, makes sure to select the network card required for the application.

- Open the **Properties** of the network card.

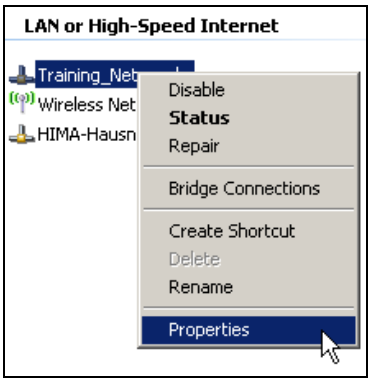


Figure 5-2: Properties of a Network Card

- Select the *Internet Protocol...* element located in the *General* tab and click **Properties**.

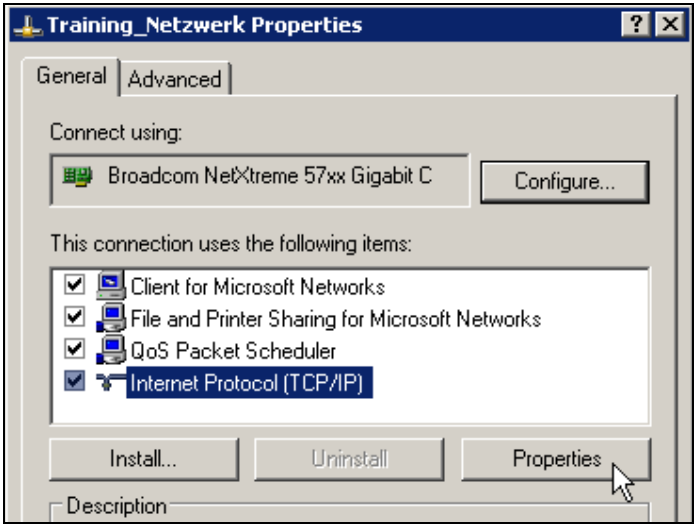


Figure 5-3: Opening the Properties of the Internet Protocol

- In the *Use the Following IP Address* group box, enter the IP address required in the project and the corresponding subnet mask.
  The setting is accepted only if the corresponding network card is active, i.e., it is already physically connected.
  Refer to Chapter 5.1.4 for details on how to configure the IP address.

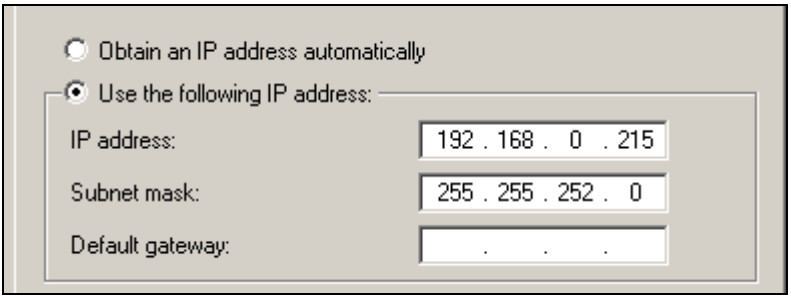


Figure 5. 4:Entering the IP Address

5.1.7 The Mode Switch on the HIMax X-CPU

The seting of the mode switch on the CPU module is only requested while booting the controller (connecting the power). Changing the mode switch position during operation has no effects on the controller.

5.1.7.1 Booting with Mode Switch set to INIT

If the mode switch is set to **INIT** and the controller is booted, the following settings become active:

- IP address: 192.168.0.99 (factory setting).
- SRS: 60000.0.X (factory setting).
- Login: Administrator, with empty password (factory setting).
- Enables: Standard enables are active.
- Deletion: It is possible to reset to the factory settings (master reset).

5.1.7.2 Booting with Mode Switch set to STOP

Setting the mode switch to **STOP** and booting the controller prevents the user program from being executed immediately and the CPU from entering the RUN state, inspite of a valid configuration and the *Autostart* set to TRUE.

This must be taken into account during a first system start-up if CPU modules previously used are put into operation.

In the STOP state, the user program is not run. A new user program can be loaded.

If a valid configuration is loaded into a CPU and the conditions for system operation are met, all settings such as SRS and IP address from the valid configuration become operative.

TIP A reset to the factory settings (master reset) should always be performed on processor modules with unknown configurations.

5.1.7.3 Booting with Mode Switch set to RUN, or Switching from INIT to RUN

If the mode switch is set to **RUN** and the controller is booted without holding a valid configuration, the controller enters the state STOP/INVALID CONFIGURATION (the yellow STOP LED is blinking). A new configuration can be loaded by performing a download.

If the mode switch is set to **RUN** and the controller is booted while holding a valid configuration, the controller enter the RUN state if *Autostart* is set to TRUE in the configuration. All user programs are run cyclically or periodically.

5.1.8 LED Indicators on the HIMax X-CPU

- The INIT LED is blinking
  The CPU module is in the INIT mode.
  In this mode, only a module login can be performed (no system login).
  A master reset is possible.
- The STOP LED is blinking
  The CPU module is in system operation. Communication to the system bus modules responsible for the two system busses is available.
  In this mode, the system login can be performed.
  The CPU module does not hold a valid configuration. A configuration can be loaded by performing a download.
- The STOP LED is lit
  The same as *STOP LED is blinking*, but the CPU module holds a valid configuration that can be started.
- The RUN LED is lit
  The CPU module is in RUN, the user programs are executed.
  This is the system's normal operation!
- The ERROR LED is lit
  The mode switch is not set to RUN.

I This list only specifies the meaning of LED indicators important for start-up. A complete description is provided in the HIMax system manual.

5.1.9 LED Indicators on the HIMatrix Controllers

5.1.9.1 HIMatrix Compact Systems

- The PROG LED is blinking
  The system is being initialized, or a new operating system is being loaded into the flash ROM.
  No login is possible.
- The PROG LED is lit
  A configuration is being loaded.
- The RUN LED is blinking
  The system is in STOP, or a new operating system is being loaded into the flash ROM.
  The user programs are not executed.
- The RUN LED is lit
  The system is in RUN. The user programs are executed. This state is the system's normal operation.

i This list only specifies the meaning of LED indicators important for start-up. A complete description is provided in the HIMatrix system manual.

5.1.9.2 HIMatrix Modular System F60

- System LEDs (upper line)
  - The RUN LED is blinking

    An operating system is being loaded.
  - The RUN LED is lit

    The CPU is operating. Refer to the program LEDs for the program status.
  - The RUN LED is off

    The system is not operating.
- Program LEDs (2nd line)
  - The RUN LED is lit

    The system is operating. The programs are processed or are in the *Freeze* state.
  - The RUN LED is off.

    The programs are in STOP.
  - The STOP LED is lit.

    The program is in STOP, or a new operating system is being loaded.

---

i This list only specifies the meaning of LED indicators important for start-up. A complete description is provided in the HIMatrix system manual.

5.2 Starting up a HIMax System

5.2.1 System Operation

A HIMax system may include the following components:

- At least one system bus module (SB).
- One to four processor modules (CPU).
- I/O modules and COM modules in the required number.

These modules are inserted in one or multiple racks in accordance with the instructions provided in the system manual. The slot assignment is determined by the hardware configuration defined in SILworX.

Additionally, the system bus modules and processor modules must be reconfigured, since the modules either contain the factory settings or settings from a previous use.

System operation is not possible until the configuration is correct. The resource configuration created by the code generator can only be loaded and started during system operation.

i The HIMax system runs in system operation if the yellow STOP LEDS located on the system bus modules and the CPU module are blinking or lit.

5.2.1.1 Requirements for System Operation

System operation is possible if the following requirements are met:

- The system bus modules and CPU modules located in the same rack must have the same system ID and the same rack ID (see 5.1.1).
- The Responsible attribute for the system bus modules must be correctly configured (see 5.1.2).
- The mode switches on the CPU modules must be set to STOP or RUN.

5.2.2 Starting-up Rack 0

5.2.2.1 Preparing the Start-up Process

1. Rack 0 is equipped with two system bus modules and one CPU module. Optionally, it may also contain I/O and COM modules. Additional CPU modules can be retrofitted after loading the user program (see Chapter 5.4) and are synchronized automatically.
2. Rack 0 is not connected to extension racks.
3. A SILworX project was prepared in accordance with the instructions specified in Chapter 4.
4. A cross-over Ethernet cable is available.

5.2.2.2 Executing the Start-up Process

- Set the mode switch to position INIT and boot the controller, e.g., by switching the operating voltage off and on again.

Figure 5-5: Mode Switch in INIT Position

- Connect the PADT to the *PADT* port of the system bus module in slot 01. To this end, use a cross-over cable.
  Ethernet cross-over cables can be recognized because, e.g., they are gray cables with green or red plugs.

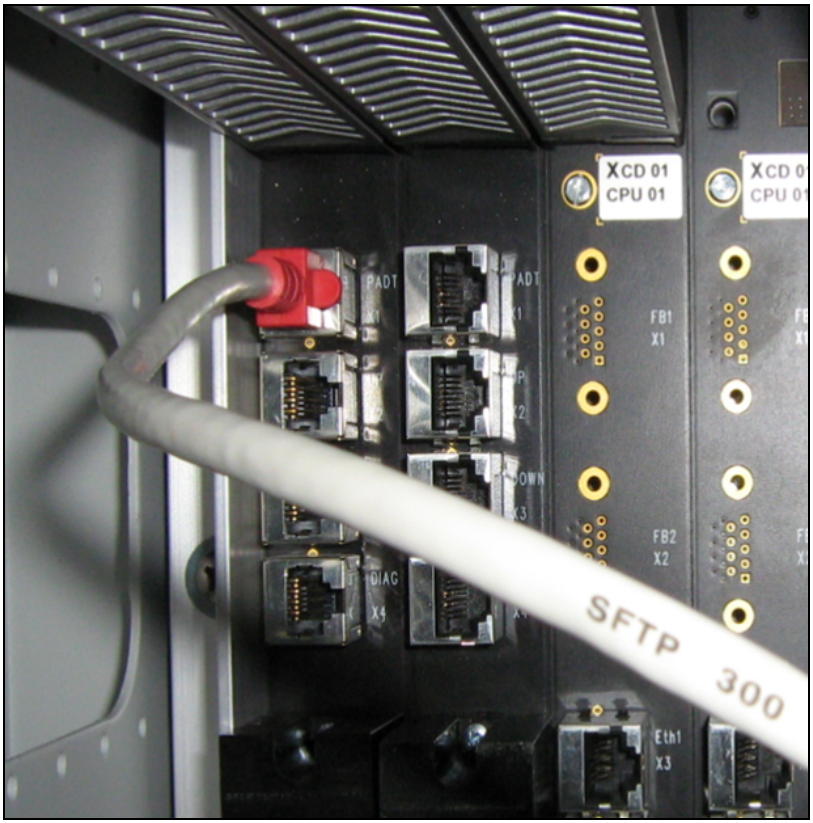


Figure 5-6: Connecting Ethernet Cables

- Start SILworX and open the project.
- Click the **Hardware** structure tree element and then the **Online** button located on the Action Bar. The *System Login* dialog box appears.

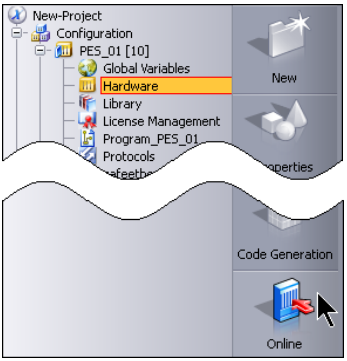


Figure 5-7: Connecting the PADT

- In the *Interface* group box, select **To Module Login.** At this point in time, it is not possible to log in to the system, since the controller is not in system operation.

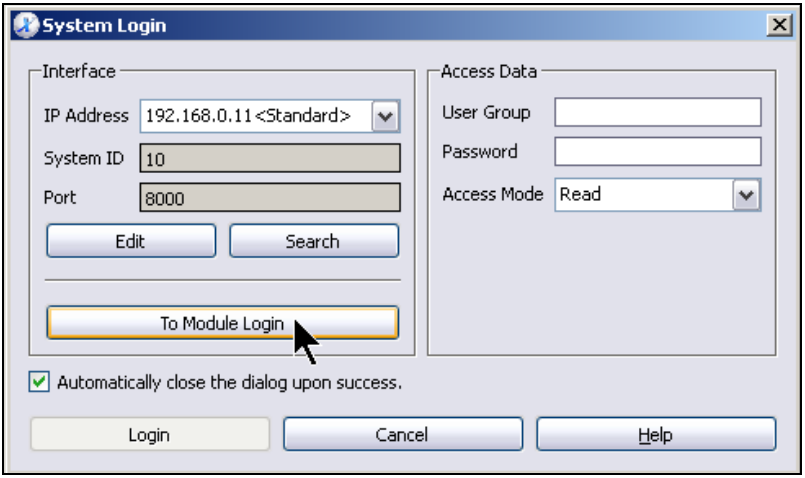


Figure 5-8: To Module Login

To perform the steps described in the following chapters, remain in the hardware online view.

5.2.2.3 Starting-up the System Bus Module in Slot 01

The following chapter explains how to start up the system bus module located in slot 01 (system bus A). The procedure to start-up the system bus module in slot 02 (system bus B) is identical.

- Double-click the system module in slot 01. The *Module Login* dialog box appears.

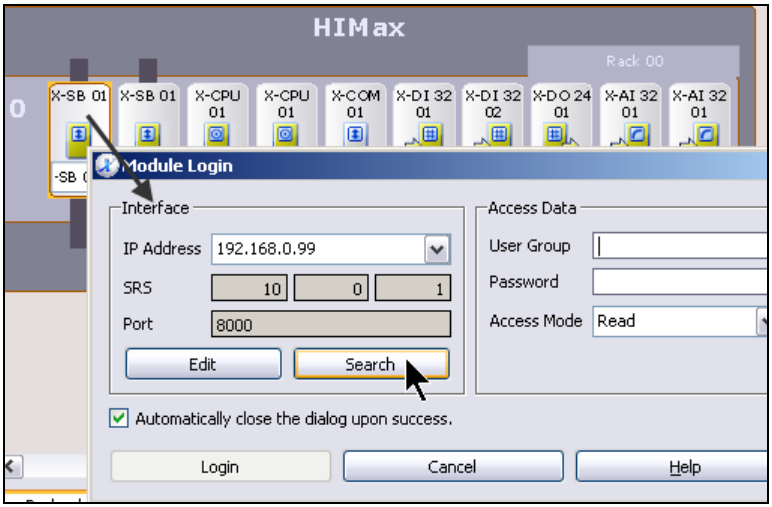


Figure 5-9: The Module Login Dialog Box

The current SRS and module IP address are required to log in to the module. If this information is not known when commissioning the system, the data can be obtained using the MAC address as follows.

- In the *Interface* group box, select **Search.** The *Search via MAC* dialog box appears.

TIP Move the *Search via MAC* dialog box such that the connection data are still visible in the login dialog box.

- In the *MAC address* field, enter the MAC address of the left system bus module. The MAC address is specified on a label on the module.

- Click **Search**.
  If the PADT can communicate with the system bus module, the IP address, subnet mask and SRS are read out and displayed in the *Settings* group box.

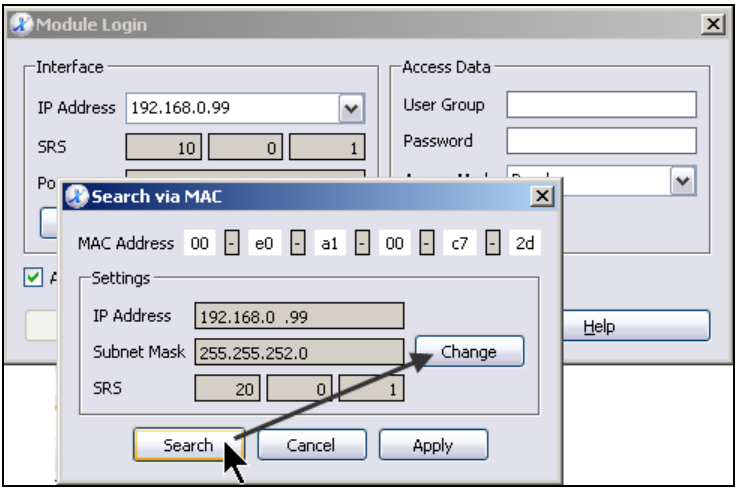


Figure 5-10: Changing the Connection Parameters

If *Search via MAC* is not successful, this may be due to the following causes:

1. The MAC address was not entered correctly.
2. The configuration of the PC's network card is incorrect. A fixed IP address is required.
3. The cable used is not a cross-over cable, or the cable is not connected to the *PADT* connector of the system bus module.
   Note the LEDs on the PADT network card or system bus module.
4. The PADT contains two or more network cards which are configured for the same subnet.
5. A firewall is active and blocks the access.

- Click **Change**.
- Move the *Write via MAC* dialog box such that the *Module Login* dialog box is visible.
- Transfer the values for system ID and rack ID specified in the *Module Login* dialog box and enter them in the *Writing via MAC* dialog box, in the example: `10.0`.

- Entering the IP address is not necessary since the IP address configured in the project is used after a download (see Chapter 5.1.2.).
- Set *SB Responsible...* (see Chapter 5.1.2).
- For authorization, enter the data for the default user group in the *Access Data* group box: Click the *User Group* field and press **Ctrl+A**. The user group and access type are automatically filled in.

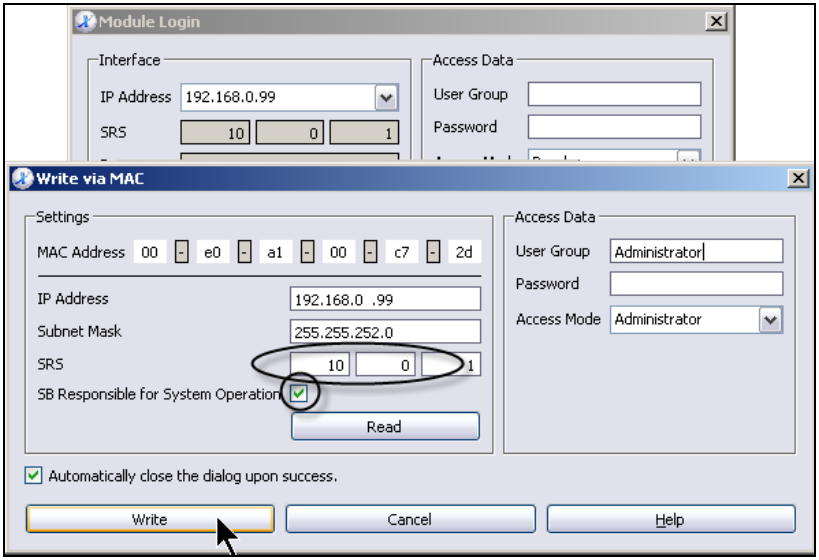


Figure 5-11: System Bus Module in Slot 01

- Click **Write** to configure the SRS for the system bus module.
- Select **Cancel** and close both the *Seach via MAC* and *Module Login* dialog boxes.

---

i Setting the SRS only defines the rack ID. The system ID is always the CPU system ID, and the slot is determined by the position.

5.2.2.4 Starting-up the System Bus Module in Slot 02

- Connect the PADT to the *PADT* connector of the system bus module in slot 02. To this end, use a cross-over cable.
- Repeat the steps described in the Chapter 5.2.2.3.
- Check the result in the logbook.

⊟ 21/04/2011 14:04:14.937	Info	Writing settings for MAC address '00:e0:a1:00:c7:2d'.	Write via MAC Dialog Box
21/04/2011 14:04:14...	Info	IP address: 192.168.0.99	Write via MAC Dialog Box
21/04/2011 14:04:14...	Info	Subnet mask: 255.255.252.0	Write via MAC Dialog Box
21/04/2011 14:04:14...	Info	SRS: 10.0.1	Write via MAC Dialog Box
21/04/2011 14:04:14...	Info	SB responsible for RP: Yes	Write via MAC Dialog Box
21/04/2011 14:04:14.984	Info	Settings written successfully.	Write via MAC Dialog Box
⊟ 21/04/2011 14:06:46.753	Info	Writing settings for MAC address '00:e0:a1:00:c7:3e'.	Write via MAC Dialog Box
21/04/2011 14:06:46...	Info	IP address: 192.168.0.99	Write via MAC Dialog Box
21/04/2011 14:06:46...	Info	Subnet mask: 255.255.252.0	Write via MAC Dialog Box
21/04/2011 14:06:46...	Info	SRS: 10.0.2	Write via MAC Dialog Box
21/04/2011 14:06:46...	Info	SB responsible for RP: No	Write via MAC Dialog Box
21/04/2011 14:06:46.878	Info	Settings written successfully.	Write via MAC Dialog Box

Figure 5-12: Logbook Entry for Setting via MAC

5.2.2.5 Starting-up a CPU Module

- Connect the PADT to an arbitrary CPU module's network port in slot 03. To this end, use a cross-over or a usual Ethernet cable.
- In the online view of the Hardware Editor, double-click the CPU icon associated with slot 3. The *Module Login* dialog box appears.

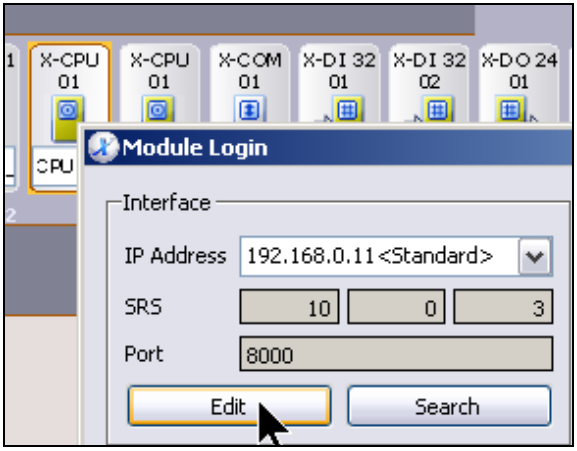


Figure 5-13: Module Login

The current SRS and module IP address are required to log in to the module. If the CPU module's Mode switch is set to INIT when booting, the standard values for IP address and SRS are active.

- Click **Edit**. The *IP/SRS* dialog box appears.
- Select the **Standard Value** in the *IP Address* and *SRS* fields, and click **OK** to confirm.

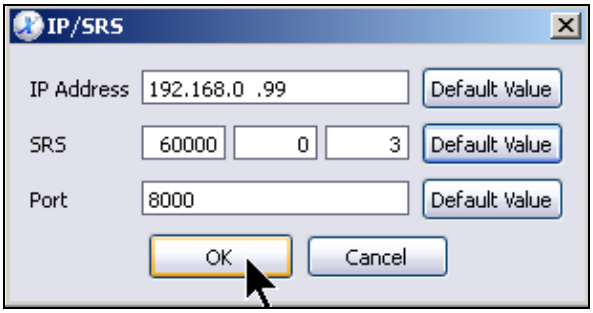


Figure 5-14: Activation of the Default Values

- Click the *User Group* field in the *Module Login* dialog box and press **Ctrl+A** to automatically enter the data for the *Administrator* default user group.
- Click **Login**. The Control Panel for the CPU module appears.

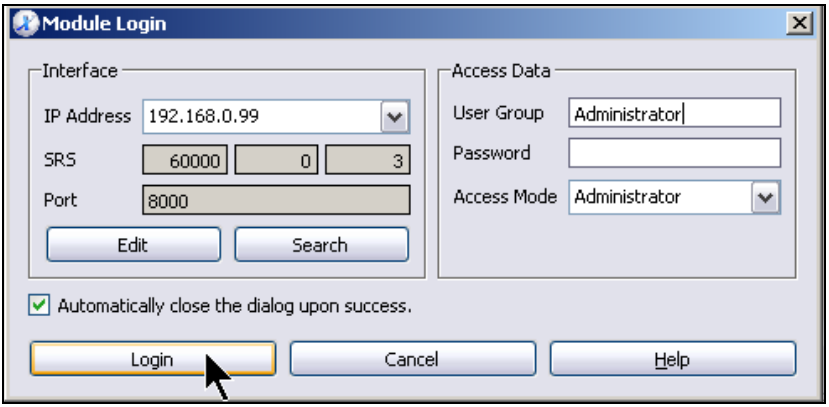


Figure 5-15: Module Login

If the login procedure is not successful, check whether the PADT IP address is located in the same network as the IP address of the CPU module.

Since the IP address of the CPU module is set by default to 192.168.0.99 in the INIT mode, the PADT IP address without routing must also be set to 192.168.0.x (with x = 1...254, except 99) (see Chapter 5.1.4 and Chapter 5.1.6.).

5.2.2.6 Step 1: Master Reset of the CPU

- Select **Online, Maintenance/Service , Reset Module Factory Settings** from the menu bar. The *Reset Module Factory Settings* appears.

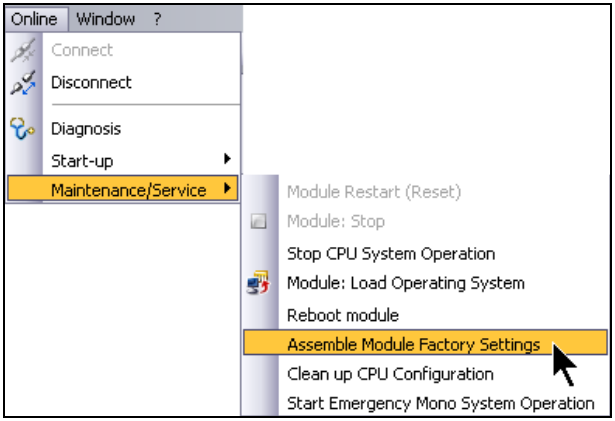


Figure 5-16: Online Menu

- Click **OK** to confirm.
  This action removes all settings and configurations from the CPU module. This step is recommended if the CPU module may contain unknown data.

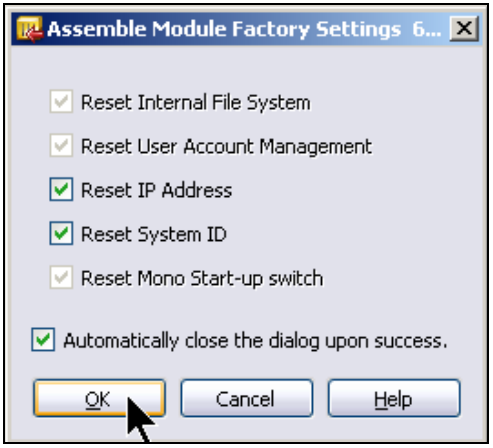


Figure 5-17: Resetting to the Factory Settings

5.2.2.7 Step 2 - Exceptional Case: Mono Operation

The fact that a system is only equipped with one system bus module and one CPU module affects the system availability: Only mono operation is possible (in contrast to redundant operation)!

A CPU switch must be activated to allow a system to run in mono operation.

i This CPU switch is only effective if a mono project is loaded. Otherwise, the switch is automatically reset.

- Click **Online, Start-up, Set Mono/Redundancy Operation** from the menu bar.

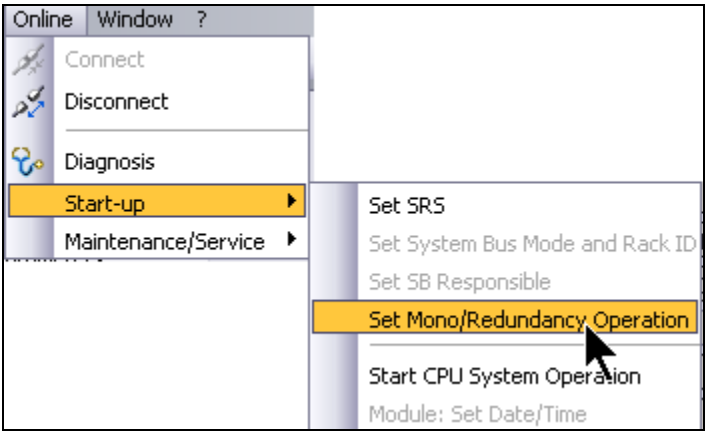


Figure 5-18: Setting the Mono/Redundant Operation

- In the *Redundancy* field, select `Mono` and click **OK** to confirm.

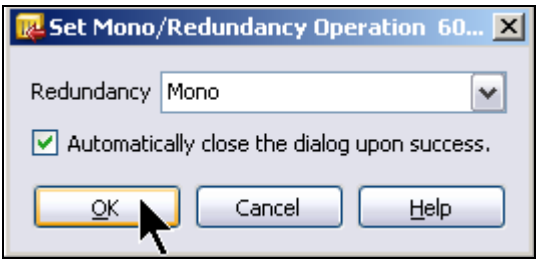


Figure 5-19: Mono Operation

5.2.2.8 Step 3: Setting the SRS for the CPU Module

- Click **Online, Start-up, Set SRS** from the menu bar. The *Set SRS* dialog box appears.

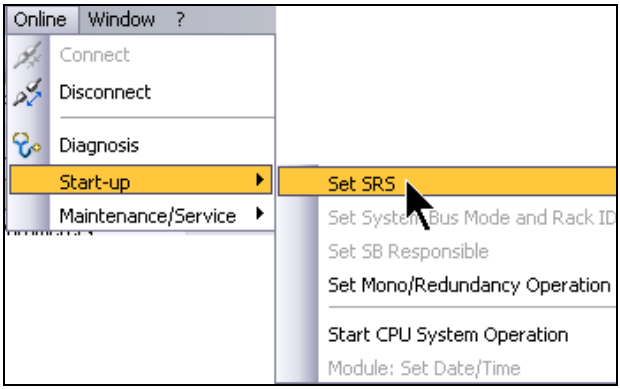


Figure 5-20: The *Set SRS ID* Menu Function

- The current SRS is displayed on the header of the dialog box.
  In the example: System ID = 60000, Rack = 0, Slot = 3.
- Enter the valid system ID associated with the project, in the example: `10`.

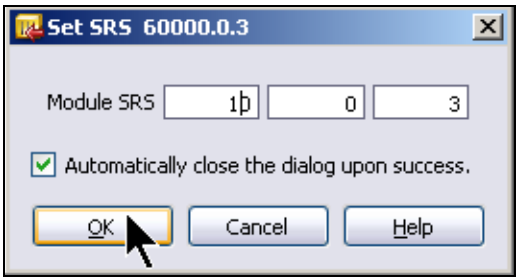


Figure 5-21: Setting the SRS

> **i** Changing the system ID interrupts the communication between the PADT and the controller since the login was performed with another (overwritten) SRS.

- Set the CPU *Mode* switch from **INIT** to **RUN**.
  After some seconds, the yellow STOP LED begins to blink.

- Check the STOP LEDs on both system bus modules and on the CPU module.
  If all yellow LEDs are blinking, the system is running in system operation (STOP/INVALID CONFIGURATION) and is ready to load a new configuration.
- If additional extension racks should be started up, do not close the Hardware Editor's online view and follow the instructions specified in the next chapter.
- If no additional extension racks should be set up, close the Hardware Editor's online view and load the resource configuration to continue the start-up procedure (see Chapter 5.4).

5.2.3 Starting-up an Extension Rack

If all the instructions specified in the previous chapters have been carefully followed, the Hardware Editor's online view is open. Otherwise, open the online view as follows:

- Click the **Hardware** structure tree element and then the **Online** button located on the Action Bar. The *System Login* dialog box appears.

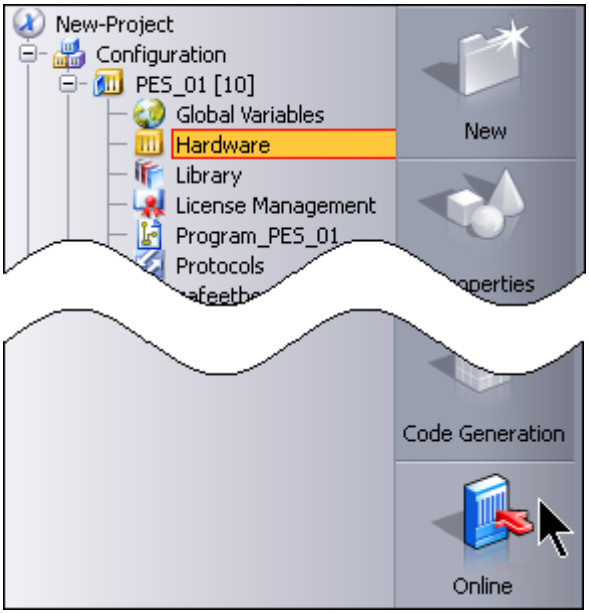


Figure 5-22: Connecting to the Hardware

5.2.3.1 Starting-up the System Bus Module in Slot 01

The following chapter explains how to start up the system bus module located in slot 01 (system bus A). The procedure to start-up the system bus module in slot 02 (system bus B) is identical.

These steps must be performed for all extensions racks and all the system bus modules!

- Connect the PADT to the *PADT* port of the system bus module in slot 01. To this end, use a cross-over cable.

⚠ NOTE

Ensure that the extension rack is not connected to other racks via Ethernet during start-up!

- In the *Interface* group box, select **To Module Login.** The Hardware Editor's online view appears.
- Double-click the system module icon located on the extension rack, slot 01. The *Module Login* dialog box appears.

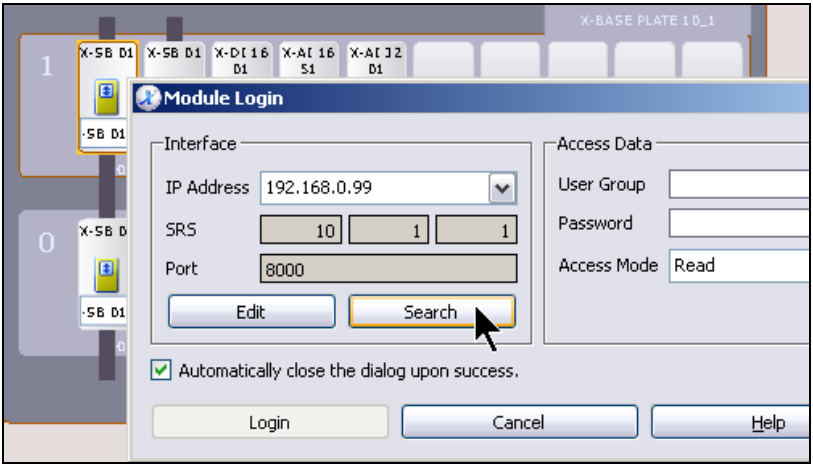


Figure 5-23: Module Login

The current SRS and module IP address are required to log in to the module. If this information is not known when commissioning the system, the data can be obtained using the MAC address as follows.

- In the *Interface* group box, select **Search.** The *Search via MAC* dialog box appears.
- Move the *Search via MAC* dialog box such that the connection data are still visible in the login dialog box.
- In the *MAC address* field, enter the MAC address of the left system bus module. The MAC address is specified on a label on the module.
- Click **Search**.
  If the PADT can communicate with the system bus module, the IP address, subnet mask and SRS are read out and displayed in the *Settings* group box.

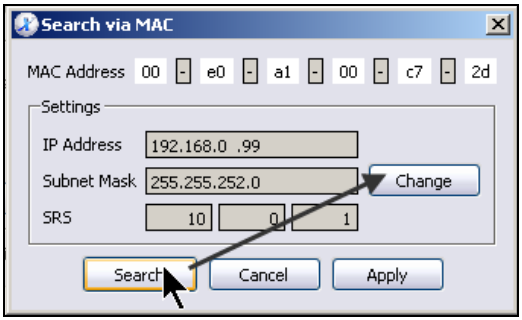


Figure 5-24: Changing the Connection Data

- Click **Change**.
- Move the *Write via MAC* dialog box such that the *Module Login* dialog box is visible.
- Transfer the values for system ID and rack ID specified in the *Module Login* dialog box and enter them in the *Writing via MAC* dialog box, in the example: `10.1` (system ID = 10, rack ID = 1).
- Entering the IP address is not necessary since the IP address configured in the project is used after a download (see Chapter 5.1.2.).
- Ensure that the *SB Responsible…* option is not active (see Chapter 5.1.2).
  SB Responsible… for system bus A may only be active for the system bus module located in slot 01 of rack 0.

- For authorization, enter the data for the default user group in the *Access Data* group box: Press **Ctrl+A**. The user group and access type are automatically filled in.

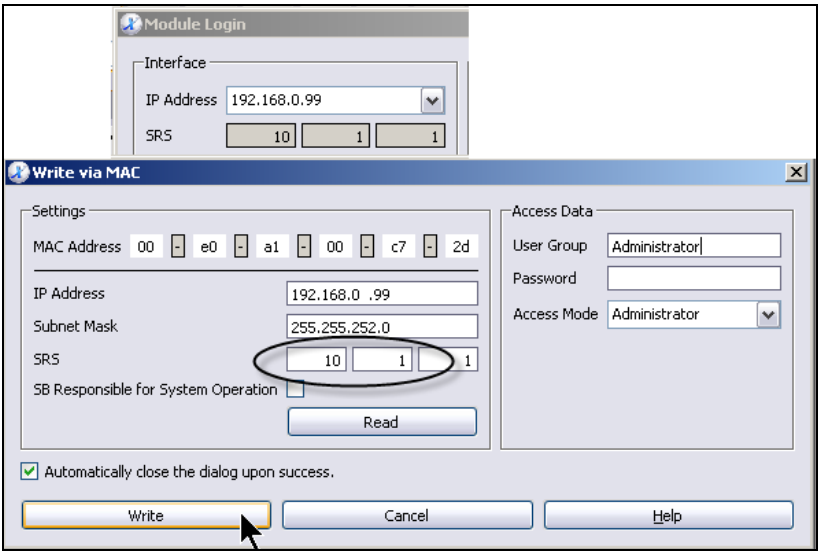


Figure 5-25: System bus Module in Slot 01, Rack 01

- Click **Write** to configure the SRS for the system bus module.
- Select **Cancel** to close both the *Seach via MAC* and *Module Login* dialog boxes.

5.2.3.2 Starting-up the System Bus Module in Slot 02

- Connect the PADT to the *PADT* connector of the system bus module in slot 02. To this end, use a cross-over cable.
- Repeat the steps described in the previous chapter.
- Note that system bus B also requires a system bus module with active *SB Responsible…* option. This is also allowed for the system bus module in slot 02 of extension rack 01, as long as it is not configured in rack 00.
- Check the result in the logbook.

⊖ 21/04/2011 16:45:05.004	Info	Writing settings for MAC address '00:e0:a1:00:c7:2d'.
21/04/2011 16:45:05...	Info	IP address: 192.168.0.99
21/04/2011 16:45:05...	Info	Subnet mask: 255.255.252.0
21/04/2011 16:45:05...	Info	SRS: 10.1.1
21/04/2011 16:45:05...	Info	SB responsible for RP: No
21/04/2011 16:45:05.035	Info	Settings written successfully.
⊖ 21/04/2011 16:45:42.004	Info	Writing settings for MAC address '00:e0:a1:00:c7:3e'.
21/04/2011 16:45:42...	Info	IP address: 192.168.0.99
21/04/2011 16:45:42...	Info	Subnet mask: 255.255.252.0
21/04/2011 16:45:42...	Info	SRS: 10.1.2
21/04/2011 16:45:42...	Info	SB responsible for RP: No
21/04/2011 16:45:42.035	Info	Settings written successfully.

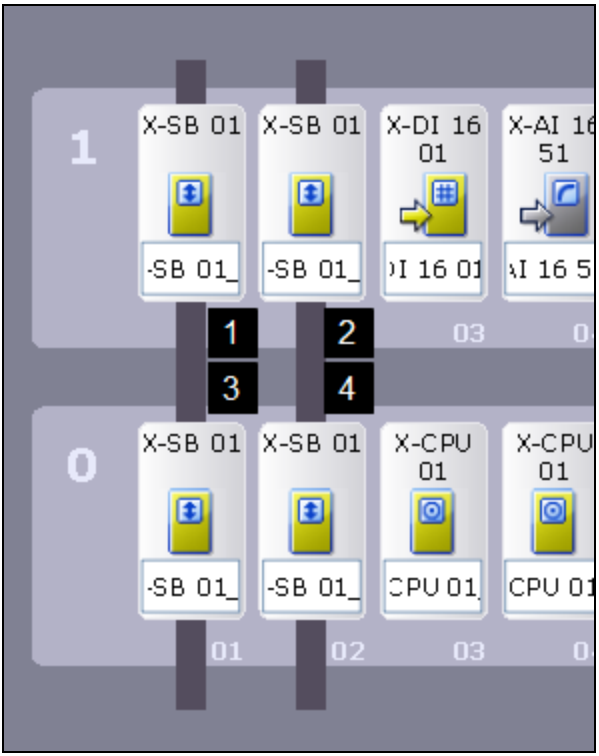
Figure 5-26: Logbook Entry for Writing via MAC

5.2.4 Connecting the Racks

- Connect the racks in accordance with the configuration defined in the Hardware-Editor.

The system bus is very fast. For the system bus, only use cables approved by HIMA. No Ethernet switches are allowed in the standard line structure!

In the network structure, only selected switches are allowed. Refer to the system manual for further information.



1 2 Port: **DOWN**

3 4 Port: **UP**

Figure 5-27: Connection of the System Bus

5.3 Starting-up a HIMatrix Controller

This chapter describes how to start up a HIMatrix controller in various applications.

5.3.1 HIMatrix System Operation

In contrast to HIMax controllers, all (internal) modules of a HIMatrix controller always have the same system ID and the same rack ID. Therefore, a HIMatrix controller always runs in system operation, i.e., a system login is feasible without previously setting the parameters through a module login.

Chapter 5.3.2 describes how to start up a HIMatrix controller configured with the factory settings and therefore has no valid configuration.

Chapter 5.3.3 describes how to start up a HIMatrix controller configured with unknown settings.

5.3.2 Starting-up a HIMatrix Controller with Factory Settings

Proceed as follows to start up a HIMatrix controller with factory settings:

- Remove all connections to inputs, outputs and communication. External wiring is not allowed for the HIMatrix controller.
- Switch on the power supply and wait for the initialization process to be completed (the RUN LED is blinking, F60: The STOP LED is lit). Connect the PADT to the controller using an Ethernet cable.
- Start SILworX and open the project.
- Select the resource name in the structure tree and click **Online** on the Action Bar. The *System Login* dialog box appears.
- In the *Interface* group box, select **Search.** The *Search via MAC* dialog box appears.
- Move the *Search via MAC* dialog box such that the connection data are still visible in the login dialog box.

- In the *MAC address* field, enter the CPU MAC address. The MAC address is specified on a label on the controller.
- Click **Search**.
  The IP address, subnet mask and SRS are read out and displayed in the *Settings* group box.

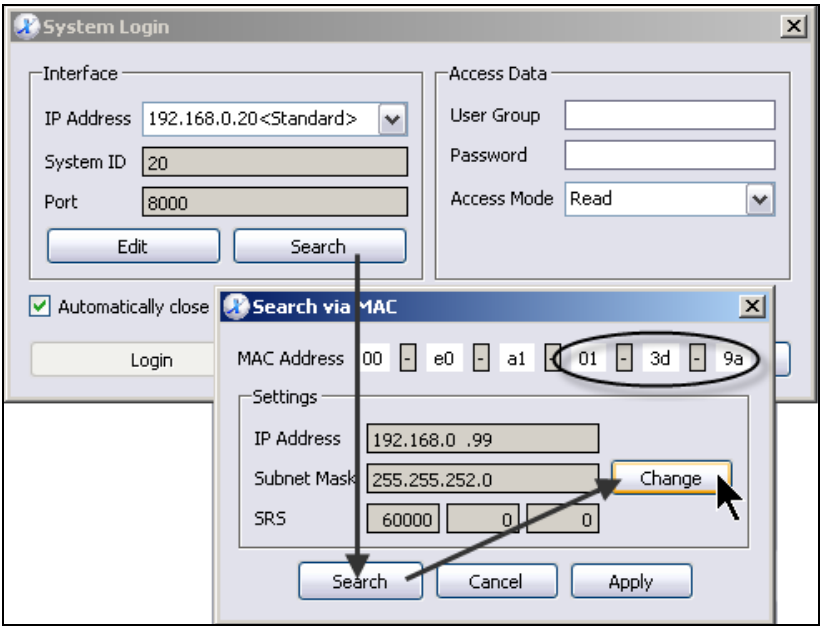


Figure 5-28: The Search via MAC Dialog Box

- Click **Change**. The *Write via MAC* dialog box appears.
- Enter the system ID and the IP address specified in the *System Login* dialog box (in the example: system ID = `20`, IP address = `192.168.0.20`.

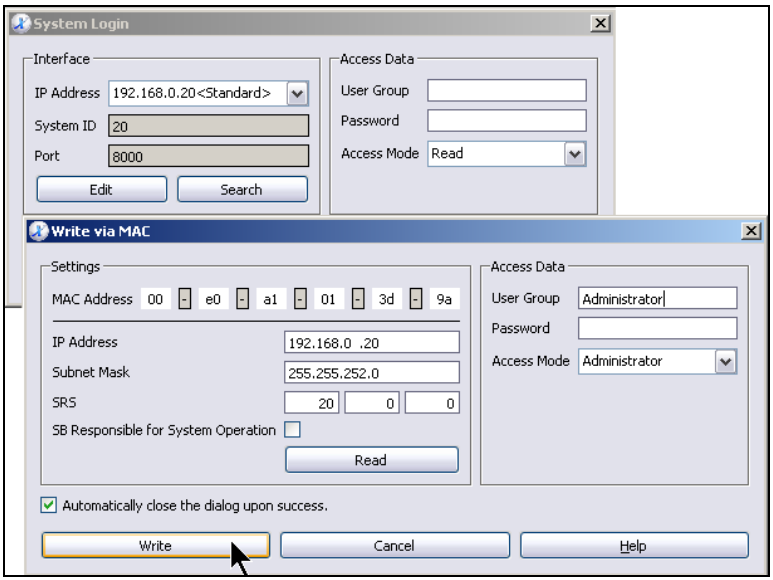


Figure 5-29: Setting the Connection Parameters for the Resource

- For authorization, enter the data for the default user group in the *Access Data* group box: Click the *User Group* field and press **Ctrl+A**. The user group and access type are automatically filled in.
- Click **Write**. A status message briefly appears during the writing procedure.

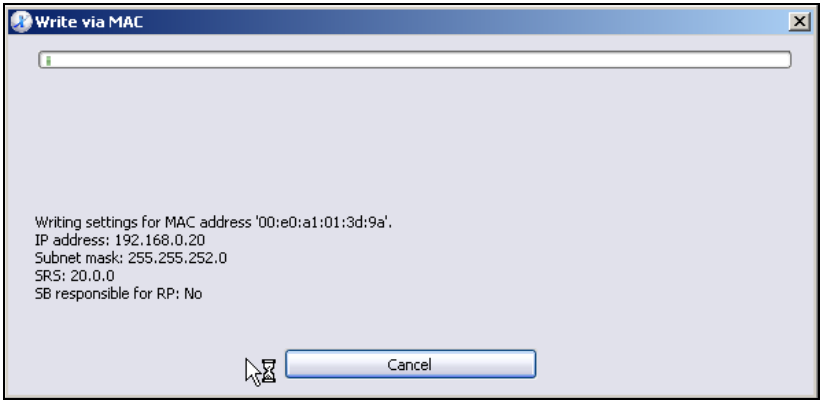


Figure 5-30: Status Message

- Select **Cancel** to close the *Search via MAC* dialog box.
- The program can now be loaded into the controller and started. Refer to Chapter 5.4 for a detailed description.

5.3.3 Starting-up a HIMatrix Controller without Factory Settings

Proceed as follows to start up a HIMatrix controller without factory settings:

- Detach all connections to inputs, outputs and communication. External wiring is not allowed for the HIMatrix controller.
- Switch on the power supply and wait for the initialization process to be completed (the RUN LED is blinking or lit, F60: The STOP or RUN (program) LED is ON).
- Connect the PADT to the controller using an Ethernet cable.
- Start SILworX and open the project.
- Select the resource name in the structure tree and click **Online** on the Action Bar. The *System Login* dialog box appears and displays the Ethernet-Parameter in accordance with the project settings.

5.3.3.1 The Ethernet Parameters of the Controller are Known

Proceed as follows if the current Ethernet parameters of the controller are known:

- Click **Edit**. The *IP/SRS* dialog box appears.
- Enter the Ethernet parameters currently configured for the controller and click **OK**.

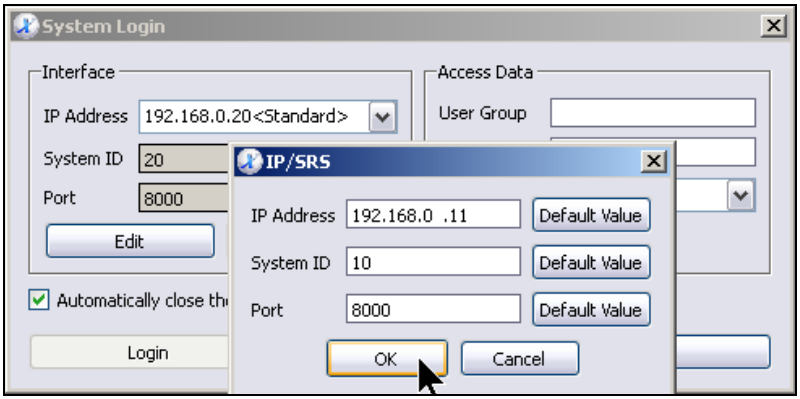


Figure 5-31: Entering the Ethernet Parameters

- Continue with Chapter 5.3.3.3.

5.3.3.2 The Ethernet Parameters of the Controller are Unknown

Proceed as follows if the current Ethernet parameters of the controller are not known:

- Click **Search**. The *Search via MAC* dialog box appears.
- In the *MAC address* field, enter the CPU MAC address. The MAC address is specified on a label on the controller.
- Click **Search**.
  The IP address, subnet mask and SRS are read out and displayed in the *Settings* group box.
- Click **Apply**. The read-out data is inserted in the *System Login* dialog box.

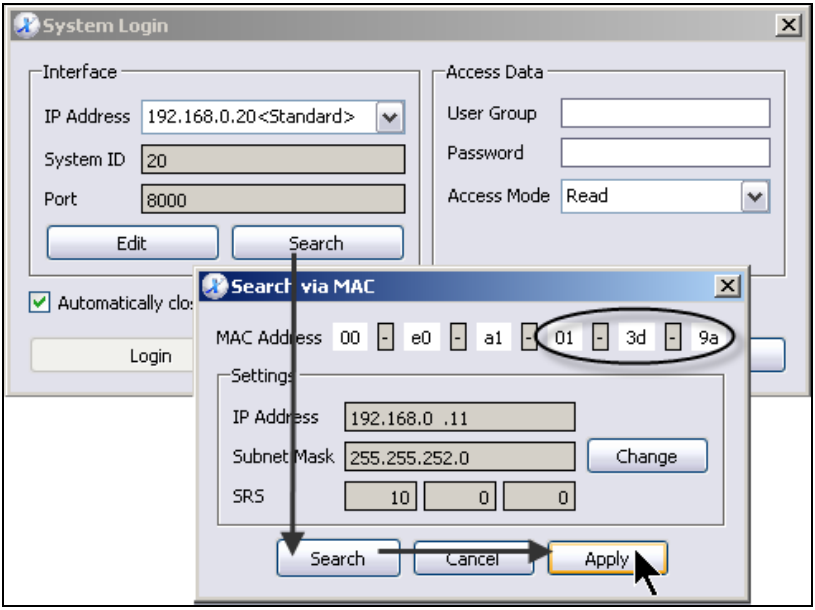


Figure 5-32: Searching the Ethernet Parameter via MAC

5.3.3.3 Logging in to the System

Proceed as follows to log in to the system:

- For authorization, enter the data for the default user group in the *Access Data* group box: Click the *User Group* field and press **Ctrl+A**. The user group and access type are automatically filled in.

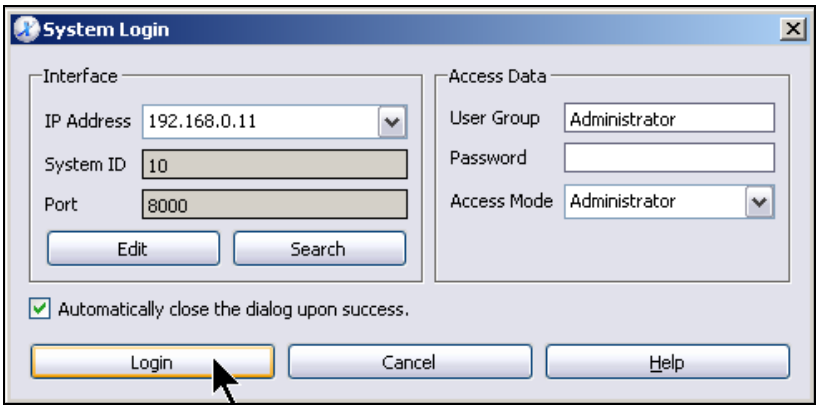


Figure 5-33: System Login

- Click **Login**. If the data specified for the default user group are not accepted, a user management scheme was configured on the controller. The administrator data defined in this user management scheme must be used for the login.
  If this information is not known, the controller must be reset to the factory settings (see Chapter 5.3.4).

5.3.3.4 Setting the System ID

- Ensure that the system is in the STOP state. Otherwise, the system ID cannot be modified.
- Click the **Resource Stop** button located on the Symbol Bar.

Figure 5-34: Stopping the Resource

- Click **Online, Start-up, Set System ID** from the menu bar. The *Set System ID* dialog box appears. The current system ID is displayed on the header of the dialog box.

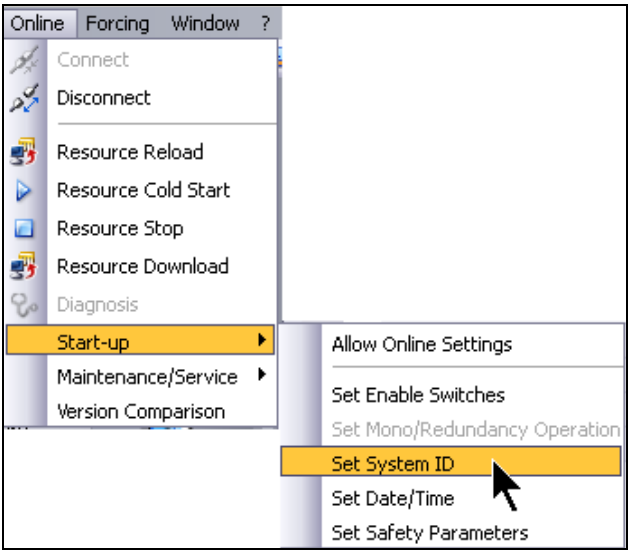


Figure 5-35: The *Set System ID* Menu Function

- Enter the required system ID and click **OK**.

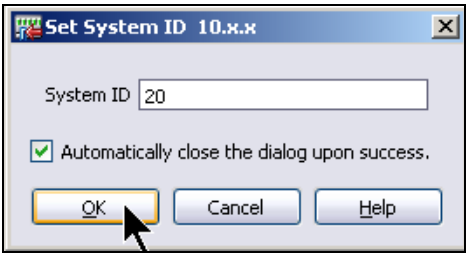


Figure 5-36: Setting the System ID

i Changing the system ID interrupts the communication between PADT and controller since the login was performed with another (overwritten) system ID.

- Close the Control Panel and continue with Chapter 5.4, Loading the Program.

5.3.4 Resetting the HIMatrix to the Factory Settings (Reset)

The reset to the factory settings is only required if a user management scheme was laoded into the controller and no administrator account specific to this scheme is known.

A reset activates the following factory settings.

- Standard IP 192.168.0.99
- Standard SRS 60000.0.X
- Standard login Administrator with empty password

The reset pushbutton of compact controllers and remote I/Os is located on the controller's upper side and can be accessed through a small opening next to the Ethernet ports.

For the F60 and F20, the reset pushbutton is located behind the front plate.

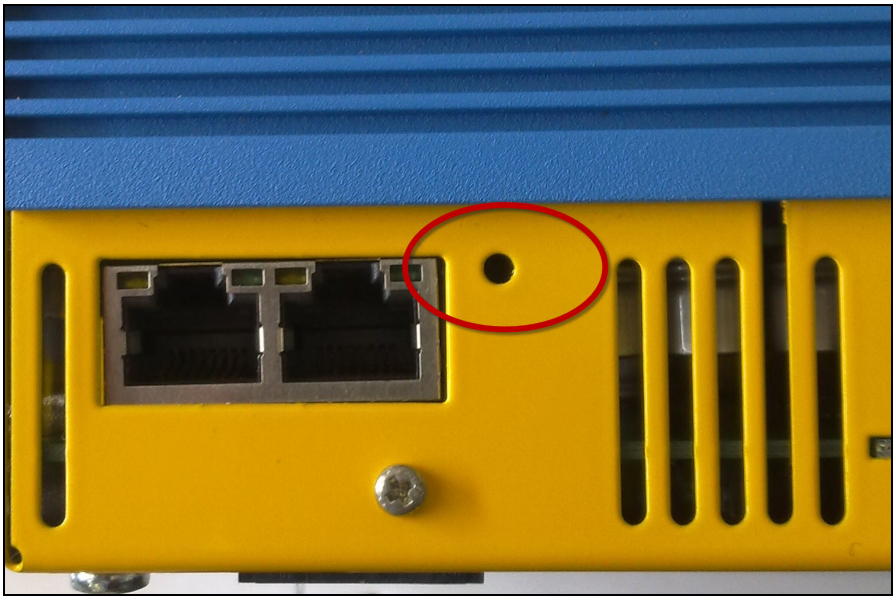


Figure 5-37: Reset Pushbutton

Proceed as follows to perform a system reset:

- Switch off the power supply of the controller.
- Press and hold the reset pushbutton. Use a non-conductive pin and apply only little pressure. Excessive pressure may damage the pushbutton!
- Press and hold the reset pushbutton while switching on the power supply.
- Press and hold the reset pushbutton until the initialization process is completed (the RUN LED is blinking, F60: the STOP LED is ON).

> i Since the factory settings do not match the loaded configuration, the system enters the STOP state and the FAULT LED is lit or blinking.
>
> The factory settings are only active until the next booting (without pressing the reset pushbutton). After that, the parameters of the last valid configuration apply again.

A system login may only be performed with the *Administrator* default user group (empty password).

Change the IP address and system ID in accordance with the project-specific settings (see Chapter 5.3.2). The required resource configuration can then be loaded (see Chapter 5.4).

5.3.5 Starting up a HIMatrix Remote I/O

A HIMatrix remote I/O cannot store a configuration permanently, but receives it from the parent resource whenever it is initialized.

For a remote I/O, only configure the connection parameters. Finally, connect the remote I/O to the corresponding parent resource.

- Detach all connections to inputs, outputs and communication. External wiring is not allowed for the HIMatrix remote I/O.
- Switch on the power supply and wait for the initialization process to be completed (the STOP LED is blinking).
- Connect the PADT to the remote I/O using an Ethernet cable.
- Start SILworX and open the project.
- In the structure tree, open the directory of the resource in which the remote I/O was configured.
- Right-click **Hardware** and selected **Online** from the context menu. The *System Login* dialog box appears.

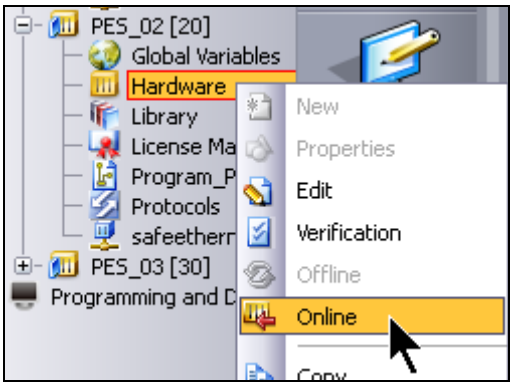


Figure 5-38: Online Context Menu

- In the *Interface* group box, select **To Module Login.** The Hardware Editor's online view appears.

- Right-click the CPU module icon and select **Detail View** from the context menu. The *Module Login* dialog box appears.

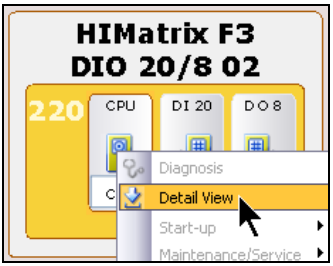


Figure 5-39: Context Menu for the RIO CPU

- In the *Interface* group box, select **Search.** The *Search via MAC* dialog box appears.
- Move the *Search via MAC* dialog box such that the connection data are still visible in the login dialog box.
- In the *MAC address* field, enter the MAC address for the remote I/O. The MAC address is specified on a label on the housing.
- Click **Search**. The IP address, subnet mask and SRS are read out and displayed in the *Settings* group box.

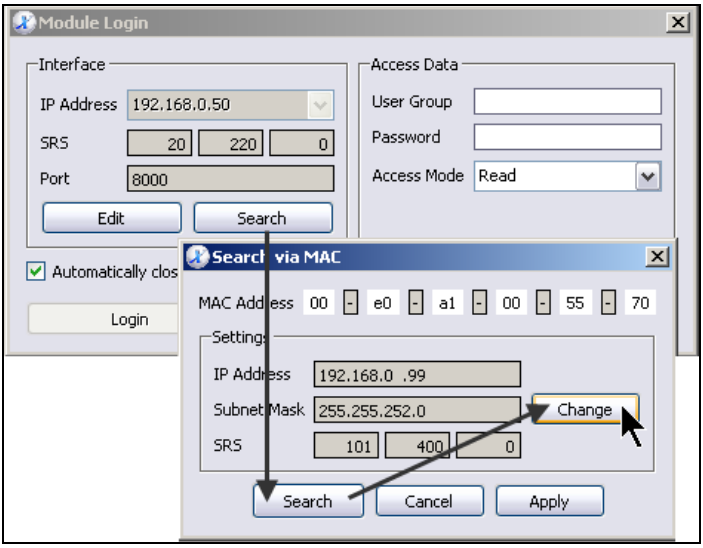


Figure 5-40: Search via MAC

- Click **Change**.
- Move the *Write via MAC* dialog box such that the *Module Login* dialog box is visible.
- Change the values for IP address, system ID and rack ID in accordance with the settings configured in the project.
- For authorization, enter the data for the default user group in the *Access Data* group box: Click the *User Group* field and press **Ctrl+A**. The user group and access type are automatically filled in.
- Click **Write** to configure the Ethernet settings for the remote I/O.

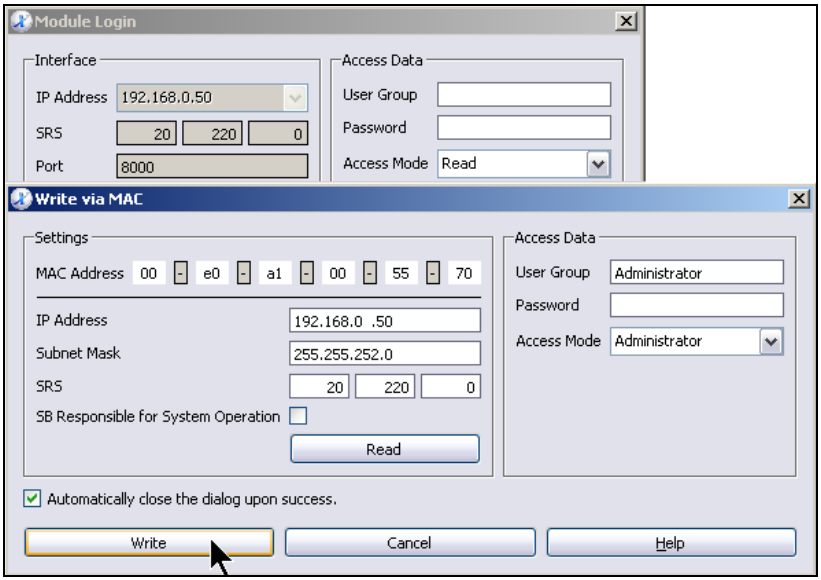


Figure 5-41: Writing the Ethernet Settings

- For control purposes:
  In the *Module Login* dialog box, click once again **Search** and read back the data. Compare the data with the values in the project.

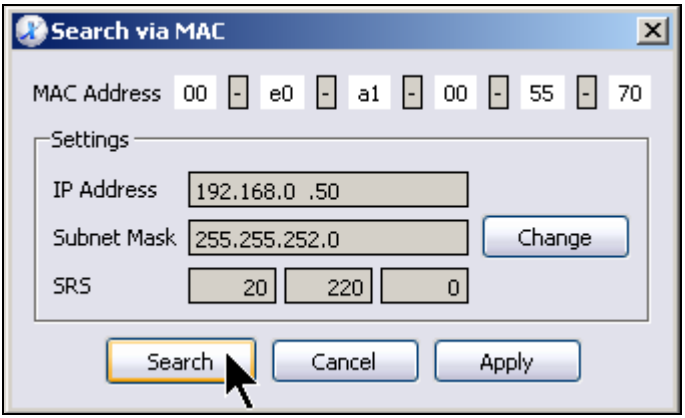


Figure 5-42: Reading back the Written Data

- Select **Cancel** to close the *Search via MAC* dialog box.
- Enter data for the default user group (shortcut: **Strg+A)** in the *Module Login* dialog box and log in to the module.
  If the login is successful, the Ethernet parameters are correctly set.
- Close the Control Panel for the remote I/O.
- Disconnect the power supply and connected all inputs and outputs of the remote I/O.
- Connect the remote I/O to the parent resource using an Ethernet cable and reconnect the power supply.

Shortly after booting, the PROG LED for the remote I/O is lit briefly and the remote I/O enters the same state as the parent resource.

5.4 Loading and Starting the Resource (PES)

5.4.1 Requirements

To load and start a ressource, the controller must be started up such as described in Chapter 5.2 (HIMax) or 5.3 Chapter (HIMatrix). The following requirements must be met:

1. HIMax: The controller must run in system operation and the system ID used in the project must be configured.
2. HIMatrix: The system ID used in the project must be configured in the controller.
3. SILworX: A project compiled without errors must be opened in SILworX.
4. User: The user must be authorized to perform a system login with write access.

5.4.2 Preparing the System Login

- Start SILworX and open the project.
- In the structure tree, click the **Resource** that should be loaded and then the **Online** button located on the Action Bar. The *System Login* dialog box appears.

5.4.2.1 Adjusting the IP Address in the Login Dialog Box

For a controller which contains the factory settings or which has been used in a different project, the IP address in the Login dialog box must be set to the IP address of the controller. Only after this step, a login is possible. The system ID was already set during start-up (see Chapter 5.2 or 5.3).

Directly proceed with Chapter 5.4.3 if the Ethernet parameters in the system and in the project are identical.

To log in with the standard IP address, or a known IP address

- In the *System Login* dialog box, click the **Edit** button. The *IP/SRS* dialog box appears.
- For standard IP address: In the *IP/SRS* dialog box, click the **Default Value** button located on the right-hand side next to the *IP Address* field. The standard IP address is activated for the login.
- For a known IP address: Type the IP address in the data field.

- Click **OK** to adopt the setting.

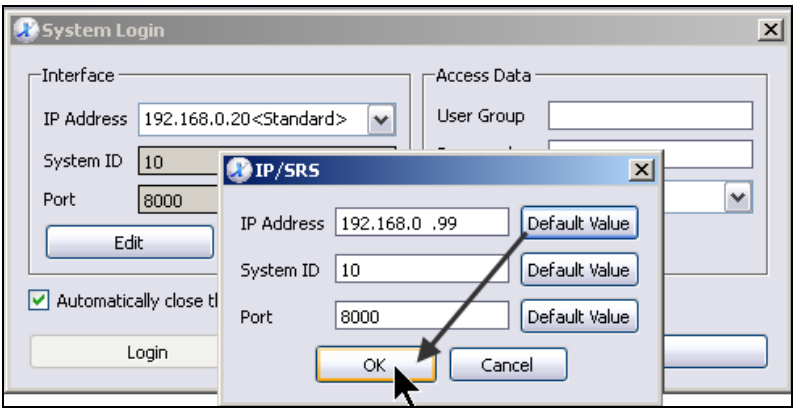


Figure 5-43: Activate the Standard IP Address

To log in with an unknown IP address

If the IP address active in the controller is not known because the controller was already used in an earlier project, use the MAC address to determine the IP address.

- In the *System Login* dialog box, select **Search** in the *Interface* group box. The *Search via MAC* dialog box appears.
- In the *MAC address* field, enter the MAC address for the controller. The MAC address is specified on a label on the controller.
- Click **Search**. The Ethernet settings are read and displayed.
- Click **Apply** to transfer the Ethernet settings into the *System Login* dialog box.

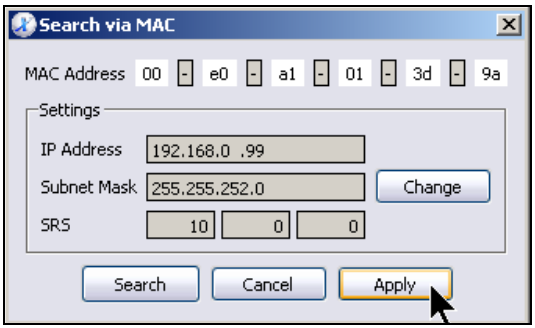


Figure 5-44: Search via MAC

5.4.3 Performing a System Login

Proceed as follows to log in to the system:

- Ensure that the correct IP address is specified in the *Interface* group box.
- For authorization, enter the data for the default user group in the *Access Data* group box: Click the *User Group* field and press **Ctrl+A**. The user group and access type are automatically filled in.
- Click **Login**. The Control Panel for the resource appears.

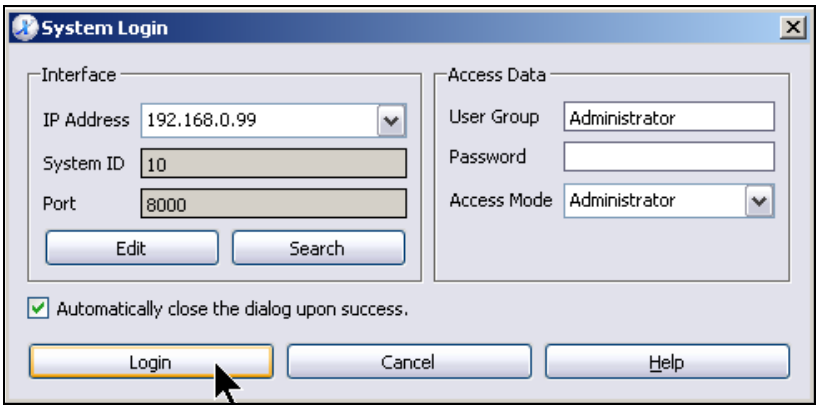


Figure 5-45: System Login

5.4.4 Performing a Download

A download can only be performed if the system is in the STOP state. The system state is displayed in the *System Information* group box of the Control Panel.

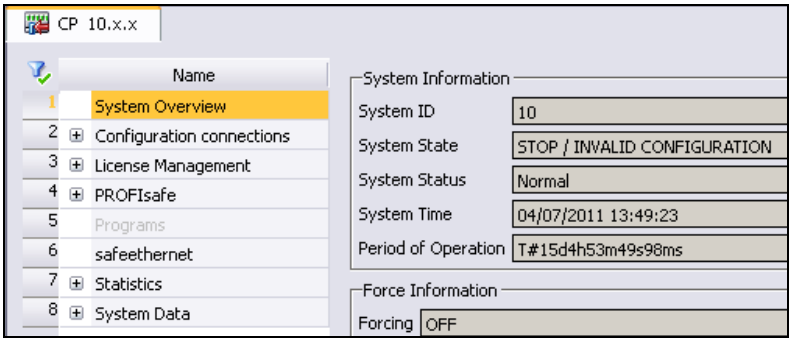


Figure 5-46: Control Panel

- Click **Resource Stop** on the Symbol Bar.

Figure 5-47: Resource Stop

- Click **Resource Download** on the Symbol Bar. The *Resource Download* dialog box appears.

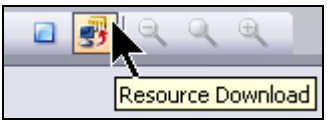


Figure 5-48: Resource Download

- Click **OK** to start the download procedure.

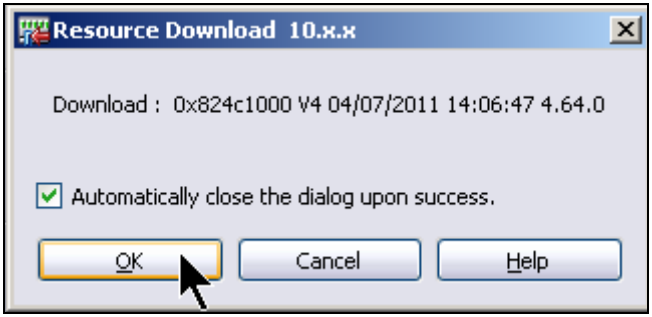


Figure 5-49: Starting the Download

5.4.5 Connection Loss after a Download

After a successful download the IP addresses configured in the project are active. If the new IP address of the resource and the IP address used during the login are not identical (normal for the first download), the communication between PADT and resource is interrupted.

The connection loss is also displayed in the logbook.

Info	Current configuration will be used for download. CRC: '0x824c1000'
Info	[192.168.0.99:8000 / 10] Loading the resource configuration started
Warning	[192.168.0.99:8000 / 10] Connection loss.
Info	[192.168.0.99:8000 / 10] Offline
Info	Resource Download: Successful.

Figure 5-50: Connection Loss

TIP In case of a new configuration of a **HIMatrix** system it is recommended to only now perform the following steps:

- Disconnect the power supply.
- Connect all the inputs and outputs of the resource.
- Reconnect the power supply.

5.4.6 Resource Cold Start

- If the connection is lost after performing a download, log in again. To this end, click **Connect** on the Symbol Bar. The *System Login* dialog box appears.

Figure 5-51: Establishing the Connection

- In the *Interface* group box, select the required IP address from the dropdown list. If the *Standard Interface* option has been selected for the resource (see Chapter 4.5.5.1), the corresponding IP address is specifically marked.

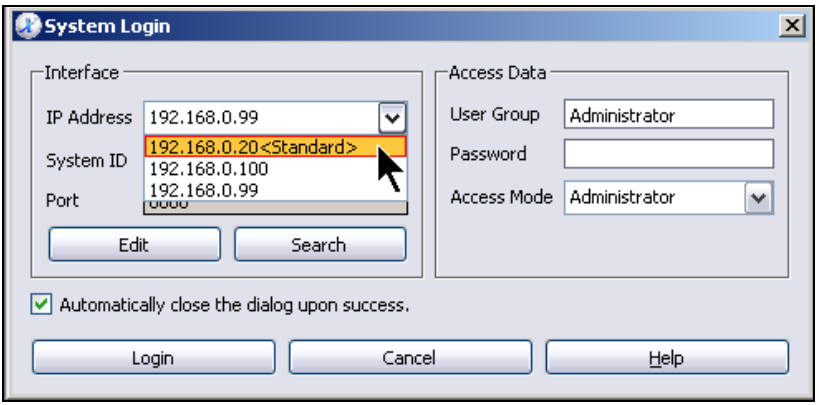


Figure 5-52: Selecting the IP Address

- Click **Login**.

- Click **Resource Cold Start** on the Symbol Bar. The CPU enters the RUN state. Also refer to the *System Information* specified on the Control Panel.

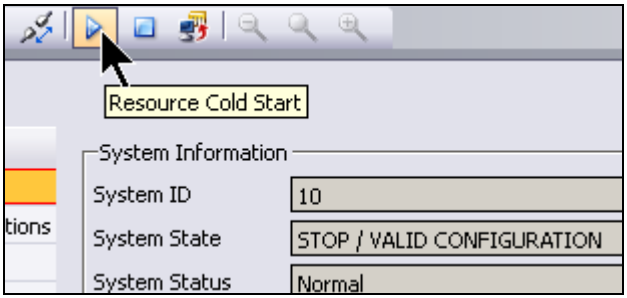


Figure 5-53: Starting the Resource

5.4.7 Synchronizing HIMax CPU Modules

If this was the first download procedure and more than one HIMax CPU module was configured, insert the redundant CPU modules now. These will be automatically synchronized and enter the RUN state.

5.4.8 Creating a Backup

As a matter of principle create a backup copy of your project in a separate directory after every load procedure. Refer to Chapter 8 for detailed instructions.

5.5 Setting the Date and Time

As long as no time synchronization over SNTP is used, configure the date and time of the resource after the download.

- Log in to the resource as described in Chapter 5.4.3.
- Select **Online, Start-up, Set Date/Time** from the menu bar. The *Set Date/Time* dialog box appears.

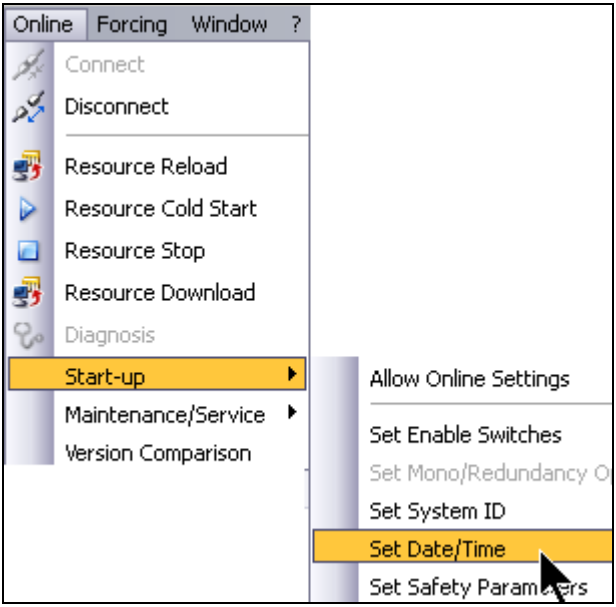


Figure 5-54: Set Date/Time

- The dialog box displays the date and time of the PADT. If required, change these settings in accordance with the specific requirements.
- Click **OK** to send the data to the resource.

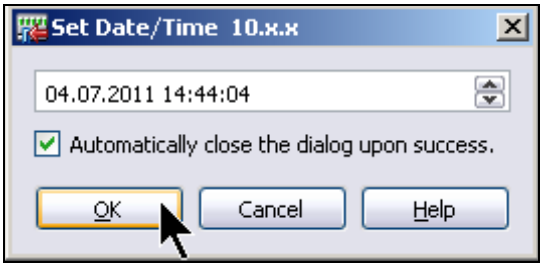


Figure 5-55: Setting the Date and Time

Based on the PADT time and the time zone configured in the operating system the time is calculated in UTC.

In the resource, the time is set to UTC.

6 Online Functions for Projects

A large number of functions can be performed in SILworX after a configuration was loaded into a resource and if the communication between PADT and resource is not disconnected.

The following elements from the resource structure tree can be viewed online:

Resource	Control Panel for system overview, diagnosis or resource load procedure.
Program	For viewing the logic online.
Hardware	For viewing the hardware online (diagnosis, module handling).
Force Editor	All global and local variables displayed as online list.

6.1 Open Project

To avoid unintentional changes in the backed-up project, a working copy of the original project should be created beforehand in Windows Explorer. By activating the write-protection you can protect the original project against changes (see also Chapter 8.2).

Proceed as follows to open a project:

- Click the **Project, Open** menu function. The *Open Project* dialog box appears.
- Select the *project file* that should be opened and click **Open**.
- Then click **OK**.

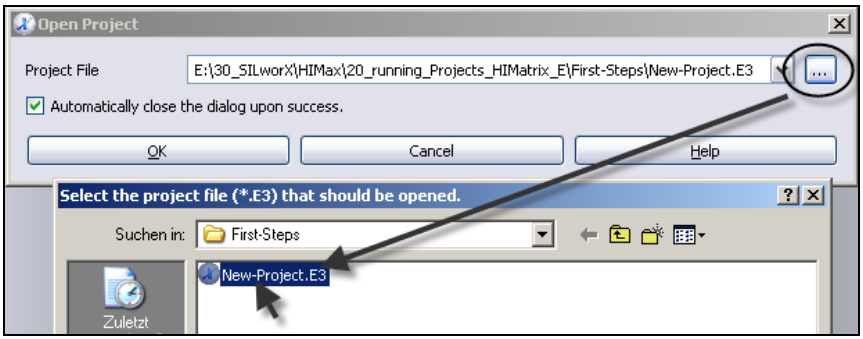


Figure 6-1: Selecting the Project File

6.2 Logging in to the System

- Select the resource name (in the example: *PES_01*) and click **Online** on the Action Bar. The *System Login* dialog box appears.
- In the *Interface* group box, select the IP address of the module used to physically connect the PADT to the resource from the dropdown list. If the *Standard Interface* option has been selected for the resource (see Chapter 4.5.5.1), the corresponding IP address is marked as <Standard>.

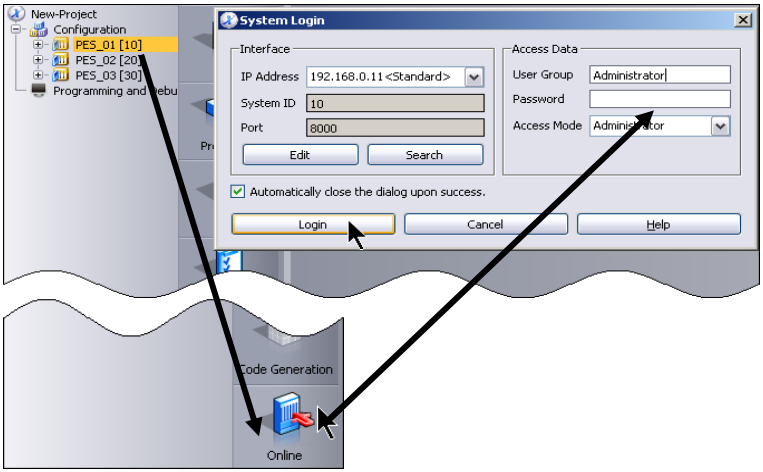


Figure 6-2: System Login

- For authorization, enter the user group data in the *Access Data* group box.

If a user management scheme was configured, the user group, password and access mode defined in the user management scheme must be used.
If no user management scheme was configured (default), for authorization enter the data for the default user group in the *Access Data* group box: Click the *User Group* field and press **Ctrl+A**. The user group and access type are automatically filled in.

- Then click **Login**. If the login procedure was successful the Control Panel appears.

6.2.1 Fault Analysis for an Unsuccessful System Login

Perform the following steps if the login procedure was not successful:

- Check the messages in the logbook.
- Ensure that the PADT IP address is located in the same network as the IP address of the selected resource. A fixed IP address is required.
- If a firewall is active, verify the settings and configure the firewall in accordance with the application.
- If one or multiple network cards are used in the PADT, they must be configured for various subnets. Ensure that the IP addresses are located in different networks, or use the routing function.
- Use a cross-over cable to directly connect the PADT to the system bus module (see Chapter 5.1.4 and Chapter 5.1.6).

6.3 System Overview

After a successful system login, the Control Panel appears with the *System Overview*. The system overview provides a summary of the most important data and settings.

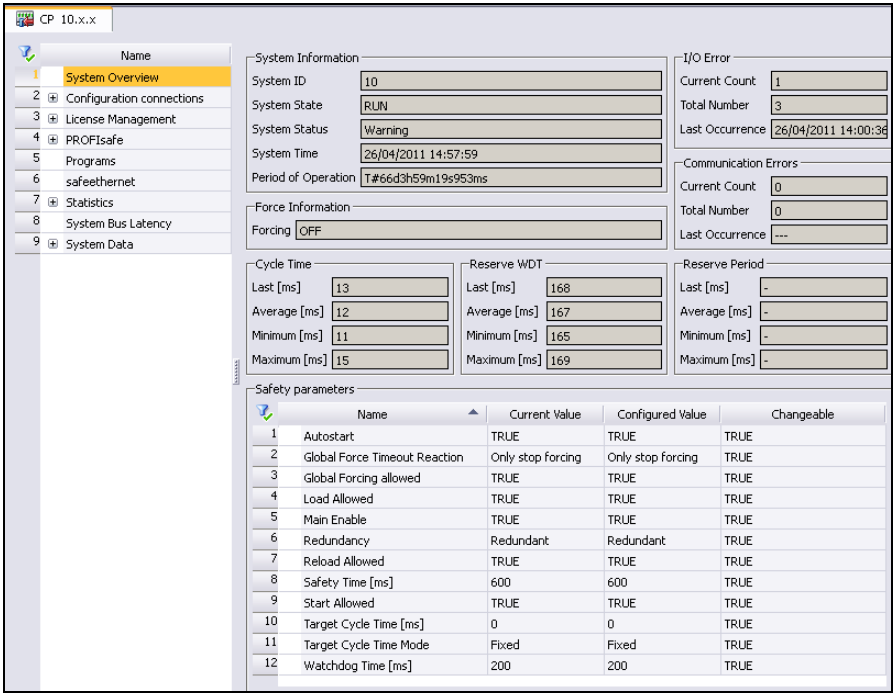


Figure 6-3: Control Panel

For instance, the Control Panel provides the following information:

- The system state and status.
- The force status.
- I/O errors and communication errors.
- The cycle time.
- Safety parameters.
- The state of the programs.
- The state of the existing safe**ethernet** connections.
- Activated or required licenses.

6.4 Programs in the Online View

After a system login (see Chapter 6.2), a program can be opened in the online view, e.g., to visualize the logic and the current values.

The information is displayed in a separate workspace tab.

6.4.1 Opening the Online View

Perform the following steps to display the online view of the program running on a resource:

- In the structure tree, open the required resource (in the example: *PES_01*).
- Select the required program name located under the resource and click **Online** on the Action Bar. The program's online view appears.

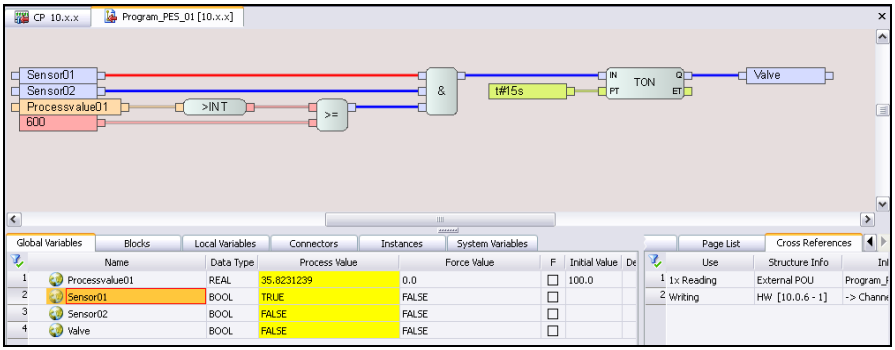


Figure 6-4: Online View of the Program

In the online view, one can get a quick survey of the current process and force values.

- The states of binary variables appear with colored connection lines: FALSE = blue, TRUE = red.
- The values of variables are displayed in the tables of the Object Panel.
- Right-click the drawing area and select *Activate Automatic OLT Field* to visualize the automatic online test fields next to the variables and POU outputs.

6.4.2 Use of Free OLT Fields

Free online test fields can be created in the logic's online view to summarize multiple variables within one worksheet.

This action also allows to visualize variables which are located at physically different positions in the logic.

- Click a variable in the Object Panel and drag it onto a free space in the logic. The name of the variable and the value are displayed in a free OLT field.
- If necessary, repeat the previous step to compose an overview of multiple variables.
- Save the changes if the OLT fields should be maintained after closing the online view. This action does not affect the online capability or the CRC value.

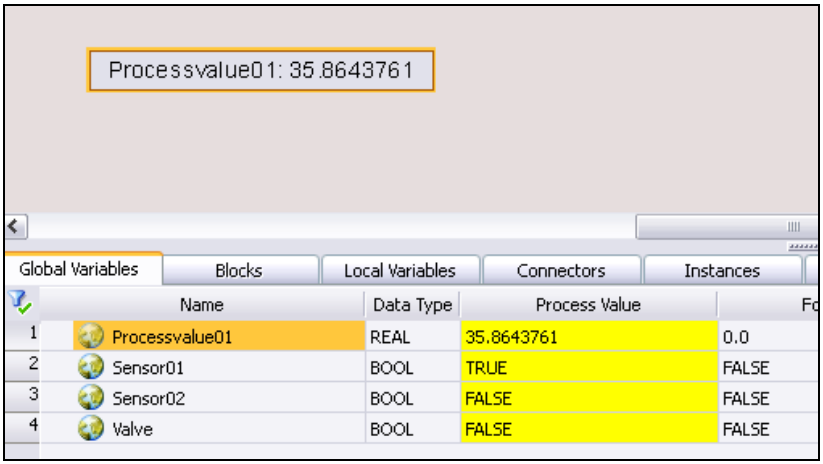


Figure 6-5: Free OLT Field

6.4.3 Orientation (Navigation) in the Logic

For large user programs, the SILworX navigation window provides three tabs with different functions that help to orient oneself within the logic:

- Logic (Overview)
- Page List
- Cross-References

6.4.3.1 Tab Logic

The zoom factor for the overview can be changed by using the scroll wheel while pressing and holding the **Ctrl** key. The red frame marks the portion of the logic that is shown in the drawing area. Click that part of the workspace on which the frame should be centered.

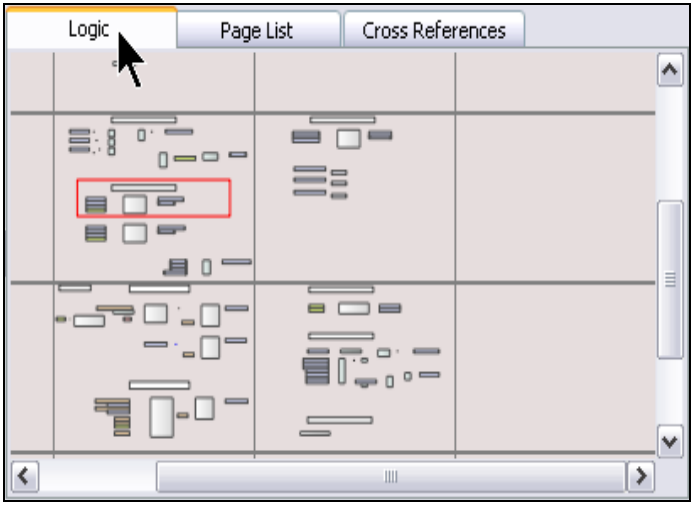


Figure 6-6: Overview of the Logic

6.4.3.2 Tab Page List

The **Page List** tab specifies all worksheets contained in the logic. If a page name and description was defined in the page properties, they are displayed next to the page position.

A worksheet can be selected and aligned in the drawing area with its upper left edge.

- Double-click a page position or select **Go to…** from the context menu.

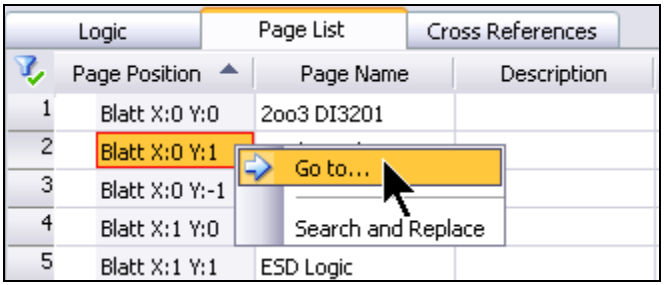


Figure 6-7: Page List

6.4.3.3 Tab Cross-References

The **Cross-References** tab displays all uses of the global and local variables. Which use applies to which variable depends on the element selected in the Object Panel.

Cross-References for Local Variables

The *Local Variables* tab of the Object Panel contains all variables used in the current function block (POU).

- Select the required variable from the list. Long lists can be filtered and sorted (see Chapter 3.2.5 and 3.2.6).
- In the *Cross-Reference,* double-click a *Use* in the local POU or select **Go to…** from the context menu. The location in which the variable is used is centered in the drawing area.

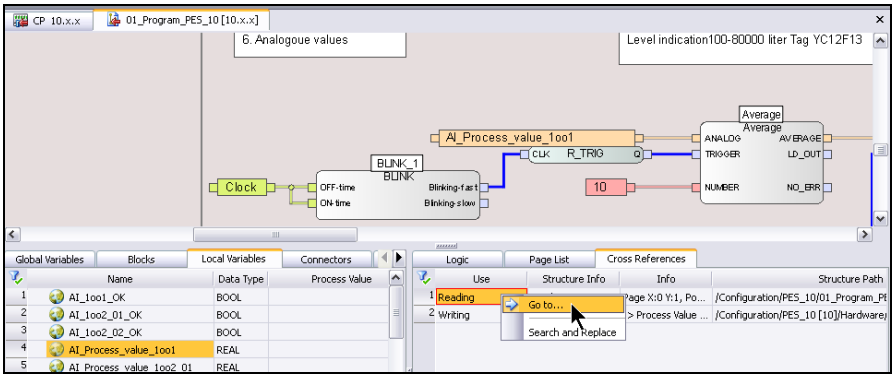


Figure 6-8: Cross-References for Local Variables

Cross-references for global variables

Since global variables are used in various locations within a project, the cross-references associated with them are not only displayed in the program's online view, but also in the following editors:

- Global Variable Editor
- Protocol Editor
- Hardware Editor
- FBD Editor

The cross-references are available wherever the list of global variables is displayed. They are always handled in the same manner.

- Select the required variable from the list. Long lists can be filtered and sorted (see Chapter 3.2.5 and 3.2.6).
- In the *Cross-Reference,* double-click a *Use* of the global variable or select **Go to…** from the context menu. The corresponding POU appears either online or offline.
- Double-click the local use. The location in which the variable is used is centered in the drawing area. The use is displayed online or offline depending on the editor.

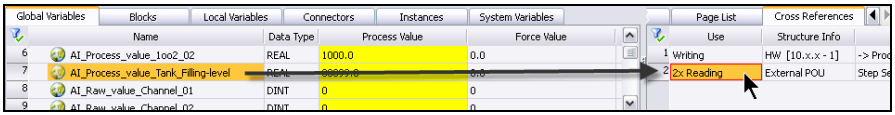


Figure 6-9: Cross-References for Global Variables

6.5 Forcing

In SILworX, forcing is divided into two functions:

1. Global forcing.
2. Local forcing.

For both functions, separate enables are required in SILworX and they are displayed in individual tables.

The following Chapters describe how to use global forcing.

The procedure for local forcing is identical. Note, however, that only variables of type *VAR Local* may be forced.

⚠ WARNING

Physical injury possible!

Forcing is always a safety-relevant intervention in the operation of a safety controller.
For this reason, always observe the instruction and notes provided in the HIMax or HIMatrix safety manual (HI 801 003, HI 800 023)!

6.5.1 Global Forcing Allowed (Force Enable)

Global Forcing Allowed is a resource property. If this parameter is not active, global forcing is not possible.

The *Global Forcing Allowed* property is loaded into the controller as part of the resource configuration. If this setting is changed subsequently, a new code generation must be performed (changes CRC!) and the resource must be loaded once again.

The resource properties can be displayed and configured as follows:

- Click the **Resource** structure tree element and select **Properties** from the Action Bar.

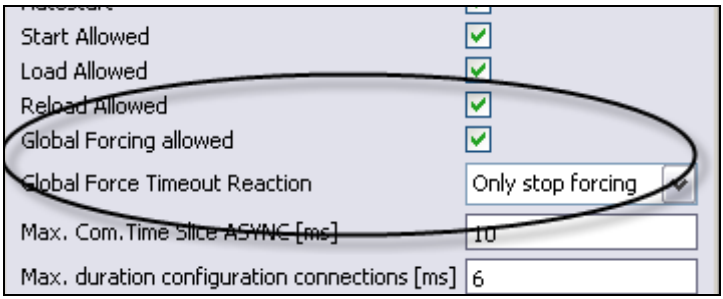


Figure 6-10: Global Forcing Allowed

6.5.2 Local Forcing Allowed (Force Enable)

Local Forcing Allowed is a program property. If this parameter is not active, local forcing is not possible.

The *Local Forcing Allowed* property is loaded into the controller as part of the resource configuration. If this setting is changed subsequently, a new code generation must be performed (changes CRC!) and the resource must be loaded once again.

The program properties can be displayed and configured as follows:

- Click the **Program** structure tree element and select **Properties** from the Action Bar. The dialog box for the program properties appears.

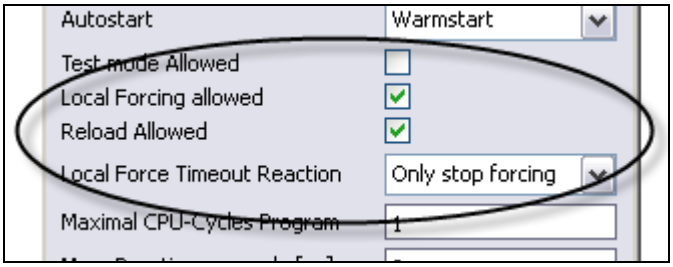


Figure 6-11: Local Forcing Allowed

6.5.3 System Variable Force Deactivation

In addition to the *Global Forcing Allowed* and *Local Forcing Allowed* parameters, (global and local) forcing can also be locked using the *Force Deactivation* system variable. This allows to deactivate forcing, e.g. with a key switch.

Double-click the *HIMax* or *HIMatrix* system name in the Hardware Editor to connect the *Force Deactivation* system variable to a global variable.

The *Force Enables* and *Force Deactivation* states are displayed in the Force Editor.

6.5.4 Force Editor

Select the **Forcing, Force Editor** menu function to open the Force Editor. The menu is only available after a system login.

Figure 6-12: Opening the Force Editor

The Force Editor provides an overview of the most important force information:

- Force state (stopped, prepared, started).
- Forced variables (yes, no).
- Remaining force duration.
- Force timeout reaction.
- Forcing allowed (resource property).
- Force deactivation (system variable).

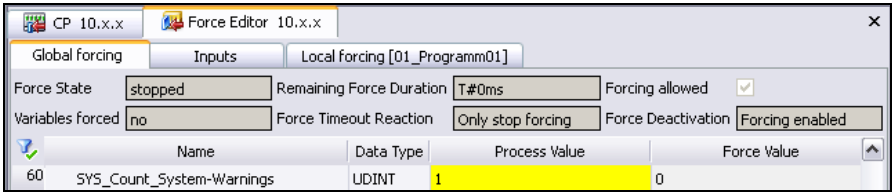


Figure 6-13: Overview of the Force Editor

6.5.5 Forcing variables

Prior to changing the force settings, ensure that the system is not influenced by unintentional changes. Check the following points:

<table>
<tr><td colspan="4">Is forcing active?</td></tr>
<tr><td colspan="2">Yes</td><td colspan="2">No</td></tr>
<tr><td colspan="2">Is there any forced variable?</td><td colspan="2">Is there any forced variable?</td></tr>
<tr><td>Yes</td><td>No</td><td>Yes</td><td>No</td></tr>
<tr><td>For details on how to proceed when forcing an already forced system, refer to Chapter 6.5.7.</td><td>No action</td><td>Reset the force data as follows:
▪ Click the Forcing, Stop Global Forcing menu function. The Stop Global Forcing dialog box appears.
▪ Select the Reset Force Data option and click OK to confirm.
Configured force switches and force values are reset in the system.</td><td>No action</td></tr>
</table>

6.5.5.1 Editing the Force Data in the Force Editor

- To edit the force data of a single variable, double-click the variable in the table. The *Edit Global Force Data* dialog box appears.

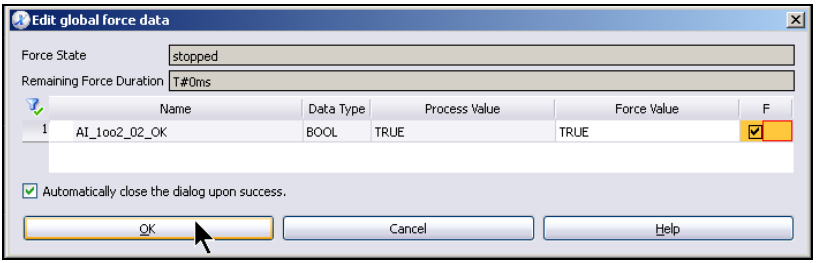


Figure 6-14: Editing the Force Data of Individual Variables

- To edit the force data associated with multiple variables, press and hold the Ctrl key while clicking the variables in the table. Right-click one of the selected variables and select **Edit Global Force Data**. The *Edit Global Force Data* dialog box appears.

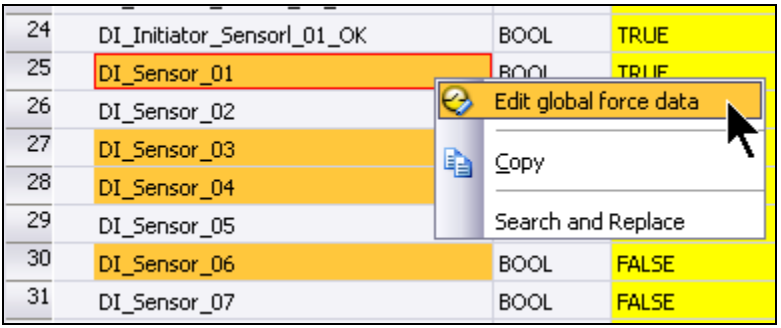


Figure 6-15: Editing Force Data

- Enter the force value in the *Force Value* column. If BOOL variables are used, the value 1 can also be entered for TRUE and 0 for FALSE.
- Activate the individual force switch in column F.
- Click **OK**.

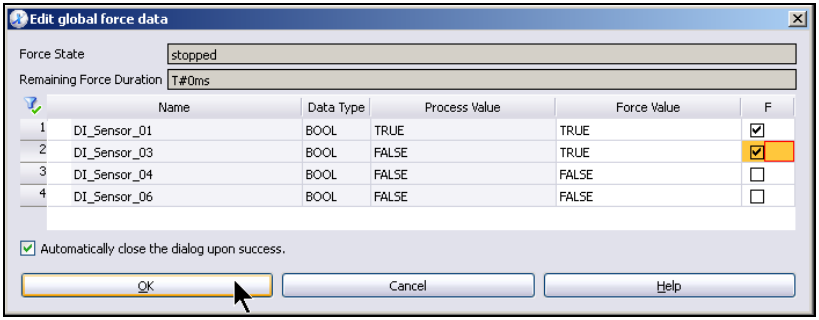


Figure 6-16: Editing Force Data for Multiple Variables

6.5.5.2 Editing the Force Data in the Logic

- Log in to the system (see Chapter 6.2).
- In the structure tree, open the required resource.
- Select the required program name located under the resource and click **Online** on the Action Bar. The program's online view appears.
- Double-click a variable in the logic. The *Edit Global Force Data* dialog box appears.

---

i If OLT fields are used, note that forcing cannot be carried out in OLT fields.

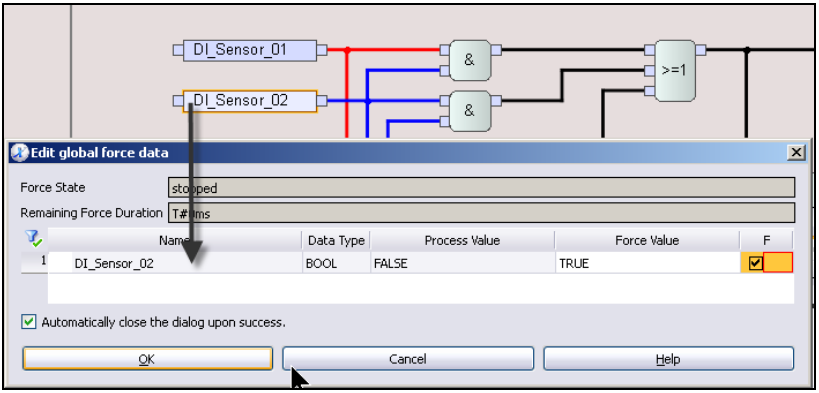


Figure 6-17: Editing Force Data

- Activate the force switch F for the selected variable and click **OK**. A switch symbol is displayed on the left-hand side, above the symbol of the variable. If forcing is started, this variable no longer uses the process value, but the force value.

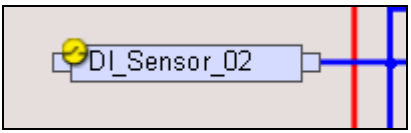


Figure 6-18: Variable with Activated Force Switch

6.5.6 Starting and Stopping Forcing

The menu for starting and stopping forcing is only active if the Force Editor has the focus, i.e., is the active window.

6.5.6.1 Starting Forcing

As soon as forcing is started, all variables with activated force switch adopt the configured force value!

⚠ CAUTION

Start forcing only after having examined that the force values and force switches F are properly set.

Check the setting as follows:

- In the Force Editor, click the filter symbol located on the upper left-hand side of the table. An additional row with filter options appears below the column title.
- Filter the F column based on the active checkboxes. Only the variables with set force switches are displayed.

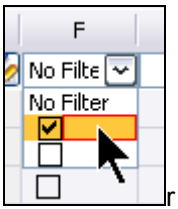


Figure 6-19: Filtering Based on the Activated Force Switches

- Check the variables with set force switches.

- Select the **Force, Start Global Forcing** menu function.

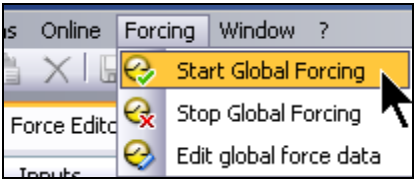


Figure 6-20: Start Global Forcing

- If required, define a force duration in the *Force Duration* field and click **OK** *to* confirm.

Figure 6-21: Starting Forcing

After starting forcing, the *Force State* parameter changes from *Stopped* to *Started*. The values used in the user program are displayed in yellow in the Force Editor.

Force values are only used for variable with active force switch.

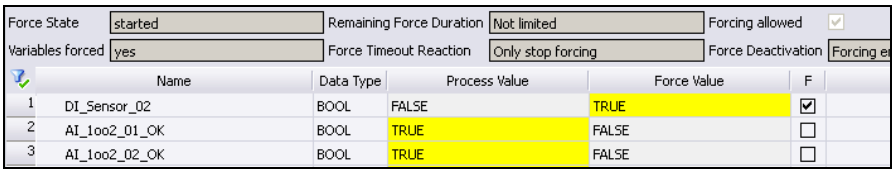


Figure 6-22: Forced Variable

6.5.6.2 Stopping Forcing Manually

If no force duration is configured when forcing is started, forcing must be stopped manually.

- Click the **Forcing, Stop Global Forcing** menu function**.** The *Stop Global Forcing* dialog box appears.

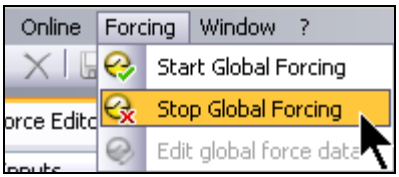


Figure 6-23: Stop Global Forcing

- Activate the **Reset Force Data** option to reset all force values and force switches after stopping forcing. After forcing, the force state changes to *Finished*.
- Deactivate the **Reset Force Data** option to retain the actual Force Data, e.g., because they will be used again for forcing later. After forcing, the force state changes to *Prepared*.
- Click **OK** to stop forcing.

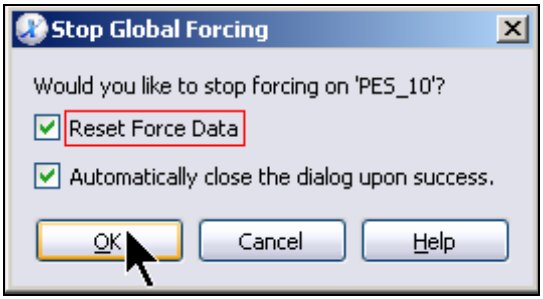


Figure 6-24: Stopping Forcing and Resetting the Force Data

6.5.7 Forcing an Already Forced System

Whether a system is already being forced when opening the Force editor, can be determined by the displayed status.

Forcing is active when the *Force State* is *Started* and *Forced Variables* is marked with *Yes*.

Figure 6-25: Forcing Active

6.5.7.1 Saving Force Data

Save the force data to restore the current force state at a later point in time. Proceed as follows:

- In the Force Editor, click the filter symbol located on the upper left-hand side of the table. An additional row with filter options appears below the column title.
- Filter the F column based on the active checkboxes. Only the variables with set force switches are displayed.
- Select all the variables. Right-click one of the selected variables and click **Edit Global Force Data** on the context menu. The *Edit Global Force Data* dialog box appears.
- In the *Edit Global Force Data* dialog box, right-click a free space and select **Save Table Content as CSV**.
- Assign a useful name to the force data.
- Deactivate the filter.

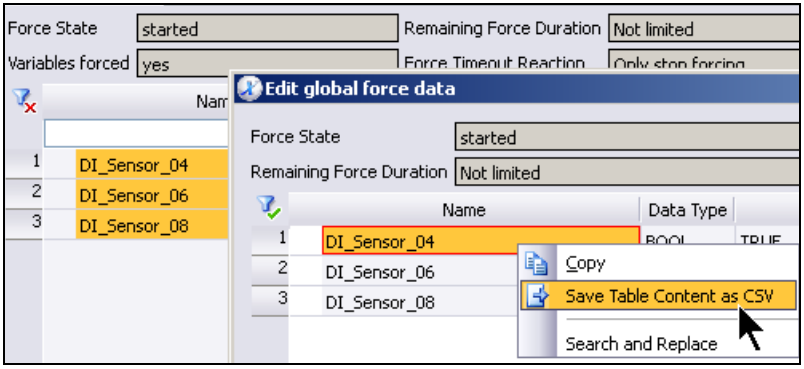


Figure 6-26: Saving Force Data

6.5.7.2 Forcing the System

After having saved the previous force data, the required additional force data can be activated.

The necessary steps are described starting from Chapter 6.5.5.1.

6.5.7.3 Restoring the Original Force State

Proceed as follows to restore the original force state:

- Use an external editor to open the CSV file previously saved. Microsoft Excel is particularly suitable for this use.
- Reactivate the filter for ticked force switches (checkbox in column F is marked).
- Select all the variables contained in the Force Editor. Right-click one variable and click **Edit Global Force Data** on the context menu. The *Edit Global Force Data* dialog box appears.
- Compare the current force data in the Force Editor with the data specified in the CSV file and restore the original settings. If required, sort the tables to improve the overview.
- Click **OK**.
- Once again compare the values displayed for the forced variables with those contained in the CSV file.

6.5.8 Peculiarities of HIMatrix Standard Systems

Every forcing action only affects the global variable. The use of the variable in POUs is not forced.

When logic processing begins, the forced value of the variable is transferred to the POUs. If – in the logic – the variable is written to, subsequent read accesses will result in a value different from the force value, except the written value is identical to the forced values.

The force value of the global variable is used if the variable is read from outside the logic. This read access includes communication and hardware outputs. Communication includes the access of the graphic online test.

Therefore, it could be that the variable in the online test is not represented with its actual value.

6.5.8.1 Workaround

For global variables that should be read and written to in the logic create two variables.

1. One variable for the hardware assignment, for the communication, and for the transfer to the POU including write access.
2. A second variable for the additional read access in the logic. In the logic their value must be assigned on the second variable after the write access on the first variable. The second variable can be defined as local variable.

Local forcing corresponds to setting a value. The value is then overwritten when the variable is accessed in write mode. Local forcing also need not be explicitly started.

Local forcing neither affects the *Forcing* LED nor the *Forcing active* system variable.

6.6 Diagnosis

The Control Panel offers a general system overview.

The various editors available in the online view can be used to perform more detailed analysis.

6.6.1 Displaying the Hardware Diagnosis

Problems in the I/O area can be analyzed in the online view of the Hardware Editor.

- Select the **Hardware** structure tree element and click **Online** on the Action Bar. If the PADT is not yet connected to the resource, the *Login* dialog box appears.
- Enter the user group, password and access mode and click **Login** (see Chapter 5.3.3.3). The Hardware Editor appears in the online view.

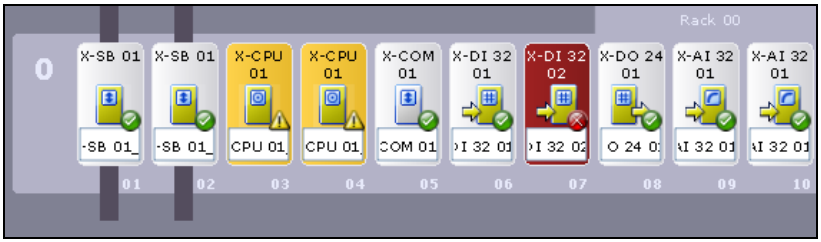


Figure 6-27: The Hardware Editor

- Double-click a module to open the detail view.

i
- Module with warnings are displayed in yellow.
- Module with errors or faults are displayed in red.

- In the left list, select an element for which details should be displayed. By default, the *Status* of the selected module is displayed.

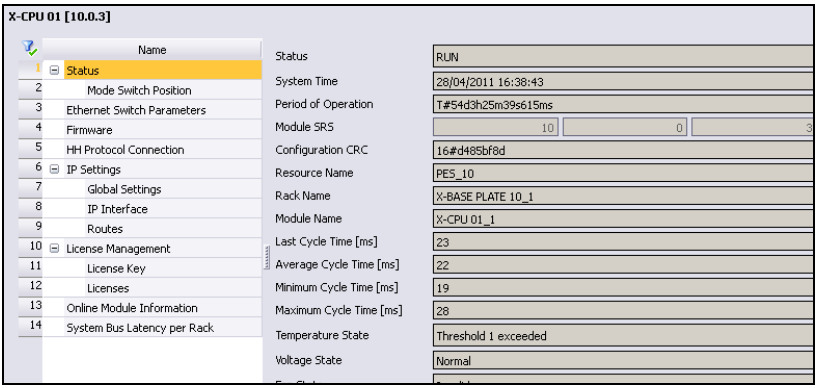


Figure 6-28: Detail View of a CPU

- Click **Firmware** to display the operating system version (OS version).

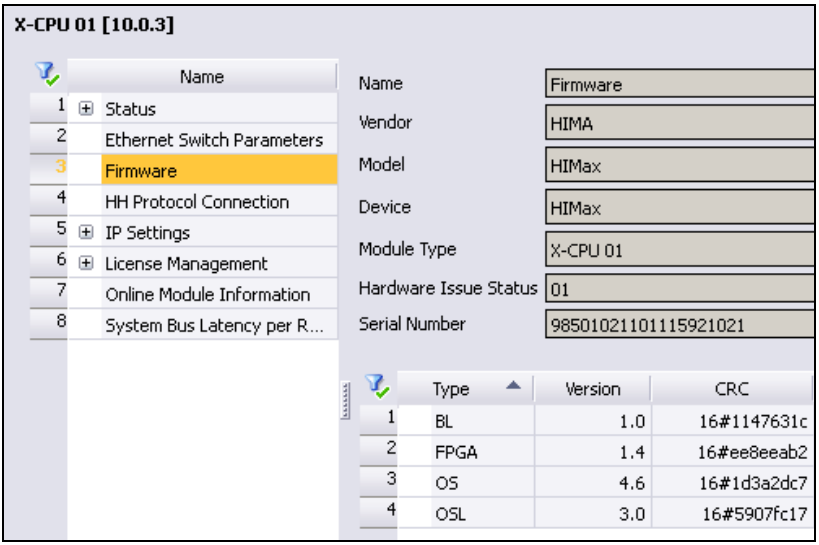


Figure 6-29: Indication of the OS Version

- Click **Close** to return to the hardware overview.

6.6.2 Displaying the Module Data Overview

The module data overview displays the following information for all inserted modules:

Module SRS	OSL
Module Type	BL
Module Name	Hardware Revision
OS	Serial Number

- Click the **Online, Module Data Overview** menu function.

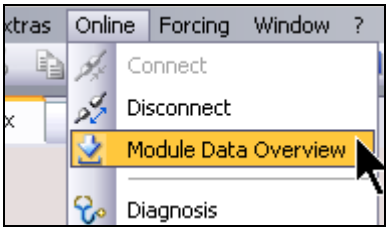


Figure 6-30: The Module Data Overview Menu Function

The module data is represented as a table. Use the context menu for the table to save the table content as CSV file.

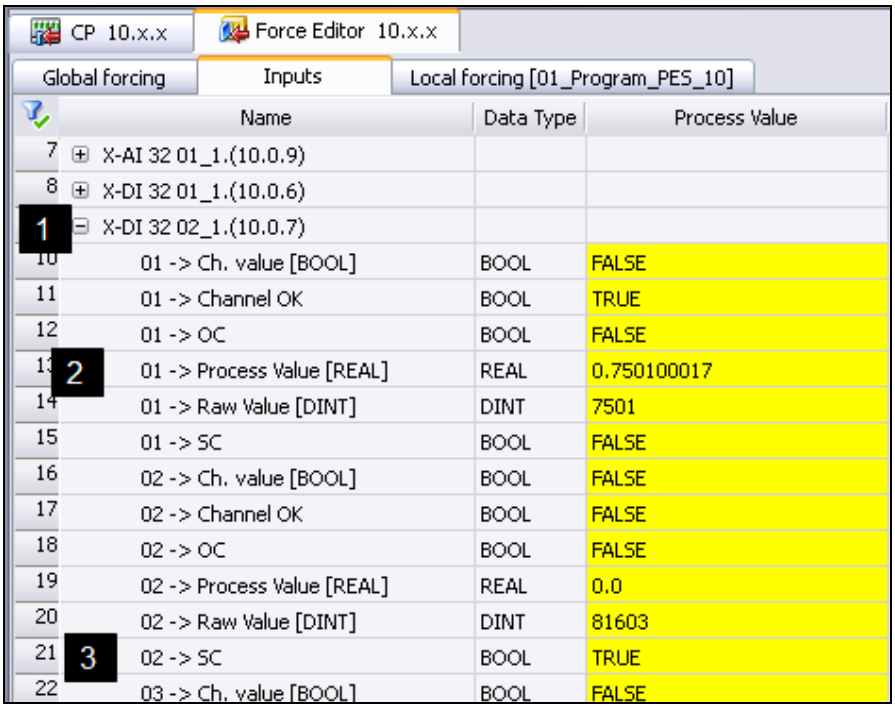
Module SRS	Module Type	Module Name	OS	OSL	BL	Hardware Issue Status	Serial Number
10.0.1	X-SB 01	X-SB A	4.6	3.0	1.0	02	98501020700115214012
10.0.2	X-SB 01	X-SB B	4.6	3.0	1.0	02	98501020700115214001
10.0.3	X-CPU 01	X-CPU 01_1	4.6	3.0	1.0	01	98501021101115921021
10.0.4	X-CPU 01	X-CPU 01_1	4.6	3.0	1.0	01	98501021101115921015
10.0.5	X-COM 01	X-COM 01_1	4.6	3.0	1.0	02	985060000000200116588002
10.0.6	X-DI 32 01	X-DI 32 01_1	4.6	3.0	1.0	02	98501020101114729010
10.0.7	X-DI 32 02	X-DI 32 02_1	4.6	3.0	1.0	02	98501020210116460008
10.0.8	X-DO 24 01	X-DO 24 01_1	4.6	3.0	1.0	02	98501020301117648005
10.0.9	X-AI 32 01	X-AI 32 01_1	4.6	3.0	1.0	02	98501021301114730015
10.0.10	X-AI 32 01	X-AI 32 01_1	4.6	3.0	1.0	02	98501021301114730020

Figure 6-31: Module Data Overview

6.6.3 Displaying the Module Values and States

The states of all system inputs can be viewed in the **Inputs** tab of the Force Editor (see 6.5.4). This does not depend on the variable assignment.

All modules are organized in a tree structure with indication of the SRS.



1 Device in System 10, Rack 0, Slot 7

2 Process Value has 0.750 mA

3 Channel with Short-Circuit

Figure 6-32: Inputs Tab in the Force Editor

Refer to the module-specific manual for a detailed description of the individual parameters.

Examples

Ch. value	State of a digital input.
Channel OK	Result of the channel internal self-test
OC	Open-circuit
SC	Short-circuit
Process value	For AI modules, scaled value in accordance with the parameter setting, otherwise the value in mA. If Channel OK is FALSE, the value is 0.0.
Raw value	Value in mA, 1mA = 10000 digits.

6.6.4 Displaying the Diagnostic Memory of the Modules

An experienced user with good system knowledge can evaluate the diagnostic memory with the aid of the module-specific manuals.

In the HIMax system family, each module is equipped with a diagnostic memory. In the HIMatrix system family, only the CPU and COM modules are provided with diagnostic memory.

If a failure occurs and the cause cannot be identified, one can read the diagnostic memory of the CPU and of the module that probably failed and send it to the HIMA hotline for analysis:

- In the online view of the Hardware Editor, right-click a module icon and selected **Diagnosis** from the context menu. The diagnostic panel appears.

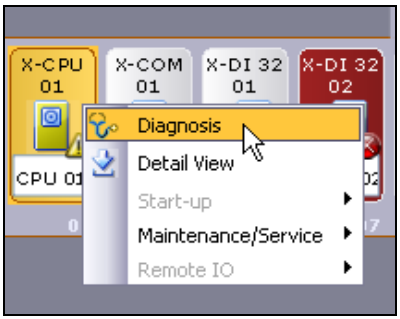


Figure 6-33: Opening the Diagnostic Panel

- Select **All Entries** to display the entire content of the diagnostic memory.
  Select **Entries Since** and modify the date and time to only display the entries for a more recent time period.
  The process for reading the data can take some time.

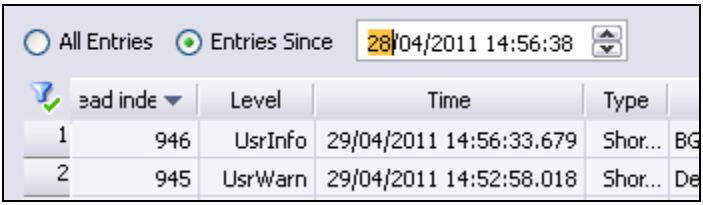


Figure 6-34: Displaying the Diagnostic Memory

Proceed as follows to back up the diagnostic memory in a file for evaluation purposes:

- Right-click the list and select **Save** from the context menu.
  The data is saved as readable XML file and includes some basic data of the module.
- Save the diagnostic file with a unique file name and, if required, send it to the HIMA hotline hotline@hima.com.

To perform the analysis, HIMA needs at least the following information:

1. SILworX Version.
2. LED state of all the CPU modules and of the module concerned.
3. Diagnostic files of all the CPU modules and of the module concerned. The XML files contain the details specified in the items 4. and 5.
4. Operating system state of the CPU modules and of the module concerned.
5. Hardware version and serial number of the module concerned (module data overview).

6.6.5 Diagnosis of a HIMatrix Remote I/O

With a HIMatrix remote I/O the detail view must be opened first, before one can invoke the **Online, Diagnose** menu.

The diagnosis of a remote I/Os is not buffered if power fails. If the diagnostic data is required, read them prior to switching off the operating voltage.

6.7 Reload

A reload can be performed regardless of the number of CPU modules contained in the system. A reload can also be performed in a mono configuration with only one CPU without interrupting operation.

6.7.1 Requirements

To load a resource by performing a reload, the following requirements must be met:

- A user program is already loaded in the resource and the resource is in RUN.
- The last loaded user program (resource configuration) is available as SILworX project.
- Changes to the user program were performed in due consideration of the restrictions specified in the system manual.
- The *Reload Allowed* parameter is activated in the properties of the resource and of the program.
- A license is required to perform a reload for HIMatrix systems with enhanced performance. The reload function cannot be used to load HIMatrix standard systems!
- Reloadable code was created during the code generation (see also Chapter 4.9).

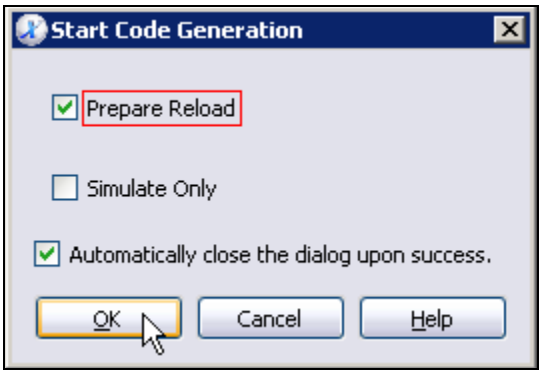


Figure 6-35: Preparing Reload

- For the safety-related operation of the controller, the code generation must be performed twice!
  The code is valid only if the code versions of both code generations are identical. This reveals theoretically possible errors resulting from the code generation. Also observe the instructions specified in the Safety Manual.

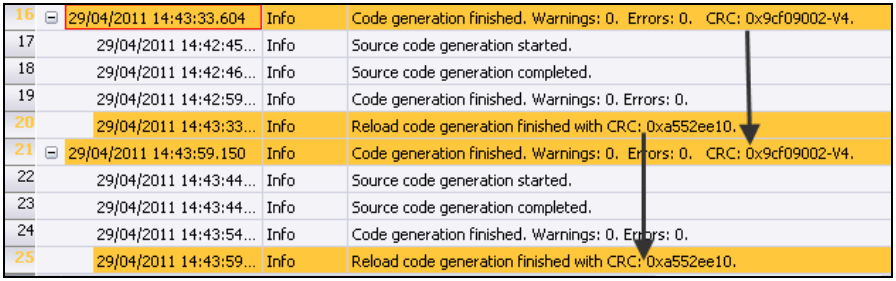


Figure 6-36: Checking for Identical CRCs

6.7.2 Performing a Reload

To be able to perform a reload, one must log in to the system and thus connect the PADT to the resource. When the Control Panel is the active window, the reload procedure can be started selecting the corresponding menu function.

⚠ WARNING

A reload is always a safety-relevant intervention in the operation of a safety controller.
For this reason, always observe the instructions and notes provided in the safety and system manuals!

- Log in to the system such as described in Chapter 5.3.3.3.
- Make sure that the Control Panel is the active window. Otherwise the menu function required for the next step is not available.

- Click the **Online, Resource Reload** menu function. The *Resource Reload* dialog box appears.

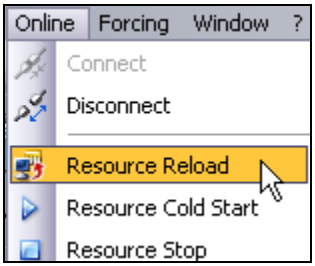


Figure 6-37: Resource Reload Menu Function

- The *Resource Reload* dialog box shows the code version currently loaded in the PES and the new code version resulting from the code generation.

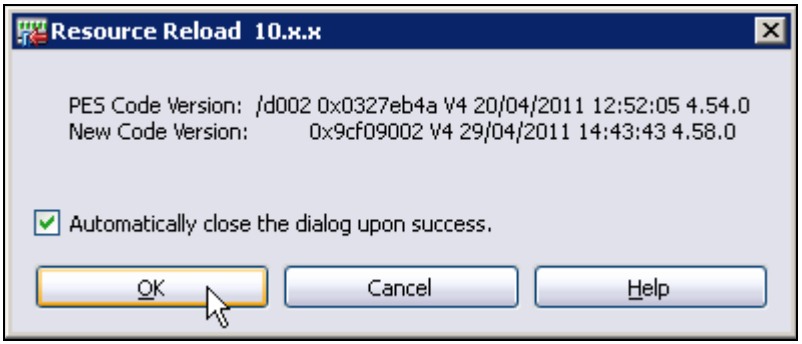


Figure 6-38: Starting the Reload

- Click **OK** to start the reload.

- Wait until the reload is completed. During the reload, no further online commands can be performed.
  The reload is accomplished when the phase RUN RELOAD CLEAN is finished.

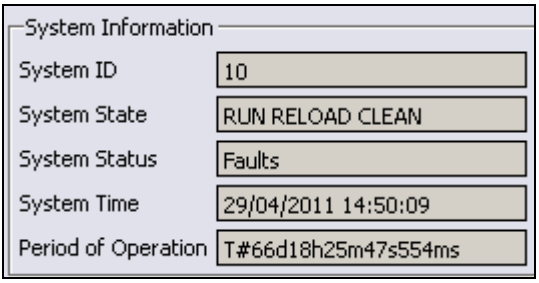


Figure 6-39: After the Reload

- Create a project backup in a separated directory after every load procedure. Refer to Chapter 8 for detailed instructions.

7 Documentation

The documentation of the current state of a project is required for the acceptance test and operating license. In SILworX the documentation can both be printed in paper format, or saved as PDF file.

Prior to creating the documentation, a version comparison with the last loaded version should be performed for each resource. This ensures that the documentation contains the current CRCs (checksums) resulted from the code generations.

7.1 Performing the Version Comparison

Proceed as follows to perform the version comparison for a resource. If the documentation should be created for the entire project, perform the version comparison for all resources in use.

- Select a resource in the structure tree.
- Click the **Extras, Version Comparison** menu function**.** The *Version Overview* dialog box appears.

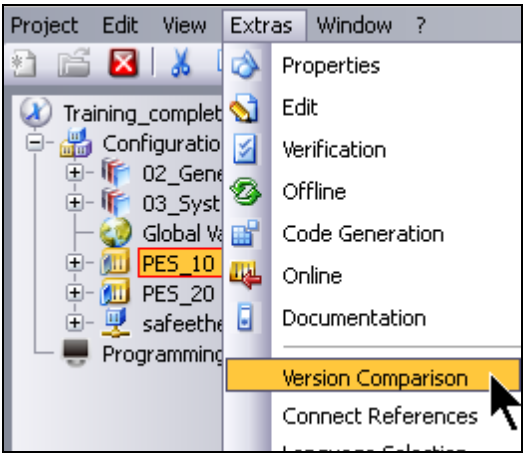


Figure 7-1: The Version Comparison Menu Function

- Check the **Last Load** option in the *Version Overview* dialog box and click **OK**. The version comparison starts.

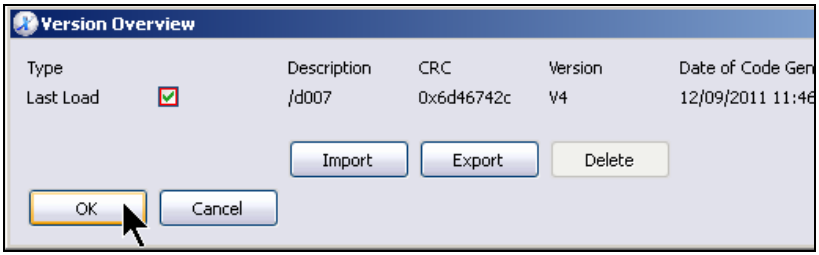


Figure 7-2: Starting the Version Comparison

- Close the version comparison window.
- If necessary, perform the steps described above for all remaining resources in the project.

7.2 Creating the Documentation

To document the project, HIMA recommends to create a PDF file. If required, the documentation content can thus be verified and changed in paperless form.

The PDF file can be sent, e.g., via e-mail and printed at a later point in time.

Proceed as follows to create the documentation:

- Click the **Documentation** button located on the Action Bar. The *Creating Documentation Parameters* dialog box appears.

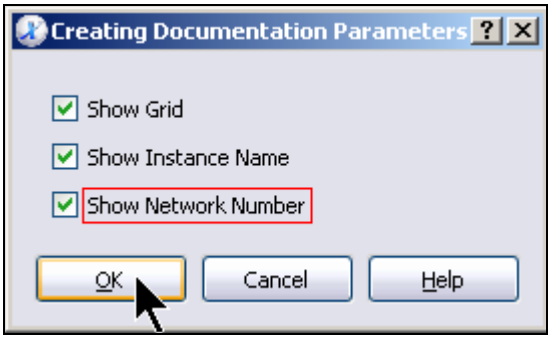


Figure 7-3: Documentation Options

- If required, activate one or more of the following options. The selected options are printed in the logic diagram.
  - Show Grid
  - Show Instance Name
  - Show Network Number
- Click **OK**. The Documentation Editor appears.
- To create the documentation for the entire project, click the checkbox for the top-most project element of the list. In doing so, all subordinated elements are also selected.

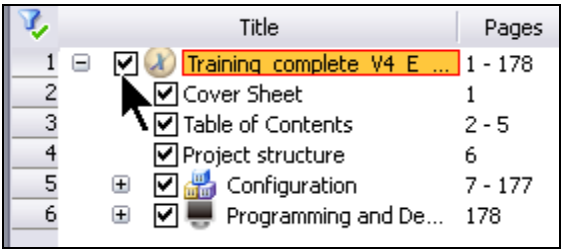


Figure 7-4: Selection of all Objects

- If required, deactivate the project elements for which no documentation should be created.

7.2.1 Editing the Cover Sheet

Adjust the cover sheet content to meet the specific requirements prior to printing out the documentation or creating a PDF file. The entries can be checked in the print preview, on the right-hand side next to the list of the project elements.

- Right-click anywhere within the Documentation Editor and select **Edit Cover Sheet** from the context menu. The Cover Sheet Editor appears.
  Alternatively, use the **Documentation, Edit Cover Sheet** menu function.

- Enter the data to be printed on the cover sheet in the text fields on the left. The tables on the right-hand side of the Cover Sheet Editor are used to record project changes.

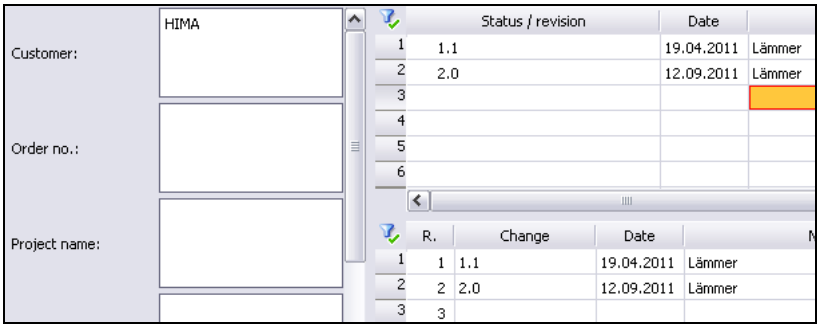


Figure 7-5: Editing the Cover Sheet

- Click **Close** to apply the entries and close the Cover Sheet Editor. Data entered in the Cover Sheet Editor are displayed in the print preview.
- Click the **Save** button located on the Symbol Bar to save the changes in the project file.

Figure 7-6: Saving

7.2.2 Printing or Saving Documents

The documentation for a SILworX project can either be directly printed out, or saved as PDF file. Watch the number of pages when printing out the documentation on paper. The number of pages is displayed in the list of project elements.

- From the list of the project elements select all elements that should be contained in the documentation.
- Select the **Documentation, Print** menu function to send the data to a printer.
- To save the documentation in a file, select the **Documentation, Save as PDF** menu function. A Windows standard dialog box appears where the path and the PDF file name can be entered.

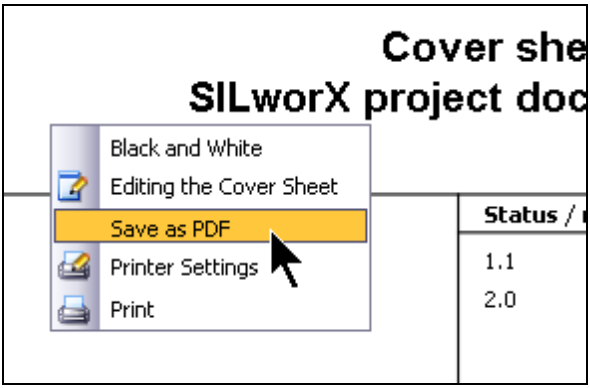


Figure 7-7: Saving as PDF

8 SILworX Project File

SILworX saves all project data in a compressed file named *Project Name.E3*. This file can be copied, renamed, moved, archived and further edited.

If a project is opened, access by other users is blocked. The project data are extracted and saved in temporary files. Saving the actions performed on a project in SILworX using the **Save** command affects the temporary files.

8.1 Closing the Project

Only when the project is closed, the project file is updated with the new temporary files and recompressed.

i If the project cannot be properly closed (computer crash, power outage etc.), SILworX sends a prompt after its next start asking to restore the project.

Click **OK** to confirm the action, otherwise the project is corrupted!

8.2 Create Copy

Once a configuration was loaded into a resource, a project copy should be created and write protected in a separate directory. This ensures that the previous project file is accessible, should erroneous changes be performed.

If necessary, project copies can be created to save the project's intermediary states.

For loaded projects, it is useful to add date, time and the note Loaded to the name of the project copy.

- Save all project changes and close all editors.
- In SILworX, select the **Project, Create Copy** menu function. The *Copy Project* dialog box appears.

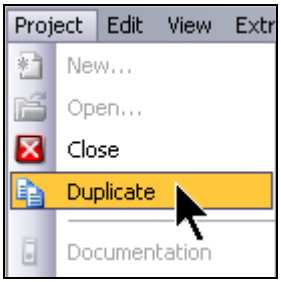


Figure 8-1: Create Copy Menu Function

- Select the *directory* in which the project copy should be created.
- Enter a file name, date, time and the note Loaded or Not loaded.
- Click **OK**. The project copy is created.

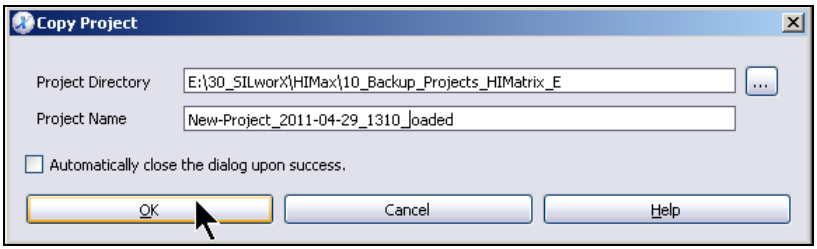


Figure 8-2: Creating a Project Copy

Always make a distinction between a backup and a working copy to be able to access the project loaded last if erroneous changes were performed.

8.2.1 Write-Protect the Copy

Copies of loaded projects created as backup should be write protected. This ensures that the backup copy is not unintentionally changed.

- Open the Windows Explorer and navigate to the directory where the project file copy is located.
- Right-click the file name and select **Properties** from the context menu. The *Properties of ...* dialog box appears.
- Activate the *Read-Only* attribute for the file and click **OK**.

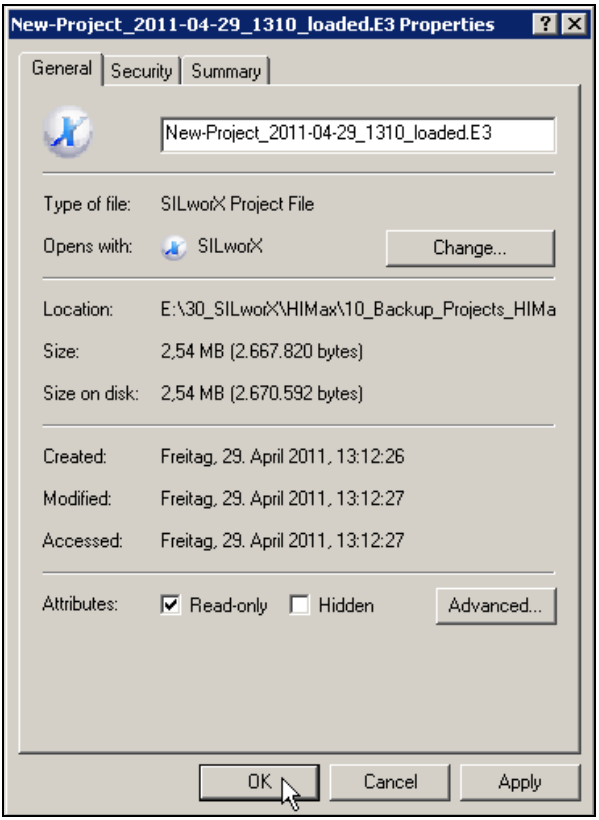


Figure 8-1: Activating the Write Protection

Appendix

Glossary

Term	Description
ARP	Address Resolution Protocol: Network protocol for assigning the network addresses to hardware addresses
AI	Analog Input
BL	Bootloader
OS	Operating System
OSL	Operating System Loader
COM	COMmunication module
CRC	Cyclic Redundancy Check
DI	Digital Input
DO	Digital Output
drag&drop	Procedure of dragging the chosen element and dropping it at the required position.
EMC	ElectroMagnetic Compatibility
EN	European Norm
ESD	ElectroStatic Discharge
FB	FieldBus
FBD	Function Block Diagrams
FTA	Field Termination Assembly
FTT	Fault Tolerance Time
ICMP	Internet Control Message Protocol: Network protocol for status or error messages
IEC	International Electrotechnical Commission
MAC Address	Media Access Control address: Hardware address of a network connection
Modules	Hardware unit to plug in to a rack
PADT	**P**rogramming **a**nd **D**ebugging **T**ool (programming tool).
PES	Programmable Electronic System (controller)
PE	Protective Earth
PELV	Protective Extra Low Voltage
POU	**P**rogram **O**rganization **U**nit (function block).

R	Read: Access mode to a system variable, it provides value, e.g., to the user program.
Rack ID	Rack identification (number).
Resource	System configured with all necessary settings.
PFD	Probability of Failure on Demand of a safety function.
PFH	Probability of Failure per Hour, probability of a dangerous failure per hour.
RIO	Remote I/O: Device that communicates with its parent resource via safe**ethernet.**
Interference-free	Supposing that two input circuits are connected to the same source (e.g., a transmitter). An input circuit is termed *interference-free* if it does not distort the signals of the other input circuit.
R/W	Read/Write: Column title for the access mode to a system variable.
safe**ethernet**	Safety related communication between HIMA PES.
SB	System Bus, also referred to as system bus module.
SELV	Safety Extra Low Voltage.
SFF	Safe Failure Fraction, portion of safely manageable faults.
SIL	Safety Integrity Level (in accordance with IEC 61508).
SILworX	Programming tool for HIMax and HIMatrix systems.
SNTP	Simple Network Time Protocol (RFC 1769).
SRS	System.Rack.Slot Addressing of a module.
Ctrl+A	Shortcut used to automatically enter the standard user group data Administrator during the login.
TMO	Timeout.
W	Write: Access mode to a system variable, it is assigned a value, e.g., from the user program.

Watchdog (WD)	Time monitoring for modules or programs. If the watchdog time is exceeded, the module or program enters the ERROR STOP state.
WDT	Watchdog Time.

Table 10: List of Abbreviations

Index of Tables

Index

HIMA Paul Hildebrandt GmbH + Co KG
P.O. Box 1261 I 68777 Brühl I Germany
Phone +49 6202 709-0 I Fax +49 6202 709-107
www.hima.com

HIMA

SAFETY
NONSTOP