SEW EURODRIVE

Manual

MOVISUITE® IEC Project Creation

Edition 12/2018

25877135/EN

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1 General information

1.1 About this documentation

The documentation is part of the product and contains important information. The documentation is for everyone who works with this product.

The documentation must be accessible and legible. Make sure that persons responsible for the system and its operation as well as persons who work independently with the software and the connected units of SEW-EURODRIVE have read through the manual carefully and understood it. If you are unclear about any of the information in this documentation or if you require further information, please contact SEW-EURODRIVE.

1.2 Content of the documentation

The descriptions in this documentation apply to the current software/firmware version at the time of publication. When new versions of software/firmware are installed, the descriptions may differ. In this case, contact SEW-EURODRIVE.

1.3 Structure of the warning notes

1.3.1 Meaning of signal words

The following table shows the grading and meaning of the signal words for safety notes.

Signal word	Meaning	Consequences if disregarded
⚠ **DANGER**	Imminent hazard	Severe or fatal injuries
⚠ **WARNING**	Possible dangerous situation	Severe or fatal injuries
⚠ **CAUTION**	Possible dangerous situation	Minor injuries
NOTICE	Possible damage to property	Damage to the product or its environment
INFORMATION	Useful information or tip: Simplifies handling of the product.	

1.3.2 Structure of section-related safety notes

Section-related safety notes do not apply to a specific action but to several actions pertaining to one subject. The hazard symbols used either indicate a general hazard or a specific hazard.

This is the formal structure of a safety note for a specific section:

SIGNAL WORD

Type and source of hazard.

Possible consequence(s) if disregarded.

- Measure(s) to prevent the hazard.

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Meaning of the hazard symbols

The hazard symbols in the safety notes have the following meaning:

Hazard symbol	Meaning
	General hazard

1.3.3 Structure of embedded safety notes

Embedded safety notes are directly integrated into the instructions just before the description of the dangerous action.

This is the formal structure of an embedded safety note:

⚠ **SIGNAL WORD** Type and source of hazard. Possible consequence(s) if disregarded. Measure(s) to prevent the hazard.

1.4 Decimal separator in numerical values

In this document, a period is used to indicate the decimal separator.

Example: 30.5 kg

1.5 Right to claim under warranty

A requirement of fault-free operation and fulfillment of any rights to claim under limited warranty is that you adhere to the information in the documentation at hand. Therefore, read the documentation before you start working with the software and the connected devices from SEW-EURODRIVE.

Make sure that the documentation is available to persons responsible for the machinery and its operation as well as to persons who work independently on the units. Also ensure that the documentation is legible.

1.6 Terms and conditions of use

SEW-EURODRIVE grants the temporarily unrestricted right to use a copy of the software including the corresponding documentation and media (together called "material") according to the detailed terms of use and other contractual agreements.

Updates or extensions to the applicable material that are provided as part of an agreement of transfer of possession or other contract (such as maintenance contract) are also part of the material provided.

The complete material belongs to SEW-EURODRIVE and is protected by copyright. If no legal exceptions apply, it is expressly forbidden to:

- Reproduce the material temporarily or permanently, in whole or in part, except for the purpose of designated and contractual uses, or for the creation of a legally permitted backup to ensure future use.
- Translate or modify the software, or to reproduce the results achieved.

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You are obliged to prevent unauthorized access of third parties to the provided material. SEW-EURODRIVE remains the proprietor of all rights, even if you modify the material or combine it with your own or third party programs.

If detailed terms of use are displayed during the software installation and must be accepted before the software can be used, these also apply in addition to the terms of use described here.

1.7 Product names and trademarks

The brands and product names in this documentation are trademarks or registered trademarks of their respective titleholders.

1.8 Copyright notice

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1.9 Applicable documentation

Observe the following applicable documents:

- "MOVI-C® CONTROLLER" manual
- "MOVIDRIVE® modular, MOVIDRIVE® system / MOVISAFE® CS..A Safety Card" manual
- Manuals for additional connected devices
- "MOVISUITE®" engineering software manual
- Manuals of the MOVIKIT® software modules in use
- "IEC Editor" manual
- "MOVI-C® CONTROLLER with EtherCAT®/SBus^{PLUS} System Bus" manual
- "MOVI-C® Software Components" catalog

Always use the latest edition of documentation and software.

The SEW-EURODRIVE website (www.sew-eurodrive.com) provides a wide selection of documents for download in various languages. If required, you can also order printed and bound copies of the documentation from SEW-EURODRIVE.

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2 Safety notes

2.1 Preliminary information

The following general safety notes serve the purpose of preventing injury to persons and damage to property. They primarily apply to the use of products described in this documentation. If you use additional components, also observe the relevant warning and safety notes.

2.2 Use

As the user, you must ensure that the basic safety notes are observed and complied with. Make sure that persons responsible for the machinery and its operation as well as persons who work on the device independently have read through the documentation carefully and understood it.

The following safety notes refer to the use of the software.

This document does not replace the detailed documentation for the connected devices. This documentation assumes that the user has access to and is familiar with the documentation for all connected products.

Do not perform installation or startup if the product is damaged.

Removing required covers without authorization, improper use or incorrect installation and operation may result in severe injury to persons, or damage to machinery.

All work in the areas of transportation, storage, operation and waste disposal must be carried out by persons who are trained appropriately.

2.3 Target group

Software specialist

Any work with the software may only be performed by a qualified specialist. Specialists in the context of this documentation are persons who have the following qualifications:

- Appropriate instruction
- Knowledge of this documentation and other applicable documentation
- SEW-EURODRIVE recommends additional training for products that are operated using this software.

The above-mentioned persons must have the authorization expressly issued by the company to operate, program, configure, label, and ground devices, systems, and circuits in accordance with the standards of safety technology.

2.4 Network security and access protection

A bus system makes it possible to adapt electronic drive technology components to the particulars of the machinery within wide limits. There is a risk that a change of parameters that cannot be detected externally may result in unexpected but not uncontrolled system behavior and may have a negative impact on operational safety, system availability, or data security.

Ensure that unauthorized access is prevented, especially with respect to Ethernet-based networked systems and engineering interfaces.

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Use IT-specific safety standards to increase access protection to the ports. For a port overview, refer to the respective technical data of the device in use.

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3 Project planning information

3.1 Requirements

Correct project planning and proper installation of the devices are required for successful startup and operation.

For detailed project planning information, refer to the documentation of the respective devices. Observe the information in chapter "Applicable documentation" (→ 🗎 9).

3.2 Hardware

The following hardware is required for operation:

- MOVI-C® CONTROLLER
- Centralized and decentralized inverter and drive technology of the MOVI-C® modular automation system

3.3 Software

The following software is required for operation:

- MOVISUITE® engineering software
- MOVIRUN® flexible software platform
- MOVIKIT® MultiMotion / MultiMotion Camming software modules
- IEC Editor

For more detailed information on the hardware requirements of the individual software components, see the documentation for the respective software. Observe the information in chapter "Applicable documentation" (→ 🗎 9).

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4 Introduction

4.1 Objective of the documentation

This manual provides users with a sample procedure to describe how to create a MOVISUITE® project, to configure a device topology, and to create the resulting IEC project with automatic code generation.

The documents listed in the chapter "Applicable documentation" (→ 🗎 9) additionally provide information on the following topics:

- Starting up and operating the devices in use
- Functions of the EtherCAT®/SBusPLUS system bus
- IEC libraries of MOVIKIT® software modules among others

4.2 Short designations

Type designation	Short designation
MOVIKIT® software module	Software module

4.3 MOVISUITE®

The MOVISUITE® engineering software is the operating platform for all MOVI-C® hardware and software components.

The following engineering tasks can be performed using MOVISUITE®:

- Project planning
- Startup
- Parameter setting
- Programming
- Diagnostics

4.4 MOVIKIT®

MOVIKIT® modules are preconfigured software modules for implementing simple drive functions, such as speed control and positioning, up to complex motion control functions, such as camming and robot control. MOVIKIT® software modules are assigned to an axis or a software node on the MOVI-C® CONTROLLER using the MOVISUITE® engineering software and are configured using the graphical user interface and editors.

All MOVIKIT® software modules can be run on MOVIRUN®. Integration into the IEC program is implemented through automated code generation. Numerous MOVIKIT® software modules are available for MOVIRUN® smart (in preparation) and can be used via the standardized fieldbus interface without additional programming effort. All MOVIKIT® software modules offer an object-oriented interface for implementing modern software architectures.

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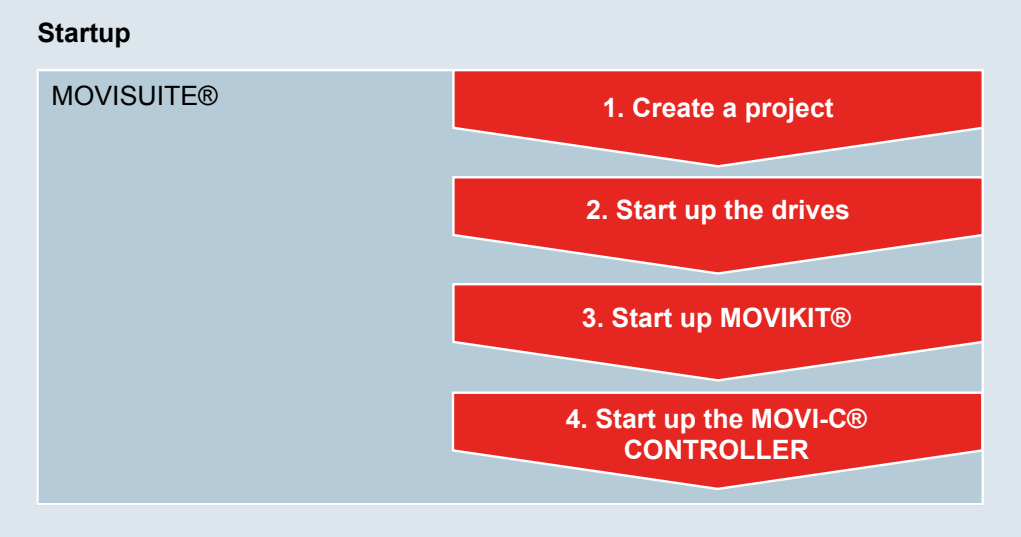
5 Startup

5.1 Startup procedure

Before an IEC project can be created, perform the following steps:



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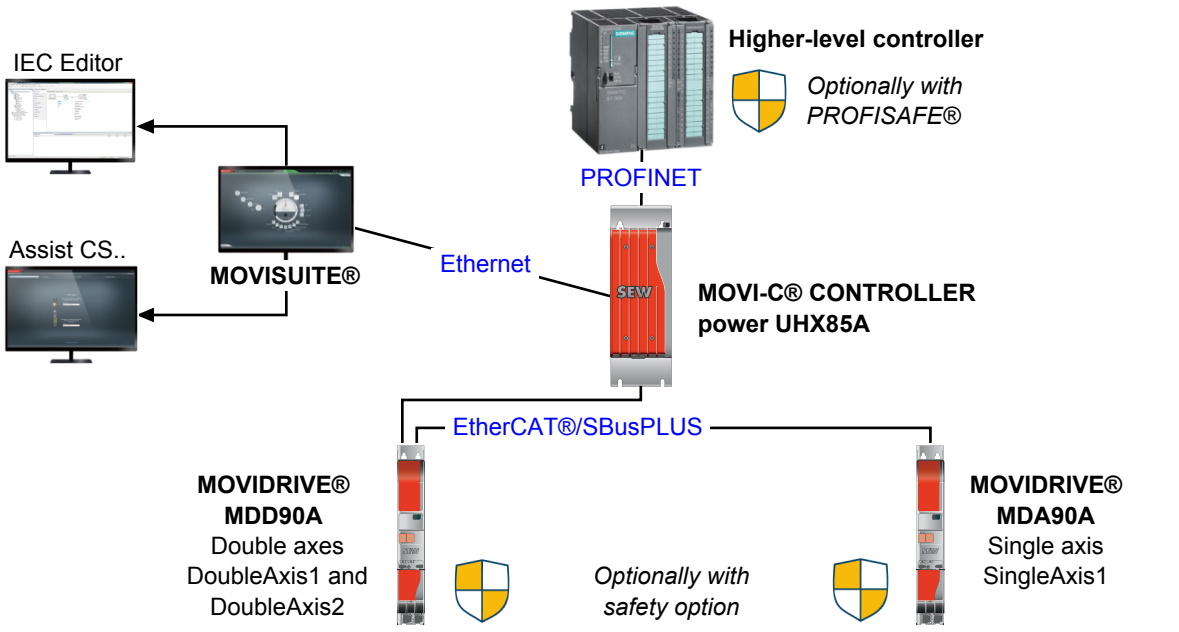
5.2 Device topology

The IEC project creation described as an example in this manual is based on the following device topology, which consists of a MOVI-C® CONTROLLER power, a MOVIDRIVE® double axis, and a MOVIDRIVE® single axis.



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5.3 Creating the MOVISUITE® project

5.3.1 Cabling devices

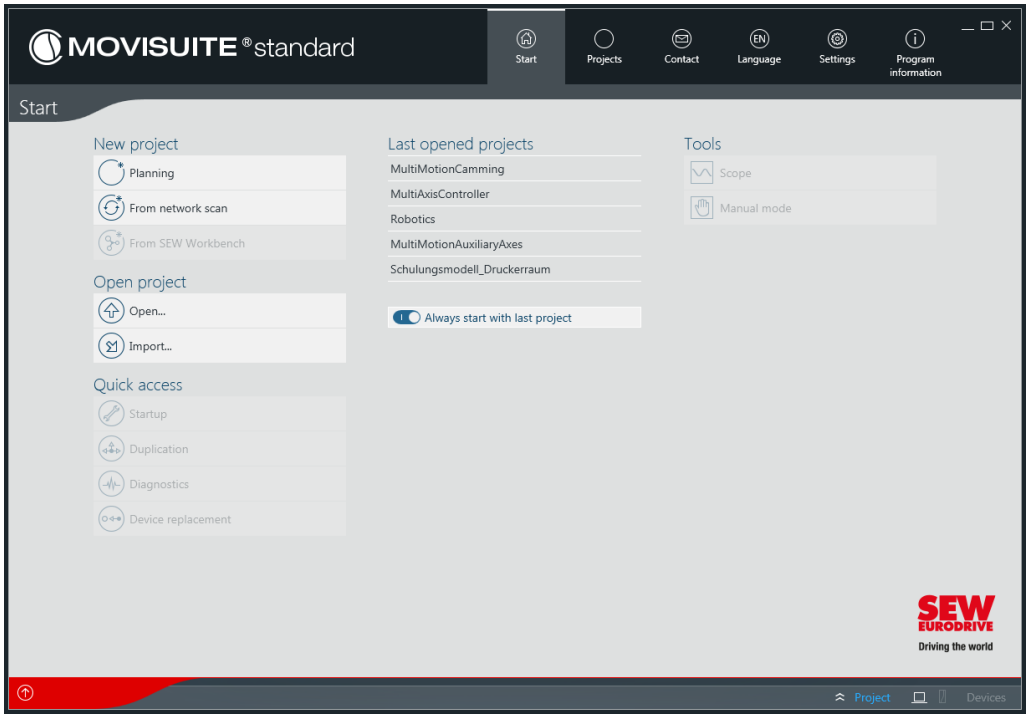
1. Cable the devices as described in chapter "Device topology" (→ 🖹 14). For more information on installing the devices, refer to the manuals of the devices in use.
2. Connect your engineering PC to the MOVI-C® CONTROLLER via the Ethernet interface.

INFORMATION

Use an USB Ethernet adapter, for example, as the Ethernet adapter on your engineering PC.

5.3.2 Creating a project

1. Open MOVISUITE® on your engineering PC.
   - ⇨ If you create a MOVISUITE® project for the first time, the main menu will open. If you have already created MOVISUITE® projects, the last opened project will be displayed depending on the setting. In this case you have to open the main menu manually and select "Start".
2. Under "New project" in the main menu, select [From network scan].



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- ⇨ A currently open project is closed and a new project is created.
- ⇨ You are prompted to configure the communication interface.

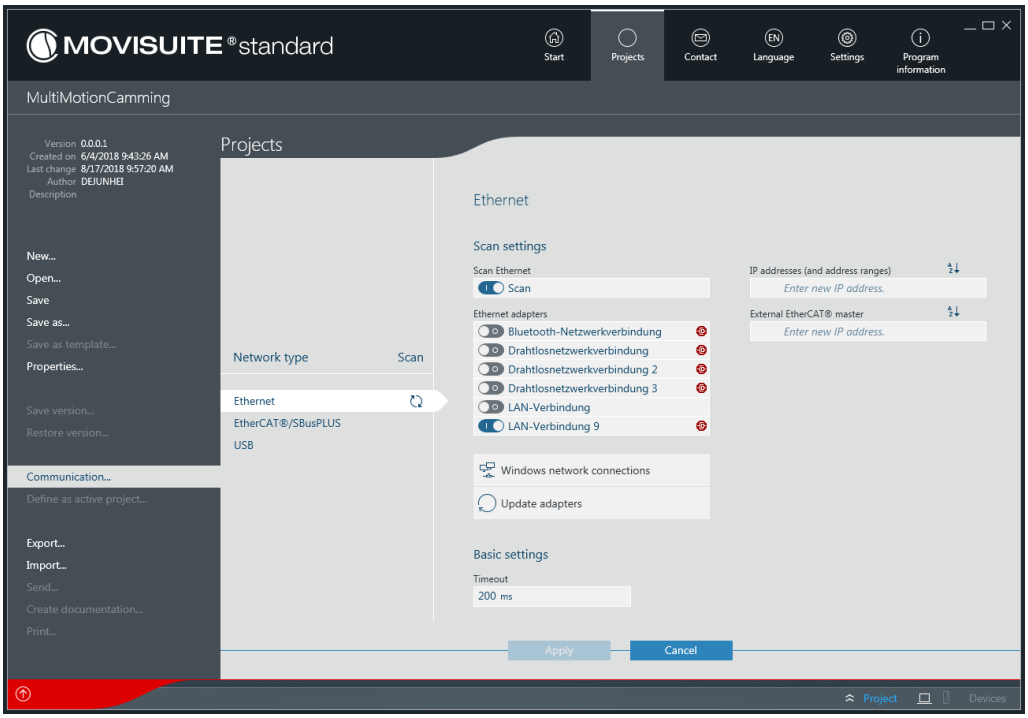
5.3.3 Configuring the communication interface

✓ There is an Ethernet connection between MOVI-C® CONTROLLER and engineering PC.

✓ The "Communication" menu of the "Projects" tab of the main menu is open. (The menu opens automatically when a new project is created.)

1. Under "Network type", select [Ethernet] as the communication interface.

   ⇨ Advanced setting options for the "Ethernet" network type are displayed. For more information, refer to the MOVISUITE® manual.



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2. Under "Scan settings", activate "Scan Ethernet".
3. Under "Scan settings" in the "Ethernet adapters" section, activate the communication adapter you want to use for scanning the network.
4. Under "Scan settings", click the [Windows network connections] button.

   ⇨ Doing so opens a Windows window with available network connections.
5. In the properties of the network connection in use, set the IP address of the adapter used by your engineering PC under "Internet protocol version 4 (TCP/IPv4)".

INFORMATION

If the connection between MOVI-C® CONTROLLER and engineering PC is correct, the command `ping <IP-Adresse>` in the Windows command prompt returns, for example, `ping 192.168.10.4` when standard IP address response telegrams are used.

6. To update the list of available adapters, click in MOVISUITE® on the [Update adapters] button under "Scan settings".
7. Optionally enter the IP addresses of the devices to be scanned in the "IP addresses (and address ranges)" edit box in the "Scan settings" section. Doing so is necessary, for example, when the devices are located in other subnets.

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8. Optionally enter the IP addresses of the required external EtherCAT® master in the "External EtherCAT® master" edit box in the "Scan settings" section.
9. Close the process by clicking [Apply and start scan].

⇨ The menu closes and the "Network scan" (→ 🗎 17) starts automatically.

5.3.4 Network scan

The network scan detects all the devices that can be addressed via the set communication interface. After completed network scan, the devices are displayed in the network view.

INFORMATION

The devices can only be scanned in "Startup" mode.

If the "New project from network scan" option is used, the devices will also be displayed in the function view. When the devices are displayed in the function view, you can synchronize the data sets. This means you can transfer the data sets of the devices to the PC and save them in the MOVISUITE® project. For more information, refer to the chapters ""Device → PC" function" (→ 🗎 88) and ""All devices → PC" function" (→ 🗎 90).

Scan without loaded IEC program or controller in configuration state

If the network scan is performed by a MOVI-C® CONTROLLER to which an IEC project has not yet been loaded or that is in configuration state, all devices connected via SBus^{PLUS} will be scanned. Addressing occurs according to the position address (sequence on the bus). As long as no IEC program is loaded, the bus topology can be changed as required (devices can be added or removed). For more information, refer to the "MOVI-C® CONTROLLER with EtherCAT®/SBus^{PLUS} System Bus" manual.

Scan with loaded IEC program

As soon as an IEC program has been loaded onto the MOVI-C® CONTROLLER and the IEC program is started, only those devices will be scanned that are present and activated in the device configuration of the IEC Editor. New devices on the bus are ignored during the scan.

If new devices have to be added to the bus in this state, or if the topology has to be changed, or devices have to be removed, the MOVI-C® CONTROLLER can be made to enter configuration state by selecting the "Activate configuration state" function from the context menu. All devices present on the bus are then scanned again. For more information, refer to chapter "Configuration state" (→ 🗎 17) and to the "MOVI-C® CONTROLLER with EtherCAT®/SBus^{PLUS} System Bus" manual.

Configuration state

The configuration state provides the following functions for configuring the system components of the MOVI-C® CONTROLLER:

- Updating all the devices connected to EtherCAT®
- Scanning all devices connected to EtherCAT® (also newly added devices)

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INFORMATION

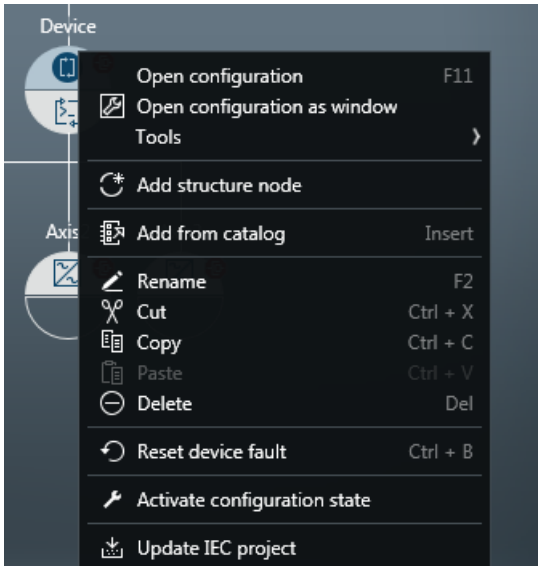
In configuration state, the position addresses are used for communication on the EtherCAT® master.

Activating configuration state

✓ There is an Ethernet connection between MOVI-C® CONTROLLER and engineering PC.

✓ MOVISUITE® is in "Startup" mode.

1. Open the context menu of the MOVI-C® CONTROLLER in the function view of the MOVISUITE® project.
2. Select the menu item [Activate configuration state].



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⇨ A notification symbol on the MOVI-C® CONTROLLER in the MOVISUITE® project indicates that configuration state is active.

⇨ The position address is displayed at the lower-level inverter nodes in the network. The position address is derived from the sequence of the physical wiring.

Deactivating configuration state

✓ Configuration state is active.

1. Open the context menu of the MOVI-C® CONTROLLER in the MOVISUITE® project.
2. From the "Tools" submenu, select the [IEC Editor] menu item.
3. Compile (build) the IEC project, log in, download the project to the MOVI-C® CONTROLLER, and then start the project. For more information, refer to the chapters "Compiling (building) the IEC project" (→ 🗎 59) and "Login and download" (→ 🗎 59) and "Starting the IEC program" (→ 🗎 60).

   ⇨ Configuration state is deactivated.

   ⇨ The notification symbol on the MOVI-C® CONTROLLER in the MOVISUITE® project disappears.

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⇨ By deactivating the configuration state, the so-called *FixedStationAddresses* of the inverters become active. This is the reason why the network has to be scanned or the device addresses have to be updated.

4. In the MOVISUITE® project, click [Scan] on the toolbar, or open the context menu of the background and select the menu item [Update device addresses].

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Communication connection

Automatic IEC project creation in MOVISUITE® requires that all inverters subordinate to a MOVI-C® CONTROLLER are connected to the MOVI-C® CONTROLLER via EtherCAT®/SBus^{PLUS}. Another requirement is that all inverter axes in the function view that are subordinate to the MOVI-C® CONTROLLER are connected with the respective inverter axes in the network view.

5.3.5 Assigning names to devices

After having created the project, assign valid names to the device nodes.

When creating a new MOVISUITE® project via network scan, the devices are automatically displayed in the network view. The names of the devices are extracted from the devices. A notification on the respective node appears if no name is present in the device or if the name has already been used for another device. Violation of a name convention (e.g. when using impermissible characters or when exceeding the maximum length of 80 characters) when entering a new name is indicated by a notification message next to the edit box.

INFORMATION

Observe the following rules when assigning a name:

– MOVI-C® CONTROLLER must not have the same name as a lower-level device.

– Third-party devices subordinate to the MOVI-C® CONTROLLER must not have the same name as lower-level SEW devices. Furthermore, third-party devices must not have the same name as the MOVI-C® CONTROLLER itself.

– Each lower-level device must have a unique name.

✓ The MOVISUITE® project created with a network scan is open.

1. To rename a device, open the context menu of the device in the MOVISUITE® project.
2. Click the [Rename] menu item.
   ⇨ Doing so opens an edit box.
3. Enter the name in this edit box.
4. To confirm your entry, click the green check mark.

5.3.6 Saving the project

Save the current MOVISUITE® project to apply the changes. A mark at the save icon to the left of the project name indicates that a MOVISUITE® project contains changes that have not yet been saved.

You can save the project in two ways:

- Click the save icon to the left of the project name.
- Click [Save] in the main menu.
- Press the key combination <CTRL>-<S>.

INFORMATION

The data retention and data storage operating principle is described in chapter "Data management" (→ 🗎 82).

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5.4 Starting up the drives

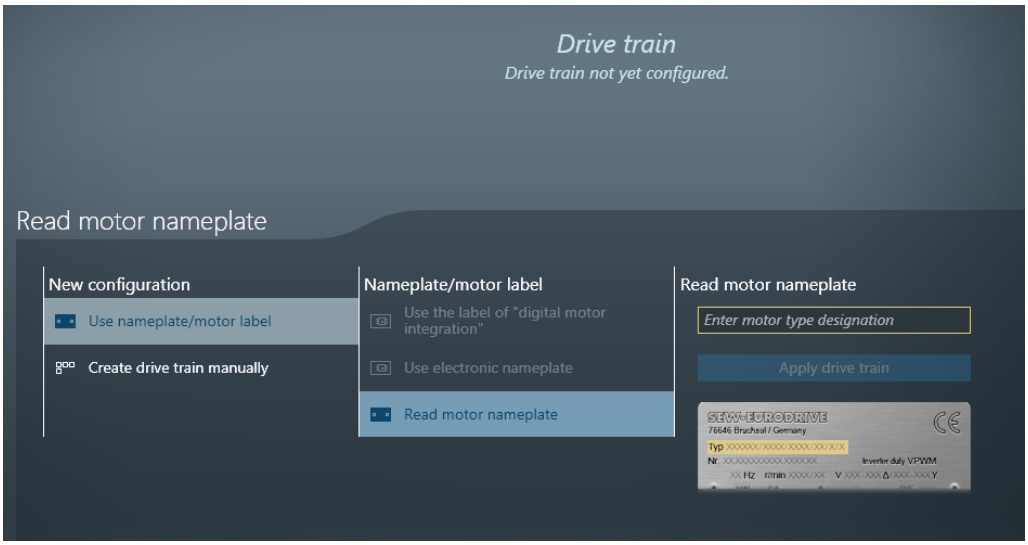
Starting up the drive trains by reading the motor nameplate is described in the subsequent chapters. For a detailed description of all the methods for starting up the drive trains, refer to the MOVISUITE® manual.

5.4.1 Creating a drive train

✓ A MOVISUITE® project has been created via network scan and is open.

✓ You know the information on the motor nameplate.

1. In the function view of MOVISUITE®, click the node of an inverter.
2. In the "Drive train" or "Drive trains" submenu open the "Drive train DT1" menu.
   ⇨ If you have not yet taken the drive train into operation, the following window appears:



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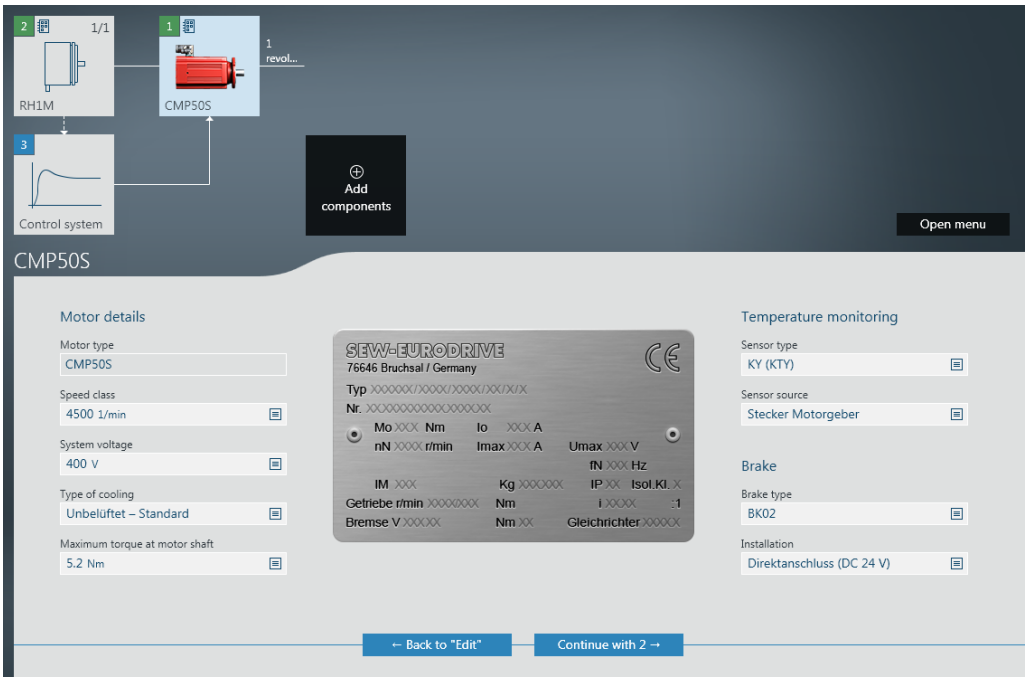
3. Enter the motor type designation in the respective edit box in the "Read motor nameplate" section.
   ⇨ The detected components are displayed.

4. Click ENTER or click the [Apply drive train] button.
   ⇨ The detected components are applied to the drive train.



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5. To take the drive train into operation, click [Next].
6. If necessary, adjust the default values and click [Next]. Selecting a field that is present on the nameplate causes it to be highlighted in the displayed nameplate.
7. Next click the [Apply drive train to project] button.

⇨ You have now created the drive train in your MOVISUITE® project and have taken it into operation with the values you have entered.

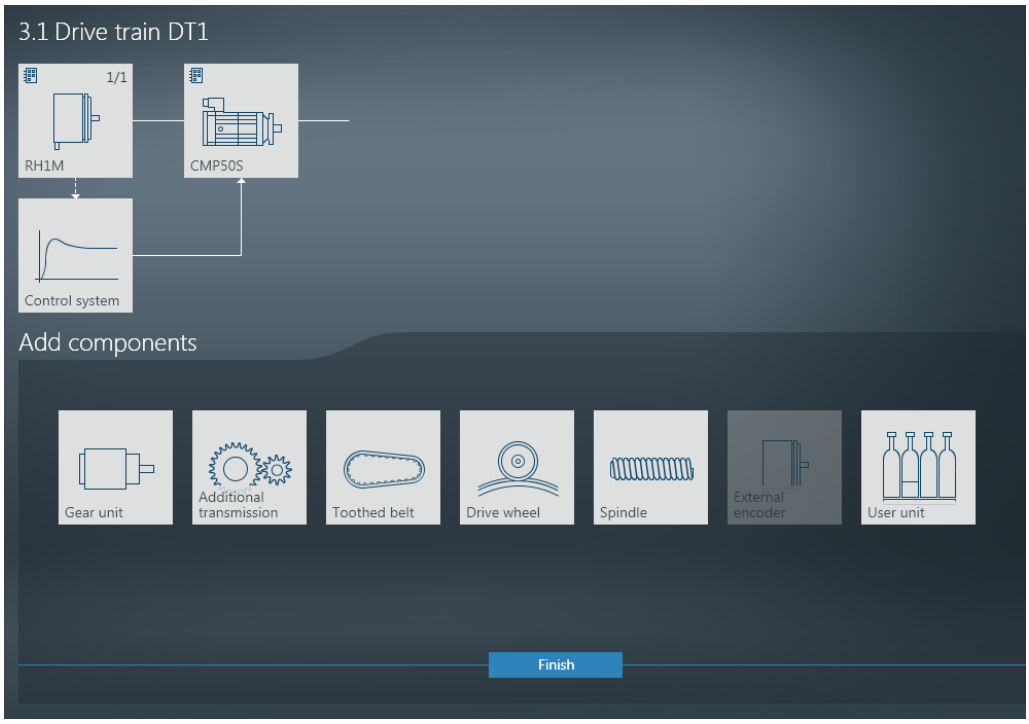
5.4.2 Adding components to the drive train

In the "Drive train" configuration menu, you can add additional components to the drive train for use and operation with the MOVI-C® CONTROLLER.

✓ A drive train has been created and taken into operation.

✓ The configuration menu of a drive train is open.

1. In the overview of the drive train, click [Add components].
   ⇨ This opens the menu for selecting and configuring the additional component.



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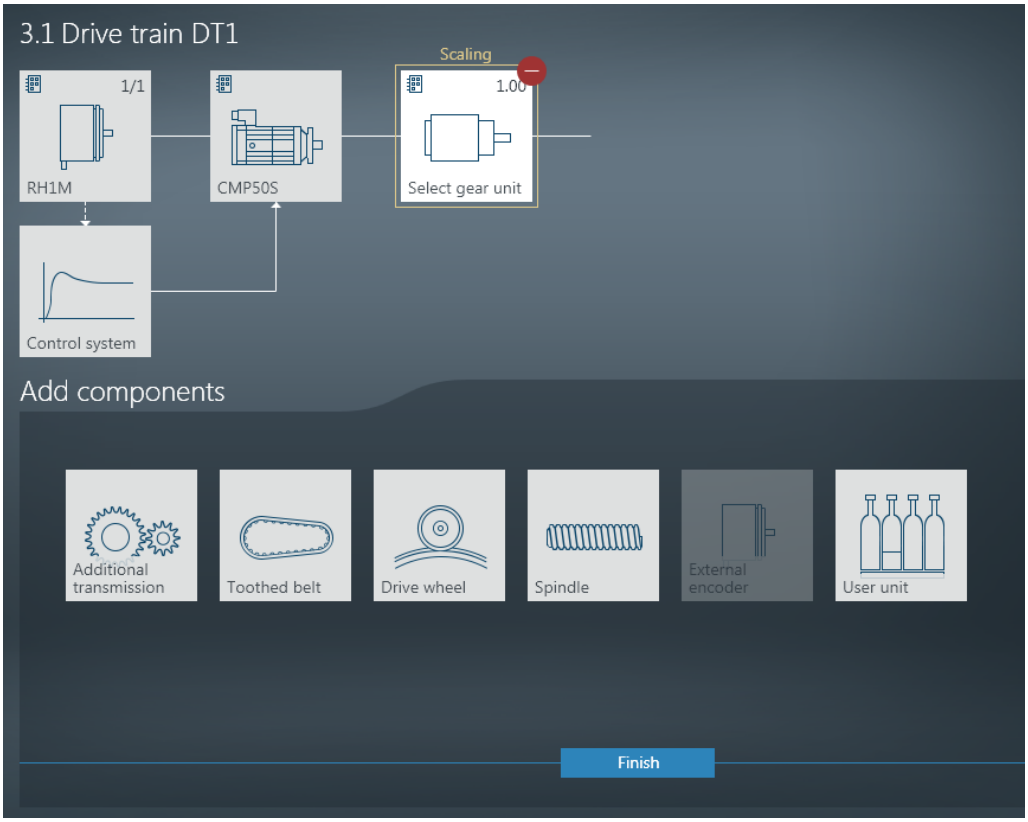
2. Double click the required additional component from the selection of components.
   ⇨ The additional component is added automatically to the respective location in the overview.

INFORMATION

To delete a component, click the "-" sign that appears on the component in the overview when you hoover over it with the mouse.



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3. Click the component in the overview.
   ⇨ The menu for configuring the component opens.
4. Configure the additional component.
5. Click [Next] to continue.

⇨ You have now expanded the drive train by an additional component.

Configuring user units

INFORMATION

When using MOVIKIT® software modules, user units are configured automatically.

For the application example in this manual, you need the additional component "User units". Add them as described in chapter "Adding components to the drive train" (→ 🗎 22).

User units make it also possible to use a gear ratio factor to offset mechanical gear ratios. In the overview, the "User units" component indicates the output values resulting from the gear ratio factor. You configure the processing and calculating of the user users in the settings for the component.

Using user units offers the following advantages:

- Definition of any user unit in which setpoints are specified and actual values are calculated. In a bottling plant, for example, the user unit can be scaled to "bottles". This means the speed is specified in bottles/min and the acceleration in bottles/(min*s).
- Optimization of number ranges and accuracy of process values in the process data as the values are scaled specifically for the application.

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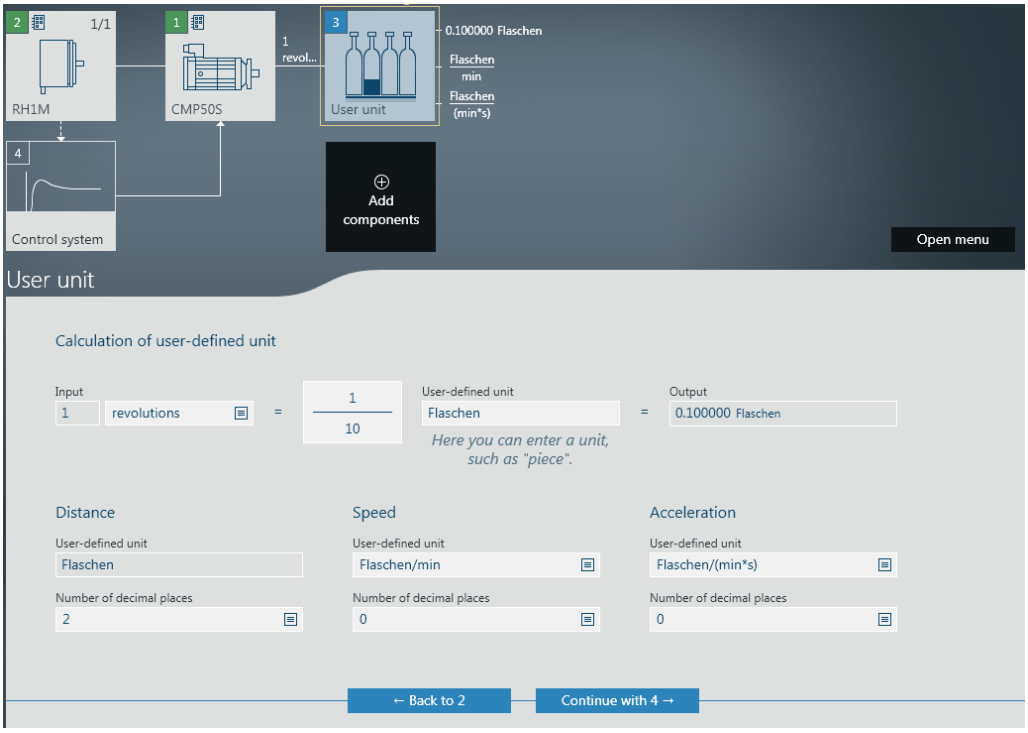

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No.	Block	Input	Output	Description
1	Motor	-	1 rev.	1 motor revolution
3	User unit	1 rev.	1 rev*1/10 = 0.1 bottle	Taking account of the gear ratio factor

Remark:

- "Bottles" was chosen as the "user-defined unit".
- "1 rev = 1/10 bottles = 0.1 bottles" was specified as the gear ratio factor.

  This means that 10 revolutions at the output shaft of the motor represent 1 bottle as the resulting distance.
- Two decimal places were specified as the number of decimal places used for the distance.
- For the speed, "bottles/min" and 0 decimal places was entered.
- For the acceleration, "bottles/(min*s)" and 0 decimal places was entered.

Processing of user units

Changing user units has the following effects: the displayed unit is adjusted (e.g. to "bottles") and the positioning accuracy is increased while at the same time the maximum travel distance is decreased. The reason for the decreasing maximum travel distance when performing a calculation is that the system uses 32-bit values for calculating the position.

The following table illustrates the decrease in the travel distance when changing the number of decimal places:

	1/1 + dec. place=0	1/1 + dec. place=2	1/10 + dec. place=4
Maximum travel distance	-2147483648 to 2147483647	-21474836.48 to 21474836.47	-21474.8364 to 21474.8364

The changes also affect the scaling of the user units. Device parameters, such as positions, speed and acceleration limits are calculated based on these user units. This is the reason why, after having changed these values, you can specify in a dialog window whether you want to maintain the device parameters or adjust them to the new scaling of the user units.

This is illustrated by way of example in the following table:

Device parameter	Actual value	Maintain device parameter	Adjust device parameter
SW limit switch positive	1000 rev.	1000 rev.	500 rev.
...			
Application limit positive speed	100 rev.	100 rev.	50 rev.
...			
Application limit acceleration	10000 rev.	10000 rev.	5000 rev.
...			

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5.4.3 Configuring the control system

✓ The configuration menu for the control system opens. After having added the "user units" component, either click [Next] or click the [Control system] component in the overview.

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1. Specify the control mode and the PWM frequency. You can change the load moment of inertia and the control dynamics in the optimization menu. See chapter "Optimizing the drive train" (→ 🗎 28).

INFORMATION

The control modes are dependent on the motor and combination of motor and encoder. The control mode is selected with a reasonable value based on the motor and encoder in use.

2. To continue, click [Continue and apply drive train to project].
   - ⇨ The startup data are transferred to the device and are saved in the MOVISUITE® project.
   - ⇨ Where applicable, the parameters defined in user units are converted. For further information, refer to chapter "Configuring user units" (→ 🗎 24).

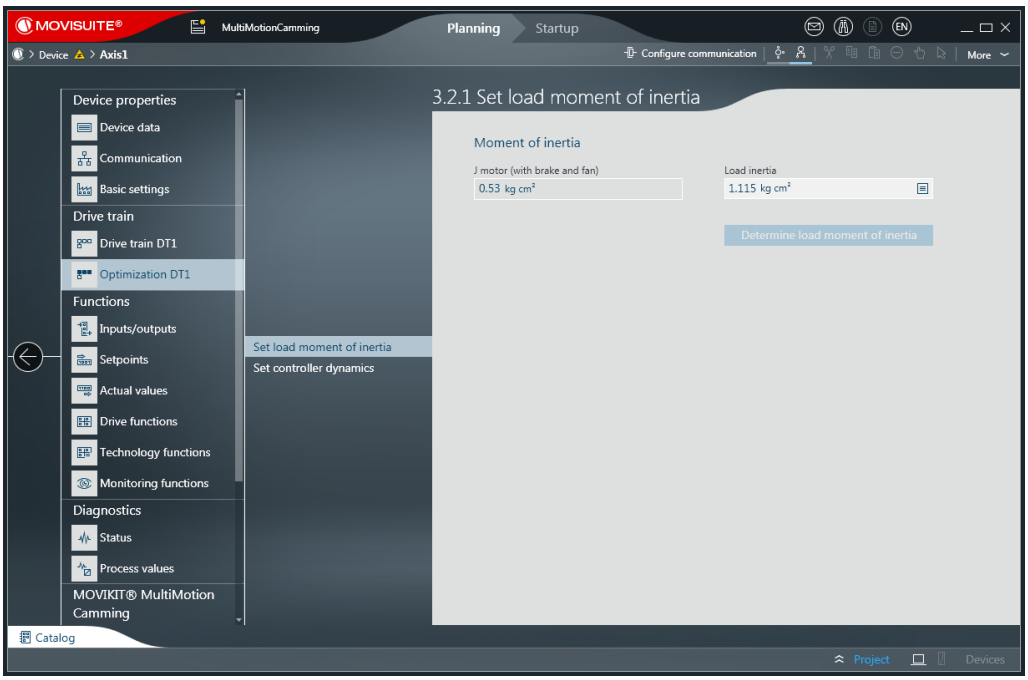
INFORMATION

To determine the load moment of inertia automatically, click the [Determine load moment of inertia] button.

5.4.4 Optimizing the drive train

✓ The configuration menu of a drive train is open.

1. In the "Drive train" or "Drive trains" submenu open the "Optimization DT1" menu.
2. Open the [Set load moment of inertia] submenu.
   ⇨ The "Set load moment of inertia" menu opens.



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3. Select the required value from the "Load inertia" drop-down list.
4. Open the [Set controller dynamics] submenu.
   ⇨ The "Set controller dynamics" menu opens.
5. Set the required value using the sliders for "Stiffness of the control system" and "Zero clearance".

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5.5 Starting up MOVIKIT® software modules

The software modules MOVIKIT® MultiMotion and MOVIKIT® MultiMotion Camming are used for the application example in this manual. For more information and notes on how to use this or other software modules, refer to the respective manuals.

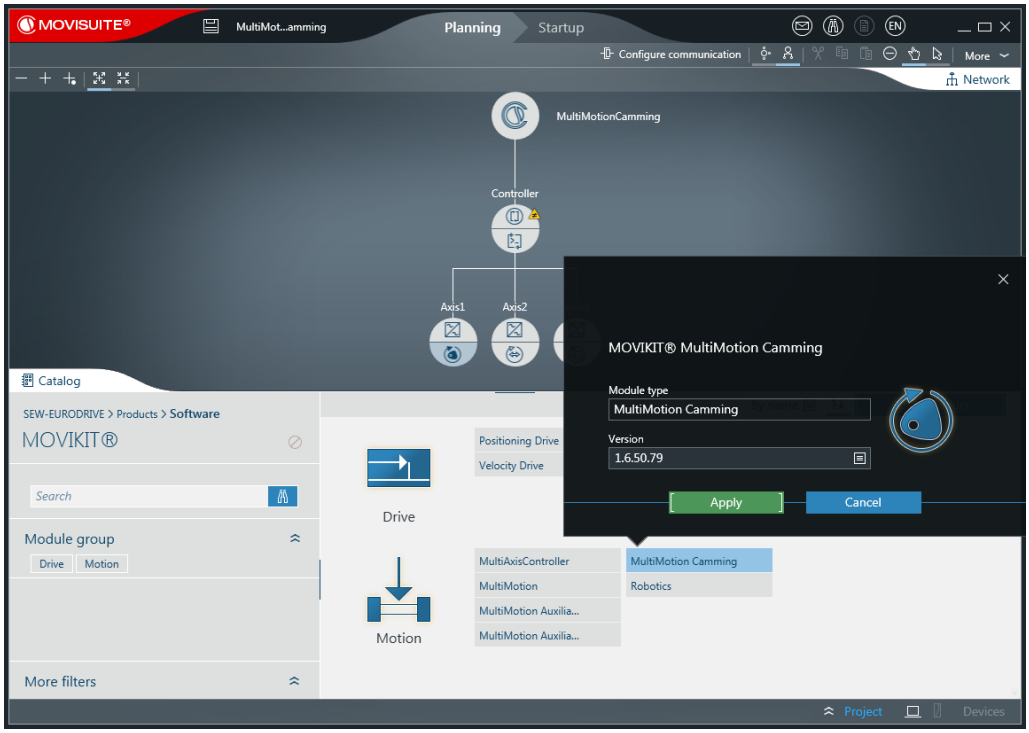
INFORMATION

You need software licenses for using MOVIKIT® software modules. For detailed information on software licenses and on how to perform licensing, refer to the "MOVI-C® Software Components" catalog.

5.5.1 Inserting the software module

✓ A MOVISUITE® project has been created and is open.

1. Click the empty software module section of the node of the desired axis. If this axis already contains a software module, open the context menu of the software module section of the node and select [Add from catalog].
2. In the catalog section, click on the desired software module.



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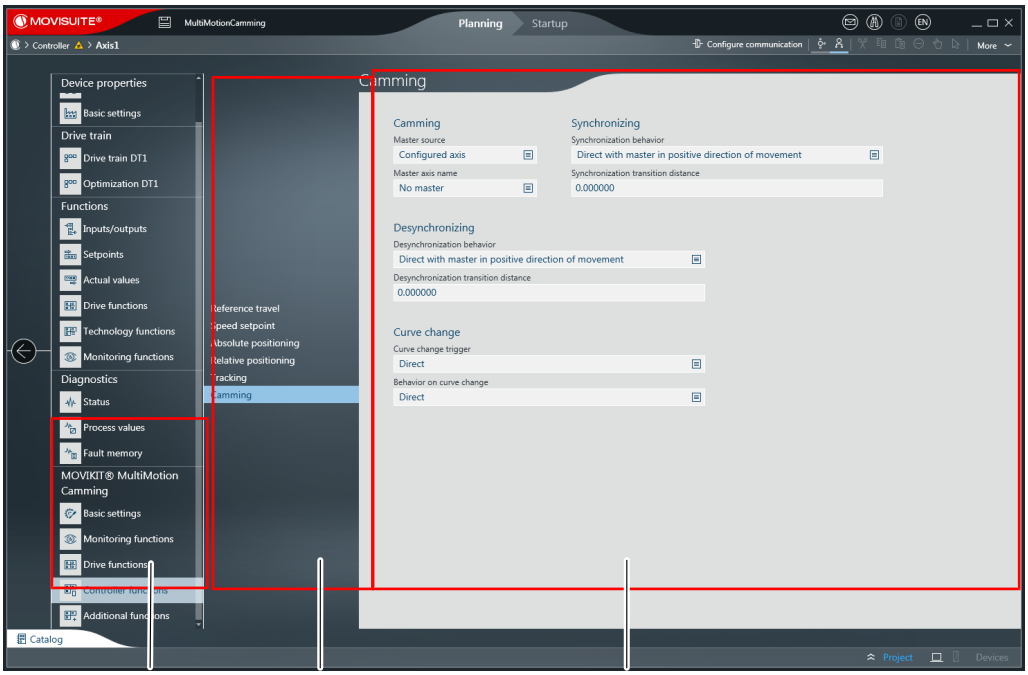
3. Select the version of the software module from the context menu that opens, and confirm your selection using [Apply].

5.5.2 Configuring the software module

1. In MOVISUITE®, click the software module.
   ⇨ The configuration menus of the software module are displayed.



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[1] Main menu of the configuration
[2] Submenus of the configuration
[3] Configuration parameters for the respective submenus

INFORMATION

The setting fields in the configuration menus represent the variables of the IEC project on the MOVISUITE® user interface. The corresponding IEC path and the index number are included in the following table listing the field descriptions, if applicable, and displayed as a tooltip in the user interface of the software. The IEC path specified is to be understood as a relative path within the selected axis or axis group.

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Basic settings

Parameter name	Value
Initialization	
"Initialize settings" button	After making changes to the PD profile, make sure to carry out the "Initialize settings" function for the profile to take effect.
Selecting the process data profile	
Process data profile	Setting regarding how much and which data is exchanged between inverter and controller.
	Index: 50000.10
	IEC name: -
General	
Activate simulation	• ON: Simulate MultiMotion axis functions. • OFF: Do not simulate MultiMotion axis functions.
	Index: 50000.2
	IEC name: Inverter.In.xSimulation
Fault response	Behavior of the profile generator in case of a fault in the assigned axis: • Stop without ramps The profile generator abruptly freezes at the current target position. • Stop at application limit The profile generator creates a stop profile with the deceleration specified in the application limits. • Stop with emergency stop deceleration The profile generator creates a stop profile with the emergency stop deceleration specified. • Following the axis The profile generator creates a stop profile based on the course of the actual position of the axis.
	Index: 50000.11
	IEC name: ProfileGeneration.Config.eErrorReaction
Process data exchange	
Mean value filter time	For setting the filter time constant for the interpolating positioning control.
	Index: 8510.3
	IEC name: -

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Monitoring functions

Limit switches

Parameter name	Value
Software limit switches	
Monitoring SW limit switch negative	• ON: Activate monitoring for negative software limit switch(es) • OFF: Deactivate monitoring for negative software limit switch(es)
	Index: 8572.3
	IEC name: SoftwareLimitSwitch.In.xActivateMonitoringNegative
SW limit switch negative	Position of the negative software limit switch
	Index: 8572.4
	IEC name: SoftwareLimitSwitch.In.lrLimitNegative
Monitoring SW limit switch positive	• ON: Activate monitoring for positive software limit switch(es) • OFF: Deactivate monitoring for positive software limit switch(es)
	Index: 8572.5
	IEC name: SoftwareLimitSwitch.In.xActivateMonitoringPositive
SW limit switch positive	Position of the positive software limit switch
	Index: 8572.6
	IEC name: SoftwareLimitSwitch.In.lrLimitPositive

Limit values

Parameter name	Value
Application limits	
Positive speed	Maximum positive speed permitted for moving the system. Limits the maximum speed to this value.
	Index: 8357.10
	IEC name: ConfigHandling.stAxisConfig.lrAppLimitVelocityPositive
Negative speed	Maximum negative speed permitted for moving the system. Limits the maximum speed to this value.
	Index: 8357.11
	IEC name: ConfigHandling.stAxisConfig.lrAppLimitVelocityNegative

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Parameter name	Value
Acceleration	Maximum permitted acceleration for accelerating the system. Limits the maximum acceleration to this value.
	Index: 8357.12
	IEC name: ConfigHandling.stAxisConfig.lrAppLimit-Acceleration
Deceleration	Maximum permitted deceleration for braking the system. Limits the maximum deceleration to this value.
	Index: 8357.13
	IEC name: ConfigHandling.stAxisConfig.lrAppLimit-Deceleration
Jerk time	The jerk time indicates the duration for producing and reducing torque or acceleration for reaching the actual setpoint. The jerk time takes effect in torque control (FCB 07), speed control (FCB 05), and positioning control (FCB 09), as well as in manual mode. The positioning process extends to twice the set jerk time.
	Index: 8357.14
	IEC name: ConfigHandling.stAxisConfig.lrAppLimitJerkTime
Torque	Maximum permitted torque applied to the system.
	Index: 8357.15
	IEC name: -
Limits	
Emergency stop deceleration	Deceleration for the ramp that is activated during an emergency stop. An emergency stop can be programmed as a response to a fault.
	Index: 8357.20
	IEC name: ConfigHandling.stAxisConfig.lrRapidStop-Deceleration
Cycle limit	
Modulo minimum	Lower modulo limits for handling process data. This limit is required for handling process data with a limited range of values.
	Index: 8357.30
	IEC name: ConfigHandling.stAxisConfig.lrModuloMin
Modulo maximum	Upper modulo limits for handling process data. This limit is required for handling process data with a limited range of values.
	Index: 8357.31
	IEC name: ConfigHandling.stAxisConfig.lrModulo-Max
Lag error	

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Parameter name	Value
Lag error window DT1	Lag error as of which the drive reports a fault (drive train 1).
	Index: 8510.4
	IEC name: -
Limit values from startup	
Maximum speed at motor shaft	Maximum permitted speed at the motor shaft calculated from motor and gear unit data during startup.
	Index: 8360.9
	IEC name: -
Maximum torque at motor shaft	Maximum permitted torque at the motor shaft calculated from motor and gear unit data during startup.
	Index: 8360.11
	IEC name: -

Drive functions

Scaling

Parameter name	Value
Encoder	
Actual position source	Encoder that acts as a source for generating the actual position.
	Index: 8565.3
	IEC name: -
Inverter scaling	
For setting the scaling of the inverter using the position, speed, and acceleration parameters.	
Index: 8554.1-4 (position), 8557.1-4 (speed), 8560.1-4 (acceleration)	
IEC name: -	
Recommended resolution	
Calculated recommendation for setting the resolution	
Index: -	
IEC name: -	
"Apply resolution to drive train" button	Apply the set resolution to the drive train.

FCB 12 reference travel

Parameter name	Value
FCB 12 Reference travel	

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Parameter name	Value
Type	• Deactivated • Zero pulse – negative direction • Reference cam – negative end • Reference cam – positive end • Limit switch positive • Limit switch negative • Reference cam flush – limit switch positive • Reference cam flush – limit switch negative • Referencing without reference travel • Fixed stop positive • Fixed stop negative
	Index: 8552.1
	IEC name: -
Reference offset	For setting the reference offset. This offset is required when the cam is not located at machine zero.
	Index: 8552.5
	IEC name: -
Search speed	Search speed for reference travel
	Index: 8552.8
	IEC name: -
Retraction speed	Retraction speed for reference travel
	Index: 8552.9
	IEC name: -
Home position	
Go to home position	• Yes • No
	Index: 8552.3
	IEC name: -
Home position	Home position that is approached automatically after reference travel is complete.
	Index: 8552.7
	IEC name: -
Homing speed	Speed for approaching the home position after referencing.
	Index: 8552.10
	IEC name: -
Advanced settings	

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Parameter name	Value
Acceleration	Homing acceleration
	Index: 8552.11
	IEC name: -
Deceleration	Homing deceleration
	Index: 8552.12
	IEC name: -
Jerk time	Homing jerk time
	Index: 8552.13
	IEC name: -
Reference to zero pulse	• Yes – reference to zero pulse • No – does not reference to zero pulse
	Index: 8552.2
	IEC name: -
Speed changeover before fixed stop	For setting whether search speed changes over to retraction speed.
	Index: 8552.4
	IEC name: -
Dwell time at fixed stop	Dwell time at fixed stop in ms.
	Index: 8552.15
	IEC name: -
Torque limit fixed stop	Limits the torque when referencing to the fixed stop.
	Index: 8552.14
	IEC name: -

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Controller functions

Reference travel

Parameter name	Value
Reference travel	
Reference travel type	• Deactivated • Reference cam – negative end • Reference cam – positive end • Positive limit switch • Negative limit switch • Referencing without reference travel with enable • Reference cam flush – positive limit switch • Reference cam flush – negative limit switch
	Index: 50007.1
	IEC name: ProfileGeneration.Homing.Config.eReferenceTravelType
Reference offset	For setting the reference offset. This offset is required when the cam is not located at machine zero.
	Index: 50007.2
	IEC name: ProfileGeneration.Homing.Config.lrReferenceOffset
Limit switch debouncing time	Debouncing time for the limit switches
	Index: 50007.3
	IEC name: ProfileGeneration.Homing.Config.lrLimitSwitchDebouncingTime
Search speed	Search speed
	Index: 50007.4
	IEC name: ProfileGeneration.Homing.Config.lrSearchVelocity
Retraction speed	Retraction speed
	Index: 50007.5
	IEC name: ProfileGeneration.Homing.Config.lrClearVelocity
Home position	
Go to home position	• Yes • No
	Index: 50007.9
	IEC name: ProfileGeneration.Homing.Config.xMoveToStartPosition

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Parameter name	Value
Home position	Position that is approached automatically after referencing.
	Index: 50007.10
	IEC name: ProfileGeneration.Homing.Config.lrStartPosition
Homing speed	Speed for approaching the home position after referencing.
	Index: 50007.11
	IEC name: ProfileGeneration.Homing.Config.lrStartPosVelocity
Advanced settings	
Acceleration	Acceleration
	Index: 50007.6
	IEC name: ProfileGeneration.Homing.Config.lrAcceleration
Deceleration	Deceleration
	Index: 50007.7
	IEC name: ProfileGeneration.Homing.Config.lrDeceleration
Jerk	Jerk time
	Index: 50007.8
	IEC name: ProfileGeneration.Homing.Config.lrJerk

Speed specification

Parameter name	Value
Speed setpoint	
Stop at position	• Off: If *xStart* = "FALSE", the drive remains exactly in its position. • Absolute: If *xStart* = "FALSE", the drive moves to a certain absolute position. • Relative: If *xStart* = "FALSE", the drive moves onward from its current position once again by the values specified at the stop position.
	Index: 50002.1
	IEC name: ProfileGeneration.Velocity.Config.stStopAtPosition.eStopMode
Stop position	Value of the stop position that is approached, if *xStart* = "FALSE".
	Index: 50002.2
	IEC name: ProfileGeneration.Velocity.Config.stStopAtPosition.lrStopPosition

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Absolute positioning

Parameter name	Value
Absolute positioning	
Without referenced encoder	• Yes: Allow positioning if the inverter has not yet been referenced. • No: Do not allow positioning if the inverter has not yet been referenced.
	Index: 50003.1
	IEC name: ProfileGeneration.Positioning.Config.xWithoutReferencedEncoder
Target position monitoring	• ON: Check if the target position is within the set software limit switches. If the target position is outside the set software limit switches, the motion is not started and an error is displayed. • OFF: Do not check if the target position is within the set software limit switches.
	Index: 50003.2
	IEC name: ProfileGeneration.Positioning.Config.TargetPositionMonitoring

Relative positioning

Parameter name	Value
Behavior on target position change	
Continue relative movement	• Yes: Continue an interrupted relative positioning if the axis has meanwhile left the interpolating operating mode, e.g. due to enable being canceled. • No: Do not continue an initiated relative positioning.
	Index: 50004.1
	IEC name: ProfileGeneration.PositioningRelative.Config.xContinueRelativeMove

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Parameter name	Value
Behavior on target position change	• OFF: The target position cannot be changing during movement. • Based on the start position: Change to target position is possible during movement. The new target position is relative to the original start position. • Based on the current position: Change to target position is possible during movement. The new target position is relative to the current position of the profile generator. • Based on the target position: The target position can be changed during ongoing movement. A new target distance is based on the last target position and is applied with a positive edge change of input signal *xAcceptNewDistance* (and a pending start signal).
	Index: 50004.2
	IEC name: ProfileGeneration.PositioningRelative.Config.eMode
Target position monitoring	• Yes: Even before traveling to the target position, check if the target position is within the set software limit switches. If the target position is outside the set software limit switches, the motion is not started and an error is displayed. • No: Before traveling to the target position, do not check if the target position is within the set software limit switches.
	Index: 50004.3
	IEC name: ProfileGeneration.PositioningRelative.Config.xTargetPositionMonitoring

Direct coupling

Parameter name	Value
Selection of the master source	
Master source	• User program: The setpoints are entered manually in this menu. • Configured axis: The setpoints for the slave are transferred from the axis selected in the *MasterAxisName* parameter. • External synchronous source: The setpoints for the slave are specified via an external source (e.g. external EtherCAT® encoder).
	Index: 50005.5
	IEC name: –
Master axis name	Name of the master axis.
	Index: 50005.1
	IEC name: –
Settings of the master source	

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Parameter name	Value
Modulo minimum	Minimum modulo limit
	Index: 50005.4
	IEC name: ProfileGeneration.Tracking.Config.lrMasterModuloMin
Modulo maximum	Maximum modulo limit
	Index: 50005.3
	IEC name: ProfileGeneration.Tracking.Config.lrMasterModuloMax
Number of decimal places	The number of decimal places to be used in the master signal.
	Index: 50005.8
	IEC name: ProfileGeneration.Tracking.Config.uiMasterResolution
Time factor for speed	Time base applicable to the speed of the master signal: • 1/min • 1/s
	Index: 50005.9
	IEC name: ProfileGeneration.Tracking.Config.stTimeBaseFactor.eVelocity
Time factor for acceleration	Time base applicable to the acceleration of the master signal: • $1/min^2$ • 1/(min*s) • $1/s^2$
	Index: 50005.10
	IEC name: ProfileGeneration.Tracking.Config.stTimeBaseFactor.eAcceleration
Gear ratio	
Numerator	Numerator value of the master/slave gear ratio.
	Index: 50005.6
	IEC name: ProfileGeneration.Tracking.In.diTracking-Numerator
Denominator	Denominator value of the master/slave gear ratio.
	Index: 50005.7
	IEC name: ProfileGeneration.Tracking.In.diTracking-Denominator

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Camming

INFORMATION

This configuration menu is only available with the "MOVIKIT® MultiMotion Camming" license.

Parameter name	Value
Camming	
Master source	• Configured axis – the setpoints for the slave are transferred from the axis selected in the *MasterAxisName* parameter.
	Index: 50006.5
	IEC name: -
Master axis name	Selection of the master axis.
	Index: 50006.1
	IEC name: -
General	
Behavior at end of cycle	• Adjust reference position of slave axis • Keep reference position of slave axis
	Index: 50006.19
	IEC name: ProfileGeneration.Camming.CONFIG.Start.eCycleMode
Synchronizing	
Synchronization behavior	• Direct synchronization with master in positive direction of movement • Direct synchronization with master in negative direction of movement • Direct synchronization with master in positive or negative direction of movement • Synchronization with reference position and master in positive direction of movement • Synchronization with reference position and master in negative direction of movement • Synchronization with reference position and master in positive or negative direction of movement
	Index: 50006.13
	IEC name: ProfileGeneration.Camming.CONFIG.Start.eStartMode
Synchronization distance	Synchronization distance in user units (master)
	Index: 50006.8
	IEC name: ProfileGeneration.Camming.CONFIG.Start.lrGearInDistance

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Parameter name	Value
Synchronization offset	The offset during synchronization to the reference position in user units (master)
	Index: 50006.9
	IEC name: ProfileGeneration.Camming.CONFIG.Start.lrGearInOffset
Reference position during synchronization	Reference position in user units (master)
	Index: 50006.10
	IEC name: ProfileGeneration.Camming.CONFIG.Start.lrGearInReferencePosition
Keep last configured phase correction	• ON – When deactivating and re-activating the operating mode, keep the last configured phase correction. • OFF – When deactivating and re-activating the operating mode, initialize the last configured phase correction with zero.
	Index: 50006.15
	IEC name: ProfileGeneration.Camming.CONFIG.Start.xStartWithLastCorrection
Desynchronizing	
Desynchronization behavior	• Direct desynchronization with master in positive direction of movement • Direct desynchronization with master in negative direction of movement • Direct desynchronization with master in positive or negative direction of movement • Desynchronization with stop position of internal master and in positive direction of movement • Desynchronization with stop position of internal master and in negative direction of movement • Desynchronization with stop position of internal master and in positive or negative direction of movement • Desynchronization with stop position of external master and in positive direction of movement • Desynchronization with stop position of external master and in negative direction of movement • Desynchronization with stop position of external master and in positive or negative direction of movement
	Index: 50006.14
	IEC name: ProfileGeneration.Camming.CONFIG.Stop.eStopMode
Desynchronization distance	Desynchronization distance in user units (master)
	Index: 50006.11
	IEC name: ProfileGeneration.Camming.CONFIG.Stop.lrGearOutDistance

Parameter name	Value
Stop position after desynchronization	Stop position after desynchronization in user units (master)
	Index: 50006.12
	IEC name: ProfileGeneration.Camming.CONFIG.Stop.lrGearOutStopPosition
Curve change	
Curve change trigger	• Direct • With position of internal master and positive direction of movement • With position of internal master and negative direction of movement • With position of internal master and positive or negative direction of movement • With position of external master and positive direction of movement • With position of external master and negative direction of movement • With position of external master and positive or negative direction of movement
	Index: 50006.17
	IEC name: ProfileGeneration.Camming.CONFIG.Change.eChangeMode
Behavior on curve change	• Direct
	Index: 50006.16
	IEC name: ProfileGeneration.Camming.CONFIG.Change.eTransitionMode
Reference position on curve change	Reference position on curve change
	Index: 50006.18
	IEC name: ProfileGeneration.Camming.CONFIG.Change.lrChangeReferencePosition

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Additional functions

Set the corresponding field of the additional function you wish to use to "Yes". A submenu then opens for the activated additional function.

Touchprobe

Parameter name	Value
General	
Data source	• Encoder • Configured axis • User program
	Index: 50008.1
	IEC name: -
Mode	• Single • Multiple
	Index: 50008.2
	IEC name: TouchProbe.Config.eTouchProbeMode
Trigger	
Source	Source for activating the trigger for recording a signal
	Index: 8352.10
	IEC name: -
Level	Selection for the type of edge that triggers the system: • Rising edge • Falling edge • Rising and falling edge
	Index: 8352.11
	IEC name: -
Data source	
Data source	Selection of the data source that is to be recorded.
	Index: 8352.30
	IEC name: -
Process data – modulo minimum	Required only if the data source runs in modulo mode. The modulo minimum of the source is configured here. The modulo minimum is required if the data source is to be recorded at the time of the modulo change.
	Index: 8352.32
	IEC name: -

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Parameter name	Value
Process data – modulo maximum	Required only if the data source runs in modulo mode. The modulo maximum of the source is configured here. Required if the data source is to be recorded at the time of the modulo change.
	Index: 8352.33
	IEC name: -
Advanced settings	
PO data format	Process data format: • 16 bit • 32 bits – Big Endian • 32 bits – Little Endian The data format is specified when accessing the PO data words. The PO data has a word width of 16 bits and can be compiled as a 32-bit value using the PO data format. This parameter has no effect for data sources with a word width of 32 bits.
	Index: 8352.31
	IEC name: -
Process data – dead time	Specification of the dead time of the process data in ms. In the case of touchprobe, the value of the data source is recorded. Using this setting, the runtime of the process data can be compensated.
	Index: 8352.34
	IEC name: -
Process data – cycle time	Specification of the cycle time of the process data in ms. In the case of touchprobe, the value of the data source is recorded. Using this setting, the runtime of the process data can be compensated.
	Index: 8352.35
	IEC name: -

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5.5.3 Virtual axes

Virtual axes are axes that do not exist physically. They are used, for example, to implement a master axis in the MOVI-C® CONTROLLER. In "Tracking" mode, a virtual axis can be used, for example, to couple several axes and move them synchronously to one another.

The virtual axis is calculated in the MOVI-C® CONTROLLER. This is the reason that virtual axes must be subordinate to a MOVI-C® CONTROLLER.

INFORMATION

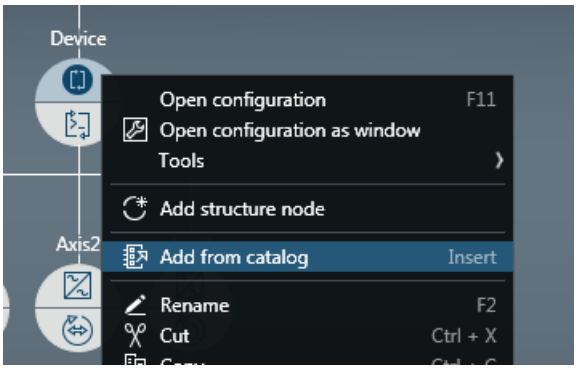
The sequence of initialization and retrievals of the devices in the programs *INIT*, *MAIN* and *PRIORITY* occurs in the sequence of devices below the MOVI-C® CONTROLLER in the function view (from left to right) in MOVISUITE®. This is necessary so that in tracking mode, for example, the setpoints of the master axis (implemented as virtual axis) can be calculated before the position setpoints of the slaves. In MOVISUITE®, a virtual axis should therefore always be arranged to the left of the devices for which it acts as the master axis. For more information, refer to the "EtherCAT®/SBusPLUS Master" manual.

Adding a virtual axis

✓ A MOVISUITE® project, which includes a MOVI-C® CONTROLLER has been created and is open.

1. Open the context menu of the MOVI-C® CONTROLLER in the MOVISUITE® project.
2. Click the [Add from catalog] menu item.

   ⇨ The catalog opens.



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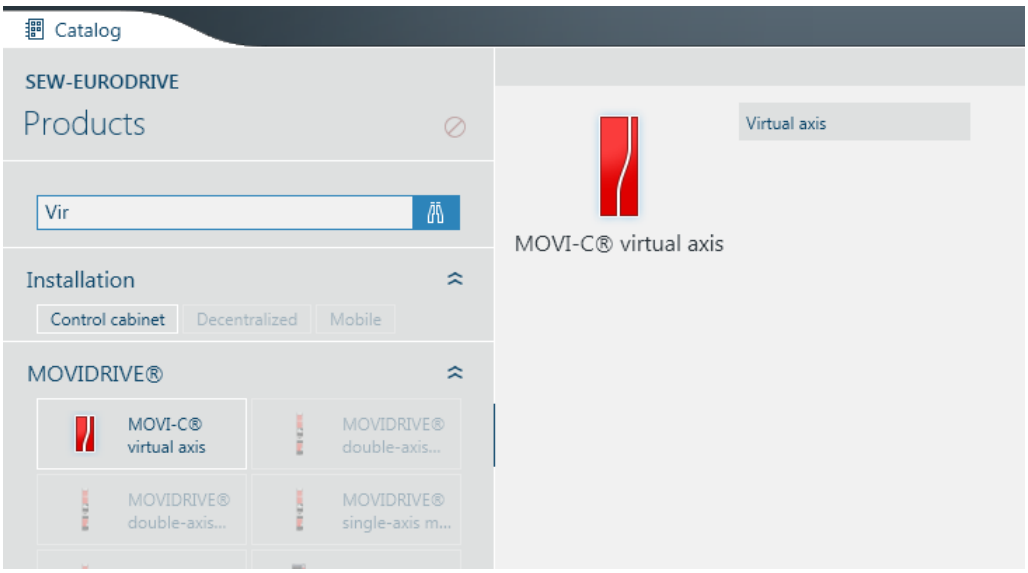
3. In the catalog, click on [Virtual axis]. If the virtual axis is not displayed in the catalog, search for it by entering "Vir" into the search field of the catalog.



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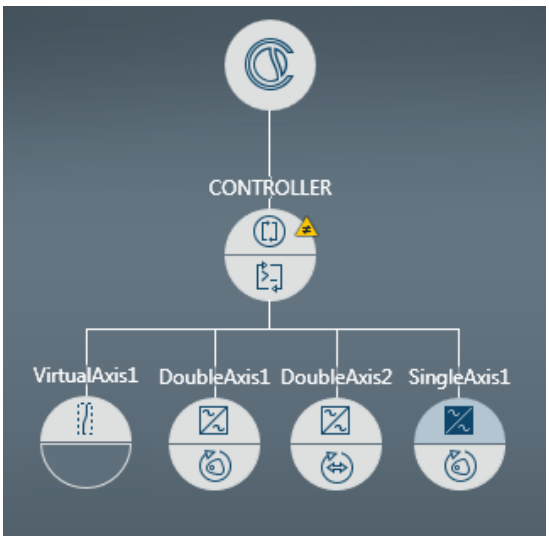
⇨ This opens a dialog window with options for inserting the virtual axis.

4. In the dialog window, click the [Apply] button.

⇨ The virtual axis is added to the function view as lower-level axis of the MOVI-C® CONTROLLER.



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5. Click the empty software module section of the virtual axis.

⇨ The catalog opens and displays the available software modules.

6. Click on [MultiMotion].

⇨ This opens a dialog window with options for inserting the software module.

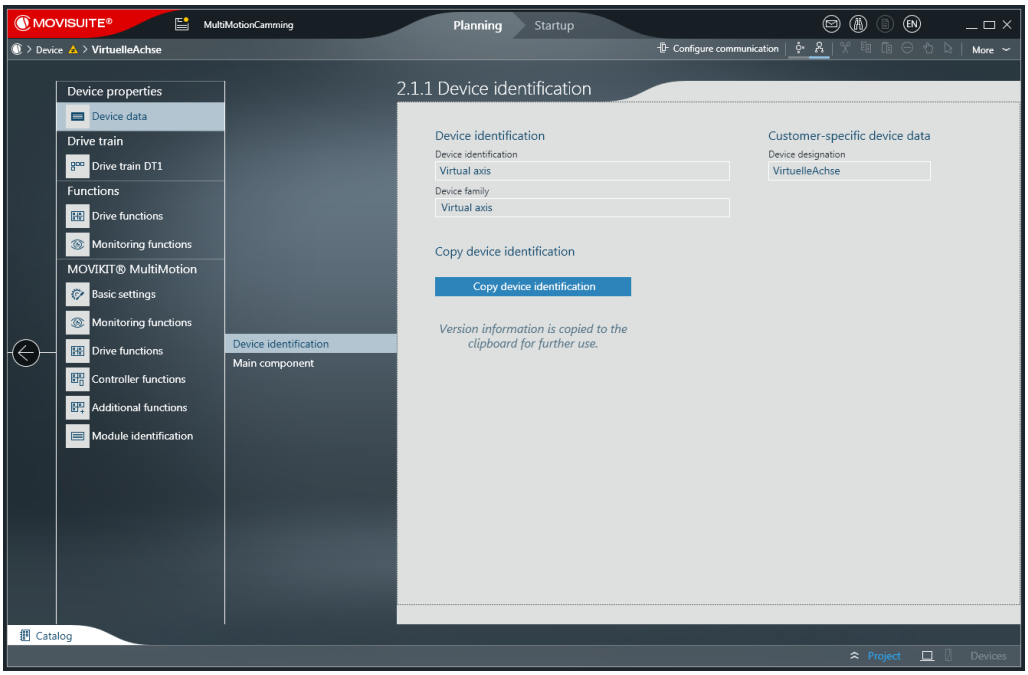
7. In the dialog window, click the [Apply] button.

⇨ The MOVIKIT® MultiMotion software module is added to the virtual axis.

Starting up the virtual axis

✓ A MOVISUITE® project with a virtual axis has been created and is open.

1. In the function view of MOVISUITE®, click the node of the virtual axis.
   ⇨ The configuration menu of the virtual axis opens.



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2. Adjust the configuration of the virtual axis as needed in the configuration menus described in the following.

The configuration menu of the virtual axis contains the following submenus:

- Device data – Description of the virtual axis. This is where you can see the customer-specific device designation.
- Drive train DT1 – The virtual axis supports exactly one drive train. This drive train contains only the "user units" component.
- Drive functions – Only a small range of functions is available here compared to a real axis (inverter).
- Monitoring functions – Limit switches and limits of the virtual axis. The limit switches are taken into operation in the MOVIKIT® MultiMotion software module.
- MOVIKIT® MultiMotion software module – The MOVIKIT® MultiMotion software module can be taken into operation as described in chapter "Starting up MOVIKIT® software modules" (→ 🖹 29).

Using a virtual axis in the IEC program

To being able to use the virtual axis in the IEC project, you have to update the IEC project on the MOVI-C® CONTROLLER after having configured the virtual axis. Proceed as described in chapter "Generating an IEC project" (→ 🖹 51).

5.6 Starting up the MOVI-C® CONTROLLER

1. In the function view of MOVISUITE®, click on the MOVI-C® CONTROLLER.
   ⇨ The configuration menu of the MOVI-C® CONTROLLER opens.
2. Adjust the configuration of the MOVI-C® CONTROLLER in the configuration menus as described in the following.

The configuration menu of the MOVI-C® CONTROLLER includes the following sub-menus:

- Communication – Specification of the fieldbus option in use
- Data management – Settings for updating configuration data and axis data sets
- Status – Device status and fault status of the MOVI-C® CONTROLLER
- IEC project – Settings for updating or creating the IEC project

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6 IEC project creation

INFORMATION

Before an IEC project can be created, the steps described in the "Startup" (→ 🗎 14) chapter must have been performed.

6.1 Automatic code generation

MOVISUITE® represents the complete integration of control technology into project management. Based on the configurations in the MOVISUITE® project, MOVISUITE® creates or updates the matching IEC project for the MOVI-C® CONTROLLER on the push of a button using already created modules. The advantage is not only that time is saved and configuration errors are avoided but also that users have to enter and configure data only in one tool (in MOVISUITE®). The data entered and configured by the user is adopted automatically when generating the IEC project. This means no errors can occur from mismatching data.

Users can focus on creating their user programs.

Automatic code generation performs the following tasks:

- Creates the IEC project in the IEC Editor
- Sets up the MOVI-C® CONTROLLER in the IEC project
- Sets up all the other devices used in the IEC project
- Configures the devices used
- Configures the safety option used
- Configures the fieldbus option (e.g. PROFINET IO)
- Configures the safety routing
- Creates the programs and global variables
- Creates instances for the devices used
- References the required libraries
- Creates the tasks and opens the created programs
- Creates the symbol configuration for diagnostics with the monitor

6.2 Generating an IEC project

Carry out the following steps to create an IEC project by means of automatic code generation and based on the configurations made in MOVISUITE®.

✓ Configuration of the software module in MOVISUITE® is complete.

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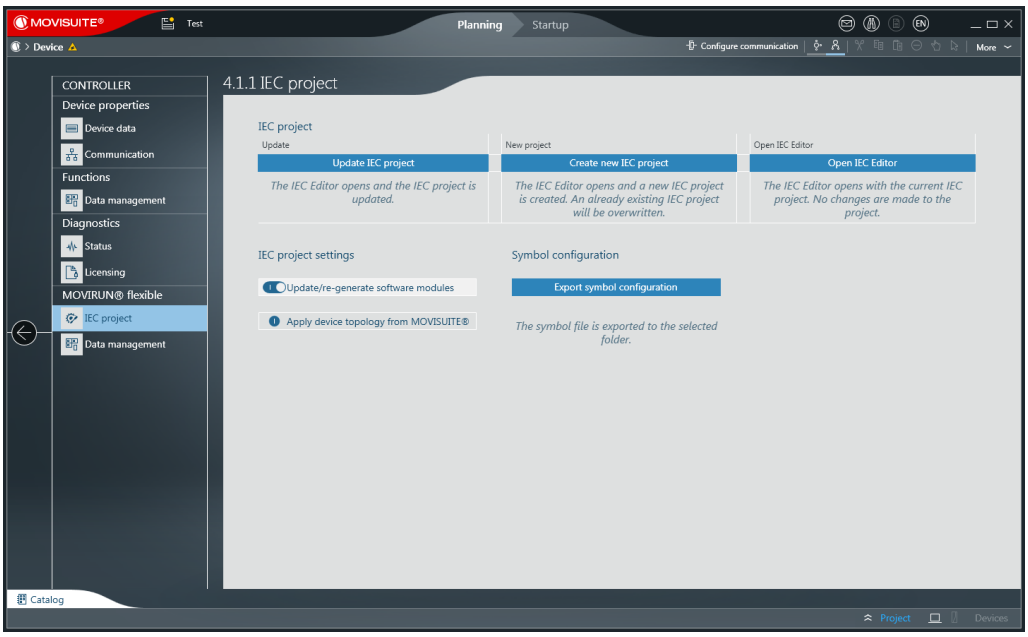
1. In the function view of MOVISUITE®, click the software module section of the MOVI-C® CONTROLLER node.
   ⇨ The "IEC project" menu opens.



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INFORMATION

If you have carried out the configuration in MOVISUITE® using the "Startup" mode and the message "Device cannot be reached" appears, proceed as follows:

- If the MOVI-C® CONTROLLER is not available via the network, switch over to "Planning" mode.
- If the MOVI-C® CONTROLLER is available via the network, carry out a network scan and connect the MOVI-C® CONTROLLER in the network view with the MOVI-C® CONTROLLER in the function view.

2. Click [Create new IEC project] or [Update IEC project].
   ⇨ Create new IEC project: The IEC Editor opens and a new IEC project is created. An existing IEC project is overwritten in full.
   ⇨ Update IEC project: The IEC Editor opens and the IEC project is updated. The update only affects the objects contained in the "SEW_Generated" folder, the task configuration, and the devices by SEW-EURODRIVE. All other objects remain unaffected (own POU, DUT, tasks, and devices).

INFORMATION

If changes are made to the project structure, to inverter data sets, or to a software module configuration, a notification symbol is displayed on the MOVI-C® CONTROLLER node. To obtain more detailed information on the change and to perform the update, click the notification symbol.

6.3 Opening the IEC project

Do the following to open an existing IEC project without update:

✓ An IEC project for the MOVI-C® CONTROLLER has already been created.

1. In the function view of your MOVISUITE® project, open the context menu of the MOVI-C® CONTROLLER node.
2. From the "Tools" submenu, select the [IEC Editor] menu item.

⇨ The IEC Editor is opened and the current IEC project is loaded.

6.4 Structure of the IEC project

The following table shows an example of the IEC project in the device tree of the IEC Editor. The table also includes a short description of the items as well as the following information:

- A: Is created by automatic code generation?
- B: Is an update made when [Update software modules] is active?
- C: Is an update made when [Update software modules] is inactive?
- D: Are changes allowed by the user?

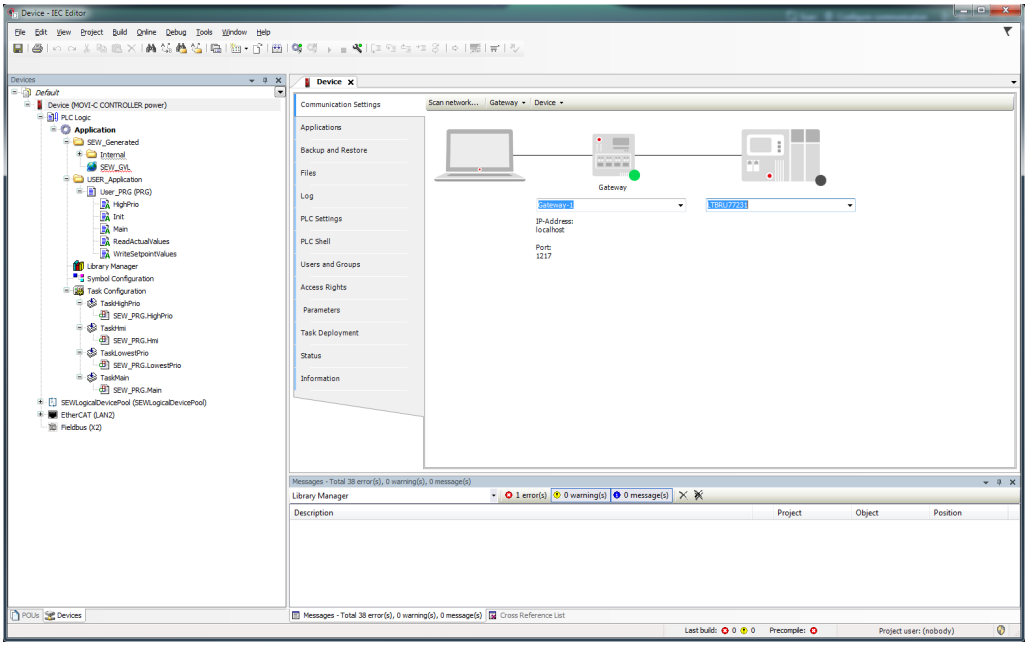
Display in the IEC Editor device tree	Description/chapter	A	B	C	D
Default *Device (MOVI-C CONTROLLER power)*	"Project and MOVI-C® CONTROLLER" (→ 🗎 54)	✓	✓	✓	✓
PLC Logic **Application**	Root node of the application	✓	✓	✗	✗
SEW_Generated Internal SEW_GVL_Internal SEW_PRG (PRG) SEW_GVL	"Global variables" (→ 🗎 54) and "System program (SEW_PRG)" (→ 🗎 56)	✓	✓	✗	✗
USER_Application User_PRG (PRG)	"User program (User_PRG)" (→ 🗎 57)	✓	✗	✗	✓
Library Manager	"Library Manager" (→ 🗎 55)	✓	✓	✗	✓
Symbol Configuration	"Symbol configuration" (→ 🗎 57)	✓	✗	✗	✓
Task Configuration	"Task configuration" (→ 🗎 57)	✓	✓	✗	✓
SEWLogicalDevicePool (SEWLogicalDevicePool) LogicalDevice_Axis1 (SEWLogicalDeviceInterpolationFlexFull) LogicalDevice_Axis2 (SEWLogicalDeviceInterpolationFlexFull) LogicalDevice_Axis3 (SEWLogicalDeviceInterpolationFlexFull)	"LogicalDevicePool" (→ 🗎 58)	✓	✓	✓	✗
EtherCAT (LAN2) SBUS_PLUS1 (EtherCAT MasterSEW) Dev_Axis1_Axis2 (MOVI-C MOVIDRIVE Double Axis) Dev_Axis3 (MOVI-C MOVIDRIVE Single Axis)	"EtherCAT (LAN)" (→ 🗎 58)	✓	✓	✓	✓
Fieldbus (X2)	"Fieldbus interface" (→ 🗎 72)	✓	✓	✓	✓
PROFIsafe_channel (SEW PROFIsafe) FailSafe_Axis3Safety (F-I/O-Modul (4/3 Bytes))	"Safety option" (→ 🗎 76)	✓	✓	✓	✗

The items of the IEC project are described in more detail in the following chapters.

6.4.1 Project and MOVI-C® CONTROLLER

The IEC project generated by MOVISUITE® initially always contains the name "Default" and represents the root node in the IEC Editor.

The MOVI-C® CONTROLLER is directly subordinate to the IEC project node. To display the properties of the MOVI-C® CONTROLLER, double click the node of the MOVI-C® CONTROLLER in the device tree.



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In the properties of the MOVI-C® CONTROLLER you can, for example, check the setting of the IP address if you cannot establish a connection with the MOVI-C® CONTROLLER (e.g. when logging in). In some cases you have to click the field with the IP address and press the ENTER key to establish a connection with the device. Once the connection is established, a green dot appears at the MOVI-C® CONTROLLER in the properties window.

6.4.2 Global variables

The global variables are located in the directory "SEW_Generated" in the nodes *SEW_GVL_Internal* and *SEW_GVL*.

The *SEW_GVL_Internal* global list of variables contains the instances that correspond to the software module used. These variables may not be written to from the user program. In addition, the structure contains an instance as a communication buffer for controlling or monitoring the software module by means of a monitor.

gc_uiTaskCycleTime	UINT
Axis1	SEW_MK_MultiMotionCam.MultiMotionCammingAxis
HMI_Axis1	SEW_MK_MultiMotionCam.MultiMotionCammingAxis_Hmi
Axis2	SEW_MK_MultiMotion.MultiMotionStandardAxis
HMI_Axis2	SEW_MK_MultiMotion.MultiMotionStandardAxis_Hmi
Axis3	SEW_MK_MultiMotionCam.MultiMotionCammingAxis
HMI_Axis3	SEW_MK_MultiMotionCam.MultiMotionCammingAxis_Hmi
VirtualAxis	SEW_MK_MultiMotionCam.MultiMotionVirtualCammingAxis
HMI_VirtualAxis	SEW_MK_MultiMotionCam.MultiMotionVirtualCammingAxis_Hmi

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The *SEW_GVL* global list of variables is the interface for accessing the functions of the software module.

Interface_Axis1	SEW_MK_MultiMotionCam.MultiMotionCammingAxis_UI
CamDescriptionScheduler_Axis1	SEW_MK_MultiMotionCam.CamDescriptionScheduler
Interface_Axis2	SEW_MK_MultiMotion.MultiMotionStandardAxis_UI
Interface_Axis3	SEW_MK_MultiMotionCam.MultiMotionCammingAxis_UI
CamDescriptionScheduler_Axis3	SEW_MK_MultiMotionCam.CamDescriptionScheduler
Interface_VirtualAxis	SEW_MK_MultiMotionCam.MultiMotionVirtualCammingAxis_UI
CamDescriptionScheduler_VirtualAxis	SEW_MK_MultiMotionCam.CamDescriptionScheduler

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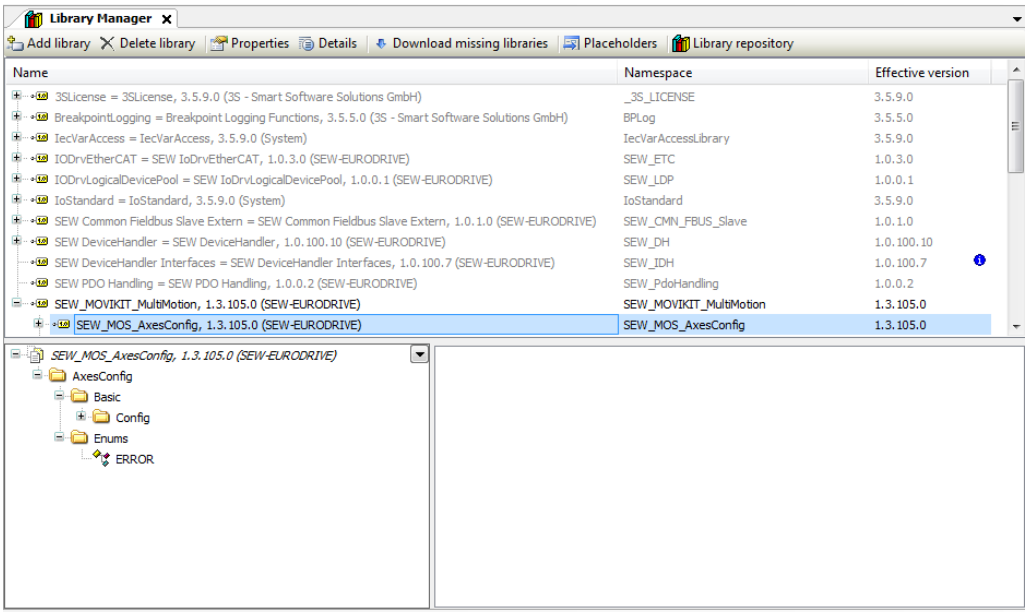
6.4.3 Library Manager

The Library Manager provides an overview of all the libraries used.

To open the Library Manager in a separate tab, double click the "Library Manager" node in the device tree.



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6.4.4 System program (SEW_PRG)

The program that contains all the important instance calls. Automatic code generation recreates this program in accordance with the configuration made in MOVISUITE® each time the IEC project is created, thereby overwriting the previous version. Therefore, you should not make any changes to this program.

The program is divided into the actions described in the following. These actions differ in the time at which they are called during the program sequence.

INIT

In the *INIT* action, the MOVIKIT® software modules are initialized before they are started. Users can supplement this initialization sequence. The *User_PRG.INIT()* action is available for this purpose.

LinkInterfaces

In the *LinkInterfaces* action, the interfaces of the individual MOVIKIT® software modules are linked.

MAIN

All program calls of the MOVIKIT® software modules to be processed in the *TaskMain* main task are included in the *MAIN* action. The *User_PRG.Main()* action with the user program is also called in this action.

INFORMATION

Implement the user program in the *User_PRG.Main()* action, not directly in the *SEW_PRG.Main()* action.

HIGHPRIO

All program calls of the MOVIKIT® software modules that must be processed in the *TaskHighPrio* task, e.g. for profile generation, are included in the *HIGHPRIO* action. The *User_PRG.HIGHPRIO()* action with the user program is also called in this action.

INFORMATION

Implement the user program in the *User_PRG.HIGHPRIO()* action, not directly in the *SEW_PRG.HIGHPRIO()* action.

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6.4.5 User program (User_PRG)

The user program is created once, initially, by automatic code generation. Since the program is not overwritten with each subsequent creation, this is the appropriate place for integrating user programs.

The program is divided into the actions described in the following. These actions differ in the time at which they are called during the program sequence.

INIT

The user program can be initialized in the *INIT* action. This action is synchronized with the *INIT* action of the *SEW_PRG* system program. Processing of the MOVIKIT® software modules does not begin until the variable *xInitDone* is set to "TRUE".

MAIN

In the *MAIN* action, the user can insert program code and call additional programs. The *MAIN* action is called in the *TaskMain* task before the *MAIN* actions of the software modules.

HIGHPRIO

In the *HIGHPRIO* action, the user can insert program code and call additional programs. The *HIGHPRIO* action is called in the *TaskHighPrio* task before the *HIGHPRIO* actions of the software modules.

ReadActualValues

The *ReadActualValues* action is run in order to read the process input data image and in this way to make it available consistently.

WriteSetpointValues

The *WriteSetpointValues* action is run to write the process output data image in order to apply all values at the same time.

6.4.6 Symbol configuration

The symbol configuration is created once when creating the IEC project. In the symbol configuration, variables are selected that are exported for external data exchange (e.g. with a visualization).

6.4.7 Task configuration

The following tasks are created in the task configuration:

- TaskHighPrio – Calls the SEW_PRG\HighPrio action
- TaskHmi – Calls the SEW_PRG\Hmi action
- TaskLowestPrio – Calls the SEW_PRG\LowestPrio action
- TaskMain – Calls the SEW_PRG\Main action

Further tasks can be added.

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6.4.8 LogicalDevicePool

For each physical device inserted via EtherCAT®/SBusPLUS, a logical device (LogicalDevice) is created matching the process data. Through the logical devices, the available functions can be opened irrespective of the system bus type. These include, for example, parameter communication, referencing the axis, and position or speed specification. LogicalDevices are also used for automatic device replacement.

The logical and physical devices are linked automatically.

INFORMATION

Do not add further LogicalDevices manually to the IEC project via IEC Editor.

6.4.9 EtherCAT (LAN)

If you use a MOVI-C® CONTROLLER of the "power" performance class, automatic code generation will create the entry "SBUS_PLUS1 (EtherCAT® MasterSEW)" in the device tree under "EtherCAT (LAN)".

All devices in the MOVISUITE® project that are subordinate to the MOVI-C® CONTROLLER are inserted under this entry. Each device entry includes process data containers for the axis (16 PD) and the safety option.

For a description of the process data assignment of the safety option, refer to chapter "Safety option" (→ 🗎 76).

6.4.10 Fieldbus

If a MOVI-C® CONTROLLER with fieldbus option (e.g. PROFINET IO) is used, automatic code generation will create a process data node with 512 process data words in the device tree subordinate to the "Fieldbus" node.

For more information on configuration of the fieldbus, refer to chapter "Fieldbus interface" (→ 🗎 72).

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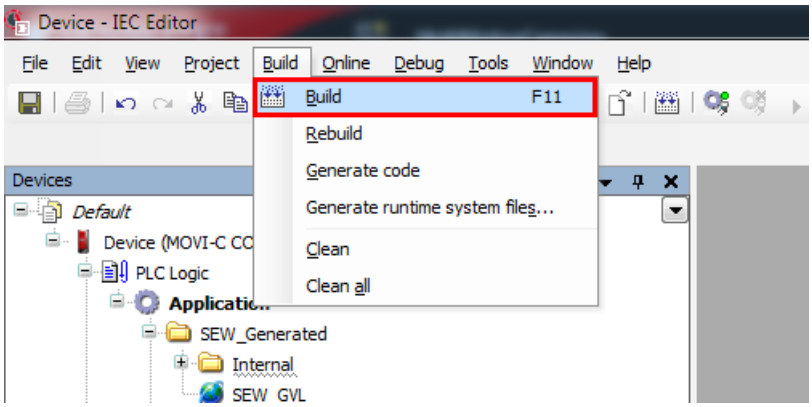
6.5 Compiling (building) the IEC project

1. Open the [Build] menu and select [Build]. You can also start the process using the key shortcut F11.



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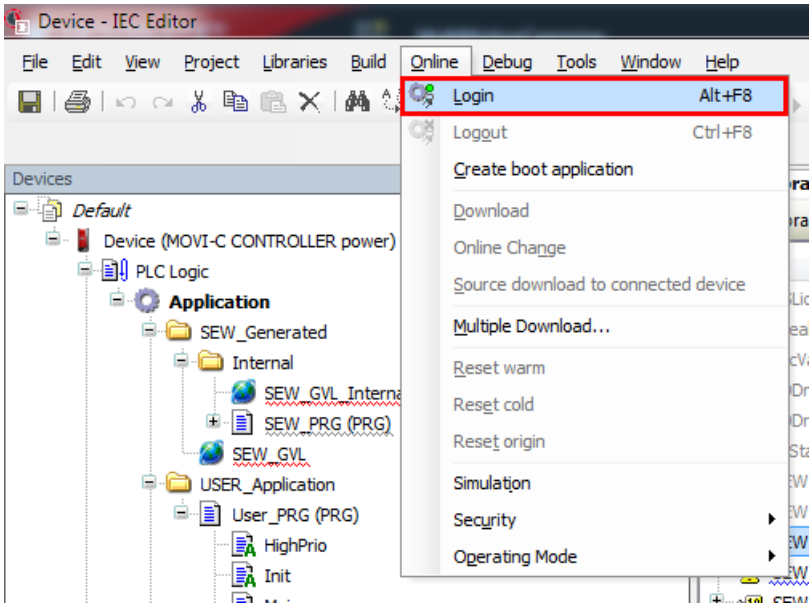
⇨ The result is displayed.

INFORMATION

If an error is indicated, double click the error message to navigate to the error. Eliminate the error and compile (build) the project again.

6.6 Login and download

1. Open the [Online] menu and select [Login]. You can also log in with the key shortcut *Alt + F8*.



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⇨ The IEC Editor performs the login to the MOVI-C® CONTROLLER.

⇨ After the login, a dialog opens asking you whether you want to download the program.

2. Choose whether the project should be downloaded by "OnlineChange" or completely. When choosing "OnlineChange", the previous program continues to run in the MOVI-C® CONTROLLER. In the case of complete downloading, the MOVI-C® CONTROLLER stops and the system is stopped.

   ⇨ The log in and download process is logged in the "Messages" section in the IEC Editor.

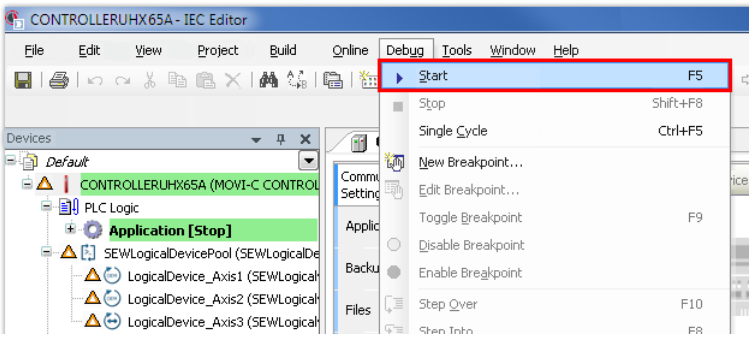
INFORMATION

You have to create a boot application so that the program will still be available after switching off and on the MOVI-C® CONTROLLER. See chapter "Creating a boot application" (→ 🗎 61).

6.7 Starting the IEC program

✓ The IEC project has been compiled successfully and downloaded to the MOVI-C® CONTROLLER after login.

1. Open the [Debug] menu and select [Start]. You can also start the IEC program using the key shortcut *F5* .



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⇨ The IEC program on the MOVI-C® CONTROLLER starts.

6.8 Stopping the IEC program

✓ The IEC project has been compiled successfully and loaded to the MOVI-C® CONTROLLER after login.

✓ The IEC program has started.

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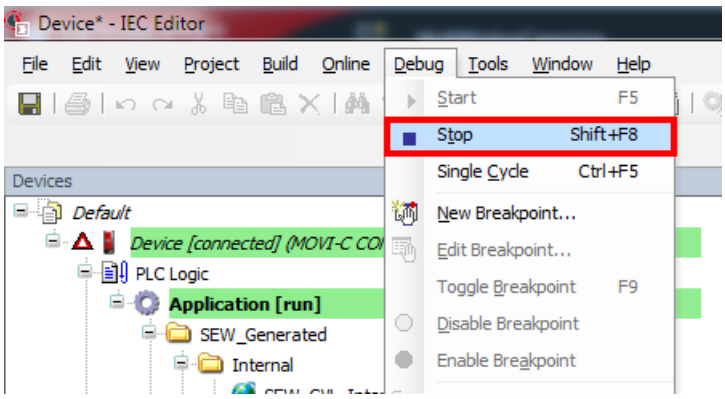
1. Open the [Debug] menu and select [Stop]. You can also stop the IEC program using the key shortcut *Ctrl + F8* .



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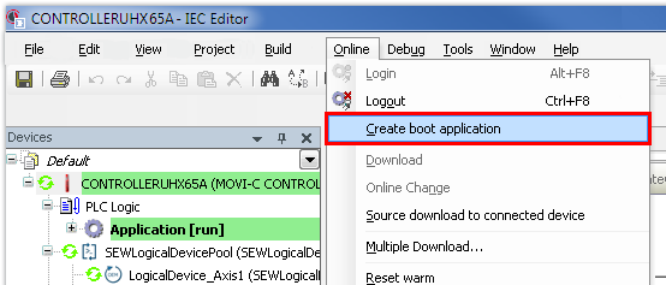
⇨ The IEC program on the MOVI-C® CONTROLLER stops.

6.9 Creating a boot application

You have to create a boot application so that the previous program will still be available after switching off and on the MOVI-C® CONTROLLER.

1. Open the [Online] menu and select [Create boot application].



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⇨ The boot application is saved on the MOVI-C® CONTROLLER so that the MOVI-C® CONTROLLER starts with the IEC program after deactivation and activation.

INFORMATION

You have to generate the boot application again after a change to the IEC project. Else the old program will be started after deactivation and activation of the MOVI-C® CONTROLLER.

INFORMATION

The fault-free boot application is always switched to "Run" state after having activated the MOVI-C® CONTROLLER.

7 Application examples

7.1 Creating an IEC project in "Startup" mode with connected axes

For information on how to create an IEC project in "Startup" mode with connected axes, refer to chapters "Startup" (→ 🗎 14) and "IEC project creation" (→ 🗎 51).

The data sets of the axes are updated with the MOVISUITE® project and are written to the memory card of the MOVI-C® CONTROLLER. Synchronization of the data sets is ensured in this way.

7.2 Creating an IEC project in "Planning" mode

Creating an IEC project in "Planning" mode lets you create an IEC project without connected devices. Proceed as follows:

1. When creating a new project in the start menu of MOVISUITE®, select [Planning].
2. Create the device topology in the function view by adding components from the catalog to the project node.

INFORMATION

When adding components from the catalog in "Planning" mode, devices will NOT be added to the network view.

3. Take the drives into operation in the same way as in "Startup" mode. See chapter "Starting up the drives" (→ 🗎 21).

INFORMATION

Optimization of axes is not necessary as no axes are connected. You therefore have to optimize the system later after having transferred the data sets to the devices.

4. Take the software modules into operation in the same way as in "Startup" mode. See chapter "Starting up MOVIKIT® software modules" (→ 🗎 29).
5. Take the MOVI-C® CONTROLLER into operation in the same way as in "Startup" mode. See chapter "Starting up the MOVI-C® CONTROLLER" (→ 🗎 49).
6. Create an IEC project in the same way as in "Startup" mode. See chapter "Generating an IEC project" (→ 🗎 51).
   - ⇨ An IEC project is created or updated just like when creating an IEC project in "Startup" mode.
   - ⇨ The devices connected via EtherCAT® are deactivated (and therefore grayed out in the device tree of the IEC Editor) and are arranged according to the function view in MOVISUITE®.

INFORMATION

When the IEC project is created in "Planning" mode, the physical sequence of the axes is adopted from the function view. The respective EtherCAT® address is created automatically from this sequence. If you cable the axes in the system in another sequence and you connect the scanned devices with the nodes of the devices in the function view, another sequence of devices will be created in the IEC project. The changed sequence does not have any effect on the IEC program code you have generated.

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7.3 Taking into operation a project created in "Planning" mode in the system

✓ A MOVISUITE® project with the required devices and software modules has been created in "Planning" mode as described in chapter "Creating an IEC project in "Planning" mode" (→ 🗎 62).

✓ The devices in the system have been cabled according to the device topology in the MOVISUITE® project.

✓ Your engineering PC is connected with the MOVI-C® CONTROLLER via Ethernet interface. Observe chapter "Configuring the communication interface" (→ 🗎 16).

1. In MOVISUITE®, switch to "Startup" mode.
2. In the toolbar, click [Scan].
   ⇨ The physically connected devices are detected and are added to the network view.

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3. Assign the devices displayed in the network view to the devices in the function view using drag and drop.

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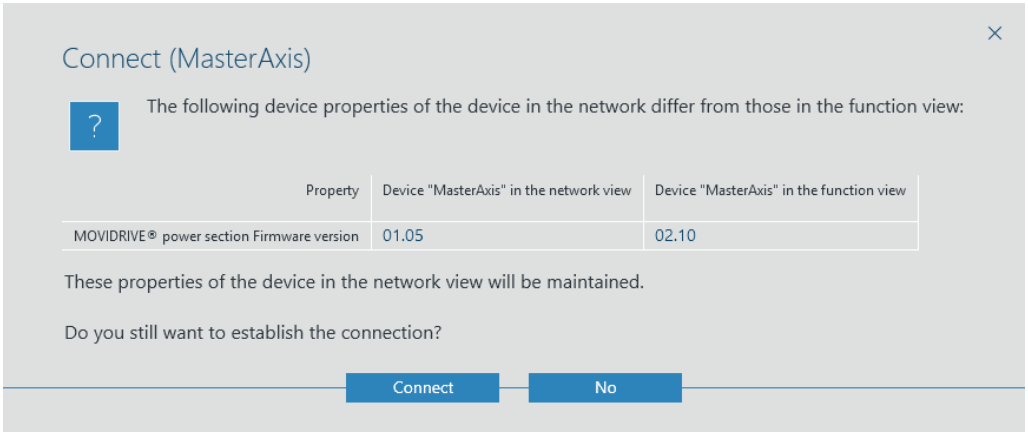
⇨ The following message is displayed:



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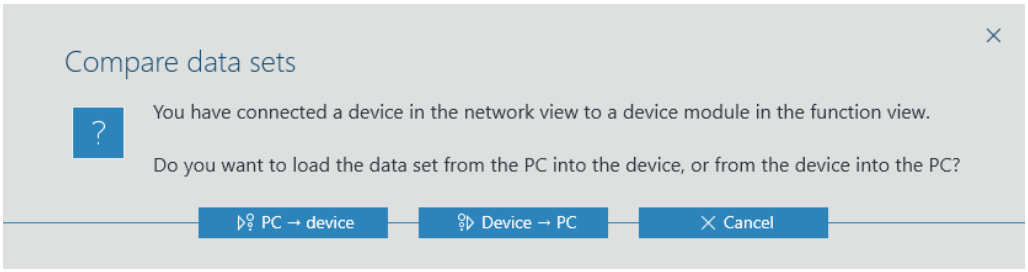
4. Acknowledge the message by clicking "Connect".

⇨ The following message is displayed:



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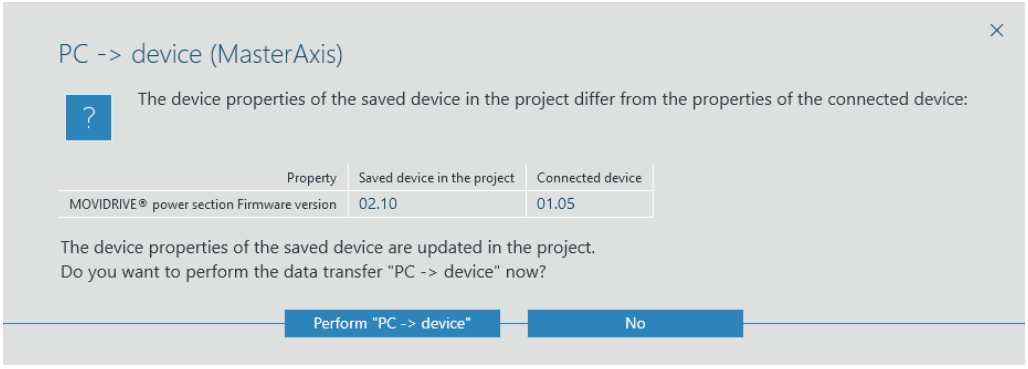
5. Click "PC → device".

⇨ The following message is displayed:



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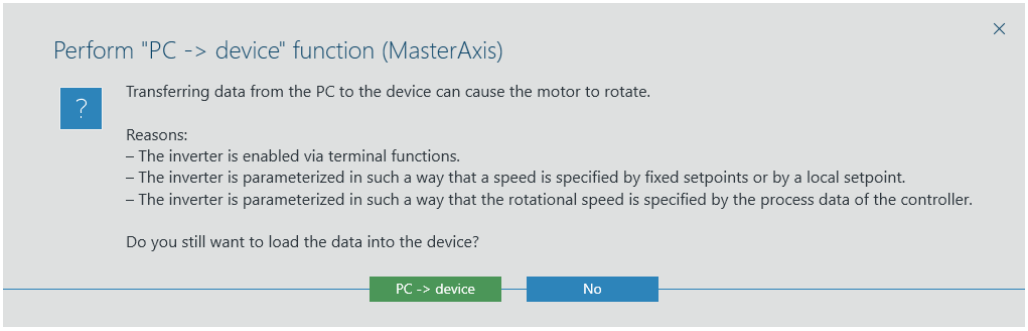
6. Click "Perform PC → device".
   ⇨ The following message is displayed:



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7. Click "Perform PC → device".
8. Update the IEC project. See chapter "Generating an IEC project" (→ 🗎 51).
   ⇨ The devices are inserted at the EtherCAT® node in the device tree of the IEC Editor in the sequence as they appear in the network view.
9. Compile (build) the IEC project. See chapter "Compiling (building) the IEC project" (→ 🗎 59).
10. Download the IEC project onto the MOVI-C® CONTROLLER. See chapter "Login and download" (→ 🗎 59).
11. Start the IEC project. See chapter "Starting the IEC program" (→ 🗎 60).
12. Create a boot application. See chapter "Creating a boot application" (→ 🗎 61).

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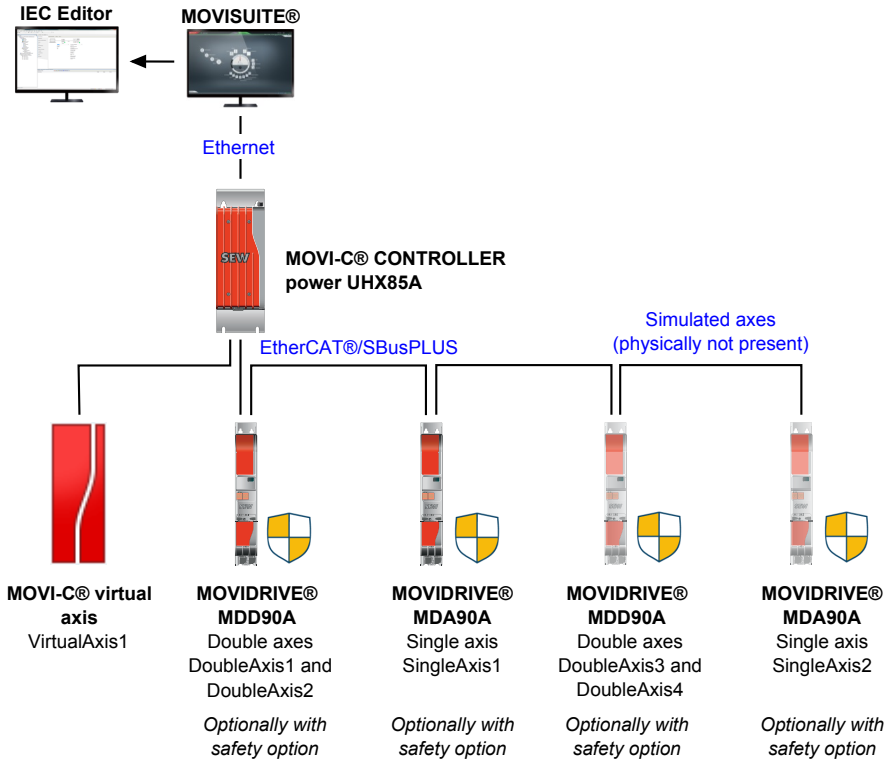
7.4 Creating an IEC project in "Startup" mode with simulated axes

Creating an IEC project in "Startup" mode with simulated axes allows for preparing an application at the office, for example.

The example described in the following is a MOVI-C® CONTROLLER that can be used to scan the axes. The axes are not physically present and connected or are only partly physically present and connected. In this case you can create an IEC project from a combination of physically present axes and simulated axes. The following figure illustrates the situation described above:



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Perform the following steps to start up this constellation in MOVISUITE® and to prepare the creation of the IEC project:

✓ The physically present devices are cabled as shown in the figure.

1. Connect your engineering PC with the MOVI-C® CONTROLLER.
2. Create a new MOVISUITE® project choosing the option "From network scan". See chapter "Creating the MOVISUITE® project" (→ 🗎 15).
3. Perform the startup procedure for both drives. See chapter "Starting up the drives" (→ 🗎 21).
4. Perform the startup procedure for the MOVI-C® CONTROLLER. See chapter "Starting up the MOVI-C® CONTROLLER" (→ 🗎 49).
5. Switch to "Planning" mode.

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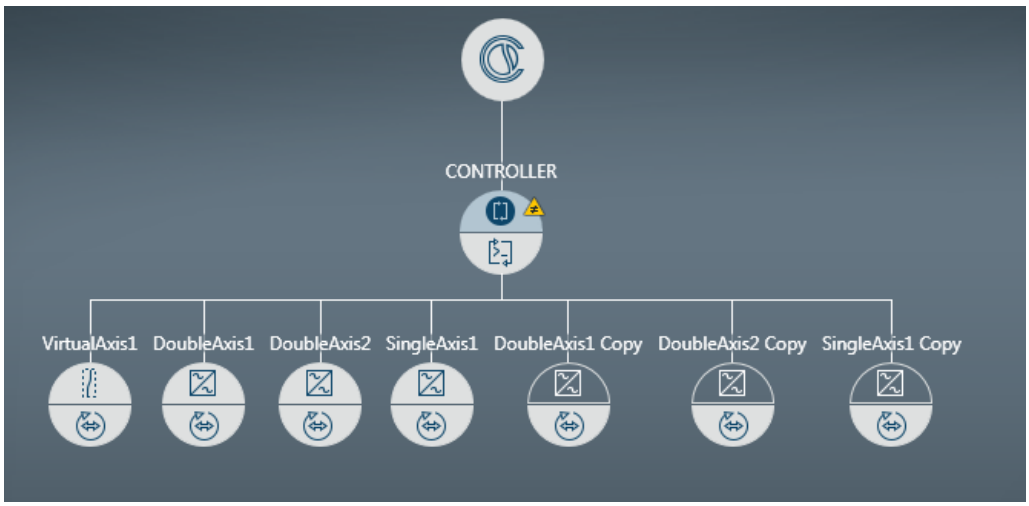
6. Select and copy the axes "DoubleAxis1", "DoubleAxis2" and "SingleAxis1", and insert them under the MOVI-C® CONTROLLER.



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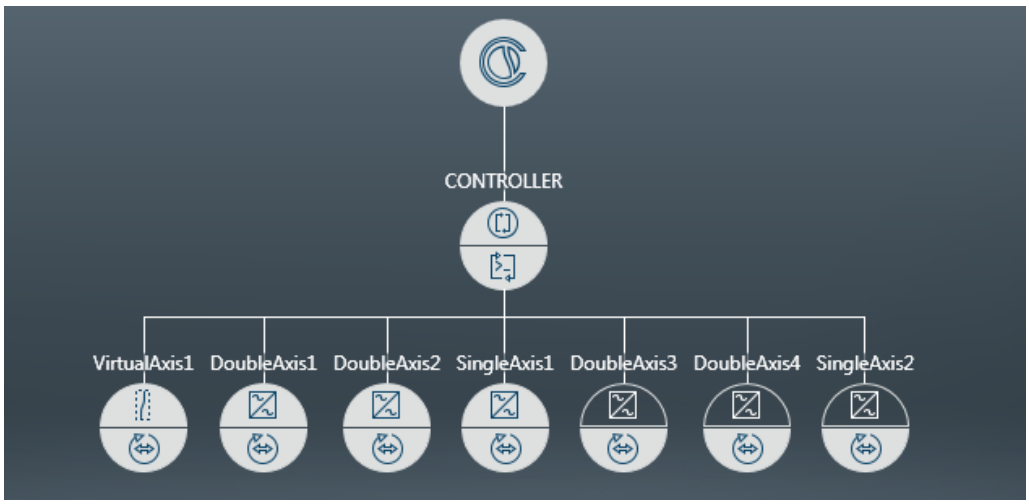
⇨ By copying the double axes and the single axis, their parameter setting is adopted as well. This means the axes need not be configured anymore.

INFORMATION

If you want to use another drive train, first add the axes from the catalog and then configure them as described in chapter "Starting up the drives" (→ 🗎 21).

7. Rename the added axes in such a way that your MOVISUITE® project looks as follows in the function view:



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⇨ The axes to be simulated are not available in the network and are therefore not connected with a device in the network view. The upper half of axes that are not connected is indicated as transparent.

8. Open the configuration of an axis that is to be simulated.
9. Under "MultiMotion", open the submenu "Basic settings".
10. In the "General" section, set the value for "Activate simulation" to "Yes".

11. Repeat these 3 previous steps for all axes that are to be simulated.
12. Generate the IEC project. See chapter "Generating an IEC project" (→ 🗎 51).
    - ⇨ Automatic code generation will generate the configuration data.
    - ⇨ The axis data sets of the physically present axes are synchronized with the devices.
    - ⇨ All data sets and the configuration data are then transferred to the memory card of the MOVI-C® CONTROLLER.
    - ⇨ The IEC project is updated.

⇨ Now you can use this IEC project to prepare programming and to perform real or simulated tests with these axes.

7.5 Operating an existing IEC project with simulated axes

Operating an existing IEC project with simulated axes allows among others for testing a project already running in the system. Simulating axes lets you perform tests with the IEC project at the office using the MOVI-C® CONTROLLER and a limited number of axes.

Proceed as follows:

1. Open the MOVISUITE® project.
2. Open the network view of MOVISUITE®.
3. In the network view, open the context menu of a device or an axis that is to be simulated.
4. Choose [Delete] from the context menu.

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- ⇨ The device or axis is deleted from the network view which means that the relation with the function view is canceled.

5. Perform the previous 2 steps for each device or axis to be simulated.
6. Create the IEC project as described in chapter "Creating an IEC project in "Startup" mode with simulated axes" (→ 🗎 66).

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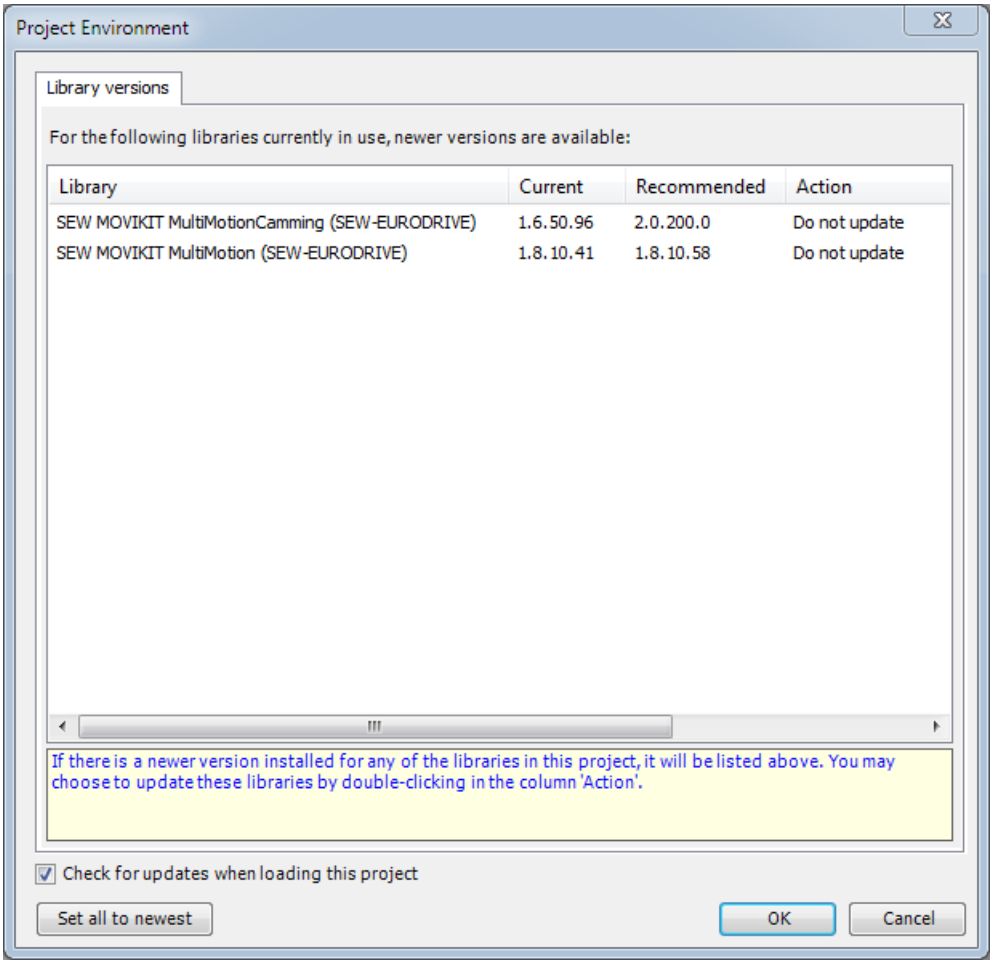
7.6 Updating the version of an IEC project

Updating the predecessor version of an IEC project to a successor version is necessary, for example, when changes are made to the IEC library. Proceed as follows:

1. Open MOVISUITE® and load the respective MOVISUITE® project.
2. Open the context menu of the MOVI-C® CONTROLLER.
3. Click the [Update IEC project] menu item.
   ⇨ The IEC Editor opens and a dialog window opens.
4. Confirm the dialog asking you to update the file format with [Yes].
   ⇨ The configuration data and axis parameter sets are created and transferred to the memory card of the MOVI-C® CONTROLLER.
   ⇨ The IEC project in the IEC Editor is updated and the following message appears:



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5. Click [OK] in this window.
   ⇨ The new libraries are added. Existing libraries are not modified.

You have to delete old versions of the MultiMotion libraries because you can work only with one library.

6. Open the Library Manager

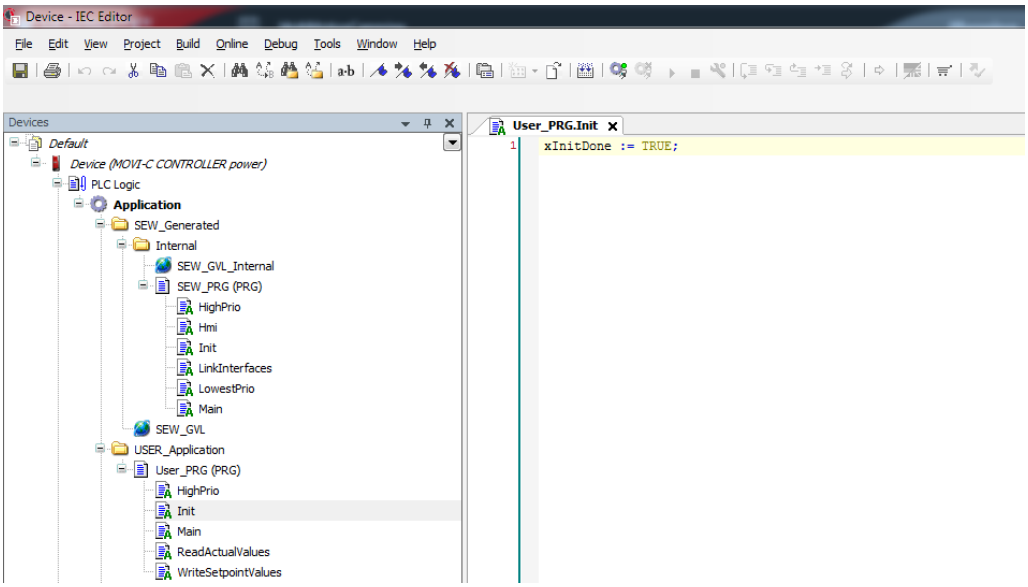
7. Open the context menu of the respective entry of the MultiMotion library in the Library Manager.
8. Choose [Delete] from the context menu.

Now you have to delete certain nodes in the device tree for the update.

9. In the device tree of the IEC Editor, open the context menu of the "SBUS-PLUS1" node.
10. Choose [Delete] from the context menu.
11. In the device tree of the IEC Editor, select the nodes SEW_GVL, SEW_GVL_Internal and SEW_PRG.
12. Open the context menu and select [Delete].

If not yet defined in the user program, now insert the line `xInitDone := TRUE;` into the program code of the User_PRG (PRG) | INIT program.

13. In the IEC Editor, open the User_PRG (PRG) | INIT program.
14. Insert the line `xInitDone := TRUE;` and confirm your entry with ENTER.



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⇨ You are then asked to define the variable.

15. Confirm the definition with [OK].

Finally you can update your IEC project by means of automatic code generation.

16. In MOVISUITE®, generate the IEC project by selecting [Update IEC project]. See chapter "Generating an IEC project" (→ 🗎 51).
17. Next you can compile (build) the project, log in, download the program to the MOVI-C® CONTROLLER and start it as described in chapter "IEC project creation" (→ 🗎 51).

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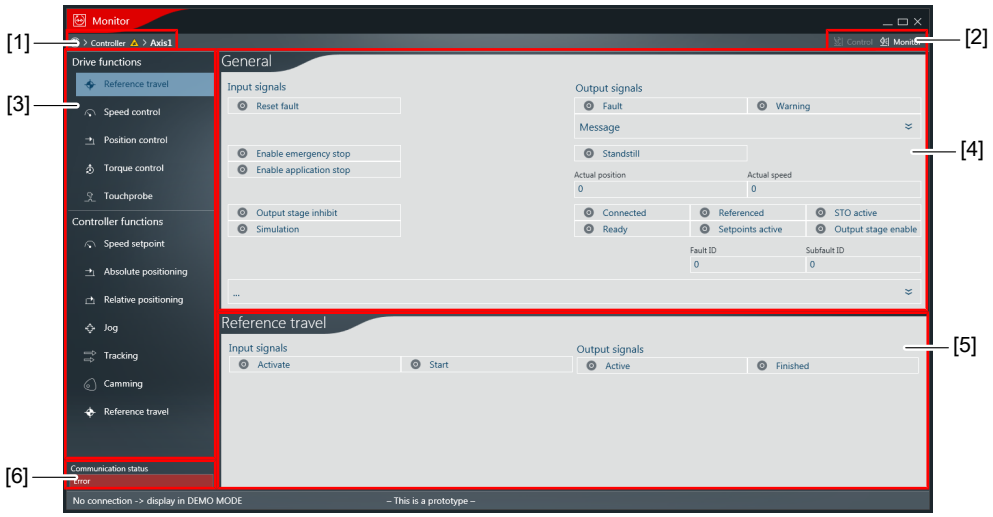
8 Monitor

The MultiMotion monitor is a tool in the MOVISUITE® engineering software for monitoring and controlling axes or axis groups.

In MOVISUITE®, click [Monitor] in the Tools menu to open the tool from the context menu of a specific node.

The user interface of the MultiMotion monitor includes the following areas:



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No.	Range	Description
[1]	Device path and name	Path and name of the axis/axis group
[2]	Mode switching	• "Control" mode: Operating mode in which the user can manually set all control bits and setpoints. Control via the IEC program is ignored. • "Monitor" mode: Operating mode for monitoring the input and output values. In this mode, the monitor only has read-only rights and displays the values set by the controller.
[3]	Main menu	Main menu for opening the configuration menus of the functions available in each case, such as drive functions, controller functions, or functions of software modules.
[4]	General	Input and output signals for basic settings.
[5]	Functions	Depending on the function selected from the main menu, this area displays the corresponding input and output signals.
[6]	Communication status	Status of the communication link.

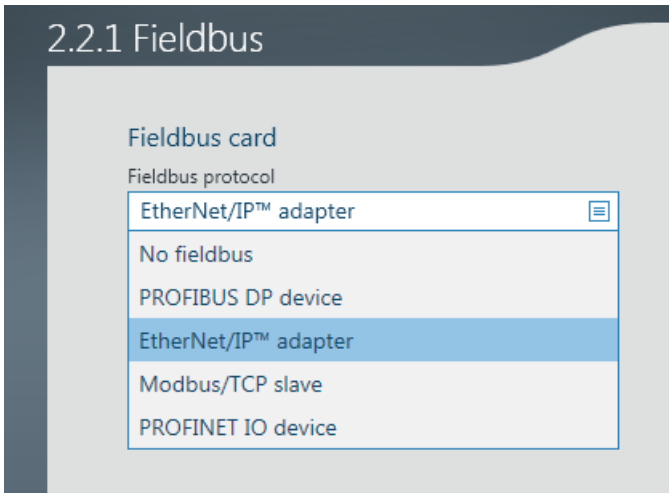
9 Fieldbus interface

In order to exchange the process data of a higher-level controller with the MOVI-C® CONTROLLER and the lower-level drives, the fieldbus interface of the MOVI-C® CONTROLLER must be configured in MOVISUITE® and in the IEC project.

9.1 Configuring a fieldbus option

✓ A MOVISUITE® project has been created and is open.

1. In MOVISUITE®, open the configuration of the MOVI-C® CONTROLLER.
2. Under "Device properties", open the submenu "Communication".
3. In the "Fieldbus card" section, select the fieldbus option used from the "Fieldbus protocol" drop-down list.



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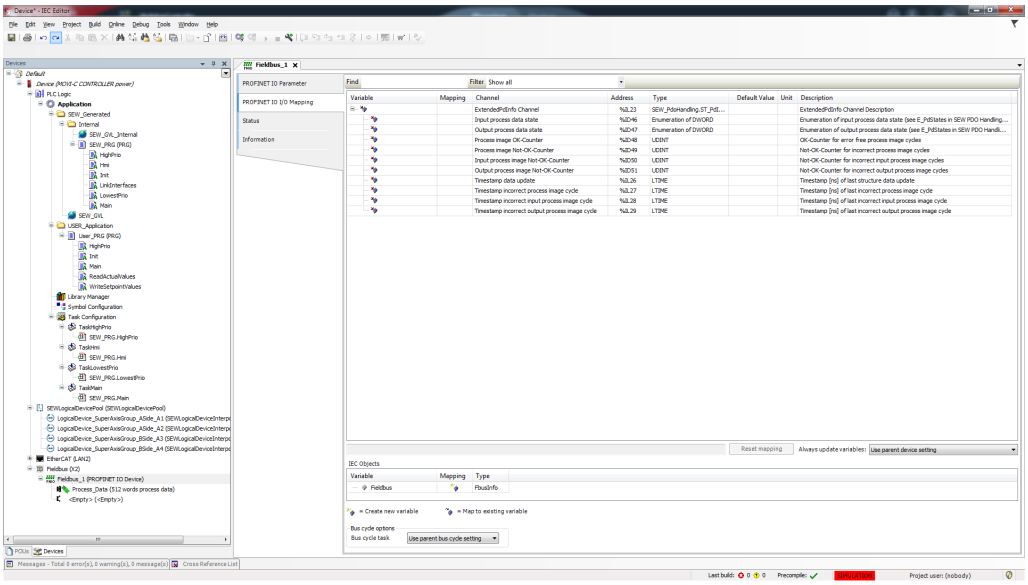
4. Return to the function view of the MOVISUITE® project.
5. Open the context menu of the MOVI-C® CONTROLLER and select [Update IEC project].

   ⇨ The node "Fieldbus ([Fieldbus name])" is added to the device tree in the IEC project. This node can be used to configure fieldbus parameters. Double clicking the node opens the following tab:



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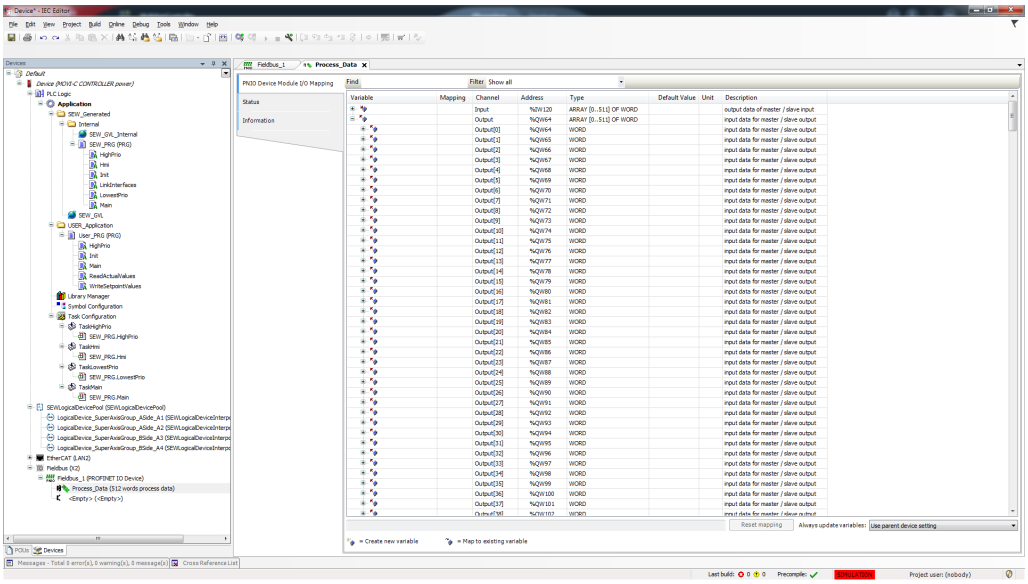
   ⇨ The process data image can be monitored via the lower-level node "Process_Data (512 process data words)" Double clicking the node opens the following tab:



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9.2 Notes for configuring fieldbus options

9.2.1 PROFIBUS

- In order to properly initialize the connection of the PROFIBUS slave to the MOVI-C® CONTROLLER, the "DP slave address" must be configured before downloading the IEC application. Because the slave address cannot be modified at runtime in the case of the PROFIBUS fieldbus option, a reset (warm, cold, or origin) must be performed to pass a new address to the slave stack.
- The "Baud rate" parameter is a read-only parameter and displays the baud rate negotiated with the master after startup of the bus system.

9.2.2 Modbus TCP

- With the Modbus TCP fieldbus option, always those IP settings are stored that are available when downloading the project or loading the boot application in the IEC project.

9.2.3 PROFINET IO

The parameters "Customer device designation" and "IP settings (IP address, subnet mask and gateway)" are relevant for the PROFINET IO fieldbus option for startup:

- The customer device designation cannot be adjusted using the IEC Editor but can only be set using MOVISUITE®. During startup, the customer device designation is converted into a PROFINET-compliant device name and used to initialize the PROFINET slave stack. This behavior is independent of all reset variants in the IEC Editor. In the IEC Editor, only the PROFINET device name converted after bus startup is displayed on the PROFINET node.
- The IP settings applicable at startup can be set as follows:
  - By downloading the application the first time if an application is not yet present on the MOVI-C® CONTROLLER.
  - By changing the IP settings in the project and downloading the project onto the MOVI-C® CONTROLLER, and performing a cold reset.

INFORMATION

In all other cases, the settings that are persistently stored in the higher-level controller are used for starting up the bus. The PROFINET controller can change the IP settings and the PROFINET device name persistently at any time.

9.2.4 EtherNet/IP™

The IP settings applicable at startup can be set as follows:

- By downloading the application the first time if an application is not yet present on the MOVI-C® CONTROLLER.
- By changing the IP settings in the project and downloading the project onto the MOVI-C® CONTROLLER, and performing a cold reset.

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9.3 Process data overview

Fieldbus protocol	UHX25A	UHX45A	UHX65A	UHX85A
PROFIBUS DP	-	-	-	120 PD
Ethernet/IP™	128 PD	248 PD	248 PD	248 PD
Modbus TCP	128 PD	256 PD	120 PD	120 PD
PROFINET IO	128 PD	256 PD	512 PD	512 PD

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10 Safety option

In order for the safety process data to be able to be exchanged with the higher-level controller via the MOVI C® CONTROLLER, the safety process data routing must be configured in the IEC program.

Detailed information on parameterization and functionality of the safety option can be found in the "MOVIDRIVE® modular, MOVIDRIVE® system / MOVISAFE® CS..A Safety Option" manual.

10.1 Adding a safety option

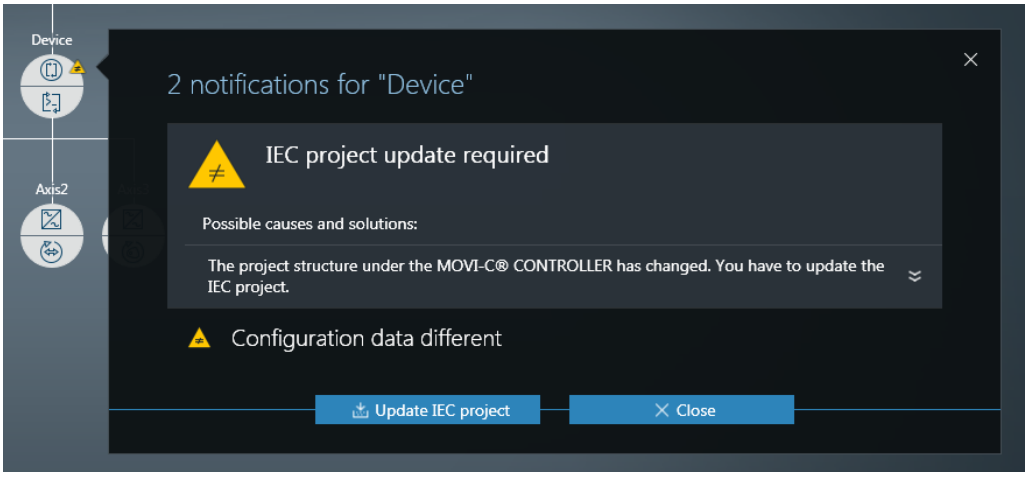
When you create a new MOVISUITE® project using the "Network scan" option, the safety option is detected and directly integrated into the MOVISUITE® project. For a detailed description, refer to chapter "Creating a project" (→ 🗎 15).

If the safety option is installed later, you have to update the respective axes in the MOVISUITE® project by selecting ""Device → PC" function" (→ 🗎 88) in the "More" menu. The installed safety option is then detected and added to the MOVISUITE® project. Next, update the IEC project.

10.2 Updating an IEC project with safety option

When a safety option is installed and configured later, MOVISUITE® automatically detects a change made to the IEC project that has not yet been updated.

The following messages are displayed at the MOVI-C® CONTROLLER in MOVISUITE®:



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- IEC project update required – The IEC project has changed. The IEC project must be updated to apply the safety option to the IEC project and to configure the safety process data.
- Configuration data different – The configuration data and parameter sets in the MOVISUITE® project differ from the configuration data and parameter sets of the device.

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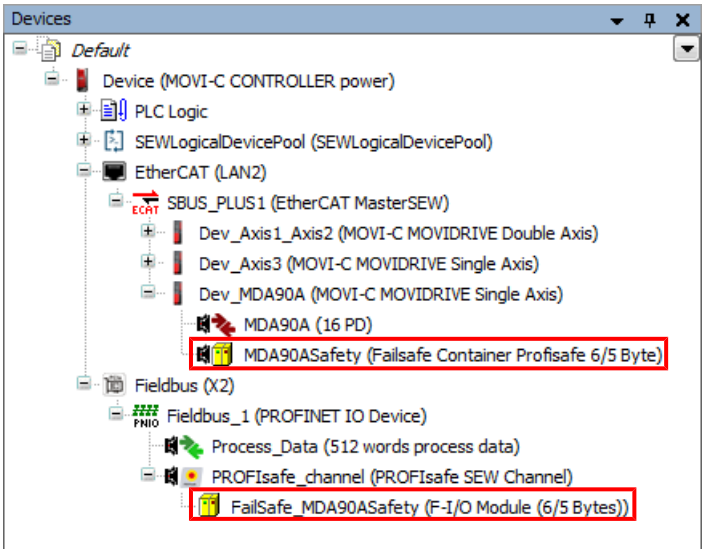
1. Update the IEC project and the configuration data by clicking the buttons in the respective messages. For further information, refer to chapter "Generating an IEC project" (→ 🗎 51).

   ⇨ The configuration data are created and written to the CFast memory card of the MOVI-C® CONTROLLER together with the axis data sets (including the safety data set).

   ⇨ The IEC Editor opens and the IEC project is updated. In the IEC Editor in the device tree under "SBUS_PLUS1(EtherCAT MasterSEW)", the safety option (MDA90ASafety – Failsafe Container Profisafe 6/5 Byte) is allocated to the free slot at the respective axis, and the node "FailSafe_MDA90ASafety" is inserted under "Fieldbus_1 (PROFINET I/O device)".



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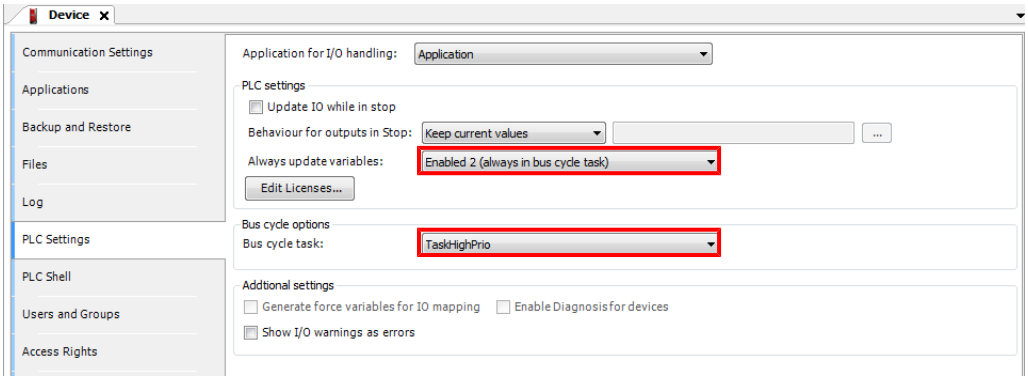
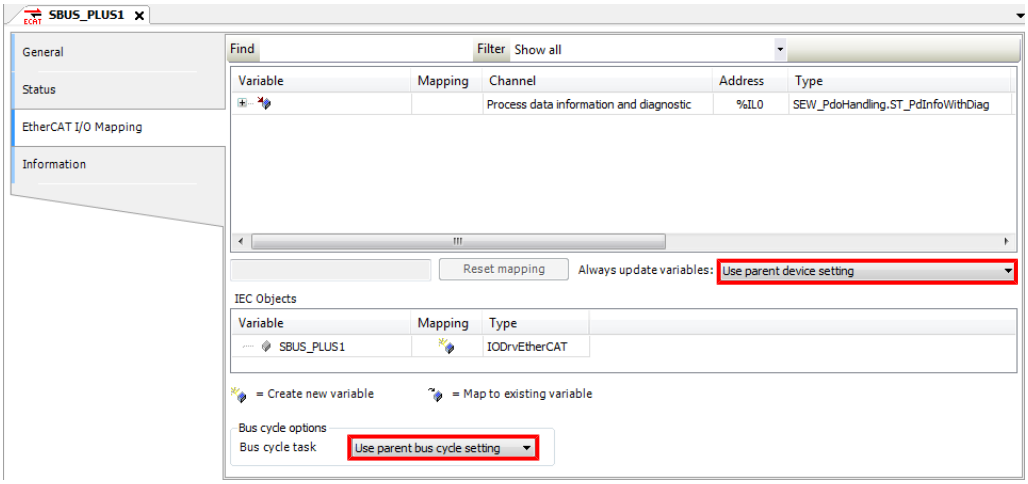
   ⇨ Set the setting for fieldbus and EtherCAT® so that the bus cycle task of the higher-level device is used.

INFORMATION

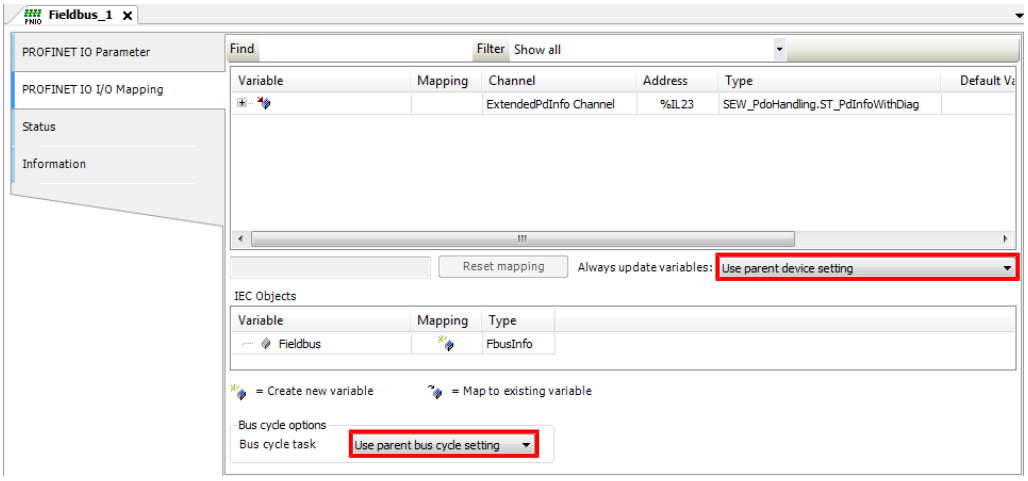
This setting is mandatory for routing the safety process data to ensure that fieldbus and EtherCAT® always use the same bus cycle task. The following figures show the respective menus with the required settings. To open these setting menus, double click the respective node in the device tree of the IEC Editor.



27737189259



27737193227



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⇨ The safe process data are routed automatically between EtherCAT® and PROFISAFE via the MOVI-C® CONTROLLER. The user does not need to set up a manual link.

10.3 Setting safety option parameters using Assist CS..

The "Assist CS.." tool is used to set the parameters of axes with safety option. The operation mode of the safety option is set among others.

The safety option differentiates between two operating modes:

- Independent operation: No status and control information is exchanged via functionally safe communication (safety protocol).
- Fieldbus operation: Information is exchanged via fieldbus (safety protocol).

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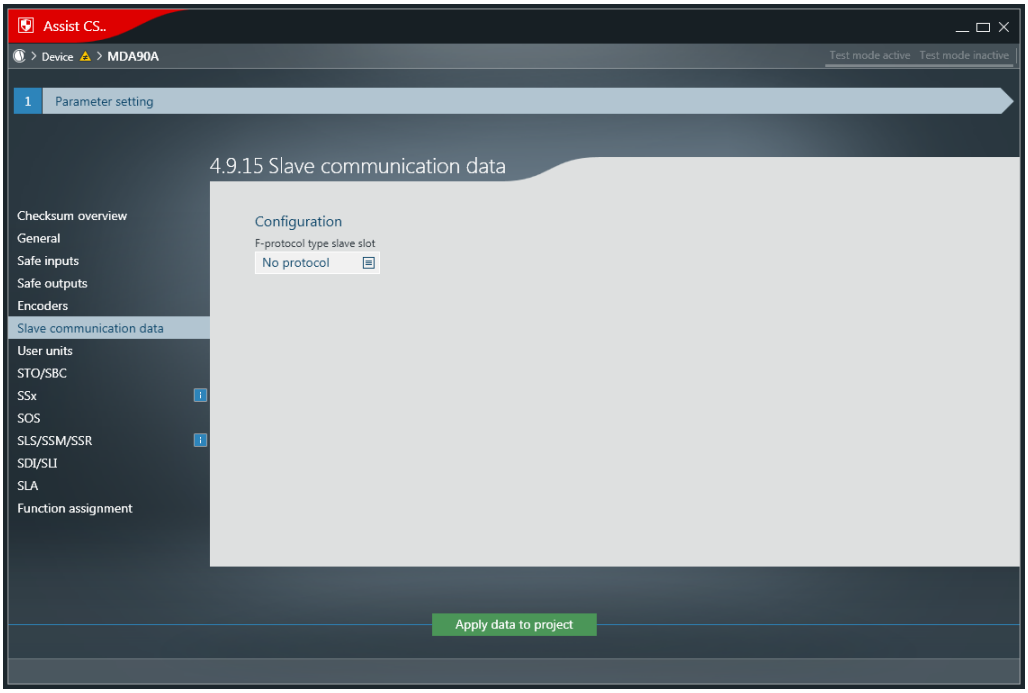
10.3.1 Independent operation

If you do not use safety-related process data in the project, make the following setting in the Assist CS.. tool: In the "F-protocol" menu under "Configuration", set the "F-protocol type slave slot" to "No protocol".



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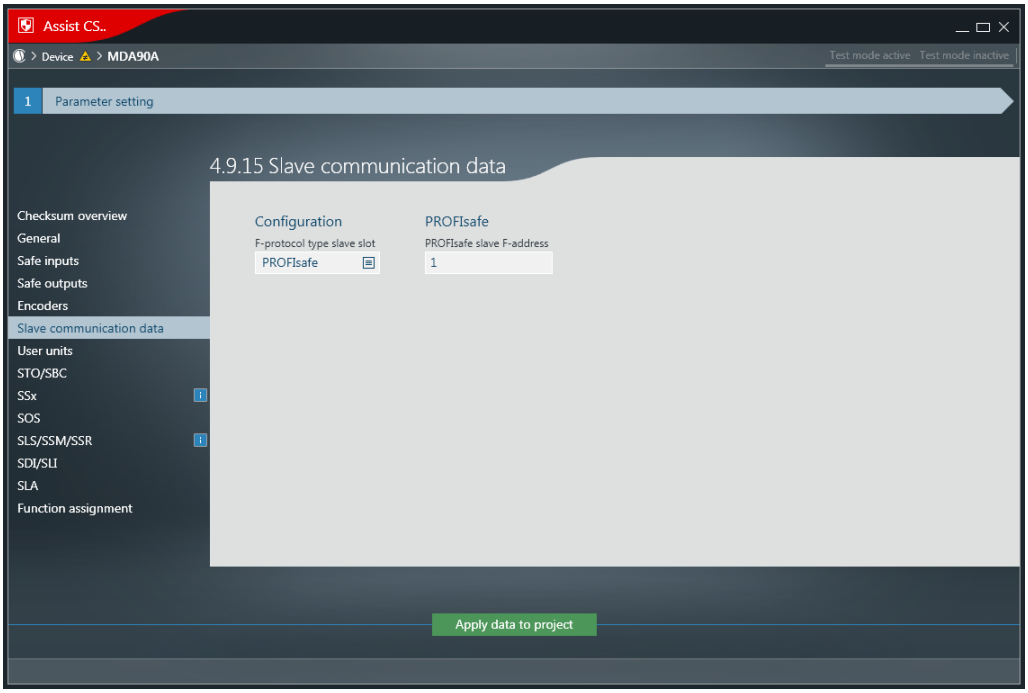
Independent operation is not relevant for IEC project creation because no safety-related process data is configured during IEC project creation.

10.3.2 PROFIsafe fieldbus operation

If you want to use fieldbus operation and "PROFIsafe", make the following setting in the Assist CS.. tool: In the "F-protocol" under "Configuration", set the "F-protocol type slave slot" to "PROFIsafe". Then also specify the "PROFIsafe slave F-address" in the "PROFIsafe" section.



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Take the CS.. safety option into operation and download the values into the axis. Generate the acceptance report using the Assist CS.. tool and carry out an acceptance of the parameter setting of the safety option.

INFORMATION

For a test run, the IEC project can be created without generating a report and without validation.

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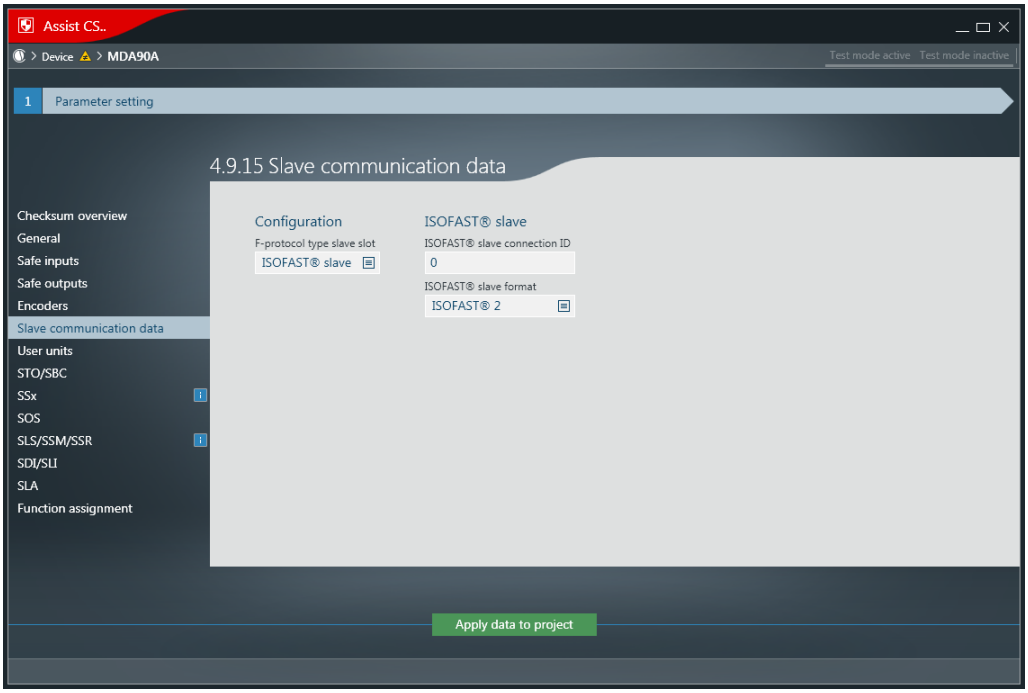
10.3.3 ISOFAST® fieldbus operation

If you want to use fieldbus operation and "ISOFAST®", make the following setting in the Assist CS.. tool: Under "Configuration", set the "F-protocol type slave slot" to ISOFAST®. Then also set the connection ID and the format in the "ISOFAST® slave" section.



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Take the safety option into operation and download the values into the axis. Generate the acceptance report using the Assist CS.. tool and carry out an acceptance of the parameter setting of the safety option.

INFORMATION

For a test run, the IEC project can be created without generating a report and without validation.

11 Data management

This chapter describes which data types are present in the overall system and which data relevant for the MOVI-C® CONTROLLER are generated or changed by the various MOVISUITE® functions.

11.1 Data types

The following table describes the data types available in the overall system:

Data	Description
AxisData	Parameter set of the inverter.
ConfigData	Configuration data set for an inverter generated by the software module.
SafetyData	Data set of the safety option taken into operation by the Assist CS tool.
SafetyKey	Safety key on the option card written by the Assist CS.. tool during validation.
ControllerPara	Parameter set of the MOVI-C® CONTROLLER.
FRAM Data	FRAM data of the IEC system on the MOVI-C® CONTROLLER.
Boot application	Boot application on the MOVI-C® CONTROLLER created by the IEC Editor.
IEC project	IEC project created by MOVISUITE®. The user can extend the IEC project in the IEC Editor.
MOVISUITE® project	MOVISUITE® project saved on the engineering PC.

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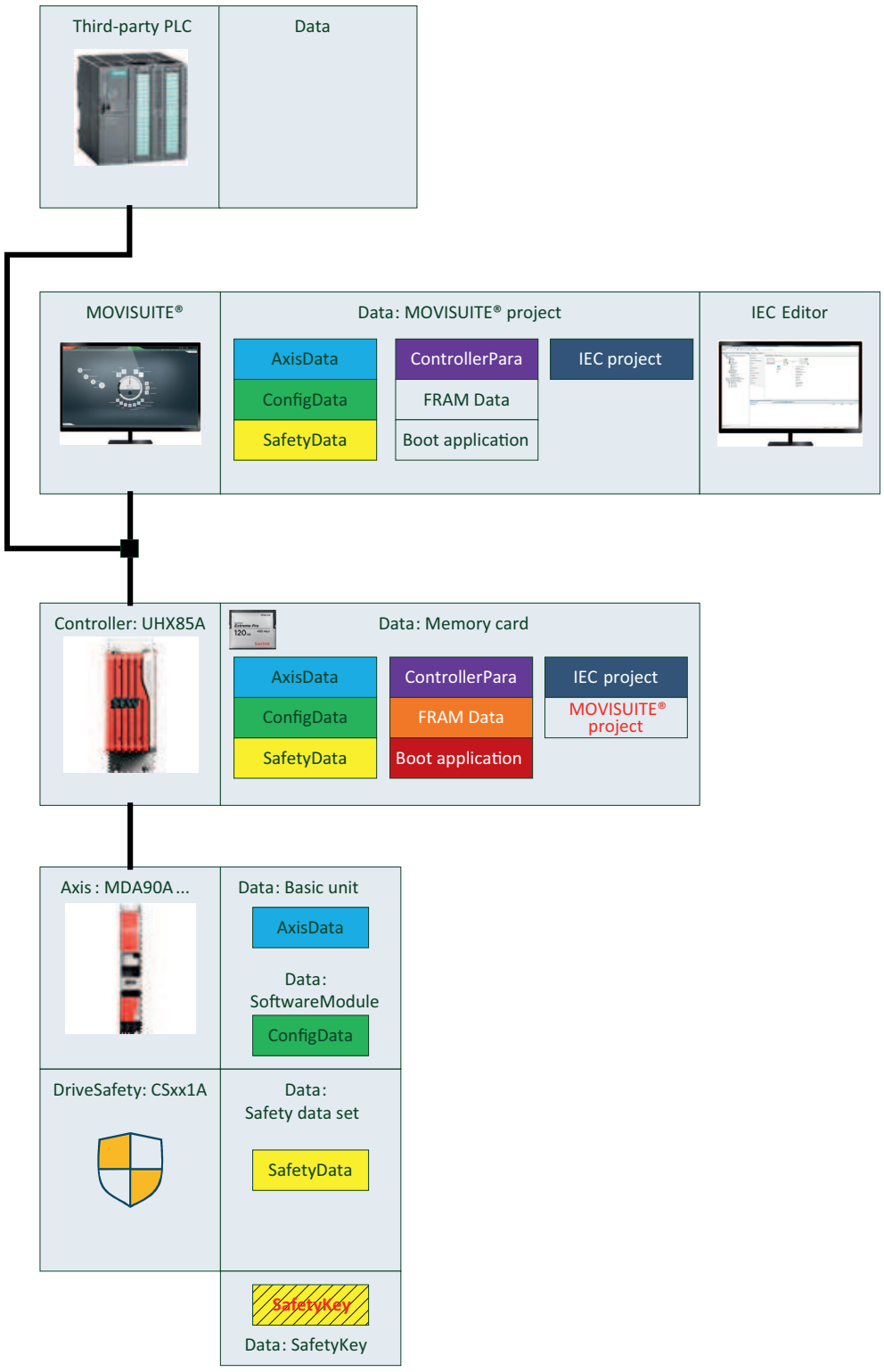
The following figure illustrates the data types in the overall system:



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11.2 "Save project" function

The "Save project" function for MOVISUITE® projects is available in MOVISUITE® on the title bar (disk icon), in the start menu on the "Projects" tab, and in the "More" menu under "Project".

Bear the following information in mind when using this function:

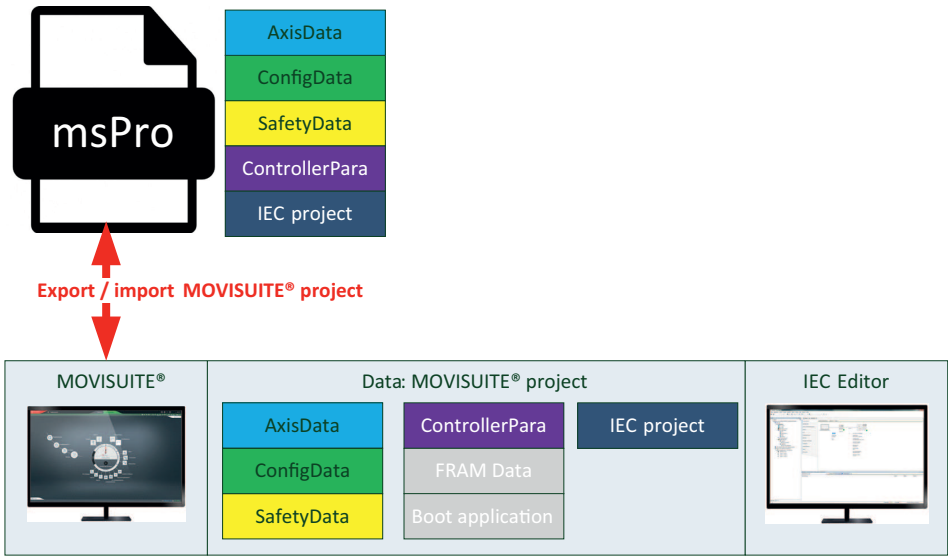
- The MOVISUITE® project is not saved completely until the changes in all the other tools (e.g. in the IEC Editor) have been saved and MOVISUITE® has saved the data in the MOVISUITE® project database.
- If you save the current status in a tool, the data are applied temporarily to the MOVISUITE® project. You then have to save the MOVISUITE® project again. If you do not save the MOVISUITE® project, the changes you have made in the other tools will be lost.

11.3 "Export project" function

The "Export project" function for MOVISUITE® projects is available in MOVISUITE® in the start menu on the "Projects" tab, and in the "More" menu under "Project".

Bear the following information in mind when using this function:

- An IEC project must exist to be able to export a project. This means you must have performed at least one save operation in the IEC Editor. The archive file is then created automatically when closing the IEC Editor or can instead be created in the IEC Editor by selecting [File] > [Project archive] > [Save MOVISUITE® archive]. See chapter "Saving a MOVISUITE® archive" (→ 🗎 100).
- Using the "Export project" function, you can store a complete MOVISUITE® project as compressed file (MSPRO file) at any location. This export includes all the data relevant for MOVISUITE®, in particular the data necessary for transfer to another computer or user (library profile, download information files, referenced devices, visualization profile, referenced libraries).



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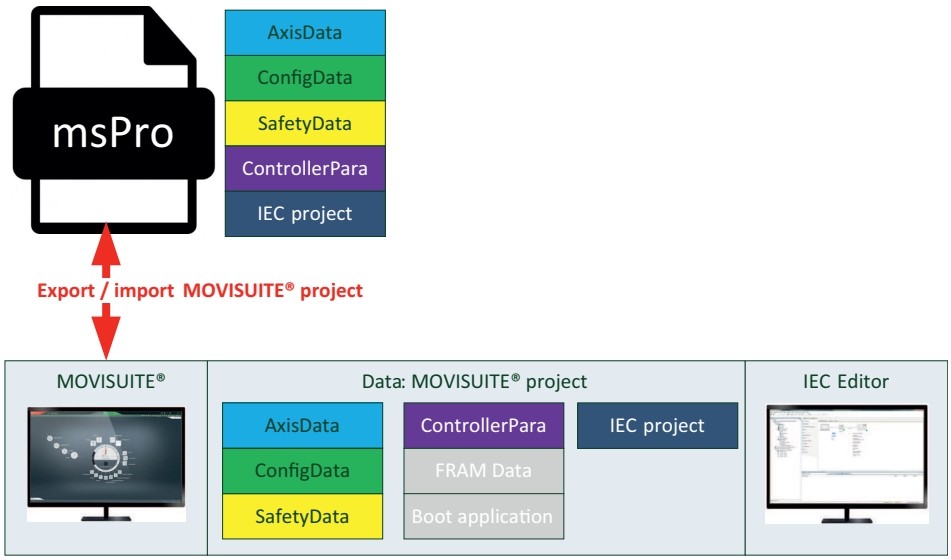
11.4 "Import project" function

The "Import project" function for MOVISUITE® projects is available in MOVISUITE® in the start menu on the "Projects" tab, and in the "More" menu under "Project".

Bear the following information in mind when using this function:

- Using the "Import project" function, you can use an export file to create a complete MOVISUITE® project as a new project in the MOVISUITE® project folder, where it is then opened. All the data relevant for MOVISUITE® and the IEC project are imported.
- To import all the libraries and device descriptions used in the original project to the IEC Editor, use the "Restoring a MOVISUITE® archive" (→ 🗎 100) function. Missing device descriptions are indicated by a red question mark in the device tree of the IEC Editor.



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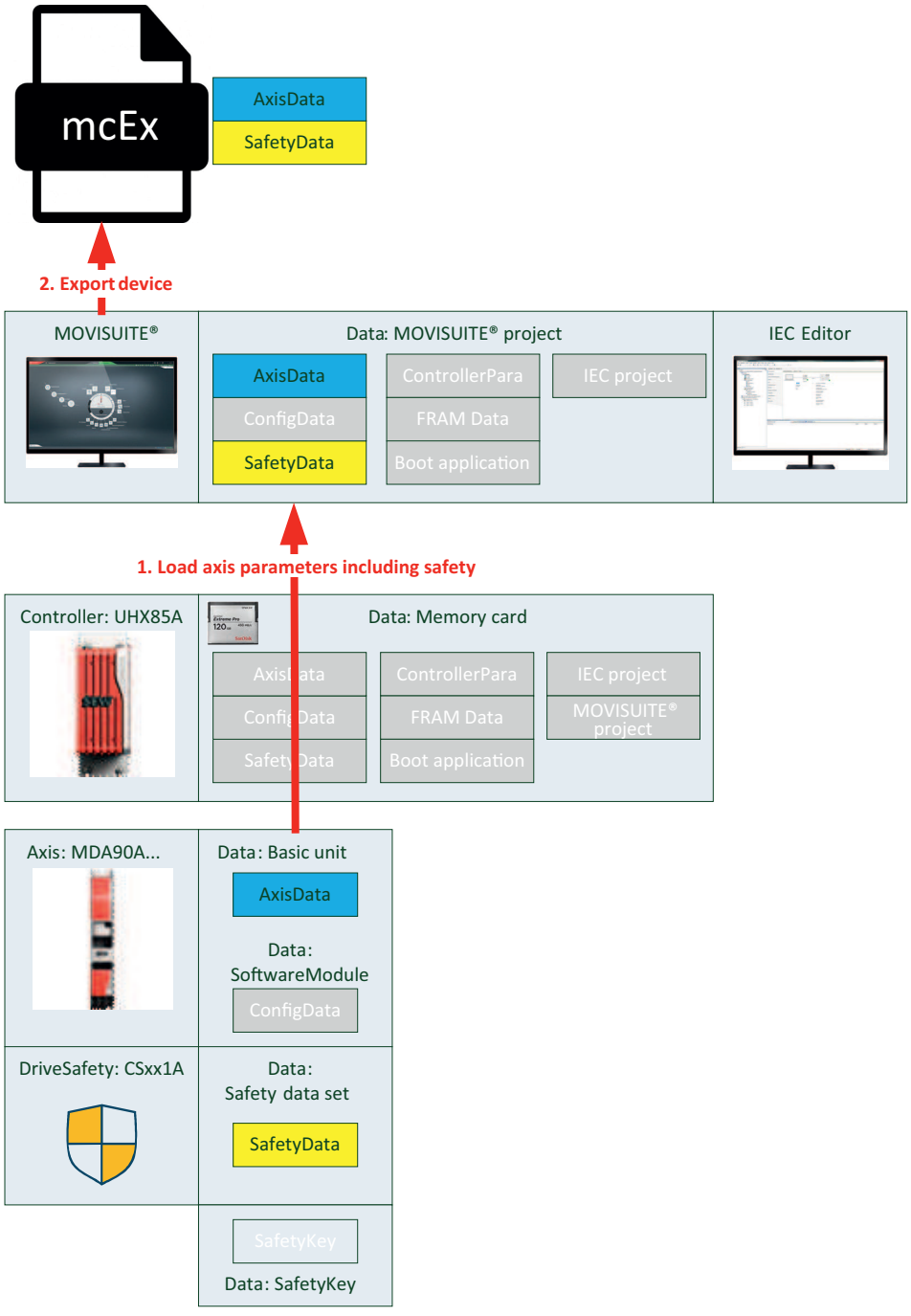
11.5 "Export data" function

The "Export data" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu under "Manage data".

Bear the following information in mind when using this function:

- The parameter data of the selected device are first red and saved in the MOVISUITE® project. Next, the data are exported into a file (mcEx file).
- The data set might also include the parameter data of the safety option.



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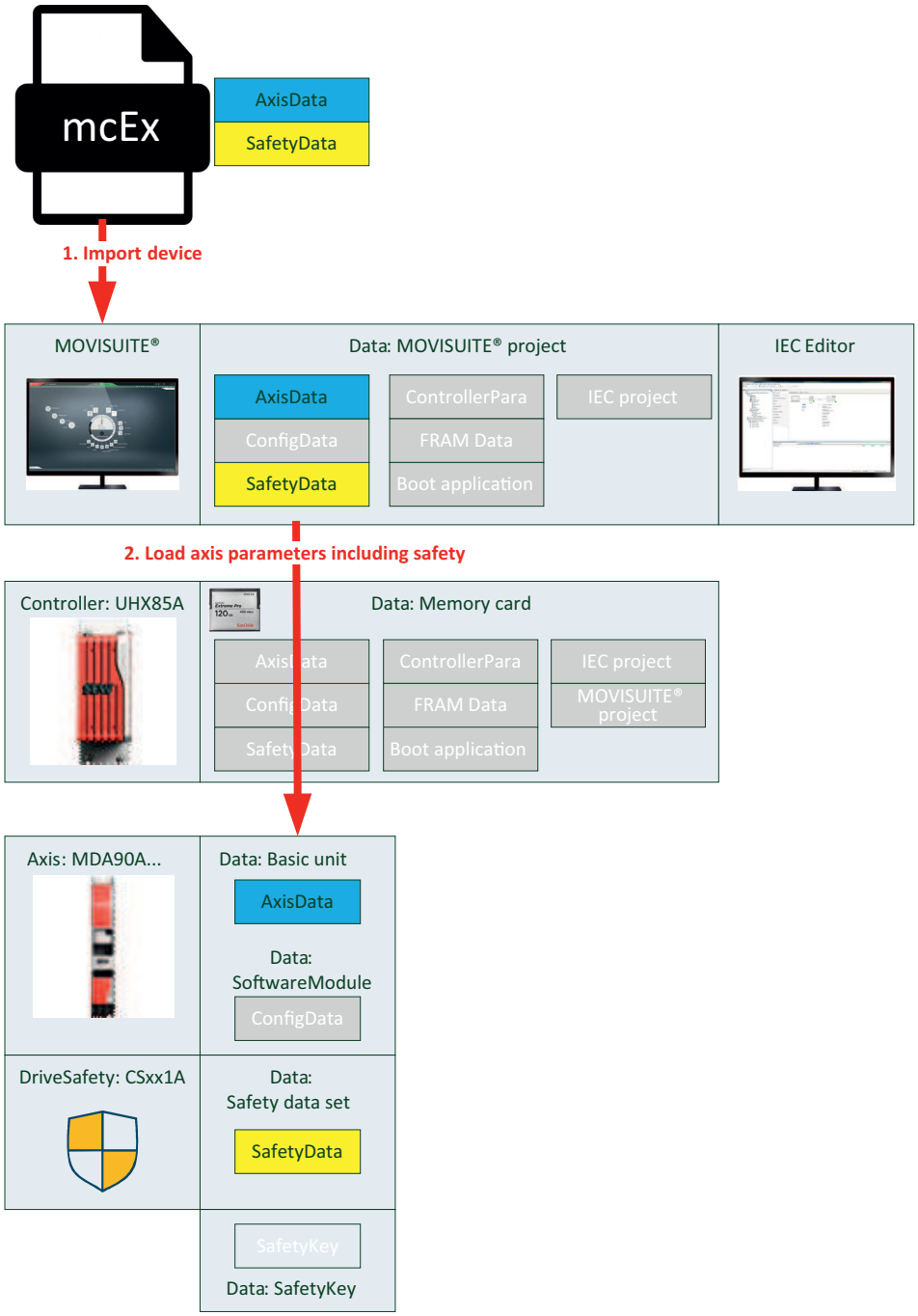
11.6 "Import data" function

The "Import data" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu under "Manage data".

Bear the following information in mind when using this function:

- The parameter data of the selected device are first saved in the MOVISUITE® project and are then loaded into the device.
- The data set might also include the parameter data of the safety option.



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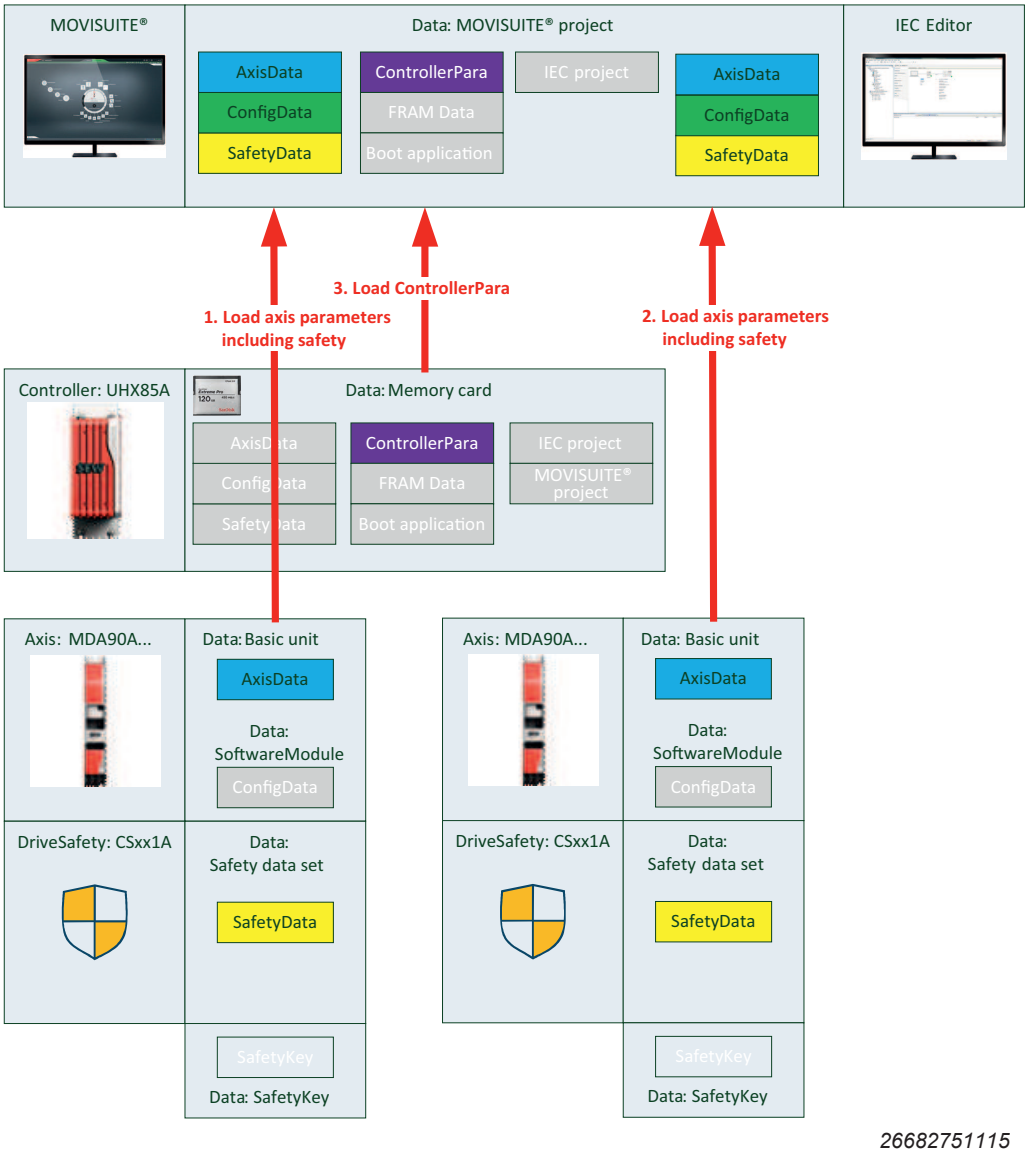
11.7 "Device → PC" function

The "Device → PC" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu.

Bear the following information in mind when using this function:

- The parameter data of all devices subordinate to the selected device are extracted and saved in the MOVISUITE® project. For example, if you perform the function for the MOVI-C® CONTROLLER, then a backup is created of the parameter data of the MOVI-C® CONTROLLER and of the lower-level inverters in the MOVISUITE® project.
- The configuration data (ConfigData) of the software modules of inverters are not included when using this function because these configuration data are not stored in the inverter. The configuration data are generated in MOVISUITE® during configuration and are loaded onto the MOVI-C® CONTROLLER using the "Update configuration data".



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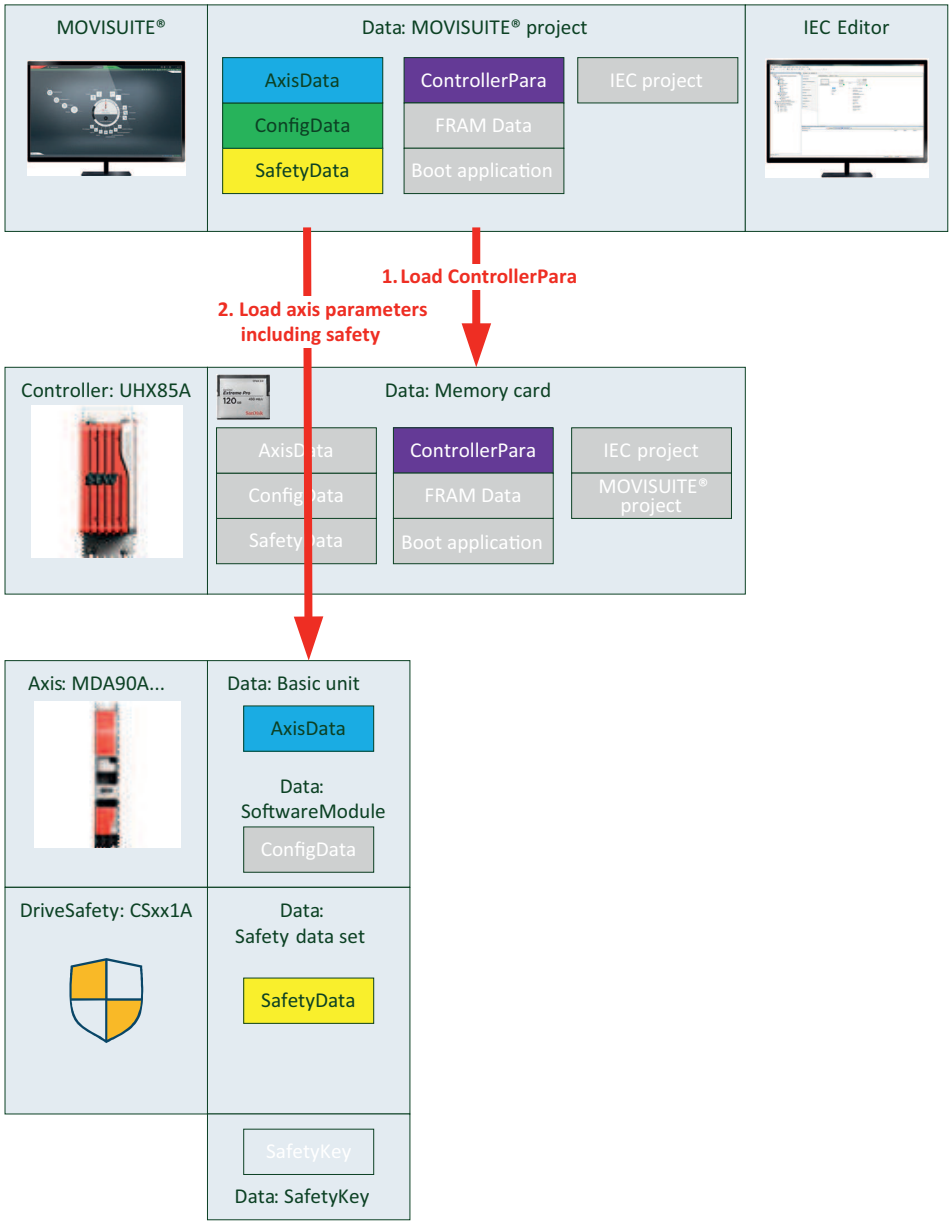
11.8 "PC → device" function

The "PC → device" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu.

Bear the following information in mind when using this function:

- The parameter data of all the devices subordinate to the selected device in the MOVISUITE® project are loaded to the respective devices. Selecting the MOVI-C® CONTROLLER and performing the "PC → device" function lets you restore the parameter data of the MOVI-C® CONTROLLER and of the lower-level inverters.



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11.9 "All devices → PC" function

The "All devices → PC" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu.

Bear in mind the following information when using this function:

- The devices read all the data sets of the devices in the function view of the MOVISUITE® project and save them in the MOVISUITE® project. The devices in the function view of the MOVISUITE® project must be connected with a device in the network view.

11.10 "PC → all devices" function

The "PC → all devices" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu.

Bear in mind the following information when using this function:

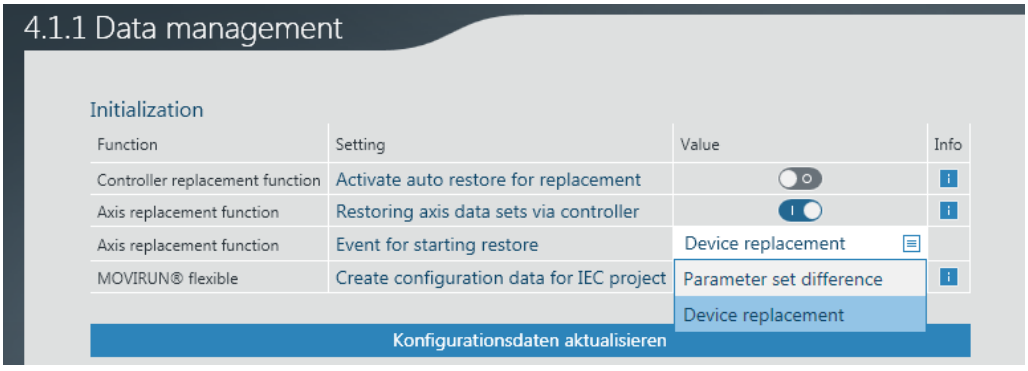
- All data sets of all devices in the function view of the MOVISUITE® project are loaded from the MOVISUITE® project into the devices. The devices in the function view of the MOVISUITE® project must be connected with a device in the network view.

11.11 "Restore axis data sets via controller" function

The MOVI-C® CONTROLLER offers the function of saving complete data sets of its lower-level devices to an SD or CFast memory card. Such data sets are, for example, axis data sets of MOVIDRIVE® devices and safety parameter sets of a safety option. You can use this function after an inverter replacement (including safety option), for example, to automatically transfer the saved data sets from the MOVI-C® CONTROLLER to the new device.

The "Restore axis data sets via controller" function is available in MOVISUITE® in the context menu of the MOVI-C® CONTROLLER in the "Data management" submenu. Selecting "Event for starting restore" in the same configuration menu offers the following options:

- Parameter set difference – Axis data sets are restored if a different CRC is detected, which means that the parameter set is not identical.
- Device replacement – Axis data sets are restored if a different UUID, and consequently a device replacement, is detected.



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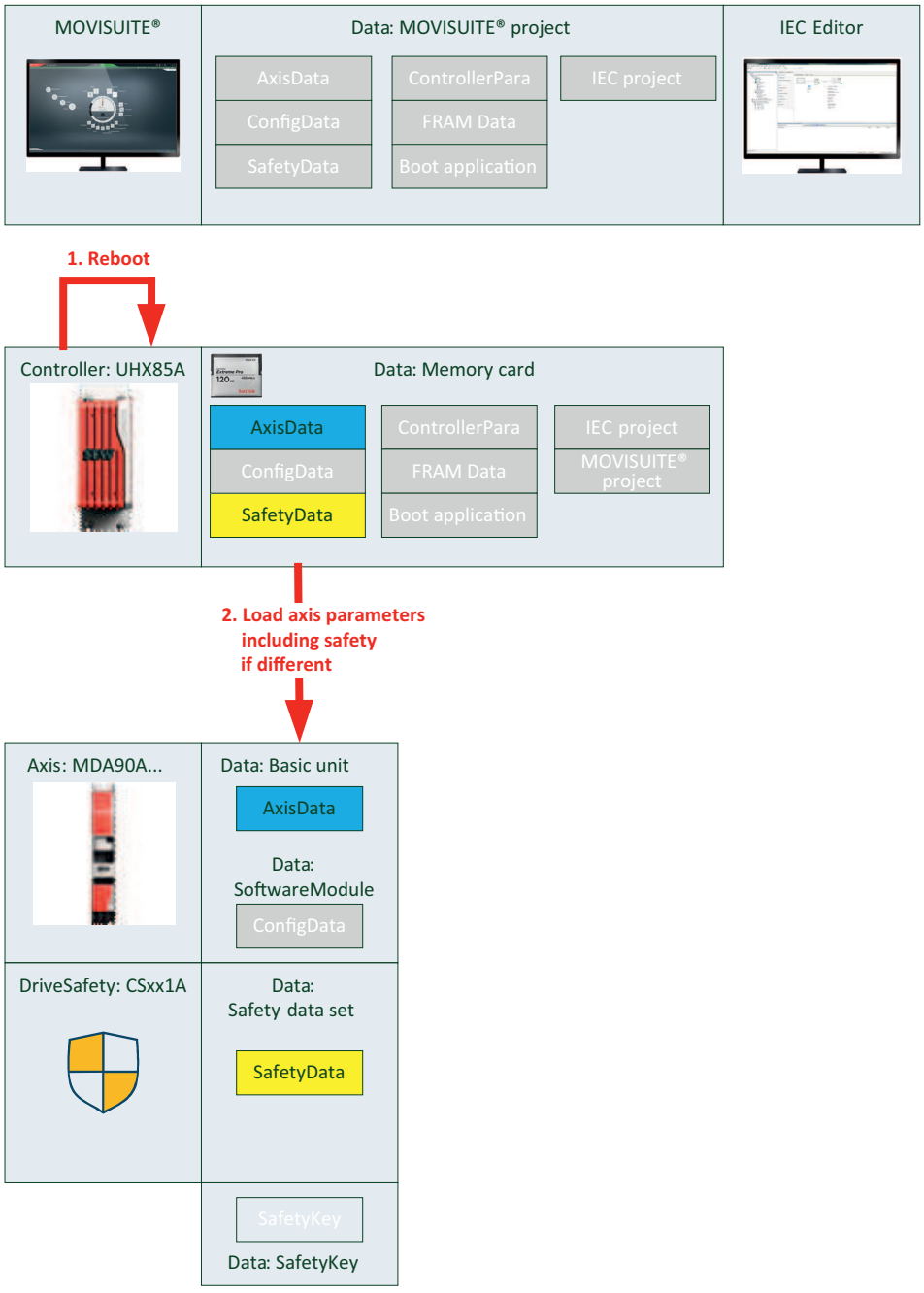
11.11.1 Functional principle

Each time the MOVI-C® CONTROLLER is restarted (24 V supply is switched on), the IEC program checks in the boot application whether the data of devices connected via system bus are still up to date. For this purpose, the system checks by means of the device name (LogicalDevice) whether an inverter data set for this device name exists on the SD memory. The bus address of the connected device is used to check whether this inverter data set differs from the current inverter data set of the device. If it differs, the inverter data set as well as the device name are restored by means of the axis replacement function of the MOVI-C® CONTROLLER.



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Observe the following notes:

- The names of the devices (LogicalDevices) in the boot application must correspond with the names of the devices in the saved configuration data. If names are changed later only in the MOVISUITE® project or in the IEC Editor, then the axis data sets cannot be restored automatically via the MOVI-C® CONTROLLER.
- When changes are made to the axis parameters, the configuration data have to be updated. Else the values saved last will be restored at the next restart due to the axis replacement function.
- When changes are made to the safety parameters, the configuration data have to be updated. Older data sets cannot be restored.

11.11.2 Requirements

The following requirements must be met to have the axis data sets restored automatically in the event of a device replacement.

- The nameplate of the inverter to be replaced and the nameplate of the new inverter must be identical (same device type, same power, same options).
- The type designation of the safety option to be replaced and the type designation of the new safety option must be identical (e.g. a safety card with the type designation CSS21A cannot be replaced by a safety card with the type designation CSB21A without intervention of the user).

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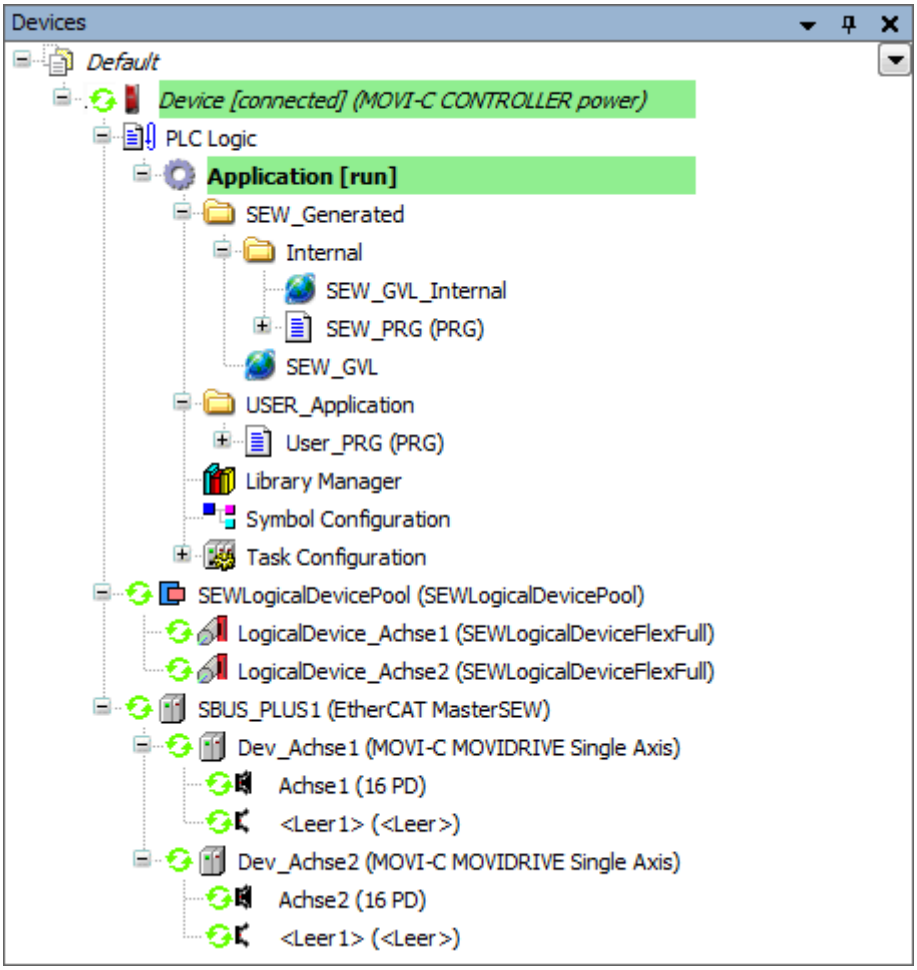
11.11.3 Presetting

To have the axis data sets restored automatically when replacing a device, the following settings must be made in advance:

✓ The function blocks in the IEC project as well as the EtherCAT®/SBusPLUS are in "OP" state.



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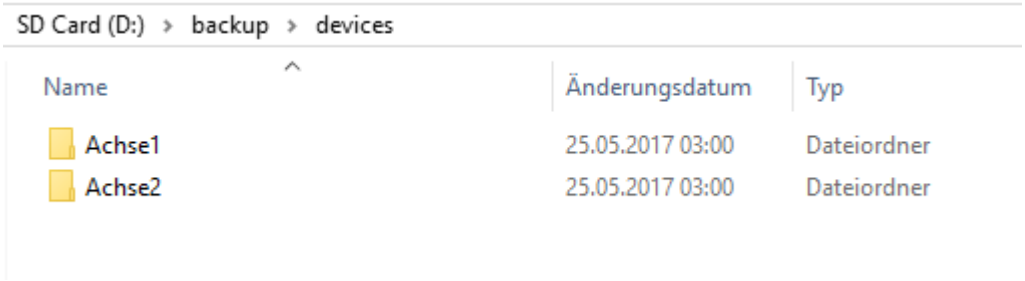
✓ The application is in "Run" state.

✓ A name has been assigned to the LogicalDevices via system bus at creation.

1. Create a boot application. See chapter "Creating a boot application" (→ 🗎 61).
   ⇨ The boot application is created on the SD memory card under `/app/project/Application.app`.
2. In MOVISUITE®, open the configuration of the MOVI-C® CONTROLLER.
3. In the "Data management" submenu under "Initialization", enable the setting *Restore axis data sets via controller*. See chapter ""Restore axis data sets via controller" function" (→ 🗎 90).

4. Click on the [Update configuration data] button.
   ⇨ The configuration data and axis data sets are transferred to the memory card of the MOVI-C® CONTROLLER. The names of the directories are adopted from the MOVISUITE® project.



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5. Save and archive the MOVISUITE® project.

11.11.4 Device replacement

The instructions described in the following chapters refer to the replacement of a complete axis. In addition to rewiring the motor, the encoder, and the system bus connection, the safety key of the safety option has been plugged from the old device into the new one. All mechanical switches (such as DIP switches or rotary switches) are set to the same settings as the defective device.

INFORMATION

The safety key of the safety option contains the activation of the parameterized safety data. After having replaced the inverter or safety option, the safety key must be plugged into exactly the same position in the EtherCAT® branch as before.

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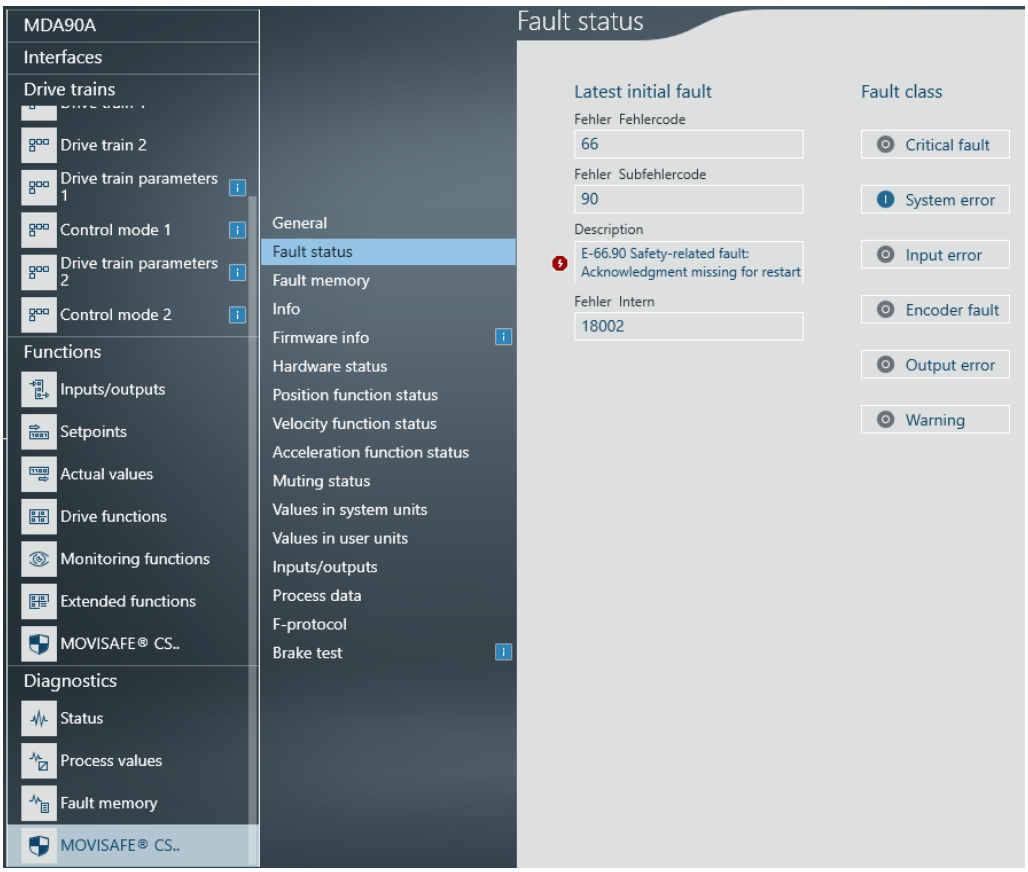
After start-up of the system, the "Run" LED of the MOVISAFE® CS..A safety card lights up red, for example. The error LED flashes red at a frequency of 1 Hz.



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The MOVISAFE® CS..A safety card requests a safety acknowledgment for restart. This acknowledgement can be made by an F-DI, by F-process data, or by a 24 V reset (depending on the parameter setting). The system is in run state after acknowledgement. Both LEDs of the MOVISAFE® CS..A safety card light up green.

Replacing the device

1. Completely switch off the MOVI-C® CONTROLLER and the device to be replaced (isolate from 400 V and 24 V supply).
2. Remove the safety key from the safety card.
3. Replace the entire device and/or the safety card.
4. Plug the safety key into the new safety card. It is important that you adhere to the sequence of the devices connected via system bus.
5. Connect the replaced device and the MOVI-C® CONTROLLER with the power supply (24 V and 400 V supply) and switch on the devices.
6. After system start-up, acknowledge the safety card.
7. Perform a function test of the inverter and of the safety card.

Creating replacement safety key

The following data are saved on the safety key of the safety card after successful startup:

- Parameter CRCs of the safety parameter setting.
- The set F-protocol including F-address.

Do the following to create a replacement safety key with unique allocation to an inverter:

1. Replace the safety key of a safety card that has already been taken into operation.
2. Take the safety card into operation again.
3. Replace the safety key of the safety card back again.
4. Document the location reference of the replacement safety key of the safety card.

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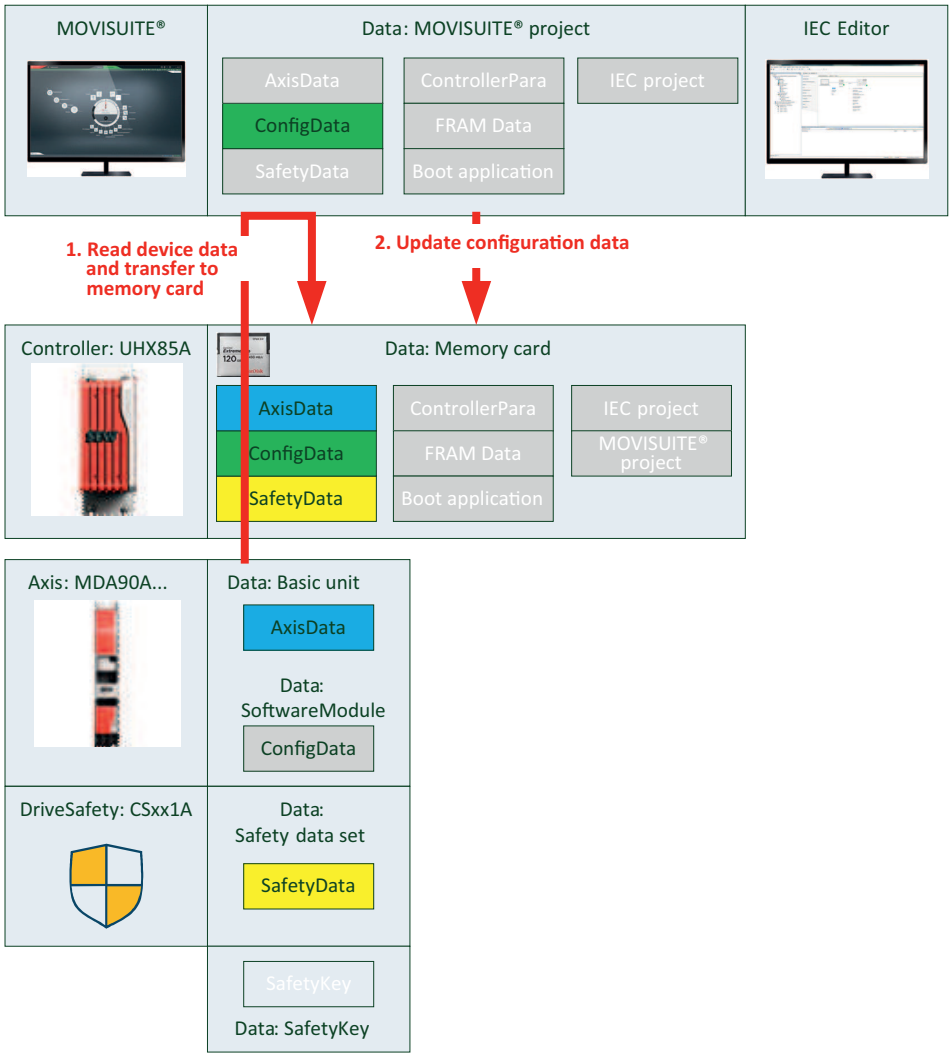
11.12 "Update configuration data" function

The "Update configuration data" function is available in MOVISUITE® for devices in the context menu of the device node in the function view, and in the "More" menu.

Bear in mind the following information when using this function:

- The configuration data of the software modules of the lower-level axes are transferred to the memory card of the MOVI-C® CONTROLLER.
- The parameter sets of the axes for automatic restore of inverter data sets (including the parameter set of the safety option) are transferred to the memory card of the MOVI-C® CONTROLLER.
- If the data sets of a connected device are not identical with the data sets of the MOVISUITE® project, a notification symbol appears at the axis in MOVISUITE®. You can enable and disable the notification symbols in the MOVISUITE® settings in the "Advanced..." submenu using the sliders for "Activate device status test" and "Activate consistency check".
- To use the "Update configuration data" function, the axis data sets must be synchronized.



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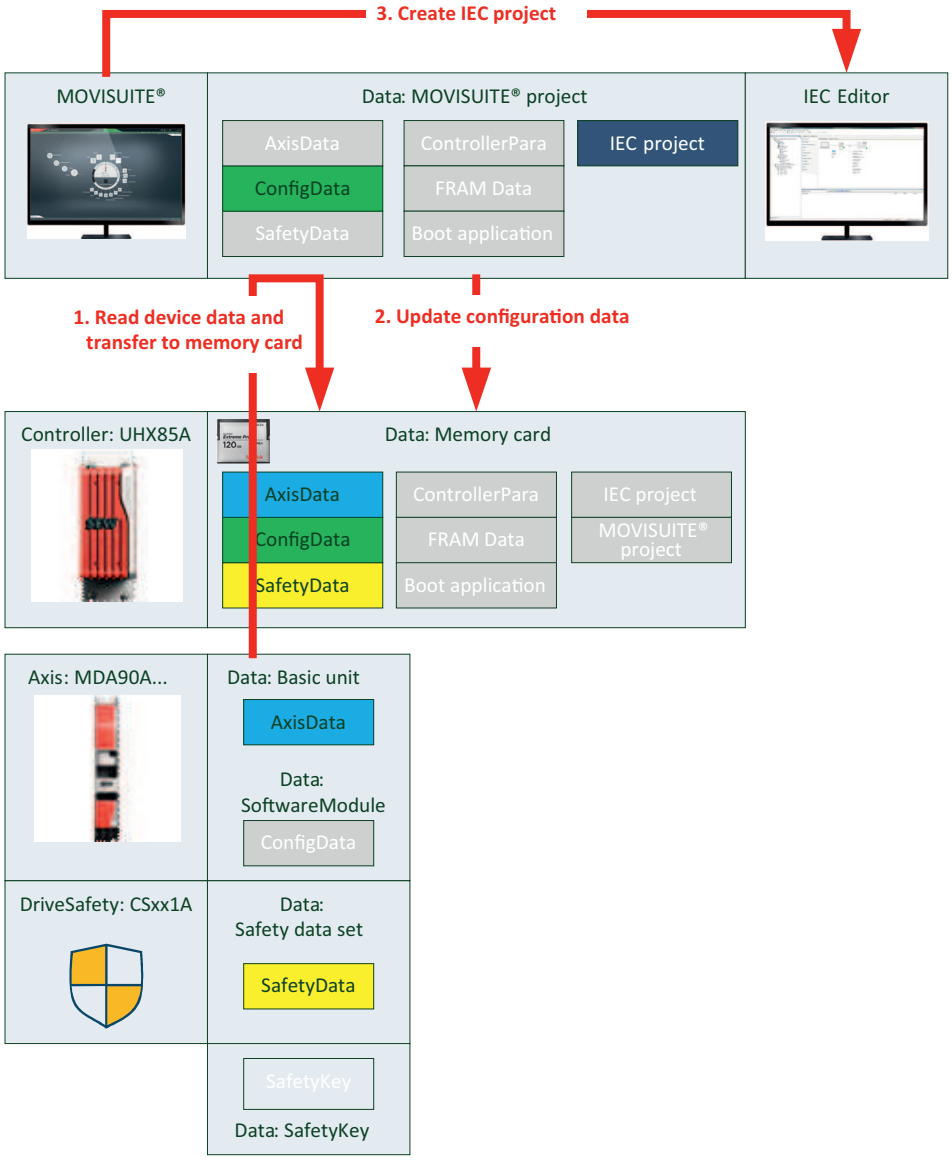
11.13 "Create new IEC project" function

The "Create new IEC project" function is available in MOVISUITE® in the configuration menu of the MOVI-C® CONTROLLER in the "IEC project" submenu.

Bear in mind the following information when using this function:

- The "Create new IEC project" function requires that the "Update configuration data" function is performed first. Next, the IEC Editor is opened and a new IEC project is created in the IEC Editor from the MOVISUITE® project data.
- An already existing project is overwritten.
- To have the program start again automatically after restart of the MOVI-C® CONTROLLER, you have to perform the "Create boot application" function in the IEC Editor.



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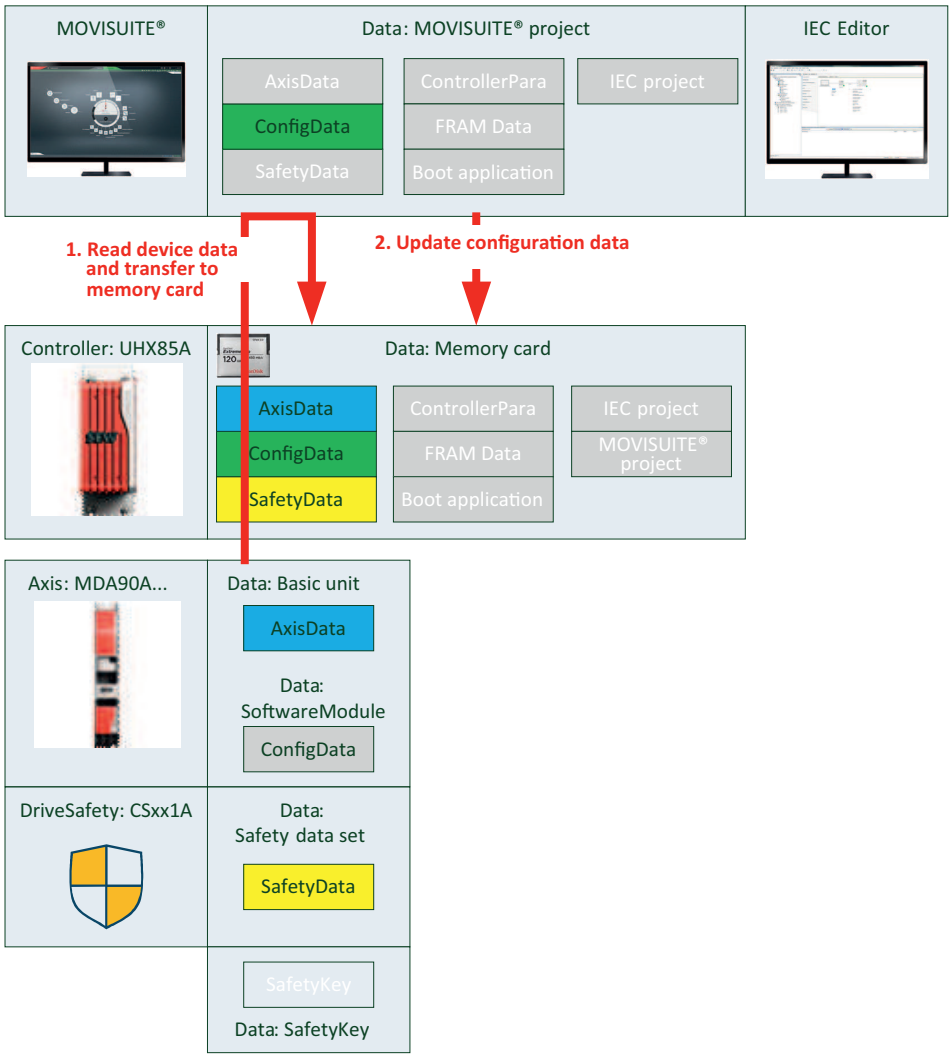
11.14 "Update IEC project" function

The "Update IEC project" function is available in MOVISUITE® in the configuration menu of the MOVI-C® CONTROLLER in the "IEC project" submenu, and in the context menu of the MOVI-C® CONTROLLER node in the function view.

Bear in mind the following information when using this function:

- The "Update IEC project" function requires that the "Update configuration data" function is performed first. The IEC Editor is then opened and the IEC project in the IEC Editor is updated with the MOVISUITE® project data.
- The user program is retained.
- To have the program start again automatically after restart of the MOVI-C® CONTROLLER, you have to perform the "Create boot application" function in the IEC Editor.



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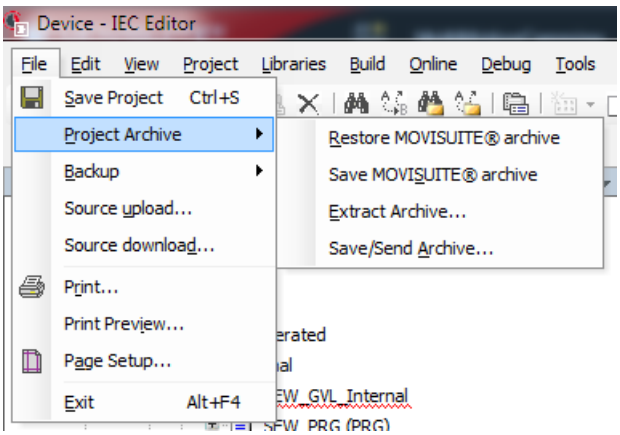
11.15 IEC project archiving functions

The IEC Editor provides several archive functions that can be used to create backup files and exchange archives.

The IEC project archive function is available in the IEC Editor under [File] > [Project archive].



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11.15.1 Restoring a MOVISUITE® archive

Bear in mind the following information when using this function:

- An archive of an IEC project saved in MOVISUITE® is restored. If libraries are not available, they will be installed when restoring the archive.
- As libraries are installed, this function for passing on a project should be used on another PC.

11.15.2 Saving a MOVISUITE® archive

Bear in mind the following information when using this function:

- An archive with all library references is created form the currently loaded IEC project and is saved in the MOVISUITE® project.
- As libraries are installed, this function for passing on a project should be used on another PC.
- The MOVISUITE® archive is created automatically when closing the IEC Editor. This is why the archive is always up to date.
- The created IEC archive is saved in the MOVISUITE® project structure under:

  `C:/ProgramData/SEW/MOVISUITE2/Projects/<Projectname>/Zahl/ModuleSettings/ Default.projectarchive`

11.15.3 Extracting an archive

Bear in mind the following information when using this function:

- An archive file stored in any directory is imported into the IEC project. The current project will be replaced.

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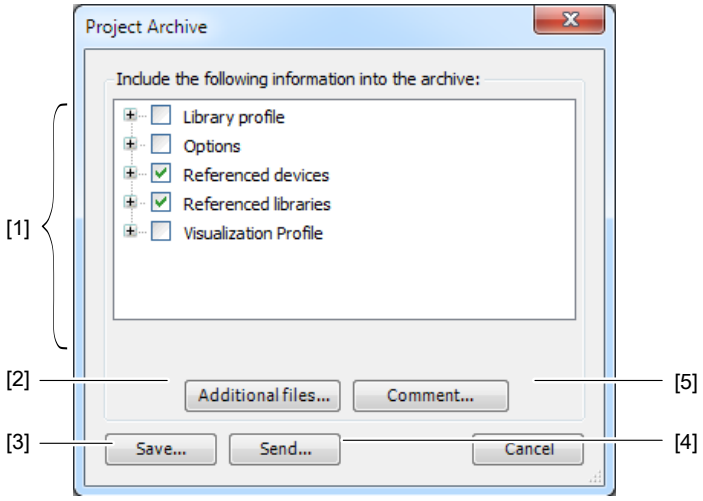
11.15.4 Saving/sending an archive

Bear in mind the following information when using this function:

- The current IEC project is saved in an archive file together with the libraries.

The following dialog opens:



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[1] Select the content you want to save.
[2] Append additional files.
[5] Add a comment.
[3] Save the IEC project archive with the specified settings.
A dialog opens where you can specify the storage location.
[4] Send the IEC project archive with the specified settings.
An e-mail opens with the IEC project archive file as attachment.

12 Troubleshooting

12.1 Cannot convert type, Unknown type

Problem

The IEC project has already been updated using the "Update IEC project" function and the IEC Editor is already open.

Remedy

Option 1

1. In the IEC Editor, select [Clean all] from the [Build] menu.
2. Log in to the MOVI-C® CONTROLLER.
3. Compile (build) the IEC project.
   ⇨ The IEC project can now be opened correctly again.

Option 2

4. Close the IEC Editor.
5. In MOVISUITE®, perform the function [Update IEC project].
   ⇨ The IEC project can now be opened correctly again.

12.2 Program loaded: Exception error

Problem

When a MOVI-C® CONTROLLER is operated in "Startup" mode without activated axes on EtherCAT® (no lower-level axes of the MOVI-C® CONTROLLER in the network view are connected with device nodes in the function view), the error message "Program loaded: exception error" appears when loading the IEC program into the MOVI-C® CONTROLLER.

Remedy

1. In the IEC Editor, open the context menu of the node "SBUS_PLUS1 (EtherCAT MasterSEW)".
2. Click the menu item [Activate device].

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12.3 Subsequent activation of axis simulation

Problem

The IEC program no longer starts properly if a simulation is activated for individual axes in a project for which configuration data and inverter data sets are already present on the memory card.

The IEC program fails to recognize the inverter data sets and attempts to transfer them to the axes. As the axes cannot be accessed, the MOVI-C® CONTROLLER signals a fault and the IEC program does not start properly.

Remedy

1. Remove the memory card from the MOVI-C® CONTROLLER
2. Delete the content of the folder named ".\backup\devices".

INFORMATION

Do NOT delete the "backup" folder. The backup folder is an essential part of the image.

3. Insert the memory card into the MOVI-C® CONTROLLER again.
4. Switch on the MOVI-C® CONTROLLER again.
5. In MOVISUITE®, perform the function "Update IEC project".

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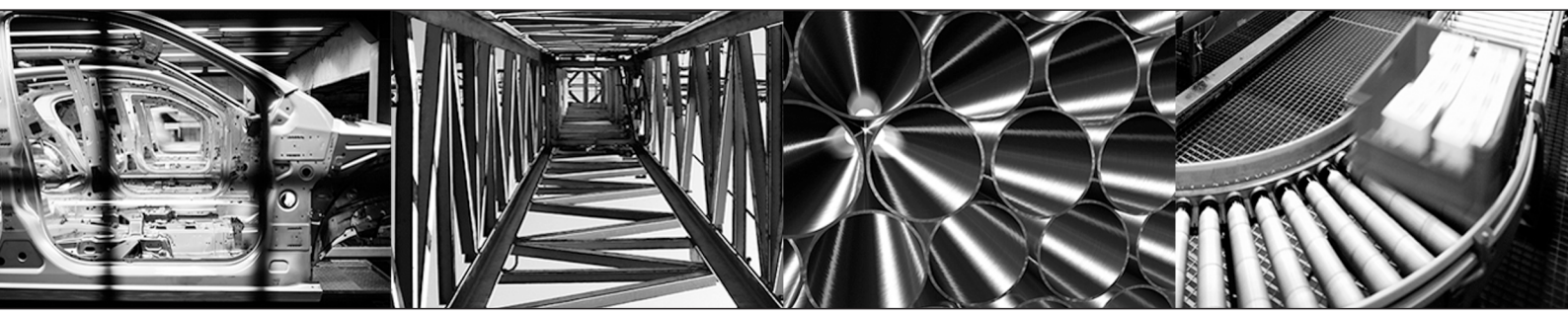

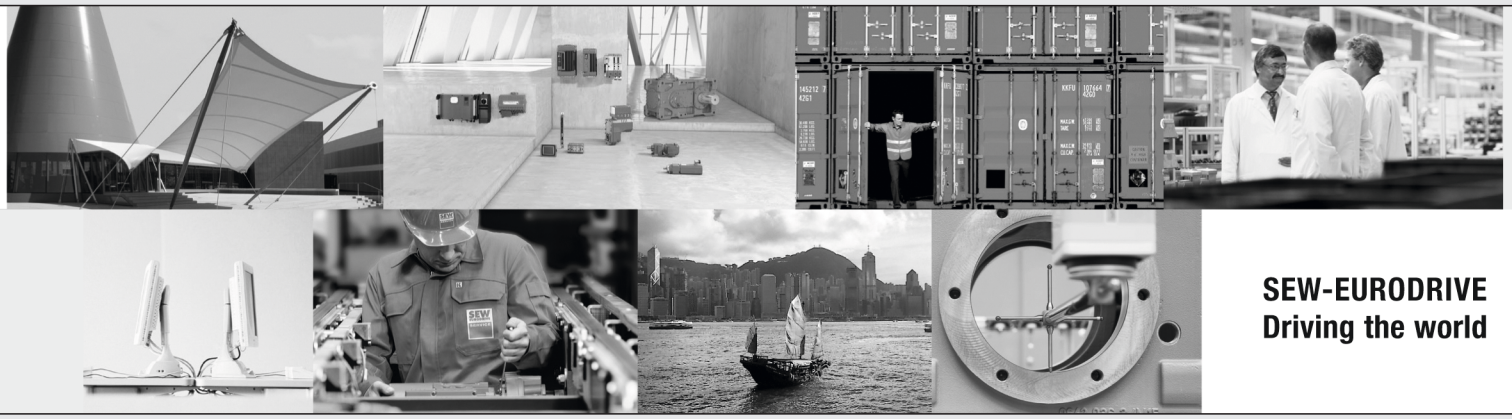

SEW-EURODRIVE
Driving the world

SEW-EURODRIVE GmbH & Co KG
Ernst-Blickle-Str. 42
76646 BRUCHSAL
GERMANY
Tel. +49 7251 75-0
Fax +49 7251 75-1970
sew@sew-eurodrive.com
➞ **www.sew-eurodrive.com**