

# EcoStruxure Machine Expert Twin

## Getting Started

### User Guide

EIO0000005022.01  
12/2023

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# Safety Information

## Important Information

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.



The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.



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

### **DANGER**

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

### **WARNING**

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

### **CAUTION**

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

### **NOTICE**

**NOTICE** is used to address practices not related to physical injury.

## Please Note

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

# About the Book

## Document Scope

This document describes the graphical user interface of the EcoStruxure Machine Expert Twin software and the functions it provides. For further information, refer to the separate documents provided in the EcoStruxure Machine Expert Twin online help.

## Validity Note

This document has been updated for the release of EcoStruxure Machine Expert Twin V2.0.

## Available Languages of this Document

This document is available in these languages:

- English (EIO0000005022)

## Related Documents

Document title	Reference
Cybersecurity Best Practices	CS-Best-Practices-2019-340
Cybersecurity Guidelines for EcoStruxure Machine Expert, Modicon and PacDrive Controllers and Associated Equipment	EIO0000004242
EcoStruxure Machine Expert Twin How to Create Device Catalogs - User Guide	EIO0000005034 (ENG)

To find documents online, visit the Schneider Electric download center ([www.se.com/ww/en/download/](http://www.se.com/ww/en/download/)).

## Product Related Information

### **▲ WARNING**

#### **LOSS OF CONTROL**

- Perform a Failure Mode and Effects Analysis (FMEA), or equivalent risk analysis, of your application, and apply preventive and detective controls before implementation.
- Provide a fallback state for undesired control events or sequences.
- Provide separate or redundant control paths wherever required.
- Supply appropriate parameters, particularly for limits.
- Review the implications of transmission delays and take actions to mitigate them.
- Review the implications of communication link interruptions and take actions to mitigate them.
- Provide independent paths for control functions (for example, emergency stop, over-limit conditions, and error conditions) according to your risk assessment, and applicable codes and regulations.
- Apply local accident prevention and safety regulations and guidelines.<sup>1</sup>
- Test each implementation of a system for proper operation before placing it into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

<sup>1</sup> For additional information, refer to NEMA ICS 1.1 (latest edition), *Safety Guidelines for the Application, Installation, and Maintenance of Solid State Control* and to NEMA ICS 7.1 (latest edition), *Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable-Speed Drive Systems* or their equivalent governing your particular location.

### **▲ WARNING**

#### **UNINTENDED EQUIPMENT OPERATION**

- Only use software approved by Schneider Electric for use with this equipment.
- Update your application program every time you change the physical hardware configuration.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

For reasons of Internet security, for those devices that have a native Ethernet connection, TCP/IP forwarding is disabled by default. Therefore, you must manually enable TCP/IP forwarding. However, doing so may expose your network to possible cyberattacks if you do not take additional measures to protect your enterprise. In addition, you may be subject to laws and regulations concerning cybersecurity.

## **⚠ WARNING**

### **UNAUTHENTICATED ACCESS AND SUBSEQUENT NETWORK INTRUSION**

- Observe and respect any and all pertinent national, regional and local cybersecurity and/or personal data laws and regulations when enabling TCP/IP forwarding on an industrial network.
- Isolate your industrial network from other networks inside your company.
- Protect any network against unintended access by using firewalls, VPN, or other, proven security measures.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Consult the [Schneider Electric Cybersecurity Best Practices](#) for additional information.

EcoStruxure Machine Expert Twin is a simulation and emulation software suite to create digital models of real machines to start the virtual design, virtual pre-commissioning, and to support co-development before building the machine – thus enabling parallel engineering of mechanical, electrical and controls work assignments.

The simulation, emulation and machine visualization functions of EcoStruxure Machine Expert Twin are intended to support you in developing your application and its configuration by simulating the behavior of the various machine or process components. These functions are not intended to substitute for, but to complement the processes of risk assessment, risk evaluation, validation, and commissioning as well as any ancillary processes, tasks, and obligations according to the applicable regulations and standards such as ISO/EN 13849 and IEC 62061. The product, though powerful, does not, nor can it, simulate every aspect of the application and its environment.

## **⚠ WARNING**

### **INSUFFICIENT TEST COVERAGE**

- Do not use EcoStruxure Machine Expert Twin as the sole means for risk assessment, risk evaluation, validation, and commissioning as well as any ancillary processes, tasks, and obligations according to the applicable regulations and standards such as, but not limited to, ISO/EN 13849 and IEC 62061.
- Verify and validate your results on the intended equipment before placing your machine or process into service.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**



Based on the system configuration and operation, a hazard and risk analysis must be conducted for the system (for example, according to ISO 12100 or ISO 13849-1) independent of the work with EcoStruxure Machine Expert Twin. The results of this analysis must be considered when designing the machine, and subsequently applying safety-related equipment and safety-related functions. The results of your analysis may deviate from any digital models of physical machines that you may create. For example, additional safety components may be required. In principle, the results from the hazard and risk analysis have priority.

## **▲ WARNING**

### **NON-CONFORMANCE TO SAFETY FUNCTION REQUIREMENTS**

- Specify the requirements and/or measures to be implemented in the risk analysis you perform.
- Verify that your safety-related application complies to applicable safety regulations and standards.
- Make certain that appropriate procedures and measures (according to applicable sector standards) have been established to help avoid hazardous situations when operating the machine.
- Use appropriate safety interlocks where personnel and/or equipment hazards exist.
- Validate the overall safety-related function and thoroughly test the application.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

Catalogs contain important data, parameters and operational aspects of the devices defined within. This information is subject to change over time for a variety of reasons. Therefore, it is necessary to maintain the relationship between the models you create and the catalogs you have used to do so. Version mismatches of catalogs may cause your models to operate in ways that are incongruent with the equipment they represent and may lead to errors in design and operation.

## **▲ WARNING**

### **UNINTENDED EQUIPMENT OPERATION**

- Impose a system of file name conventions that readily indicate the version of the catalogs you use and models you create.
- Create documentation that records catalog and model versions, as well as firmware versions of the equipment used in your models.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

In addition, changes to your underlying application (logic, data address, functions, I/O configurations, device types and configuration, etc.) can have serious impact on the models you have created.

## **▲ WARNING**

### **UNINTENDED EQUIPMENT OPERATION**

- Update your models every time you modify your application or change the physical hardware configuration.
- Verify that objects you have created in your models are coherent with the modifications and/or changes you have made to your application and that they are associated with the correct variables.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

It is also important to connect to the correct automation logic/motion controller in a networked, multi-controller environment.

## ▲ WARNING

### UNINTENDED EQUIPMENT OPERATION

Verify that you have connected to the intended automation controller.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

It is important to manage the amount of data that is transmitted between your automation logic/motion controller and EcoStruxure Machine Expert Twin. Large amounts of data, or data that is not contiguous in the controller memory may impact performance of EcoStruxure Machine Expert Twin, the controller or both.

## Information on Non-Inclusive or Insensitive Terminology

As a responsible, inclusive company, Schneider Electric is constantly updating its communications and products that contain non-inclusive or insensitive terminology. However, despite these efforts, our content may still contain terms that are deemed inappropriate by some customers.

## Terminology Derived from Standards

The technical terms, terminology, symbols and the corresponding descriptions in the information contained herein, or that appear in or on the products themselves, are generally derived from the terms or definitions of international standards.

In the area of functional safety systems, drives and general automation, this may include, but is not limited to, terms such as *safety*, *safety function*, *safe state*, *fault*, *fault reset*, *malfunction*, *failure*, *error*, *error message*, *dangerous*, etc.

Among others, these standards include:

Standard	Description
IEC 61131-2:2007	Programmable controllers, part 2: Equipment requirements and tests.
ISO 13849-1:2023	Safety of machinery: Safety related parts of control systems. General principles for design.
EN 61496-1:2013	Safety of machinery: Electro-sensitive protective equipment. Part 1: General requirements and tests.
ISO 12100:2010	Safety of machinery - General principles for design - Risk assessment and risk reduction
EN 60204-1:2006	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
ISO 14119:2013	Safety of machinery - Interlocking devices associated with guards - Principles for design and selection
ISO 13850:2015	Safety of machinery - Emergency stop - Principles for design
IEC 62061:2021	Safety of machinery - Functional safety of safety-related electrical, electronic, and electronic programmable control systems
IEC 61508-1:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: General requirements.
IEC 61508-2:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Requirements for electrical/electronic/programmable electronic safety-related systems.
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.

Standard	Description
IEC 61784-3:2021	Industrial communication networks - Profiles - Part 3: Functional safety fieldbuses - General rules and profile definitions.
2006/42/EC	Machinery Directive
2014/30/EU	Electromagnetic Compatibility Directive
2014/35/EU	Low Voltage Directive

In addition, terms used in the present document may tangentially be used as they are derived from other standards such as:

Standard	Description
IEC 60034 series	Rotating electrical machines
IEC 61800 series	Adjustable speed electrical power drive systems
IEC 61158 series	Digital data communications for measurement and control – Fieldbus for use in industrial control systems

Finally, the term *zone of operation* may be used in conjunction with the description of specific hazards, and is defined as it is for a *hazard zone* or *danger zone* in the *Machinery Directive (2006/42/EC)* and *ISO 12100:2010*.

**NOTE:** The aforementioned standards may or may not apply to the specific products cited in the present documentation. For more information concerning the individual standards applicable to the products described herein, see the characteristics tables for those product references.



# Introduction

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# General Introduction to the EcoStruxure Machine Expert Twin

## What's in This Chapter

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## Overview of the EcoStruxure Machine Expert Twin Product Portfolio

### Introduction

The EcoStruxure Machine Expert Twin product portfolio consists of the following segments:

- EcoStruxure Machine Expert Visu  
This viewer integrated in EcoStruxure Machine Expert provides a subset of the functions of EcoStruxure Machine Expert Twin. It allows you to test the application code and to display a 3-D emulation of the objects, for example, one multi carrier track or one robot, from within EcoStruxure Machine Expert. You can reuse the scenes of single machines to virtual commissioning of the entire machine production line inside EcoStruxure Machine Expert Twin Builder.
- EcoStruxure Machine Expert Twin  
The standalone EcoStruxure Machine Expert Twin application is installed using the Schneider Electric Software Installer and requires a separate license. It includes different components:
  - EcoStruxure Machine Expert Twin Builder  
The Builder License allows the emulation of a machine when the controller is connected. It includes predefined catalogs that provide objects you can use as assemblies in your scene.
  - EcoStruxure Machine Expert Twin Designer  
The EcoStruxure Machine Expert Twin Designer allows the emulation of machines without a controller being connected (discrete events simulation).
  - EcoStruxure Machine Expert Twin Developer  
The Developer License allows you to create your own emulation components and catalogs as well as plugins, tools, interfaces you can adapt to your workflow, processes and data sources.

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# User Interface

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# Overview of the User Interface

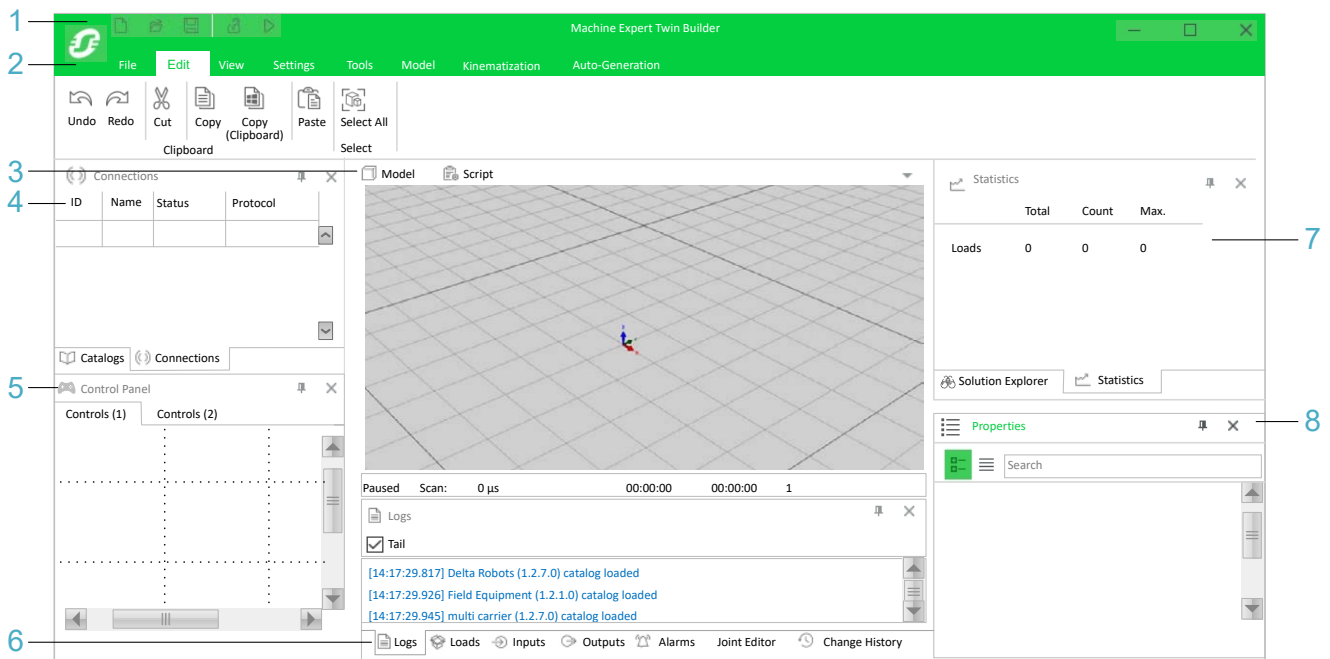
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## Elements of the Screen

### Default Screen

After initial startup, the default screen is displayed. It consists of the following elements:



1 **Toolbar**, page 20

2 **Menu bar**, page 21 with button bar representing the commands corresponding to the selected menu

3 **Model** view, page 45, **Script** view, page 48

4 **Connections** view, page 39 / **Catalogs** view, page 42

5 **Control Panel** view, page 43 providing tabs for different controls

6 **Logs** view, page 49, **Loads** view, page 51, **Inputs**, **Outputs** views, page 52, **Alarms** view, page 53, **Joint Editor** view, page 54, **Change History** view, page 57

7 **Statistics** view, page 61 / **Solution Explorer** view, page 58

8 **Properties** view, page 62



# Information About the Coordinate System

## General Definition for 3-D Software Applications

In 3-D software applications, a coordinate system is a mathematical system that is used to represent the position and orientation of objects in a three-dimensional space. It consists of three perpendicular axes (X axis, Y axis, and Z axis) that intersect at a point called the origin.

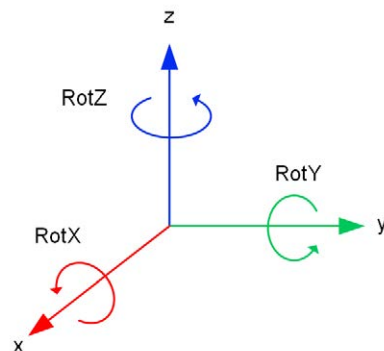
## Color Definition of Coordinates and Denomination of Rotation

The axes of the coordinate system in EcoStruxure Machine Expert Twin are color-coded as follows:

- X: red
- Y: green
- Z: blue

Denomination of rotational movement around the different axes is as follows:

- Rotation around the X axis: **RotX**
- Rotation around the Y axis: **RotY**
- Rotation around the Z axis: **RotZ**



## Intrinsic Rotations Convention

With reference to the global EcoStruxure Machine Expert Twin coordinate system, rotations of local assembly coordinate systems of individual body assemblies are performed according to the intrinsic convention with the default orientation convention ZYX. In an intrinsic system, each of the elemental rotations is performed on the coordinate system as rotated by the previous operation(s).

As an example, suppose the three angles specify rotations around the Z, Y, and X axes are in that order:

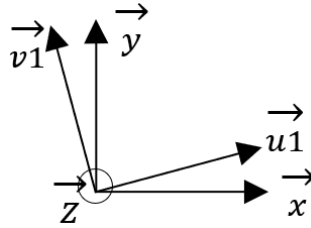
- The first elemental rotation is around the Z axis.
- For the intrinsic convention the second elemental rotation is performed around the Y axis in the new position resulting from the first rotation.
- The final rotation around the X axis is performed around the X axis as rotated by the two previous operations in the intrinsic system.

The relationship between the three axes is fundamental in EcoStruxure Machine Expert Twin and is used to determine the orientation and position of body assemblies in a scene.

## Order of Rotational Movements

When values for rotational movements of the different types are provided at the same time, for example, if an object is added by using the orientation values from the OPC UA structures, rotational movements are executed in the following order:

### 1. Around the Z axis:

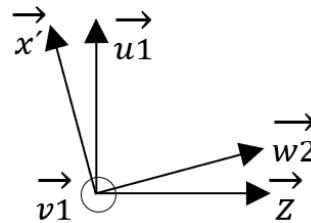


The vector  $z$  is pointing in your direction.

$$\text{rot}Z = (\vec{x}, \vec{u}_1) = (\vec{y}, \vec{v}_1)$$

The intermediate vectors  $u1$  and  $v1$  are implicit.

### 2. Around the Y axis:

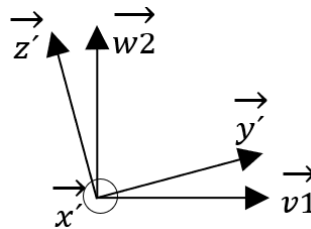


The vector  $v_1$  is pointing in your direction.

$$\text{rot}Y = (\vec{z}, \vec{w}_2) = (\vec{u}_1, \vec{x}')$$

The intermediate vectors  $u1$ ,  $v1$ , and  $w2$  are implicit.

### 3. Around the X axis:



The vector  $x'$  is pointing in your direction.

$$\text{rot}X = (\vec{v}_1, \vec{y}') = (\vec{w}_2, \vec{z}')$$

The intermediate vectors  $u1$ ,  $v1$ , and  $w2$  are implicit.

# Toolbar

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# Toolbar

## Default Elements of the Toolbar

By default, the toolbar provides the following elements:

Element	Shortcut	Description
<b>New</b>	<b>Ctrl + N</b>	Create a new project.
<b>Open</b>	<b>Ctrl + O</b>	<p>Open an existing project. Your file contains script code created or modified by you or by someone else. The execution of the script code may compromise the security of your IT system.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>INFORMATION SYSTEM VULNERABILITY</b></p> <ul style="list-style-type: none"> <li>• Ensure the integrity of the script code contained in the file by ascertaining the originator and intent of the script before opening the file.</li> <li>• Do not open the file if you can not determine the originator and intent of the script, including confirming any modifications that may have been made.</li> <li>• Verify and confirm that you want to execute this code when using the model contained in the file.</li> </ul> <p><b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b></p> </div> <p>When attempting to open a file with a model containing script code, you are asked to acknowledge this advisory and accept responsibility for the execution of the code of the embedded script.</p>
<b>Save</b>	<b>Ctrl + S</b>	Save the open project with file extension <i>.Experior</i> .
<b>Lock</b>	<b>Ctrl + L</b>	<p>Lock the open project: the scene is locked against edits, no modifications are possible, values are greyed and buttons are unavailable.</p> <p>To lock specific elements of a scene, such as an assembly or a section, refer to the <b>Solution Explorer</b> view, page 58 or the <b>Properties</b>, page 62 of the specific element.</p>
<b>Play</b>	-	Play the scene. The <b>Play</b> button enables the physical simulation.
<b>Show Quick Access Toolbar Below the Ribbon / Show Quick Access Toolbar Above the Ribbon</b>	-	<p>Click <b>Show Quick Access Toolbar Below the Ribbon</b> to shift the toolbar below the menu bar.</p> <p>Click <b>Show Quick Access Toolbar Above the Ribbon</b> to shift the toolbar above the menu bar.</p> <p>Right-click this toggle buttons to access the following commands:</p> <ul style="list-style-type: none"> <li>• <b>Minimize the Ribbon:</b> Execute this command from the contextual menu to display or hide the button bar corresponding to the menu selected in the menu bar: The buttons are hidden until you execute the <b>Minimize the Ribbon</b> command again or until you select another menu in the menu bar.</li> <li>• <b>Customize the Ribbon</b> Opens the <b>Ribbon customization window</b> and allows you to customize the buttons and commands displayed in the menus.</li> </ul>

# Menu Bar

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The menu bar is by default extended by a button bar that provides the commands of each menu in the form of buttons. This chapter describes the default commands, provided by each menu.

## File Menu

### Commands of the File Menu

The **File** menu is grouped in different sections:

## File Section

Command	Shortcut	Description
<b>New</b>	<b>Ctrl + N</b>	<p>Creates a new project. Your file contains script code created or modified by you or by someone else. The execution of the script code may compromise the security of your IT system.</p> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>INFORMATION SYSTEM VULNERABILITY</b></p> <ul style="list-style-type: none"> <li>• Ensure the integrity of the script code contained in the file by ascertaining the originator and intent of the script before opening the file.</li> <li>• Do not open the file if you can not determine the originator and intent of the script, including confirming any modifications that may have been made.</li> <li>• Verify and confirm that you want to execute this code when using the model contained in the file.</li> </ul> <p><b>Failure to follow these instructions can result in death, serious injury, or equipment damage.</b></p> </div> <p>When attempting to open a file with a model containing script code, you are asked to acknowledge this advisory and accept responsibility for the execution of the code of the embedded script.</p>
<b>Open</b>	<b>Ctrl + O</b>	<p>Opens an existing project.</p> <p>As a project file contains executable script code, carefully verify whether this project file originates from a trusted source because opening a tampered project file can compromise the security of your IT system before you click <b>Exit</b> or activate the check box and click <b>Continue</b>.</p>
<b>Save</b>	<b>Ctrl + S</b>	Saves the open project with file extension <i>.Experior</i> .
<b>Save As</b>	<b>Ctrl + Shift + S</b>	Saves the open project with a file name and in the directory of your choice.

## Import Section

Command	Shortcut	Description
<b>Merge</b>	-	Allows you to merge two parts of a machine that have been designed independently as scenes and saved as EcoStruxure Machine Expert Twin projects in <i>.Experior</i> file format. For a step-by-step description, refer to <i>Merging Projects</i> , page 23.
<b>XML</b>	-	Imports an XML file that has an EcoStruxure Machine Expert Twin-compatible format. Files of type <i>.Experior</i> or <i>.zip</i> are supported.

Also refer to Importing a CAD File, page 34 in the **Kinematization** Menu, page 31.

## Merging Projects

To merge two parts of a machine that have been designed as independent *.Experior* projects, proceed as follows:

Step	Action
1	Create an EcoStruxure Machine Expert Twin project in <i>.Experior</i> file format for a part of your machine, for example, a conveyor belt.
2	Save and close this project file.
3	Create a second EcoStruxure Machine Expert Twin project in <i>.Experior</i> file format and design another part of your machine, for example, a robot.
4	Save the second file and click <b>File &gt; Merge</b> to display a file open dialog box.
5	Browse to the <i>.Experior</i> file you created for the conveyor belt and click <b>Open</b> . <b>Result:</b> The <b>Merge/Overwrite Objects</b> dialog box opens.
6	Verify the objects that are selected in the dialog box for <b>Insert</b> and <b>Overwrite</b> and adapt the selections to your needs.
7	Select the option <b>Reuse sections (if they exist in the current model)</b> to add the assemblies of the conveyor belt project to be merged to an existing section of the open robot project if the section name is identical and click <b>OK</b> . <b>Result:</b> In the <b>Solution Explorer</b> view, the conveyor belt is added to the respective <b>Section</b> node.



For a visual illustration of this merging process, refer to the merge functionality video sequence.

## Export Section

Command	Shortcut	Description
<b>Collada</b>	-	Exports the assemblies in the scene as a Collada (COLLAborative Design Activity) file with the file extension <i>.dae</i> to allow for exchange with other applications.

For importing a Collada file, refer to [Importing a CAD File](#), page 34 in the **Kinematization Menu**, page 31.

## Help Section

Command	Shortcut	Description
<b>About</b>	-	Opens a dialog box providing information about the components (such as catalogs or plugins) that are loaded. Furthermore, it provides links to the EcoStruxure Machine Expert Twin Release Notes and to the Schneider Electric License Manager allowing you to verify the license status.
<b>Help</b>	-	Opens the EcoStruxure Machine Expert Twin Online Help.

## Edit Menu

### Commands of the Edit Menu

The **Edit** menu is grouped in different sections:

## Clipboard Section

Command	Shortcut	Description
<b>Undo</b>	<b>Ctrl + Z</b>	Undoes the action which was most recently executed. Repeated use undoes the actions back to when the project was opened.
<b>Redo</b>	<b>Ctrl + Y</b>	Restores an action in the open project which has been undone before.
<b>Cut</b>	<b>Ctrl + X</b>	Cuts selected parts of the <b>Model</b> view and transfers the selection to the clipboard.
<b>Copy</b>	<b>Ctrl + C</b>	Copies selected parts of the <b>Model</b> view and allows to paste these parts within the same EcoStruxure Machine Expert Twin instance.
<b>Copy (Clipboard)</b>	-	Copies the selection to the clipboard and allows for pasting between separate EcoStruxure Machine Expert Twin instances.
<b>Paste</b>	<b>Ctrl + V</b>	Pastes the content from the clipboard at the cursor position.

## Select Section

Command	Shortcut	Description
<b>Select All</b>	<b>Ctrl + A</b>	Selects all components in the <b>Model</b> view.

## View Menu

### Commands of the View Menu

The **View** menu is grouped in different sections:

## Windows Section

Command	Shortcut	Description
<b>Windows</b>	-	Select the views from the list that should be displayed in the EcoStruxure Machine Expert Twin screen. The selection is saved in the general settings. When you open EcoStruxure Machine Expert Twin next time, the selected views will be displayed.
<b>Reset</b>	-	Resets the views within the EcoStruxure Machine Expert Twin screen to the default state in terms of location and state as indicated in the section <i>Default Screen</i> , page 16.

## Colors Section

Command	Shortcut	Description
<b>Background</b>	-	Select the color used for the background in the <b>Model</b> view.
<b>Assembly</b>	-	Select the color used for the components you have placed in the <b>Model</b> view. You can select different colors for: <ul style="list-style-type: none"> <li>• <b>Assembly</b>: Color of the assemblies.</li> <li>• <b>Selection</b>: Color of selected components.</li> <li>• <b>Locked</b>: Color of locked components.</li> </ul>



## Scene Section

Command	Shortcut	Description
<b>Rendering</b>	-	Switch the rendering function <b>On</b> or <b>Off</b> by sliding the control to the right or to the left.  When rendering is deactivated, no modifications are displayed in the scene.
<b>Lock / Unlock</b>	-	Lock either the entire scene or the selected assemblies to help avoid inadvertent actions or unintended modifications.
<b>Sections</b>	-	Opens a list of sections you created and displays the available options: <ul style="list-style-type: none"> <li>• <b>Show/hide Section</b></li> <li>• <b>Lock/unlock Section</b></li> <li>• <b>Enable/disable Section</b></li> </ul>

## Floor Section

Command	Shortcut	Description
<b>AutoCad</b>	-	Opens a <b>Select AutoCAD Files</b> dialog box that allows you to import <i>.dwg</i> or <i>.dxf</i> files.

## Debug Section

Command	Shortcut	Description
<b>Level</b>	-	This command allows you to select the following debug levels: <ul style="list-style-type: none"> <li>• <b>None</b> (default)</li> <li>• <b>Debug</b>: Additional information is provided in the <b>Logs</b> view.</li> <li>• <b>Detailed</b>: Graphical indications, applied to the objects in the scene, that allow you to visualize interactions and forces applied to those objects, allowing further investigation of the physics of the simulation.</li> </ul>

## Camera Section

Command	Shortcut	Description
<b>Reset</b>	<b>F5</b>	Resets the camera to the default mode.
<b>Orthogonal</b>	<b>F12</b> for the <b>Top</b> view	Displays the <b>Model</b> view without perspective. This allows you to visualize the scene from different angles and to align your components accurately.  The following <b>Orthogonal</b> views are available: <ul style="list-style-type: none"> <li>• <b>Top</b></li> <li>• <b>Front</b></li> <li>• <b>Left</b></li> <li>• <b>Back</b></li> <li>• <b>Right</b></li> </ul> To return to the default view with perspective, move the camera or click the <b>View &gt; Reset</b> button.
<b>Fit</b>	-	Displays all components in the <b>Model</b> view simultaneously.
<b>Camera [1...9]</b>	<b>Ctrl + Shift + [1...9]</b>	Allows you to save up to 9 different camera positions by pressing <b>Ctrl + Shift +</b> a number between 1 and 9.  To go to one of the saved positions, click the <b>Camera</b> button with the corresponding number or the shortcut <b>Ctrl +</b> the corresponding number.

Command	Shortcut	Description
<b>Clear</b>	-	Resets the saved camera positions.
<b>Export</b>	-	Allows you to export the camera positions to an XML file.
<b>Import</b>	-	Allows you to import a camera position from an XML file.
<b>Follow Load</b>	-	Follows a selected load on the way through the scene.

## Shadow Section

Command	Shortcut	Description
<b>Shadow</b>	-	Move the slider from <b>Off</b> to <b>Solid</b> to determine how much of a shadow the production line casts.
<b>Lighting</b>	-	Select from the list where the light source is placed in the scene. The following places are available: <ul style="list-style-type: none"> <li>• <b>Top</b></li> <li>• <b>Front</b></li> <li>• <b>Back</b></li> <li>• <b>Left</b> <ul style="list-style-type: none"> <li>◦ <b>Perpendicular</b></li> <li>◦ <b>Front</b></li> <li>◦ <b>Back</b></li> </ul> </li> <li>• <b>Right</b> <ul style="list-style-type: none"> <li>◦ <b>Perpendicular</b></li> <li>◦ <b>Front</b></li> <li>◦ <b>Back</b></li> </ul> </li> </ul>

## Visibility Section

Command	Shortcut	Description
<b>Motors</b>	<b>Ctrl + M</b>	Click this toggle button to switch the visibility of motors on and off.
<b>Label</b>	<b>Ctrl + E</b>	Click this toggle button to switch the visibility of labels on and off. Labels are displayed as tooltips when hovering over an assembly in the <b>Model</b> view.

## Settings Menu

### Commands of the Settings Menu

Click the **Settings** button to open the view for configuring the settings for the different functions and features. It is grouped in different sections:

## Camera Section

The **Camera** area allows you to configure shortcut keyboard keys for moving the cameras.

By default, the **Use Standard Configuration** check box is not selected. To define your own shortcuts, enter the key you want to use per camera movement in the different lines.

To use the following default keys, select the **Use Standard Configuration** check box:

Camera movement	Default keyboard key
Forward	W
Backward	S
Pan Left	A
Pan Right	D
Rotate Left	Left Arrow
Rotate Right	Right Arrow
Zoom In	Up Arrow
Zoom Out	Down Arrow

## Snapping Section

The **Snapping** area allows you to enter the radius (in meters) in which the assembly snaps to the nearest assembly automatically while double-clicking the assembly and holding down the **Ctrl** key.

## Globalization Section

The **Globalization** area allows you to select the **Measurement System: Metric** or **Imperial**.

## Pointer Section

Check box	Setting
<b>Keep the selection when placing a new assembly</b>	If the check box is not selected, the new assembly continues to follow the arrow pointer when you move it around the scene.  If the check box is selected, the new assembly is placed at the position that you click first.
<b>To be able to move and rotate you have to hold down the left mouse button when this feature is enabled.</b>	Select this check box to help avoid moving the assembly unless you hold down the left mouse button while turning it.
<b>Invert rotation</b>	Change the way you move across the screen with the mouse.

## Copy/Paste Section

Function / Feature	Setting
<b>Mode</b>	Select where to insert an assembly you copied: <ul style="list-style-type: none"> <li>• <b>Mouse:</b> The copied assembly is inserted at the position of the mouse.</li> <li>• <b>Offset:</b> The copied assembly is inserted next to the source object.</li> </ul>
<b>Snap</b>	Select this check box to snap a copied assembly to the nearest assembly. As a prerequisite, the assembly must be equipped with snapping points.
<b>Continuously Copying</b>	Select this check box to place assemblies continuously with an offset related to the last assembly you pasted.

## Statistics Section

Function / Feature	Setting
<b>Random Seed</b>	Click the up or down buttons to set the number you wish to use to initialize a pseudo-random sequence.
<b>Warn on determinism lost</b>	Select this check box to display advisory messages when the random sequence differs from the previous random sequence.

## Visibility Section

Check box	Setting
<b>See assemblies being constructed</b>	Select this check box to see how the scene builds up when you load it instead of displaying all components at once.
<b>Display warning signs in locked mode</b>	Select this check box to display advisory messages when the scene is locked.

## Tools Menu

### Commands of the Tools Menu

The **Tools** Menu is grouped in different sections:

### Capture Section

Command	Description
<b>Screen Shot</b>	Takes a screen capture of the <b>Model</b> view that you can save to a folder of your choice in <i>.png</i> or <i>.jpg</i> format.
<b>Assembly Shot</b>	Takes a screen capture of the assemblies you selected in the <b>Model</b> view. You can save it to a folder of your choice in <i>.png</i> or <i>.jpg</i> format.

## Measure Section

Click the **Measure** button and then click within the **Model** view to display a measuring tape. It is a good practice to switch to top view for displaying the measuring tape.

To measure the distance between different components, hold down the **Ctrl** key to snap the tape to snap points. An alternative method, which is not as accurate, is to drag the arrows of the tape.

## Model Menu

### Commands of the Model Menu

The **Model** menu is grouped in different sections:

### Time Section

Command	Shortcut	Description
<b>Play</b>	-	Starts the physical simulation.
<b>Scale</b>	-	Click to open the list of available execution speeds for the scene and select a speed rate. <b>NOTE:</b> Selecting an execution speed higher than 1 can lead to inaccuracies. The option <b>1x</b> sets the execution speed to real time which is indicated by <b>1</b> displayed in the status bar below the <b>Model</b> view. Alternatively, click the button <b>1:1</b> for real time setting.
<b>Increase</b>	-	Click to increase the execution speed by 0.1.
<b>Decrease</b>	-	Click to decrease the execution speed by 0.1.
<b>Infinity</b>	-	Click to set the execution speed to 10. <b>NOTE:</b> Selecting an execution speed higher than 1 can lead to inaccuracies.
<b>1:1</b>	-	Click to set the execution speed to real time.
<b>Reset</b>	<b>Ctrl + R</b>	Click to reset time and machines to 0 and to delete the loads. <b>NOTE:</b> To reset the recording of events, click the <b>Reset</b> button.
<b>Single Step</b>	-	Switch the <b>Single Step</b> function <b>On</b> by sliding the control to the right to pause after every time step.

## Event Recorder Section

The commands provided in this area allow you to record events that occur during connection to a controller and save this recording to a separate *\*.events* file. This file can be replayed to allow for reviewing the behavior of the scene or to perform repetitive tests with a fixed timing without a controller being connected.

Command	Shortcut	Description
<b>Record / Stop</b> <b>Replay</b>	-	Connect to a controller and click to start / stop the recording of events being displayed in the <b>Model</b> view. Events include, for example, incoming TCP/IP messages, signals from a controller (controller outputs), manual feeding of loads.  After you have loaded a *.events file, click the <b>Replay</b> button to start replaying the recording.  While replaying an events file, further information on the events is provided in the status bar at the bottom of the <b>Model</b> view.
<b>Load</b>	-	Click to load event recordings.  As a prerequisite for replaying a recording, do the following: <ul style="list-style-type: none"> <li>• Disconnect from the controller from which you recorded the events.</li> <li>• Click the <b>Reset</b> button from the <b>Time</b> area to reset the scene.</li> </ul>
<b>Save</b>	-	Click to save event recordings in *.events format.
<b>Options</b>	-	Click to open the options for event recordings: <ul style="list-style-type: none"> <li>• <b>Pause when buffer is empty</b></li> <li>• <b>Display the time for next recorded event</b></li> </ul>

## Statistics Section

Command	Shortcut	Description
<b>Snapshot</b>	-	Click to open a <b>Save As</b> dialog box allowing you to export the information about the scene and to save them as . csv file.
<b>Info</b>	-	Opens a <b>Model Information</b> window that provides information about the number of <b>Assemblies, Motors, Parts, Connections, Outputs, Inputs, PhysX</b> available in the scene you are playing.

## Selectables Section

Command	Shortcut	Description
<b>Filter</b>	-	Click to open the list of components of the scene that can be displayed / hidden: <b>Loads, Assemblies, Motors, Nodes.</b>

## Loads Section

Command	Shortcut	Description
<b>Move</b>	-	Click to prevent loads from being moved.
<b>Eat</b>	-	Click to automatically delete loads that have fallen to the floor.

## Routes Section

Command	Shortcut	Description
<b>Auto / Man</b>	-	Click to select whether you want EcoStruxure Machine Expert Twin to calculate routes on the assembly line if more than one option is available, or if you want to do it manually.

# Kinematization Menu

## Commands of the Kinematization Menu

The **Kinematization** menu is grouped in different sections:

- **Create** Section, page 31
- **Assembly** Section, page 37
- **URDF** Section, page 37

It allows you to create body assemblies and kinematic axes as well as to import CAD files and to create customized kinematics with these elements.

## Create Section

The **Create** section allows you to create body assemblies of the selected type within the scene at the default position. When a body assembly is selected, its local coordinate system is displayed in the scene and its properties are displayed in the **Properties** view, page 32.

Command	Description
<b>Box</b>	Click to add a box to the scene at the default position (X=0, Y=0, Z=500 mm).
<b>Cylinder</b>	Click to add a cylinder to the scene at the default position (X=0, Y=0, Z=500 mm).
<b>Sphere</b>	Click to add a sphere to the scene at the default position (X=0, Y=0, Z=500 mm).
<b>CAD/Convex</b>	Click to import a *.dae or *.stl file and to add the CAD drawing together with the convex mesh at the default position to the scene.  <b>NOTE:</b> In case your CAD file does not contain information on units (such as millimeter or inch), EcoStruxure Machine Expert Twin by default interprets the dimensions of objects as meter. To achieve a correct interpretation of dimensions, rescaling in your CAD tool may be required before importing the file into EcoStruxure Machine Expert Twin.  For further information, refer to <a href="#">Importing a CAD File</a> , page 34.
<b>Kinematic Axis</b>	Click to add a kinematic axis at the default position to the scene.  Alternatively, select one or multiple body assemblies before clicking the <b>Kinematic Axis</b> button. One kinematic axis is then created as parent node per selected body assembly.  A kinematic axis allows you to move the associated body assembly or imported CAD object within the scene. The motion can be controlled by controller signals or a motor can be added as sub device to the kinematic axis to generate motion.  For further information, refer to <a href="#">Properties of a Kinematic Axis</a> , page 34.

## Properties of Body Assemblies

To customize a body assembly you have added to your scene using the **Kinematization** menu, select it in the **Model** view and configure your settings in the **Properties** view.

With the **Dynamics > Parameters**, configure the following:

Parameter	Description
<b>Type</b>	Select from the list: <ul style="list-style-type: none"> <li>• <b>Bodiless</b>: The body assembly is displayed only for visualization purposes. No interaction with other objects in the scene or with the physics is performed.</li> <li>• <b>Rigid</b>: The body assembly interacts with other objects in the scene but is not subjected to gravitational forces.</li> <li>• <b>Physics</b>: The body assembly interacts with other objects in the scene and is subjected to gravitational forces.</li> </ul>
<b>Min Position Iterations</b>	Enter the minimum number of iterations executed by the physical simulation to calculate the position of the body assembly based on the forces acting on it.  Default value: 4
<b>Min Velocity Iterations</b>	Enter the minimum number of iterations executed by the physical simulation to calculate the velocity of the body assembly based on the forces acting on it.  Default value: 1
<b>Center Of Mass</b>	By default, the center of mass is in the center of the body assembly with the setting: <b>0:0:0 mm</b> .  To shift the center of mass, edit the X, Y, and / or Z coordinate of the local coordinate system.
<b>Weight</b>	Enter the weight of your body assembly (in kg).  Default value: 1 kg
<b>Collision</b>	The property is available if the parameter <b>Type</b> is set to <b>Rigid</b> or <b>Physics</b> .  It allows you to enable or disable collision detection with body assemblies in the scene without impact on the collider. It is mainly used for <b>Physics Joints</b> .
<b>Gravity</b>	The property is available if the parameter <b>Type</b> is set to <b>Physics</b> .  It allows you to enable or disable the effect of gravity on the selected body assembly. It is mainly used for <b>Physics Joints</b> .

With the **Geometry > Parameters**, configure the following:

Parameter	Description
<b>Type</b>	Select the type of your body assembly and configure the corresponding sub parameters. You can change the type whenever required. <ul style="list-style-type: none"> <li>• <b>Box</b> <ul style="list-style-type: none"> <li>◦ <b>Length</b></li> <li>◦ <b>Height</b></li> <li>◦ <b>Width</b></li> </ul> </li> <li>• <b>Cylinder</b> <ul style="list-style-type: none"> <li>◦ <b>Length</b></li> <li>◦ <b>Radius</b></li> </ul> </li> <li>• <b>Sphere</b> <ul style="list-style-type: none"> <li>◦ <b>Radius</b></li> </ul> </li> <li>• <b>CAD/Convex</b> <ul style="list-style-type: none"> <li>◦ <b>Scale</b>: Enter the scale factor to resize a CAD drawing with respect to the original size. The default value is 1 (no scaling).</li> </ul> </li> </ul>
<b>Local Position</b>	Edit the X, Y, and / or Z coordinate to modify the position of the body assembly with reference to the origin of its own assembly coordinate system.  Default value: 0:0:0 mm



Parameter	Description
<b>Local RotX</b>	Enter a rotation angle in ° to rotate the body assembly around the X axis of its assembly coordinate system. Default value: 0°
<b>Local RotY</b>	Enter a rotation angle in ° to rotate the body assembly around the Y axis of its assembly coordinate system. Default value: 0°
<b>Local RotZ</b>	Enter a rotation angle in ° to rotate the body assembly around the Z axis of its assembly coordinate system. Default value: 0°
<b>Visible</b>	Deselect the check box to hide the body assembly from the scene. With the check box deselected, the body assembly is not displayed. When it is selected (for example, in the <b>Properties</b> view) its assembly coordinate system is displayed along with the body assembly.

With the **Global Pose** parameters, configure the following:

Parameter	Description
<b>Position</b>	Edit the X, Y, and / or Z coordinate to modify the position of the body assembly within the scene. Default value: 0:0:0 mm
<b>RotX</b>	Enter a rotation angle in ° to rotate the assembly and its local assembly coordinate system around the X axis. Default value: 0°
<b>RotY</b>	Enter a rotation angle in ° to rotate the assembly and its local assembly coordinate system around the Y axis. Default value: 0°
<b>RotZ</b>	Enter a rotation angle in ° to rotate the assembly and its local assembly coordinate system around the Z axis. Default value: 0°

Select the **Position > Locked** check box to lock the position of the body assembly to help prevent it from being moved within the scene.

The **Scripts > Event** parameters allow you to configure programming code that is executed when a selectable event is detected on the body assembly:

Parameter	Description
<b>Events</b>	Select one of the following <b>Events</b> : <ul style="list-style-type: none"> <li>• <b>Deselect</b></li> <li>• <b>DoubleClick</b></li> <li>• <b>Reset</b></li> <li>• <b>Select</b></li> </ul> Click the <b>Source &gt; ...</b> button of the event to open the <b>Script</b> view, page 48.

The **Visualization** parameters allow you to configure programming code that is executed when a selectable event is detected on the body assembly:

Parameter	Description
<b>Visible</b>	Deselect this check box to hide the body assembly in the scene.
<b>Color</b>	If the <b>Visible</b> check box is selected, select a color for the body assembly.

## Importing a CAD File

EcoStruxure Machine Expert Twin supports the import of files with the file extensions *.dae* (Collada file) and *.stl*.

**NOTE:** In case your CAD file does not contain information on units (such as millimeter or inch), EcoStruxure Machine Expert Twin by default interprets the dimensions of objects as meter. To achieve a correct interpretation of dimensions, rescaling in your CAD tool may be required before importing the file into EcoStruxure Machine Expert Twin.

To add a CAD drawing together with the convex mesh at the default position (X=0, Y=0, Z=500 mm) to the scene, proceed as follows:

Step	Action
1	Click the <b>CAD/Convex</b> button from the <b>Kinematization</b> menu. <b>Result:</b> The <b>Importing CAD File</b> dialog box is displayed.
2	Browse to the CAD file and click <b>Open</b> . <b>Results:</b> <ul style="list-style-type: none"> <li>If you have selected an <i>.stl</i> file for import, the content of the file is displayed as new assembly in the scene and one new node is added to the <b>Assemblies</b> tree of the <b>Solution Explorer</b>.</li> <li>If you have selected a <i>.dae</i> file for import, the message <b>Split the Collada File</b> is displayed requesting you to decide whether you want to import this Collada file as one assembly to the scene (proceed with step 3a) or to split it into its sub assemblies (proceed with step 3b).</li> </ul>
3a	To import this Collada file as one assembly to the scene, click <b>No</b> . <b>Result:</b> The content of the file is displayed as new assembly in the scene and one new node is added to the <b>Assemblies</b> tree of the <b>Solution Explorer</b> .
3b	To split the Collada file into its sub elements and to import them as individual assemblies, click <b>Yes</b> . <b>Result:</b> The content of the file is displayed as new assembly in the scene and several new nodes are added to the <b>Assemblies</b> tree of the <b>Solution Explorer</b> representing the sub elements that exist in the Collada file.

To display the convex mesh in the scene, execute the command **Level > Detailed** from the **Debug** section of the **View** menu, page 25.

## Properties of a Kinematic Axis

To customize a kinematic axis you have added to your scene using the **Kinematization** menu, select it in the **Model** view and configure your individual settings in the **Properties** view.

The **Coordinate Axes > Properties** parameters allow you to configure the local coordinate system of the kinematic axis:

Parameter	Description
<b>Scale</b>	Allows you to scale the axes of the assembly coordinate system of the kinematic axis that is selected. Default value: 1.5
<b>Visible</b>	Deselect this check box to hide the local coordinate system of the selected kinematic axis in the scene.

The **Global Pose** parameters allow you to configure the kinematic axis with reference to the global coordinate system of the scene:

Parameter	Description
<b>Position</b>	Edit the X, Y, and / or Z coordinate to modify the position of the kinematic axis.  Default value: 0:0:0 mm
<b>RotX</b>	Enter a rotation angle in ° to rotate the kinematic axis around the X axis of the global coordinate system.  Default value: 0°
<b>RotY</b>	Enter a rotation angle in ° to rotate the kinematic axis around the Y axis of the global coordinate system.  Default value: 0°
<b>RotZ</b>	Enter a rotation angle in ° to rotate the kinematic axis around the Z axis of the global coordinate system.  Default value: 0°

From the **Motion > Type** list, select the following options:

Parameter	Description
<b>Fixed</b>	The kinematic axis is fixed and the associated body assemblies are not moved.  This is the default setting.
<b>Translation</b>	The kinematic axis exerts a translational movement on the associated body assembly.
<b>Rotation</b>	The kinematic axis exerts a rotational movement on the associated body assembly.

With **Motion > Type** selected, the following parameters are available:

Parameter	Description
<b>Axis</b>	Select the direction of movement based on the assembly coordinate system: <ul style="list-style-type: none"> <li>• <b>X</b></li> <li>• <b>Y</b></li> <li>• <b>Z</b></li> </ul> <p><b>NOTE:</b> The assembly coordinate system can be rotated which can have the effect that the directions differ from the global coordinate system.</p>
<b>Drive Type</b>	The three options add a <b>Motor</b> as sub node to the <b>Kinematic Axis</b> node. Select an option from the list to define the controller input that is valid for the motor: <ul style="list-style-type: none"> <li>• <b>Position:</b> A position value for the motor (in <b>Units</b>) is provided by a variable from the controller.</li> <li>• <b>Velocity:</b> A velocity value for the motor (in <b>Units</b>) is provided by a variable from the controller.</li> <li>• <b>Forward/Backward:</b> Boolean forward/backward signals are provided by a variable from the controller.</li> </ul> <p>The motor is configured with the parameter <b>Drive</b> in this list of <b>Motion</b> parameters.</p>
<b>Units</b>	Select the units of movement: <ul style="list-style-type: none"> <li>• For translational movement:               <ul style="list-style-type: none"> <li>◦ <b>Millimeters</b></li> <li>◦ <b>Meters</b></li> </ul> </li> <li>• For rotational movement:               <ul style="list-style-type: none"> <li>◦ <b>Degrees</b></li> <li>◦ <b>Radians</b></li> </ul> </li> </ul>
<b>Limits</b>	To limit the movement, activate the option <b>Use Limits</b> and configure the parameters (the units configured with the <b>Units</b> parameter are used): <ul style="list-style-type: none"> <li>• <b>Min. Limit</b></li> <li>• <b>Max. Limit</b></li> <li>• <b>PLC Input - Min. Limit</b></li> <li>• <b>PLC Input - Max. Limit</b></li> </ul>
<b>Drive</b>	Configure the motor according to the selection for the parameter <b>Drive Type</b> .  The motor parameters are configured as described in the <i>How to Use Device Catalogs User Guide</i> . Alternatively, you can right-click the motor node in the <b>Solution Explorer</b> and control the motor manually with the <b>Stop, Start, Forward, Backward</b> commands

Select the **Position > Locked** check box to lock the position of the kinematic axis to help prevent it from being moved within the scene.

The **Scripts > Event** parameters allow you to configure programming code that is executed when a selectable event is detected on the kinematic axis:

Parameter	Description
<b>Events</b>	Select one of the following <b>Events</b> : <ul style="list-style-type: none"> <li>• <b>Deselect</b></li> <li>• <b>DoubleClick</b></li> <li>• <b>Reset</b></li> <li>• <b>Select</b></li> </ul> <p>Click the <b>Source &gt; ...</b> button of the event to open the <b>Script</b> view, page 48.</p>

The **Visualization** parameters allow you to configure programming code that is executed when a selectable event is detected on the kinematic axis:

Parameter	Description
<b>Visible</b>	Deselect the check box to hide the kinematic axis in the scene.
<b>Color</b>	If the <b>Visible</b> check box is selected, select a color for the kinematic axis.

## Assembly Section

Command	Description
<b>Create</b>	<p>Creates an empty container assembly. It allows you to group body assemblies and to create parent-child relationships. Click the <b>Create</b> button.</p> <p>A new node <b>Assembly [n]</b> is added to the <b>Solution Explorer</b>. When this node is selected, the empty assembly is represented by a local coordinate system in the scene.</p>
<b>Attach</b>	<p>Creates parent-child relationships between assemblies or kinematic axes.</p> <p>To achieve this, select a container or a body assembly or a kinematic axis in the scene or in the <b>Solution Explorer</b>, hold down the <b>Ctrl</b> key and select another body assembly or a kinematic axis. Click the <b>Attach</b> button.</p> <p>As a result, the second assembly is displayed as a sub node of the first assembly in the <b>Solution Explorer</b> view. In the scene, the two assemblies act as one assembly. The relative relationship is fixed and is maintained while moving them within the scene.</p> <p>You can attach more body assemblies to the same parent assembly or you can create another hierarchy level by selecting the child assembly in the scene or in the <b>Solution Explorer</b>, holding down the <b>Ctrl</b> key and selecting another body assembly.</p>
<b>Detach</b>	<p>Removes a parent-child relationship between assemblies and kinematic axes.</p> <p>To achieve this, select an assembly in the scene or in the <b>Solution Explorer</b> that is a child of another assembly. Click the <b>Detach</b> button to untie this relationship.</p> <p>As a result, the former child assembly is now displayed as a node in the root level of the <b>Solution Explorer</b> view. In the scene, there is no longer a fixed relative relationship between the two assemblies.</p>

## URDF Section

Command	Description
<b>Import</b>	<p>Click to import a <b>URDF</b> (Unified Robotics Description Format) file or alternatively an XML (eXtensible Markup Language) file that contains the adequate information. Browse to the file in the <b>Importing URDF File</b> dialog box and click <b>Open</b>.</p> <p><b>Result:</b> The imported robot is displayed in the scene and a new node is created in the <b>Solution Explorer</b> view with sub nodes representing the body assemblies and kinematic axes the robot consists of.</p>

# Auto-Generation Menu

## Commands of the Auto-Generation Menu

The **Auto-Generation** menu allows you to read the configuration of a multi carrier, a robot or a servo belt and to create the corresponding assemblies after having established a connection to the controller. As a prerequisite, the IP address and the connection parameters must be configured correctly and an OPC UA connection must be established. For further information on the prerequisites, refer to:

- The *Procedure for Starting the Emulation* in the *How to Emulate User Guide* of the EcoStruxure Machine Expert online help.
- The description of *Creating Emulation Data* in the *Lexium™ MC multi carrier Configuration Guide* of the EcoStruxure Machine Expert online help.

The menu is grouped in different sections:

### multi carrier Section

Command	Description
<b>Name</b>	Enter the name of the multi carrier object to be generated, for example, MC_Track_1.
<b>Connection ID</b>	Select the <b>Connection ID</b> from the list in accordance with the <b>Connections</b> view, page 39.
<b>Load Object</b>	Click to establish a connection to the configured controller and to read the configuration of the multi carrier.  You can also click the button to update the created assemblies after you have modified the configuration of the multi carrier.

### Robots Section

Command	Description
<b>Name</b>	Enter the name of the robot object to be generated, for example, T_Robot_1.
<b>Connection ID</b>	Select the <b>Connection ID</b> from the list in accordance with the <b>Connections</b> view, page 39.
<b>Load Object</b>	Click to establish a connection to the configured controller and to read the configuration of the robot.  You can also click the button to update the created assemblies after you have modified the configuration of the robot.

### Servo Belts Section

Command	Description
<b>Name</b>	Enter the name of the servo belt object to be generated, for example, Infeed_Belt.
<b>Connection ID</b>	Select the <b>Connection ID</b> from the list in accordance with the <b>Connections</b> view, page 39.
<b>Load Object</b>	Click to establish a connection to the configured controller and to read the configuration of the servo belt.  You can also click the button to update the created assemblies after you have modified the configuration of the servo belt.

# Connections View

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## Connections View

### Creating Connections

The **Connections** view allows you to create connections to your controllers or higher level systems. By default, the view is empty. Right-click within the view to open the **Communication** dialog box for selecting the communication protocol for your connection.

Select a communication protocol and an entry will be displayed in the **Connections** view for this connection.

By default, the following communication protocols are supported:

Address-based communication protocols:

- **Siemens**
- **Modbus TCP**
- **Serial (Raw)**
- **XCom**

Tag-based communication protocols:

- **Beckhoff ADS**
- **OPC UA Client**

Messages-based communication protocols:

- **STC/ETX**
- **3964R**
- **RFC 1006**

## Configuring Connections

For a detailed description on how to configure an OPC UA connection, refer to the EcoStruxure Machine Expert Twin How to Use Device Catalogs User Guide.

In general, configure a connection in two steps:

1. Select the row in the list of the **Connections** view and configure the corresponding settings in the **Properties** view.
2. Right-click the row in the list of the **Connections** view to open the contextual menu providing the following commands, depending on the connection type:

Command	Description
<b>Connect All / Disconnect All</b>	Connects / disconnects all controllers simultaneously providing you have entered an IP address for each connection.
<b>Connect / Disconnect</b>	Connects to / disconnects from the selected controller.
<b>Generate SmartVisu</b>  Only available when an OPC UA connection to a PacDrive LMC or a Modicon M262 Motion Controller (TM262M25MESS8T, TM262M35MESS8T) is established.	<p>Reads the settings made in the DigitalTwinCommunication library and displays a 3-D digital twin of your machine in the <b>Model</b> view.</p> <p>The connection from EcoStruxure Machine Expert Twin to the controller is using a handshake mechanism to acknowledge that event data was received and ensure consistent information is displayed in the <b>Model</b> view (single-instance mode).</p> <p>In the case of multiple connections from EcoStruxure Machine Expert Twin to the same controller, the primary connection is verifying the data exchange by the handshake mechanism. Further connections are working in multi-instance mode, and can process event data simultaneously, but the handshake mechanism is not used for multiple connections.</p> <p>In few cases, under high utilization of the communication bandwidth, full transmission of events may not be possible, and might result in events not being displayed in the instances using multi-instance mode.</p> <p>For further information, refer to the EcoStruxure Machine Expert DigitalTwinCommunication Library Guide.</p>
<b>Remove SmartVisu</b>  Only available when an OPC UA connection to a PacDrive LMC or a Modicon M262 Motion Controller (TM262M25MESS8T, TM262M35MESS8T) is established.	<p>Removes all assemblies and loads generated from this connection from the <b>Model</b> view.</p> <p>For further information, refer to the EcoStruxure Machine Expert DigitalTwinCommunication Library Guide.</p>
<b>Listen / Disconnect</b>	<p>Listens to / disconnects from the selected server.</p> <p>The communication protocols <b>RFC 1006</b> and <b>3964R</b> TCP/IP can act as server or client depending on the configuration in the <b>Properties</b> view.</p>
<b>Enable Logging</b>	Logs the messages sent by the controller and displays them in the <b>Logs</b> view, page 49.
<b>Truncate Log</b>	<p>If logging is enabled on the controller, text files (*.txt) are created in your local Windows user directory:</p> <p><i>%localappdata%\Schneider Electric\Machine Expert Twin\1\Work\Logs</i></p> <p>The log files are updated when the project is closed.</p> <p>With this option selected, the log files are cleared when the project is opened.</p>
<b>Import</b>	Imports the addresses from an Excel file to the controller.
<b>Export</b>	Exports the addresses from the controller to an Excel file.
<b>Alarms</b>	Opens the <b>Alarm Scheme</b> dialog box that allows you to set alarms and which error messages they will display. For further information, refer to the description of the <b>Alarm Scheme</b> Dialog Box, page 41.
<b>Delete</b>	Deletes the connection.



## Alarm Scheme Dialog Box

In the **Connections** section, right-click on a connection and select **Alarms** to display the **Alarms Scheme** dialog box.

Column	Description
<b>Subscribe</b>	Select whether or not the alarm is activated.
<ul style="list-style-type: none"><li>• <b>Address</b></li><li>• <b>Bit</b></li><li>• <b>Source</b></li></ul>	These parameters define the address of the alarm.
<b>Description</b>	Enter the description for the alarm.

If the data exchange to the controller is address-based, add alarms when the controller is not connected. If the data exchange is tag-based, add alarms when the controller is connected. Also refer to the description of the **Alarms** view, page 53.

# Catalogs View

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## Catalogs View

### General Information

The **Catalogs** view displays the catalogs that have been selected during start-up of EcoStruxure Machine Expert Twin in the **Select Catalog(s)** dialog box.

Catalogs are handled as DLL files that are by default provided in the EcoStruxure Machine Expert Twin installation folder. The default catalogs are extended by the prefix *Experior.Catalog*, for example *Experior.Catalog.SchneiderElectric.Accessories.dll*.

Catalogs function as a form of libraries that provide different assemblies and other items. You can also create your own catalogs using the C# programming language. To reference your own catalogs, click the browse (...) button in this dialog box and browse to the folder that contains your catalogs.

### Selecting Objects from Catalogs

The **Catalogs** view displays the catalogs you selected in the **Select Catalog(s)** dialog box either in a **Gallery View Style** or in a **Tree View Style**. Select a catalog to see the objects it contains. To use an object in your scene, select the object, position the cursor in the **Model** view and click to place the object.

If the **Gallery View Style** is selected, objects you insert consecutively are automatically connected. For example, you can insert different types of conveyors consecutively by double-clicking the conveyor objects in the **Belts & Conveyors** catalog. As a result, each new conveyor is snapped to the end of the last conveyor extending the line of conveyors.

For further information, refer to the EcoStruxure Machine Expert Twin How to Use Device Catalogs User Guide.

# Control Panel View

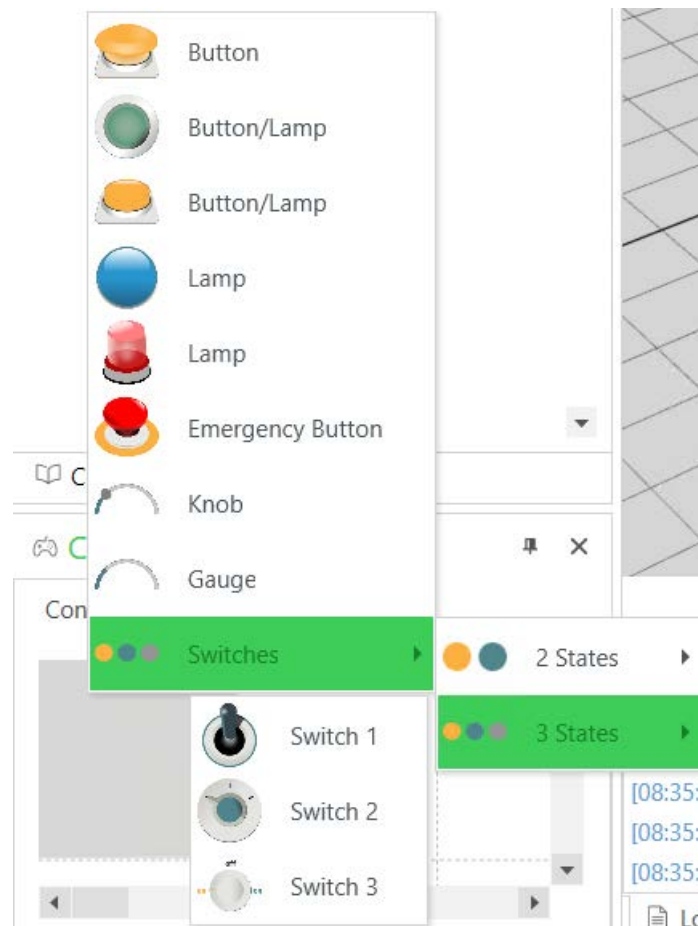
## What's in This Chapter

Control Panel View ..... 43

## Control Panel View

### Creating Controls

The **Control Panel** view allows you to insert controls for communicating with the controller. Right-click on an empty square of the **Control Panel** view to open a contextual menu that provides different types of controls:



The **Buttons** work when you press them while the **Lamps** light up when a specific controller signal is sent.

The **Knob** allows you to switch between different values which you can select in the **Properties** view.

The **Gauge** displays values sent from the controller.

The **Switches** option allows you to choose between two-state and three-state switches.

After you have selected a control, you can edit the properties in the **Properties** view such as name and color.

## Copying / Pasting / Removing Controls

To copy a control, right-click it in the **Controls (n)** tab and execute the command **Copy** from the contextual menu.

Right-click in the **Controls (n)** tab and execute the command **Paste** to insert the control you copied.

To remove a control, right-click it in the **Controls (n)** tab and execute the command **Delete** from the contextual menu.

## Managing Control Panel Tabs

To manage the tabs of the **Control Panel** view, right-click the header of a **Controls (n)** tab. A contextual menu with the following commands is displayed:

Command	Description
<b>Left / Right</b> <b>First / Last</b>	Allows you to move a <b>Controls (n)</b> tab to the left, to the right, to the first or to the last position.
<b>New Control Panel</b>	Creates a new <b>Controls (n+1)</b> tab and inserts it at the right end.
<b>Duplicate (tab name)</b>	Copies the active tab with its content and inserts it as new tab with tab name <b>Copy of (tab name)</b> to the right of the existing tabs.
<b>Delete (tab name)</b>	Deletes the active tab.
<b>Delete All</b>	Deletes all tabs. As a result, the two empty default tabs <b>Controls (1)</b> and <b>Controls (2)</b> are provided.
<b>Undock</b>	Allows you to move the selected tab to another position in the EcoStruxure Machine Expert Twin screen.
<b>Alignment</b>	Allows you to display the tab headings not at the <b>Top</b> of the <b>Control Panel</b> view, as it is by default, but at the <b>Bottom</b> , the <b>Left</b> or the <b>Right</b> of the view.

# Model View

## What's in This Chapter

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## Model View

### Overview

The **Model** view is where you display your scene and its constituent assemblies and loads. You can also graphically visualize what happens when you play the scene.

The three arrows in the middle represent the 3-D coordinate system of the **Model** view using the colors X = red, Y = green, Z = blue. For further information, refer to *Information About the Coordinate System*, page 17.

### Zooming, Rotating, Moving the Camera View

To zoom the camera view within the **Model** view, scroll the mouse wheel or set the zoom shortcuts in the **Settings** menu, page 26.

To rotate the camera view, hold down the left mouse button, and move the mouse.

To move the camera view, hold down the right mouse button, and move the mouse.

### Rotating Objects in the Scene

Select an object in the **Model** view and perform the following mouse actions for rotation around the different axes:

Mouse Action	Rotation around axis
Scroll the mouse wheel	Z
Hold down the <b>Ctrl</b> key and scroll the mouse wheel	Y
Hold down the <b>Alt</b> key and scroll the mouse wheel	X

### Sections

By default, the **Model** view contains one section. The section is the container of assemblies inside a scene. The default section has a size of 50,000 mm x 50,000 mm and can be modified in the **Properties** view. The floor of the section is displayed gray by default but if you flip the scene to see it from below the floor appears transparent. In the **Properties** view, the floor can be modified regarding color and type.

## Adding Sections

To add sections to the **Model** view, proceed as follows:

Step	Action
1	<p>In the <b>Solution Explorer</b> view, right-click the <b>Assemblies</b> node and execute the command <b>Add Section</b> from the contextual menu.</p> <p><b>Results:</b></p> <ul style="list-style-type: none"> <li>In the <b>Solution Explorer</b> view, a new node <b>Section[n+1]</b> is added below the last section node.</li> <li>In the <b>Model</b> view, a new section is displayed on top of the existing section. Unless you changed the dimensions or the position of the existing section you will not be able to see the new section immediately as it is directly on top of the existing.</li> </ul>
2	<p>In the <b>Solution Explorer</b> view, select the node of the new section, to make it active.</p> <p><b>Result:</b> Further information on the section is displayed in the <b>Properties</b> view.</p>

## Modifying the Floor Using the Section Properties

You can modify what is displayed as the floor in the **Model** view by modifying the properties of the section. Proceed as follows:

Step	Action
1	In the <b>Solution Explorer</b> view, expand the <b>Assemblies</b> node and select the <b>Section</b> node.
2	In the <b>Properties</b> view, modify the properties.

- With the parameter **Section > Name** you can assign a name to the section that is displayed at the lower right corner of the floor in the **Model** view.
- To hide the selected section from the **Model** view, deselect the check box **Visible**.
- Enter the **Size > Width** and **Size > Length** of your choice to modify the size of the section.
- Enter the **Transformation > Position > 0:0:0 mm** and / or the **Transformation > Yaw** (in °) to modify the position of the section in space (in a cartesian coordinate system).
- Select an option from **Assemblies** to move, lock, enable or select assemblies in the selected section.
- Select another option from **Floor > Type** to modify, for example, the color or the texture of the section displayed as floor.
- In **Grid**, you can, for example, hide the grid and enable bounds or you can import a floor design of your choice by selecting the option **AutoCAD** and importing a \*.dxf or \*.dwg file.

The properties defined here are specific to the selected section. When you open a new **Model** view, a default section with the default settings opens.

## Status Bar

The status bar at the bottom of the **Model** view displays information about the scene:

Column	Description
<b>Paused / Running</b>	Indicates if the time is running (the scene is playing) or paused.
<b>Scan</b>	Indicates the time (in ms) it took to calculate the last step of the physical simulation. If this number becomes too high, an advisory message will be displayed on the right-hand side of this status bar.
Lock icon	Indicates whether the scene is locked.
Time displayed as [dd:hh:mm:ss]	Displays the time elapsed while playing the scene.
Time scale	Displays the time scale for playing the scene, such as:  <b>1</b> = real time  <b>2</b> = double real time  The maximum is <b>10</b> times real time.
Information and diagnostic messages	Provides information and advisory messages that are relevant while playing the scene. The messages are color-coded according to the severity. For information on messages provided in the <b>Logs</b> view, refer to the chapter <b>Logs View</b> , page 49.

# Script View

## What's in This Chapter

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# Script View

## Overview

The **Script** view allows you to write scripts inside EcoStruxure Machine Expert Twin using the C# programming language.

To integrate the code in the program, click the **Build** button on the left side of the button bar or execute the **Build project** command from the **Build** menu.

Errors that are detected during the build process are displayed in the **Error List** view below the **Script** view.



# Logs View

## What's in This Chapter

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## Logs View

### Overview

The **Logs** view provides information on how the program is running and displays different types of messages. By default, time stamps are added and the messages are color-coded according to their severity. You can disable the time stamp and the color in the *Properties View*, page 62.

**NOTE:** It is also possible to disable log messages completely. Thus, if the **Logs** view is empty, verify whether the **Mode** parameter in the **Properties** of the **Logs** view is set to **None**.

Message type	Description	Color
<b>Action</b>	Notification concerning a certain action executed in the scene.	black
<b>Communication</b>	Notification providing controller information, such as <code>connection set</code> .	black
<b>Error</b>	An error has been detected.	red
<b>System</b>	Information provided during start-up of EcoStruxure Machine Expert Twin.	blue
<b>Debug</b>	Customized messages defined in the <b>Script</b> view, page 48 with the command <code>`Log . DebugMessage&lt;"Your message"&gt;`</code> to be generated, for example, when activating a specific object.	black
<b>Warning</b>	Advisory messages indicating that the scene is not playing properly, for example, due to the connection to the controller being interrupted.	orange
<b>Information</b>	General information about the instance.	green

Select the check box **Tail** to activate an automatic scrolling function to display new log messages that are added at the end of the **Logs** list. If this check box is not selected, you will have to scroll manually to the latest log messages at the end of the list.

## Contextual Menu

Right-click a message to open a contextual menu with the following commands:

Command	Description
<b>Clear</b>	Deletes all messages from the <b>Logs</b> view.
<b>Copy</b>	Copies the selected line or lines to the clipboard.
<b>Insert Separator</b>	Inserts a line with the time stamp at the end of the messages. This can be useful to structure the log, for example, to mark the time when a test is being started.

## Customizing the Logs View

To customize the log messages, select a message and configure your individual settings in the **Properties** view, page 62.

# Loads View

## What's in This Chapter

Loads View .....51

# Loads View

## Overview

The **Loads** view displays the loads that are available in the scene. This information is relevant for discrete events mode.

Selecting a load in the **Loads** view also selects the load in the **Model** view. Further information on the selected load is displayed in the **Properties** view, page 63.

## Information Provided in the Loads View

To fill or update the columns of the **Loads** view, right-click within the **Loads** view and execute the command **Refresh**. The following information is displayed:

Column	Description
<b>Identification</b>	Displays the identifier (usually a barcode) of each load.  To modify the identifier of the load, edit the <b>Identification</b> parameter in the <b>Properties</b> view, page 63.
<b>Next</b>	Indicates the next action point the load will hit.
<b>Destination</b>	Indicates the final destination of the load.
<b>Description</b>	Provides further information on the load.

## Further Information in the Properties View

For further information on the selected load and modification of the **Identification** parameter as well as the color, refer to the **Properties** view, page 63.

# Inputs / Outputs Views

## What's in This Chapter

Inputs / Outputs Views ..... 52

## Inputs / Outputs Views

### Overview

Inputs and outputs (I/Os) are relevant for connections to controllers.

The **Inputs** view displays the inputs the controller receives, such as sensor signals.

The **Outputs** view displays the outputs that are sent by the controller, such as control commands.

Selected inputs / outputs are displayed in green.

Red cells within the table indicate that the parameter has not been configured correctly.

### Contextual Menu

Right-click in the **Inputs / Outputs** table to open a contextual menu with the following commands:

Command	Description
<b>Add</b>	Adds a new input or output for the controller and adds a new row to this table. You can also add new inputs or outputs through components.
<b>Refresh</b>	Updates the content of the <b>Inputs / Outputs</b> table.
<b>Export</b>	Exports inputs or outputs to an Excel file.

### Further Information in the Properties View

The **Properties** view allows you to modify the symbol and the description of the input / output.

# Alarms View

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## Alarms View

### Overview

The **Alarms** view displays the alarms you have created for performing controller tests. To create an alarm, right-click a connection in the **Connections** view and execute the **Alarms** command from the contextual menu to open the **Alarm Scheme** dialog box, page 41.

## Information Provided in the Alarms View

The **Alarms** view provides the following information:

Column	Description
Connection	Indicates the controller to which the alarm belongs.
Alarm	Indicates the description that you have set for the alarm.

When an alarm is raised, it is displayed in the **Alarms** view, but will also be displayed as an advisory in the status bar of the **Model** view, page 47.

# Joint Editor

## What's in This Chapter

Joint Editor View..... 54

## Joint Editor View

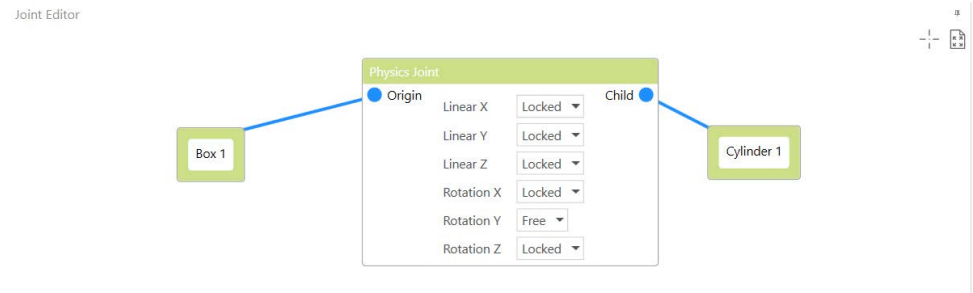
### Overview

The **Joint Editor** view allows you to create **Physics Joints** between two or more body assemblies created with the **Kinematization** Menu, page 31.

The **Physics Joint** is configurable in the editor and allows you to lock or allow the six degrees of freedom (DOF) individually.

For a joint, one reference is considered the stationary reference (rigid), while the other is considered the moving reference (physics). The moving and the stationary references of the joint must be located on two different body assemblies.

Example of a **Physics Joint** configuration in the **Joint Editor**:



The editor automatically verifies the configuration and indicates detected configuration issues by a red triangle in each box that is affected. A tooltip is provided that indicates a solution. The total number of issues detected in the editor is displayed in the lower left corner.

The **Joint Editor** provides two buttons in the upper right corner:

Button	Description
<b>Moves the camera to position 0.0.</b>	Click to move the camera view of the editor to the upper left edge.
<b>Fits all nodes within the view</b>	Click to zoom in or out of the editor view so that all available objects are displayed.

## Creating Physical Joints

To create a physical joint between two assemblies, proceed as follows:

Step	Action
1	<p>Right-click in the <b>Joint Editor</b> view and execute the command <b>Add Body</b> from the contextual menu.</p> <p><b>Result:</b> A new body block is displayed in the <b>Joint Editor</b>.</p>
2	<p>Create a relationship between the block in the <b>Joint Editor</b> and an assembly in the scene by selecting the assembly in the scene or in the <b>Solution Explorer</b>, right-clicking the block in the <b>Joint Editor</b> and executing the command <b>Link to assembly</b> from the contextual menu.</p> <p><b>Result:</b> The name of the assembly is assigned to the selected block in the <b>Joint Editor</b>.</p>
3	<p>Repeat steps 1 and 2 to create a second block in the <b>Joint Editor</b> and to link it to a second assembly in the scene.</p> <p><b>Result:</b> Two blocks representing two different assemblies are available in the <b>Joint Editor</b>.</p>
4	<p>Right-click in the <b>Joint Editor</b> view and execute the command <b>Add Physics Joint</b> from the contextual menu.</p> <p><b>Result:</b> A <b>Physics Joint</b> block is added to the <b>Joint Editor</b>.</p>
5	<p>Click in the frame of the first assembly, hold down the left mouse button and draw a connecting line to the <b>Origin</b> connection point of the <b>Physics Joint</b> block.</p> <p><b>Result:</b> The first assembly is defined as origin or stationary reference for the joint and the <b>Origin</b> connection point is highlighted in blue.</p>
6	<p>Verify the configuration of the body assembly that is connected as <b>Origin</b>:</p> <p>The <b>Dynamics</b> parameter <b>Type</b> must be set to <b>Rigid</b> or <b>Physics</b> (refer to the <i>Properties of Body Assemblies</i>, page 32). If the <b>Type = Bodiless</b> is selected, correct the configuration.</p>
7	<p>Click the <b>Child</b> connection point of the <b>Physics Joint</b> block, hold down the left mouse button and draw a connecting line to the second assembly.</p> <p><b>Result:</b> The second assembly is defined as child or moving reference for the joint, the <b>Child</b> connection point is highlighted in blue.</p>
8	<p>Verify the configuration of the body assembly that is connected as <b>Child</b>:</p> <p>The <b>Dynamics</b> parameter <b>Type</b> must be set to <b>Physics</b> (refer to the <i>Properties of Body Assemblies</i>, page 32).</p> <p>If this is not the case, a red triangle is displayed at the upper right corner of the body block. To adapt the configuration, right-click the assembly that is defined as child and execute the command <b>Set to Physics</b> from the contextual menu.</p> <p><b>Result:</b> The <b>Dynamics</b> parameter <b>Type</b> is set to <b>Physics</b> and the red triangle is removed.</p>
9	<p>Configure the <b>Physics Joint</b>. For further information, refer to <i>Configuring Physical Joints</i>, page 56.</p>

## Configuring Physical Joints

By default, the six parameters representing the six degrees of freedom are set to **Locked**:

- **Linear X**
- **Linear Y**
- **Linear Z**
- **Rotation X**
- **Rotation Y**
- **Rotation Z**

To allow motion in one or more directions, select **Free** from the list for the respective parameters.

**NOTE:** In the **Properties** of the **Child** assembly, set the **Dynamics Parameters** to **Type = Physics** for allowing the physical simulation to display the motion in the scene.

To hide the **Physics Joint** from view, deselect the check box **Visible**. You can then display it by executing the command **Level > Detailed** from the **Debug** section of the **View** menu, page 25.

By combining the physical joints feature with the functions provided in the **Kinematization** menu, you can create customized robot kinematics.



# Change History View

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## Change History View

### Overview

The **Change History** view records modifications performed in the **Model** view such as adding an object.

You can right-click an entry in the list and execute the command **Set the assembly [ASSEMBLY NAME]'s properties back to what they were before this action** from the contextual menu to undo this specific action.

# Solution Explorer View

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## Solution Explorer View

### Overview

The **Solution Explorer** view lists the components you are using in the **Model** in a tree structure consisting of categories:

- **Assemblies**
- **Motors**
- **Controllers**

By default, the items that are available under the **Assemblies** node are grouped by section, as first subnode and then by the type of assembly as second subnode (for example, Lexium P Robot). To avoid the categorization according to the type of assembly, click the button **Do not categorize the assemblies** in the upper part of the **Solution Explorer** view, on the left-hand side of the **Search** field.

## Category Assemblies

The category **Assemblies** provides the **Sections** available in the **Model** as subnodes. Assemblies selected in the **Solution Explorer** view are highlighted in the **Model** view. You can drag assemblies between different **Section** subnodes. As an alternative, you can select the assembly you want to move and then change the section it is placed under in the **Properties** view. By editing the **Name** parameter in the **Properties** view, you can rename sections.

Right-clicking the **Assemblies** node opens a contextual menu with the following commands:

Command	Description
<b>Add Section</b>	Adds a node <b>Section[n+1]</b> below the last section node.
<b>Show All Sections</b>	Displays all sections that have been hidden previously.
<b>Collapse All</b>	Closes all subnodes that are open.

Right-clicking a **Section** subnode opens a contextual menu with the following commands:

Command	Description
<b>Hide All Sections But This</b>	Displays in the <b>Model</b> view only the assemblies that are placed in the selected section.
<b>Show All Sections</b>	After executing the command <b>Hide All Sections But This</b> this command restores the assemblies of all sections in the <b>Model</b> view.
<b>Hide Assemblies</b>	Hides the assemblies and the floor of the selected section from the <b>Model</b> view.
<b>Lock Assemblies / Unlock Assemblies</b>	Locks the assemblies that are available in the selected section. New assemblies that you are adding are not locked.
<b>Fit</b>	Resizes the floor to fit around the assemblies placed in the <b>Model</b> view.
<b>Delete Section[n]</b>	Deletes the selected section. It is not possible to delete the last remaining section.
<b>Disable Assemblies</b>	Disables the assemblies that are available in the selected section. To indicate this, they are displayed gray in the <b>Model</b> view. If you attempt to place a load on a disabled assembly, the load will "fall through" the assembly. To re-enable disabled assemblies, execute the <b>Disable Assemblies</b> command again.
<b>Collapse All</b>	Closes all subnodes that are open.

Right-clicking the subnode of an assembly allows you to disable or delete this assembly.

## Category Motors

Right-clicking a motor subnode opens a contextual menu with the following commands:

Command	Description
<b>Start / Stop</b>	Starts / stops the motor.
<b>Backward / Forward</b>	Toggles the moving direction of the motor.
<b>Copy</b>	Copies the motor.
<b>Disable</b>	Disables the motor.
<b>Delete</b>	Deletes the motor.

## Category Controllers

Right-clicking the **Controllers** node opens a contextual menu providing the **Load** command. It opens a **File Open** dialog box that allows you to browse for the controller file.

Your file contains script code created or modified by you or by someone else. The execution of the script code may compromise the security of your IT system.

### **⚠ WARNING**

#### **INFORMATION SYSTEM VULNERABILITY**

- Ensure the integrity of the script code contained in the file by ascertaining the originator and intent of the script before opening the file.
- Do not open the file if you can not determine the originator and intent of the script, including confirming any modifications that may have been made.
- Verify and confirm that you want to execute this code when using the model contained in the file.

**Failure to follow these instructions can result in death, serious injury, or equipment damage.**

When attempting to open a file with a model containing script code, you are asked to acknowledge this advisory and accept responsibility for the execution of the code of the embedded script.

After the controller has been loaded, it will be displayed as a new subnode of the **Controllers** node.

# Statistics View

## What's in This Chapter

Statistics View .....61

# Statistics View

## Overview

The **Statistics** view provides information about the loads in the scene monitored by sensors.

You can monitor different types of sensors, such as scanners, weights, counters and eaters. Scanners, for example, provide information about how many loads they have scanned. The information for buttons indicates how many times they have been pressed.

## Managing Sensors

To add a sensor to the **Statistics** view, right-click it in the **Model** view and select the option **Observe** in the contextual menu.

To modify the name of a sensor, proceed as follows:

Step	Action
1	Select the sensor in the <b>Model</b> view.
2	Edit the <b>Name</b> parameter in the <b>Properties</b> view. <b>Result:</b> The name is changed in the <b>Model</b> view.
3	To display the new name also in the <b>Statistics</b> view, right-click the sensor in the <b>Model</b> view and deselect the option <b>Observe</b> in the contextual menu and then select the option <b>Observe</b> again.

# Properties View

## What's in This Chapter

Properties View..... 62

# Properties View

## Overview

The **Properties** view provides information about items selected in different views of EcoStruxure Machine Expert Twin, such as assemblies in the **Model** view, buttons in the **Control Panel** or **Connections**. Parameters of the **Properties** view that can be edited are displayed in black. Fixed values that cannot be edited are displayed in gray.

The buttons in the upper left part of the view allow you to select whether to display the properties as one list or grouped in categories.

## Properties of the Logs View

To customize the log messages, select a message and configure your individual settings in the **Properties** view:

**Message** parameters:

Parameter	Description
Font	Enter the font type and size for displaying the selected log message type. For example: [Font: Name=Courier New, Size=8.25, Units=3, GdiCharSet=0, GdiVerticalFont=False]
Mode	Select from the list whether to display the messages in <b>Color</b> or in <b>Black</b> . For information on the types of messages and the corresponding color, refer to the <b>Logs View</b> , page 49.  The option <b>None</b> switches off the log function. No new log messages will be displayed.
Time/Clock Log Format	Select the format of the time stamp from the <b>Time/Clock</b> list. The selected format is indicated in the <b>Log Format</b> line. <ul style="list-style-type: none"> <li><b>None</b>: No time stamp is displayed for the log messages.</li> <li><b>Clock</b>: The time stamp is displayed in <b>Log Format</b>: [HH:mm:ss.fff]</li> <li><b>Elapsed</b>: The time stamp is displayed in <b>Log Format</b>: [{0:dd\ .hh\:mm\:ss\ .fff}]</li> <li><b>Simulated</b>: The time stamp is displayed in <b>Log Format</b>: [{0:dd\ .hh\:mm\:ss\ .fff}]</li> <li><b>DateTime</b>: The time stamp is extended by the date and displayed in <b>Log Format</b>: [yyyy-MM-dd HH:mm:ss.fff]</li> </ul> <b>Elapsed</b> and <b>Simulated</b> differ if the time scale (parameter <b>Scale</b> in the <b>Model</b> menu, page 29) is set to value other than <b>1x</b> as the <b>Simulated</b> time would differ from elapsed time. The <b>Simulated</b> time is calculated from the <b>Elapsed</b> time multiplied by the selected scaling factor.
Search	Select the check box to highlight components that match a word in the selected log message.

**File parameters:**

If activated, log files are saved in the user directory of the logged in Windows user in the following default path:

*%localappdata%\Schneider Electric\Machine Expert Twin\1\Work\Logs*

Parameter	Description
<b>Mode</b>	The following options are provided for log files: <ul style="list-style-type: none"> <li>• <b>None:</b> No log file is created.</li> <li>• <b>File:</b> A log file is created in the default path with the default name <i>debug.log</i>.</li> <li>• <b>FileDate:</b> A log file is created with the file name derived from the system date and time of day when EcoStruxure Machine Expert Twin has been started.</li> <li>• <b>FileModelName:</b> A log file is created when a project is opened or saved with the project file name as log file name.</li> </ul>
<b>LogFile Wrap Mode</b>	This option is available if a log file is to be created. It defines how the log file is buffered: <ul style="list-style-type: none"> <li>• <b>Continuous:</b> Append new log entries to an existing log file.</li> <li>• <b>Wrap:</b> Append new log entries to an existing log file until the maximum threshold is reached. Then the oldest entries are overwritten.</li> <li>• <b>Create new:</b> Append new log entries to an existing log file until the maximum threshold is reached. Then a new log file is created.</li> </ul>

**Filter parameters:**

Parameter	Description
<b>Text</b>	Enter text you want to apply as a filter to the log messages. Only messages that contain this text are displayed in the <b>Logs</b> view.
<b>Type</b>	Select from the list the types of messages that are displayed in the <b>Logs</b> view: <ul style="list-style-type: none"> <li>• <b>None</b></li> <li>• <b>Action</b></li> <li>• <b>Communication</b></li> <li>• <b>Error</b></li> <li>• <b>System</b></li> <li>• <b>Debug</b></li> <li>• <b>Warning</b></li> <li>• <b>Information</b></li> </ul> For further information on the different message types, refer to the chapter <b>Logs View</b> , page 49.

**Highlight parameters:**

Parameter	Description
<b>Text</b>	Enter a text string you want to highlight in the log messages.
<b>Color</b>	Select the color to use for highlighting.

## Properties of the Loads View

To customize a load, select it in the **Model** view and configure your individual settings in the **Properties** view:

In **Identification**, the **Type** parameter indicates the type of the load, for example, a box. With the **Identification** parameter, you can modify the identifier of the load which is usually a barcode.

With the other parameters, you can define physical characteristics of the load, the dimensions, the color and the position in space (in a cartesian coordinate system).

## Properties of the Inputs / Outputs View

The **Properties** view allows you to modify the symbol and the description of the input or output.

## Properties of the Alarms View

The **Properties** view provides further information on the alarm selected in the **Alarms** view, page 53 for controller tests.

## Properties of the Solution Explorer View

The **Properties** view allows you to modify the settings of the **Assemblies**, **Motors** or **Controllers** selected in the **Solution Explorer** view. For further information on the properties of catalog objects, refer to the EcoStruxure Machine Expert Twin How to Use Device Catalogs User Guide.



# Glossary

## D

### digital twin:

A digital twin refers to a virtual representation or digital replica of a physical object, system, or process. It is a digital counterpart that simulates the behavior, characteristics, and performance of its physical counterpart in real-time or historical contexts. The concept of a digital twin allows for the integration of the physical and digital worlds, enabling organizations to monitor, analyze, and optimize the performance of their assets or processes.

EcoStruxure Machine Expert Twin provides features for visualization, simulation, and emulation of machines and automation lines throughout the complete lifecycle.

## E

### emulation:

Based on the *ISO 24765-2017 International Standard - Systems and software engineering--Vocabulary*, emulation is defined as the use of a data processing system to imitate another data processing system, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system.

## M

**Model view:** In EcoStruxure Machine Expert Twin, the **Model** view provides the graphical representation of the scene.

## P

**physical simulation:** The physical simulation is a software library that is designed to simulate and model physical systems in a computer-generated environment. It is used to create realistic and dynamic animations and simulations of objects, environments, and interactions between them. In EcoStruxure Machine Expert Twin the physical simulation uses mathematical algorithms to simulate physical phenomena, such as gravity, friction, and collision detection.

**project:** An EcoStruxure Machine Expert Twin project file is saved with the extension *\*.experior*. It contains the information about assemblies, connections, loads, settings.

## S

**scene:** In the EcoStruxure Machine Expert Twin context, a scene is a representation of a set of assemblies interacting with loads.

### simulation:

Based on the *ISO 24765-2017 International Standard - Systems and software engineering--Vocabulary*, simulation describes two concepts:

- A model that behaves or operates like a given system when provided a set of controlled inputs.
- The use of a data processing system to represent selected behavioral characteristics of a physical or abstract system.

In the context of this manual, the term simulation is used whenever it is referred to modeling physical systems in EcoStruxure Machine Expert Twin.

## U

**URDF:** (unified robotics description format) A special type of eXtensible Markup Language (XML) file that includes the physical description of a robot and contains information on the mechanical structure, joints, 3-D modelling graphics, motors and colliders. URDF files are provided by numerous robotic manufacturers for download. EcoStruxure Machine Expert Twin allows importing URDF files for integrating third-party robots into a project without manual programming.

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