EcoStruxure Machine Expert Twin

How to Use Device Catalogs

User Guide

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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 how to use the device catalogs provided by EcoStruxure Machine Expert Twin.

Validity Note

This document has been updated for the release of EcoStruxure Machine Expert Twin V2.2.

Available Languages of this Document

This document is available in these languages:

- English (EIO0000005034)

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 Automation Expert - Motion, EcoStruxure Machine Expert DigitalTwinCommunication - Library Guide	EIO0000004735 (ENG);
EcoStruxure Automation Expert - Motion, EcoStruxure Machine Expert How to Emulate - User Guide	EIO0000004858 (ENG); EIO0000004859 (FRE); EIO0000004860 (GER); EIO0000004862 (SPA); EIO0000004861 (ITA); EIO0000004863 (CHS)
EcoStruxure Machine Expert Twin Getting Started - User Guide	EIO0000005022 (ENG);

To find documents online, visit the Schneider Electric download center (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.[1]
- 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.

[1] 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 61496-1:2020	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.

Standard	Description
IEC 61508-3:2010	Functional safety of electrical/electronic/programmable electronic safety-related systems: Software requirements.
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

What’s in This Part

General Information on Device Catalogs

What's in This Chapter

General Information on Device Catalogs

General Information

Catalogs function as a form of libraries that provide different objects. You can drag these objects into the **Model** view to use them as assemblies in your scene. EcoStruxure Machine Expert Twin provides predefined catalogs that are described in this user guide. Additionally, you can create your own catalogs of customized mechatronic systems for the EcoStruxure Machine Expert Twin Builder. As prerequisites, you must have a EcoStruxure Machine Expert Twin Developer license and Microsoft Visual Studio must be installed to develop your own catalogs in C# programming language.

Catalogs are handled as DLL files. The default catalogs are extended by the prefix *Experior.Catalog*, for example *Experior.Catalog.SchneiderElectric.Accessories.dll*.

Selecting Device Catalogs for Your Project

During start-up of EcoStruxure Machine Expert Twin, the **Select Catalog(s)** dialog box is displayed. By default, it lists the catalogs that are provided in the EcoStruxure Machine Expert Twin installation folder. To load one or more of these catalogs along with your project, select the respective check box.

Additionally, you can reference your own catalogs. Click the browse (**...**) button in the **Select Catalog(s)** dialog box and browse to the folder that contains your catalogs. By default, the path points to your local Windows user directory:

%userprofile%\Documents\Visual Studio XXXX

Catalogs View

After start-up of EcoStruxure Machine Expert Twin, the device catalogs selected in the **Select Catalog(s)** dialog box are displayed in the **Catalogs** view 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, move the cursor to the **Model** view and click to place it.

By default, EcoStruxure Machine Expert Twin provides the following catalogs:

- **Accessories**, page 26
- **Belts & Conveyors**, page 27
- **Cobot**, page 38
- **Delta Robots**, page 41
- **Field Equipment**, page 48
- **multi carrier**, page 55

How to Work With Catalogs

What’s in This Part

Building-up a Scene in Offline Mode

What's in This Chapter

EcoStruxure Machine Expert Twin allows you to build up your scene by selecting the assemblies provided in the catalogs and dragging them to the **Model** view. For inserting, arranging and performing general configurations of assemblies in your scene, a connection to the controller is not required. You can also play the scene to visualize emulations, such as following a load as it is transported by multiple conveyors.

Assigning variables created in EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert to assemblies available in your scene can also be performed. To achieve this, a controller connection is required. For further information on the processes, refer to Reading Variables and Configurations from the Controller, page 21.

Building-up Conveyors

Overview

You can use the predefined belts and conveyors provided in the **Belts & Conveyors** catalog to create your scene.

Adding Single Conveyors to the Scene

To add an object of the **Belts & Conveyors** catalog to your scene, select it in the **Catalogs > Belts & Conveyors** view and click in the **Model** view to insert it.

The **Straight** conveyors dragged from the catalog have the following default dimensions:

- **Length**: 1000 mm (39.37 in.)
- **Width**: 360 mm (14.17 in.)
- **Height**: 500 mm (19.67 in.)

To insert several conveyors with specific dimensions, proceed as follows:

Step	Action
1	Drag a conveyor type that suits your needs from the **Belts & Conveyors** catalog to your scene.
2	Select the conveyor in the **Model** view.
3	Adapt the dimensions of this conveyor in the **Properties** view: **Size > Length** or **Size > Width**. To modify the height, edit the Z coordinate of the **Position** parameter or hold down the **Shift** key and move the cursor up or down.
4	Press **Ctrl+C** to copy the adapted conveyor in the **Model** view.
5	Press **Ctrl+V** to paste a new conveyor with the specified dimensions to the **Model** view.

Connecting Conveyors Automatically

If the catalog is displayed in **Gallery View Style**, you can insert default conveyors consecutively by double-clicking the conveyor object in the catalog. Every new conveyor is inserted at the end of the last inserted conveyor adapting the height. Use this snapping function to add several conveyors with default dimensions consecutively and connecting them automatically.

As a result, a line of conveyors is created. The starting point of the first conveyor is indicated by a red triangle, the end point of the line of conveyors at the last conveyor is indicated by a blue triangle. The connections between conveyors are indicated by purple triangles. Each conveyor indicates the transport direction by a red arrow on the conveyor surface.

For a visual illustration of automatically connecting conveyors, refer to the video sequence in the corresponding online help.

Connecting Conveyors Manually

If single conveyors are available in your scene, you can connect them manually. To achieve this, select a conveyor, hold down the **Ctrl** key and move it to another conveyor. When the red triangle of the selected conveyor is moved over the blue triangle of another conveyer, the two conveyors are snapped together and a connection is established.

For a visual illustration of manually connecting conveyors, refer to the video sequence in the corresponding online help.

Grouping Conveyors

To group different conveyors in the scene to form one object, proceed as follows:

Step	Action
1	Click to select conveyor 1 in the scene.
2	Hold down the **Ctrl** key.
3	Click to select conveyor 2 in the scene. Click the other conveyors while holding down the **Ctrl** key until all conveyors you want to group have been selected and are displayed in grey in the scene.
4	Right-click one of the selected conveyors and execute the command **Collect** from the contextual menu. **Result**: A rectangle is displayed around the grouped conveyors indicating the length and width.

You can move the grouped conveyors within the scene and keep the conveyors unchanged by selecting the rectangle and moving the cursor. You can modify the relative distance between the conveyors by selecting one conveyor of the group within the rectangle and moving the cursor.

For a visual illustration of grouping conveyors, refer to the video sequence in the corresponding online help.

Ungrouping Conveyors

To ungroup a group of conveyors, right-click one of the conveyors, and execute the command **Dispose (Separate)** from the contextual menu.

For a visual illustration of ungrouping conveyors, refer to the video sequence in the corresponding online help.

Attaching Conveyors to an Assembly

To attach different conveyors and add a sensor, proceed as follows:

Step	Action
1	Select and hold conveyor 1 in the scene.
2	Drag the conveyor assembly to another assembly, conveyor 2 in the scene, and attach the two conveyor assemblies together.
3	Select a sensor and drag it to the conveyors.
4	Hold down the **Ctrl** key.
5	Select conveyor 1, keep the **Ctrl** key pressed and select conveyor 2.
6	Right-click one of the selected items (conveyor 1 or 2 or the sensor) and execute the command **Attach** from the contextual menu. **Result**: The two conveyors are attached to the sensor: In the **Solution Explorer** view, the conveyors are displayed as subnodes of the **SENSOR** node. The three objects can be moved as one in the scene.

NOTE: This sequence of steps apply equally to other assemblies.

NOTE: To separate the conveyors from the sensor, right-click the object consisting of three assemblies and execute the command **Unattach** from the contextual menu.

For a visual illustration of attaching conveyors, refer to the video sequence in the corresponding online help.

Configuring Motors

Motors in the Scene

Motors are added to the scene with the conveyors as each conveyor is equipped with a motor. They are represented in the scene by the arrow displayed on the conveyor.

You can control the motor manually by right-clicking the arrow and executing the commands from the contextual menu. The motor can also be controlled by controller output variables. To this end, establish a controller connection, page 21 and assign the variables.

When a load touches the surface of the conveyor, it is transported by the conveyor according to the parameters configured in the **Properties** view when playing the scene.

If you delete a conveyor from the scene, the corresponding motor remains available as a subnode of the **Motors** node in the **Solution Explorer** view allowing you to assign it to another assembly. When the project is saved, unassigned motors are removed from the **Motors** node.

Assigning One Motor to Several Conveyors

You can assign one motor to several conveyors by right-clicking each conveyor and executing the command from the contextual menu: **Surface > Basic > Basic Surface Motor[n]**

You can then remove the default motors of the conveyors that are no longer used from the **Solution Explorer** view. Otherwise they will be removed when the project is saved.

Controlling a Motor

To start a motor, right-click the arrow on a conveyor and execute the command **Start** from the contextual menu or double-click the motor. If loads are available, they are moved over the conveyor in the direction of the arrow when playing the scene.

To stop a motor, right-click the arrow on a conveyor and execute the command **Stop** from the contextual menu.

To change the moving direction of the motor, right-click the arrow on a conveyor and execute the command **Forward** or **Backward** from the contextual menu or hold down the **Ctrl** key and click the motor to toggle the moving direction.

Configuring the Direction of the Motor

Right-click the arrow on a conveyor and execute the command **Forward** or **Backward** to change the direction of the motor or hold down the **Ctrl** key and click the motor to toggle the moving direction. If loads are available, they are moved in the configured direction over the conveyor when playing the scene.

Adding and Activating Feeders

Adding a Feeder

Feeders are objects that generate loads in your scene. You can add a feeder by right-clicking a conveyor and executing the command **Insert Feeder** from the contextual menu. As a result, the feeder is shown at the beginning of the conveyor as a yellow triangle.

Activating a Feeder

You can activate a feeder in the scene in three different ways:

- Double-click a feeder in the scene to generate a single load.
- Right-click the yellow triangle on the conveyor showing the feeder and execute the command **Start** from the contextual menu. As a result, loads are generated automatically as configured in the **Properties** of the feeder with the **Automatic Feeding** parameter.
- Assign a **PLC Output** signal **Feed** to the feeder that is creating a load upon every rising edge of the signal.

Configuring the Loads

To configure the type of loads that is generated by the feeder, configure the parameters in the **Load** section of the **Properties** of the feeder.

Reading Variables and Configurations from the Controller

What's in This Chapter

This chapter describes how to create a connection to the controller and to assign variables created in EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert to assemblies available in your scene.

How to Create a Controller Connection

Overview

EcoStruxure Machine Expert Twin allows you to establish a connection to a controller using different communication protocols.

As an example, this chapter describes the steps required to create an OPC UA connection to a Schneider Electric controller.

Prerequisites

As a prerequisite, an OPC UA server must be configured on your controller and must be started.

- For a description of the procedure required for starting the emulation of Schneider Electric controllers from EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert, refer to the *How to Emulate* User Guide in the EcoStruxure Automation Expert - Motion / EcoStruxure Machine Expert online help.
- For information about starting an OPC UA server on a PacDrive LMC controller, refer to the *OPC UA Server Configuration* in the *LMC Device Objects and Parameters* part of the EcoStruxure Automation Expert - Motion / EcoStruxure Machine Expert online help.
- For information about starting an OPC UA server on a Modicon M262 Logic/Motion Controller, refer to the *OPC UA Server Configuration* in the *M262 Logic/Motion Controller - Programming Guide* in the EcoStruxure Automation Expert - Motion / EcoStruxure Machine Expert online help.

Creating an OPC UA Connection

To create an OPC UA connection, proceed as follows:

Step	Action
1	In the **Connections** view, right-click in the table and execute the command **OPC UA Client** from the contextual menu. **Result**: A new row is added to the table with **Protocol** = **OPC UA**.
2	Select this row and configure the connection in the **Properties** view.
3	In the **Communication** section, edit the parameter **OPC Server Address** and enter the IP address and the port of the controller you want to establish a connection to in accordance with the following format: `opc.tcp://127.0.0.0:4840`
4	In the **Connections** view, right-click the row you created for the **OPC UA** connection and execute the command **Connect** from the contextual menu. **Result**: After the connection to the controller has been established, the **Status** = **Connected** is displayed in the row.

How to Add and Configure a Robot

Overview

EcoStruxure Machine Expert Twin allows you to add an assembly to the scene by dragging an object from the **Catalogs** view and dragging it to the **Model** view.

As an example, this chapter describes the steps for adding a Lexium P Robot from the **Delta Robots** catalog and provides further information.

Prerequisites

As a first prerequisite, the **Delta Robots** catalog must have been selected during start-up of EcoStruxure Machine Expert Twin in the **Select Catalog(s)** dialog box and must be available in the **Catalogs** view.

For general information about the **Catalogs** view, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide.

As a second prerequisite, a controller connection must have been established as described in How to Create a Controller Connection, page 21.

Adding a Lexium P Robot

To add a Lexium P Robot, proceed as follows:

Step	Action
1	In the **Catalogs** view, select the **Delta Robots** catalog node and expand, for example, the **P4Series** subnode.
2	Select a subnode, for example **VRKP4S0RNCxx000**, and drag it to the **Model** view. **Result**: A **VRKP4S0RNCxx000** assembly is added to the scene and is displayed as a new node in the **Solution Explorer** view.
3	In the **Solution Explorer** view, expand the **VRKP4S0RNCxx000** node and the corresponding subnode **P4S0RNCxx001**. **Result**: The variables **Joint A**...**Joint D** of the **VRKP4S0RNCxx000** are displayed as subnodes as well as a **Standard Gripper** subnode. A small black triangle at each subnode indicates that the variable is not assigned to a variable defined in EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert.
4	Configure the variables by selecting each node in the **Solution Explorer** view and configuring the corresponding parameters in the **Properties** view.

Configuring the Lexium P Robot

To configure the Lexium P Robot, proceed as follows:

Step	Action
1	In the **Solution Explorer** view, select the **Joint A** subnode of the **VRKP4S0RNCxx000**.
2	In the **Properties** view, optionally configure the **Addressing > Description** and **Addressing > Symbol** according to your requirements.
3	In the **Properties** view, expand the **Tags > Application** list. **Result**: If the connection to the controller is available, the variables defined in EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert are provided in two subnodes: • **DTC** Contains the variables provided by the DigitalTwinCommunication library. • **OPCUA_Server_Objects**
4	Select the variable *astRobotPSeries* from **Tags > Application > DTC > GVL_OpcUaRobotics > G_stROB**. For further information, refer to the EcoStruxure Machine Expert DigitalTwinCommunication Library Guide.
5	Select the variable *lrRefPositionAxisA* from **Tags > Application > DTC > GVL_OpcUaRobotics > G_stROB > astRobotPSeries > astRobotPSeries[1] > stConfigData**. **Result**: The variable is assigned and the small black triangle at the **Joint A** node is no longer displayed.
6	Execute the same steps for the remaining joints **Joint B**...**Joint D** to assign the variables. **Result**: Movements of the robot initiated by the controller will now be emulated in the **Model** view and you will see the Lexium P Robot moving in the scene.

Configuring the Gripper

To configure the gripper that is part of the assembly to allow the Lexium P Robot to pick up loads, proceed as follows:

Step	Action
1	In the **Solution Explorer** view, select the **Standard Gripper** subnode of the **VRKP4S0RNCxx000** that, in turn, provides two subnodes: • **Vacuum Actuator** • **Vacuum Sensor**
2	Select the **Vacuum Actuator** node.
3	In the **Properties** view, select the controller output variable for the gripper from the **Tags > Application > DTC > GVL_OpcUaRobotics > G_stROB > astToolDefault > astToolDefault[1] > stConfigData** list. **Result**: The variable is assigned.

You can optionally configure a controller input signal to provide feedback of the gripper.

Default Catalogs

What's in This Part

This part lists the catalogs that are provided by default with EcoStruxure Machine Expert Twin.

Accessories Catalog

What's in This Chapter

Accessories

Content of the Catalog

The **Accessories** catalog provides predefined objects you can move to the **Model** view and use as static assemblies to make your scene look more realistic.

Importing CAD Files

Additionally, it allows you to import your own CAD files, store them in the **Accessories** catalog and re-use them in multiple projects.

The following formats of CAD files are allowed:

- Microsoft DirectX (.x)
- Wavefront (.obj)
- Autodesk 3D Studio (.3ds)
- Autodesk 3D Studio Max ASCII (.ase)
- Blender (.blend)
- Stereolithography (.stl)
- LightWave (.lwo)
- AutoCAD DXF (.dxf)

To import CAD files, proceed as follows:

Step	Action
1	Right-click in the **Accessories** tab and execute the command **Import** from the contextual menu. **Result**: The **Importing CAD files** dialog box opens.
2	Select the CAD file format from the list and browse to the folder where your CAD file is stored.
3	Select the file to import and click **Open**. **Result**: The object is added to the **Accessories** catalog and is available for selection. You can move it to the **Model** view to integrate it into your scene.

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.

Importing CAD files with the file extensions **.dae*, **.stl*, **.stp*, **.step*, **.sldprt* or **.CATPart* is available by using the **CAD/Convex** button of the **Kinematization** menu. For further information, refer to the *EcoStruxure Machine Expert Twin Getting Started User Guide*.

Belts & Conveyors Catalog

What's in This Chapter

Belts & Conveyors - General Information

Content of the Catalog

The **Belts & Conveyors** catalog provides predefined objects that can be directly integrated into your scene.

Select the **Belts & Conveyors** catalog in the **Catalogs** view to display the different types of belts and conveyors represented as subnodes:

- **Belt Conveyors**
- **Roller Conveyors**
- **Strap Conveyors**
- **Miscellaneous**

Each subnode contains further subnodes which, in turn, represent the objects you can move to the **Model** view and use as assemblies in your scene.

Properties of Straight and Curve Belts and Conveyors

Once you have added an object of the **Belts & Conveyors** catalog to the **Model** view, you can select it and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen. The properties of a belt or a conveyor assembly consist of different sections providing the parameters. The parameters described in the following paragraphs are the general parameters provided by belts and conveyors of the types **Straight** and **Curve**. Parameters that are specific to other objects provided by the **Belts & Conveyors** catalog are described in **Belts & Conveyors** - Specific Objects, page 32.

Identification Section

Parameter	Description
Type	Indicates the type of the conveyor or belt as defined in the catalog.
Category	Indicates the category of the object.
Name	Indicates the default name of the conveyor or belt. Click the field to edit the name and adapt it to your requirements.

Association Section

Parameter	Description
Section	Indicates the section in which the selected belt or conveyor is placed. To shift the belt or conveyor to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the belt or conveyor is displayed as a subnode of **Section<n> > Conveyors**.
Control Panel	By default, belts or conveyors are not assigned to a control panel. To assign the selected belt or conveyor to controls, open the list and select a control panel. The assigned **Control Panel** will then be selected upon selection of the belt or conveyor.

Boundaries Section

Parameter	Description
Start	Select this check box to display a boundary at the start side (represented by the red triangle) of the belt or conveyor.
End	Select this check box to display a boundary at the end side (represented by the blue triangle) of the belt or conveyor.
Right	Select this check box to display a boundary on the right side (seen from the start of indicated by the red triangle) of the belt or conveyor.
Left	Select this check box to display a boundary on the left side (seen from the start indicated by the red triangle) of the belt or conveyor.
Height	Enter a height value (in mm) for your belt or conveyor.
Width	Enter a width value (in mm) for your belt or conveyor.
Ramp	Enter the length of the chamfer the boundary should provide from the left side and from the right side. Value range: 0...half the length of the belt or conveyor Default value: 15 mm
Friction	Click the **Friction** arrow to open a list of parameters defining the friction of the boundaries that is applied when a load is touching the boundaries: • **Coefficient**: Select an entry from the list: ◦ **None** ◦ **Slippy** ◦ **Smooth** ◦ **Sticky** ◦ **Custom** • **Dynamic**: If **Custom** is selected, enter a value of your choice. For the predefined friction types, the value is not editable. • **Static**: If **Custom** is selected, enter a value of your choice. For the predefined friction types, the value is not editable.
Color	Select a color for the boundaries of the selected belt or conveyor.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the belt or conveyor is enabled. If this check box is not selected, the belt or conveyor is disabled and is displayed in grey in the **Model** view. Physical properties are not available.

Orientation Section

Parameter	Description
RotZ	Enter an angle in ° to rotate the belt or conveyor around the Z axis (within the XY-plane).
RotY	Enter an angle in ° to incline the selected conveyor. Value range: -45°...45°

Photo Eyes Section

Parameter	Description
Items	Click the plus sign of the **Items > Collection** line to add a sensor to the selected conveyor. **Result**: The sensor is displayed on the belt or conveyor in the scene and a subnode **[0]** is inserted under the **Items** node that provides the following parameters.
Name	Indicates the default name of the sensor. Click the field to edit the name and adapt it to your requirements.
Height	Enter a height value (in mm) for the sensor above the belt or conveyor.
Position	Enter a position value (in mm) for the sensor on the belt or conveyor measured from the start (red triangle).
RotX	Enter an angle in ° to incline the sensor upward from the belt or conveyor.
RotZ	Enter an angle in ° to incline the sensor sideward from the belt or conveyor.
Blocked	Configure an input variable to the controller that is set as soon as a load is detected by the sensor. Configure the following parameters: • **Size**: Indicates the data type of the variable (BOOL). • **Connection Id**: Select the connection ID from the list, in accordance with the **Connections** view. • **Description**: Enter a describing text. • **Symbol**: Select the input variable of the controller. The list is provided when a connection to the controller is established. • **NO/NC**: Select from the list whether a **NO (Normally Open)** or **NC (Normally Closed)** sensor is used.

By clicking the plus sign of the **Items > Collection** parameter, you can add more sensors.

Position Section

Parameter	Description
Locked	Select the check box to lock the position of the selected belt or conveyor to prevent it from being moved unintentionally.
Position	Enter the x, y, z coordinates (in mm) of the selected belt or conveyor to modify the position. You can also use the fundamental mathematical operations (addition, subtraction, multiplication and division) to calculate the position coordinates.

Scripts Section

The **Scripts** section allows you to configure programming code that is executed when a selectable event is detected on the belt or conveyor:

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. This **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Size Section

The following parameters are provided for **Belt Conveyors > Straight**:

Parameter	Description
Length	Enter a value for the length of the selected belt or conveyor. Default value: 1000 mm Value range: 100...4000 mm
Width	Enter a value for the width of the selected belt or conveyor. Default value: 360 mm Value range: 50...1500 mm

The following parameters are provided for **Belt Conveyors > Curve Clockwise** / **Curve Counter Clockwise**:

Parameter	Description
Radius	Enter a value for the radius of the curved conveyor. Default value: 600 mm Value range: 400...1500 mm
Width	Enter a value for the width of the curved conveyor. Default value: 360 mm Value range: 100...1500 mm
Angle	Enter a value for the angle of the curved conveyor. Default value: 90 ° Value range: 30...180 °

Surface Section

Parameter	Description
Friction	Click the **Friction** arrow to open a list of parameters defining the friction of the surface of the conveyor: • **Coefficient**: Select an entry from the list: ◦ **None** ◦ **Slippy** ◦ **Smooth** ◦ **Sticky** ◦ **Custom** • **Dynamic**: Enter a value of your choice if **Coefficient > Custom** is selected. For the predefined friction types, the value is not editable. • **Static**: Enter a value of your choice if **Coefficient > Custom** is selected. For the predefined friction types, the value is not editable.
Type	Select the type of conveyor from the list: • **Roller** • **Belt** • **Straps**
Belt Height	Enter the thickness of the belt. Value range: 40 mm...60 mm
Color	Select a color for the surface of the selected belt or conveyor.

Visualization Section

Parameter	Description
Support	Deselect the check box to hide the supporting legs of the conveyor.
Visible	Deselect this check box to hide the belt or conveyor in the scene.

Visualize Motion Section

These parameters are exclusive to servo belt conveyors.

Parameter	Description
Enable	Select this check box to visualize the motion of a servo belt conveyor.
Pockets Distance	Enter a pockets distance (in mm) for the visual representation of the movement of the servo belt.

Belts & Conveyors - Specific Objects

Overview

In addition to the general properties provided by the **Belts & Conveyors** catalog described in **Belts & Conveyors** - General Information, page 27, this chapter describes the additional properties that are provided by the following objects.

- **Divert** / **Merge**, page 32
- **Transfer Conveyor**, page 33
- **Alignment Conveyor**, page 33
- **Switch Sorter**, page 34
- **Pusher Unit** / **Vertical Blade Stopper**, page 35

Divert / Merge

Divert conveyors are designed to allow separation of loads by diverting them from the main conveyor line.

Merge conveyors are designed to insert loads from another line of conveyors to the main conveyor line.

The following parameter is provided in addition to the general **Properties** described in **Belts & Conveyors** - General Information, page 27.

Parameter	Description
Orientation	**RotZ**: Enter the angle (in °) to fit the **Divert** / **Merge** conveyor to the main conveyor line.
Surface	• **Connection Edge**: Select from the list the side of the **Divert** / **Merge** conveyor that is to be longer (seen from the start of indicated by the red triangle): ◦ **Left** ◦ **Right** • **Flow Direction**: Select the direction of loads in which loads are moved: ◦ **Infeed**: Loads are moved towards the main conveyor line. The moving direction of the belt is reversed. It is opposed to the red triangle. ◦ **Outfeed**: Loads are moved away from the main conveyor line. The moving direction of the belt is as indicated by the red triangle.

Transfer Conveyor: Basic Vector Motor

As the **Transfer Conveyor** is designed to lift loads upward and downward, it is equipped with a **Basic Vector Motor** to execute the vertical movement. You can configure the following parameters in addition to the general **Properties** described in Motors, page 35:

Parameter	Description
PLC Input Signal	Configure input signals sending status information to a connected controller. • **Mechanical Switch**: Select this check box if the motor is equipped with a mechanical switch. When this check box is selected, the additional signal **Ready** is provided. • **Running**: Signal indicating that the **Basic Vector Motor** has been started and is moving. • **Max. Position**: Signal indicating that the transfer conveyor has been lifted upward and has reached the maximum position configured with the parameter **Movement > Max. Limit**. • **Mid. Position**: Signal indicating that the transfer conveyor is within the middle range configured with the parameters **Movement > Middle**: **Max. (Distance)** and **Min. (Distance)**. • **Min. Position**: Signal indicating that the transfer conveyor has been moved downward and has reached the minimum position configured with the parameter **Movement > Min. Limit**.
Movement	Parameters to configure the vertical movement of the transfer conveyor: • **OffSet**: Enter an offset. • **Max. Limit**: Enter the maximum position (in mm) the transfer conveyor is lifted to. • **Middle**: Enter a **Max. (Distance)** value and a **Min. (Distance)** value (in mm) to configure a range for the transfer conveyor. It can be indicated as status information to the controller with the **PLC Input Signal > Mid. Position**. • **Min. Limit**: Enter the minimum position (in mm) the transfer conveyor is moved to. • **Limit Type**: Select the behavior of the transfer conveyor when reaching the maximum or minimum position: ◦ **Stop**: The transfer conveyor stops moving. ◦ **Eccentric**: The transfer conveyor continues moving in the opposite direction. • **Reset Position**: Select the default position of the transfer conveyor from the list: ◦ **Down** ◦ **Middle** ◦ **Up**

Alignment Conveyor

The **Alignment Conveyor** is a special type of **Roller Conveyors** designed to align the loads on one side of the conveyor providing the following specific parameter in the **Surface** section:

Parameter	Description
Direction Offset Angle	Enter the angle (in °) within the range of 5...20° to align the loads to the right side of the conveyor or within the range of -20...-5° to align the loads to the left side of the conveyor (seen from the start of the belt indicated by the red triangle).

Switch Sorter

Miscellaneous objects of type **Switch Sorter** are designed to sort loads by diverting them from the main conveyor line to the right or to the left depending on controller signals. You can configure the following **Properties** in addition to the general **Properties** described in **Belts & Conveyors** - General Information, page 27:

Parameter	Description
PLC Input Signals	Configure input signals sending status information to a connected controller. • **Right Position**: Signal indicating that the load is diverted to the right. • **Left Position**: Signal indicating that the load is diverted to the left. • **Center Position**: Signal indicating that the load is not diverted. The load remains on the main conveyor line.
PLC Output Signals	Configure output signals from the controller for diverting loads: • **Activate Right Diverting**: Configure the controller signal for diverting a load to the right of the conveyor. • **Activate Left Diverting**: Configure the controller signal for diverting a load to the left of the conveyor.

Pusher Unit / Vertical Blade Stopper

Miscellaneous objects of type **Pusher Unit** and **Vertical Blade Stopper** both consist of a cylinder with a shield at one end. The cylinder is ejected by pneumatic forces upon a controller input. Both objects are designed in a similar way with the difference that the pusher unit is moving a plate in horizontal direction whereas the vertical blade stopper is moving a plate in vertical direction. You can configure the following specific **Properties**:

In the **Size** section, configure the dimensions of the plate with the parameters **Length**, **Width**, **Height** (in mm).

The **Pneumatic > Parameters** section provides the following parameters:

Parameter	Description
Speed	Enter the velocity (in m/s) the plate is pushed forward by the pusher or upward by the vertical blade stopper.
Travel	Enter the distance (in mm) the plate is pushed forward or upward.
Valve	Select the type of pneumatic valve from the list: • **MonoStable**: With a monostable valve, the plate remains in forward or upward position as long as a signal is applied. When the signal becomes invalid, the plate returns to its initial position. • **Bistable**: With a bistable valve, the plate remains in forward or upward position even if the signal is no longer applied. The controller output signal **Inject Cylinder** is required to return the plate to the initial position.
Injected	Configure a controller input signal indicating that the plate of the pusher or stopper is injected.
Ejected	Configure a controller input signal indicating that the plate of the pusher or stopper is ejected by the distance defined with the parameter **Travel**.
Inject Cylinder	Configure a controller output signal for bistable valves: As the cylinder is not injected automatically when using bistable valves, this signal is required. Once it becomes TRUE, the cylinder of the pusher or vertical blade stopper is injected.
Eject Cylinder	Configure a controller output signal: Once this signal becomes TRUE, the cylinder of the pusher or vertical blade stopper is ejected by the distance defined with the parameter **Travel** and the velocity defined with the parameter **Speed**.

Motors

Overview

By default, each conveyor is equipped with a motor that is represented in the scene by the arrow displayed on the conveyor.

In the **Solution Explorer** view, the motor is displayed as a subnode of the conveyor. Select the subnode in the **Solution Explorer** to configure the motor in the **Properties** view. The properties displayed depend on the type of the motor. The parameters described in the following paragraphs are the general parameters provided by **Motors** of types **Basic Surface Motor** and **Basic Servo Motor**. For properties of a **Basic Vector Motor**, refer to the section **Transfer Conveyor**: **Basic Vector Motor**, page 33.

Identification Section

Parameter	Description
Type	Indicates the type of the motor as defined in the catalog.
Name	Indicates the default name of the motor. Click the field to edit the name and adapt it to your requirements.

Speed Section

Two different speeds can be configured for the conveyor motor.

Parameter	Description
Base Speed	Configure the default speed of the motor in m/s.
Alternative Speed	Configure the alternative speed of the motor in m/s. This velocity is used when the **PLC Output Signal > Alternative Speed** of the controller is TRUE.

Acceleration / Deceleration Section

Parameter	Description
Enabled	The function is by default enabled. To disable the acceleration / deceleration, deselect this check box.
Ramp Up	Configure the acceleration for the motor to ramp up in ms.
Ramp Down	Configure the deceleration for the motor to ramp down in ms.

Control Mode Section

These parameters are exclusive to servo motors (**Motors > Basic Servo Motor**). You can select the control mode type **Positioning** or **Velocity** for the servo belt and provide position or velocity values as output signals for representing motion.

NOTE: To transport a stack of loads on a servo belt, select **Control Mode > Type > Velocity** to achieve realistic results from the simulation.

Control Mode type	Description
Velocity	Select **Control Mode > Type > Velocity** to select the velocity mode for the servo belt. A speed variable (in mm/s) needs to be provided by a controller output signal.
Positioning	Select **Control Mode > Type > Positioning** to select the positioning mode for the servo belt. Additionally, the parameter **Position Controller** is displayed providing the following values: • **Absolute**: The servo belt is following absolute position values provided by the controller. • **Modulo** The servo belt is following absolute position values provided by the controller. Additionally, configure the parameter **Modulo Period** (in mm) to allow for an endless movement considering the position value to jump from **Modulo Period** to zero.

PLC Input Signal Section

You can configure input signals sending status information to a connected controller.

PLC Output Signal Section

You can configure signals allowing you to control the direction (**Forward** / **Backward**) and to switch from **Base Speed** to **Alternative Speed** (refer to the **Speed** Section, page 36). The velocity values are parameters of the **Basic Surface Motor**.

For servo motors, the servo belt can be controlled by a controller using LREAL variables. The **PLC Output Signal** is adapted to the **Control Mode > Type** selected.

The velocity values are provided in mm/s. The position values are provided in mm.

> **NOTE:** When the servo belt is running in **Control Mode > Type > Velocity**, and the OPC UA connection is terminated, the belt continues to move using the velocity value sent by the controller before disconnecting. Values provided by the controller are not updated after disconnection. To restart, reset the scene (**Ctrl**+**R**).

Functionable Section

Enable or disable the motor / servo motor function by selecting or deselecting the check box.

Cobot Catalog

What's in This Chapter

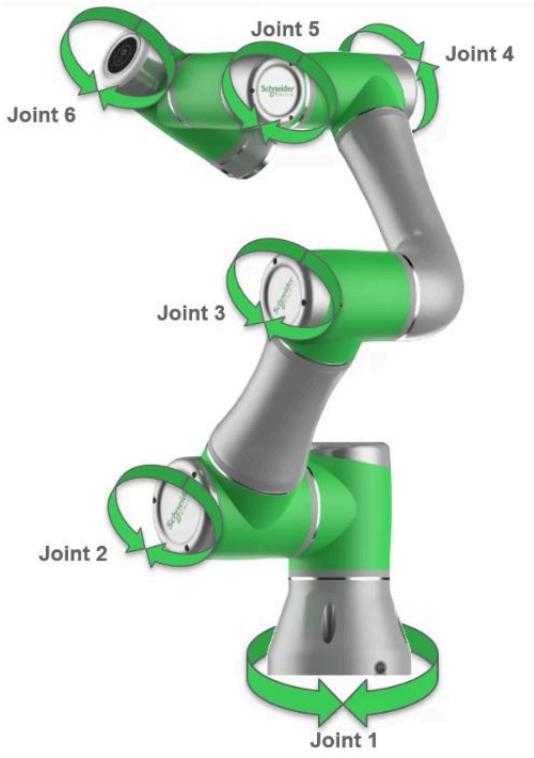
Cobot

Content of the Catalog

The **Cobot** catalog provides a predefined LXMRL03S0••• Lexium Cobot you can move to the **Model** view and use as assembly in your scene.

Subnodes of the Cobot Assembly

A Lexium Cobot is driven by reference values from a Lexium Cobot Controller. To this end, the **Cobot** assembly provides the subnodes **Joint 1**...**Joint 6** in the **Solution Explorer** for configuration. Connect them to reference values of a REAL data type.



To add a gripper, right-click the **Cobot** assembly and execute the command **Tool Manager**. For further information, refer to *Managing Tools Within the **Model** View* in the EcoStruxure Machine Expert Twin Getting Started User Guide. To activate the gripper, connect the **Vacuum Actuator** signal of type BOOL to your controller. For status messages to the controller, connect the **Vacuum Sensor** signal of type BOOL.

Properties of a Cobot

Once you have added an object of the **Cobot** catalog to the **Model** view, you can select it and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen. If you select the

Lexium Cobot assembly in the scene or the **Cobot** node in the **Solution Explorer** view, the following parameters can be configured in the **Properties** view.

Identification Section

Parameter	Description
Type	Indicates the type of the Lexium Cobot as defined in the catalog.
Category	Indicates the category of the Lexium Cobot.
Name	Indicates the default name of the Lexium Cobot. Click the field to edit the name and adapt it to your requirements.

Association Section

Parameter	Description
Section	Indicates the section in which the selected Lexium Cobot is placed. To shift the Lexium Cobot to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the Lexium Cobot is displayed as a subnode of **Section<n> > Cobot**.
Control Panel	Indicates the **Controls** tab the Lexium Cobot is connected to.

Display Options Section

Parameter	Description
Show Recommended Envelope	Select the check box to display the working envelope. The Lexium Cobot can position the Tool Center Point (TCP) in any desired direction in the displayed working space without restriction on translation and rotation of the tool flange.
Show Maximum Envelope	Select the check box to display the maximum working envelope. The Lexium Cobot can position the Tool Center Point (TCP) in the displayed working space with restrictions on rotation of the tool flange.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the Lexium Cobot is enabled. If this check box is not selected, the Lexium Cobot is disabled and is displayed in grey in the **Model** view. Physical properties are not available.

Orientation Section

The **RotX**, **RotY**, **RotZ** parameters allow you to modify the angle (in °) of rotation of the assembly around the X, Y and Z coordinate.

Position Section

Parameter	Description
Locked	Select the check box to lock the position of the selected Lexium Cobot to help prevent it from being moved unintentionally.
Position	Enter the x, y, z coordinates (in mm) of the selected Lexium Cobot to modify the position. You can also use the fundamental mathematical operations (addition, subtraction, multiplication and division) to calculate the position coordinates.

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Visualization Section

Parameter	Description
Visible	Deselect this check box to hide the Lexium Cobot in the scene.

Delta Robots Catalog

What's in This Chapter

Delta Robots

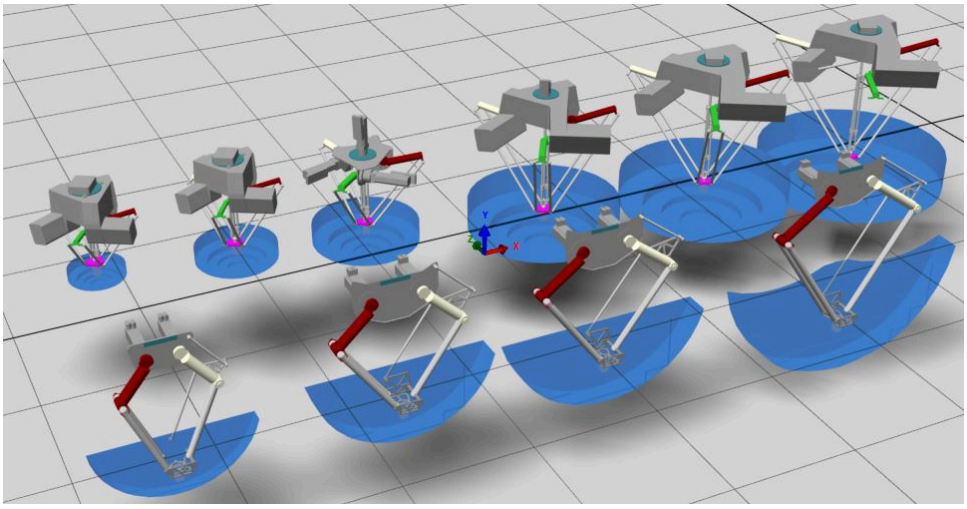
Content of the Catalog

Select the **Delta Robots** catalog in the **Catalogs** view to display the different types of Lexium P Robot and Lexium T Robot represented as subnodes.

Each subnode contains further subnodes which, in turn, represent a robot you can move to the **Model** view and use as assembly in your scene.

Details of Delta Robots Assemblies

A delta robots assembly is driven by reference values from a controller, for example, a PacDrive controller or a Modicon M262 Logic/Motion Controller. To this end, connect the joint values to reference values of an LREAL data type. Depending on the type of robot, a different number of axes needs to be connected. Lexium P Robot assemblies have three main joints (**Joint A**, **Joint B**, **Joint C**) and an optional rotational axis (**Joint D**). The Lexium T Robot is equipped with two joints for performing 2D movements.



To add a gripper, right-click the delta robots assembly and execute the command **Tool Manager** from the contextual menu. For further information, refer to *Managing Tools Within the **Model** View* in the EcoStruxure Machine Expert Twin Getting Started User Guide. To activate the gripper, connect the **Vacuum Actuator** signal of type BOOL to your controller. For status messages to the controller, connect the **Vacuum Sensor** signal of type BOOL.

Properties of Delta Robots

Once you have added an object of the **Delta Robots** catalog to the **Model** view, you can select it and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen. The properties of a **Delta Robot** assembly consists of different sections providing the parameters described in the following paragraphs.

Identification Section

Parameter	Description
Type	Indicates the subnode of the **Delta Robot** as defined in the catalog.
Category	Indicates the commercial reference of the **Delta Robot**.
Name	Indicates the default name of the **Delta Robot**. Click the field to edit the name and adapt it to your requirements.
Id	Indicates the ID as provided by the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide) for this **Robot** connection.

Association Section

Parameter	Description
Section	Indicates the section in which the selected **Delta Robot** is placed. To shift the **Delta Robot** to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the **Delta Robot** is displayed as a subnode of **Section<n>**.
Control Panel	Indicates the name of the **Controls** tab the **Delta Robot** is connected to.

Configuration Options Section

Parameter	Description
Rotational Axis – Left Rotation	Exclusive to Lexium P Robot: By default, the rotational axis positive movement direction is *right*, meaning it moves clockwise when you face the motor shaft. Select the check box to revert the movement and change to *left*, meaning it moves counterclockwise when you face the motor shaft. For further information, refer to the description of the parameter *Direction* in a *Device Objects and Parameters User Guide* of a Schneider Electric drive in the EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert Online Help. For example, the *Lexium LXM62 Drive Device Objects and Parameters User Guide*.
TCP Plate Size - Radius	Exclusive to Lexium P Robot: Configure the radius of the Tool Center Point (TCP) plate size (in mm). Value range: 50...75 mm
Parallel Linkage – Left Side	Exclusive to Lexium T Robot: By default, the parallel linkage is mounted on the right side. Select the check box to mount the parallel linkage on the left side.

Display Options Section

Parameter	Description
Show Envelope	By default, the working space is hidden from the scene. To display the working space where the robot can position the TCP, select the check box.
Show Coordinate System Robot (CSR)	Select the check box to display the coordinate system (based on the right-handed coordinate system) that is used in EcoStruxure Automation Expert - Motion and EcoStruxure Machine Expert on the tool flange of the robot in the scene.
Show Upper Boundary	Exclusive to Lexium P Robot: Select the check box to display the boundary for the upper arms in the scene.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the **Delta Robot** is enabled. Clear this check box to disable the **Delta Robot**: The **Standard Gripper** is displayed in grey in the **Model** view and is disabled. Physical properties are not available.

Info Section

The number of axes of the selected **Delta Robot** is displayed.

Orientation Section

The **RotX**, **RotY**, **RotZ** parameters allow you to modify the angle (in °) of rotation of the assembly around the X, Y and Z coordinate.

Position Section

Parameter	Description
Locked	Select the check box to lock the position of the selected **Delta Robot** to help prevent it from being moved unintentionally.
Position	Enter the x, y, z coordinates (in mm) of the selected **Delta Robot** to modify the position. You can also use the fundamental mathematical operations (addition, subtraction, multiplication and division) to calculate the position coordinates. The origin of the robot coordinate system (the Z position or height) is set for the main axes motor layer.

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Visualization Section

Parameter	Description
Visible	Deselect this check box to hide the **Delta Robot** in the scene.
Color	If the **Visible** check box is selected, select a color for the **Delta Robot**.

Trajectory Section

As a prerequisite for displaying trajectory lines, start the physical simulation.

Parameter	Description
Visible	Select this check box to enable trajectory plotting.
Color	If the **Visible** check box is selected, select a color for the trajectory lines.
Retention Time	Enter a time (in milliseconds) each trajectory line is visible in the scene. Default value: 2000 ms

Scara Robots Catalog

What's in This Chapter

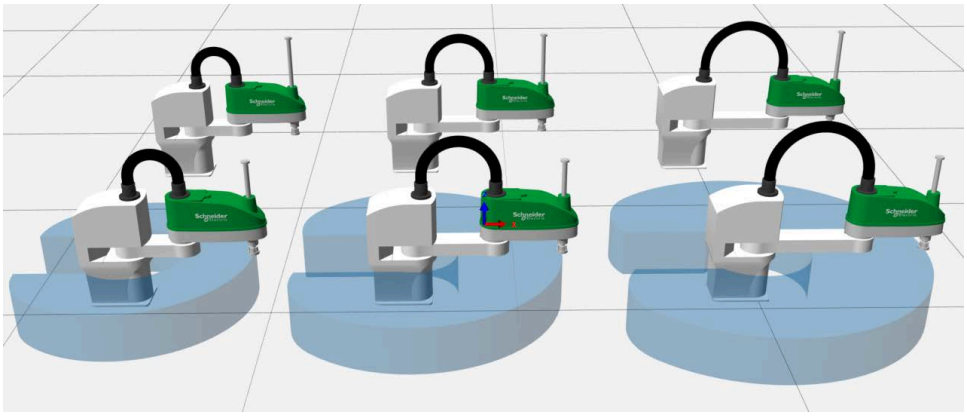
Scara Robots

Content of the Catalog

Select the **Scara Robots** catalog in the **Catalogs** view to display the different types of Lexium SCARA Robot represented as subnodes that you can move to the **Model** view and use as assembly in your scene.

Details of Scara Robots Assemblies

A **Scara Robots** assembly is driven by reference values from a PacDrive controller. To this end, connect the joint values to reference values of an LREAL data type. Lexium SCARA Robot assemblies have four joints represented by the subnodes **Joint 1**, **Joint 2**, **Joint 3** and **Joint 4** in the **Solution Explorer**.



To add a gripper, right-click the **Scara Robots** assembly and execute the command **Tool Manager** from the contextual menu. For further information, refer to *Managing Tools Within the **Model** View* in the EcoStruxure Machine Expert Twin Getting Started User Guide. To activate the gripper, connect the **Vacuum Actuator** signal of type BOOL to your controller. For status messages to the controller, connect the **Vacuum Sensor** signal of type BOOL.

Properties of Scara Robots

Once you have added an object of the **Scara Robots** catalog to the **Model** view, you can select it and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen. The properties of a **Scara Robot** assembly consists of different sections providing the parameters described in the following paragraphs.

Identification Section

Parameter	Description
Type	Indicates the subnode of the **Scara Robot** as defined in the catalog.
Category	Indicates the commercial reference of the **Scara Robot**.
Name	Indicates the default name of the **Scara Robot**. Click the field to edit the name.
Id	Indicates the ID as provided by the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide) for this **Robot** connection.

Association Section

Parameter	Description
Section	Indicates the section in which the selected **Scara Robot** is placed. To shift the **Scara Robot** to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the **Scara Robot** is displayed as a subnode of **Section<n>**.
Control Panel	Indicates the name of the **Controls** tab the **Scara Robot** is connected to.

Display Options Section

Parameter	Description
Show Envelope	By default, the working space is hidden from the scene. To display the working space where the robot can position the TCP, select the check box.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the **Scara Robot** is enabled. Clear this check box to disable the **Scara Robot**: The **Standard Gripper** is displayed in grey in the **Model** view and is disabled. Physical properties are not available.

Orientation Section

The **RotX**, **RotY**, **RotZ** parameters allow you to modify the angle (in °) of rotation of the assembly around the X, Y and Z coordinate.

Position Section

Parameter	Description
Locked	Select the check box to lock the position of the selected **Scara Robot** to help prevent it from being moved unintentionally.
Position	Enter the x, y, z coordinates (in mm) of the selected **Scara Robot** to modify the position. You can also use the fundamental mathematical operations (addition, subtraction, multiplication and division) to calculate the position coordinates.

Scripts Section

Parameter	Description
Event	Select one of the following **Event**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Trajectory Section

As a prerequisite for displaying trajectory lines, start the physical simulation.

Parameter	Description
Visible	Select this check box to enable trajectory plotting.
Color	If the **Visible** check box is selected, select a color for the trajectory lines.
Retention Time	Enter a time (in milliseconds) each trajectory line is visible in the scene. Default value: 2000 ms

Visualization Section

Parameter	Description
Visible	Clear this check box to hide the **Scara Robot** in the scene.

Field Equipment Catalog

What's in This Chapter

Field Equipment

Content of the Catalog

The **Field Equipment** catalog provides predefined field equipment you can directly integrate into your scene.

Select the **Field Equipment** catalog in the **Catalogs** view to display the different types of equipment represented as subnodes:

- **Sensors**, page 49
- **Scanners**, page 49
- **Scale**, page 49
- **Stack Lights**
- **Buttons**
- **Miscellaneous**, page 50

Each subnode contains further subnodes which, in turn, represent the components you can move to the **Model** view and use as assemblies in your scene.

Once you have added an object of the **Field Equipment** catalog to the **Model** view, you can select it and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen.

Field Equipment Detecting Load

Overview

The **Field Equipment** catalog provides the following types of **Sensors** to detect loads:

- **Photoeye**
- **Cylinder**
- **Box**
- **Sphere**
- **Light Beam**

Additionally, it contains the following predefined equipment that provides further information on the detected load:

- **Scanners**
  - **Barcode**
- **Scale**
  - **Weight**

Sensors

To use a sensor in your scene, select the suitable type from the **Field Equipment > Sensors** catalog and drag it to the **Model** view.

In addition to the properties already described for other assemblies, sensors provide the following specific **Properties**:

Behavior Section

Parameter	Description
Collisions	Select from the list which type of collisions are to be detected: • Collisions with **Loads**. • Collisions with **Equipment**. • Collisions with **Both**: loads and equipment.

PLC Input Section

Parameter	Description
Delay	Configure a delay (in mm).
Blocked	Configure a Boolean input variable to the controller that is set as soon as the sensor has been blocked upon a rising edge.

PLC Input (Distance) Section

Exclusive to **Light Beam** sensors:

Parameter	Description
Distance	Configure an input variable of a type defined with the **Size** parameter sending the distance information to the controller.

Statistics Section

Parameter	Description
Observe	Select this check box to add the selected sensor to the **Statistics** view: It displays the number of times the sensor has been triggered.

Barcode Scanners

To use a barcode scanner in your scene, select the object **Barcode** from the **Field Equipment > Scanners** catalog and drag it to the **Model** view.

In addition to the properties already described for other assemblies, the barcode scanner provides the following specific **Properties**:

PLC Input Section

Parameter	Description
Barcode Length	Enter the length of the barcode.
Barcode	Configure an input variable sending the barcode string information to the controller.
Blocked	Configure a Boolean input variable sending the status information that a barcode has been detected to the controller upon a rising edge.

Weight Detection

To use a scale in your scene, select the object **Weight** from the **Field Equipment > Scale** catalog and drag it to the **Model** view.

In addition to the properties already described for other assemblies, the scale provides the following specific **Properties**:

PLC Input (Weight) Section

Parameter	Description
Weight	Configure an input variable of a type defined with the **Size** parameter sending the weight information to the controller.

Feeders, Loads and Eaters

Feeders

Feeders are objects that generate loads in your scene. You can add feeders in two different ways:

- In the **Field Equipment** catalog, expand the subnode **Miscellaneous**, select the object **Feeder** and drag it to the **Model** view.

  As a result, the feeder is shown as a small yellow square in the **Model** view and is added to the **Solution Explorer** view as a new subnode of the **Feeder** node in the selected **Section**. You can resize and re-orientate this square and move it within the **Model** view.
- Right-click a conveyor that is available as an assembly in you scene. Execute the command **Insert Feeder** from the contextual menu.

  As a result, the feeder is shown at the beginning of the conveyor as a yellow triangle.

Properties of Feeders

The properties described in the following sections apply to feeders that were added from the **Field Equipment** catalog. Feeders that are subnodes of a conveyor do not provide all the properties.

Select a feeder in the **Model** view or in the **Solution Explorer** view and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen. The properties of a feeder consist of different sections providing the parameters described in this chapter. These parameters also define the loads that are generated by the feeder.

Identification Section

Parameter	Description
Type	Indicates the type of the feeder as defined in the catalog.
Category	Indicates the category of the feeder.
Name	Indicates the default name of the feeder. Click the field to edit the name and adapt it to your requirements.

Association Section

Parameter	Description
Section	Indicates the section in which the selected feeder is placed. To shift the feeder to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the belt or conveyor is displayed as a subnode of **Section<n> > Feeder**.
Control Panel	By default, feeders are not assigned to a control panel. To assign the selected feeder to controls, open the list and select a control panel.

Automatic Feeding Section

Parameter	Description
Feed By	Select **Feed By > Timer** and configure a time **Interval** for generating loads. Select **Feed By > Gap** and configure a **Gap** (in mm) defining the distance a load must have been moved away from the feeder before a new load is generated.
Started	Select the check box to start generating loads according to the configuration.
Interval	When you selected **Feed By > Timer**, configure a feeding interval by configuring the following parameters: • **Mean (μ)**: Enter a mean value defining that every x unit a new load is created by the timer. • **Std. Deviation (σ)**: Enter a deviation of x units that is allowed for generating loads. • **Base**: Select a time unit for the interval: **Second**, **Millisecond**, **Minute**, **Hour** **NOTE:** To modify these parameters, ensure that the check box **Started** is not selected.
Gap	When you selected **Feed By > Gap**, configure a distance (in mm) a load must have been moved away from the feeder before a new load is generated.
Max Loads	Enter a maximum number of loads to be generated.
Auto Start	Select the check box to start the feeder automatically, for example, depending on a motor configured with the parameter **Motor Dependency**.
Pause	Select the check box to pause generating loads.
Motor Dependency	With the **Auto Start** check box selected, select a motor from the list: When the selected motor is running, the feeder starts generating loads. **NOTE:** To modify this parameter, ensure that the check box **Started** is not selected.

Barcodes Section

Parameter	Description
Automatic Generate	By default, the loads generated by the feeder are not equipped with a barcode. To add a barcode to each load, select this check box.
Next Barcode	If the **Automatic Generate** check box is selected, each load is assigned a barcode, starting from 1. You have the following options: • Enter a figure, for example, `100`, to start from this figure assigning barcodes to the new loads. • Enter a string, for example, `box`, that will be used as a prefix for each barcode number, starting with `box1`, for example.

Load Section

Parameter	Description
Type	From the list, select a type of load that suits your needs, for example, **Package** or **Euro Pallet**.
Mode	From the list, define the size of the load: • **Fixed** Loads that are created have the same size. Further parameters are displayed to specify the loads to be created. They depend on the selected **Type** of load. For a **Package**, for example, the following parameters are available: **Length**, **Width**, **Height**, **Density Mode**, **Density**, **Rigid**, **Center Of Mass**, **Color**. • **Random** Loads of random size are created. Further parameters are displayed allowing you to configure a range for the size of the load with the parameters **Min. Dimension** and **Max. Dimension**. • **RandomLength** Loads of random lengths are created. Further parameters are displayed allowing you to configure a range for the length of the load with the parameters **Length (Min.)** and **Length (Max.)**.

PLC Output Section

Load management can be controlled by controller outputs:

Parameter	Description
Feed	Configure a Boolean controller output signal that starts the feeding process of this feeder upon a rising edge.
Delete all loads	Configure a Boolean controller output signal that initiates deleting the loads that were created by this feeder from the **Model** view upon a rising edge.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the feeder is enabled. To disable the feeder, deselect this check box.

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Statistics Section

Parameter	Description
Observe	Select this check box to add the selected feeder to the **Statistics** view: It displays the number of loads generated by this feeder in the scene.

Visualization Section

Parameter	Description
Visible	Deselect this check box to hide the feeder in the scene.

Eaters

Eaters are objects that remove loads from the scene. You can add an eater by selecting the **Eater** object from the **Miscellaneous** section of the **Field Equipment** catalog and dragging it to the **Model** view.

In addition to the properties already described for the feeder or other assemblies, it provides the following specific **Properties**:

PLC Input Section

Parameter	Description
Eated	Configure a Boolean input signal sending the status information that a load has been eaten upon a rising edge.

PLC Output Section

Parameter	Description
Enabled	Configure a Boolean controller output signal that enables the eater upon a rising edge.

Statistics Section

Parameter	Description
Observe	Select this check box to add the selected eater to the **Statistics** view: It displays the number of loads that have been removed by this eater from the scene.

multi carrier Catalog

What's in This Chapter

multi carrier - General Information

General Information

Configure your multi carrier or your robot in EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert. Then, open EcoStruxure Machine Expert Twin, establish an OPC UA connection to the controller and use the **Auto-Generation** menu to read the configuration. As a result, the assemblies are created automatically and the **multi carrier** catalog is displayed for reference.

For further information about the **Auto-Generation** menu, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide.

NOTE: Due to the definition of the **Track** object for Lexium™ MC12 multi carrier, the multi carrier objects (except the carriers themselves) are now child objects of a **Track** assembly. In case you are developing your own catalog, access these items using the Entities property of the **Track** assembly.

Content of the Catalog

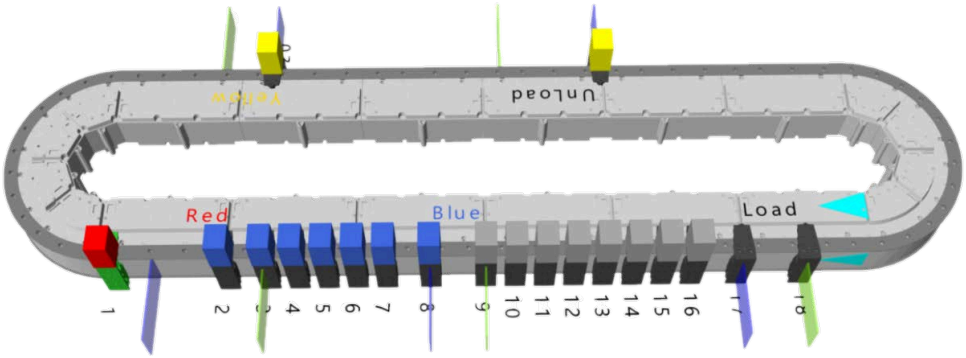
After you have read your multi carrier configuration from EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert, the **multi carrier** catalog is available.

Select the **multi carrier** catalog in the **Catalogs** view to display the **Lexium MC12** node representing the Lexium™ MC12 multi carrier. This node contains subnodes for segments and carriers.

- **Longstator motor straight**
- **Longstator motor arc 45°**
- **Carrier**

  NOTE: multi carrier assemblies cannot be moved from the catalog to the **Model** view. Use the **Auto-Generation** menu to create multi carrier assemblies in the scene. For further information, refer to the **Auto-Generation** Menu chapter of the EcoStruxure Machine Expert Twin Getting Started User Guide.

The figure displays a multi carrier configuration read from EcoStruxure Automation Expert - Motion or EcoStruxure Machine Expert that consists of a track with segments and stations as well as carriers.



Properties of multi carrier

Once you have added an object of the **multi carrier** catalog to the **Model** view, you can select it and display the associated parameters in the **Properties** view on the right-hand side of the EcoStruxure Machine Expert Twin screen. The properties of a **multi carrier** assembly consists of different sections providing the parameters described in the following paragraphs.

multi carrier - Tracks

Overview

A Lexium™ MC12 multi carrier track is an assembly composed of segments and stations.

Identification Section

Parameter	Description
Type	Indicates the type of the **multi carrier** assembly as defined in the catalog.
Category	Indicates the category of the object.
Name	Indicates the default name of the track. Click the field to edit the name.

Association Section

Parameter	Description
Section	Indicates the section in which the selected **multi carrier** track is placed. To shift the **multi carrier** track to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the **multi carrier** track is displayed as a subnode of **Section<n> > multi carrier**.
Control Panel	Indicates the name of the **Controls** tab the **multi carrier** is connected to.

Collision Detection Section

Parameter	Description
Enabled	Indicates that the carrier collision detection is activated.
Overlapping time	Indicates the time during which the carriers should overlap in EcoStruxure Machine Expert Twin to detect a collision.

A collision detection function is available in EcoStruxure Machine Expert Twin. By default, collision detection is enabled and carriers that collide are displayed in red in the scene. A feedback signal is provided to the controller by using the variable *xCollisionDetection* of the DigitalTwinCommunication library (for further information, refer to the *DigitalTwinCommunication Library Guide*).

To enable or disable collision detection, proceed as follows:

Step	Action
1	Select a track or the first physical segment of a multi carrier track in the scene.
2	In the **Solution Explorer** view, select the option **Collision Detection > Enabled**.
3	With the parameter **Overlapping time**, configure a time span within the range of 10 ms...400 ms allowing the carriers to overlap before a collision is detected. The default value is 64 ms that is applicable when the carriers are running with maximum velocity (4000 mm/s) and in close proximity (>5 mm).

NOTE: For collision detection between carriers to become active, enable the physical simulation by clicking the **Play** button.

Display Options Section

Parameter	Description
Show Direction and Logical Start	Select the check box to display a green triangle on the logical position 0 of the track, pointing towards the positive values, and a cyan triangle on the physical zero position of the track. **NOTE:** When both triangles coincide, only the green triangle is visible.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the **multi carrier** track is enabled. Clear this check box to disable the **multi carrier** track: The **multi carrier** track is displayed in grey in the **Model** view and is disabled. Physical properties are not available.

Misc Section

Parameter	Description
Connection Id	Select the check box to display the ID as provided by the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide) for this **multi carrier** connection.
Multi carrier name	Select the check box to display the name of the multi carrier as entered in the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide).

Orientation Section

Parameter	Description
Rot X	Enter the angle (in °) to rotate the track around the X-axis.
Rot Y	Enter the angle (in °) to rotate the track around the Y-axis.
Rot Z	Enter the angle (in °) to rotate the track around the Z-axis.

NOTE: The rotation follows the ZYX convention.

Physical First Segment Section

Parameter	Description
Track ID	Select the check box to display the ID of the track. Carriers with the corresponding **Track ID** are positioned on the track.
Direction Clockwise	Indicates the track direction. If **Direction Clockwise** is TRUE, a movement of carriers in positive moving direction (forward) corresponds to increasing position values, a movement in negative moving direction (backward) corresponds to decreasing position values. For details on the working direction of a multi carrier track, refer to the Multicarrier library (see Multicarrier Library Guide).

Position Section

Parameter	Description
Locked	Select the check box to lock the position of the selected **multi carrier** track to help prevent it from being moved unintentionally.
Position	Enter the x, y, z coordinates (in mm) of the selected **multi carrier** track to modify the position. You can also use the fundamental mathematical operations (addition, subtraction, multiplication and division) to calculate the position coordinates.

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Track Section

Parameter	Description
Total Length	Select the check box to display the length of the multi carrier track. It is the sum of the length of all segments belonging to the track.
Closed	Select the check box to display whether the multi carrier track is closed. A closed track forms a loop, whereas an open track has two open ends.
Geometry	Select the check box to display the geometry of the multi carrier track as a string. Each “s” corresponds to a straight segment (**Longstator motor straight**), and each “c” to a curved segment (**Longstator motor arc 45°**). The geometry is defined in clockwise direction, starting from the first physical segment.

Visualization Section

Parameter	Description
Color	If the **Visible** check box is selected, select a color for the upper and lower guide rails of the **multi carrier** track.
Contrast	If the **Contrast** check box is selected, the **multi carrier** track is displayed in contrast colors. If the **Contrast** check box is cleared, the **multi carrier** track is displayed in the default colors. By default, the **Contrast** check box is selected.
Visible	Clear this check box to hide the **multi carrier** track in the scene.

multi carrier - Segments

Overview

Linked segments form a Lexium™ MC12 multi carrier track. Straight segments (**Longstator motor straight**) and curved segments (**Longstator motor arc 45°**) are available for building a closed or an open track.

Identification Section

Parameter	Description
Type	Indicates the type of the **multi carrier** segment as defined in the catalog.
Category	Indicates the category of the object.
Name	Indicates the default name of the segment. Click the field to edit the name.

Association Section

Parameter	Description
Section	Indicates the section in which the selected **multi carrier** segment is placed. To shift the **multi carrier** segment to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the **multi carrier** segment is displayed as a subnode of **Section<n> > multi carrier**.

Collision Detection Section (for first physical segment)

Parameter	Description
Enabled	Indicates that the carrier collision detection is activated. The property is linked to the **Track** assembly if one is defined.
Overlapping time	Indicates the time during which the carriers should overlap in EcoStruxure Machine Expert Twin to detect a collision. The property is linked to the **Track** assembly if one is defined.

For further information, refer to the **Collision Detection**, page 57 section of the **Track** object.

Display Options Section (for first physical segment)

Parameter	Description
Show Direction and Logical Start	Select the check box to display a green triangle on the logical position 0 of the track, pointing towards the positive values, and a cyan triangle on the physical zero position of the track. The property is linked to the **Track** assembly if one is defined.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the **multi carrier** segment is enabled. Clear this check box to disable the **multi carrier** segment: The **multi carrier** segment is displayed in grey in the **Model** view and is disabled. Physical properties are not available.

Misc Section

Parameter	Description
Connection Id	Select the check box to display the ID as provided by the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide) for this **multi carrier** connection.
Multi carrier name	Select the check box to display the name of the multi carrier as entered in the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide).
Error	Indicates the error state of the segment. If **Error** is TRUE, the check box is selected and an error sign is displayed on top of the segment in the scene.

Physical First Segment Section

Parameter	Description
Enabled	Select the check box for setting the segment as the first physical segment. **NOTE:** Do not set more than one segment per track as first physical segment.
Track ID	Select the check box to display the ID of the track. Carriers with the corresponding **Track ID** are positioned on the track. The property is only available for the first physical segment. The property is linked to the **Track** assembly if one is defined.
Direction Clockwise	Indicates the track direction. If **Direction Clockwise** is TRUE, a movement of carriers in positive moving direction (forward) corresponds to increasing position values, a movement in negative moving direction (backward) corresponds to decreasing position values. For details on the working direction of a multi carrier track, refer to the Multicarrier library (see Multicarrier Library Guide). The property is only available for the first physical segment. The property is linked to the **Track** assembly if one is defined.

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Size Section

Parameter	Description
Length	Select the check box to display the length of a multi carrier segment.

Track Section (for first physical segment)

Parameter	Description
Total Length	Select the check box to display the length of amulti carrier track. It is the sum of the length of all segments belonging to the track.
Closed	Select the check box to display whether the multi carrier track is closed. A closed track forms a loop, whereas an open track has two open ends.

Visualization Section

Parameter	Description
Color	If the **Visible** check box is selected, select a color for the upper and lower guide rails of the **multi carrier** track. The property is only available for the first physical segment. The property is linked to the **Track** assembly if one is defined.
Contrast	If the **Contrast** check box is selected, the **multi carrier** track is displayed in contrast colors. If the **Contrast** check box is cleared, the **multi carrier** track is displayed in the default colors. By default, the **Contrast** check box is selected. The property is only available for the first physical segment. The property is linked to the **Track** assembly if one is defined.
Visible	Clear this check box to hide the **multi carrier** segment in the scene.

multi carrier - Stations

Overview

Stations represents the station objects in the MulticarrierStation library (see MulticarrierStation Library Guide). They are displayed in EcoStruxure Machine Expert Twin to show the position and the name of the station. Stations belong to a Lexium™ MC12 multi carrier track.

Identification Section

Parameter	Description
Type	Indicates the type of the **multi carrier** station as defined in the catalog.
Category	Indicates the category of the object.
Name	Indicates the default name of the station. Click the field to edit the name.

Association Section

Parameter	Description
Section	Indicates the section in which the selected **multi carrier** station is placed. To shift the **multi carrier** station to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the **multi carrier** station is displayed as a subnode of **Section<n> > multi carrier**.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the **multi carrier** station is enabled. Clear this check box to disable the **multi carrier** station: The **multi carrier** station is displayed in grey in the **Model** view and is disabled. Physical properties are not available.

Misc Section

Parameter	Description
Connection Id	Select the check box to display the ID as provided by the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide) for this **multi carrier** connection.
Multi carrier name	Select the check box to display the name of the multi carrier as entered in the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide).

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Visualization Section

Parameter	Description
Visible	Clear this check box to hide the **multi carrier** station in the scene.

multi carrier - Carriers

Overview

A carrier moves on a Lexium™ MC12 multi carrier track.

Identification Section

Parameter	Description
Type	Indicates the type of the carrier as defined in the catalog.
Category	Indicates the category of the object.
Name	Indicates the default name of the carrier. Click the field to edit the name.
Carrier Id	Indicates the carrier ID.

Association Section

Parameter	Description
Section	Indicates the section in which the selected carrier is placed. To shift the carrier to another section, open the **Section** list and select **Section<n>**. **Result**: In the **Solution Explorer** view, the carrier is displayed as a subnode of **Section<n> > multi carrier**.

Functionable Section

Parameter	Description
Enabled	By default, the check box is selected and the carrier is enabled. Clear this check box to disable the carrier: The carrier is displayed in grey in the **Model** view and is disabled. Physical properties are not available.

Misc Section

Parameter	Description
Connection Id	Indicates the ID as provided by the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide) for this **multi carrier** connection.
Multi carrier name	Select the check box to display the name of the multi carrier as entered in the **Auto-Generation** menu (for details, refer to the EcoStruxure Machine Expert Twin Getting Started User Guide).
Track ID	Select the check box to change the value of the **Track ID** assigned to the carrier. The **Track ID** of the track on which the carrier is intended to run and the **Track ID** of the carrier must be identical.
Error	Indicates the error state of the carrier. If **Error** is TRUE, the check box is selected and an error sign is displayed on top of the carrier in the scene.
Text	Select the check box to edit the text displayed next to the carrier in the scene. By default, the text is the carrier ID.

Orientation Section

Parameter	Description
Rot X	Enter the angle (in °) to rotate the carrier around the X-axis.
Rot Y	Enter the angle (in °) to rotate the carrier around the Y-axis.
Rot Z	Enter the angle (in °) to rotate the carrier around the Z-axis.

NOTE: The rotation follows the ZYX convention.

Position Section

Parameter	Description
Locked	Select the check box to lock the position of the selected carrier to help prevent it from being moved unintentionally.
Position	Enter the x, y, z coordinates (in mm) of the selected carrier to modify the position. You can also use the fundamental mathematical operations (addition, subtraction, multiplication and division) to calculate the position coordinates.

Scripts Section

Parameter	Description
Events	Select one of the following **Events**: • **Deselect** • **DoubleClick** • **Reset** • **Select** Click the **Source > ...** button of the event to open a **Script** view where you can enter the programming code to execute when the selected event is detected. The **Script** view provides the same functions as described in the EcoStruxure Machine Expert Twin Getting Started User Guide.

Visualization Section

Parameter	Description
Color	If the **Visible** check box is selected, select a color for the carrier.
Visible	Clear this check box to hide the carrier in the scene.

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.

STEP: (STandard for the Exchange of Product model data) This ISO 10303 standard specifies a standard file format for 3-D models and allows for product data exchange across different platforms.

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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