Demo projects with Bosch Rexroth ctrlX

See also Selmo Help Center

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Customizing the Selmo Studio Project (SEO)

As part of a new Selmo Studio project, the decision has to be made in which control system the PLC program will be used. Although the main part of the program is identical, there are differences, especially in terms of communication and the use of internal libraries.

In Selmo Studio, the selection of the appropriate controller is done in the Target System section. In this case: "Bosch ctrX COREvirtual". The OPC-UA communication protocol is used for this. The settings that were made during the installation and configuration of the OPC-UA server are entered here.



If a virtual PLC is used on the local PC, "Bosch ctrIX COREvirtual" must be entered with the server address localhost and the set port, usually 4840. "boschrexroth" must be entered as username and password. These credentials can be changed if necessary.

Here, communication can then be tested.

Target System -

Select Target System: Bosch ctrIX CORE

Target OPC UA Settings

OPC UA Server Address:	
opc.tcp://192.168.188.45:4840	
OPC UA Server Security Policy:	
None	~
OPC UA Server Security Mode:	
None	•
OPC UA Username:	
boschrexroth	
OPC UA Password:	
•••••••	⋗
Test OPC UA Connection	

In the case of a hardware PLC, the target "Bosch ctrlX CORE" must be selected. In the "Server Address" field, enter the IP address of the PLC. In addition, the login data must be entered according to the settings in the OPC-UA server.

After completion of the modeling, the PLC code is generated and exported in an XML file. It should be noted that the entire PLC program must be exported during the first export.

S Selmo Studio 2024 SP2 Professional [AgitatorTank (AgitatorTank.seo)]
File View Generate Tools Windows Help
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Project Explorer 🚽 📮 🗙 Generate PLC-code 🗄

Afterwards, the export should take place without the IO mapping modules. These building blocks are edited in ctrlX (see below) and could be overwritten in a complete export. It should be noted that any links could be lost.

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Project E	kplorer		▼ 1	+ ×	Ta <mark>G</mark> e	enerate PLC-code without IO mapp	ing

It is essential that this export and subsequent import into ctrlX is carried out in the Selmo Studio every time you make a change. For this reason, it is recommended not to make changes in the exported blocks in ctrlX, as they will be overwritten the next time they are imported.

The SelmoBasic library is still required for the integration of the internal functions. This can be obtained via the export function in the Selmo Studio.



It should always be ensured that the version of the library used in ctrlX matches the version of Selmo Studio. The procedure for import and activation is explained in the corresponding documentation.

Installation and configuration of Bosch Rexroth ctrlX

First, download ctrIX WORKS and then perform the installation. The installation can be done using the default settings, but the following prerequisites should be met:

- MS Windows version 10 or 11.
- Selmo Studio in the current version 2024 SP2
- Currently used version of ctrlX WORKS is 2.6.3
- An OPC UA server is installed as part of the installation.
- A demo license is used locally, and a temporary license can be created online for the HW-PLC.

Optionally, UaExpert can be installed to monitor and diagnose UPC-UA communication.

Please also check which versions are current and what dependencies exist on the other components. It should also be ensured that the following ports are not blocked in the operating system:

Service	Ports (Inbound)
ctrlX CORE Web Interface:	443/TCP (HTTPS, inbound)
ctrlX Data Layer:	2069/TCP (inbound)
OPC UA:	4840/TCP (inbound)
MQTT:	1883/TCP (inbound) and 8883/TCP (secure, inbound)
Modbus TCP:	502/TCP (inbound)
EtherCAT:	34980/UDP (incoming)

Setting up Virtual Control

After successful installation of ctrIX WORKS, a virtual PLC can be created in the Devices section with the following settings:

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ctrlX WORKS ×	Devices				? 🛱 rexroth
亞 Devices					
📟 Engineering Tools					© C +
App Build Environments	Name	State	Туре	IP addresses	Actions
	VirtualControl-1	Offline	ctrlX CORE ^{vir}	tual 127.0.0.1:8443	▷ _
VirtualControl-1					
Basics Extended					
Network adapter O Port	forwarding				
Post formulae *	0				
8022:22,8443:443,8740:1174	0,4840:4840,2069:2	2069,2070:20)70		
External access					
None			\sim		
4			\sim		
RAM (GB)					
4			\sim		
Hardware acceleration					
Windows Hypervisor Platform	1	v U			
Base image version					
2.6.8					
User image					
12kn1zka.user.qcow2					

Start Virtual Control and log in by clicking on "Virtual Control-1" as soon as the status "Online"

appears.

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ctrlX WORKS $ imes$	Devices				?	a rexroth
章 Devices						
📟 Engineering Tools						© C +
🕮 App Build Environments	Name	State	Туре	IP addresses		Actions
	VirtualControl-1	Offline	ctrlX CORE	virtual 127.0.0.1:8443	3	
	2					1

Log in with the user data "boschrexroth" and the corresponding password.



Click on "Install an app" and then select the desired apps from the local directory via "Install from file". These can be selected in the downloaded demo folder.



The apps "PLC" and "OPC UA Server" are required:

VirtualControl-1	×	Settings > A	ops			Service	~	Û	8	ß	?	it a	rexroth
🔓 Home		Apps											
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CC OPC UA	\sim	🗭 Sea	ırch	Q	Search in All	\sim	\mathbb{Y}	Sho	w sys	tem aj	pps		:
Ie PLC		Installed app	DS										
		OPC UA Server	2.6.2 OPC UA Serve	er	Uninsta	u	PLC	2 F	2.6.3 PLC				Uninstall
		ctrlX	Provide data to a	n OPC UA C	lient	ç	triX		Jevelop	o and ru	in PLC i	applicatioi	ns

In the settings of the OPC UA server, activate the option "NONE" and set the check mark to "Allows the use of deprecated 'Security Policies'". Then restart the server.

VirtualControl-1	×	OPC UA >	OPC UA Server configuration	> Server				Service	~ Û	8	e ?	te re	exroth
🔓 Home		Server											
$V_{ m B}$ Diagnostics	\sim												
CPC UA	^	Name	Endpoint URL	Active sessions	Status	Actions		Setup Serve	r				×
Overview		Server	opc.tcp://VirtualControl- 1:4840	0	RUNNING	0	~	Certificate	Endpo	oint S	ession S	Subscription	_
Server							-	Port number * 4840					
								🗸 Allows the	use of de	precatec	l 'Security F	'olicies'	
								'Security' co	nfigurat	ions	\oplus		
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								'User Token'	configu	irations	; ⊕		
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								USERINAIVIE		AE	S256 SHA2	256 RSAPS	
								USERNAME		S			
Settings O								Save Car	ncel				

Then set the operating mode back to Operating.



The settings for a ctrIX CORE controller are similar, you also have to transfer the licenses and set the IP address.

Settings in the ctrlX PLC project

In the Engineering Tools section, open the program "ctrlX PLC-Engineering".



Create a new project and choose a name and path for the project:

📟 ctrIX PLC Engineering					- (x c
File Edit View Project Build Online Debug Tools Window Help						
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	Latest projects use	d	Gith	ib.		
	Close page after loading	g the project				
POUs Z Devices	Show page upon start					
Messages - Total 0 error(s), 0 warning(s), 0 message(s)						- ₽ X
• O varning(s) • O varning(s)	message(s) X X		D : .			
Description			Project	Object	Position	
Messages - Total 0 error(s), 0 warning(s), 0 message(s) 🕱 Cross Reference List						
		Last build: 🙆 0 😗 0	Precompile 🗸	Project user:	(nobody)	()

Select "ctrlX OS x64 project" as the template and select name and save path.

📋 New Pro	oject			×
Categories	3	Templates		
Lit	praries	PLC	PLC	
		ctrlX OS ARM64 project	ctrlX OS x64 pro	
		PLC	PLC	
		Empty project	Standard project	
Standard p	roject using a ctrlX OS x64 d	evice		
Name	Project xy			
Location	C:\Projekte\Project xy			~
			ОК	Cancel

It is then necessary to import the PLCopenXML file from the Selmo Studio. First, select "Application" and then click on "Project". In the following menu, select the option "Import PLCopenXML".

C:\Projekte\Project xy	Project xy.project - ctrIX PLC Engineering	
File Edit View P	oject Build Online Debug Tools	Window Help
12 🚅 🖬 🛯 🖌 🎽	Add Object	🕨 🆄 l 🛱 👘 - 🖸
2	Add Folder	
Devices	Scan for Devices	- 4 X
Project xy	Update Device	-
B- Device (ctrlX	Edit Object	
PLC Logic	Edit Object With	
= C App	Online Config Mode	
	Set Active Application	
	Project Information	
	Project Settings	
🖻 🥨 1	Project Environment	
≡ -\$	Project Localization	•
Datal aur d	Project synchronization	
JataLaye	Synchronization cache	
æ	Document	
5	Compare	
7.	Commit Accepted Changes	
	Export	
	Import	
	Export PLCopenXML	
	Import PLCopenXML	
3	User Management	•
B	Insert templates	
	Enable SoftMotion	
POUs 🧝 Devices		

Check all the "Insertable Items" you need and then press "Ok". If you have already created the project and only want to apply changes, select the option "Replace the existing objects (for all conflicts)".

Import PLCopenXML	×
Contents Additional Information	
Please select the items which should be imported. All items will be imported below the node which is currently You can change this selection while this dialog is open. Currently selected target object: Application [Device: PLC Logic]	y selected in the navigator.
Insertable Items ♥ ① Assembler ♥ ② Assembler_Drivers ♥ ② Assembler_InputMapping ♥ ② Assembler_OutputMapping ♥ ② Assembler_Project ♥ ③ Assembler_Project_Control ♥ ④ Assembler_Project_TCMZ ♥ ④ Base_conveyor_1 ♥ ④ Base_conveyor_1 ♥ ④ Base_conveyor_2 ● ④ Base_conveyor_3	Conflict Resolution
Select > Deselect > Conflicts > Show Contents Replace the existing object (for Rename the new object (for Skip the new object (for all contents)	. OK Cancel (for all conflicts). (all conflicts).

Under "Application", add a new folder named "GVLs".





Right-click the new GVLs folder, and then select Add Object. Then select "Global Variable List..." from.

E:\Projekte\Project xy\Project xy.project* - ctrlX PLC Enginee	ring	
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		Add Global Variable List
Devices	→ ‡ X	
Project xy		Create a new global variable list
Device (ctrlX CORE x64)		create a new grobal variable hat
Add Data Layer variables		Name
🚺 🗉 📄 Import from FlatBuffers file		GVL
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Kan Add Object	Alarm Configuration	
Add Folder	Alarm countemplate	
Edit Object	Application	
Edit Object With	Axis Group	
Insert templates	🔏 Cam table	
	🖄 CNC program	
Login	- 🔬 CNC settings	Add
Delete application from device	Communication Manager	
	Data Sources Manager	
	◆☆ DUT	
POUs 🗶 Devices	External File	
Messages - Total 950 error(s), 19 warning(s), 46 message(s)	Global Variable List	Furthermore, check whether th

current "Selmo Basic" library is already installed. To do this, first select the "Library Manager" menu item and then select the "Library Repository" menu item. In the selection there, under "Application \rightarrow Common", the library "Selmo Basic" should be available in the version that was previously exported from the Selmo Studio. Otherwise, you will need to reinstall the library via the "Install" menu item.

ces	🗸 🕂 🗙 👔 Library Manager 🗙		
Project xy	💽 🛃 Add Library 🔀 Delete Library 🔤 Properties 💿 Details 💷 Placeholders 🦻 Library Param	eters 🎁 Library Rep	ository 🕦 Icon Legend
Device (ctrlX CORE x64)	Libraries used in application 'Device.Application'		
Application ChedFunction ChedFunctions ChedFunctions ChedFunctions	Name #-1 33License = 35License, 3.5.19.10 (35 - Smart Software Solutions GmbH) # 1 BreakpointLogging = Breakpoint Logging Functions, 3.5.17.0 (35 - Smart Software Solutions GmbH)	Namespace _3S_LICENSE BPLog	Effective Version 3.5.19.10 3.5.17.0
Library Manager LC_PRG (PRG) Symbol Configuration Task Configuration	Location System V Edit Locations	CmpLog CXAC_Base CXA_CommonTypes CXA_Utilities	3.5.17.0 1.18.3.0 1.18.1.0 2.6.2.0
● 愛 MainTask (IEC-Tasks) □ PLC_PRG □ DataLayer_Realtime	Instaled Libraries Install Company (All companies) Uninstall		
	Bandartor System Find		
	Details		
	Trust Certificate		

If the library exists, it must be accessed via "Add Library..." can be added to the project.



In the menu item "Symbol Configuration...", check whether the options "Support OPC UA features" and "Optimized Layout" are selected.



In the following, the inputs and outputs in the GVL are written, which can be found in the documentation of the demo program. The use of these specific labels is crucial to ensure optimal communication with the simulation.



The variables are linked to the prepared I/Os of the respective sequences in the corresponding "xxx_InputMapping" or "xxx_OutputMapping" modules. For this purpose, it is necessary to remove the comment of the lines and to read or write the variables from the GVL.



Open PLC_PRG (PRG) and enter "GlobalControl ();".

📟 C:\Projekte\Project xy\Project xy.project - ctrlX PLC Engineering <u>File Edit View Project Build Online Debug Tools Window Help</u> 🎦 🚄 🔚 🖕 🗠 👗 🛍 🎕 🛤 🍇 🍓 🌿 🗍 🦜 🦄 🍓 🔚 🖬 🖉 🛍 🛗 🖬 🖓 🛍 👘 🗗 🕮 🛯 🧐 🔶 👘 👋 💭 👘 Devices **-** ₽ X 🙆 GVL Assembler_InputMapping PLC_PRG X PROGRAM PLC_PRG Project xy • 1 Device (ctrlX CORE x64) VAR END_VAR PLC Logic Application 🗄 🚞 CheckFunctions 🖶 🚞 GVLs 🧭 GVL POUs 🗄 🗀 Plant GlobalControl(); 👘 Library Manager PLC_PRG (PRG) Symbol Configuration 🖹 🔣 Task Configuration MainTask (IEC-Tasks) PLC_PRG 间 DataLayer_Realtime

Go to the icon configuration and click on "Build".



Right-click the context menu and select "Application" and then "Add Object". Then select "Persistent Variables..." from.



Open "Persistent Variables", right-click and go to "Add All Instance Paths".



Press F11 or "Build", after which you can save the project.

PLC C:\	Projekte	e∖Project	xy\Projec	t xy.project - ctr	IX PLC En	gineering				
File	Edit	View	Project	Declarations	Build	Online	Debug	Tools	Window	Help
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Devices							-	д X	PLC	_PRG
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<u> </u>	👔 Devi	ice (ctrlX	CORE x64)						⊟ 2	VAR
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			PLC	PRG					16	
		ŢΓ	PersistentVa	ars					17	
		DataLaye	er_Realtime						18	
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Make sure that "ctrlX PLC Gateway - x64" is running.



Next, select the network path to the controller. Use "Scan Network" to find the active device and log in with an IP address:



You may be asked to accept the controller's certificate and install it.



Now you can generate the code (F11) and log in. In the process, the code is transmitted.

C:\Projekte\Project xy\Project xy.project - ctrlX PLC Engineering			- 🗆 X
<u>File Edit View Project Build Online Debug Tool</u>	s <u>W</u> indow <u>H</u> e	elp	
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Devices	- ₽ X	Device x	-
Project xy	-	Communication Applications Files Log PLC Settings PLC Shell Users and Groups Access Rights Symbol Rights	Licensed Software Metrics
Device (ctrlX CORE x64)		Scan network Gateways • Device •	
E II PLC Logic			
Application		IP-address not yet applied	
CheckFunctions			
GVLs			
GVL		PLC gateway ctrIX OS device	
POUS		CtrlX-PLC-Gateway	Apply
Dirary Manager			
		IP address localhost Device name <u>VirtualControl-1</u>	
- 1944 Task Configuration		Port 1217 System status OPERATING	
MainTask (IFC-Tasks)		Hardware platform amd64 (x64)	
- I PLC PRG		Serial number FD5383CC-2977-11	B2-A85C-8C529114C10A
T PersistentVars		Type code ctrlX COREvirtual	
DataLayer Realtime		App 2.6.3	
		License(s) Basic, Standard, Ad	vanced, Performance
		Ports HTTPS:443 (OK)	
		PLC:11740 (OK)	

The controller can now be started and you can observe, set/reset the variables online, etc.

<u>File Edit View Project Build On</u>	line <u>D</u> ebug <u>T</u> ools <u>W</u> indow <u>H</u> elp			
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