SIEMENS

SINUMERIK

SINUMERIK ONE
Create MyESW - Engineering & Service Workflow

System Manual

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Valid for:
CMC software Version 6.2
SINUMERIK ONE Version 6.15
Create MyESW Version 1.2

07/2021
A5E51086628B-AB

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ **DANGER**
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ **WARNING**
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ **CAUTION**
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ **WARNING**
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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A5E51086628B-AB
Ⓟ 10/2021 Subject to change

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Introduction 1

1.1 About SINUMERIK

From simple, standardized CNC machines to premium modular machine designs – the SINUMERIK CNCs offer the right solution for all machine concepts. Whether for individual parts or mass production, simple or complex workpieces – SINUMERIK is the highly dynamic automation solution, integrated for all areas of production. From prototype construction and tool design to mold making, all the way to large-scale series production.

Visit our website for more information SINUMERIK (https://www.siemens.com/sinumerik).

1.2 About this documentation

Target group

OEMs with high automation needs, both in the field of commissioning and in engineering, are the target group for Engineering & Service Workflow (ESW).

Precondition

To create a specific workflow, it is necessary to have a good knowledge of configuring and programming TIA, Openness and C#, as well as Create MyConfig (CMC) and also, if used, EPLAN.

Knowledge of commissioning processes is required to use the workflow.

Standard scope

This documentation only describes the functionality of the standard version. This may differ from the scope of the functionality of the system that is actually supplied. Please refer to the ordering documentation only for the functionality of the supplied drive system.

It may be possible to execute other functions in the system which are not described in this documentation. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

For reasons of clarity, this documentation cannot include all of the detailed information on all product types. Further, this documentation cannot take into consideration every conceivable type of installation, operation and service/maintenance.

The machine manufacturer must document any additions or modifications they make to the product themselves.

Websites of third-party companies

This document may contain hyperlinks to third-party websites. Siemens is not responsible for and shall not be liable for these websites and their content. Siemens has no control over the information which appears on these websites and is not responsible for the content and information provided there. The user bears the risk for their use.

1.3 Documentation on the internet

1.3.1 Documentation overview SINUMERIK ONE

Comprehensive documentation about the functions provided in SINUMERIK ONE Version 6.13 and higher is provided in the Documentation overview SINUMERIK ONE (https://support.industry.siemens.com/cs/ww/en/view/109768483).



You can display documents or download them in PDF and HTML5 format.

The documentation is divided into the following categories:

- User: Operating
- User: Programming
- Manufacturer/Service: Functions
- Manufacturer/Service: Hardware
- Manufacturer/Service: Configuration/Setup
- Manufacturer/Service: Safety Integrated
- Information and training
- Manufacturer/Service: SINAMICS

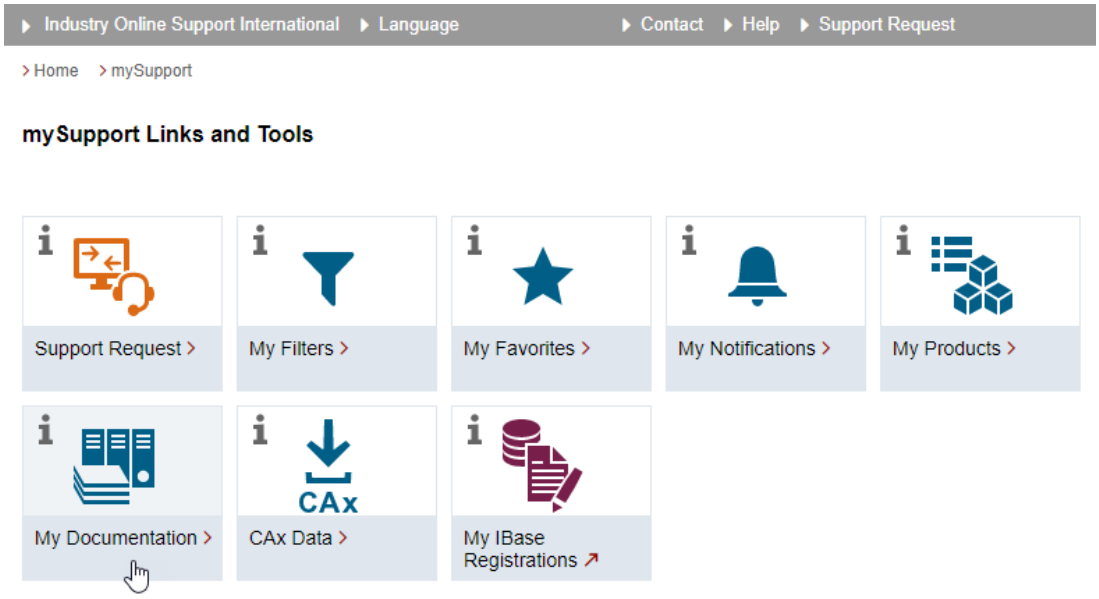
1.4 Feedback on the technical documentation

If you have any questions, suggestions or corrections regarding the technical documentation which is published in the Siemens Industry Online Support, use the link "Send feedback" link which appears at the end of the entry.

1.5 mySupport documentation

With the "mySupport documentation" web-based system you can compile your own individual documentation based on Siemens content, and adapt it for your own machine documentation.

To start the application, click on the "My Documentation" tile on the mySupport homepage (https://support.industry.siemens.com/cs/ww/en/my):



The configured manual can be exported in RTF, PDF or XML format.

Note

Siemens content that supports the mySupport documentation application can be identified by the presence of the "Configure" link.

1.6 Service and Support

Product support

You can find more information about products on the internet:

Product support (https://support.industry.siemens.com/cs/ww/en/)

The following is provided at this address:

- Up-to-date product information (product announcements)
- FAQs (frequently asked questions)
- Manuals
- Downloads
- Newsletters with the latest information about your products
- Global forum for information and best practice sharing between users and specialists
- Local contact persons via our Contacts at Siemens database (→ "Contact")
- Information about field services, repairs, spare parts, and much more (→ "Field Service")

Technical support

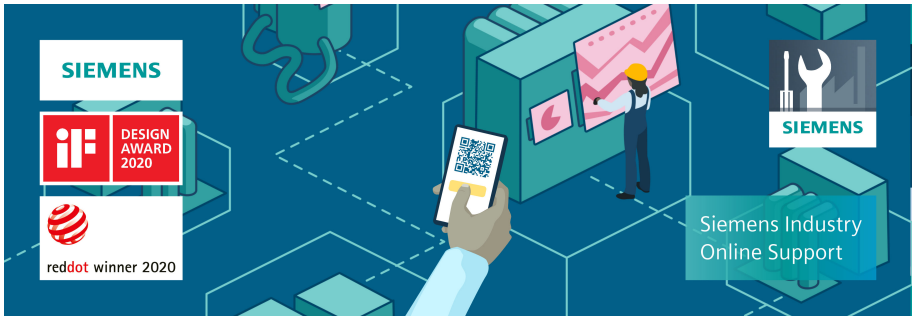
Country-specific telephone numbers for technical support are provided on the internet at address (https://support.industry.siemens.com/cs/ww/en/sc/4868) in the "Contact" area.

If you have any technical questions, please use the online form in the "Support Request" area.

Training

You can find information on SITRAIN at the following address (https://www.siemens.com/sitrain).
SITRAIN offers training courses for automation and drives products, systems and solutions from Siemens.

Siemens support on the go



With the award-winning "Siemens Industry Online Support" app, you can access more than 300,000 documents for Siemens Industry products – any time and from anywhere. The app can support you in areas including:

- Resolving problems when implementing a project
- Troubleshooting when faults develop
- Expanding a system or planning a new system

Furthermore, you have access to the Technical Forum and other articles from our experts:

- FAQs
- Application examples
- Manuals
- Certificates
- Product announcements and much more

The "Siemens Industry Online Support" app is available for Apple iOS and Android.

Data matrix code on the nameplate

The data matrix code on the nameplate contains the specific device data. This code can be read with a smartphone and technical information about the device displayed via the "Industry Online Support" mobile app.

1.7 Important product information

Using OpenSSL

This product can contain the following software:

- Software developed by the OpenSSL project for use in the OpenSSL toolkit
- Cryptographic software created by Eric Young.
- Software developed by Eric Young

You can find more information on the internet:

- OpenSSL (https://www.openssl.org)
- Cryptsoft (https://www.cryptsoft.com)

Compliance with the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the data minimization rules (privacy by design).

For this product, this means:

The product does not process or store any personal data, only technical function data (e.g. time stamps). If the user links this data with other data (e.g. shift plans) or if he/she stores person-related data on the same data medium (e.g. hard disk), thus personalizing this data, he/she must ensure compliance with the applicable data protection stipulations.

Fundamental safety instructions 2

2.1 General safety instructions

⚠ WARNING

Danger to life if the safety instructions and residual risks are not observed

If the safety instructions and residual risks in the associated hardware documentation are not observed, accidents involving severe injuries or death can occur.

- Observe the safety instructions given in the hardware documentation.
- Consider the residual risks for the risk evaluation.

⚠ WARNING

Malfunctions of the machine as a result of incorrect or changed parameter settings

As a result of incorrect or changed parameterization, machines can malfunction, which in turn can lead to injuries or death.

- Protect the parameterization against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

2.2 Warranty and liability for application examples

Application examples are not binding and do not claim to be complete regarding configuration, equipment or any eventuality which may arise. Application examples do not represent specific customer solutions, but are only intended to provide support for typical tasks.

As the user you yourself are responsible for ensuring that the products described are operated correctly. Application examples do not relieve you of your responsibility for safe handling when using, installing, operating and maintaining the equipment.

2.3 Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions constitute one element of such a concept.

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to

an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

For additional information on industrial security measures that may be implemented, please visit
https://www.siemens.com/industrialsecurity (https://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends that product updates are applied as soon as they are available and that the latest product versions are used. Use of product versions that are no longer supported, and failure to apply the latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under
https://www.siemens.com/industrialsecurity (https://new.siemens.com/global/en/products/services/cert.html#Subscriptions).

Further information is provided on the Internet:

Industrial Security Configuration Manual (https://support.industry.siemens.com/cs/ww/en/view/108862708)

⚠ WARNING

Unsafe operating states resulting from software manipulation

Software manipulations, e.g. viruses, Trojans, or worms, can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- On completion of commissioning, check all security-related settings.

Objectives of the workflow

3

3.1 Overview

The automated engineering and service workflow "Create MyESW" meets the machine tool manufacturer's requirement to automate not only in terms of commissioning, but also the upstream engineering workflow.

A completely automated workflow has therefore been achieved: for series machines, modular machines and series machines equipped with options. At the press of a button, essentially free of manual entries - from customer order through to commissioning.

The engineering workflow, as well as commissioning, can be tested in the office on a PC via "Create MyVirtual Maschine" (CMVM).

The engineering workflow only functions for SINUMERIK ONE.

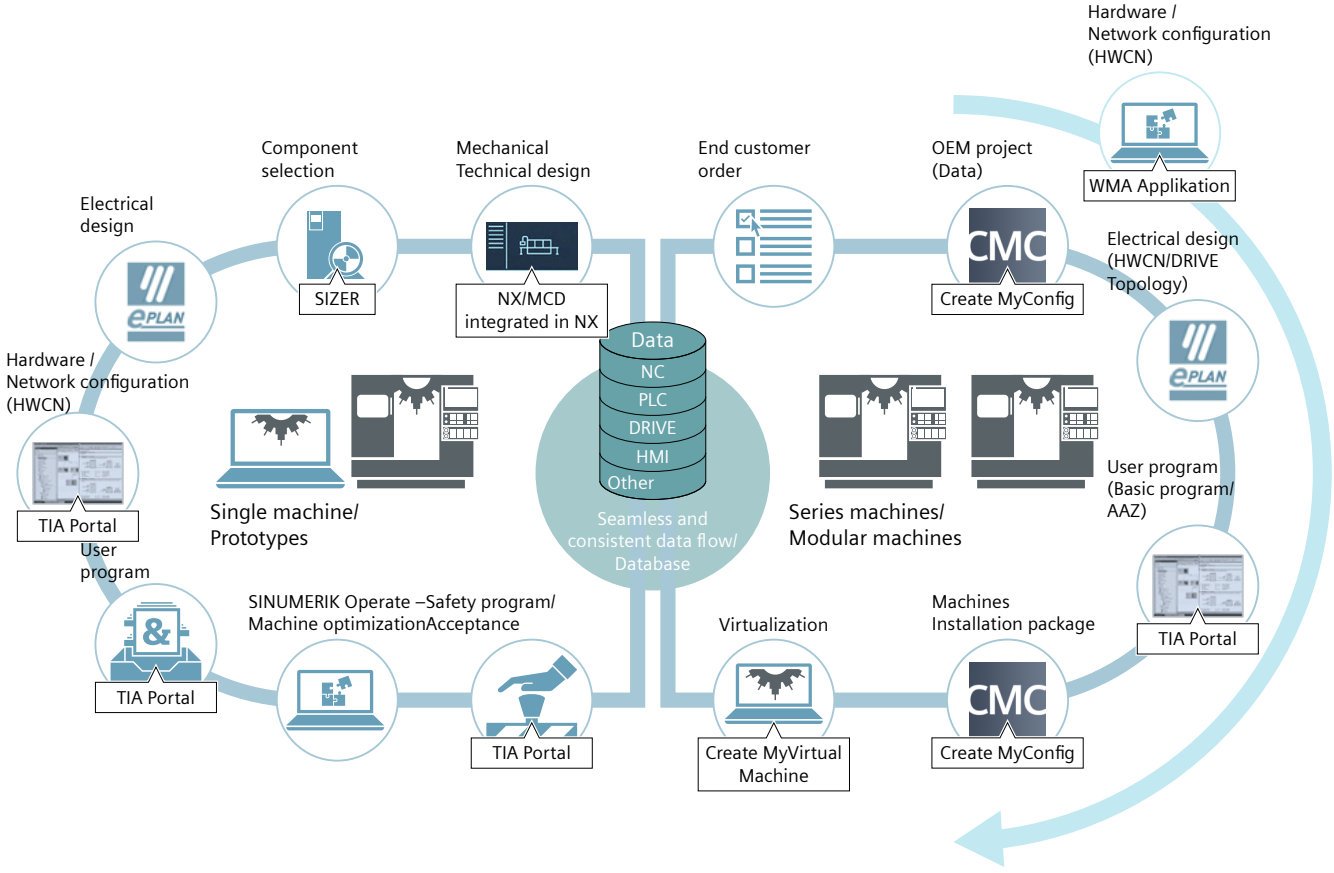


Figure 3-1 Overview - Seamless and consistent data flow

Automated workflow

4

4.1 Overview

The entire production process for machine tool systems on the OEM side is divided into two basic phases:

1. Preparation and development phase (left)
2. Automated workflow for the production process at the OEM (right)

The "Central Repository" is the central database store for all available machine instances and the "Machine concept list 150%", from which the OEM obtains all data available to him.

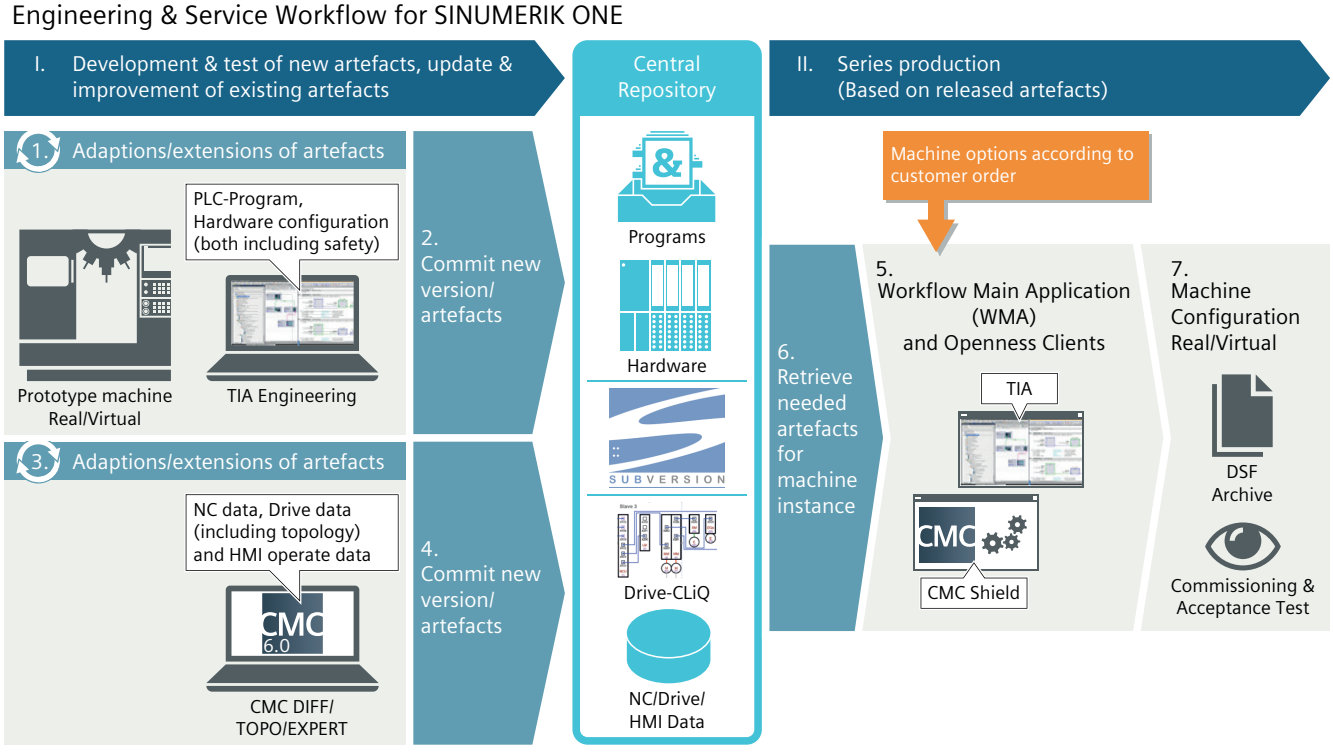


Figure 4-1 Automated workflow - overview

Preparation and development phase

Left side of the graphic:

The engineering artifacts are interactively created, tested and maintained by the OEM developers using the respective engineering tools. This is usually done with the help of a machine prototype at the OEM's production site.

Engineering artifacts are all data that are combined into a machine configuration using the appropriate engineering tools.

This is, for example, the normal manual use of TIA Portal to create (Safety) program blocks or to configure hardware modules ①.

The artifacts for NCK, Drive and HMI Operate are developed and programmed with the components of the engineering software Create MyConfig Diff, Expert or Topo③.

Whenever an artifact has reached a version or status that is to be used in the production process, this version or status is checked into the "Central Repository" ②.

For TIA Portal, for example, these are artifacts such as (Safety) program blocks or hardware configuration data ②.

CMC-related artifacts can be, for example, HMI operating data, NCK parameters or drive data ④.

Central database store (Central Repository)

Center part of the graphic:

The "Central Repository" represents a version control system that contains the work results of the preparation phase. These are, for example, artifacts such as program blocks, drive parameter lists, machine data, etc. The work results are created by the OEM's developers or configuration engineers using the engineering tools.

The left and middle parts of the graphic, thus the preparation and development phase and the "Central Repository", represent an analogy to the current software development processes, where developers create and manage source code. This data is finally stored in a "Central Repository".

Automated workflow for the production process at the OEM

Right side of the graphic:

The automated workflow for the production process at the OEM is shown, which includes the handling of the engineering artifacts for the F-PLC from SINUMERIK ONE with TIA Portal. TIA Portal includes, for example, the program blocks, including Safety and HW configuration.

In this second phase of the workflow, engineering artifacts are retrieved from the "Central Repository" in the required version to create complete machine configurations in an automated way.

The engineering artifacts are selected from the central database store with a specific machine instance depending on the order of a customer ⑤. The selected artifacts are automatically assembled to create a consistent machine configuration for a specific machine instance ⑥.

The engineering tool chain required for this workflow is controlled by the "Workflow Main Application (WMA)" ⑤. The WMA ensures that all required engineering steps run in the correct order for all required engineering tools. This means that the same tools for the same artifacts run as they already did in the preparation and development phase (left side of the graphic). Data is transferred between the engineering tools and the central database store via files. The data resides locally on a Build server. Therefore, all required tools are run on the Build server (a PC) at the OEM site, in a so-called "Workspace". The "Workspace" is a directory structure that serves as an exchange medium with the "Central Repository".

The "Workflow Main Application (WMA)" is provided by SIEMENS as a sample application for the OEMs with source code (C# for Microsoft.NET, a Windows application) so that the OEMs can

adapt it to their infrastructure and processes. This includes, for example, existing repositories, databases, sequence, management systems, or additional data to be considered.

Furthermore, for some tasks that are required to control the TIA Portal, SIEMENS provides specific "Openness Clients", some of which can also perform safety-related actions. This includes, for example, the creation of a SINUMERIK DSF PLC archive in the TIA Portal for SINUMERIK ONE with Safety program.

The resulting machine configuration, which is mapped in the DSF archive ⑦, is then ready for use to be called on a real SINUMERIK ONE and/or its digital twin Create MyVirtual Machine (CMVM).

Provisioning can only take place in a separate, additional step via a USB flash drive or CMC Shield. This final step is not automated for safety reasons.

Note

Workflow Main Application (WMA)

The WMA is provided to you. You will find the WMA on the DVD of the Toolbox.

4.2 Requirements

The engineering workflow only functions in conjunction with the "Create MyConfig" engineering tool from Version 6.0. As a consequence, it is advantageous or necessary that users are familiar and have experience in using "Create MyConfig" (CMC). Users, who have already created modular commissioning packages using CMC can build on this know-how.

Superset:

An additional precondition involves "150% data packages" (supersets) for machine series. "150% data packages" minimize the engineering costs; as a consequence, if only one machine is engineered, then only the necessary components are activated or deactivated.



Figure 4-2 Superset

- 150%: The superset contains all data of a machine series
- 100%: The subset contains a subset of the superset. Only the data of the machine currently being configured

A typical example is the SINUMERIK CNC software. Axes, functions and technologies required are activated or deactivated using machine data and licenses. The CNC software therefore represents a "150% function and data package", the activated part, "100%".

To keep the engineering costs as low as possible, establish the data management system for the engineering workflow in a similar way.

Axes and spindles:

DO lists:

Axes and spindles are required in "150% DO lists" for CMC or for accepting the drive topology from EPLAN.

Note

More information

You can find the concept of DO lists under Create MyConfig Topo in the section "Topo - Operation" > "Managing DO lists" in:

- Create MyConfig Topo online help
- Create MyConfig Diff, Expert, Topo Operating Manual

Machine concept list:

In the "150% machine concept list", all NC axes and their parameterization (e.g. I/O addresses, Safety telegram) are listed.

User program:

Structure the "150% PLC user program" so that you do not have to make any code changes when engineering the system. The functions required are activated using options. In order that commissioning can be flexibly arranged, it is planned to facilitate the setup of the data management system later online when commissioning with or without CMC.

Failsafe program:

Appropriately prepare a series: with a user program, a "150 % failsafe program" and a list of all of the possible axes and spindles.

Note

For reasons of variance, the drive topology, the hardware configuration in EPLAN or Step7 (HWCN) and axis-drive assignments are not part of the preparation. The engineering workflow generates these.

4.3 Licenses

4.3.1 Software and licenses

Overview of the software and licenses that you require:

Description	Optional	Article number	Available license forms				
			Procedure	Float	Single	30d Trial	50h Service
TIA Portal STEP 7 Professional V17		6ES7822-1..06-	ALM	✓	-	✓	
• SINUMERIK ONE STEP 7 Toolbox V17		6FC58..- (on CNC software DVD)	No additional license				✓
TIA Portal Safety Advanced V17	✓	6ES7833-1F.1.-	ALM	✓	-	✓	
Automated Engineering & Service Workflow (Create MyESW)		6FC5862-2YF60-0YA0	ALM	✓	-	✓	-
Openness clients: - Axis-drive assignment - Configuration data (Config Data) - F-initialization - Create DSF archive	-	Included in SINUMERIK ONE Toolbox	No additional license				
Create MyConfig 6.2 Create MyConfig from Version 6.1		6FC5862-2YC60-0YA8 MCS1025 (Product ID)	CoL				
ADDON "ECAD IMPORT" (EPLAN Add-In) Precondition: EPLAN Professional V2.7 to 2.9 & EADN270 license	✓	6FC5862-2YF44-1YA0 MCS10201	ALM	✓	-	✓	-

Figure 4-3 Software and licenses

Note

Trial license without Create MyConfig

If you use Openness Clients without Create MyConfig, then manually copy the trial license to [CommonAppDataFolder]Siemens\Automation\SWS\Templates.

4.3.2 Constraints

With the current version of "Create MyESW - Engineering & Service Workflow V1.2", not all steps of the described procedure are executed automatically.

The focus is on the initial commissioning of a series machine of a series.

Future versions will then support step-by-step commissioning, service and updates.

Notes

Carefully observe the following engineering workflow notes.

Note

Safety "Workflow Main Application"

The application for the workflow (Create MyESW / WMA) is provided as code sample and template for developing your own OEM application. Only the interfaces and handling in the tools involved, e.g. the openness interface of the TIA Portals, are secured.

Customers are responsible for the reliability and maintaining the security guidelines of the "Workflow Main Application".

Note

Installation on a computer

It is essential to install and use the following on one computer:

- Application for the workflow (Create MyESW / WMA)
- Openness Clients
- TIA Portal

The data exchange between the applications takes place locally on a computer. Cross-computer communication is not permissible.

Hardware

5

5.1 Machine concept list

5.1.1 Creating a machine concept list for a machine or series

A machine concept list "mclist.mcl" contains all NC axes and their I/O addresses and the telegrams of a machine series.

You can also create a machine concept list for a single machine, just like a DO list.

If the machine concept list contains more than one machine, it corresponds to a 150% list and you only create it once for a series. The machine concept list is then reused for each configuration of an individual machine.

Note

150% list

Synonym for data of a superset.

The superset contains all data of a machine series.

5.2 Schematic diagram with EPLAN

In the following schematic diagram, an initial overview shows in which order and with which tool you create and import which files.

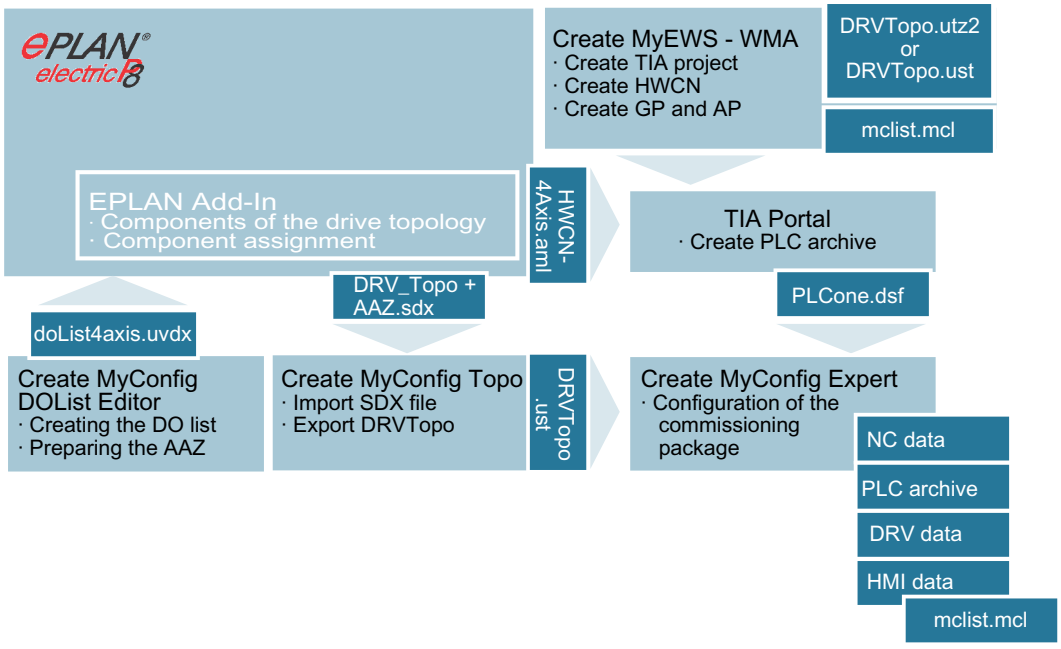


Figure 5-1 Schematic diagram with EPLAN

More information

Abbreviations and file names can be found in the appendix in the "List of abbreviations (Page 73)".

5.3 Schematic diagram without EPLAN

In the following schematic diagram, an initial overview shows in which order and with which tool you create and import which files.

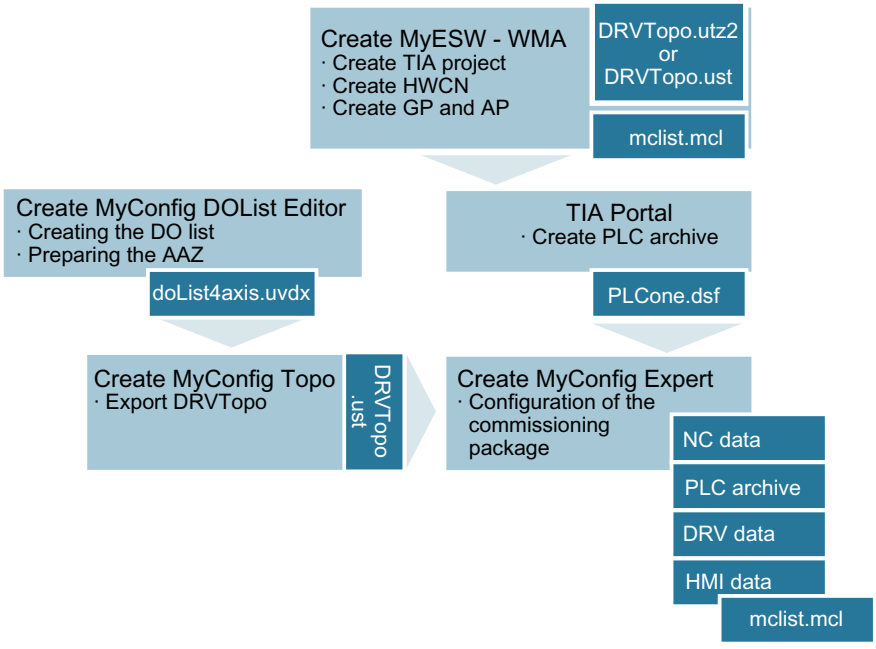


Figure 5-2 Schematic diagram without EPLAN

More information

Abbreviations and file names can be found in the appendix in the "List of abbreviations (Page 73)".

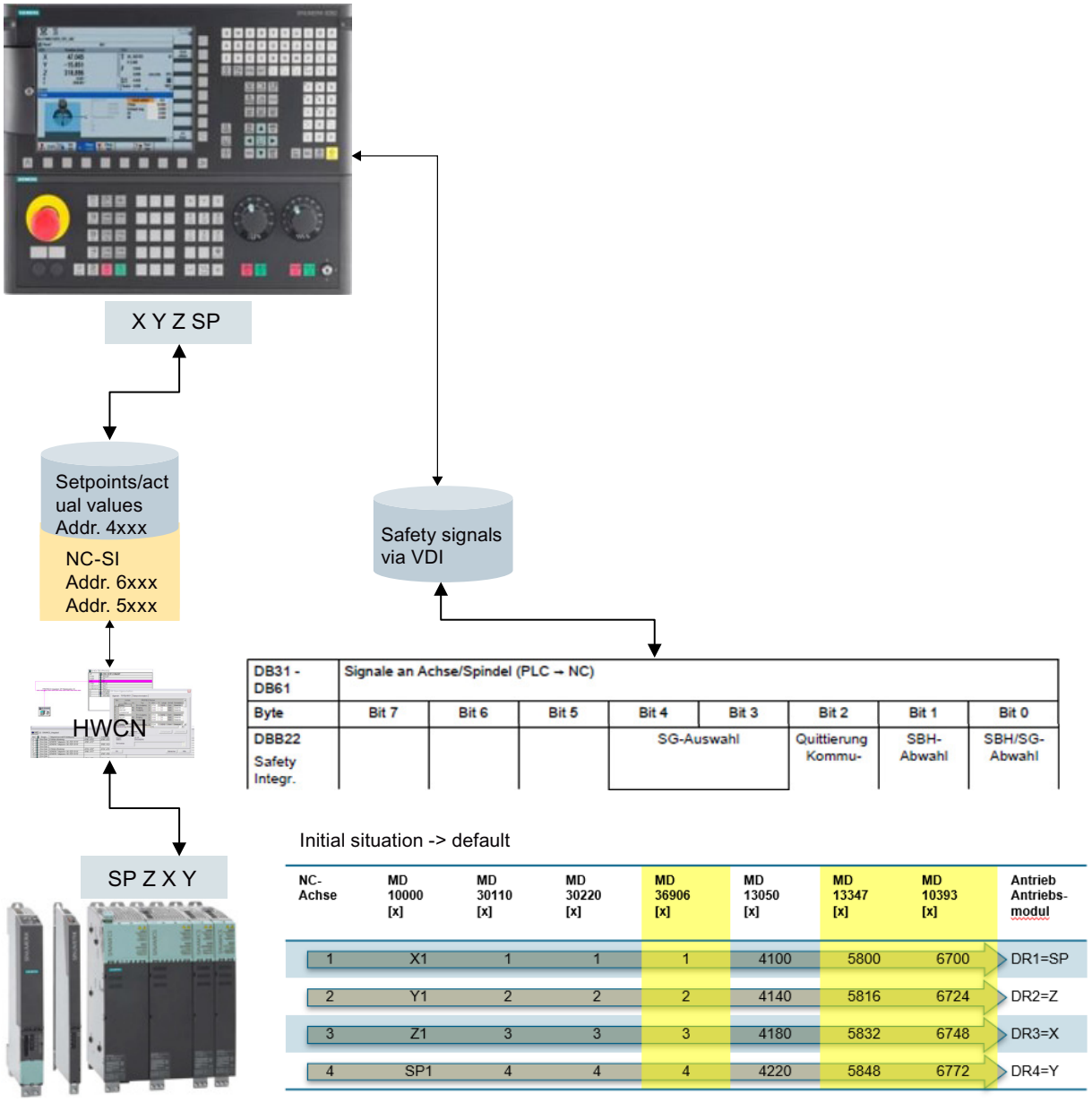
5.4 Axis-drive assignment

5.4.1 Introduction

For SINUMERIK 840D sl, an "axis-drive assignment" is recommended using the NC machine data.

The "blue route" or the "green route" was used:

- Blue route: Assigning the drive number in "MD30110"
- Green route: Assignment using "I/O addresses" in "MD13050"



DB31 - DB61	Signale an Achse/Spindel (PLC → NC)							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DBB22 Safety Integr.				SG-Auswahl		Quittierung Kommu-	SBH-Abwahl	SBH/SG-Abwahl

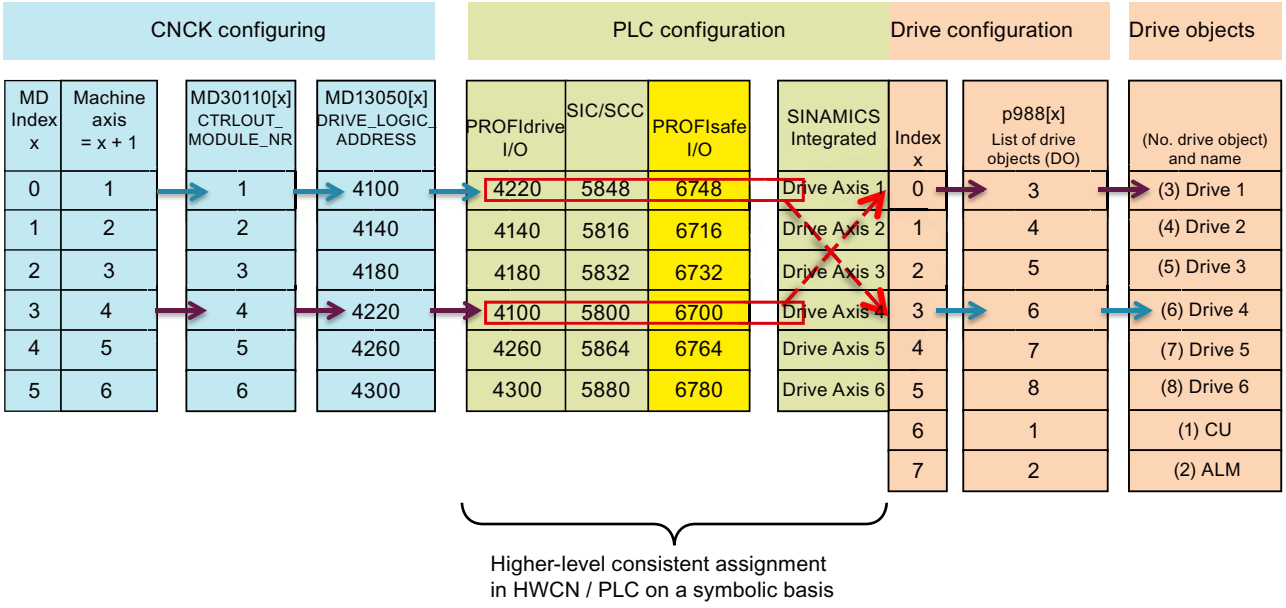
Initial situation -> default

NC-Achse	MD 10000 [x]	MD 30110 [x]	MD 30220 [x]	MD 36906 [x]	MD 13050 [x]	MD 13347 [x]	MD 10393 [x]	Antrieb Antriebs-modul
1	X1	1	1	1	4100	5800	6700	DR1=SP
2	Y1	2	2	2	4140	5816	6724	DR2=Z
3	Z1	3	3	3	4180	5832	6748	DR3=X
4	SP1	4	4	4	4220	5848	6772	DR4=Y

Figure 5-3 Axis-drive assignment - initial situation, SINUMERIK 840D sl

5.4.2 Using the axis-drive assignment with SINUMERIK ONE

When using Safety Integrated in SINUMERIK ONE, the drive safety telegrams are directly processed in the F-PLC. On the other hand, all standard telegrams are processed by the NC. However, a consistent "axis-drive assignment" must always take into account both aspects for each axis, both standard as well as safety telegrams.

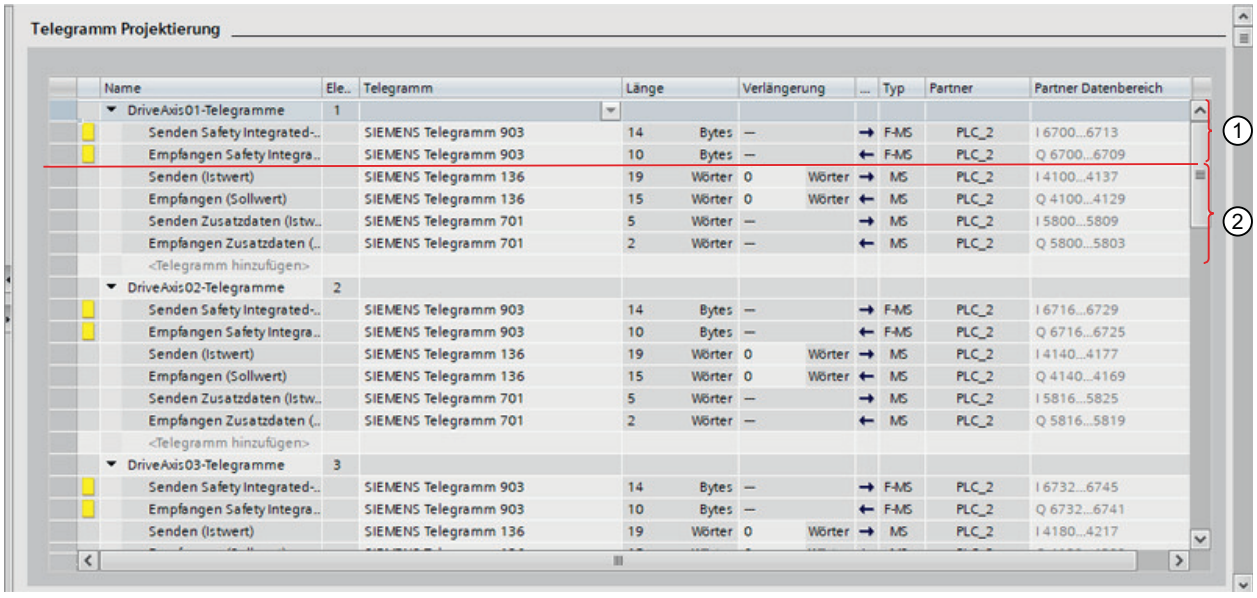


As a consequence, a consistent "axis-drive assignment" can no longer be solely implemented in the NC using machine data "MD30110 / MD13050" so that all telegrams of a drive object can be assigned together as a unit/telegram bundle. As a consequence, for SINUMERIK ONE, an axis-drive assignment in the hardware configuration is recommended using the TIA Portal.

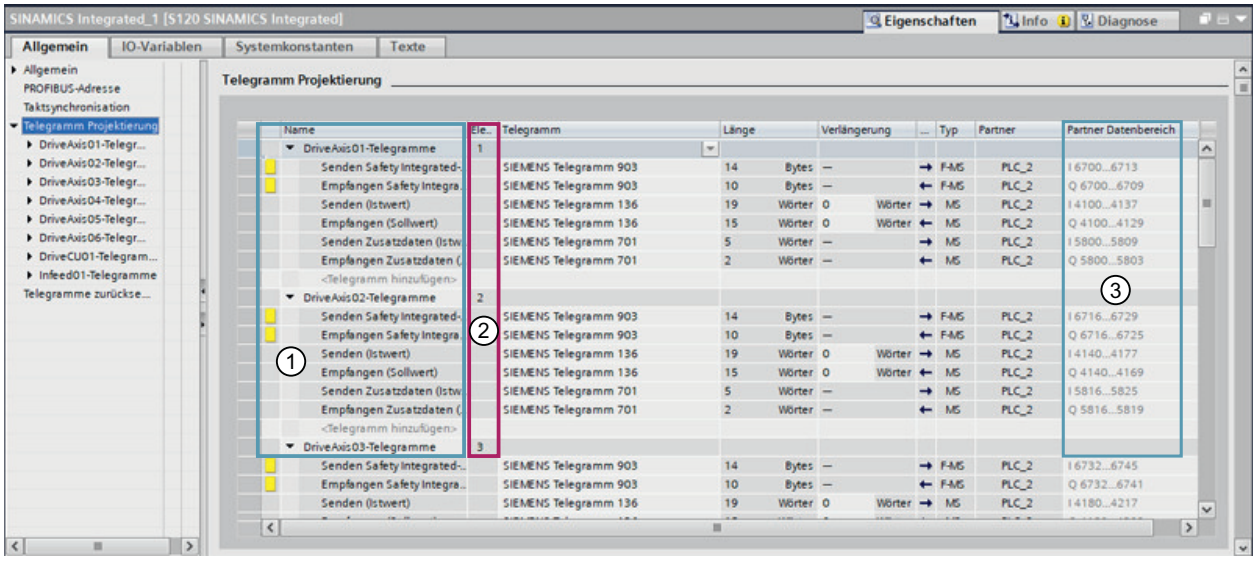
5.4.3 Manual axis-drive assignment

A common assignment at the drive object level (DO) is only possible in the PLC in the hardware configuration (HWCN) using TIA Portal and option package "SINUMERIK ONE STEP7 Toolbox" and "SINUMERIK 840D sl STEP7 Toolbox" (for NX devices).

In the TIA Portal, the default address scheme corresponds to the scheme in the NC. An axis-drive assignment in the TIA Portal can therefore be made in the telegram configuration of the integrated drives simply by using the drag-and-drop feature, without having to adapt the I/O addresses beforehand. You only adapt the physical sequence of the telegram bundle, still maintaining all additional information (I/O addresses, PROFIsafe addresses) of the corresponding drive topology.



① Processing in the safety program of the "F-PLC"
② Processing in the NC



① Telegram bundle
② Geographical assignment - sequence of the Motor Modules (MoMo) in the control cabinet
③ Standard address scheme of the telegram bundle
-> it is not necessary to adapt NC machine data

Figure 5-4 SINAMICS Integrated - telegram configuration

If the "I/O addresses" of the telegrams in the TIA Portal do not correspond to the standard assignment in the NC, e.g. I/O 20100, Default 4100, you must also adjust the addressing in the NC in the "MD13050" accordingly.

5.4.4 Axis-drive assignment in the automated workflow

In the automated workflow, TIA Portal / SINUMERIK ONE STEP7 Toolbox recommend the following workflow:

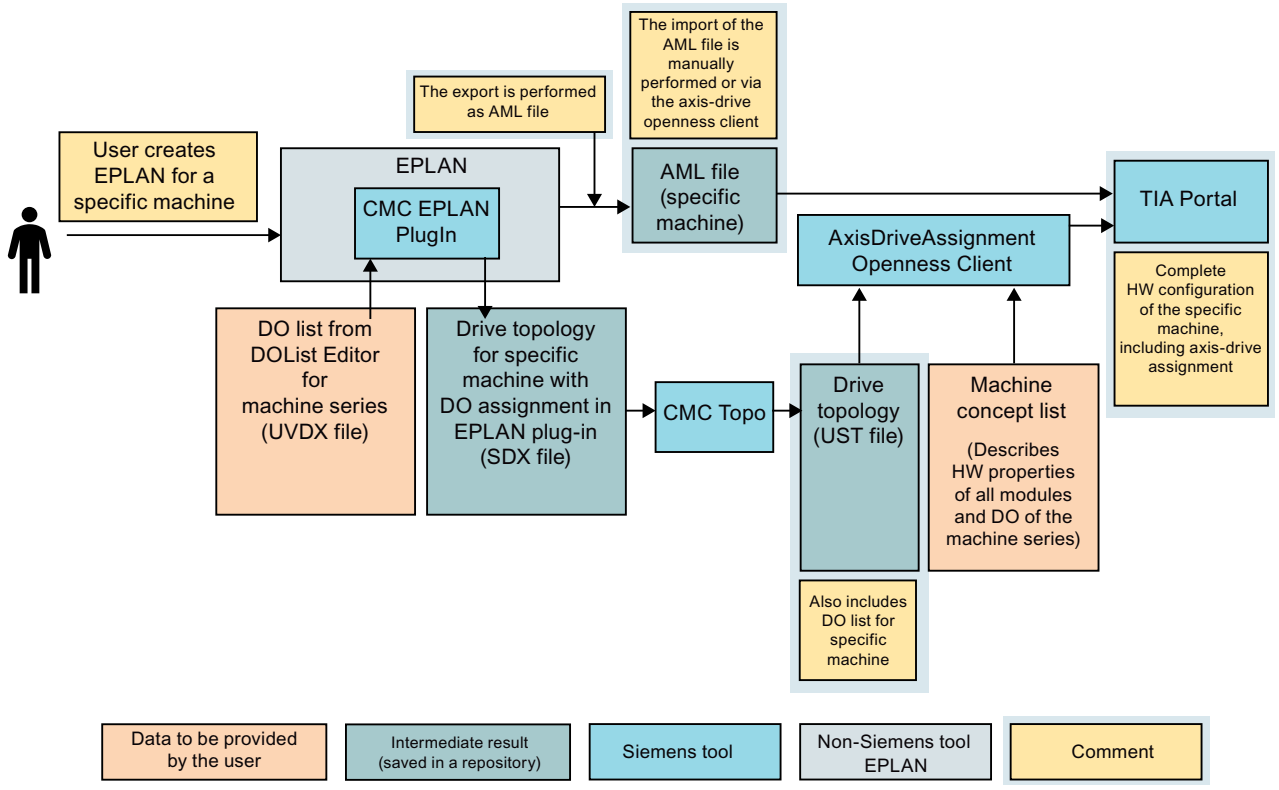


Figure 5-5 Axis-drive assignment in the automated workflow

As user, you first create a DO list for a machine series using the "Create MyConfig DOList Editor" (UVDX file). If you wish to fabricate a specific machine of the machine series, then first generate the circuit diagram using EPLAN. When doing this, the DO are also assigned from a DO list corresponding to the specific machine variant within the machine series using the EPLAN PlugIns.

The result of this step is:

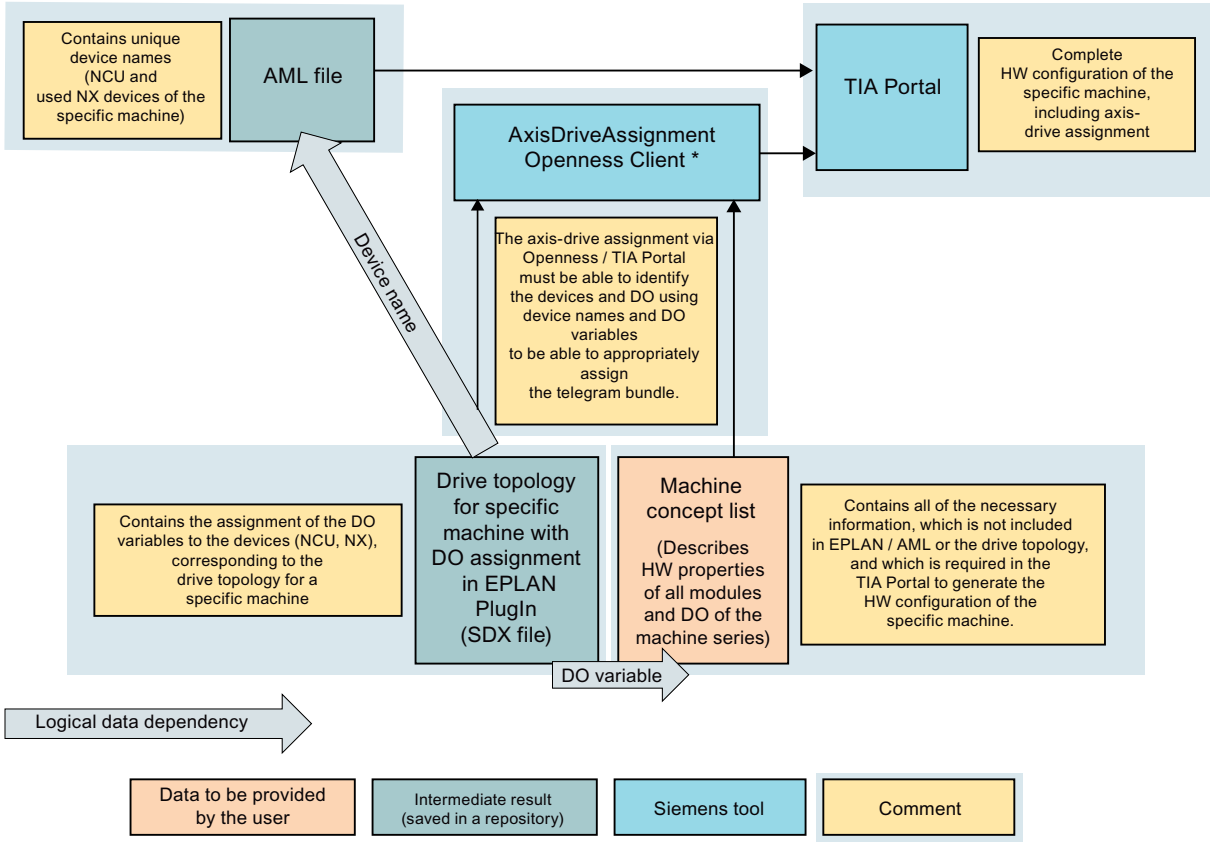
- A drive topology SDX file from the EPLAN plugin
- An AML file - Automation ML
  Standardized data exchange format between engineering tools, which describes the hardware configuration of the specific machine for subsequent import into the TIA Portal

Using topology software "Create MyConfig Topo", the drive topology (SDX file) is not converted into a comparison topology (UST file). The AML file is then imported into the TIA Portal, which is then used as a basis to create the hardware configuration of the specific machine. The hardware configuration includes a standard telegram configuration according to the address scheme of the NC.

Using the "AxisDriveAssignment Openness Client", which is supplied with the "SINUMERIK ONE STEP7 Toolbox", the axis-drive assignment is automatically performed, i.e. the corresponding telegram bundles are assigned in the TIA Portal.

As input, the "AxisDriveAssignment Openness Client" requires the comparison topology (*.ust) or user-specified topology (*.utz2) from Topo and a "150% machine concept list", which contains all hardware-related data of the machine series. This includes DO, telegram information and additional information about peripheral (I/O) modules.

The "AxisDriveAssignment Openness Client" processes the input data as shown in the diagram:



* The "AxisDriveAssignment Openness Client" is part of the setup.
The "SINUMERIK ONE STEP7 Toolbox" can be found on the DVD under:
\Support\Workflow\AxisDriveAssignment

Figure 5-6 AxisDriveAssignment Openness Client - principle of operation

The "AxisDriveAssignment Openess Client" assigns the corresponding drive objects (DO) to the devices, NCU and NX devices using unique device names. Using the unique names of the DO variables of a DO, the "AxisDriveAssignment Openess Client" can determine the corresponding data in the machine concept list and assign the telegram bundle in the TIA Portal to the corresponding device. DO variable names are included as keys in the machine concept list.

The corresponding settings for the telegram bundle, e.g. telegram number, I/O addresses and PROFIsafe settings, are simultaneously accepted in the hardware configuration.

The axis-drive assignment has now been completed, and an appropriate hardware configuration is available in the TIA Portal.

Openness clients

6

6.1 Overview

Openness Clients are tools offered by SIEMENS that support the machine manufacturer within the workflow in order to generate and automatically use certain data required for the workflow.

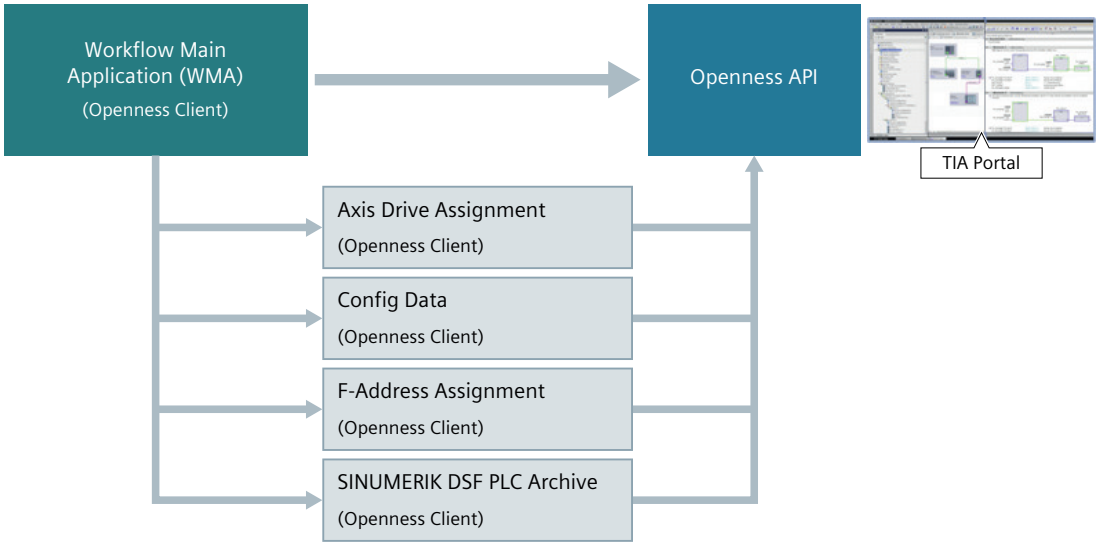


Figure 6-1 Openness Clients - overview

The Openness Clients are supplied on the DVD of the Toolbox.

Note

Openness Clients

The Openness Clients can be found on the DVD of the Toolbox under "**Support** > **Workflow**":

- Axis Drive Assignment (axis-drive assignment) ⇒ AxisDriveAssignment.exe
- Config Data (configuration data from TIA Portal) ⇒ ConfigData.exe
- F-initialization ⇒ FAddressAssignment.exe
- DSF archive (PLC portion from TIA Portal) ⇒ DsfPlcArchive.exe

The Openness Clients are described in the following sections:

- Axis-drive assignment (Page 32)
- Configuration data (Config Data) (Page 34)
- F-initialization (F-address assignment) (Page 37)
- Create DSF archive (SINUMERIK DSF PLC archive) (Page 39)

6.2 Axis-drive assignment

6.2.1 Rules for automated workflow and AxisDriveAssignment Openness Client

The following rules apply to the automated workflow and using the "AxisDriveAssignment Openness Client" (client for axis-drive assignment):

- For the machine series, the names of the DO variables must be unique.
  If different configurations that mutually exclude one another are required for one and the same DO, then create 2 drive objects (DO) in the DO list with different DO variable names; however, with the same DO names.
  The selection is then made using the different DO variables. The DO names are the same as they also serve as "day of creation", therefore facilitating that a uniform set of symbols is used in the PLC.
- In the automated workflow, the DO names of all drive objects (DO) used in a specific machine should be unique, as the DO names in the example application are also used to generate the symbols in the TIA Portal. Otherwise, the application must be adapted.
- The device names (NCU and NX) must be unique for the machine series, in:
  - EPLAN
  - TIA Portal
- The information from the machine concept list (MCL) and the DO list are merged using the DO variable name:
  Same DO variable name for information in the particular list
- Each entry for a DO in the "Machine concept list" (unique, based on its DO variable) defines the properties for the corresponding DO / telegram bundle in the hardware configuration in TIA Portal
  If available, these are the following data:
  - I/O addresses
  - Telegram selection
  - Safety properties of the corresponding safety telegram

  Further, the following are possible using the machine concept list (MCL):
  - PIP and OB assignment for telegrams
  - Definition of telegram extensions for standard telegrams
- If the standard address scheme of the NC is not applied, then also adapt the NC machine data to the axis-drive assignment in the TIA Portal (MD13050).

6.2.2 Openness Client for axis-drive assignment

Calling the axis-drive assignment client

A brief description of the call and interfaces of the axis-drive assignment client is subsequently given.

Precondition

- Valid license for Create MyESW
  A 30-day trial license is made available when installing "Create MyConfig V6.2"
- TIA project with a SINUMERIK ONE NCU is open
- TIA Openness is installed. The local Windows user is added to the "Siemens TIA Openness" group

Input parameters

The axis-drive assignment client expects the following input parameters:

1. Process ID of the active TIA project
   Refers to the running TIA Portal instance with an integrated TIA project for the machine configuration currently to be created
2. Name of the NCU for which the telegram should be configured
   Specifies the NCU for which the telegram configuration is to be created. More than one NCU is possible in the TIA project. The default name is the name of the NCU device in TIA Portal.
3. Machine concept list "*.mcl"
   Complete path and name of the MCL file (machine concept list)
4. User-specified topology "*utz2" or comparison topology "*.ust" from Create MyConfig Topo
   Complete path and name of the UTZ2 file containing the UST file with the drive topology to be created directly for the defined NCU or UST file. The "Axis-drive assignment client" distinguishes between UTZ2 and UST files using the default file name extension (UTZ2 or UST).

Call the client

Via the batch file, for example. The path to the client and the input parameters (each separated by a space) must be entered in the batch file.

The process ID of the TIA project is determined via the Task Manager (Ctrl+Shift+Esc).

Example:

```
AxisDriveAssignment.exe 5288 "CNC_1"
"D:\MyRepository\123_456_789_MachineConceptList.mcl"
"D:\MyRepository\123_456_789_Topology.ust"
pause
```

A batch example, a topology example and machine concept list are provided with the client.

On completion, the user is informed as to whether the client was executed without any errors. The error code (Page 69) and a message are output if errors occurred.

Note

Dialog for the Openness Firewall

When starting for the first time, an Openness Firewall dialog opens, which you confirm with "Yes" or "Yes, all".

With "Yes, all" the client is entered into the registry. The message is no longer displayed when restarting.

For "Yes", at each start you reconfirm the Openness Firewall dialog.

Function

The axis-drive assignment client retrieves the telegram information from the comparison topology and the machine concept list, and based on this information, creates the corresponding telegram bundle for all axes of the NCU-internal SINAMICS and connected NXs.

The telegram bundles are first completely deleted for this purpose. Then the telegram bundles with the specified DO names, telegram types and I/O addresses are rewritten using the machine concept list.

The sequence of the telegram bundle corresponds to the user-specified or comparison topology.

If Safety telegrams are specified in the machine concept list, the safety mode of the NC must be active before starting the axis-drive assignment client. The safety mode of the NCU is set in the NCU properties in the hardware configuration (HWCN) in TIA Portal.

Error codes

A list of the error codes that the axis-drive assignment client outputs can be found in the appendix under "Error codes (Page 69)".

6.3 Configuration data (Config Data)

6.3.1 Overview

Config Data Openness Client

In the context of the workflow, you should call the "Config Data Openness Client" **before** the final call to the Openness Client to create the DSF archive.

What does the Openness Client do?

1. In an opened project, a search is made in the TIA Portal for "Config Data Items".

   Note

   Config Data Items

   These are "DB member" with the following properties:
   - Retentive
   - Setpoint
   - Readable with HMI
   - Writable with HMI

2. The client collects the "Config Data Items".
3. Then all "Config Data Items" are written to a newly created data block (DB) as XML file: "ConfigDataDescriptionDB"
   A "ConfigDataDescriptionDB" that already exists in the project is replaced by a newly created one.
   This completes task "Config Data Openness Client".

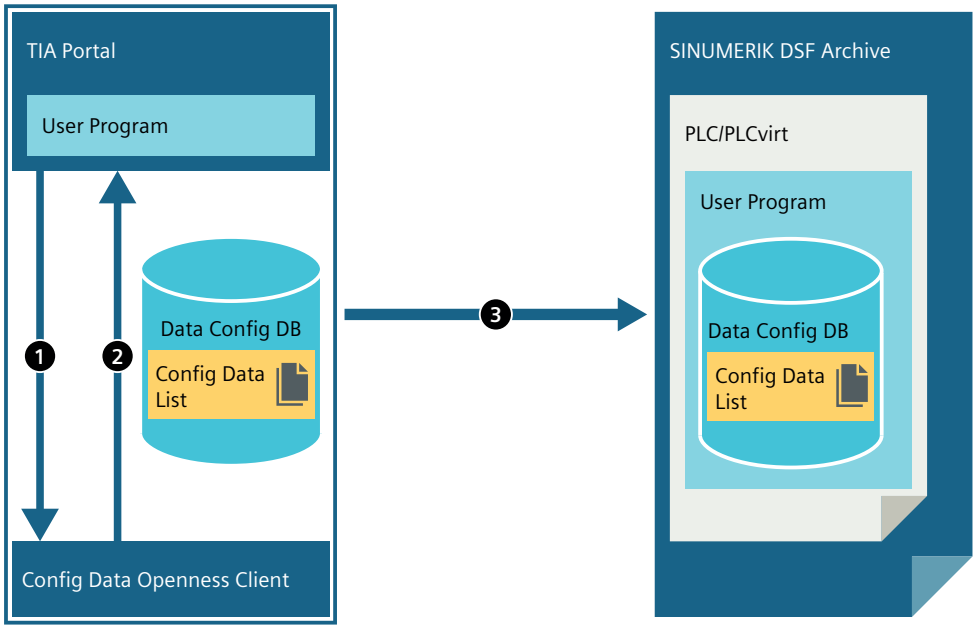


Figure 6-2 Config Data Openness Client - principle of operation

Concept of the configuration data (Config Data)

Configuration of a machine without engineering system:

- Superset adaptation (150% project) to the current machine configuration
- Setting of machine-specific values, e.g. reference points, mechanical system, etc.
- Handling of configuration data independent of the compatible superset project

Possible scenarios:

- First commissioning of a machine
- Machine expansion / machine upgrade / machine conversion on site
- Data transport (PLC status) between real machine and simulation

6.3.2 Preconditions

The following preconditions must be fulfilled for the ConfigData Openness Client to run successfully:

- TIA Portal must be started with an already opened project to enable the Openness Client to establish a connection via the Openness API.
- The PLC software has already been imported into the PLC of the NCU and able to be compiled.
- A license to run the Config Data Openness Client is available

6.3.3 Command lines call

The following command line options are supported to control the behavior of the Openness Client:

Table 6-1 Command line options - SINUMERIK ConfigData Openness Client

Command line options	Command line abbreviations	Optional / Required	Description
Process ID	/pid	Required	The "Process ID" of a running TIA Portal instance.
TargetNCU	/dev	Required	The name of the NCU.
ConfigDataItems-File	/cdi	Optional	Full path of a file where all found configuration data is stored.
BlockFilterPattern	/bfp	Optional	This command line contains string prefixes, where blocks use one of these prefixes and are filtered out of the analysis. For example, the SINUMERIK basic program can be filtered out. Separator ";"
IncludeReadonlyI-tems	/iri	Optional	Check whether read-only configuration data should be included in the configuration data XML list or not. Default value: False

6.4 F-initialization (F-address assignment)

6.4.1 Overview

F-Address Assignment Openness Client

The F-Address Assignment Openness Client is an optional client.

However, the Openness Client is required for the automated F-initialization in the workflow main application (WMA).

For the F-initialization, which the Openness Client performs automatically, certain addresses are assigned to safety modules.

The F-initialization is necessary as ET 200 SP F-modules and S7 1500F PLC CPUs no longer have a DIL switch, but instead, a coding element so that they can set and save the F-Dest and F-Source retentively and with diversity at the module.

Generally, setting the F-addresses for SIMATIC 1500 and SINUMERIK ONE do not differ from one another, and this operation can be manually performed in the TIA Portal.

The advantage of the automated engineering workflow is the fact that commissioning engineers can set F-addresses without directly using the TIA Portal.

For SINUMERIK ONE, F-Address Assignment Openness Client is made available, which implements a procedure for SINUMERIK that is already known from SIMATIC.

6.4.2 Preconditions

The following preconditions must be satisfied so that F-Address Assignment Openness Client can be successfully started:

- The starting point is a running TIA Portal instance, i.e. the TIA Portal must be open
- The required TIA project is also open

Current constraints

Take the following constraints into account:

- A maximum of 64 stations are supported, each with a maximum of 64 modules, which in total is 4096 modules
- Option handling is not supported

After exiting the Openness Client

Observe the following points:

- Evaluate any error codes that are present
  Information about error codes is provided in the Appendix (Page 69) to this documentation.
- If "Errorcode == 0": The DSF archive for the F-initialization was generated and is available
- The TIA Portal and the TIA project are closed
- The TIA project is not backed up

Result

A SINUMERIK-DSF archive with the following properties:

- A DSF archive is generated separately from the productive DSF archive
- The DSF archive is generated in the engineering workflow
- It is not possible to use the DSF archive in the virtual environment
- When commissioning, via a USB stick and SINUMERIK Operate, the commissioning engineer loads the SINUMERIK DSF archive **before** the productive DSF archive is loaded
- The F-address assignment PLC program included is a standard program and is specific for a certain machine instance.
- Data block (DB) "MachineDescription" contains all of the data required to assign F-addresses
- After loading the DSF archive, the required F-addresses are assigned to F-I/O modules on the machine

6.4.3 Command lines call

The following command line options are supported to control the behavior of the Openness Client:

Table 6-2 Command line options - F-AddressAssignment Openness Client (F-initialization)

Command line options	Optional / Required	Description
Process ID	Required	The "Process ID" refers to the running TIA Portal instance; this contains the current productive machine configuration and serves as basis for the F-initialization when generating the PLC program.
Name of the NCU	Required	Specify the NCU for which the DSF archive is to be created, since a TIA project may contain more than one NCU.
DSF Archive file name	Required	Specify the full path and the names of the DSF archive file to be generated on the local hard disk for the F-initialization of the PLC program.

Command line options	Optional / Required	Description
Comment	Optional	Enter a comment. The information is integrated in the meta data of the DSF archive. (Identical to the UI functionality)
Author	Optional	Details of the author The information is integrated in the meta data of the DSF archive. (Identical to the UI functionality)
F-Program password	Optional	The F-program password is required if the NCU was already assigned a password, e.g. project is retrieved per upload.

6.5 Creating a DSF archive

6.5.1 Overview

SINUMERIK DSF PLC Archive Openness Client

The Openness Client is finally used for the "SINUMERIK DSF PLC Archive" in the TIA Portal to configure the PLC portions of the machine configuration from the TIA Portal and to create a DSF archive automatically.

All information required for execution is controlled by specifying command lines through the "Workflow Main Application (WMA)".

Messages (including errors and warnings) of the Openness Client are displayed via the standard console.

Information, warnings and errors are additionally output to "Std-Err".

6.5.2 Preconditions

For the SINUMERIK DSF PLC Archive Openness Client to be executed successfully, the following requirements must be met:

- TIA Portal must be started to enable the Openness Client to establish a connection via the Openness API.
- Safety must be activated at the corresponding NCU.
- The target project that contains the desired and consistent PLC-related data for the current machine configuration must be opened in the already executed TIA Portal instance.
  This is usually done by using the "Workflow Main Application (WMA)" via the Openness API.
  The client can be used together with the WMA or also be used separately.

Workflow sequence with the SINUMERIK DSF PLC Archive Openness Client

If the prerequisites are fulfilled, a successful call of the "SINUMERIK DSF PLC Archive Openness Client" can be made by the WMA which coordinates the automated workflow.

Creating a DSF archive with PLC portion from the TIA Portal

1. The "Workflow Main Application" starts the "SINUMERIK DSF PLC Archive Openness Client" and executes this application with the desired command line options.
2. The "SINUMERIK DSF PLC Archive Openness Client" searches for the TIA Portal instance specified by the process ID in the command line options.
3. After successfully locating the TIA Portal instance, the "SINUMERIK DSF PLC Archive Openness Client" establishes a connection to the Openness API of the TIA Portal instance.
4. After successfully connecting to the TIA Portal instance, the "SINUMERIK DSF PLC Archive Openness Client" searches for the NCU referenced by the NCU name in the command line options of the currently loaded project of the TIA Portal instance.
   After successfully calling the NCU, the "SINUMERIK DSF PLC Archive Openness Client" navigates to the integrated F-PLC.
5. After successful login with the F program password at the F-PLC, the "SINUMERIK DSF PLC Archive Openness Client" initiates a complete compilation of the HW configuration and the (safety) program to ensure project consistency. All compiler result messages (information, warnings, and errors) are sent to the "Std-Err console".
6. After successful compilation, the desired DSF archive with the PLC portion is created at the specified file storage location along with the specified author and comment data as specified in the command line options.
7. Creation of the safety printout is triggered according to the settings in the command line options. The printout is saved in the specified file on the local hard disk.
8. Depending on the setting of the command line options, the created safety printout is also stored in the DSF archive.
9. The connected TIA Portal instance is closed. The project is only saved if the corresponding command line option "Save project" was specified.
10. Subsequently, the "SINUMERIK DSF PLC Archive Openness Client" is also closed after the "Workflow Main Application" has reported back a result or exit code indicating whether the workflow has been executed successfully.
    If an error occurs during this phase of the "SINUMERIK DSF PLC Archive Openness Client", the respective TIA Portal instance is closed without saving changes in the project data itself, and a corresponding result code is passed on in the WMA.
    Furthermore, all results/files created until the error occurred (DSF archive file or safety printout) will be deleted.

6.5.3 Command lines call

The following command line options are supported to control the behavior of the Openness client:

Table 6-3 Command line options - SINUMERIK DSF PLC Archive Openness Client

Command line options	**Optional / Required**	**Description**
Process ID	Required	The process ID refers to the execution of the TIA Portal instance with a consistent TIA Portal project for the machine configuration currently to be created.
F-Program password	Required	F-Program password for NCU / F-PLC. It is the OEM's responsibility to ensure a secure password management infrastructure and strategy.
Name of the NCU	Required	Specify the NCU for which the DSF archive is to be created, since a TIA project may contain more than one NCU.
DSF Archive file name	Required	Specify the full path and name of the DSF archive file that will be created on the local hard drive.
Comment	Optional	Specification of a comment that will be integrated into the metadata of the DSF archive.
Author	Optional	Specification of the author that will be integrated into the metadata of the DSF archive.
Safety printout file name	Optional	Full path and name of the DSF archive file that will be created on the local hard drive if the safety printout is not part of the DSF archive. This information is relevant for later browsing in HMI Operate.
Name of printer to use safety printout	Required	Specify the name of the printer to be used to create the safety printout.
Integrated safety printout into DSF Archive	Required	Information for the Openness Client whether the safety printout is additionally stored in the DSF archive.
Save project	Optional	Instructs the Openness client whether to save the current project when the DSF archive is successfully created in order to save the current project status, e.g. with "FProgramPassword" set.

Workflow Main Application (WMA) 7

7.1 Overview

Exemplary WMA procedure

This example shows how you can use Openness and the provided workflow clients to implement an application for automated creation of a PLC project.

The workflow clients, such as the client for axis-drive assignment, form partial aspects for an automated engineering workflow.

The machine manufacturer can integrate these clients into his own Openness application, in which the constraints for the use of the clients are created and further processing of the TIA project can be inserted.

The example is concretely about the automated creation of the hardware configuration, with the correct telegram configuration of the drives. In addition, the SINUMERIK basic program is inserted, the user program is generated from XML sources, and the DSF archive is created at the end.

Restriction

This example only deals with the part of the engineering workflow that concerns the TIA Portal and the creation of the PLC project. The hardware configuration in EPLAN or CMC Topo and the filling of the machine are not taken into account.

Required components

The components required for this example are listed below:

Table 7-1 Required components

Component	Note
C# Solution WorkflowMainApp (Visual Studio 2015 with .NET-Framework 4.8)	-
TIA Portal V17 with STEP 7 - TIA Openness V17 - STEP 7 Professional V17 - STEP 7 Safety V17 - SINUMERIK STEP 7 Toolbox V17	-

Component	Note
Axis-drive assignment client	- Supply with SINUMERIK ONE Toolbox - Licensing via Create MyConfig
ConfigData Openness Client	
DsfPlcArchive Openness Client	

Process

In the example, the following steps are performed in the PLC project:

- Creating/opening a project
- Importing hardware from AML
- Finding/selecting a NCU in the project
- Checking/activating Safety mode
- Call of the axis-drive assignment client
- Inserting the SINUMERIK basic program
- Inserting the PLC user program
- Activating the NCK-PLC signal exchange
- Executing optional functions
- Saving and creating a SINUMERIK PLC archive (optional)
- Creation of variable tables for the drive telegrams (optional)

Prior knowledge

In this application example, knowledge of C# programming and the use of Visual Studio and TIA Portal Openness is assumed.

No further references will be made to fundamentals of these topics.

Note

More information

Information and basics about Openness can be found in the Siemens Industry Online Support:

TIA Portal Openness: Introduction and demo application

https://support.industry.siemens.com/cs/ww/en/view/108716692 (https://support.industry.siemens.com/cs/ww/en/view/108716692)

7.2 Procedure

A brief description of a possible procedure:

1. Based on the customer order, the "WMA" (Workflow Main Application) receives information about the data set to be selected for the corresponding machine series and the options required.
2. The appropriate CMC project with the complete NC and drive data of the series is selected. The required options in the CMC are deactivated. The matching DO list is transferred to the ECAD system (here EPLAN).
3. The DO variables are assigned the drive components actually available in the EPLAN.
4. After the drive topology has been exported, CMC Topo generates a UST file, which is then transferred to the "AxisDriveAssignment Openness Client".
5. The "WMA" (Workflow Main Application) creates a TIA STEP 7 project.
6. The "WMA" imports the hardware configuration (HWCN) from the ECAD system
7. The "AxisDriveAssignment Openness Client" filters the actually required axes (UST file) from the machine concept list.
   This means that all information for the "axis-drive assignment" (AAZ) is available.
8. The AAZ is configured in the hardware configuration (HWCN) via the "AxisDriveAssignment Openness Client".
9. The user program and the "failsafe program" are inserted by "WMA".
10. The project is compiled, the "PLC.dsf" archive generated, and transferred to CMC.
11. The required options are activated or deactivated in the CMC (possibly even earlier preferences).
12. The "CMC commissioning package" is generated for the PLC, NC, drives and HMI.

Note

Example

A detailed process description with corresponding data can be found in the "Workflow examples" chapter under "Example of first commissioning (Page 61)".

7.3 Setup

7.3.1 Preparations

Precondition

- All required software components are installed.
  Information on this can be found in the "Overview" section > "Required components (Page 43)" table.
- The local Windows user is added to the "Siemens TIA Openness" group.
  For a description of the procedure, see the Openness demo application:
  TIA Portal Openness: Introduction and demo application (https://support.industry.siemens.com/cs/ww/en/view/108716692)

The following data are available:

- Hardware export from EPLAN "*.aml"
- Topology "*.sdx", "*.ust" or "*.utz2"
- A suitable machine concept list "mclist.mcl"

Procedure

1. Specify a reference number in the format "XXX_XXX_XXX", e.g. "123_456_789".
2. Create a folder that represents your central data store (Repository).
3. Add the topology, the machine concept list, and the AML file to the data store.
   The file names must always start with the reference number, e.g. "`123_456_789_MyTopology.ust`".
4. Create a "lib" folder in the data store.
5. Create a "hardware" subfolder in the "lib" folder.
6. Insert the reference libraries for AML import in the "hardware" subfolder.
7. Create a "software" subfolder in the "lib" folder.
8. Insert your user program in the form of SIMATIC-ML "*.xml" files in the "software" subfolder.
9. Optional: Create a "telegrams" subfolder in the "lib" folder.
   - In the "telegrams" subfolder, insert the library with data types for drive telegrams.
10. In the data store, create a "clients" folder.
11. Insert the Openness clients in the "clients" folder.
    - Supply with SINUMERIK ONE Toolbox, "Support\Workflow" folder
12. In the data store, create a "archive" folder.

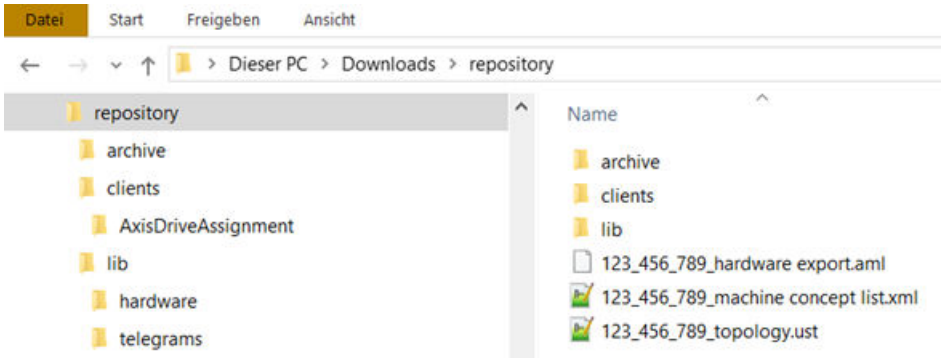


Figure 7-1 Creating the folders in the central data store (Repository)

Note

Sample data store

A sample data store (repository.zip) is supplied with the application example. You can unpack the ZIP file to any location and use it for initial first test attempts.

Note

Folder names in data store

The names of the folders in the data store can be adapted as needed in the "Constants.cs" class in the "WMA" project.

7.3.2 Starting the application

Open the programming example in Visual Studio via the "WorkflowMainApp.sln" file.

Check the references in both projects to see if the "Siemens.Engineering.dll" is found. Relink the "Siemens.Engineering.dll", if necessary.

You can find the "dll" in the installation directory of the TIA Portal under "PublicAPI" > "V17".

Note

TIA Portal - Openness safety message

When accessing TIA Portal for the first time, an Openness safety message is displayed, which you confirm with "Yes" or "Yes, all".

If you want to avoid the manual confirmation, you have the option to let the Openness application enter itself into the "Whitelist" of the Registry.

Instructions on how to do this can be found in the:

TIA Portal online help

Section "Openness: Automating creation of projects"

7.3.2.1 Input parameters

At the start, the application expects 3 input parameters. If Safety is used, 4 input parameters are required.

When the application is started, in the "Program.cs" class in the Main() method it is checked whether all input parameters are present, otherwise an error value is returned. In addition, the individual parameters are checked for the correct format.

If not enough arguments have been transferred, error code "1" is returned.

The "Repository" is to be used for an entire machine series. The reference number is used to identify a specific machine and must therefore only be included in the names of machine-specific files, such as the EPLAN derivation "*.aml" and the topology "*.sdx", "*.ust", "*.utz2". All other data that apply across machines can be freely named. This includes, for example, libraries and code sources.

An exception is the machine concept list, which is valid across machines and must be called "mclist.mcl".

Parameters

Observe the following points:

1. The path to the template project
   It must be a full path to an existing project, including the file extension "*.ap17".
   If the transferred path does not have the correct file extension or the project does not exist, error code "2" is returned.
2. The path to the data store
   Full path without "\" at the end
   If the specified folder does not exist, error code "3" is returned.
3. Reference number in the format "XXX_XXX_XXX"
   If the reference number does not have the correct format, error code "4" is returned.
4. Safety password (optional)
   If "Safety" is activated, enter a password to lock the Safety data.
   If "Safety" is not activated, no password has to be specified.

Depending on the start mode, the input parameters can be transferred to the application in different ways.

7.3.2.2 Starting in debug mode

To start in debug mode, navigate to:

"Project" > "Properties" > "Debug"

Enter the parameters, each separated by a space, in the "Command Line Arguments" field:

```
<Path to TIA project> <Path to data store> <Reference number>
<Password>
```

Example

```
D:\MyTIAProject\MyTIAProject.ap16 D:\MyRepository 123_456_789
password
```

Then start the application via the Start button in the menu bar or via F5.

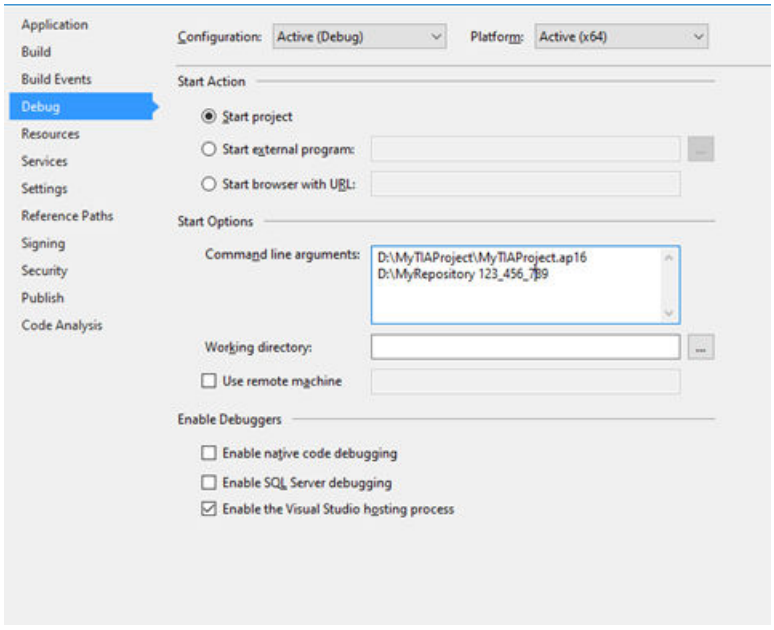


Figure 7-2 Starting the application

7.3.2.3 Starting with a batch file

To start with a batch file:

Create a batch file with a text editor, e.g. "WMA.bat"

With the following content:

```
<Path to the application> <Path to the TIA project> <Path to the data
store> <Reference number> <Password>
```

Example

```
MWMApp.exe D:\MyTIAProject\MyTIAProject.ap16 D:\MyRepository
123_456_789 password
```

Then execute the batch file by double-clicking on it.

7.4 Procedure and function

The "C# Solution" contains 2 projects:

- CommonFunctions
- WMA

The "CommonFunctions" project contains general functions that are very often used in Openness applications, e.g. Open project, Find device.

The "CommonFunctions" project is therefore kept independent so that it can be easily integrated and used in other "Solutions".

The "WMA" project contains more specific functions for the current application.

This project contains the "Program.cs" classes, in which the transfer parameters are checked and then the concrete functions are called according to the procedure. The "ProjectFunctions.cs" class contains these functions.

Both projects contain a "Constants.cs" class; this class contains concrete values, e.g. names, paths or version number, which must be adapted by the user, if necessary.

Process

The steps are already listed in the section "Overview" > "Procedure (Page 43)".

Note

The methods in the application example have function comments. Descriptive texts can be displayed by hovering the mouse pointer over a function call. When programming and calling the methods, IntelliSense can thus also be used.

Note

More information

Functions of the Openness API that are used in the application example are not described in detail here.

The documentation for these functions can be found in the online help of the TIA Portal:

Section "Openness: Automating creation of projects"

7.4.1 Opening a template project

Precondition

The initial situation is that you are working with a "template project" in which the general basic settings have already been made.

To obtain a "template project", a project is saved again under a different name directly after opening.

In the example, the new name is composed of the reference number and the name of the template project.

GetProcessID function

The "GetProcessID" function returns the process ID of the current TIA project. This process ID is later used to transfer the TIA project to the Openness clients, such as the axis-drive assignment client.

First it is checked if the project is already running or, if necessary, the project is opened.

In both cases, the process ID is then read from the current project and returned. Only standard functions of the Openness API are used for this purpose.

When calling the function "GetProcessID", via the "userInterfaceYN" parameter, it can also be specified whether the TIA Portal is to be started with or without a user interface.

7.4.2 Collecting resources

GetResources function

In the "GetResources" function, the required files are collected from the data store and transferred to the higher-level function.

For this purpose, the data store for the hardware export from EPLAN "*.aml", the comparison or user-specified topology "*.ust" or "*.utz2" are searched for files with the correct extension and the reference number at the beginning of the file name.

The machine concept list must also be in the data store and have the name "mclist.mcl". This specification comes from CMC Shield.

If one of the files is not found, an error is triggered.

In the files are found, the file paths are returned as a list of strings in the following order:

1. Hardware export
2. Topology
3. Machine concept list

To avoid version conflicts, it is then checked whether the Openness Clients have the version that is compatible with the TIA Portal.

7.4.3 Hardware import from the AML file

Import from the AML file

After collecting the resources, the TIA project is accessed from the process ID determined at the beginning in order to import the hardware specified in the AML.

Note

No hardware export from EPLAN

If you do not have a hardware export from EPLAN, you can find instructions on how to use the workflow anyway in the section: "PLC filling".

"ImportFromAML" function

In the example, it is assumed that the file is an AML file with library references.

In the AML file, a reference to a "Global library" in the TIA Portal is specified for a hardware component, from which the hardware component is then inserted into the project.

The hardware component may then contain defaults.

If the referenced component is not found in the library, the corresponding standard component from the hardware catalog is inserted.

NOTICE
The reference is language-dependent The reference path that is specified in the AML file is language-dependent. Make sure to set the user interface language of the TIA according to the reference specification. **Example** The English library/reference contains the "Master copies" directory. The German library/ reference contains the "Kopiervorlagen" directory.

For the import service of the TIA Portal (CAx provider) to be able to insert the hardware component from the referenced library, this library must already be open, because the reference does not contain the complete file path to the library.

Therefore, in the application example, all libraries are opened before the import. The libraries are located in the data store in the "lib\hardware" folder.

Add all referenced libraries there before starting the application.

Information about the import progress can be found in the "Log file". The "Log file" is assigned the name of the AML file with the suffix "_CAxlog" and is stored in the data tray next to the AML file.

Note

After changing the directory name, adjust the parameter

If you changed the directory name in the data store, you must set the "LIB_PATH_HW" parameter in the "Constants.cs" class in the "WMA" project.

If you stored the reference library in a completely different location, adapt this via the "libPath" transfer parameter to the "ImportFromAML" function.

7.4.4 Searching for and selecting the NCU

In the project, the function "SelectNCU" is used to search for and select the SINUMERIK NCU. The "FindDeviceByType" function of the "CommonFunctions" project is used for the subsequent telegram configuration.

Here it is iterated over all "ProjectDevices" and the parameter "TypeName" determines whether it is the searched object.

The function searches only in the upper level of the "ProjectDevices" and in the "UngroupedDevices" group. The function is not suitable for searching for "DeviceItems" below a device, e.g. SINUMERIK PLC.

The "FindDeviceByType" function finds all hardware components with the corresponding "TypeName" and returns them as a list.

If no corresponding object is found, an error is triggered.

If several NCUs are found, the user is prompted via the command line to select an NCU in the higher-level function "SelectNCU" to continue. If there is only one NCU in the project, this NCU is returned directly to the higher-level function.

Note

Change of the "TypeName" parameter

The "TypeName" parameter is set in the object model and should be constant. If the parameter changes, adapt the STRING in the "Constants.cs" class of the "CommonFunctions" project.

7.4.5 Networking an internal PROFIBUS

In TIA V17, already networked NCU and NX modules can be imported into the project via AML. However, since conflicts can still occur and the modules are then imported without connection, the networking of these components must be performed subsequently after the import.

The "ConnectNX" function searches the project for NXs that are not connected to a subnet and lists them in the output window of the command line with an index and the name of the NX head module.

If no NX or no unlinked NX is found, it is returned to the higher-level program.

If unconnected NXs are found and listed, the users must list the NXs they want connected to the selected NC in the order they are to be connected.

The 1st NX, as is usual with SINUMERIK, is connected to the "X105" interface and receives the PROFIBUS address "15", the next one is then connected to "X104" with the address "14", etc.

For example, the output could look like this:

```
0: NX_1
1: NX_Robo
2: NX_3
```

If the user wants to connect NX_Robo to X105, NX_3 to X104, and does not want to connect NX_1, he enters the indices in the desired order separated by commas:

```
1,2
```

If no NX is to be connected, the user must simply press "Enter".

If no valid input is made, the prompt is repeated until the input is valid:

e.g. text instead of numbers or wrong separators

If incorrect or non-existing indices are entered, an error is triggered.

7.4.6 Checking and activating Safety mode

In the next step, the "ActivateSafetyMode" function is used to check whether Safety is already active for the selected NCU. The transfer parameter "activate" is used to determine whether Safety is to be activated.

If you have also specified Safety telegrams in your machine concept list, it is mandatory to activate the Safety mode. Otherwise the axis-drive assignment client will trigger an error.

If Safety is activated, a password must also be transferred as an input parameter to the WMA, otherwise an error will be triggered.

7.4.7 Calling the axis-drive assignment client

Precondition

- The axis-drive assignment client ("AxisDriveAssignment") is located in the "clients" folder of the data store.
  - Copy not only "AxisDriveAssignment.exe", but the whole directory.
  - If you stored the client in a different location, adjust the "ADA_PATH" constant in the "Constants.cs" class of the "WMA" project.
- You have a license for Create MyESW.
  A trial license is made available when installing Create MyConfig V6.2.
  More information can be found in the "Licenses (Page 21)" section.

Input parameters

The axis-drive assignment client expects the following input parameters.

The respective name of the corresponding variable in the application example is shown in parentheses.

1. Process ID of the active TIA project ("processID")
2. Name of the NCU for which the telegram should be configured ("ncu.Name")
3. Machine concept list ("adaFiles[0]")
4. Topology ("adaFiles[1]")

You can also call the axis-drive assignment client manually, e.g. via a batch file.

Calling the client

The client is started as a new process.

The storage location of the client and the input parameters are communicated to the process via the "StartInfo" property.

The command line window of the client is suppressed and the outputs are redirected to the command window of the application.

Since the client's outputs are not read asynchronously, they do not appear in the application's command window until the client is terminated.

At the end, the user is informed as to whether the client has been executed without errors.

The error code and a message are output if errors occurred.

7.4.8 Inserting the SINUMERIK basic program

The "ImportSinumerikBP" function searches for the SINUMERIK basic program in the system libraries of the TIA Portal and copies all data types and blocks of this library into the project.

You can select the version of the basic program to be copied to the project in the "Constants.cs" class in the "WMA" project. If something changes in the structure of the basic program library, you can adjust this there as well.

7.4.9 Inserting the PLC user program

The "ImportFromXML" function inserts your PLC user program in the TIA project.

To use the function, your user PLC project must be available in the form of SIMATIC ML files (*.xml).

This format can include blocks (FC, FB, DB, OB), data types, and variable tables. To export a block, data type or variable table as SIMATIC ML from a project, you need Openness. For this purpose, you can write your own application, use the TIA Openness Explorer, or use the Version Control Interface (VCI) of the TIA Portal.

Create subfolders to structure your user program. The folders are then also created as groups in the TIA Portal accordingly and the objects are inserted in them.

All SIMATIC ML files are inserted from the "repsitory/lib/software" directory into the TIA project. The WMA recognizes whether it is a block, a data type, or a variable table.

Note

TIA Openness Explorer

You can find more information on the TIA Openness Explorer at:

https://support.industry.siemens.com/cs/ww/en/view/109760816 (https://support.industry.siemens.com/cs/ww/en/view/109760816)

7.4.10 Activating the NCK-PLC signal exchange

So that M, S and H functions can be used in the G code of the machine tool, the signal exchange between the NCK and the PLC must be activated and a suitable HardwareInterrupt OB must be specified.

The "SetNCKEvent" function makes these settings in the hardware configuration of the NCK. As last parameter you have to specify the name of the HardwareInterrupt OB, which is to be called when an event is triggered, for the function. This OB calls the FC "LBP_NCKProcessIRT" [FC3] of the SINUMERIK basic program.

In the WMA, the name of the HardwareInterrupt OB is specified in the "Constants.cs" file.

7.4.11 Executing optional functions

7.4.11.1 ConfigData client

If you want to use the Config data concept, it is necessary to call the Config data client.

Before calling the Config data client, the hardware and software must be compiled, otherwise no data blocks can be exported.

The call works according to the same principle as the call of the axis-drive assignment client.

The "ConfigData.exe" file must be located in the "clients" folder of the data store. The client is called as a separate process.

For more information on calling the client, refer to the section "Calling the axis-drive assignment client" > "Calling the client" (Page 54).

The expected input parameters are:

1. Process ID of the active TIA project ("processID")
2. Name of the NCU that contains the marked DBs ("ncu.Name")

The name of the corresponding variable in the application example is shown in parentheses.

In addition, there are optional parameters:

More information on the Config. data client can be found in section "Configuration data (Config Data) (Page 34)".

7.4.11.2 Creating variables for drive telegrams

So that programming in the PLC program can be purely symbolic and thus independent of addresses, variables are created for the drive telegrams for each drive object (Drive Object/DO, corresponds to axis, CU, ALM).

A variable table is created for each drive line-up (SINAMICS Integrated, NX), and in that table an input variable and an output variable are created for each telegram (PROFIdrive, PROFIsafe and SOC/SIC).

A library with the corresponding data types is required for the data structure of the telegrams. A library with the data types needed for the example is included in the example data store in the "lib/telegrams" directory.

Note

Siemens drive telegrams / PROFIsafe telegrams

A complete library with all drive telegrams commonly used at Siemens may be found in the Industry Online Support:

- Library with PLC data types (LPD) for STEP 7 (TIA Portal) and SIMATIC S7-1200 / S7-1500 https://support.industry.siemens.com/cs/ww/en/view/109482396 (https://support.industry.siemens.com/cs/ww/en/view/109482396)
- SIMATIC - Failsafe library LDrvSafe to control the Safety Integrated Functions of the SINAMICS drive family https://support.industry.siemens.com/cs/ww/en/view/109485794 (https://support.industry.siemens.com/cs/ww/en/view/109485794)

The "CreateDriveTagTables" function first determines the structure of all DOs on the controller.

In the TIA object model, SINAMICS Integrated is listed as separate "ProjectDevice" and only an empty copy is attached as "DeviceItem" of the controller.

Therefore, first the SINAMICS is identified in the "DeviceItems" of the NCU and then the associated "ProjectDevice" is found via the name.

The "GetDriveObjects" function then iterates across all DOs and reads out the DO name, the telegram types and the assigned addresses, and subsequently calls the "CreateTags" function.

Note

Observing the sequence of calls

It is mandatory to perform this step after calling the axis-drive assignment client, since the client processes the above values.

The "CreateTags" function copies the required data types from the library into the project and then creates an input and output variable for each telegram type, for each DO.

The naming convention for the variable is "<DO name> + telegram number + Send/Rec".

Note

Changing the telegram library or variables

If you change the structure of the telegram library, you must change the corresponding constants in the "Constants.cs" class in the "WMA" project.

If you want to change the naming of the tags, this must be done directly in the "CreateTags" function in the "ProjectFunctions.cs" class.

When SINAMICS Integrated has been processed, the "CreateDriveTagTables" function determines whether NXs are connected to the controller. The function performs the above steps for the DOs of the NXs as well.

7.4.11.3 Creating a variable table for a machine control panel

The variables for the machine control panel (MCP) can either be stored as SIMATIC ML in the "Repository" for the user program and then imported or generated directly by Openness.

The advantage of the generation is that the data type (type of MCP) and the start addresses of the inputs and outputs can be adapted. In the SIMATIC ML, this data is permanently entered and cannot be changed.

The "CreateMCPTagTable" function requires the following input parameters:

- PLC software container
- Data type of the installed MCP
  Included in the SINUMERIK basic program, for MCP 483 e.g. "LBP_typeMcp310Pn"
- Name to be assigned to the variable table
- Name for the input variable
- Name for the output variable
- Byte number, for the start address of the inputs and outputs respectively

7.4.11.4 Inserting function blocks from sources

If you do not want to use your blocks as SIMATIC ML, but as sources "*.scl" or "*.db", you need another Openness function for importing into the TIA project.

This is implemented as example in the WMA function "ImportFunctionBlocks".

7.4.12 Creating a SINUMERIK PLC archive

To create a SINUMERIK PLC archive with activated Safety, the PLC DSF archive client has to be called. Without Safety, the "DsfArchiveProvider" standard of Openness could also be used.

Before the client is called, the project is saved, because if an error occurs while the archive is being generated, the project will be closed without saving.

The call works according to the same principle as the call of the axis-drive assignment client. The "DsfPlcArchive.exe" file must be located in the "clients" folder of the data store and the client is called as a separate process.

For more information on calling the client, refer to the section "Calling the axis-drive assignment client" > "Calling the client" (Page 54).

The expected input parameters are:

1. Process ID of the active TIA project ("processID")
2. Safety password ("savePw")
3. Name of the NCU for which the archive is to be generated ("ncu.Name")
4. Full path for saving the archive
   Is composed of the path to the "archive" folder in the data store and the name of the project

In addition, there are optional parameters.

More information on the archive client can be found in the section "Create DSF archive (Page 39)".

After creating the archive, the project is closed.

7.5 Worth knowing

7.5.1 Further steps for an executable PLC program

No blocks for the PLC user project are provided in the example repository. However, the following blocks are absolutely necessary to create an executable PLC program:

- Organization blocks for startup (Startup, OB100), cyclic operation (Main, OB1) and event-driven data exchange between NC and PLC (HardwareInterrupt, OB40), with their corresponding calls of the basic program
- If the PLC program is to run in a virtual SINUMERIK, set the support for simulation in the project properties

---

Note

More information

on commissioning a SINUMERIK ONE and using the basic program can be found, for example, in the Commissioning Manual:

SINUMERIK ONE works steps for configuring and commissioning

https://support.industry.siemens.com/cs/de/en/view/109783536 (https://support.industry.siemens.com/cs/de/en/view/109783536)

7.6 Alternative solutions / partial automation

7.6.1 Workflow without hardware from EPLAN export

If no hardware export from EPLAN "*.aml" is available, there are several options to nevertheless use the remaining steps of the workflow:

- Start with a template project that already contains the desired hardware
- Create an Openness function for yourself that copies a preconfigured hardware from a library into the project (similar to the library reference from the AML file).
  To automate this as far as possible, you can, for example, use the reference number and copy from a template library all hardware components that have the first triple of the reference number in their name.
  The code snippets that are not needed must be commented out or removed.

7.6.2 PLC filling

In the example, the application ends with the creation of a SINUMERIK PLC archive.

You have several options for filling the machine with the PLC data:

- You call "Create MyConfig" (CMC) directly in the WMA via the command interface and transfer the archive to have an installation package for the controller created from it. To do this, prepare a CMC project so that it contains a link to the archive storage location.
- You manually create a CMC Expert project and use the archive there.
- You save the archive on a USB flash drive and load it into the machine via SINUMERIK Operate
- You omit the step "Create archive" and load the project directly from TIA into the PLC.

Note

More information

General information or the command line control of the CMC can be found in the Operating Manual:

SINUMERIK ONE Create MyConfig - Diff, Expert, Topo, 07/2021

Workflow example

8

8.1 First commissioning example

8.1.1 Introduction

In this section you will find a detailed process description of the video example "Engineering and Service Workflow for SINUMERIK ONE". The video sample is provided on the CMC DVD and is located in the "Samples" folder.

You can implement the procedure with or without EPLAN. For the workflow without EPLAN you do not need the "ECAD Import" option, the EPLAN plug-in or the EPLAN configuration tool.

The example description does not go into detail about the procedure without EPLAN.

The video example described is based on a milling machine with 3 axes X, Y, Z and a main spindle with the option of selecting the spindle as required in 3 different versions:

- Weiss spindle
- Kessler spindle
- Fischer spindle

All operating steps are explained in detail in the included video.

For SINUMERIK ONE, the axis-drive assignment is exclusively done in the hardware configuration (HWCN).

One of the strengths of the "Engineering and Service Workflow" (ESW) is the automation of this engineering process. The prerequisite for this is an advanced, well thought-out DO and machine concept list based on machine series.

8.1.2 Requirements

Tools and options for the EPLAN workflow

In order to be able to carry out the automated workflow with ECAD configuration, you need the following tools or options.

Table 8-1 Tools and options for the EPLAN workflow

Tool designation	Software/ license	Article number/PridaNet	Description/comment
TIA Portal Step7 Professional V17	SW	-	-
• SINUMERIK ONE STEP7 Toolbox V17	SW	PridaNet	-
• SIMATIC STEP 7 TIA Advanced V17	License	6ES7833-1FA17-0YF5	-
Automated Engineering & Service Workflow	License	6FC5862-2YF60-0YA0	-
• Create MyESW/WMA	SW	GTAC / Support Center	WMA = Workflow Main Application
• Create MyESW/ADA	SW	Pridanet ⇒ Toolbox	ADA = Axis Drive Assignment
Create MyConfig 6.2	SW	MCS1025 (Product ID)	-
EPLAN P8 ab V2.4 - V2.9	SW	⇒	SW and license to be provided by the user
• EADN 270	License	⇒	To be obtained from EPLAN
• addon "ECAD IMPORT"	License	MCS 10201 (Product ID)	-
• EPLAN plugin SW	SW	⇒	Included on the DVD: Create MyConfig - SW 6.x

Tools and options without ECAD configuration

You need the following tools or options to carry out the automated workflow without EPLAN.

Table 8-2 Tools and options without ECAD configuration

Tool designation	Software/license	Article number/PridaNet	Description/comment
TIA Portal Step 7 Professional V17	SW	-	-
• SINUMERIK ONE STEP 7 Toolbox V17	SW	PridaNet	-
• SIMATIC STEP7 TIA Advanced V17	License	6ES7833-1FA17-0YF5	-
Automated Engineering & Service Workflow	License	6FC5862-2YF60-0YA0	-
• Create MyESW/WMA	SW	GTAC / Support Center	WMA = Workflow Main Application
• Create MyESW/ADA	SW	Pridanet ⇒ Toolbox	ADA = Axis Drive Assignment
Create MyConfig 6.2	SW	MCS1025 (Product ID)	-

Designations of the sample files

The following files are used in the procedure example.

Table 8-3 Designations of the sample files

Brief description	File names used in the example
Workflow video: CMC DVD in the "Samples" folder	2021_07_Engineering und Service Workflow.mp4
EPLAN drive topology ⇒ plugin export	2021_07_ESW_EplanTopo_4Axis.sdx
EPLAN AML export of the HWCN	2021_07_ESW_EplanAML_4Axis.aml
CMC 6.0 150% DO list	2021_07_ESW_DOList_4Axis.uvdx
CMC 6.0 comparison topology export	2021_07_ESW_VglTopo_4Axis.ust
CMC 6.0 user-specified topology export	2021_07_ESW_VorTopo_4Axis.utz2

Brief description	File names used in the example
Machine concept list 150%	mclist.mcl **Note** The name of the machine concept list must not be changed!
PLC archive of WMA ⇒ TIA created	PLCone.dsf
CMC Windows installation package **Note** A suitable test track must be available for testing	2021_07_TestRackSample.exe
EPLAN 2.7 project	SPS-Drives-OEM-Schrank_IEC_V001_EP27_V2_4Achsen.zw1
CMC Expert project folder	Sample_CMC6x

8.1.3 General procedure and chapter in the video

The chapters correspond to the supplied sample video "2021_07_Engineering und Service Workflow.mp4".

Chapter 1 DO list with predefined axis-drive assignment (Page 64)

Chapter 2 EPLAN ⇒ Assignment of components EPLAN ⇒ Export of drive topology (Page 65)

Chapter 3 CMC import drive topology ⇒ Creating the comparison topology (Page 66)

Chapter 4 Creating a machine concept list for a machine or series (Page 66)

Chapter 5 AML export ⇒ TIA (Page 66)

Chapter 6 Creating a WMA TIA project automatically (Page 66)

Chapter 7 Creating a CMC Expert project (Page 67)

8.1.3.1 Defining a DO list with predefined axis-drive assignment

The SINAMICS drive creates drive objects (DO) for components, e.g. for NCU, Line Modules and Motor Modules. The drive objects, in turn, contain individual components.

A drive object references the components:

- Motor Module
- Sensor Module
- Encoder
- Motor

For an efficient configuration of the drive topology and as an aid for field service, a structured procedure with a name and number concept is useful. Therefore, names and numbers are assigned for DO and components.

For support, CMC offers a powerful DOList Editor "DOVarEditor.exe". More information is provided in the Operating Manual "Create MyConfig - Diff, Expert, Topo" in Section "Topo - operation" > "DOList Editor".

A DO list is created for a single machine. However, you can also create a DO list for a complete machine series. When configuring you can take the data from this oversized 150% DO list.

The DO list must be consistent with the machine concept list. More information on this can be found in the section "Creating a machine concept list for a machine or series" (video = Chapter 4).

In addition, the reference to the NC axis can also be established in the DO list. This is done to predefine which NC axis belongs to which drive or DO (AAZ).

Output data:

- 2021_07_ESW_DOList_4Axis.uvdx

8.1.3.2 EPLAN - assignment of components EPLAN / export of drive topology

After importing the DO list into the EPLAN project, the predefined DO variables can be assigned to the components contained in the EPLAN project using the EPLAN add-in.

In the example the following assignments were made:

- 1st drive ⇒ Spindle
- 2nd drive ⇒ Z axis
- 3rd drive ⇒ X axis
- 4th drive ⇒ Y axis

This basically determines which drive belongs to which machine axis. The predefined axis-drive assignment (AAZ) also defines the associated NC axis.

Input data:

- 2021_07_ESW_DOList_4Axis.uvdx

Output data:

- 2021_07_ESW_EplanTopo_4Axis.sdx

8.1.3.3 Importing the drive topology / creating a comparison or user-specified topology

To create the comparison topology or user-specified topology, you load the exported SDX file from EPLAN into CMC Topo.

Input data:

- 2021_07_ESW_EplanTopo_4Axis.sdx

Output data:

As output data you will receive either a comparison topology "*.ust" or a user-specified topology "*.utz2".

- 2021_07_ESW_VglTopo_4Axis.ust
- 2021_07_ESW_VorTopo_4Axis.utz2

8.1.3.4 Creating a machine concept list for a machine or series

The machine concept list "mclist.mcl" contains all NC axes and their I/O addresses and the telegrams of a machine series. You can also create a machine concept list for a single machine, just like a DO list. If the machine list contains more than one machine, it corresponds to a 150% list and you only create it once for a series. The machine concept list is then reused for each configuration of an individual machine.

Note

150% list

Synonym for data of a superset.

The superset contains all data of a machine series.

Output data:

- mclist.mcl

8.1.3.5 AML export - TIA

For the automated creation of the hardware configuration in TIA, the HWCN can be transferred from EPLAN via AML.

Output data:

- 2021_07_ESW_EplanAML_4Axis.aml

8.1.3.6 Creating a TIA project and axis-drive assignment automatically

The Workflow Main Application (WMA) creates automatically:

- TIA project
- Transfers the AML import of the hardware configuration (HWCN) from EPLAN

- Calls the Axis Drive Assignment Client (ADA) and describes the I/O addresses and telegrams in the hardware configuration (HWCN)
- Creates the basic program/user program from corresponding libraries
- Compiles the project and creates the archive "PLCone.dsf"
  Note
  Only applies if Safety is not active.
  If Safety is active, you must compile and create the archive manually.

Note

WMA - source code in the video example

For the example in the video, the source code of the Workflow Main Application has been adapted. (Not included in the scope of delivery.)

For more information, refer to the documentation on the Workflow Main Application.

The information on WMA is provided on the CMC DVD, under "Samples" > "WMA".

Input data:

- 2021_07_ESW_DRVTopo_4Axis.ust
- 2021_07_ESW_EplanAML_4Axis.aml
- mclist.mcl

Output data:

- PLCone.dsf

8.1.3.7 Creating a CMC Expert project

The creation of a CMC project is explained in detail in the video.

When executing the "2021_07_TestRackSample.exe" or a self-created package, make sure that the corresponding "mclist.mcl" is next to the package.

Input data:

As input data you either use a comparison topology "*.ust" or a user-specified topology "*.utz2".

- 2021_07_ESW_VglTopo_4Axis.ust or 2021_07_ESW_VorTopo_4Axis.utz2
- PLCone.dsf

Output data:

- 2021_07_TestRackSample.exe
- mclist.mcl

8.1.4 Constraints

EPLAN - Topo project

Observe the following notes.

Note

SDX ⇒ UST file

- The ALM was removed according to the actual hardware setup
- The NCU was adapted from NCU1750 to NCU1760 according to the hardware setup

Error codes for the Openness Clients

A

A.1 Error codes

The following error codes can be signaled to the Openness Clients.

Openness Clients error codes	Error code number	Error code description
OtherError	-1	Another unexpected error has occurred. See details under the corresponding error code
Success	0	Successful
NotEnoughArguments	1	Insufficient command line arguments specified
ProcessIdNotValid	2	TIA PID is not valid (specified "cmd line parameter")
PathNotFound	3	The specified file path is invalid or the file/directory cannot be created.
DeviceNotFound	5	Device not found in TIA project
ActionNotCompletedDueToOpennessError	6	An error occurred when using Openness or an attribute
MismatchOfTopologyInformation	7	Input of the file for topology or machine concept list is inconsistent.
ProjectNotFound	8	No open project was found in the TIA Portal instance referenced using parameter "/pid".
CertificateCheckError	111	Openness Client certificate not available or invalid.
LibraryError	122	Possible meaning, e.g.: • The global library could not be loaded due to version differences • Requested block or blocks not found in the library
CompileError	123	Device cannot be compiled
DSFArchiveError	124	Meaning, e.g.: • Archive creation was started, but failed

Openness Clients error codes	Error code number	Error code description
DeviceStateError	125	Meaning, e.g.: • The device should be in the "Safety mode", but it is not
ExportError	126	The data block (DB) cannot be exported as an XML source for setting the address values for FAA.
ImportError	127	The changed data block (DB) cannot be reimported.
FAANotNeeded	128	The NCU is not in the "Safety mode" or has no F-I/O, which would require an F-initialization.
UnknownNCUType	129	Openness API methods are limited to use with SINUMERIK ONE NCUs only
TIAOrDeviceInOnlineMode	130	No utilization possible in online mode - see Meas-ESWF-003
CannotCreateTempFolder	131	Temporary folder for import or export of data blocks (DB) as XML source cannot be created. This folder must be deleted when exiting the FAA Openness Client (F-initialization).
FProgramLoginError	132	The PLC is password-protected, login is not possible
SafetyPrintoutError	133	"Safety printout" could not be created: • The specified path is invalid or the printer name is incorrect
ProjectSaveError	134	The project could not be saved.
CannotCreateTempDirectory	205	No temporary working directory could be created for import/export actions
UserFolderNameAlreadyInUse	207	The defined user folder name is already being used by other program blocks. (not configuration data)
TooManyConfigDataItems	208	Too many configuration data items ⇒ Code import fails
IncompatibleConfigDataVersion	211	Incompatible Config Data version in the project
CannotExportUDTs	212	Required UDTs cannot be exported
CannotExportDBs	213	Required data blocks (DB) cannot be exported
CannotExportUserConstants	214	Error when exporting data structures that are defined using "User Constants".

Openness Clients error codes	Error code number	Error code description
InsufficientUMACRights	215	Config Data Openness Client does not have the required access rights, due to UMAC
ConfigDataFileTooBig	216	Estimated file size for a configuration data file is too large, e.g. more than 16 MB
TabCharNotSupported	217	A tabulator was used in a symbol relevant for Config Data Items (DB / UDT name)

List of abbreviations

B

B.1 Abbreviations

The list of abbreviations includes abbreviations used in Diff, Expert and Topo.

AAZ	Axis-drive assignment
ADA	Axis Drive Assignment
AGK	Automatic device configuration (per HMI)
ALM	Active Line Module
AML	Automation Markup Language
AP	User program
AX	Axis data
EI	Equipment identifier
CMC	Create MyConfig
CMVM	Create MyVirtual Machine
CNC	Computerized Numerical Control
Create MyESW	Create MyEngineering & Service Workflow
CU	Control unit
DB	Data Block
DO	Drive Object
DRV	Drive Data
DRVTopo	Drive topology

FAA	FAddressAssignment F-initialization
FB	Function Block
FC	Function
F-PLC	Failsafe Programmable Logic Control "F" stands for "failsafe", which means that SINUMERIK Safety Integrated can be used
GUD	Global User Data
HWCN	Hardware configuration
HW Config	Hardware configuration (Step 7)
IPC	Computer that is used in the industrial environment, e.g. process visualization, robotics, industrial automation, test stands for industry or safety equipment and quality assurance
MCL	Machine concept list
MoMo	Motor Module
NC	Numerical control
NCK	Numerical control kernel
NCU	Numerical Control Unit (example: NCU 720.2)
OB	Organization Block
PC	Personal Computer
PG	Programming device
PLC	Programmable logic controller
PPU	Panel Processing Unit: SINUMERIK 828D PPU combines, in one component, CNC, PLC, HMI, closed-loop drive control and communication functions.
RTS	RunTimeSystem (runtime system)
SDB	System data block
SIC	Safety Info Channel

SCC	Safety Control Channel
SM	Sensor Module
SMC	Sensor Module Cabinet
TCU	Thin Client Unit
UAC	User Account Control - user account control running under Windows
VT	Comparison topology
WMA	Workflow Main Application

Table B-1 File extensions for the file formats used in CMC

*.arc	NC, PLC, SDB or DRV archive
*.ard	Data class archive
*.dsf	SINUMERIK ONE archive
*.mcl	Machine concept list 150%
*.sdx	Siemens Data Exchange (from EPLAN Add-In)
*.tgz	CNC software
*.ucz	Expert component
*.upproj	Expert project
*.upscr	Script file: External scripts can be used in change tasks and in Diff.
*.upstep	Step project
*.uptz	Topology project
*.ust	Comparison topology

*.usz	Executable Linux package
*.utz2	User-specified topology
*.uvdx	DO list

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