SIEMENS

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SINUMERIK ONE
SINUMERIK Run MyRobot /Direct Control

Configuration Manual

Valid for:
control system
SINUMERIK ONE

Software	version
NCU system software for ONE	6.22
SINUMERIK Run MyRobot /Direct Control	2.2.0

06/2024
A5E51375437B AC

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 Aktiengesellschaft. 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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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

This documentation is intended for the following target groups:

- Planners and project engineers

Purpose

The manual supports you during the configuration of a 6-axis robot and additional kinematics with the SINUMERIK ONE. Specific knowledge is needed for configuring 6-axis robots and additional kinematics. This knowledge is compiled in this manual.

This document will not go into detail about the general knowledge needed for configuring and commissioning with SINUMERIK ONE. You can find more extensive references in Section Overview of the manuals for SINUMERIK ONE and Run MyRobot /Direct Control.

Benefits

This documentation enables the addressed target group to configure the system.

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: Configuring/Commissioning
- Manufacturer/Service: Safety Integrated
- Information and training
- Manufacturer/Service: SINAMICS

1.3.2 Documentation overview SINUMERIK operator components

Comprehensive documentation about the SINUMERIK operator components is provided in the Documentation overview SINUMERIK operator components (https://support.industry.siemens.com/cs/document/109783841/technische-dokumentation-zu-sinumerik-bedienkomponenten?dti=0&lc=en-WW).

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

The documentation is divided into the following categories:

- Operator Panels
- Machine control panels
- Machine Pushbutton Panel
- Handheld Unit/Mini handheld devices
- Further operator components

An overview of the most important documents, entries and links to SINUMERIK is provided at SINUMERIK Overview - Topic Page (https://support.industry.siemens.com/cs/document/109766201/sinumerik-an-overview-of-the-most-important-documents-and-links?dti=0&lc=en-WW).

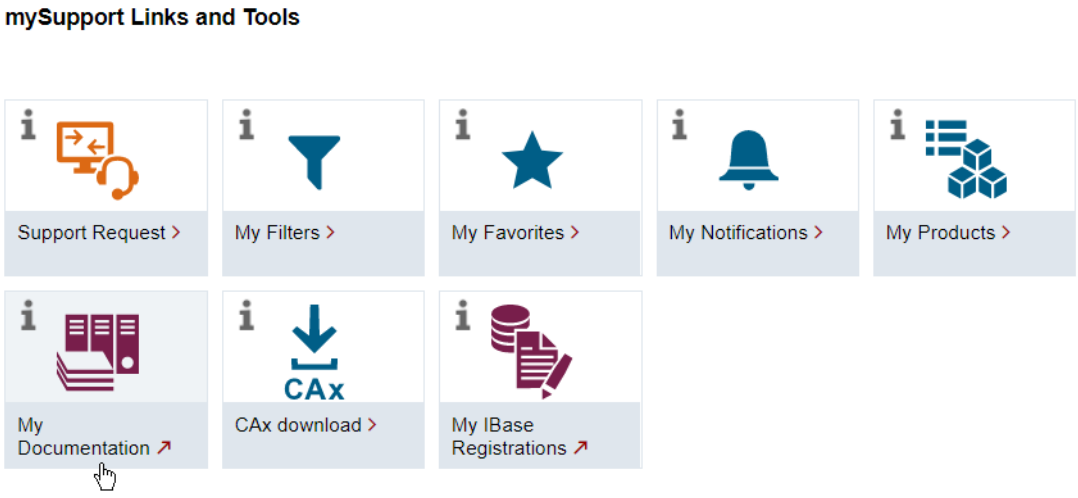
1.4 Feedback on the technical documentation

If you have any questions, suggestions, or corrections regarding the technical documentation published in the Siemens Industry Online Support, use the "Provide 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 links and tools" (https://support.industry.siemens.com/cs/ww/en/my) portal page:



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

1.7 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)

1.8 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 customer-specific solutions, but merely serve to provide assistance with 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 Cybersecurity information

Siemens provides products and solutions with industrial cybersecurity 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 cybersecurity 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 cybersecurity measures that may be implemented, please visit
https://www.siemens.com/cybersecurity-industry.

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 Cybersecurity RSS Feed under
https://new.siemens.com/cert.

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 state-of-the-art, integrated industrial cybersecurity concept for the installation or machine.
- Make sure that you include all installed products in the integrated industrial cybersecurity concept.
- Protect files stored on exchangeable storage media from malicious software by with suitable protection measures, e.g. virus scanners.
- Carefully check all cybersecurity-related settings once commissioning has been completed.

Requirements for commissioning 3

3.1 Software and hardware preconditions

To commission a 6-axis robot with SINUMERIK Run MyRobot /Direct Control, you need the following hardware and software components.

The components differ, depending on the type of robot. You will get a complete description of the necessary components for the corresponding type of robot when you configure the system using SIZER (see Section Configuration (Page 23)).

Hardware

Table 3-1 Hardware components

Component	Quantity	Article number	Comment
SINUMERIK NCU 1760 or SINUMERIK NCU 1750 or SINUMERIK NCU 1740 or SINUMERIK PPU 1740	1	See catalog or Mall	• NCU selection is application-specific • SINUMERIK NCU/PPU 1740 for handling only
Smart Line Module	1	See catalog or Mall	Depending on the type of robot (included in the respective SIZER project)
SINAMICS Motor Module	3-4	See catalog or Mall	Depending on the type of robot (included in the respective SIZER project)
Additional components			Depending on the type of robot (included in the respective SIZER project)

Software

Table 3-2 Software components

Component	Quantity	Article number	Comment
• CNC software NCU/PPU, software version V6.22 ≤ GIV ≤ V6.22.xx.xx • Create MyVirtual Machine – SINUMERIK virtual CNC software ≥ V6.22 – Create MyVirtual Machine ≥ 1.4.1	1	See catalog or Mall	After installation with Create MyConfig, it is possible to upgrade to GIV > V6.22 and < V6.24
TIA Portal V19 with SIMATIC STEP 7 Professional V19 and SINUMERIK STEP 7 Toolbox V19	1	See catalog or Mall	
PLC project template > V5.1.0			Siemens Industry Support Portal (https://support.industry.siemens.com/cs/ww/en/view/109758486)
SIMATIC STEP7 Safety Advanced V19	1	See catalog or Mall	
Safe Kinematics V19	1		
Create MyConfig ≥ V6.6.0	1	[1]	PC license: Only needed once, not for each robot
SI axes	6		
Additional NC axes	3	[1]	
SINUMERIK ONE multi-axis interpolation (>4 interpolating axes)	1	[1]	
SINUMERIK ONE SINUMERIK Operate /NCU	1	[1]	
SINUMERIK ONE cross-mode actions (ASUB and synchronized actions)	1	[1]	
SINUMERIK Run MyCC /ROBX_AR	1	[1]	Installation with SINUMERIK Integrate Create MyConfig

Component	Quantity	Article number	Comment
SINUMERIK Run MyCC /ROPE	1		Installation with SINUMERIK Integrate Create MyConfig included in option ROBX_AR
Alternatively: SINUMERIK Run MyRobot /Direct Handling (package license) It contains the following licenses: • 6FC5800-0BR05-0YB0 - Robot transformation (ROBX_AR) • 6FC5800-0BS60-0YB0 - Safety Integrated Plus • 7 x 6FC5800-0BK00-0YB0 - SI axes • 6FC5800-0AM15-0YB0 - Interpolations, multi-axis interpolation (>4 axes) (M15) • 4 x 6FC5800-0BA00-0YB0 - Controllable interpolation axes, extension • 6FC5800-0BM43-0YB0 - Synchronized actions, multiple mode actions (M43) • 6FC5800-0BS00-0YB0 - Operation, SINUMERIK Operate on NCU (S00)	1	6FC5800-0**B**P84-0YB0	The following restrictions apply: • No spindle • No tool offsets • No COMPCAD / COMPSURF **Note:** The restrictions affect all channels and the entire NCU. **Recommendation:** Use NCU/PPU 1740

1) The articles to be ordered are obtained from the SIZER configuration.

Quantity structure

- A maximum of 4 robots are controlled in 4 channels.
- Up to 3 linear and 3 rotary special axes per channel are supported (see ROBX documentation, Section Overview of the manuals for SINUMERIK ONE and Run MyRobot /Direct Control).
- The robot configurator provides support with configuration of up to 1 linear special axis and 4 rotary additional kinematics per channel, or 5 rotary additional kinematics per channel. A maximum of 5 additional kinematics per channel are possible.
- A maximum of 12 interpolating axes are supported on a NCU 1740 and PPU 1740.
- A maximum of 31 interpolating axes are supported on a NCU 1750 and NCU 1760.

Example of a system configuration

The following figure shows an example system layout for connecting a 6-axis robot to a SINUMERIK ONE.

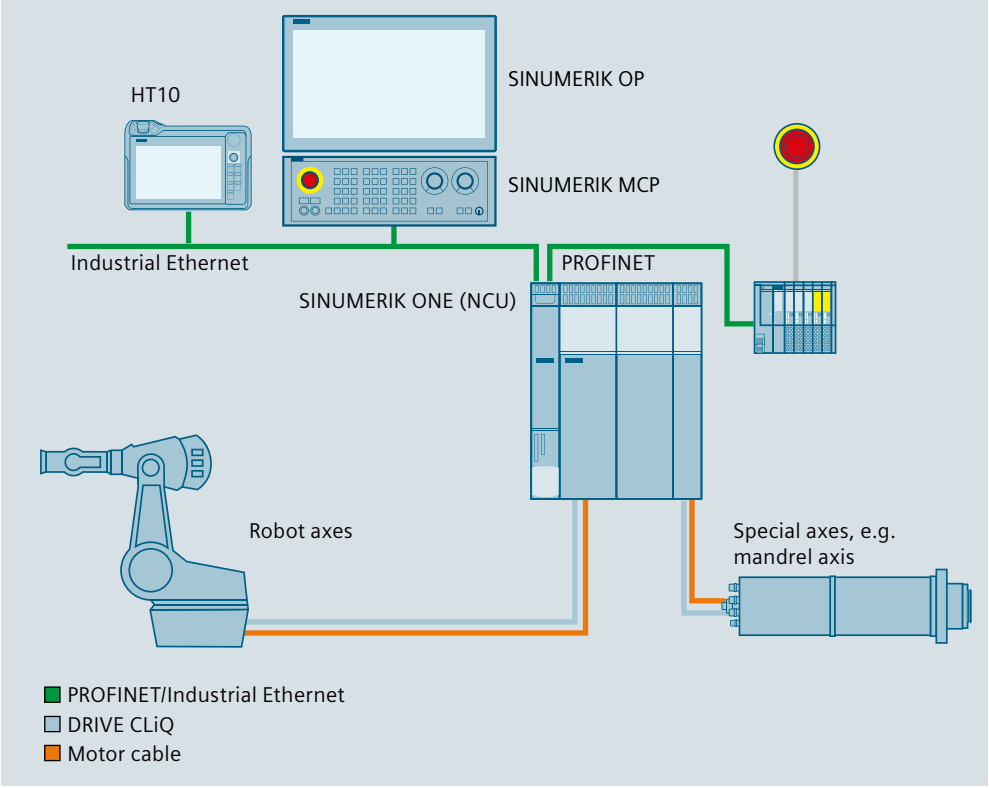


Figure 3-1 Example of a system configuration

Configuring

4

4.1 Configuration with SIZER

A SIZER project is provided as a download in the SIOS Portal (https://support.industry.siemens.com/cs/document/109757564) for the respective type of robot for easy and correct configuration of the necessary hardware and software components. The SIZER projects include the minimum configuration in regard to SINAMICS drives, operator components, and software options for operating a 6-axis robot. The SIZER projects serve as a template for the respective configuration. Expand the projects by the needed axes, options, etc. that are right for your application.

4.2 Configuration of a SIZER project for Comau

Hardware components

Each SIZER project contains SINAMICS drives for the specific robot or additional axis types. If possible, a layout with 3 dual-axis modules is selected for robots. This is the most compact and most cost-effective variant. The motor data and the mechanical limits (maximum torque in the drive train) of the respective robot or additional kinematic type serve as the criteria for the layout.

All robot or additional kinematic types of Comau use third-party motors.

The merging of the SIZER projects of robots and additional kinematics required for the specific customer application is described in Section Importing the SIZER data of additional kinematics into a robot project (Page 41).

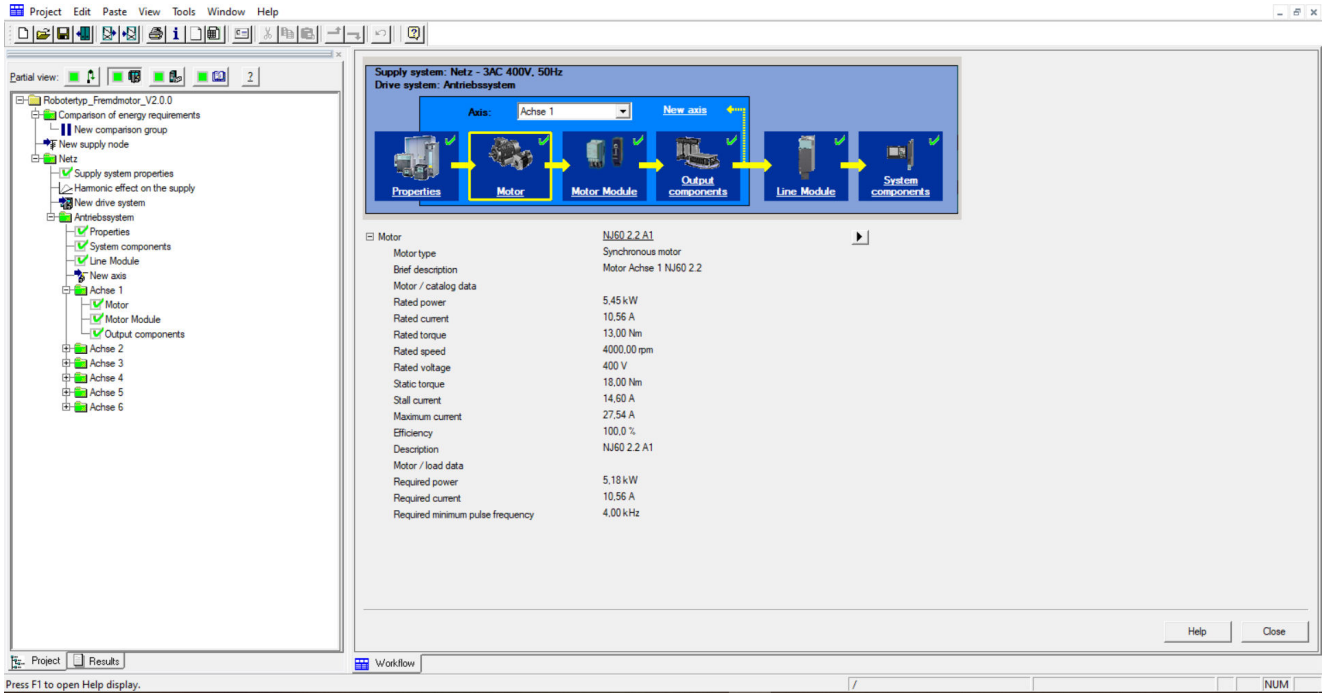


Figure 4-1 SIZER - drive systems - axis 1

SLM infeeds are configured for all types of robots. Configuration is carried out for maximum load (RDF=0.5).

If you specify an exact motion profile for your application, the RDF can be further reduced and, as a result, a smaller infeed can be selected.

SMC40 modules are additionally needed for connecting the encoder systems Endat2.2.

24 V power supply

Because third-party motors are used, for the layout of the 24 V supply (SITOP), the sum of the rated braking currents of the 6 robot axes is entered under "Current needed for additional electronic components".

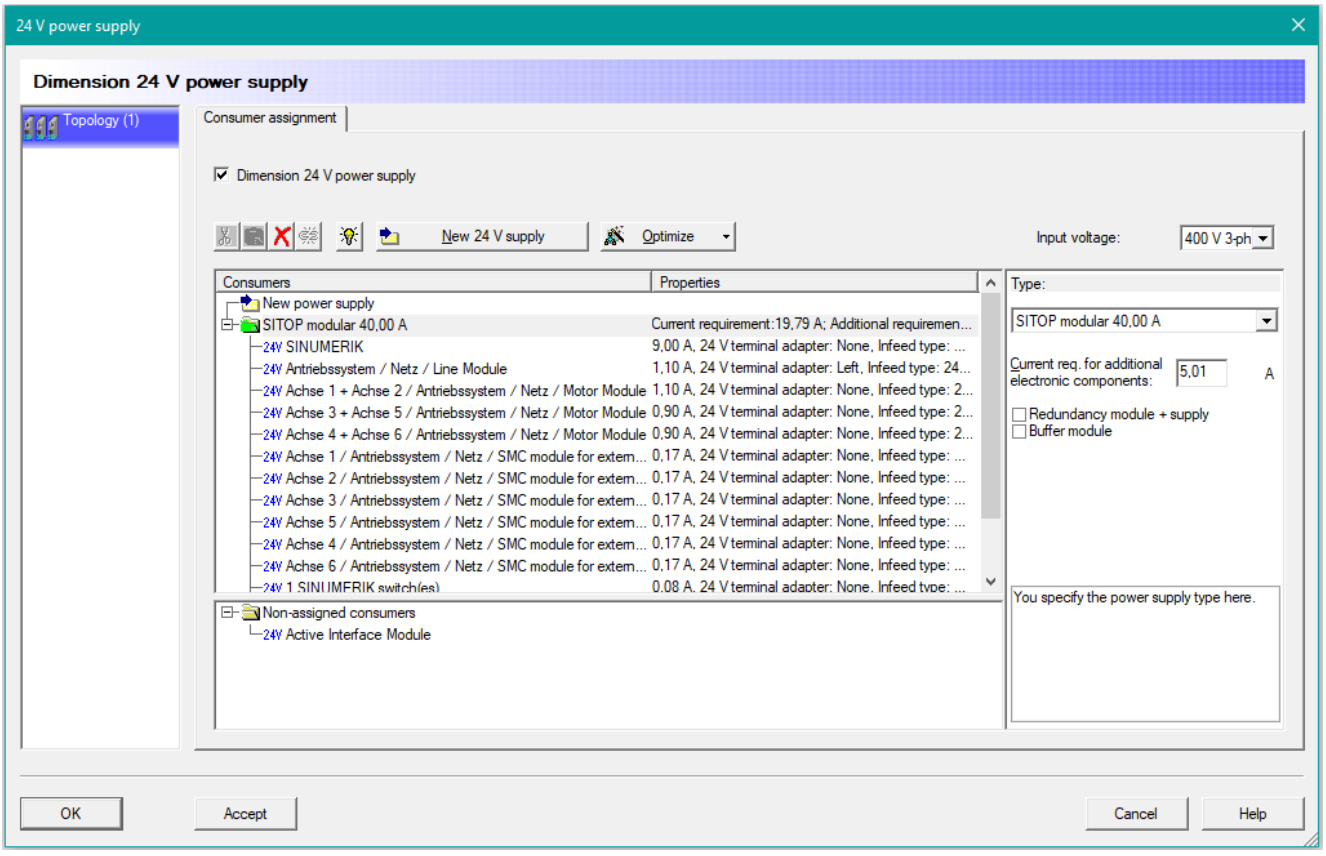


Figure 4-2 Configuration of the 24 V power supply

As an alternative to the "SITOP modular", the "SITOP PSU8600 40A" and the associated "BUF8600 4s" buffer module are configured under "Additional components". This means the 24 V are buffered in the event of a power failure. The SINAMICS drives can brake the robot axes from maximum speed at the current limit until they come to a standstill. The drives do not coast down. For motors with single-turn absolute encoders, this ensures that the axis adjustment remains valid for the associated axes.

Operator components

The HT10, including connection box, is selected as the operator component. Expand these if necessary.

Software options

- SINUMERIK Run MyRobot /Direct Control
  The minimum necessary software options for the operation of the robot with Run MyRobot / Direct Control are listed in Section Requirements for commissioning (Page 19). Depending on your specific application, additional software options may be necessary.
- SINUMERIK Run MyRobot /Direct Handling
  Alternatively, you can choose the package license Run MyRobot /Direct Handling (6FC5800-0BP84-0YB0).
  For more information, see Section Requirements for commissioning (Page 19).

Motor and encoder cables

The motor and encoder cables between the robot base/additional kinematics and the control cabinet are supplied by the robot manufacturer. The cables are fully pre-assembled. The interface with the control cabinet is a Harting plug, both for the motor cable and for the encoder cable.

The technical specification for the cables (including the grounding and shielding measures) is included in the delivery kit of the robot and is provided by the robot manufacturer.
In addition to the robot, you therefore need at least 2 further items from the robot manufacturer (see table below).

The motor and encoder cables inside the control cabinet, including the motor plugs for the SINAMICS S120 (3 A-30 A!) or the 15-pin D-sub connector for the SMC40, are parts of the SIZER project. Further necessary components from third-party manufacturers (e.g. Harting) for wiring inside a control cabinet and installation instructions (incl. grounding and shielding) are contained in the document "Schnittstellenerklärung zur Schaltschrankintegration Comau.pdf" (Interface Declaration for the integration of Comau Control Cabinet Interfaces). You can find the document in the folder for the SIZER projects. The Harting plug can be integrated on a separate plate or directly in the control cabinet panel.

The control cabinet's internal motor and encoder cable kit can also be ordered fully pre-assembled from Comau.

If the Robot Control Cabinet (RCC) is ordered from SIEMENS WKC, the motor and encoder cable inside the control cabinet is completely pre-assembled and does not have to be ordered separately from Comau.

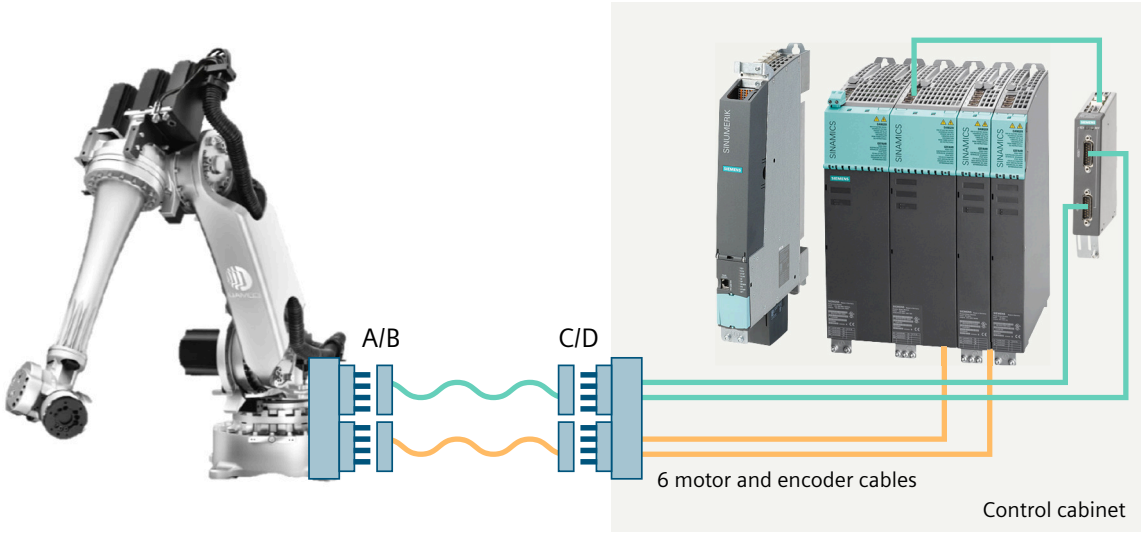


Figure 4-3 Ordering concept for cable between robot base, control cabinet and SINAMICS/sensor module cabinet-mounted SMC40

	Components for motors/encoders	**Available from**
A	Harting plug + encoder cable for connecting the robot and the control cabinet	Robot manufacturer
B	Harting plug + motor cable for connecting the robot and the control cabinet	Robot manufacturer
C	Connection Kit: Harting plugs in the control cabinet, including pins for connecting the 6 encoder cables with 15-pin D-sub connectors (connection to SMC40)	SIEMENS WKC (for RCC only) or cables assembled by the machine manufacturer or order from Comau
D	Connection Kit: Harting plugs in the control cabinet, including pins for connecting the 6 motor cables with motor plugs for SINAMICS C/D type (connection of the Motor Modules)	SIEMENS WKC (for RCC only) or cables assembled by the machine manufacturer or order from Comau

The DRIVE-CLiQ topology configured in the SIZER project corresponds exactly to the topology that is contained in the supplied CMC Topo project "RMRDC_Topologieprojekte_xxx.uptz". If you wire the SINAMICS component according to this specification, you can export the drive topology ("*.utz2") directly from the CMC Topo project ("*.uptz").

You will find further constraints relating to DQ topology in the Commissioning Manual Run MyRobot /Direct Control, section Generating the user-specified topology in Create MyConfig Topo.

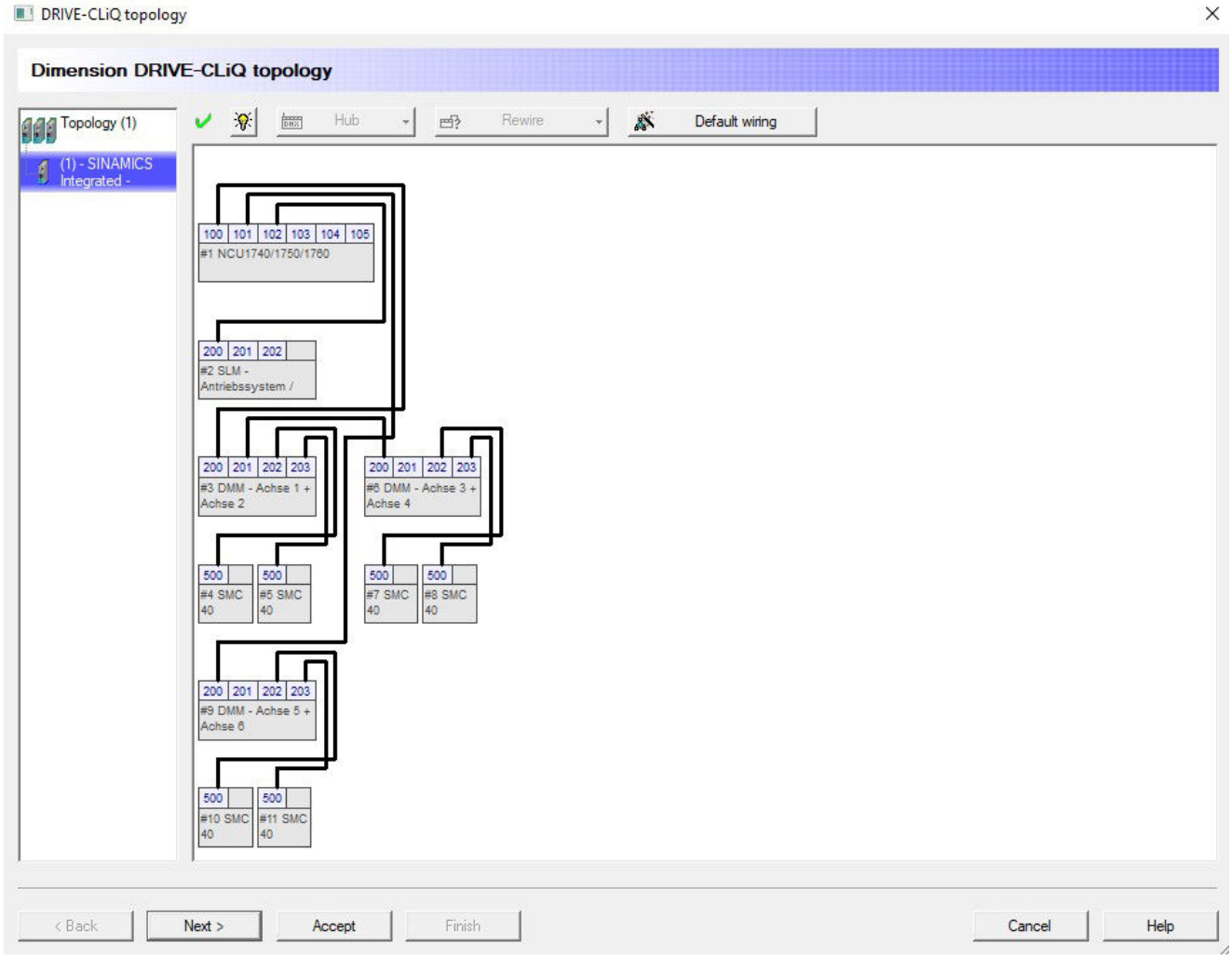


Figure 4-4 DRIVE-CLiQ topology (third-party motor)

Note

In SIZER, the following message is displayed under "Info" for robots with a direct measuring system:

Restrictions for the US market, MLFB "R05" (CC ROBX_AR) in conjunction with a buckling arm robot with a first and second feedback system (motor and axis angular encoder) neither released nor planned for the US market.

References

More information on the measures can be found in the following manuals:

- Configuration Manual SINAMICS Low Voltage (V6.5)
- EMC Installation Guideline Configuration Manual / Basic system requirements (01/2012)

4.3 Configuration of a SIZER project for MABI

Hardware components

Each SIZER project contains SINAMICS drives for the specific robot or additional axis types. If possible, a layout with 3 dual-axis modules is selected for robots. This is the most compact and most cost-effective variant. The motor data and the mechanical limits (maximum torque in the drive train) of the respective robot or additional kinematic type serve as the criteria for the layout.

All robot and additional kinematic types from MABI use SIEMENS motors. The SIEMENS motors, including order numbers, are included in each robot axis in the generated bill of materials. These are ordered by the robot manufacturer and mounted on the robot. You do not therefore have to order the motors yourself. The motors are identified accordingly in the SIZER project.

The merging of the SIZER projects of robots and additional kinematics required for the specific customer application is described in Section Importing the SIZER data of additional kinematics into a robot project (Page 41).

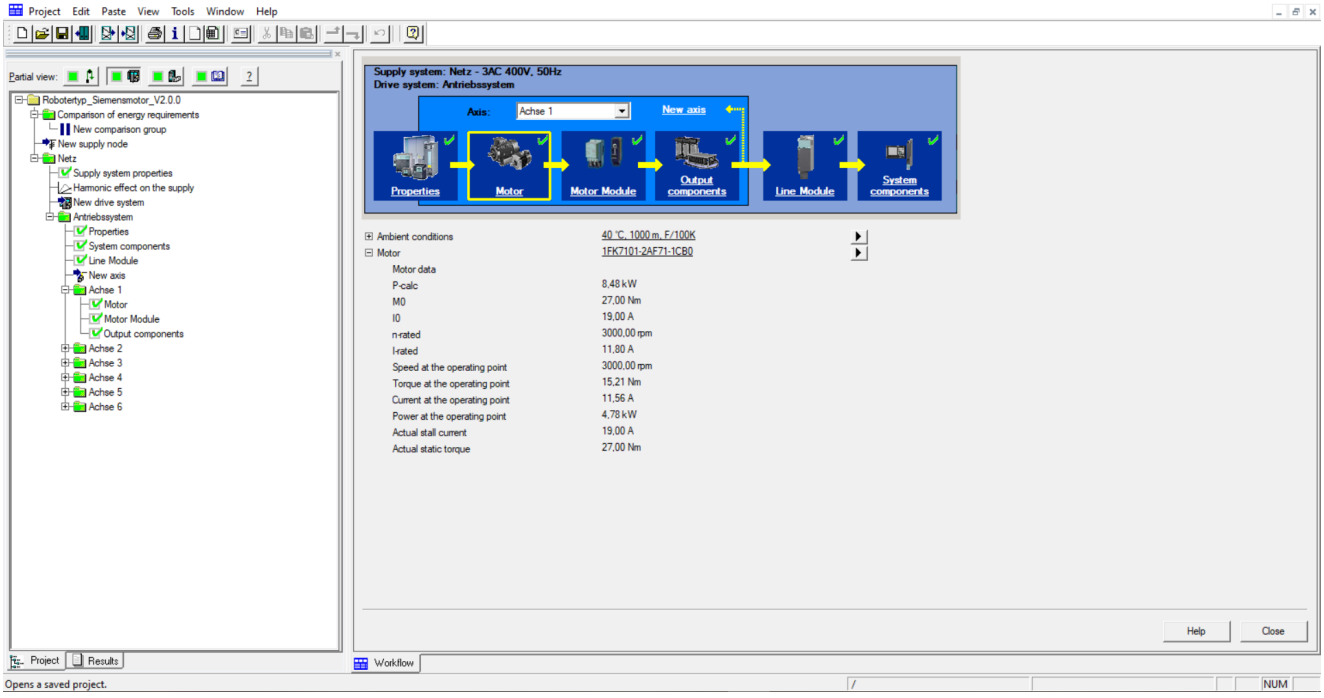


Figure 4-5 SIZER - drive systems - axis 1

SLM infeeds are configured for all types of robots. Configuration is carried out for maximum load (RDF=0.5).

If you specify an exact motion profile for your application, the RDF can be further reduced and, as a result, a smaller infeed can be selected.

24 V power supply

As an alternative to the "SITOP modular", the "SITOP PSU8600 40A" and the associated "BUF8600 4s" buffer module are configured under "Additional components". This means the 24 V are buffered in the event of a power failure. The SINAMICS drives can brake the robot axes from maximum speed at the current limit until they come to a standstill. Therefore the drives do not coast down.

Operator components

The HT10, including connection box, is selected as the operator component. Expand these if necessary.

Software options

- SINUMERIK Run MyRobot /Direct Control
  The minimum necessary software options for the operation of the robot with Run MyRobot / Direct Control are listed in Section Requirements for commissioning (Page 19). Depending on your specific application, additional software options may be necessary.
- SINUMERIK Run MyRobot /Direct Handling
  Alternatively, you can choose the package license Run MyRobot /Direct Handling (6FC5800-0AP84-0YB0).
  For more information, see Section Requirements for commissioning (Page 19).

Motor and encoder cables

The motor and encoder cables between the robot base and control cabinet are part of the offer made by the robot manufacturer. The cables are fully pre-assembled. Harting plugs are used as the interface to the control cabinet, both for the motor and the encoder cable.

The motor and encoder cables inside the control cabinet, including the motor plugs for the SINAMICS S120 (3A-30A!) and Profinet cables and plugs, are part of the SIZER project. The note "Schaltschrank/switching cabinet:" in the column "Article description" indicates this. A complete bill of materials for the components necessary for the wiring inside the control cabinet from third-party manufacturers (e.g. Harting) and installation instructions (incl. grounding and shielding) is contained in the document "Schnittstellenerklärung zur Schaltschrankintegration MABI Robotic.pdf" (Interface Declaration for the integration of MABI Robotic Control Cabinet Interfaces). You can find the document in the folder for the SIZER projects. The Harting plugs can be integrated on a separate plate or directly in the control cabinet panel.

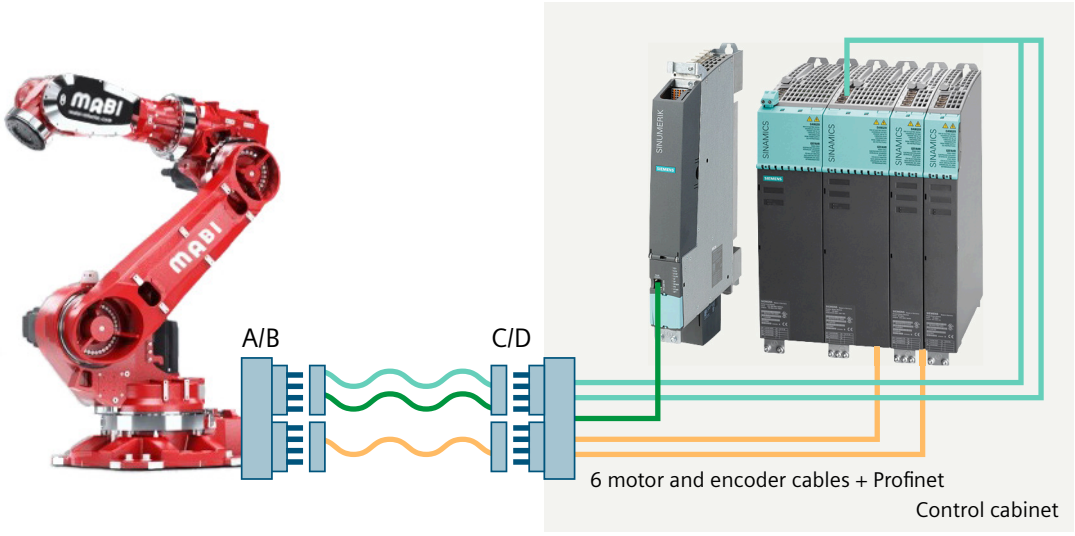


Figure 4-6 Ordering concept for cables between the robot base control cabinet and wiring inside the control cabinet

	Components for motor/encoder connection	Available from
A	Encoder cable (DQ) for connecting the robot and the control cabinet (fully pre-assembled)	Robot manufacturer
B	Motor cable for connecting the robot and the control cabinet (fully pre-assembled)	Robot manufacturer
C	Connection kit encoder/Profinet: Encoder cables + Profinet inside the control cabinet incl. Harting plugs	SIEMENS WKC (for RCC only) or cables assembled by the machine manufacturer
D	Connection kit motor: Motor cables + Profinet inside the control cabinet incl. Harting plugs	SIEMENS WKC (for RCC only) or cables assembled by the machine manufacturer

For robots with direct measuring systems on the robot axis, the DRIVE-CLiQ topology configured in the SIZER project differs from the CMC-Topo project "RMRDC_Topologieprojekte_xxx.uptz" supplied. Therefore use the topology from "RMRDC_Topologieprojekte_xxx.uptz". Deviations occur if, for example, DQHubs (DMC20) are integrated in the robot base to minimize the number of encoder cables between the robot base and the control cabinet. These components are part of the robot manufacturer's scope of delivery and are therefore not included in the SIZER project. The SINAMICS components are wired according to the SIZER project. You can export the drive topology ("*.utz2") directly from the CMC Topo project ("*.uptz").

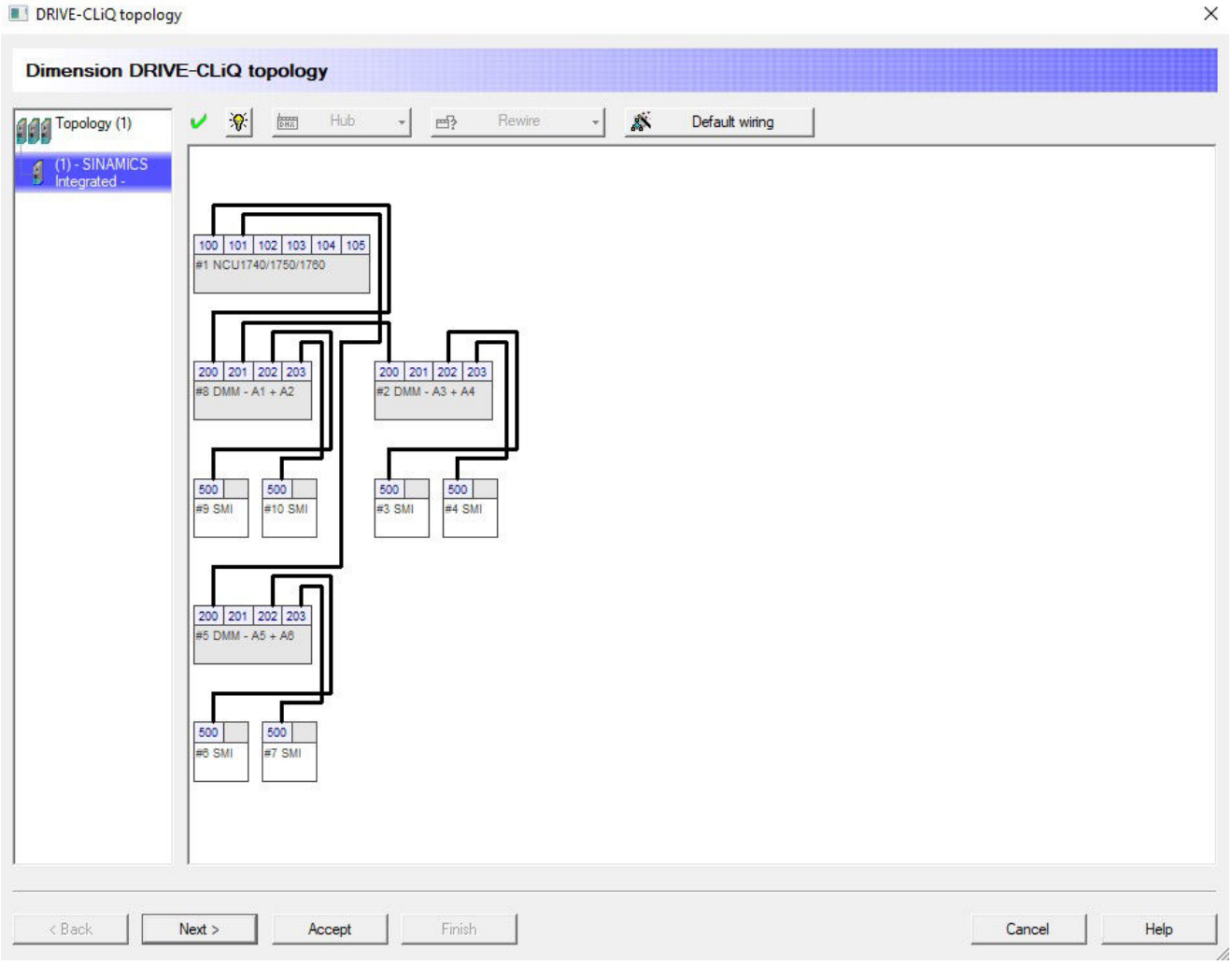


Figure 4-7 DRIVE-CLiQ topology (SIEMENS motors)

You will find further constraints relating to DQ topology in the Commissioning Manual SINUMERIK Run MyRobot /Direct Control, Section Generating the user-specified topology in Create MyConfig Topo.

Note

In SIZER, the following message is displayed under "Info" for robots with a direct measuring system:

Restrictions for the US market, MLFB "R05" (CC ROBX_AR) in conjunction with a buckling arm robot with a first and second feedback system (motor and axis angular encoder) neither released nor planned for the US market.

References

Further information on the measures can be found in the following manuals:

- SINAMICS Low Voltage Engineering Manual (V6.5)
- EMC Installation Guideline Configuration Manual / Basic system requirements (01/2012)

4.4 Configuration of a SIZER project for Autonox

Hardware components

Each SIZER project contains SINAMICS drives for the specific robot or additional axis types. If possible, a layout with 3 dual-axis modules is selected for robots. This is the most compact and most cost-effective variant. The motor data and the mechanical limits (maximum torque in the drive train) of the respective robot or additional kinematic type serve as the criteria for the layout.

Depending on the type of robot from Autonox, specific SIEMENS or third-party motors are used:

1. Use of SIEMENS motors
   The motors are part of the SIZER project. You must order the motors and choose "Autonox" as the delivery address. The motors are installed at Autonox. Motors cannot be ordered and supplied by WKC!
   - **Europe/Germany:**
     autonox Robotics GmbH
     Industriestrasse 1
     77731 Willstaett (Germany)
   - **USA:**
     autonox Robotics LLC
     130 Satellite Blvd NE, Suite D.
     Suwanee, GA 30024 (USA)
   - **Other countries:**
     Talk to the customer service engineer responsible for you.
2. Use of third-party motors
   The motors are ordered by the robot manufacturer and mounted on the robot. This is identified accordingly in the bill of materials of the SIZER projects.

The merging of the SIZER projects of robots and additional kinematics required for the specific customer application is described in Section Importing the SIZER data of additional kinematics into a robot project (Page 41).

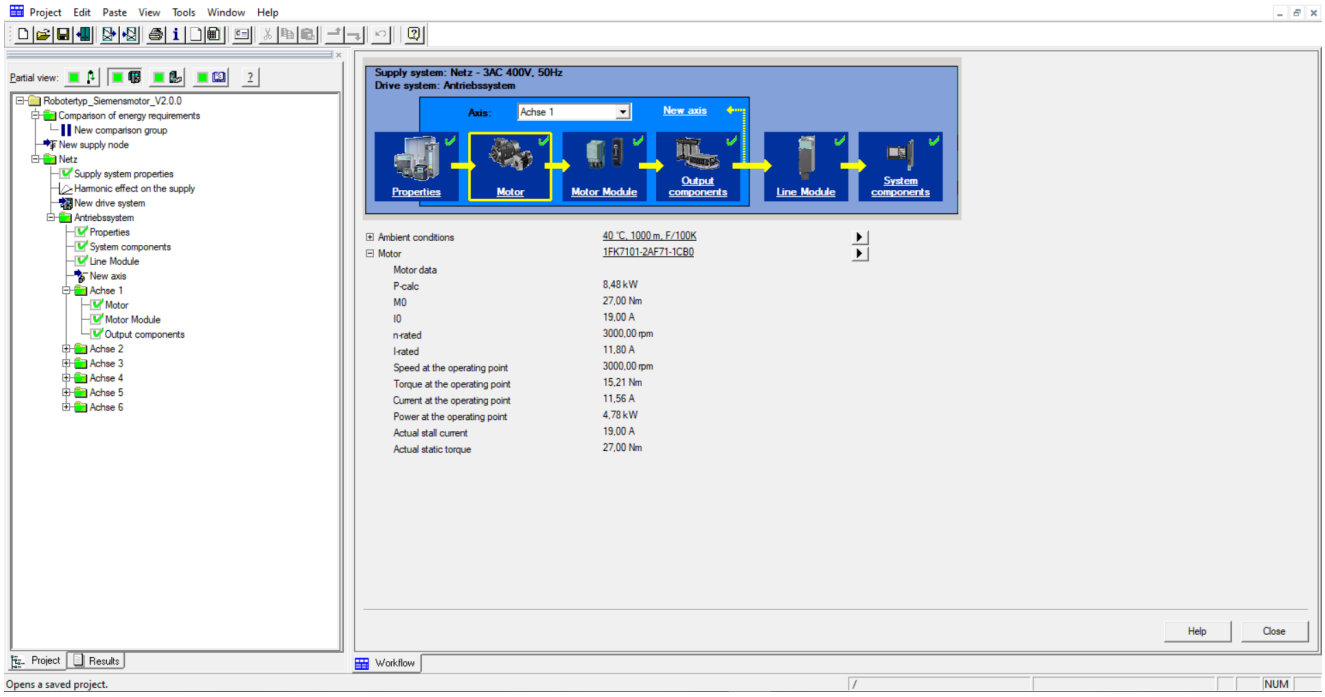


Figure 4-8 SIZER - drive systems - axis 1

SLM infeeds are configured for all types of robots. Configuration is carried out for maximum load (RDF=0.5).

If you specify an exact motion profile for your application, the RDF can be further reduced and, as a result, a smaller infeed can be selected.

24 V power supply

Because third-party motors are used, for the layout of the 24 V supply (SITOP), the sum of the rated braking currents of the 6 robot axes is entered under "Current needed for additional electronic components".

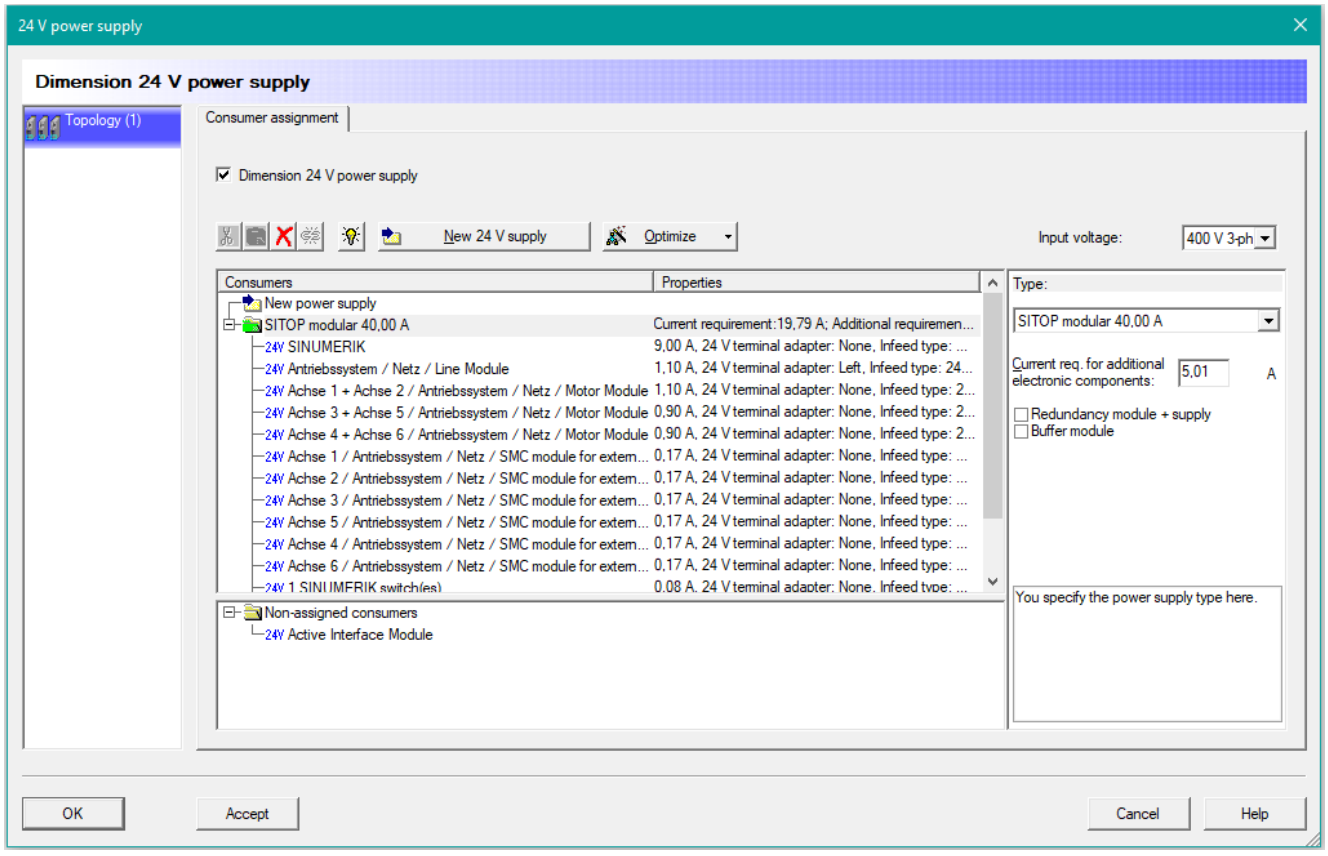


Figure 4-9 Configuration of the 24 V power supply

As an alternative to the "SITOP modular", the "SITOP PSU8600 40A" and the associated "BUF8600 4s" buffer module are configured under "Additional components". This means the 24 V are buffered in the event of a power failure. The SINAMICS drives can brake the robot axes from maximum speed at the current limit until they come to a standstill. Therefore the drives do not coast down.

Operator components

The HT10, including connection box, is selected as the operator component. Expand these if necessary.

Software options

- SINUMERIK Run MyRobot /Direct Control
  The minimum necessary software options for the operation of the robot with Run MyRobot / Direct Control are listed in Section Requirements for commissioning (Page 19). Depending on your specific application, additional software options may be necessary.
- SINUMERIK Run MyRobot /Direct Handling
  Alternatively, you can choose the package license Run MyRobot /Direct Handling (6FC5800-0AP84-0YB0).
  For more information, see Section Requirements for commissioning (Page 19).

Motor and encoder cables

The motor and encoder cables between the robot base and control cabinet are part of the SIZER project.

Depending on the motors used, the following variants must be considered:

- Use of SIEMENS motors
  Fully pre-assembled standard cables (MOTION-CONNECT 500) are used for the motor and encoder cable, including the motor plug for the SINAMICS S120 (3A-30A!). Both for motor cables and encoder cables, direct connection to the Motor Modules is effected through a cabinet bushing.
  The cable lengths between the control cabinet and the robot base have to be individually adapted in the SIZER project.
  Default: 12 m (contains 2 m spare for wiring inside the control cabinet)

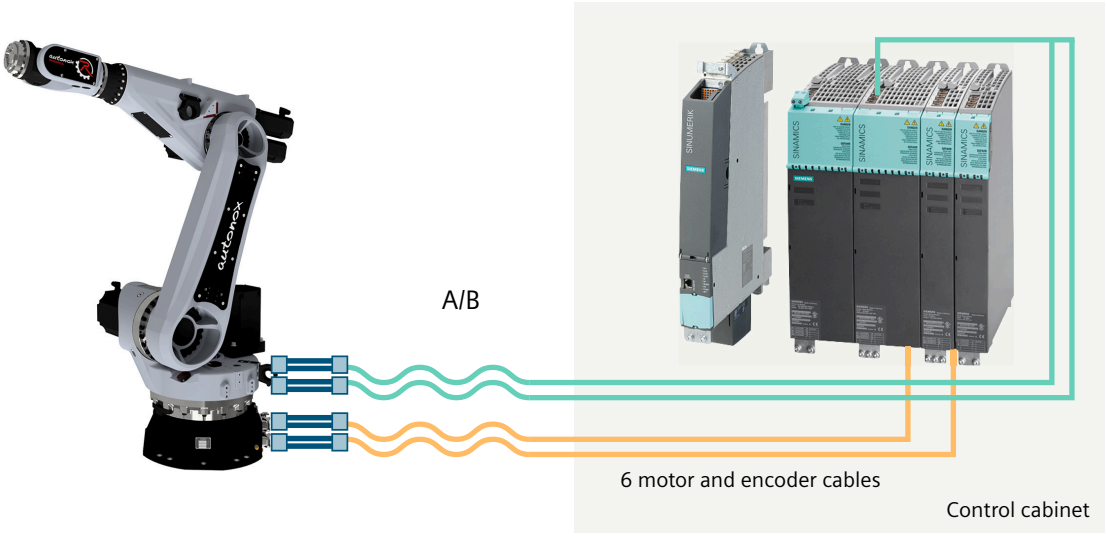


Figure 4-10 Order concept for cables between the robot and control cabinet

	Components for motor/encoder connection for SIEMENS motors	**Available from**
A	Encoder cable (DQ) for connecting the robot and the control cabinet (fully pre-assembled)	SIEMENS WKC (for RCC only) or ordering through the machine manufacturer
B	Motor cable for connecting the robot and the control cabinet (fully pre-assembled)	SIEMENS WKC (for RCC only) or ordering through the machine manufacturer

- Use of third-party motors
  Fully pre-assembled standard cables (MOTION-CONNECT 500) are used. The encoder cables are not pre-assembled. The individual components (Siemens/third-party manufacturers) of the encoder cables and the pre-assembled motor cables are listed in the SIZER project under "Info". Both for motor cables and encoder cables, direct connection to the Motor Modules or SMC40 is effected through a cabinet bushing.
  The cable lengths between the control cabinet and the robot base have to be individually adapted in the SIZER project.
  Default: 12 m (contains 2 m spare for wiring inside the control cabinet)

	Components for motor/encoder connection for third-party motors	Available from
A	Encoder cable for connecting the robot and the control cabinet (cable must be assembled by the user)	SIEMENS WKC (for RCC only) or ordering through the machine manufacturer
B	Motor cable for connecting the robot and the control cabinet (fully pre-assembled)	SIEMENS WKC (for RCC only) or ordering through the machine manufacturer

The DRIVE-CLiQ topology configured in the SIZER project corresponds exactly to the topology that is contained in the supplied CMC Topo project "RMRDC_Topologieprojekte_xxx.uptz". If you wire the SINAMICS component according to this specification, you can export the drive topology ("*.utz2") directly from the CMC Topo project ("*.uptz").

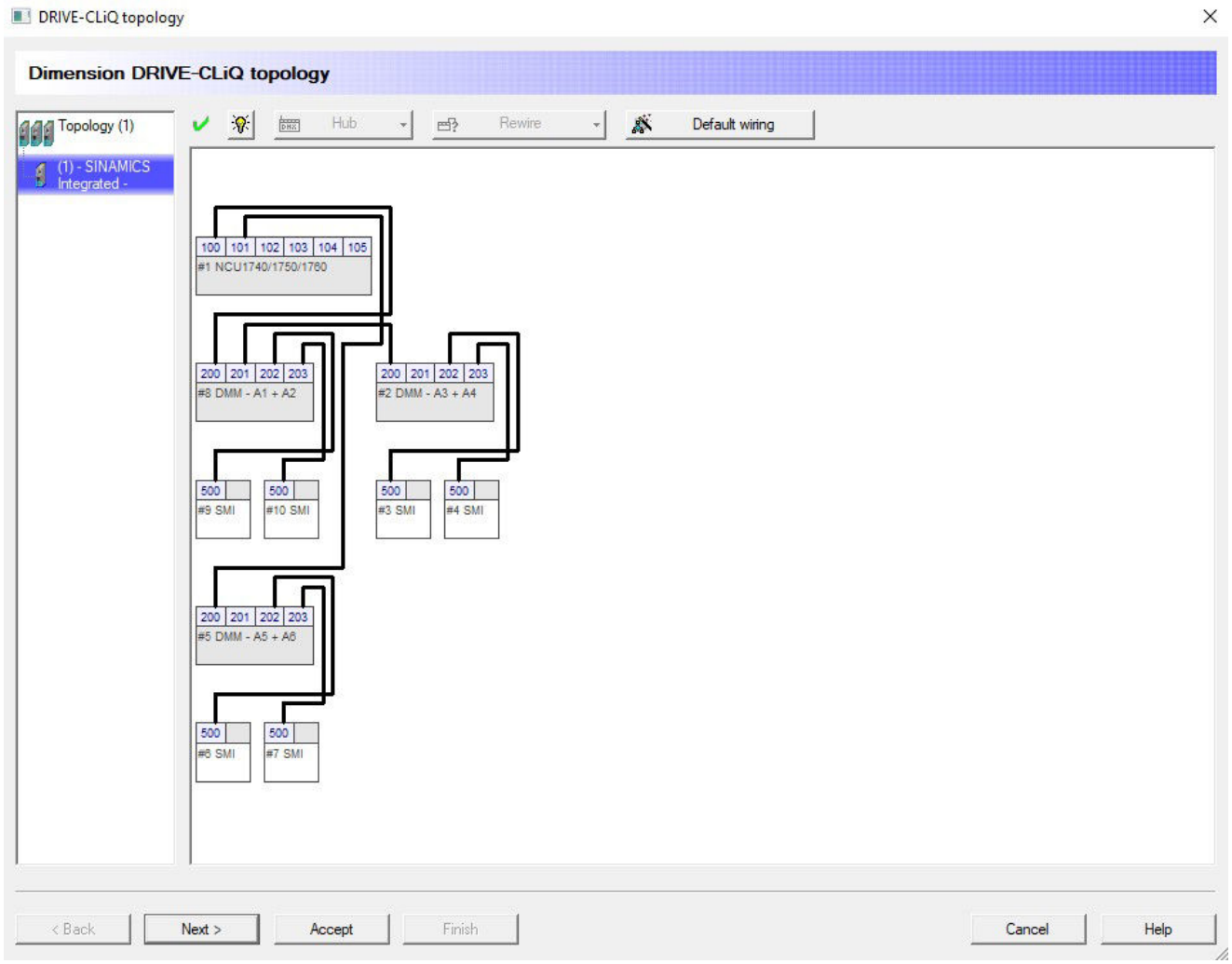


Figure 4-11 DRIVE-CLiQ topology (SIEMENS motors)

You will find further constraints relating to DQ topology in the Commissioning Manual SINUMERIK Run MyRobot /Direct Control, Section Generating the user-specified topology in Create MyConfig Topo.

Note

In SIZER, the following message is displayed under "Info" for robots with a direct measuring system:

Restrictions for the US market, MLFB "R05" (CC ROBX_AR) in conjunction with a buckling arm robot with a first and second feedback system (motor and axis angular encoder) neither released nor planned for the US market.

References

Further information on the measures can be found in the following manuals:

- SINAMICS Low Voltage Engineering Manual (V6.5)
- EMC Installation Guideline Configuration Manual / Basic system requirements (01/2012)

4.5 Importing the SIZER data of additional kinematics into a robot project

Mechatronic components are additional kinematics. You can order them additionally from the robot manufacturers and integrate them into your plant. Additional kinematics may, for example, be vertical/horizontal rotary or rotary/tilting tables or linear axes. Additional kinematics are configured in a separate SIZER project.

For complete configuration for your application, you can merge the SIZER configurations of one or more additional kinematics and robots.

The procedure is explained below based on two SIZER projects. The data of the SIZER project for additional kinematics (e.g. linear axis) are imported into the SIZER project of a robot.

Procedure

1. Open the SIZER project of the robot.
2. Open the "Import components" dialog with menu "Project" > "Import from project".
3. Select the drive system of the additional kinematics. Confirm the selection with the "Import selected component" button.

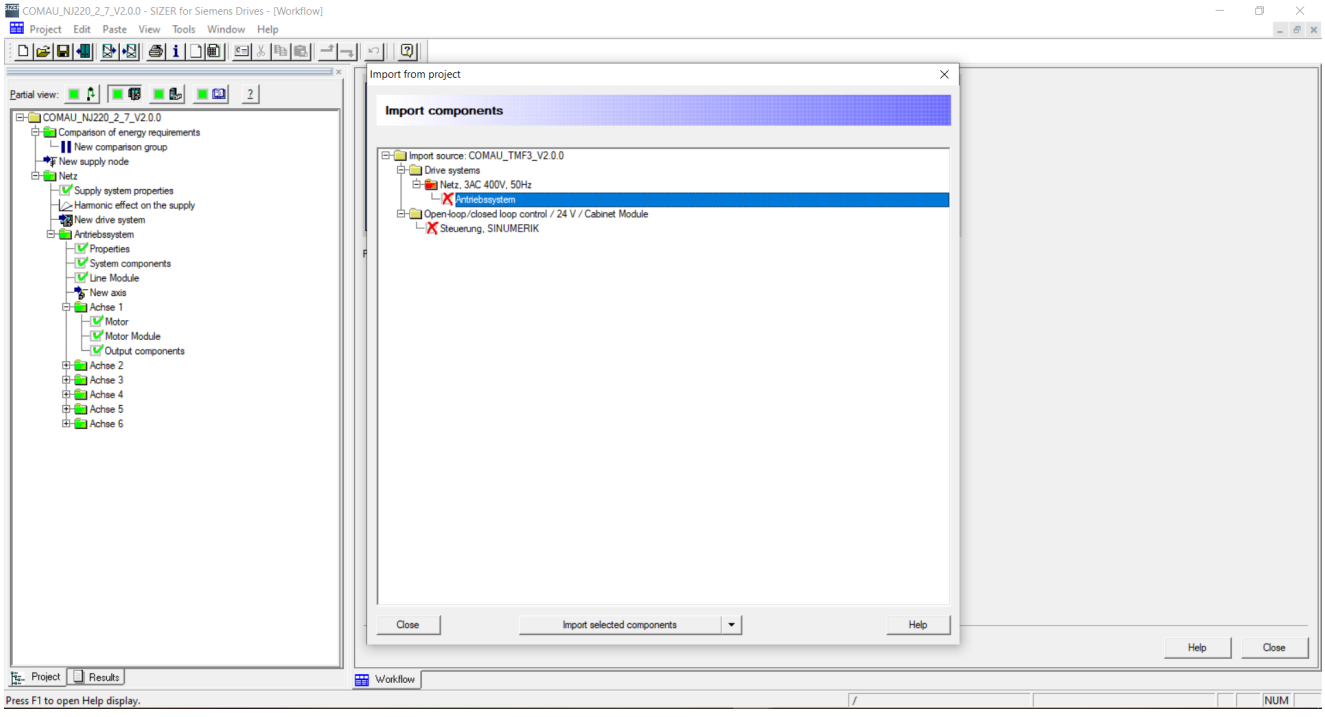


Figure 4-12 Import components - select drive system

4. Start the import with the "Close" button.

5. Copy the axis data of the additional kinematics into the drive system of the robot. Right-click on "Network (1)" > "TMF3 Axis 1" > "Copy" and then "Network" > "TMF3 Axis 1" > "Insert".

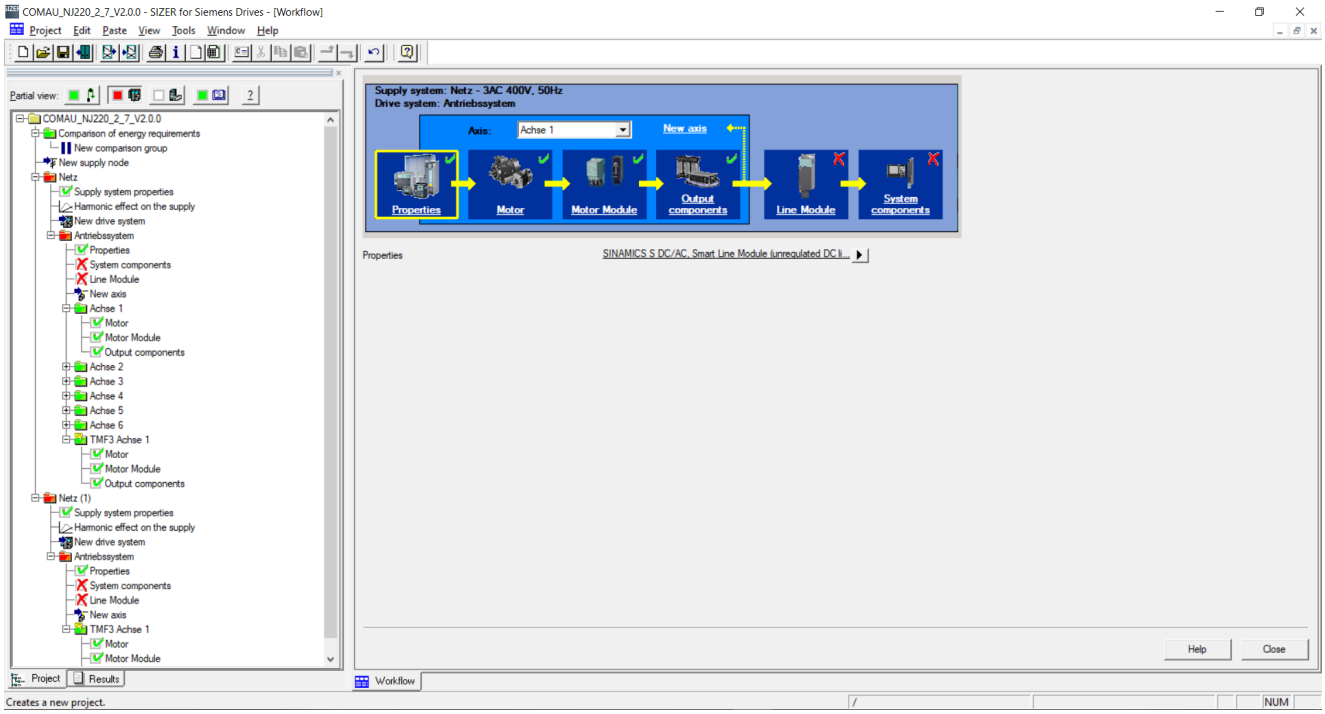


Figure 4-13 Insert TMF3 Axis 1

6. Delete the imported drive system "Network (1)".

7. If necessary, adapt the configuration of the Smart Line Module to the necessary performance class under "Line Module".

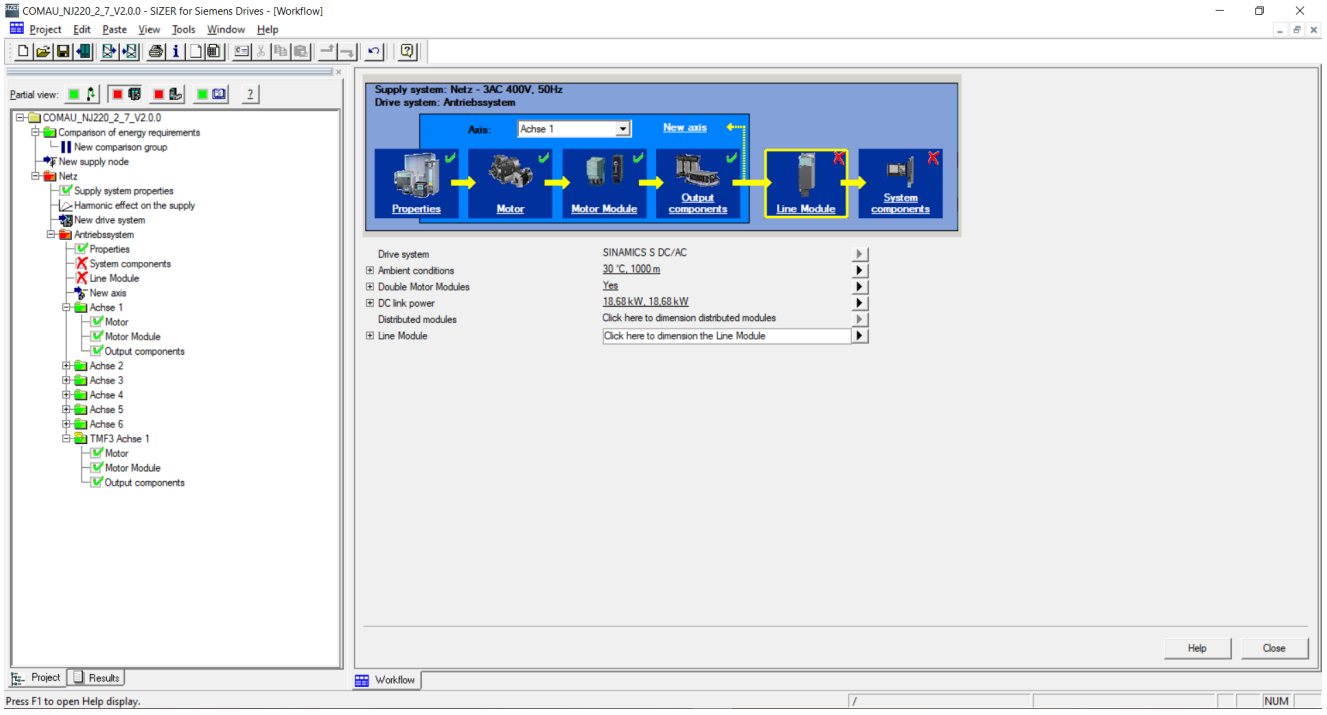


Figure 4-14 Adapt the configuration of the Smart Line Module

8. Open the menu "Controller/Closed-loop control/24 V/Cabinet Module" and click on the "Assign components" button to generate an additional NX module. Click "Yes" to confirm the "Assignment".

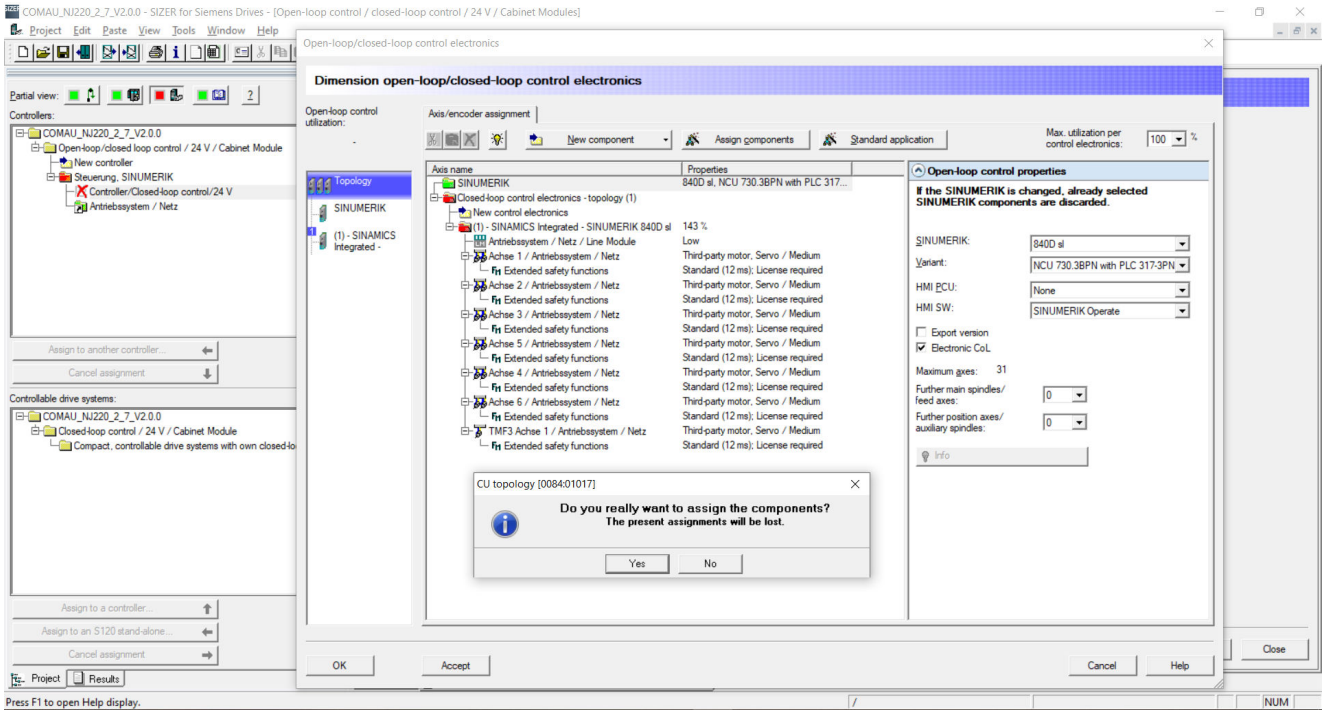


Figure 4-15 Creating an additional NX module

9. Click "OK" to close the dialog.

Note

The number of NC and SI axes is automatically increased by the number of special axes.

10. Under the menu item "Installation Arrangement", click the "Generate default installation arrangement" button and confirm by clicking "OK".

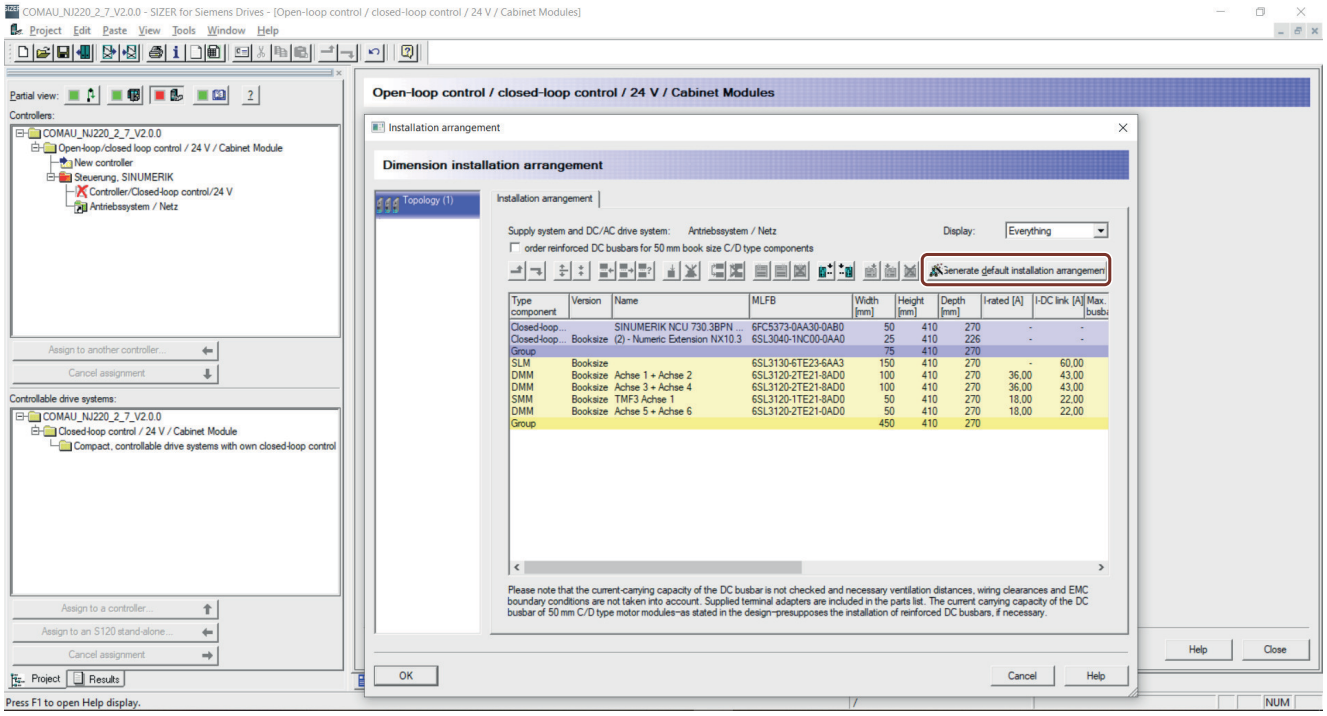


Figure 4-16 Generating an installation arrangement

11. Then click, under menu item "DRIVE CLiQ Topology", both for "(1) Sinamics Integrated" and for "(2) Numeric Extension NX10.3", on the "Set all recommended cable lengths" button.

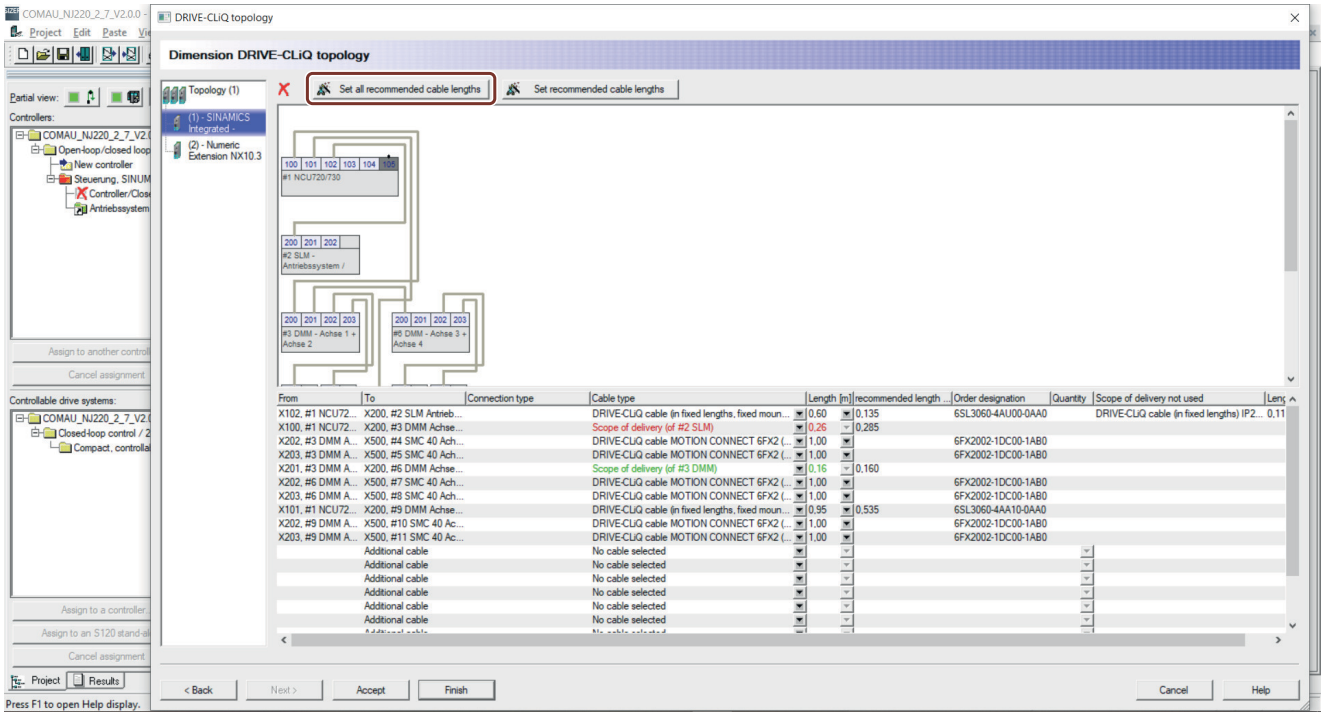


Figure 4-17 DRIVE CLiQ Topology - Setting recommended cable lengths

12. Then confirm the selection with "Finish".
13. The necessary 24 V power requirement for the brakes of additional kinematics with third-party motors and the comments on the cable concept for the motor and encoder cables between the robot base and control cabinet are stored in the comment field of the special axis/axes.
    Right-click on the imported axis, choose "Edit comment" and copy the 24 V current requirement, 1.04 A in the example.

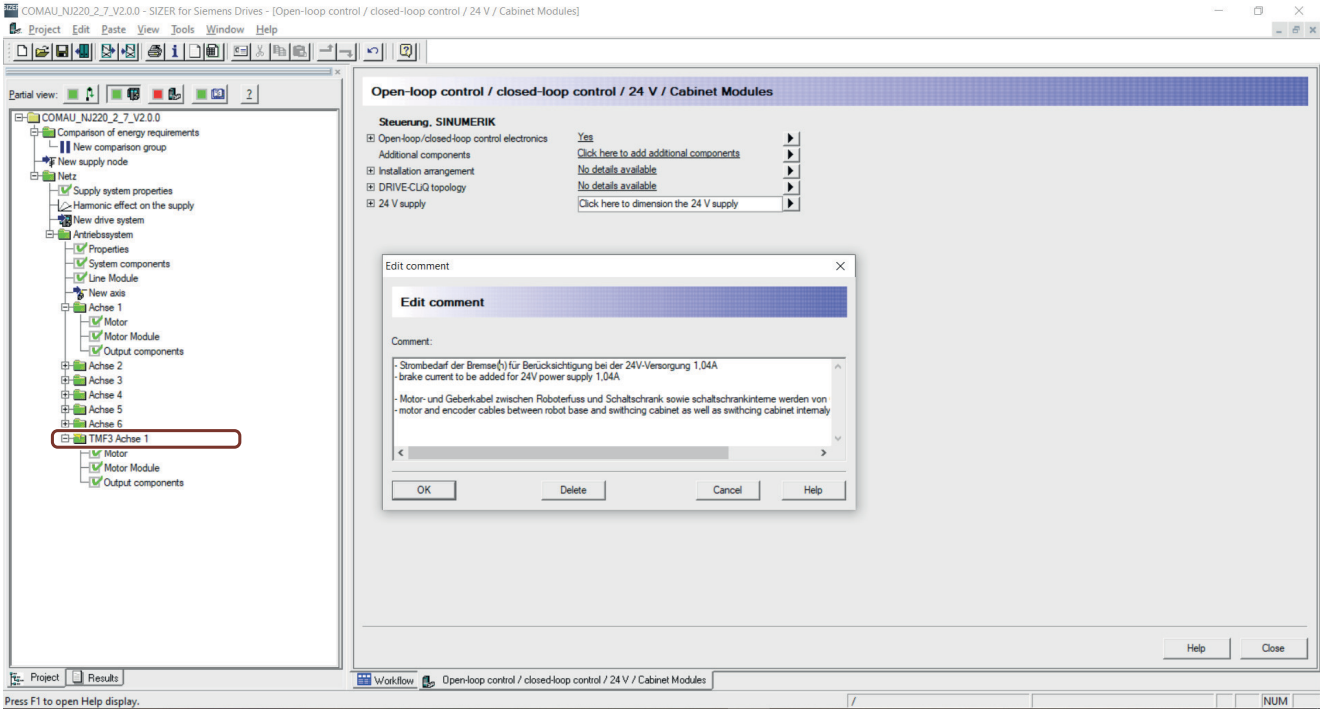


Figure 4-18 24 V power supply - Inserting a comment

14. Under menu item "24V power supply", add the 24 V power supply of the brakes of all special axes with third-party motors to the power supply of the brakes of the robot with third-party motors, 6 A + 1.04 A = 7.04 A in the example.

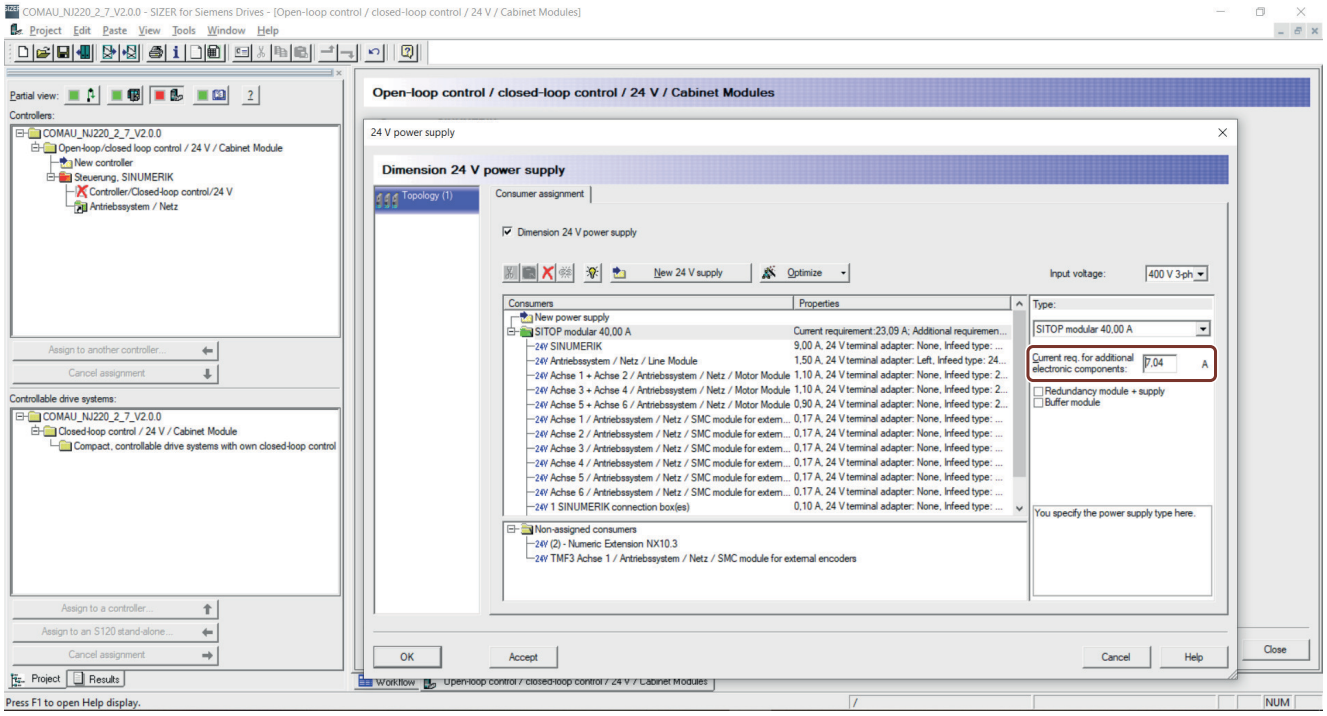


Figure 4-19 24 V power supply - Adding the power supply

15. Confirm your entry with "OK."

16. Save the SIZER project and click on "Export parts list" under menu item "Tools" to export the bills of materials into Excel.