SIEMENS

SINUMERIK

SINUMERIK 840D sl
SINUMERIK Run MyRobot /Direct Control

Commissioning Manual

Valid for

Control
SINUMERIK 840D sl
Software version
NCU system software for 840D sl 4.8 SP3

12/2018
A5E45238414B 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.

Siemens AG
Division Digital Factory
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E45238414B AB
℗ 01/2019 Subject to change

Copyright © Siemens AG 2018.
All rights reserved

Preface

SINUMERIK documentation

The SINUMERIK documentation is organized into the following categories:

- General documentation/catalogs
- User documentation
- Manufacturer/service documentation

Additional information

You can find information on the following topics at the following address (https://support.industry.siemens.com/cs/de/en/view/108464614):

- Ordering documentation/overview of documentation
- Additional links to download documents
- Using documentation online (find and search in manuals/information)

If you have any questions regarding the technical documentation (e.g. suggestions, corrections), please send an e-mail to the following address (mailto:docu.motioncontrol@siemens.com).

mySupport/Documentation

At the following address (https://support.industry.siemens.com/My/ww/en/documentation), you can find information on how to create your own individual documentation based on Siemens' content, and adapt it for your own machine documentation.

Training

At the following address (http://www.siemens.com/sitrain), you can find information about SITRAIN (Siemens training on products, systems and solutions for automation and drives).

FAQs

You can find Frequently Asked Questions in the Service&Support pages under Product Support (https://support.industry.siemens.com/cs/de/en/ps/faq).

SINUMERIK

You can find information about SINUMERIK at the following address (http://www.siemens.com/sinumerik).

Target group

This documentation is intended for commissioning personnel.

Note

Requirements

The following knowledge and skills are required:

- TIA Portal V15
- Commissioning of SINUMERIK and SINAMICS

Benefits

The intended target group can use the commissioning manual to test and commission the product, system or the plant correctly and safely.

Standard scope

This documentation only describes the functionality of the standard version. Additions or revisions made by the machine manufacturer are documented by the machine manufacturer.

Other functions not described in this documentation might be executable in the control. This does not, however, represent an obligation to supply such functions with a new control or when servicing.

For the sake of simplicity, this documentation does not contain all detailed information about all types of the product and cannot cover every conceivable case of installation, operation, or maintenance.

Note regarding the General Data Protection Regulation

Siemens observes standard data protection principles, in particular the principle of privacy by design. That means that

this product does not process / store any personal data, only technical functional data (e.g. time stamps). If a user links this data with other data (e.g. a shift schedule) or stores personal data on the same storage medium (e.g. hard drive) and thus establishes a link to a person or persons, then the user is responsible for ensuring compliance with the relevant data protection regulations.

Technical Support

Country-specific telephone numbers for technical support are provided in the Internet at the following address (https://support.industry.siemens.com/sc/ww/en/sc/2090) in the "Contact" area.

Table of contents

Fundamental safety instructions

1

1.1 General safety instructions

⚠ WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or severe injury.

- Only work on electrical devices when you are qualified for this job.
- Always observe the country-specific safety rules.

Generally, the following six steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check whether the existing auxiliary supply circuits are de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness in the inverse sequence.

⚠ WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV-(Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠ WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.

⚠ WARNING

Electric shock due to unconnected cable shields

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- As a minimum, connect cable shields and the cores of cables that are not used at one end at the grounded housing potential.

⚠ WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠ WARNING

Spread of fire from built-in devices

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠ WARNING

Unexpected movement of machines caused by radio devices or mobile phones

When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- If you come closer than around 2 m to such components, switch off any radios or mobile phones.
- Use the "SIEMENS Industry Online Support app" only on equipment that has already been switched off.

⚠ WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

⚠ WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have guaranteed that the functions relevant to safety are running correctly.

Note

Important safety notices for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety notices in the Safety Integrated manuals.

⚠ 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 (parameter assignments) against unauthorized access.
- Handle possible malfunctions by taking suitable measures, e.g. emergency stop or emergency off.

1.2 Equipment damage due to electric fields or electrostatic discharge

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Equipment damage due to electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.3 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.

1.4 Industrial security

Note

Industrial security

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:

Industrial security (http://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 at:

Industrial security (http://www.siemens.com/industrialsecurity)

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, malware 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.
- Protect the drive against unauthorized changes by activating the "know-how protection" drive function.

1.5 Residual risks of power drive systems

When assessing the machine- or system-related risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer or system installer must take into account the following residual risks emanating from the control and drive components of a drive system:

1. Unintentional movements of driven machine or system components during commissioning, operation, maintenance, and repairs caused by, for example,
   - Hardware and/or software errors in the sensors, control system, actuators, and cables and connections
   - Response times of the control system and of the drive
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of wireless devices/mobile phones in the immediate vicinity of electronic components
   - External influences/damage
   - X-ray, ionizing radiation and cosmic radiation
2. Unusually high temperatures, including open flames, as well as emissions of light, noise, particles, gases, etc., can occur inside and outside the components under fault conditions caused by, for example:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage
3. Hazardous shock voltages caused by, for example:
   - Component failure
   - Influence during electrostatic charging
   - Induction of voltages in moving motors
   - Operation and/or environmental conditions outside the specification
   - Condensation/conductive contamination
   - External influences/damage
4. Electrical, magnetic and electromagnetic fields generated in operation that can pose a risk to people with a pacemaker, implants or metal replacement joints, etc., if they are too close
5. Release of environmental pollutants or emissions as a result of improper operation of the system and/or failure to dispose of components safely and correctly
6. Influence of network-connected communication systems, e.g. ripple-control transmitters or data communication via the network

For more information about the residual risks of the drive system components, see the relevant sections in the technical user documentation.

Introduction 2

2.1 Configuration and commissioning of 6-axis robots

The manual supports you during the configuration and commissioning of a 6-axis robot with the SINUMERIK 840D sl. Specific knowledge is needed for configuring and commissioning 6-axis robots. 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 840D sl. You can find additional notes relating to references in Section Overview of the manuals for SINUMERIK 840D sl and Run MyRobot /Direct Control (Page 18).

2.2 Overview of the manuals for SINUMERIK 840D sl and Run MyRobot / Direct Control

You can find further information in the following manuals.

SIEMENS

- SINAMICS Low Voltage Engineering Manual (V6.5)
- EMC Installation Guideline Configuration Manual / Basic system requirements
- SINUMERIK 840D sl Safety Integrated plus Commissioning Manual
- Commissioning manual SINUMERIK 840D sl
- SINUMERIK Integrate Create MyConfig – Diff, Expert, Topo Operating Manual

Comau

You can download the Comau manuals at the following URL http://www.comau.com/de/unsere-kompetenzen/robotik/robot-team (http://www.comau.com/en/our-competences/robotics/robot-team):

- Technical specifications
- Maintenance
- Transport and installation

2.3 System overview of SINUMERIK 840D sl with 6-axis robot

Example system configuration

The following figure shows an example system layout for connecting a 6-axis robot to a SINUMERIK 840D sl.

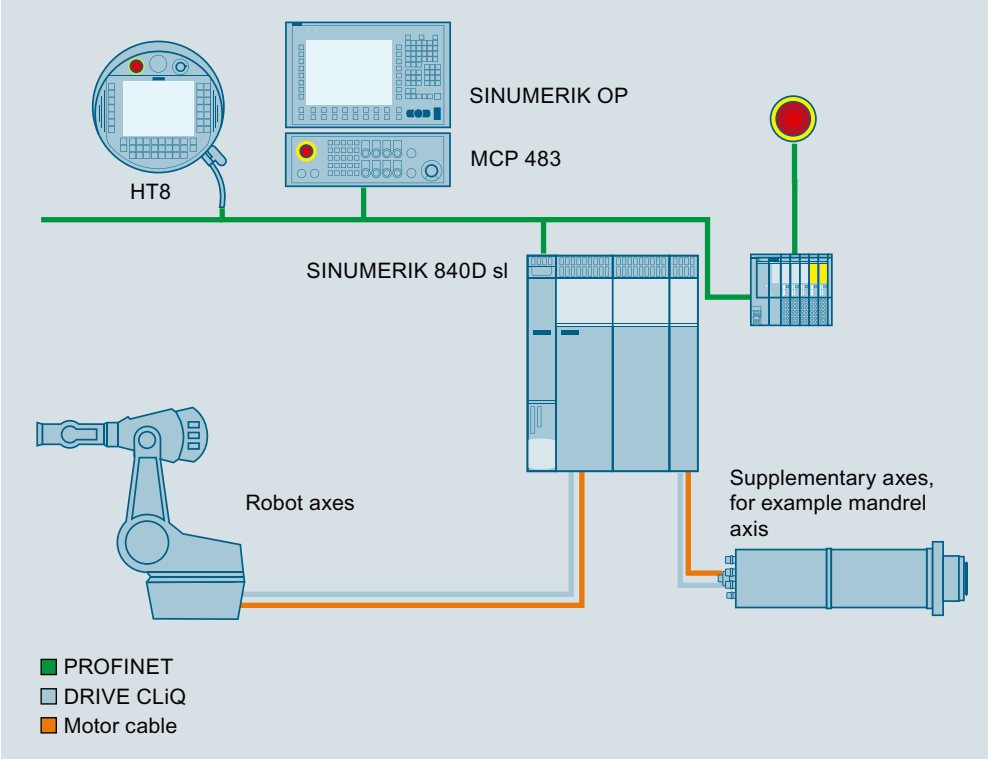


Figure 2-1 Example of a system configuration

2.4 Procedure when engineering and commissioning

The following gives you an overview of the necessary work steps for configuring and commissioning SINUMERIK Integrate Run MyRobot /Direct Control.

Configuring and commissioning Run MyRobot /Direct Control

Sequence		Reference to section
Configuration		
①	Configuring with SIZER	Configuring (Page 23)
Commissioning		
②	Creating DRIVE-CLiQ topology (user-specified topology) with Create MyConfig Topo	Generating the user-specified topology in Create MyConfig Topo (Page 31)
③	Configuration using the robot configurator	Robot configurator (Page 35)
④	Executing the CMC script	CMC script (Page 41)
⑤	Manual steps after installation	Manual steps after installation (Page 42)
⑥	Calculation of controller data	Calculating controller data (Page 53)

Requirements for commissioning

3

To commission a 6-axis robot with SINUMERIK Integrate 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 with SIZER (Page 23)).

Hardware

Table 3-1 Hardware components

Component	Number	Article number	Comment
SINUMERIK NCU 710.3 PN or SINUMERIK NCU 720.3 PN or SINUMERIK NCU 730.3 PN	1	See catalog or Mall	• NCU selection is application-specific • SINUMERIK NCU 710.3 PN only for handling
Active Line Module or 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	Number	Order number	Comment
CNC software Software version 4.8 SP2 HF3	1	See catalog or Mall	
TIA Portal V15 with SIMATIC STEP 7 Professional V15 and SINUMERIK STEP 7 Toolbox V15 **or** SIMATIC STEP 7 V5.5 SP4 with SINUMERIK Toolbox 840Dsl, V04.08.07.00	1	See catalog or Mall	

Component	Number	Order number	Comment
additional NC axes	3	1)	
SINUMERIK 840D sl multi-axis interpolation (>4 interpolating axes)	1	1)	
SINUMERIK 840D sl SINUMERIK Operate /NCU	1	1)	
SINUMERIK 840D sl cross-mode actions (ASUB and synchronized actions)	1	1)	
SINUMERIK Integrate Run MyCC / ROBX_AR	1	1)	Installation with SINUMERIK Integrate Create MyConfig
SINUMERIK Integrate Run MyCC /ROPE	1	1)	Installation with SINUMERIK Integrate Create MyConfig included in option ROBX_AR
SINUMERIK Integrate Run MyCC /AXCO	1	1)	Only necessary for selected types of robots (included in the SIZER project)
SINUMERIK Integrate Lock MyCycles	1	1)	
SINUMERIK Integrate Create MyConfig	1	1)	Only needed once, not for each robot
SIMATIC STEP7 Safety Advanced V15	1	See catalog or Mall	Necessary for, among other things, the application "Cartesian Safety"

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

Quantity structure

- A maximum of 3 robots are controlled in 3 channels.
- Up to 3 linear and 3 rotary supplementary axes per channel are supported (see ROBX documentation, Chapter Overview of the manuals for SINUMERIK 840D sl and Run MyRobot /Direct Control (Page 18)).
- A maximum of 31 interpolating axes are supported on one NCU 730.3.

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/109758486/sinumerik-run-myrobot-direct-control?dti=0&lc=en-WW) 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

Hardware components

Each SIZER project contains SINAMICS drives for 6 robot axes. If possible, a layout with 3 dual-axis modules is selected because this is the most compact and most cost-effective version. The motor data and the mechanical limits (maximum torque in the drive train) of the respective robot type serve as the criteria for the layout.

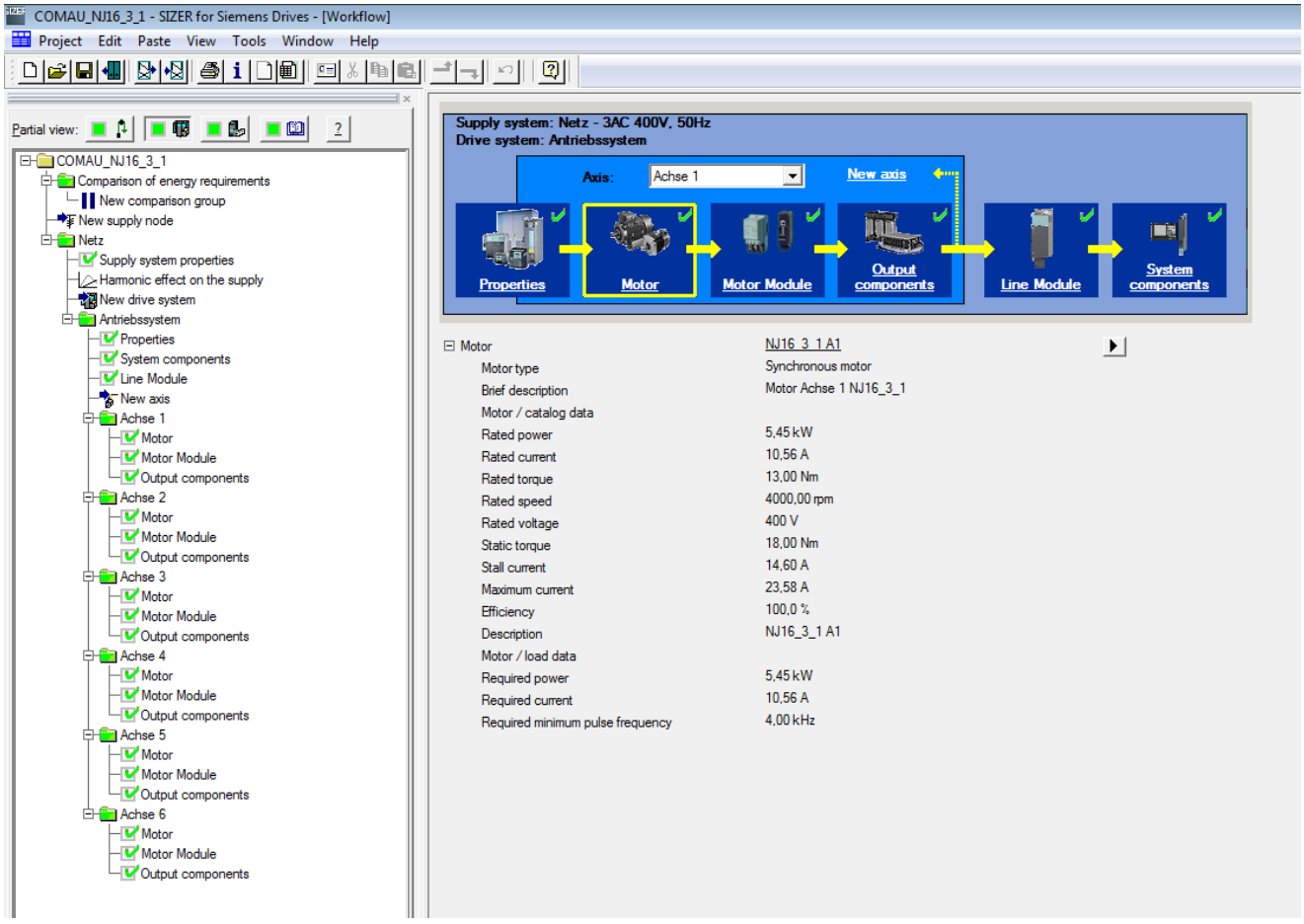


Figure 4-1 SIZER - drive systems - axis 1

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.

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

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

conditions for the DQ topology can be found in Section Generating the user-specified topology in Create MyConfig Topo (Page 31).

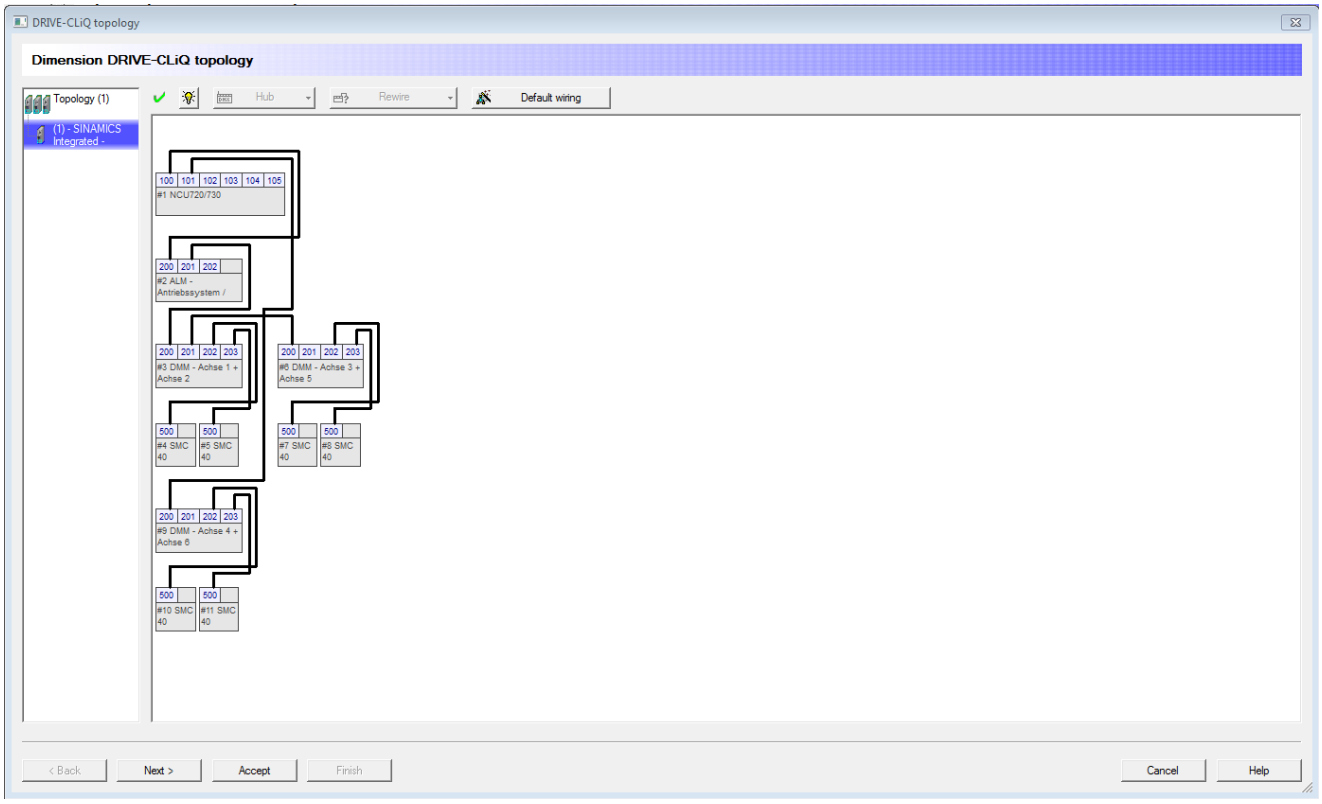


Figure 4-2 DRIVE-CLiQ topology

24 V supply

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".

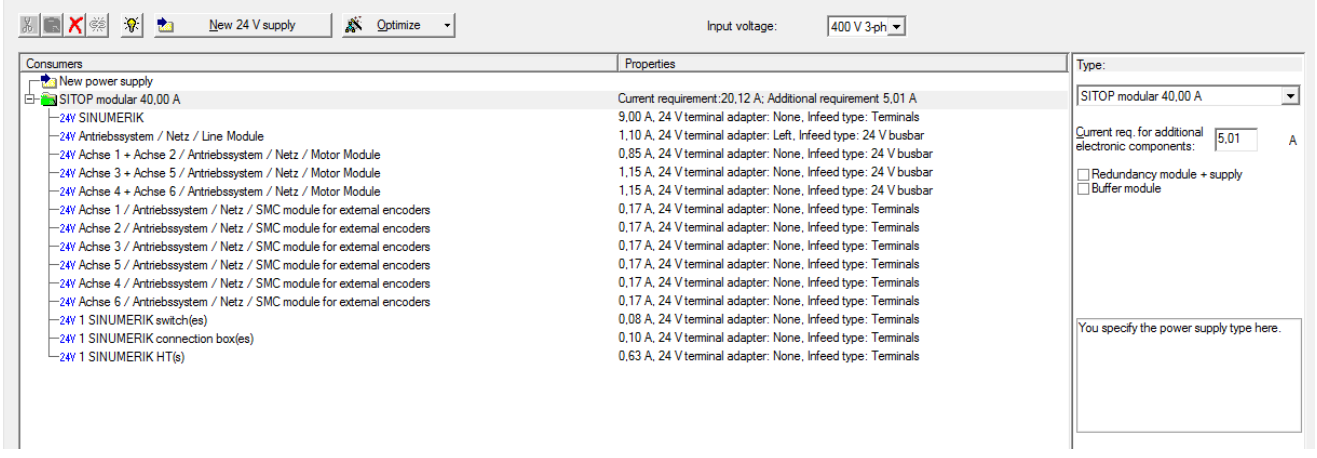


Figure 4-3 Layout 24 V supply

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. This ensures that the single-turn absolute encoder values retain their validity.

Operator components

The HT8, including connection box, is selected as the operator component. Expand these if necessary.

Software options

The minimum requirements for operating the robot are listed in Section Requirements for commissioning (Page 21). Depending on your specific application, additional software options may be necessary.

Note that the option CC AXCO (mechanical positive coupling of the hand axes) is not needed for every type of robot. The option is included in the SIZER projects as needed.

Motor and encoder cables

Both the motor and encoder cables between the robot base and the control cabinet and the motor and encoder cables inside the control cabinet are supplied by Comau. In addition to the robot, you thus need at least 4 additional items from Comau (refer to the table below). The cables from Comau are completely prefabricated. The cables include the motor plug for the SINAMICS S120 (3 A-30 A!) or the 15-pin D-sub connector for the SMC40. The interface in the control cabinet is a Harting connector, both for the motor cable and for the encoder cable. The Harting connector is integrated on a separate plate or directly in the control cabinet panel.

Therefore, no motor cable and encoder cable and no motor connector and encoder connector are selected in the SIZER project of the respective robot type. 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 Comau.

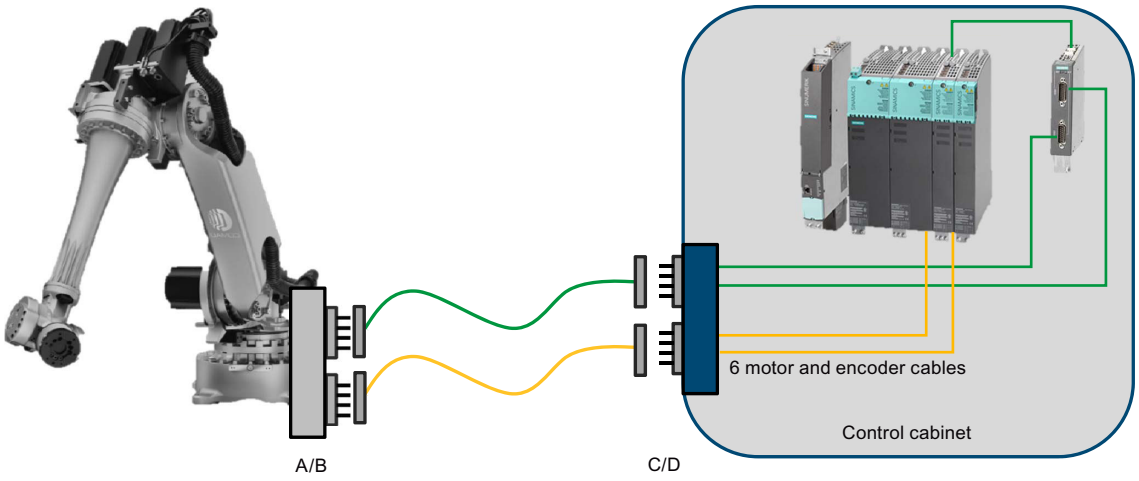


Figure 4-4 Ordering concept cable between base of robot, control cabinet and SINAMICS/Sensor Modul Cabinet-Mounted SMC40

	Components for motors/encoders	Available from
A	Harting connector + encoder cable for connecting the robot and the control cabinet	Comau
B	Harting connector + motor cable for connecting the robot and the control cabinet	Comau
C	Connection Kit: Harting connectors in the control cabinet, including pins for connecting the 6 encoder cables with 15-pin D-sub connectors (connection to SMC40)	Comau
D	Connection Kit: Harting connectors in the control cabinet, including pins for connecting the 6 motor cables with motor connectors for SINAMICS C/D type (to connect the Motor Module)	Comau

References

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

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

See also

Robot configurator (Page 35)

4.3 Special designs

Depending on the type of robot used, you must consider specific boundary conditions during the configuration.

Robot types with axis fans

For the following types of robots, additional 24 V wiring is needed for the control of the additional fans for cooling the motors:

- NJ 500 -2.7
- NJ 650-2.7
- NJ 420-3.0

References

You can find more detailed information about this in the Comau manuals.

Commissioning

5

5.1 General procedure

The following flow diagram shows the general procedure for the commissioning of SINUMERIK Integrate Run MyRobot /Direct Control.

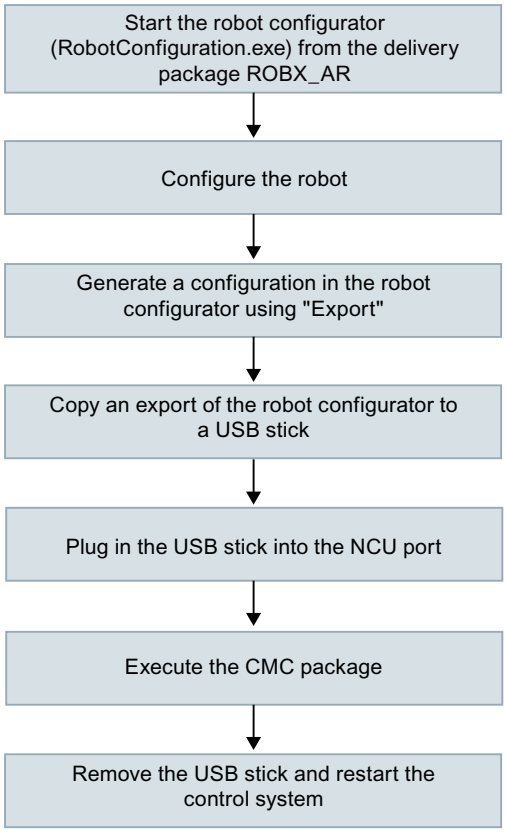


Figure 5-1 Commissioning of SINUMERIK Integrate Run MyRobot /Direct Control

5.2 Requirements

Before you start the commissioning process, you must ensure that the following requirements are fulfilled:

- The robot is correctly installed and wired. See the documentation from Comau, *Technical Specification* and *Transport and Installation*.
- The HW configuration is created in the TIA Portal and loaded into the NCU. Deactivate "Safety Integrated" as shown in the following figure.

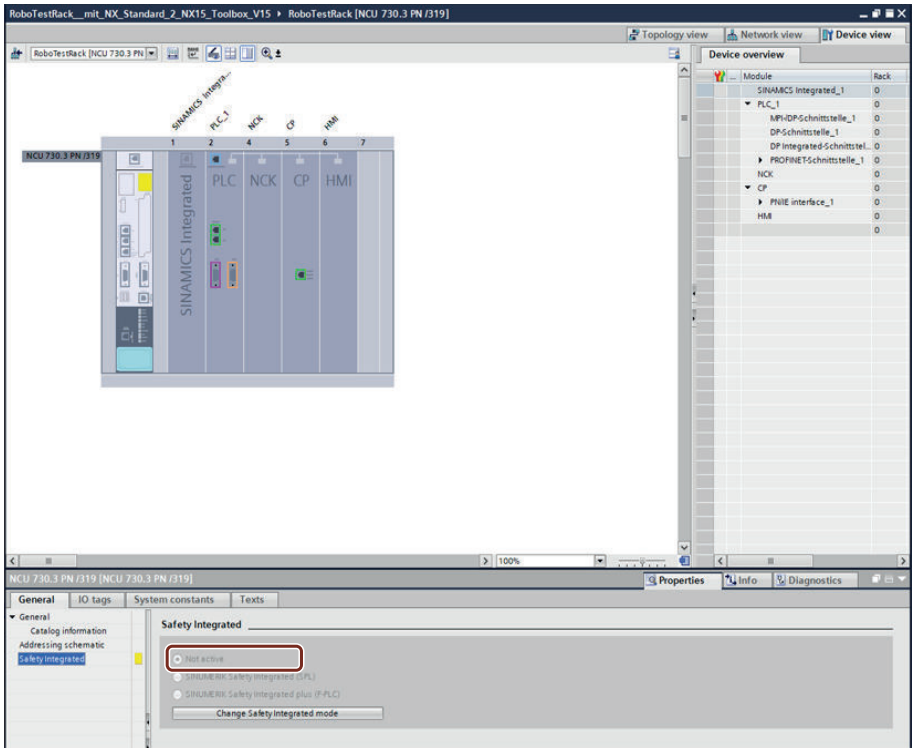


Figure 5-2 HW configuration in the TIA Portal (without Safety Integrated)

- The SINUMERIK Integrate Create MyConfig software is installed on the PC. This means that the .net framework is also installed. This is necessary for starting the robot configurator.
- The DRIVE-CLiQ topology is correctly wired (see Section Generating the user-specified topology in Create MyConfig Topo (Page 31))
- SINUMERIK Integrate Run MyCC /ROBX_AR has been downloaded from PridaNet.
- Optional, depends on robot type: SINUMERIK Integrate Run MyCC /AXCO has been downloaded from PridaNet.
- Optional: The example PLC project is downloaded from the SIOS Portal (https://support.industry.siemens.com/cs/document/109758486/sinumerik-run-myrobot-direct-control?dti=0&lc=en-WW).

5.3 Generating the user-specified topology in Create MyConfig Topo

Requirement

Before you begin commissioning with the robot configurator, you must generate the user-specified topology for DRIVE-CLiQ.

Standard topology

The standard topologies for all currently supported robots are contained in a Topo project "*.uptz" in the "cmc" folder of the delivery package. If the user-specified topology corresponds exactly to the user-specified topology in the SIZER project, you can transfer this standard topology directly as a user-specified topology without changes in CMC Topo (mode: User-specified topology, transfer version: "*.utz").

User-defined topology

If the user-specified topology deviates from the standard topology, e.g. because additional SINAMICS axes or other DRIVE-CLiQ components have been added, you must create a user-defined topology with CMC-Topo. The standard topologies for all currently supported robots are contained in a Topo project "*.uptz" in the "cmc" folder of the delivery package. You must use these as the basis for expansions.

Comply with the DRIVE-CLiQ rules when generating the user-specified topology. In addition, observe the rules for operating a 6-axis robot with RMR/DC:

- It is permissible to connect a maximum of 4 drives to one DRIVE-CLiQ line (requirement for Cartesian Safety).
- All 6 robot DOs must be wired on one drive unit (NCU or NX). Distribution of the 6 robot axes on NCU and NX is not permitted, because the correct execution of the drive macro and thus the drive commissioning are not guaranteed.
- The physical order of the SINAMICS axes must be arranged and wired in ascending order to guarantee error-free processing of the drive macro.
  Examples:
  - Motor module sequence 1,2,3,4,5,6 corresponds to RA1 to RA6
  - Motor module sequence 1,2,3,6,4,5 is not permitted

- The infeed (SLM with DRIVE-CLiQ or an ALM) must be connected as follows for the physical wiring of the DRIVE-CLiQ cable:
  - After the last Motor Module on axis 6:

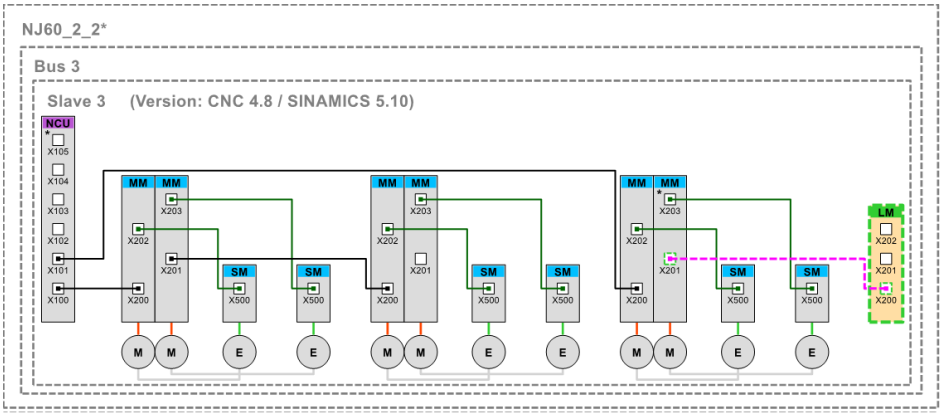


Figure 5-3 Example topology for the NJ60 with infeed on axis 6

  - As the last module on the DRIVE-CLiQ port X102 of the Control Unit:

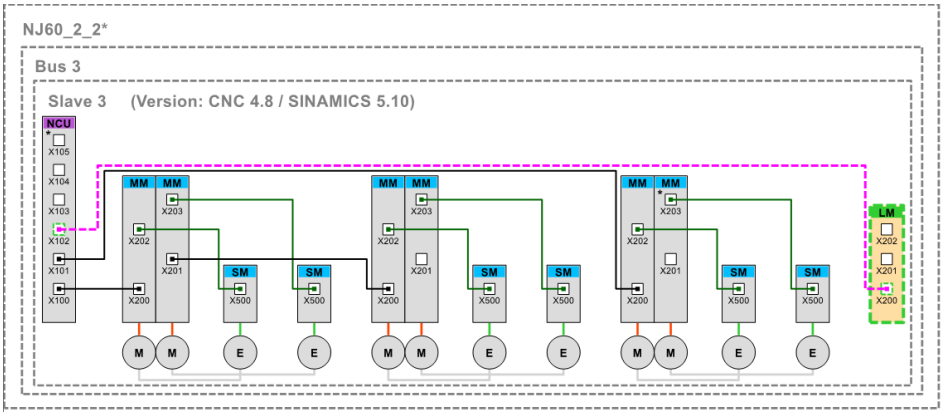


Figure 5-4 Example topology for the NJ60 with infeed at port X102 of the Control Unit

For robots with a Smart Line Module without DRIVE-CLiQ connection, the Motor Modules are connected to the DRIVE-CLiQ connections of the Control Unit in ascending order:

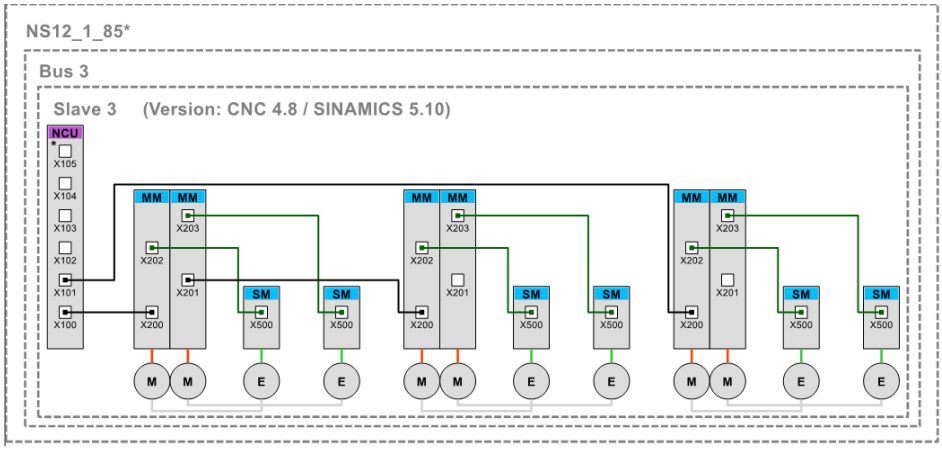


Figure 5-5 Example topology for the NS12 with infeed without DRIVE-CLiQ connection

Adhere to this physical wiring specification to ensure error-free processing of the drive macros.
Apply these specifications in an analogous manner for a drive line-up on an NX.

- The DO variables DO No. and DO name must be addressed as follows (see figure below) in order to guarantee the correct execution of the drive macro:
  - Robot axis RA1_1 has DO No. 2
  - Robot axis RA2_1 has DO No. 3
  - ...
  - Robot axis RA6_1 has DO No. 7

Call the DO list in "CMC-Topo" via the menu command "Data" > "Manage DO list".

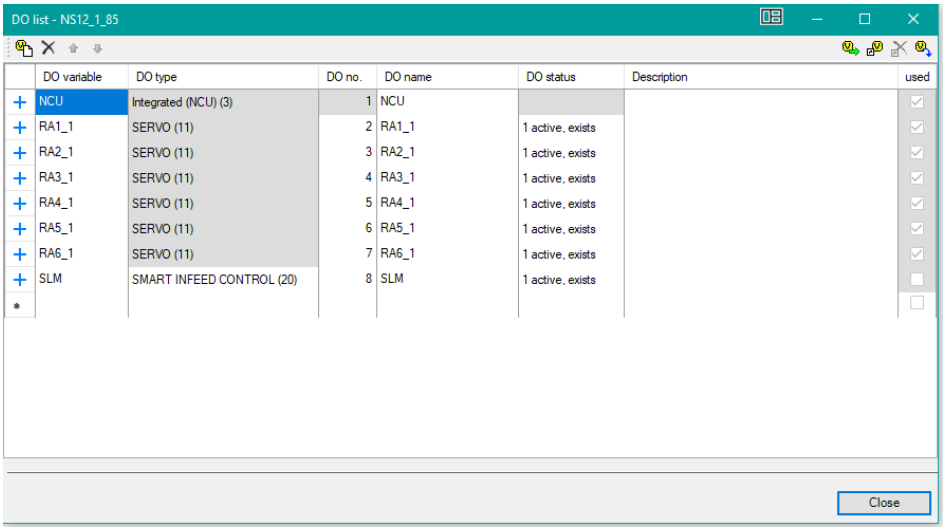
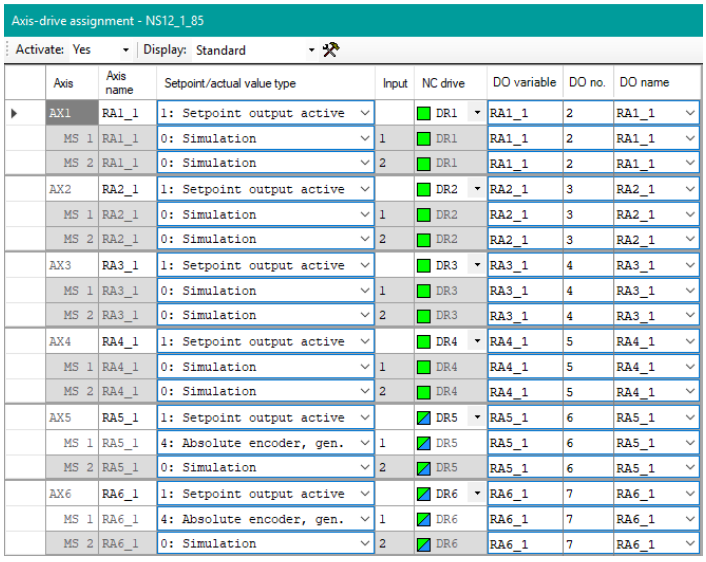


Figure 5-6 DO list

- Carry out the axis-drive assignment. The example assignment for robot type NS12 1.85 is displayed in the following figure.



Axis	Axis name	Setpoint/actual value type	Input	NC drive	DO variable	DO no.	DO name
AX1	RA1_1	1: Setpoint output active		DR1	RA1_1	2	RA1_1
MS 1	RA1_1	0: Simulation	1	DR1	RA1_1	2	RA1_1
MS 2	RA1_1	0: Simulation	2	DR1	RA1_1	2	RA1_1
AX2	RA2_1	1: Setpoint output active		DR2	RA2_1	3	RA2_1
MS 1	RA2_1	0: Simulation	1	DR2	RA2_1	3	RA2_1
MS 2	RA2_1	0: Simulation	2	DR2	RA2_1	3	RA2_1
AX3	RA3_1	1: Setpoint output active		DR3	RA3_1	4	RA3_1
MS 1	RA3_1	0: Simulation	1	DR3	RA3_1	4	RA3_1
MS 2	RA3_1	0: Simulation	2	DR3	RA3_1	4	RA3_1
AX4	RA4_1	1: Setpoint output active		DR4	RA4_1	5	RA4_1
MS 1	RA4_1	0: Simulation	1	DR4	RA4_1	5	RA4_1
MS 2	RA4_1	0: Simulation	2	DR4	RA4_1	5	RA4_1
AX5	RA5_1	1: Setpoint output active		DR5	RA5_1	6	RA5_1
MS 1	RA5_1	4: Absolute encoder, gen.	1	DR5	RA5_1	6	RA5_1
MS 2	RA5_1	0: Simulation	2	DR5	RA5_1	6	RA5_1
AX6	RA6_1	1: Setpoint output active		DR6	RA6_1	7	RA6_1
MS 1	RA6_1	4: Absolute encoder, gen.	1	DR6	RA6_1	7	RA6_1
MS 2	RA6_1	0: Simulation	2	DR6	RA6_1	7	RA6_1

Figure 5-7 Axis-drive assignment

- You must transfer the topology as a user-specified topology (mode: User-specified topology, transfer version: "*.utz").

References

SINUMERIK Integrate Create MyConfig – Diff, Expert, Topo Operating Manual

5.4 Robot configurator

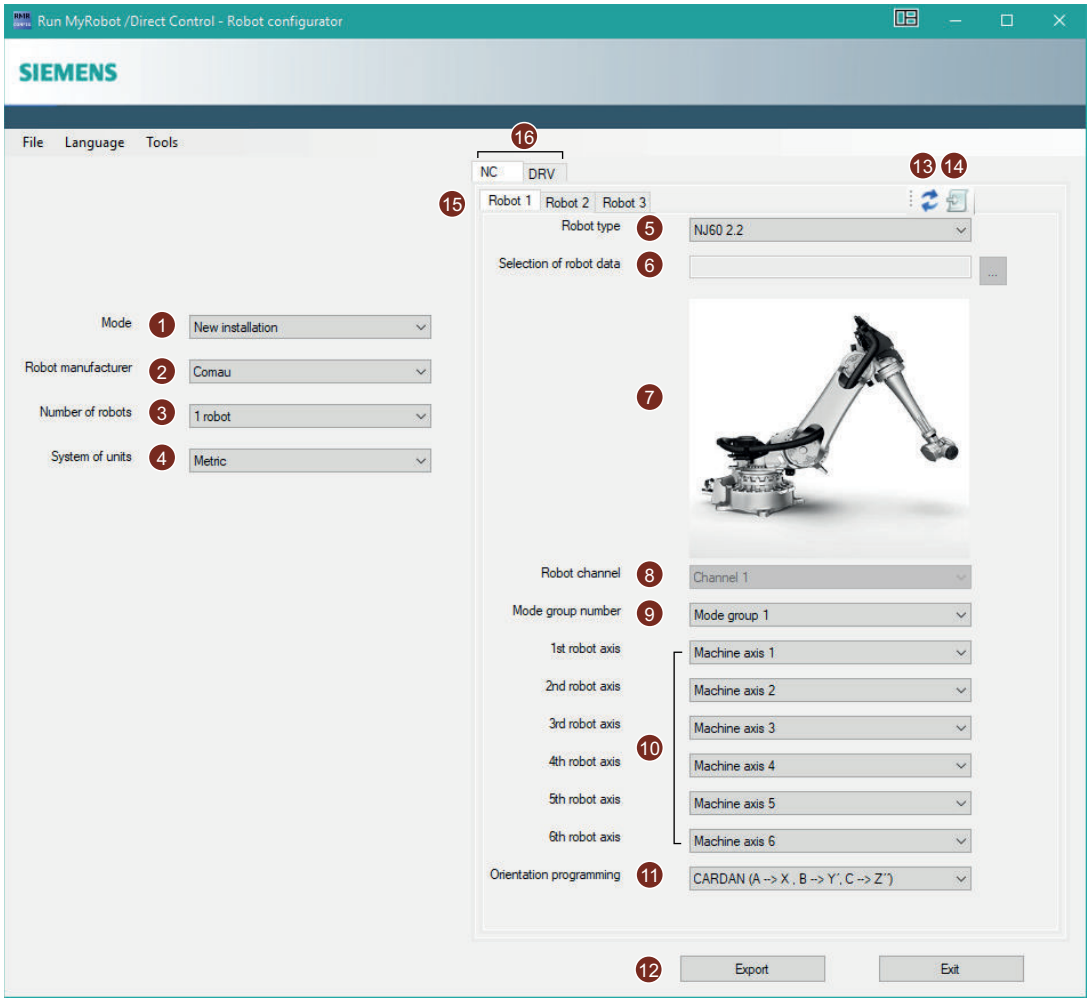
5.4.1 Overview

The robot configurator simplifies the selection of the robot types to be installed, including the channel, the machine axes, and the drive topology.

5.4.2 Robot configurator

The robot configurator allows you to easily select the robot types to be installed, including the channel, the machine axes, and the drive topology.

Configuration with the robot configurator



① Setting of the installation mode:

- New installation: Installation of a robot on a generally reset controller
- New installation with machine tool: The 1st channel is reserved for the machine tool. The robot can be installed in a channel ≥ 2. The NC automatically creates a 1st channel, including the standard axes. After the installation with the CMC expert script ("*.usz"), you must configure the 1st channel individually.

② Selection of the robot manufacturer

③ Specification of the number of robots (see also 15)

④ Setting of the system of units (metric or inches)

⑤ Selection of the type of robot

⑥ Selection of the "Customer" folder for the data of a user-defined robot.

User-defined robot types are provided in the SIOS Portal under "Run MyRobot /Direct Control".

⑦ Image of the selected type of robot

⑧ Selection of the installation channel of the robot

Note: In the "New installation" mode, the first robot is always installed in the 1st NC channel.

⑨ Selection of the mode group (BAG)

⑩ Assignment of the robot axes (channel axes) to the corresponding machine axes.
If there is a change to the default assignment, you must adapt the topology project.

⑪ Setting of the rotation sequence during the orientation programming:
- RPY: Standard for robot manufacturers (A ⇓ Z, B ⇓ Y', C ⇓ X''), Z points out of the flange
- CARDAN: Standard for machine tools (A ⇓ X, B ⇓ Y', C ⇓ Z''), Z points into the flange

⑫ Export of the configuration files

⑬ Resetting the configuration (button functions specifically for each robot)

⑭ Loading the standard configuration (button functions specifically for each robot)

⑮ If you select several robots, you must carry out the configuration for the corresponding number of robots.

⑯ Settings in the various main areas:
- NC: Setting for NC-specific data (axis, channel, ...)
- DRV: Setting for the configuration of the drives (topology)

Figure 5-8 SINUMERIK Integrate Run MyRobot /Direct Control - Robot configurator

Notes

Notes on the topology

The DRIVE-CLiQ wiring, also called topology, is saved in the "cmc" folder of the delivery package as a *.uptz file by default. The topologies for all of the topologies contained in the robot configurator are saved in this file.

You must change the topology in CMC-Topo in the following cases:

- Standard wiring changed (unlike SIZER demo projects)
- Axis assignment changed (see standard configuration when pressing the button ⑭, figure above)
- The number of robots to be installed has changed

Procedure:

Select the created or adapted topology (*.utz) under "Selection of topology" in the "DRV" tab of the robot configurator.

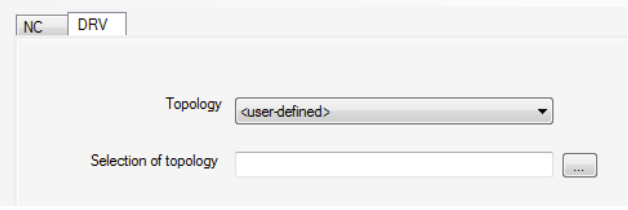


Figure 5-9 Robot configurator - Topology

Notes on the types of robots

12 types of robots from Comau are supported. The data for these types of robots is available in the software by default. Additional types of robots are provided by Comau in the SIOS Portal (intranet) and can be installed via the "User-defined" selection box.

User-defined robot types

If you select the robot type "User-defined", you must save the necessary data in the structure specified by Siemens in the "Customer" folder.

Procedure:

1. Select the robot type "User-defined" in the robot configurator. The input field for the user folder is enabled.
2. Specify the path for the "Customer" folder.

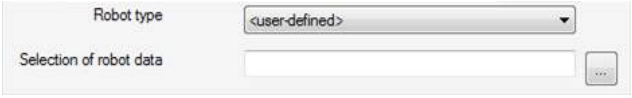


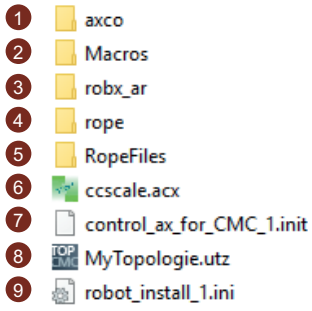
Figure 5-10 Robot configurator - Robot type

Export of the configuration files

You can only export the configuration if it is complete and consistent. If the configuration is erroneous, an error message is displayed.

Procedure:

Press the "Export" button. The "Robot Installation" folder is created with the following files and folders:



① Optional: Folder "acxo"

If the compile cycle AXCO is needed for the selected robot, this folder is created.

Copy the downloaded compile cycle ("*.elf") into this folder.

② Folder "Macros"

The files for configuring the drives are located in this folder.

③ Folder "robx_ar"

The compile cycle ROBX_AR is located in this folder.

④ Folder "rope"

The compile cycle ROPE is located in this folder.

⑤ Folder "RopeFiles"

The encrypted cycle ("*.cpf") located in this folder is relevant for data protection and is needed by the compile cycle ROPE.

⑥ File "ccscale.acx"

This file is needed for data protection.

⑦ "control_ax_for_CMC_1.init" file

This file is needed for setting the NC-side controller data.

⑧ Optional: File "MyTopologie.utz"

This file is needed for the DRIVE-CLiQ topology (user-specified topology). It is created using CMC-Topo.

⑨ File "robot_install_1"

This file contains the configuration that was created in the robot configurator. This file must **not** be edited or manipulated, because it controls the sequence of the CMC scripts! The number of robots determines the number of configuration files. A "robot_install_xxx.ini" file is created for each robot.

Optional: MD_CUST.ini - Expert function

You can insert your own NC machine data using the "MD_CUST.ini" file. The installation is done via the CMC expert script.

Applications**:** e.g. for the parameterization of special axes or other application-specific settings

The "MD_CUST.ini" file is loaded from the CMC ExpertscriptShield package ("*.usz") with an Extcall command. If the file does not exist, the installation is continued without an alarm message. Save the file "MD_CUST.ini" in the "RobotInstallation" folder.

Notice: You are responsible for the content of the "MD_CUST.ini" file and its syntactical and semantic correctness. The scope of the language commands can be found in the CMC documentation.

Figure 5-11 Export of the configuration files

In addition to the "RobotInstallation" folder, a CMC package (*.usz") is automatically saved. All of the files in the created folder are needed for this package.

Note

Select the root directory of your USB flash drive that you want to use to install the robots as the destination path. In this way, you ensure that all of the files are saved at the correct location.

NOTICE
CMC package
The CMC package ("*.usz") must be located in the root directory of the USB flash drive. Never use a boot stick for the installation.
Format the USB flash drive with the "FAT32" file system.
Do not make any changes to the files, the folder structure, or the storage of the files!
All of the files are correctly saved and do not have to be further processed.
Exception: Copy the compile cycle AXCO into the folder provided.

5.5 CMC script

When the CMC package is executed, a CMC script is created. The CMC package (*.usz) is a package that can be run on Linux, that was created by Create MyConfig - Expert and was supplied for RMR /DC. Within the package, various steps are executed to correctly commission the robot.

The CMC script has the following tasks:

- Setting the machine data (general, channel, axis and CC), see Section Machine data (Page 61)
- Copying and activating the scaling file for data protection
- Copying the drive macro
- Copying and activating the compile cycles, including machine data and the associated alarm texts

Procedure

Start the CMC script as described below:

1. Plug the USB flash drive (not a boot flash drive!) with the .usz file in the root directory into USB port X125 or X135 of the NCU.
2. Perform a cold start (POWER ON) and follow the instructions on the screen.
3. After successfully executing the CMC script, switch off the system and bring it into a no current condition and remove USB stick from the NCU. Then switch on the system again.

5.6 Manual steps after installation

NOTICE
Non-observance of the procedure described can cause personal injury
Carry out the steps described below. Non-observance can cause personal injury as well as material damage.

After installation, you must manually perform the following steps:

1. Load the system-specific PLC blocks.
2. Start up the infeed SLM or ALM.

3. Start the drive macro in SINAMICS.
   The drive macro puts the 6 third-party motors of the 6 robot axes into operation. In addition, the drive macro sets the controller data described in Section Calculating controller data (Page 53) for each robot axis. 2 DDS are created for each axis so that the previously calculated controller data is not overwritten during an optimization with AST (see Section Auto Servo Tuning (AST) for the robot axes (Page 53)). The drive macro thus replaces the third-party motor commissioning via SINUMERIK Operate. The macro is copied via the CMC script into the CF card path of the NCU */card/oem/sinamics/data/pmacros/003/p15* or of the NX */card/oem/sinamics/data/pmacros/004/p15*. The following execution authorizations are automatically set (in the properties of the file).

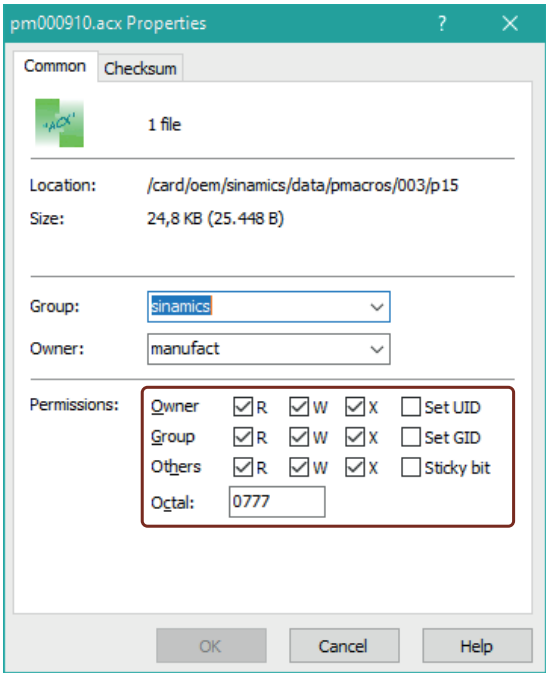


Figure 5-12 Properties of the file

Two drive macros are copied to the CF card per robot. In this way, depending on the DQ topology, you can put the 6 Sinamics drives on the NCU or on the NX into operation. For an installation of 3 robots, 6 macros are copied to the CF card, 3 in the NX path and 3 in the NCU path.
The naming of the drive macros is as follows:

Robots	NCU	NX
1st robot	pm000910.acx	pm000911.acx
2nd robot	pm000920.acx	pm000921.acx
3rd robot	pm000930.acx	pm000931.acx

Note

Only start one drive macro per robot!

Starting the drive macro
Proceed as follows to start the drive macro pm000910.acx:

– Set parameter p9 of the Control Unit to "1".

– Enter the macro number ("910") in parameter p15 of the Control Unit. Confirm the entry with the Enter key.

Control Unit parameter			CU_I_3.3:1
r2	Control Unit operating display	[34] Exit commissioning m...	
p9	Device commissioning parameter filter	[1] Device configuration	
p15	Macro drive unit	910	
r18	Control Unit firmware version	5102302	
r37[0]	Control Unit temperature:Actual measured value	-200	°C
r37[1]	Control Unit temperature:Maximum measured value	-200	°C
p92	Clock synchronous operation pre-assignment/check	[1] Isochronous PROFIBUS	
p97	Select drive object type	[1] Drive object type SERVO	
r98[0]	Actual device topology:DRIVE-CLiQ socket X100	10000000H	
r98[1]	Actual device topology:DRIVE-CLiQ socket X101	3330000H	
r98[2]	Actual device topology:DRIVE-CLiQ socket X102	3330000H	
r98[3]	Actual device topology:DRIVE-CLiQ socket X103	0H	
r98[4]	Actual device topology:DRIVE-CLiQ socket X104	0H	
r98[5]	Actual device topology:DRIVE-CLiQ socket X105	0H	
p99[0]	Device target topology:DRIVE-CLiQ socket X100	10000000H	
p99[1]	Device target topology:DRIVE-CLiQ socket X101	3303000H	
p99[2]	Device target topology:DRIVE-CLiQ socket X102	3303000H	
p99[3]	Device target topology:DRIVE-CLiQ socket X103	0H	
p99[4]	Device target topology:DRIVE-CLiQ socket X104	0H	

Figure 5-13 Control Unit parameter

– The macro now automatically carries out the commissioning of the drive and sets the optimized controller data for the respective robot axis. The motors are commissioned in ascending order from DO No. 3 (Axis 1) to DO No. 8 (Axis 6). This process takes approximately 5 minutes. You can track the progress via parameter p10 (>0 for commissioning) in the respective DO. The drive restarts several times during this process.

– After successful execution of the macro, check whether the parameter p10 is set to "0" and r3998 is set to "2".
The value "910" in p15 is not automatically reset.
If you want to check whether the drive macro has completely finished executing, proceed as follows.
Try to enter a 1 in the parameter p9 of the CU after the drive macro is started. As long as the drive macro is being processed, it is not possible to write the parameter p9. An appropriate message is output.

4. Confirm the encoder serial number (p440=1) for all of the robot axes.
5. Activate at least the following Safety Integrated functions provided by SINUMERIK Safety Integrated plus:
   – SS1/STO (emergency stop) and
   – Axial SLS

6. Determine the commutation angle offset for all of the robot axes.
   The following variables are set by the drive macro:
   - Pole ID method "saturation-based" (p1980=1)
   - The max. path for the pole ID method is 1° (p1981=1)
   - Pole position identification current (p329 >= 0.35*p323)

   Now perform the following steps for all 6 SINAMICS drives of the robot. Begin with axis 6:
   Note:
   You must not linger within reach of the robot. If the identification fails, jerky movement of the mechanisms is possible.
   - Step 1: Set p1990 = 1. The SINAMICS drive determines the pole position angle during this (duration approx. 1 second). After completion, p1990 = 0 is set. The pol position angular difference is shown in p1984.
   - Step 2: To check the results, set p1983 = 1. An angle <5° must then be visible in r1984.
   - Step 3: Move the axis slightly. Set p1983 = 1. The value in r1984 should be < 5°. If this is not the case, increase the current in p329 by 5 percentage points (=> 0.40*p323) and go back to Step 1.

7. Check the current controllers for all of the 6 robot axes. Please proceed as follows:
   - Select the screen form to parameterize the measurement via menu "Commissioning → Optimization/test → Current control loop".
   - Under measurement, select "Current controller measurement with active speed controller"

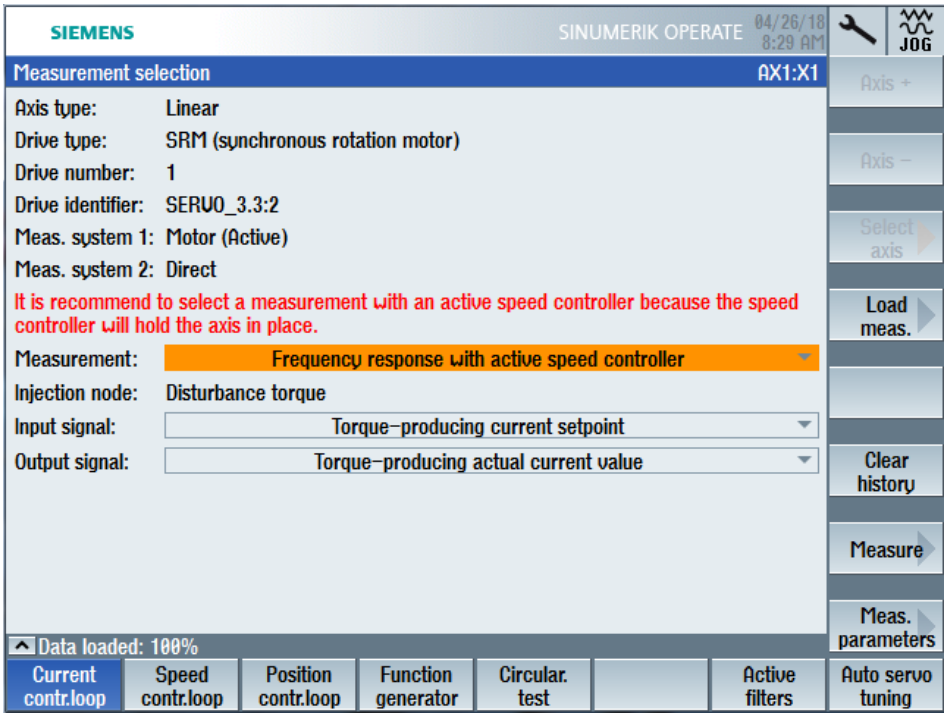


Figure 5-14 Selecting the measurement function

– In the "Measurement parameters" screen form, make the following settings:
→ Offset = 0 rpm
→ Amplitude = 1%

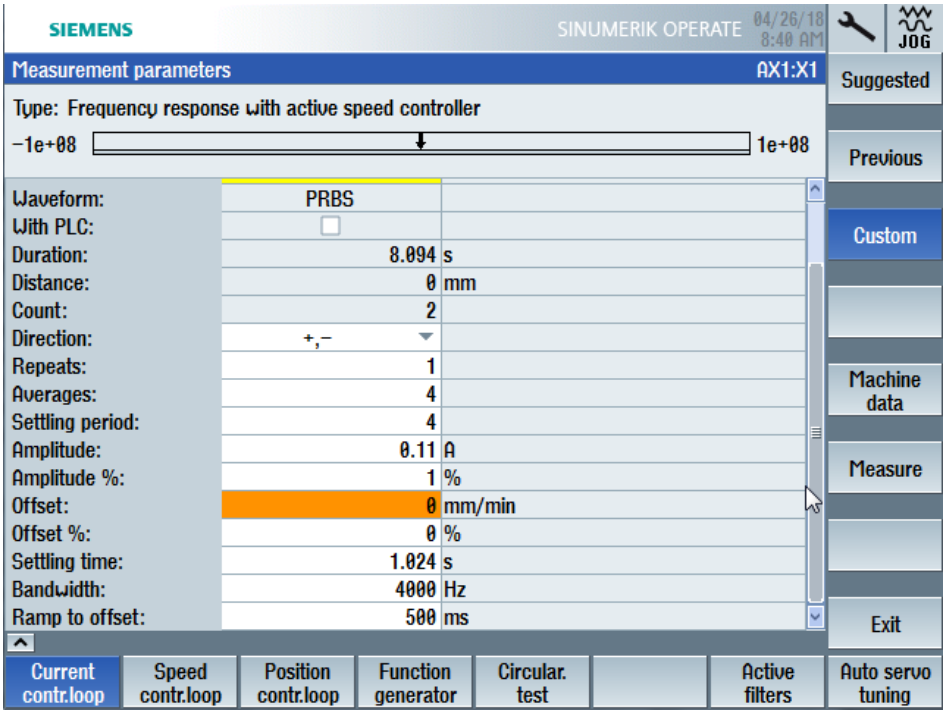


Figure 5-15 Measurement parameters

– Using the vertical "Measure" softkey to open the "Measurement" screen form. Start the measurement from this screen form.
The following conditions must be met to carry out the measurement:
- The "JOG" mode is active.
- The override is not set to 0%.
- There are no active alarms.
- The axes are enabled.
Once all of the preconditions are satisfied, start the measurement using the vertical "Start measurement" softkey. The measurement starts after pressing "NC start". You can cancel the measurement at any time by pressing the RESET button.

– The following conditions must be fulfilled for an optimal frequency response:
  - 0 dB line is not exceeded
  - Bandwidth (amplitude response > -3 dB) > 600 Hz
  An optimally set current controller is shown in the following figure:

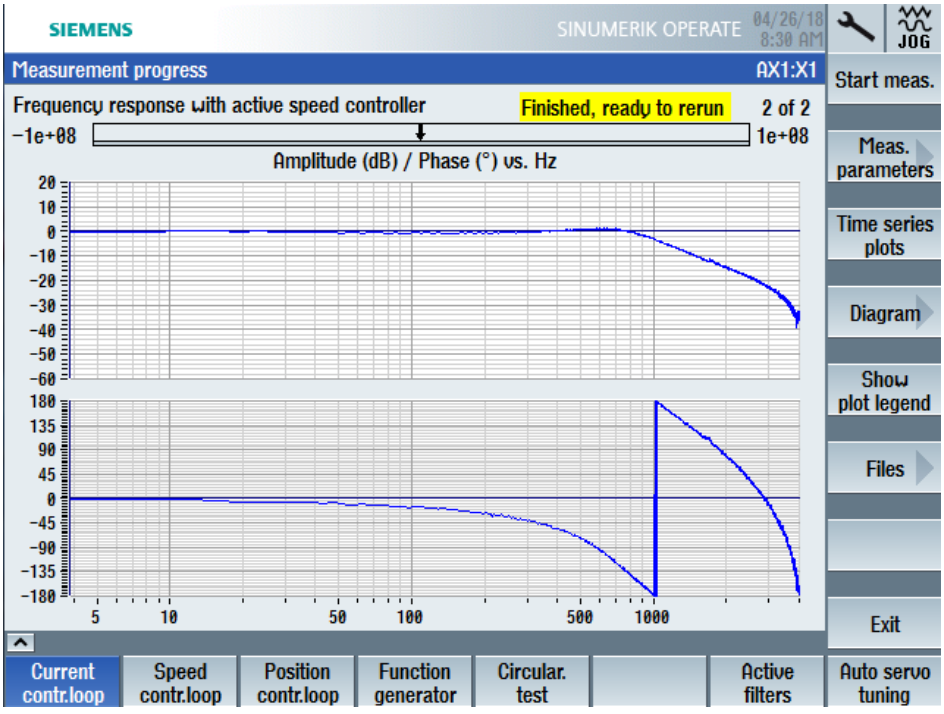


Figure 5-16 Frequency response p1715, optimum

– We recommend the following procedure if the frequency response is too low or too high (see the following diagrams):
  - Current controller optimization (p1715)
  - Checking the motor data. In this case, contact the hotline.

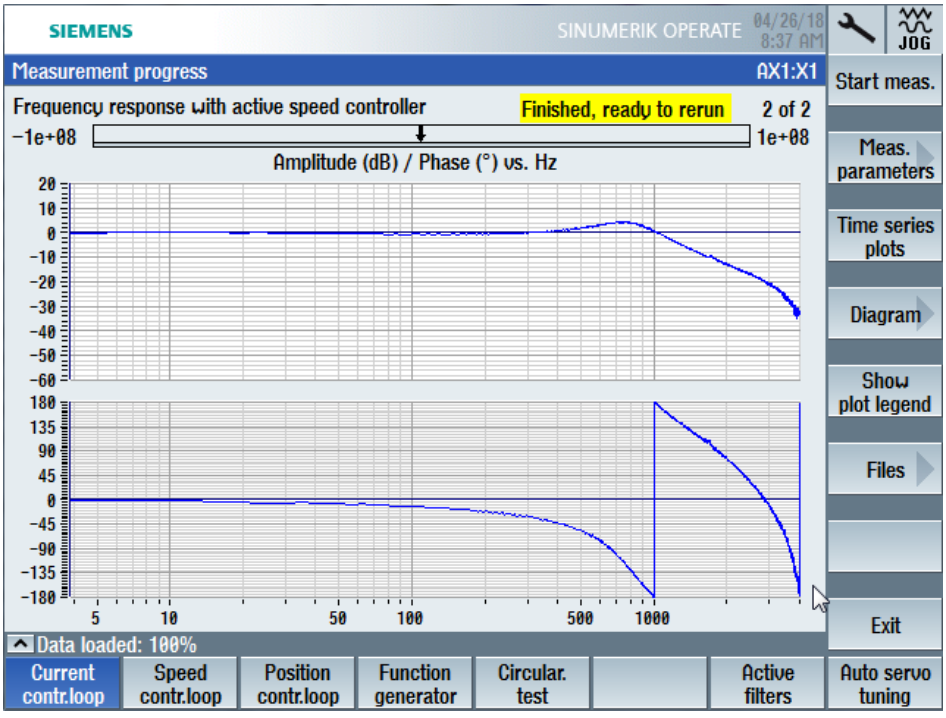


Figure 5-17 Frequency response p1715, too high

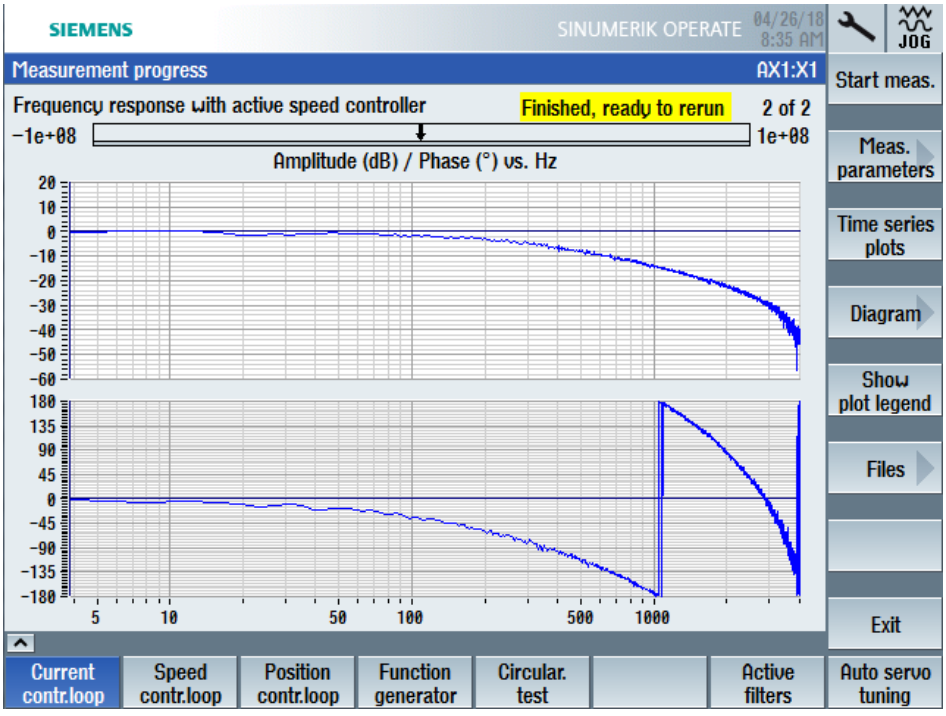


Figure 5-18 Frequency response p1715, too low

8. If necessary, adjust the direction of rotation of the axis ($MA_AX_MOTION_DIR) such that it corresponds to the "Technical Specification" of Comau for the respective type of robot (Chapter "Operating Areas").

Note

$MC_ROBX_AXES_DIR must not be changed!

9. Set the adjustment/calibration values for all of the robot axes. You need the adjustment set (calibration tool) from Comau that is right for the respective type of robot (see Comau documentation of the respective robot type "Technical Specification" - Chapter "Devices for calibration"). To ensure that the actual values to be set in the adjustment position are correct, the machine data $MA_REFP_SET_POS is preset for each robot axis by the CMC script, depending on the type of robot. The calibration position of each robot axis is also part of the "Technical Specification" of the respective type of robot from Comau.

Figure 5-19 Example calibration tool with dial gauge, from Comau

Procedure for setting the adjustment values of the robot axes:
In the following example, the calibration values of the 1st axis are set.
a) Using the calibration tool, move the 1st machine axis in JOG mode to the adjustment position.
b) Set the override on the machine control panel to 0%.
c) Switch to JOG-REF mode (Machine → JOG-REF).
d) Open the "axis machine data" input screen via Commissioning -> Machine data -> Axis machine data.
e) Set the machine data 34210 $MA_ENC_REFP_STATE[0] = 1 in the 1st axis and the position measurement system used.
f) Switch back to JOG-REF mode (Machine → JOG-REF).
g) Select the 1st machine axis on the machine control panel.
h) Press the "+" directional movement button on the machine control panel.
i) On the 1st machine axis, the icon axis referenced is displayed.
Repeat steps a - i for all other axes.

10. In case of need, activate further Safety Integrated functions provided by SINUMERIK Safety Integrated plus. Carry out the commissioning of Cartesian Safety as needed.

References

- SINUMERIK 840D sl Safety Integrated plus Commissioning Manual
- Technical Specification, Comau

5.7 Calculating controller data

5.7.1 Controller data - default setting

Within the scope of commissioning of a supported robot from Comau, the controller data (speed and position controller) is set, in addition to all of the relevant axis and motor data. The parameters used for this form an optimal setting, taking the following boundary conditions into consideration:

- The control loops are stable in the entire working area of the robot.
- The control loops are stable for all and any payloads and add-on loads within the scope of the specification of the Comau documentation "Technical Specification".

The controller parameterization used corresponds to a so-called "damping-optimized" setting. As a result, the best possible damping of the respective first natural frequency is achieved.

During the commissioning, the controller data is written to the first 2 data sets (Index 0 and 1). The second data set has no functional relevance at first. The second data set is used exclusively as a backup in the event that the data is overwritten, by the "Auto Servo Tuning" function for example.

References

Comau documentation "Technical Specification"

5.7.2 Auto Servo Tuning (AST) for the robot axes

With SINUMERIK 840D sl Auto Servo Tuning (AST), an optimal controller setting can be automatically determined for a feed axis. This optimal controller setting is relative to the measured dynamic response of the axis in a specific operating point (= pose + payload). The dynamic response of the robot axes can change very dramatically depending on the pose and the payload. This is not taken into consideration by AST, however.

- If AST is carried out in a "dynamically disadvantageous" pose, e.g. with the robot arm extended, this can lead to an unstable condition of the speed control loop when the robot arm is retracted.
- If AST is carried out in a "dynamically advantageous" pose, e.g. with the robot arm retracted, this can lead to an unstable condition of the speed control loop when the robot arm is extended.

The use of AST on the robot arm is only possible in individual cases, assuming the working area is extremely limited. For automatic controller optimization, the robot should be positioned approximately in the center of the working area.

If you perform the controller parameterization for an individual axis with AST, the interpolation behavior of the axis group is changed at first. To correct the interpolation behavior, you must equalize the parameterization of the setpoint channel in all axes (see Section Interpolating special axes (Page 54)).

After a controller optimization by AST, the newly determined controller parameters are written to the active data set. When you provide a different data set as 0 for the optimization by AST, you must switch over the active data set before the optimization via the PLC.

5.7.3 Interpolating special axes

For the robot-specific default controller setting, it is intended that all of the robot axes correctly interpolate with one another. In the event of one or more with interpolating special axes (e.g. linear axis, rotary tilting table), you must ensure the correct interpolation behavior during their parameterization. To do this, equalize the parameterization of the setpoint channel of the special axes with that of the robot axes after the basic optimization has been carried out with AST. Proceed as described below:

1. Put the axis in a dynamically unfavorable condition, e.g. maximum bearing load or lowest natural frequency.
2. Carry out the basic optimization of the special axis with AST using the "damping optimal" strategy.
3. Manually import the machine data from the following list from the robot axes into the special axis.

MD number	MD name	Comment
32400	MA_AX_JERK_ENABLE	Activation jerk filter
32402	MA_AX_JERK_MODE	Jerk filter type
32410	MA_AX_JERK_TIME	Jerk filter time constant
32900	MA_DYN_MATCH_ENABLE	Dynamic adjustment activation
32910	MA_DYN_MATCH_TIME	Dynamic adjustment time constant
32890	MA_DESVAL_DELAY_ENABLE	Axial phase filter activation
32895	MA_DESVAL_DELAY_TIME	Axial phase filter time constant
32620	MA_FFW_MODE	Feedforward control type
32800	MA_EQUIV_CURRCTRL_TIME	Symmetrization time precontrol
32640	MA_STIFFNESS_CONTROL_ENABLE	Dynamic Stiffness Control
33000	MA_FIPO_TYPE	Fine interpolator type

5.8 Sample PLC application

For a quick and uncomplicated start, you can download an example PLC application in the SIOS Portal under "Run MyRobot /Direct Control". In this example, the most important blocks are included and pre-parameterized.

References

Further information regarding PLC programming is provided in the Commissioning Manual SINUMERIK 840D sl.

Data protection concept

6

6.1 Warranty claim

For Comau to grant a two-year warranty, you may only operate the machine within specified parameters (e.g. maximum speed or maximum torque of the gearbox, etc.).

The data protection concept therefore prescribes that you cannot change some of the NC machine data and driver parameters.

Compliance with this specification is ensured by the following mechanisms:

- Various properties of the NC machine data, e.g. default value, minimum and maximum value, read only, etc. are defined during the commissioning of the robot by scaling, with the aid of the "ccscale.acx" file.
- The compile cycle "ROPE" monitors the corresponding SINAMICS drive parameters.

Note

Note that a maximum of 2 DDSs are supported (Index 0 and Index 1).

6.2 Principle of operation of ROPE compile cycle

The ROPE compile cycle is in the configuration phase after each run-up. If you start a part program/ASUB in this phase, the alarm 75042 and a missing axis release are displayed in the corresponding channel. Alarm 75042 is self-acknowledging. Once the configuration of ROPE is concluded (e.g. with the call of the ROPE_MAIN.cpf cycle), the alarm with the missing axis release is no longer displayed.

The following points result from this behavior and must be observed:

- The ASUB ROPE_MAIN.cpf cycle must run before any other ASUBs and NC programs.
- After alarm 75042 occurs, axes can no longer be referenced (even in JOG mode). You can only reference the axes if the configuration has been successfully carried out with ROPE_MAIN.cpf.

6.3 CMC script

The following files are copied by the CMC script to the CF card, activated if applicable, and the corresponding or associated machine data is set:

- Copying and executing the file ccscale.acx
- Copying and activating the compile cycle ROPE.elf
- Copying the file CYCPE_MA.spf with the call of the ROPE_MAIN.cpf cycle in the "Manufacturer cycles" folder. Ensure that the cycle ROPE_MAIN.cpf is loaded when the controller (prog event) is run up. The corresponding machine data and the associated option bit are also set by the CMC script.
- Copying the files ROPE_MAIN.cpf into the "Manufacturer cycles" folder. The file is started by the prog event CYCPE_MA.spf during run-up and it calls the suitable ROPE_XXX.cpf cycle for the respective type of robot.
- The ROPE_XXX.cpf file (e.g. ROPE_60.cpf) is copied to the "Manufacturer cycles" folder for each type of robot. For a multi-channel installation, up to 3 files (3-channel installation) can be copied. This file contains the limit values to be monitored for the machine data p1082, p1520 and p1521 for all robot axes.
- You can find an overview of the machine data influenced by the data protection concept in Section Machine data (Page 61). Changing this machine data is prohibited or leads to NC start-inhibiting alarms (see Alarm, fault and system events (Page 89)).

Assigning the robot type to the channel

The following ID is used to unambiguously assign the robot type to the channel:

;Racer7_1_4 = 10 – e.g. ROPE_10.cpf

;NS16_1_65 = 30

;NJ16_3_1   = 40

;NJ60_2_2   = 60

;NJ130_2_05 = 70

;NJ165_3_0 = 90

;NJ220_2_7 = 100

;NJ650_2_7 = 130

;user specific robot 1 = 500

;user specific robot 2 = 510

;user specific robot 3 = 520

This ID is entered into the MD 14510 $MN_USER_DATA_INT[0-9] depending on the channel to be installed. If, for example, the robot type NJ60 2.2 is installed in the first channel (Index 0), then $MN_USER_DATA_INT[0] = 60 is scaled.

Note

- The machine data MD10000 $MN_AXCONF_MACHAX_NAME_TAB must not be changed.
- The call of ROPE_MAIN in the prog event can only be processed if the drives have been put into operation by means of the drive macro. Otherwise, the power-on alarm "75040 channel 1, CC function CC ROPE error ID: -1".

Machine data

7

7.1 Overview

The following machine data is set by the CMC script (see Section NC machine data (Page 62)) or by the drive macro (see Section Drive machine data (Page 84)).

The following distinction is made for machine data:

- Machine data depending on the robot type
- Machine data independent of the robot type
- Machine data set by the robot configurator

Separate columns display whether the machine data is subject to data protection (DP) or is written by the automatic controller data calculation (CD).

See also

CMC script (Page 41)

7.2 NC machine data

7.2.1 General machine data

Machine data	Value	DS	RD	Comment
N10000 $MN_AXCONF_MACHAX_NAME_TAB[0+x]		X		Default assignment with RA1_x
N10000 $MN_AXCONF_MACHAX_NAME_TAB[1+x]		X		Default assignment with RA2_x
N10000 $MN_AXCONF_MACHAX_NAME_TAB[2+x]		X		Default assignment with RA3_x
N10000 $MN_AXCONF_MACHAX_NAME_TAB[3+x]		X		Default assignment with RA4_x
N10000 $MN_AXCONF_MACHAX_NAME_TAB[4+x]		X		Default assignment with RA5_x
N10000 $MN_AXCONF_MACHAX_NAME_TAB[5+x]		X		Default assignment with RA6_x
N10010 $MN_ASSIGN_CHAN_TO_MODE_GROUP				
N10050 $MN_SYSCLOCK_CYCLE_TIME				
N10070 $MN_IPO_SYSCLOCK_TIME_RATIO	2			
N10240 $MN_SCALING_SYSTEM_IS_METRIC				
N10620 $MN_EULER_ANGLE_NAME_TAB[0]	"A"			
N10620 $MN_EULER_ANGLE_NAME_TAB[1]	"B"			
N10620 $MN_EULER_ANGLE_NAME_TAB[2]	"C"			
N10131 $MN_SUPPRESS_SCREEN_REFRESH	0			
N11640 $MN_ENABLE_CHAN_AX_GAP	'H1'			
N10720 $MN_OPERATING_MODE_DEFAULT	0			

Machine data	Value	DS	RD	Comment
N13080 $MN_DRIVE_TYPE_DP[AX1]	1			
N13080 $MN_DRIVE_TYPE_DP[AX2]	1			
N13080 $MN_DRIVE_TYPE_DP[AX3]	1			
N13080 $MN_DRIVE_TYPE_DP[AX4]	1			
N13080 $MN_DRIVE_TYPE_DP[AX5]	1			
N13080 $MN_DRIVE_TYPE_DP[AX6]	1			
N13150 $MN_SINAMICS_ALARM_MASK	=			='Hffff'
N14504 $MN_MAXNUM_USER_DATA_INT		X		
N14510 $MN_USER_DATA_INT[0]		X		
N14510 $MN_USER_DATA_INT[1]		X		
N14510 $MN_USER_DATA_INT[2]		X		
N14510 $MN_USER_DATA_INT[3]		X		
N14510 $MN_USER_DATA_INT[4]		X		
N14510 $MN_USER_DATA_INT[5]		X		
N14510 $MN_USER_DATA_INT[6]		X		
N14510 $MN_USER_DATA_INT[7]		X		
N14510 $MN_USER_DATA_INT[8]		X		
N14510 $MN_USER_DATA_INT[9]		X		
N17400 $MN_OEM_GLOBAL_INFO[0]	=			="RMR/DC"
N18040 $MN_VERSION_INFO[6]	=	X		="ROBX_AR_MD"
N18080 $MN_MM_TOOL_MANAGEMENT_MASK	'H6'			

Machine data	Value	DS	RD	Comment
N18096 $MN_MM_NUM_CC_TOA_PARAM	3			
N18360 $MN_MM_EXT_PROG_BUFFER_SIZE	2000			
N18362 $MN_MM_EXT_PROG_NUM	4			
N19100 $ON_NUM_AXES_IN_SYSTEM	6			
N19110 $ON_NUM_IPO_AXES	6			
N19220 $ON_NUM_MODE_GROUPS				
N19240 $MN_USER_MEM_DYNAMIC	4			
N19250 $MN_USER_MEM_BUFFERED	0			
N19300 $ON_COMP_MASK	'H1'			
N19334 $ON_SYSTEM_FUNCTION_MASK	=			='H100' ;LockMyCycles
N19340 $ON_PROG_MASK	'H4'			Option cross-mode actions
N19410 $ON_TRAFO_TYPE_MASK	'H10'			Option OEM transformer
N19610 $ON_TECHNO_EXTENSION_MASK[1]	'H4'			Option AXCO (optional)
N19610 $ON_TECHNO_EXTENSION_MASK[4]	=			='H200000' ;Option ROBX_AR
N51039 $MNS_PROGRAM_CONTROL_MODE_MASK	'H0'			
N52010 $MCS_DISP_NUM_AXIS_BIG_FONT	0			
N60959 $MN_CC_ACTIVE_IN_CHAN_AXCO[0]				optional
N60959 $MN_CC_ACTIVE_IN_CHAN_AXCO[1]				optional
N60959 $MN_CC_ACTIVE_IN_CHAN_AXCO[2]				optional
N60959 $MN_CC_ACTIVE_IN_CHAN_ROBX[0]		X		
N60959 $MN_CC_ACTIVE_IN_CHAN_ROBX[1]				

Machine data	Value	DS	RD	Comment
N60959 $MN_CC_ACTIVE_IN_CHAN_ROBX[2]				
N60949 $MN_CC_ACTIVE_IN_CHAN_ROPE[0]		X		
N60949 $MN_CC_ACTIVE_IN_CHAN_ROPE[1]				
N60949 $MN_CC_ACTIVE_IN_CHAN_ROPE[2]				

7.2.2 Channel-specific machine data

Machine data	Value	DS	RD	Comment
N20000 $MC_CHAN_NAME				
N20050 $MC_AXCONF_GEOAX_ASSIGN_TAB[0]	0			
N20050 $MC_AXCONF_GEOAX_ASSIGN_TAB[1]	0			
N20050 $MC_AXCONF_GEOAX_ASSIGN_TAB[2]	0			
N20060 $MC_AXCONF_GEOAX_NAME_TAB[0]	"X"			
N20060 $MC_AXCONF_GEOAX_NAME_TAB[1]	"Y"			
N20060 $MC_AXCONF_GEOAX_NAME_TAB[2]	"Z"			
N20070 $MC_AXCONF_MACHAX_USED[0]		X		
N20070 $MC_AXCONF_MACHAX_USED[1]		X		
N20070 $MC_AXCONF_MACHAX_USED[2]		X		
N20070 $MC_AXCONF_MACHAX_USED[3]		X		
N20070 $MC_AXCONF_MACHAX_USED[4]		X		
N20070 $MC_AXCONF_MACHAX_USED[5]		X		
N20080 $MC_AXCONF_CHANAX_NAME_TAB[0]	"RA1"			

Machine data	Value	DS	RD	Comment
N20080 $MC_AXCONF_CHANAX_NAME_TAB[1]	"RA2"			
N20080 $MC_AXCONF_CHANAX_NAME_TAB[2]	"RA3"			
N20080 $MC_AXCONF_CHANAX_NAME_TAB[3]	"RA4"			
N20080 $MC_AXCONF_CHANAX_NAME_TAB[4]	"RA5"			
N20080 $MC_AXCONF_CHANAX_NAME_TAB[5]	"RA6"			
N20105 $MC_PROG_EVENT_IGN_REFP_LOCK				
N20106 $MC_PROG_EVENT_IGN_SINGLEBLOCK				
N20107 $MC_PROG_EVENT_IGN_INHIBIT				
N20108 $MC_PROG_EVENT_MASK				
N20110 $MC_RESET_MODE_MASK	'H45'			
N20112 $MC_START_MODE_MASK	'H470'			
N20140 $MC_TRAFO_RESET_VALUE	1			
N20150 $MC_GCODE_RESET_VALUES[0]	2			
N20150 $MC_GCODE_RESET_VALUES[3]				According to adjustment specification Advanced Surface
N20150 $MC_GCODE_RESET_VALUES[9]	2			
N20150 $MC_GCODE_RESET_VALUES[20]	2			
N20150 $MC_GCODE_RESET_VALUES[44]				According to adjustment specification Advanced Surface
N20150 $MC_GCODE_RESET_VALUES[48]				According to adjustment specification Advanced Surface
N20150 $MC_GCODE_RESET_VALUES[49]	3			

Machine data	Value	DS	RD	Comment
N20150 $MC_GCODE_RESET_VALUES[50]				According to adjustment specification Advanced Surface
N20152 $MC_GCODE_RESET_MODE[5]	1			
N20152 $MC_GCODE_RESET_MODE[7]	1			
N20170 $MC_COMPRESS_BLOCK_PATH_LIMIT				According to adjustment specification Advanced Surface
N20171 $MC_SURF_BLOCK_PATH_LIMIT				According to adjustment specification Advanced Surface
N20172 $MC_COMPRESS_VELO_TOL				According to adjustment specification Advanced Surface
N20173 $MC_SURF_VELO_TOL				According to adjustment specification Advanced Surface
N20193 $MC_PROG_EVENT_IGN_STOP				
N20240 $MC_CUTCOM_MAXNUM_CHECK_BLOCKS				According to adjustment specification Advanced Surface
N20250 $MC_CUTCOM_MAXNUM_DUMMY_BLOCKS				According to adjustment specification Advanced Surface
N20252 $MC_CUTCOM_MAXNUM_SUPPR_BLOCKS				According to adjustment specification Advanced Surface
N20310 $MC_TOOL_MANAGEMENT_MASK	'H2'			
N20450 $MC_LOOAH_RELIEVE_BLOCK_CYCLE				According to adjustment specification Advanced Surface
N20455 $MC_LOOKAH_FUNCTION_MASK				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N20460 $MC_LOOKAH_SMOOTH_FACTOR				According to adjustment specification Advanced Surface
N20465 $MC_ADAPT_PATH_DYNAMIC[0]				According to adjustment specification Advanced Surface
N20465 $MC_ADAPT_PATH_DYNAMIC[1]				According to adjustment specification Advanced Surface
N20470 $MC_CPREC_WITH_FFW				According to adjustment specification Advanced Surface
N20476 $MC_ORISON_STEP_LENGH				According to adjustment specification Advanced Surface
N20478 $MC_ORISON_MODE				According to adjustment specification Advanced Surface
N20480 $MC_SMOOTHING_MODE				According to adjustment specification Advanced Surface
N20482 $MC_COMPRESSOR_MODE				According to adjustment specification Advanced Surface
N20485 $MC_COMPRESS_SMOOTH_FACTOR[0]				According to adjustment specification Advanced Surface
N20485 $MC_COMPRESS_SMOOTH_FACTOR[1]				According to adjustment specification Advanced Surface
N20485 $MC_COMPRESS_SMOOTH_FACTOR[2]				According to adjustment specification Advanced Surface
N20485 $MC_COMPRESS_SMOOTH_FACTOR[3]				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N20485 $MC_COMPRESS_SMOOTH_FACTOR[4]				According to adjustment specification Advanced Surface
N20486 $MC_COMPRESS_SPLINE_DEGREE[0]				According to adjustment specification Advanced Surface
N20486 $MC_COMPRESS_SPLINE_DEGREE[1]				According to adjustment specification Advanced Surface
N20486 $MC_COMPRESS_SPLINE_DEGREE[2]				According to adjustment specification Advanced Surface
N20486 $MC_COMPRESS_SPLINE_DEGREE[3]				According to adjustment specification Advanced Surface
N20486 $MC_COMPRESS_SPLINE_DEGREE[4]				According to adjustment specification Advanced Surface
N20487 $MC_COMPRESS_SMOOTH_FACTOR_2[0]				According to adjustment specification Advanced Surface
N20487 $MC_COMPRESS_SMOOTH_FACTOR_2[1]				According to adjustment specification Advanced Surface
N20487 $MC_COMPRESS_SMOOTH_FACTOR_2[2]				According to adjustment specification Advanced Surface
N20487 $MC_COMPRESS_SMOOTH_FACTOR_2[3]				According to adjustment specification Advanced Surface
N20487 $MC_COMPRESS_SMOOTH_FACTOR_2[4]				According to adjustment specification Advanced Surface
N20550 $MC_EXACT_POS_MODE				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N20552 $MC_EXACT_POS_MODE_G0_TO_G1				According to adjustment specification Advanced Surface
N20560 $MC_G0_TOLERANCE_FACTOR				According to adjustment specification Advanced Surface
N20600 $MC_MAX_PATH_JERK[0]				According to adjustment specification Advanced Surface
N20600 $MC_MAX_PATH_JERK[1]				According to adjustment specification Advanced Surface
N20600 $MC_MAX_PATH_JERK[2]				According to adjustment specification Advanced Surface
N20600 $MC_MAX_PATH_JERK[3]				According to adjustment specification Advanced Surface
N20600 $MC_MAX_PATH_JERK[4]				According to adjustment specification Advanced Surface
N20602 $MC_CURV_EFFECT_ON_PATH_ACCEL[0]				According to adjustment specification Advanced Surface
N20602 $MC_CURV_EFFECT_ON_PATH_ACCEL[1]				According to adjustment specification Advanced Surface
N20602 $MC_CURV_EFFECT_ON_PATH_ACCEL[2]				According to adjustment specification Advanced Surface
N20602 $MC_CURV_EFFECT_ON_PATH_ACCEL[3]				According to adjustment specification Advanced Surface
N20602 $MC_CURV_EFFECT_ON_PATH_ACCEL[4]				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N20603 $MC_CURV_EFFECT_ON_PATH_JERK[0]				According to adjustment specification Advanced Surface
N20603 $MC_CURV_EFFECT_ON_PATH_JERK[1]				According to adjustment specification Advanced Surface
N20603 $MC_CURV_EFFECT_ON_PATH_JERK[2]				According to adjustment specification Advanced Surface
N20603 $MC_CURV_EFFECT_ON_PATH_JERK[3]				According to adjustment specification Advanced Surface
N20603 $MC_CURV_EFFECT_ON_PATH_JERK[4]				According to adjustment specification Advanced Surface
N20605 $MC_PREPDYN_SMOOTHING_FACTOR[0]				According to adjustment specification Advanced Surface
N20605 $MC_PREPDYN_SMOOTHING_FACTOR[1]				According to adjustment specification Advanced Surface
N20605 $MC_PREPDYN_SMOOTHING_FACTOR[2]				According to adjustment specification Advanced Surface
N20605 $MC_PREPDYN_SMOOTHING_FACTOR[3]				According to adjustment specification Advanced Surface
N20605 $MC_PREPDYN_SMOOTHING_FACTOR[4]				According to adjustment specification Advanced Surface
N21100 $MC_ORIENTATION_IS_EULER	0			
N21102 $MC_ORI_DEF_WITH_G_CODE	1			
N21104 $MC_ORI_IPO_WITH_G_CODE	1			
N21106 $MC_CART_JOG_SYSTEM	'H7'			

Machine data	Value	DS	RD	Comment
N21110 $MC_X_AXIS_IN_OLD_X_Z_PLANE	0			
N21120 $MC_ORIAX_TURN_TAB_1[0]				1 (Cardan); 3(RPY)
N21120 $MC_ORIAX_TURN_TAB_1[1]				2 (Cardan); 2(RPY)
N21120 $MC_ORIAX_TURN_TAB_1[2]				3 (Cardan); 1(RPY)
N21150 $MC_JOG_VELO_RAPID_ORI[0]	4			
N21150 $MC_JOG_VELO_RAPID_ORI[1]	4			
N21150 $MC_JOG_VELO_RAPID_ORI[2]	4			
N21155 $MC_JOG_VELO_ORI[0]	2			
N21155 $MC_JOG_VELO_ORI[1]	2			
N21155 $MC_JOG_VELO_ORI[2]	2			
N21158 $MC_JOG_JERK_ORI[0]	2			
N21158 $MC_JOG_JERK_ORI[1]	2			
N21158 $MC_JOG_JERK_ORI[2]	2			
N21159 $MC_JOG_JERK_ORI_ENABLE[0]	1			
N21159 $MC_JOG_JERK_ORI_ENABLE[1]	1			
N21159 $MC_JOG_JERK_ORI_ENABLE[2]	1			
N21160 $MC_JOG_VELO_RAPID_GEO[0]	10000			
N21160 $MC_JOG_VELO_RAPID_GEO[1]	10000			
N21160 $MC_JOG_VELO_RAPID_GEO[2]	10000			
N21165 $MC_JOG_VELO_GEO[0]	2000			
N21165 $MC_JOG_VELO_GEO[1]	2000			

Machine data	Value	DS	RD	Comment
N21165 $MC_JOG_VELO_GEO[2]	2000			
N21166 $MC_JOG_ACCEL_GEO[0]	2			
N21166 $MC_JOG_ACCEL_GEO[1]	2			
N21166 $MC_JOG_ACCEL_GEO[2]	2			
N21168 $MC_JOG_JERK_GEO[0]	5			
N21168 $MC_JOG_JERK_GEO[1]	5			
N21168 $MC_JOG_JERK_GEO[2]	5			
N21170 $MC_ACCEL_ORI[0]	2			
N21170 $MC_ACCEL_ORI[1]	2			
N21170 $MC_ACCEL_ORI[2]	2			
N22430 $MC_FGROUP_PATH_MODE				According to adjustment specification Advanced Surface
N22440 $MC_FGROUP_PATH_RATIO				According to adjustment specification Advanced Surface
N24030 $MC_FRAME_ACS_SET	1			
N24100 $MC_TRAFO_TYPE_1	4100			
N24110 $MC_TRAFO_AXES_IN_1[0]	1			
N24110 $MC_TRAFO_AXES_IN_1[1]	2			
N24110 $MC_TRAFO_AXES_IN_1[2]	3			
N24110 $MC_TRAFO_AXES_IN_1[3]	4			
N24110 $MC_TRAFO_AXES_IN_1[4]	5			
N24110 $MC_TRAFO_AXES_IN_1[5]	6			

Machine data	Value	DS	RD	Comment
N24120 $MC_TRAFO_GEOAX_ASSIGN_TAB_1[0]	1			
N24120 $MC_TRAFO_GEOAX_ASSIGN_TAB_1[1]	2			
N24120 $MC_TRAFO_GEOAX_ASSIGN_TAB_1[2]	3			
N24130 $MC_TRAFO_INCLUDES_TOOL_1	1			
N24585 $MC_TRAFO5_ORIAX_ASSIGN_TAB_1[0]	4			
N24585 $MC_TRAFO5_ORIAX_ASSIGN_TAB_1[1]	5			
N24585 $MC_TRAFO5_ORIAX_ASSIGN_TAB_1[2]	6			
N28060 $MC_MM_IPO_BUFFER_SIZE				According to adjustment specification Advanced Surface
N28070 $MC_MM_NUM_BLOCKS_IN_PREP				According to adjustment specification Advanced Surface
N28071 $MC_MM_NUM_SURF_LEVELS				According to adjustment specification Advanced Surface
N28072 $MC_MM_MAXNUM_SURF_GROUPS				According to adjustment specification Advanced Surface
N28100 $MC_MM_NUM_CC_BLOCK_USER_MEM	3			
N28291 $MC_MM_SMOOTH_SURFACE_NORMALS				According to adjustment specification Advanced Surface
N28520 $MC_MM_MAX_AXISPOLY_PER_BLOCK				According to adjustment specification Advanced Surface
N28530 $MC_MM_PATH_VELO_SEGMENTS				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N28533 $MC_MM_LOOKAH_FFORM_UNITS				According to adjustment specification Advanced Surface
N28540 $MC_MM_ARCLENGTH_SEGMENTS				According to adjustment specification Advanced Surface
N28580 $MC_MM_ORIPATH_CONFIG				According to adjustment specification Advanced Surface
N28590 $MC_MM_ORISON_BLOCKS				According to adjustment specification Advanced Surface
N28610 $MC_MM_PREPDYN_BLOCKS				According to adjustment specification Advanced Surface
N29000 $OC_LOOKAH_NUM_CHECKED_BLOCKS				According to adjustment specification Advanced Surface
N52020 $MCS_ORIAXES_EULER_ANGLE_NAME	1			
N52032 $MCS_STAT_DISPLAY_BASE	10			STAT machine basic screen display
N52033 $MCS_TU_DISPLAY_BASE	10			TU machine basic screen display
N62920 $MC_ROBX_AXIS_SEQ[0]	1			
N62920 $MC_ROBX_AXIS_SEQ[1]	2			
N62920 $MC_ROBX_AXIS_SEQ[2]	3			
N62920 $MC_ROBX_AXIS_SEQ[3]	4			
N62920 $MC_ROBX_AXIS_SEQ[4]	5			
N62920 $MC_ROBX_AXIS_SEQ[5]	6			
N62929 $MC_ROBX_VELCP[0]	60000			

Machine data	Value	DS	RD	Comment
N62929 $MC_ROBX_VELCP[1]	60000			
N62929 $MC_ROBX_VELCP[2]	60000			
N62930 $MC_ROBX_ACCCP[0]	4			
N62930 $MC_ROBX_ACCCP[1]	4			
N62930 $MC_ROBX_ACCCP[2]	4			
N62931 $MC_ROBX_VELORI[0]	6			
N62931 $MC_ROBX_VELORI[1]	6			
N62931 $MC_ROBX_VELORI[2]	6			
N62932 $MC_ROBX_ACCORI[0]	4			
N62932 $MC_ROBX_ACCORI[1]	4			
N62932 $MC_ROBX_ACCORI[2]	4			
N62934 $MC_ROBX_DYN_LIM_REDUCE	1			
N62935 $MC_ROBX_VEL_FILTER_TIME	0.024			
N62936 MC_ROBX_CC_TOA_START_NUM	1			
N62949 $MC_ROBX_TOOL_DIR				1 (Cardan); 0 (RPY)
N62900 $MC_ROBX_KINCLASS		X		
N62901 $MC_ROBX_AXES_TYPE[0]		X		
N62901 $MC_ROBX_AXES_TYPE[1]		X		
N62901 $MC_ROBX_AXES_TYPE[2]		X		
N62901 $MC_ROBX_AXES_TYPE[3]		X		
N62901 $MC_ROBX_AXES_TYPE[4]		X		

Machine data	Value	DS	RD	Comment
N62901 $MC_ROBX_AXES_TYPE[5]		X		
N62902 $MC_ROBX_SPECIAL_KIN		X		
N62903 $MC_ROBX_MAIN_AXES		X		
N62904 $MC_ROBX_WRIST_AXES		X		
N62905 $MC_ROBX_NUM_AXES		X		
N62906 $MC_ROBX_A4PAR		X		
N62907 $MC_ROBX_MAIN_LENGTH_AB[0]		X		
N62907 $MC_ROBX_MAIN_LENGTH_AB[1]		X		
N62908 $MC_ROBX_TX3P3_POS[0]		X		
N62908 $MC_ROBX_TX3P3_POS[1]		X		
N62908 $MC_ROBX_TX3P3_POS[2]		X		
N62909 $MC_ROBX_TX3P3_RPY[0]		X		
N62909 $MC_ROBX_TX3P3_RPY[1]		X		
N62909 $MC_ROBX_TX3P3_RPY[2]		X		
N62910 $MC_ROBX_TFLWP_POS[0]		X		
N62910 $MC_ROBX_TFLWP_POS[1]		X		
N62910 $MC_ROBX_TFLWP_POS[2]		X		
N62911 $MC_ROBX_TFLWP_RPY[0]				
N62911 $MC_ROBX_TFLWP_RPY[1]				
N62911 $MC_ROBX_TFLWP_RPY[2]				
N62912 $MC_ROBX_TIRORO_POS[0]				

Machine data	Value	DS	RD	Comment
N62912 $MC_ROBX_TIRORO_POS[1]				
N62912 $MC_ROBX_TIRORO_POS[2]				
N62913 $MC_ROBX_TIRORO_RPY[0]				
N62913 $MC_ROBX_TIRORO_RPY[1]				
N62913 $MC_ROBX_TIRORO_RPY[2]				
N62914 $MC_ROBX_DHPAR4_5A[0]				
N62914 $MC_ROBX_DHPAR4_5A[1]				
N62915 $MC_ROBX_DHPAR4_5D[0]				
N62915 $MC_ROBX_DHPAR4_5D[1]				
N62916 $MC_ROBX_DHPAR4_5ALPHA[0]				
N62916 $MC_ROBX_DHPAR4_5ALPHA[1]				
N62917 $MC_ROBX_MAMES[0]				
N62917 $MC_ROBX_MAMES[1]				
N62917 $MC_ROBX_MAMES[2]				
N62917 $MC_ROBX_MAMES[3]				
N62917 $MC_ROBX_MAMES[4]				
N62917 $MC_ROBX_MAMES[5]				
N62918 $MC_ROBX_AXES_DIR[0]				
N62918 $MC_ROBX_AXES_DIR[1]				
N62918 $MC_ROBX_AXES_DIR[2]				
N62918 $MC_ROBX_AXES_DIR[3]				

Machine data	Value	DS	RD	Comment
N62918 $MC_ROBX_AXES_DIR[4]				
N62918 $MC_ROBX_AXES_DIR[5]				
N62650 $MC_CC_AXCO_COUPLED_AXIS[3]				Optional
N62650 $MC_CC_AXCO_COUPLED_AXIS[4]				Optional
N62651 $MC_CC_AXCO_DENOMINATOR[3]		X		Optional
N62651 $MC_CC_AXCO_DENOMINATOR[4]		X		Optional
N62652 $MC_CC_AXCO_NUMERATOR[3]		X		Optional
N62652 $MC_CC_AXCO_NUMERATOR[4]		X		Optional
N62653 $MC_CC_AXCO_ACTIVE[3]				Optional
N62653 $MC_CC_AXCO_ACTIVE[4]				Optional
N62659 $MC_CC_AXCO_COUPLED_AXIS_2[3]				Optional
N62660 $MC_CC_AXCO_DENOMINATOR_2[3]		X		Optional
N62661 $MC_CC_AXCO_NUMERATOR_2[3]		X		Optional
N62662 $MC_CC_AXCO_ACTIVE_2[3]				Optional

7.2.3 Channel-specific setting data

Machine data	Value	DS	RD	Comment
N42470 $SC_CRIT_SPLINE_ANGLE				According to adjustment specification Advanced Surface
N42471 $SC_MIN_CURV_RADIUS				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N42472 $SC_MIN_SURF_RADIUS[0]				According to adjustment specification Advanced Surface
N42472 $SC_MIN_SURF_RADIUS[1]				According to adjustment specification Advanced Surface
N42472 $SC_MIN_SURF_RADIUS[2]				According to adjustment specification Advanced Surface
N42473 $SC_ACTNUM_SURF_GROUPS				According to adjustment specification Advanced Surface
N42500 $SC_SD_MAX_PATH_ACCEL				According to adjustment specification Advanced Surface
N42502 $SC_IS_SD_MAX_PATH_ACCEL				According to adjustment specification Advanced Surface
N42510 $SC_SD_MAX_PATH_JERK				According to adjustment specification Advanced Surface
N42512 $SC_IS_SD_MAX_PATH_JERK				According to adjustment specification Advanced Surface
N42674 $SC_ORI_SMOOTH_DIST				According to adjustment specification Advanced Surface
N42676 $SC_ORI_SMOOTH_TOL				According to adjustment specification Advanced Surface
N42678 $SC_ORISON_TOL				According to adjustment specification Advanced Surface

7.2.4 Axis-specific machine data

Machine data	Value	DS	RD	Comment
N30130 $MA_CTRLOUT_TYPE	1	X		
N30132 $MA_IS_VIRTUAL_AX	0			
N30200 $MA_NUM_ENCS	1			
N30240 $MA_ENC_TYPE	4	X		
N30300 $MA_IS_ROT_AX	1			
N30310 $MA_ROT_IS_MODULO	0			
N30320 $MA_DISPLAY_IS_MODULO	0			
N30350 $MA_SIMU_AX_VDI_OUTPUT	1			
N31020 $MA_ENC_RESOL[0,]	256			
N31050 $MA_DRIVE_AX_RATIO_DENOM[0]				
N31050 $MA_DRIVE_AX_RATIO_DENOM[1]				
N31050 $MA_DRIVE_AX_RATIO_DENOM[2]				
N31050 $MA_DRIVE_AX_RATIO_DENOM[3]				
N31050 $MA_DRIVE_AX_RATIO_DENOM[4]				
N31050 $MA_DRIVE_AX_RATIO_DENOM[5]				
N31060 $MA_DRIVE_AX_RATIO_NUMERA[0]				
N31060 $MA_DRIVE_AX_RATIO_NUMERA[1]				
N31060 $MA_DRIVE_AX_RATIO_NUMERA[2]				
N31060 $MA_DRIVE_AX_RATIO_NUMERA[3]				
N32200 $MA_POSCTRL_GAIN			X	
N32000 $MA_MAX_AX_VELO		X		
N32010 $MA_JOG_VELO_RAPID	4			
N32020 $MA_JOG_VELO	2			
N32060 $MA_POS_AX_VELO	=			= $MA_MAX_AX_VELO
N32100 $MA_AX_MOTION_DIR				
N32300 $MA_MAX_AX_ACCEL[0]		X		
N32300 $MA_MAX_AX_ACCEL[1]		X		
N32300 $MA_MAX_AX_ACCEL[2]		X		
N32300 $MA_MAX_AX_ACCEL[3]		X		
N32300 $MA_MAX_AX_ACCEL[4]		X		
N32310 $MA_MAX_ACCEL_OVL_FACTOR[0,]				According to adjustment specification Advanced Surface
N32310 $MA_MAX_ACCEL_OVL_FACTOR[1,				According to adjustment specification Advanced Surface
N32310 $MA_MAX_ACCEL_OVL_FACTOR[2,				According to adjustment specification Advanced Surface
N32310 $MA_MAX_ACCEL_OVL_FACTOR[3,				According to adjustment specification Advanced Surface

Machine data	Value	DS	RD	Comment
N32310 $MA_MAX_ACCEL_OVL_FACTOR[4,				According to adjustment specification Advanced Surface
N32400 $MA_AX_JERK_ENABLE	1		X	
N32402 $MA_AX_JERK_MODE	2		X	
N32410 $MA_AX_JERK_TIME	0.02		X	
N32420 $MA_JOG_AND_POS_JERK_ENABLE	1			
N32430 $MA_JOG_AND_POS_MAX_JERK	2			
N32431 $MA_MAX_AX_JERK[0]			X	
N32431 $MA_MAX_AX_JERK[1]			X	
N32431 $MA_MAX_AX_JERK[2]			X	
N32431 $MA_MAX_AX_JERK[3]			X	
N32431 $MA_MAX_AX_JERK[4]			X	
N32432 $MA_PATH_TRANS_JERK_LIM[0]			X	
N32432 $MA_PATH_TRANS_JERK_LIM[1]			X	
N32432 $MA_PATH_TRANS_JERK_LIM[2]			X	
N32432 $MA_PATH_TRANS_JERK_LIM[3]			X	
N32432 $MA_PATH_TRANS_JERK_LIM[4]			X	
N32434 $MA_G00_ACCEL_FACTOR				According to adjustment specification Advanced Surface
N32435 $MA_G00_JERK_FACTOR				According to adjustment specification Advanced Surface
N32620 $MA_FFW_MODE	4		X	
N32630 $MA_FFW_ACTIVATION_MODE	0		X	
N32640 $MA_STIFFNESS_CONTROL_ENABLE	1		X	
N32650 $MA_AX_INERTIA			X	
N32800 $MA_EQUIV_CURRCTRL_TIME			X	
N32810 $MA_EQUIV_SPEEDCTRL_TIME			X	
N33000 $MA_FIPO_TYPE	3		X	
N33100 $MA_COMPRESS_POS_TOL				According to adjustment specification Advanced Surface
N33120 $MA_PATH_TRANS_POS_TOL				According to adjustment specification Advanced Surface
N34100 $MA_REFP_SET_POS[0,]	0			
N34100 $MA_REFP_SET_POS[1,]	0			
N34100 $MA_REFP_SET_POS[2,]	0			
N34100 $MA_REFP_SET_POS[3,]	0			
N34200 $MA_ENC_REFP_MODE[0,]	0			
N34210 $MA_ENC_REFP_STATE[0,]	0			
N34220 $MA_ENC_ABS_TURNS_MODULO[0,]	1			
N36000 $MA_STOP_LIMIT_COARSE	0.01			

Machine data	Value	DS	RD	Comment
N36010 $MA_STOP_LIMIT_FINE	0.005			
N36100 $MA_POS_LIMIT_MINUS				
N36110 $MA_POS_LIMIT_PLUS				
N36200 $MA_AX_VELO_LIMIT[0,]	=			1.1 * $MA_MAX_AX_VELO
N36200 $MA_AX_VELO_LIMIT[1,]	=			1.1 * $MA_MAX_AX_VELO
N36200 $MA_AX_VELO_LIMIT[2,]	=			1.1 * $MA_MAX_AX_VELO
N36200 $MA_AX_VELO_LIMIT[3,]	=			1.1 * $MA_MAX_AX_VELO
N36200 $MA_AX_VELO_LIMIT[4,]	=			1.1 * $MA_MAX_AX_VELO
N36200 $MA_AX_VELO_LIMIT[5,]	=			1.1 * $MA_MAX_AX_VELO
N36610 $MA_AX_EMERGENCY_STOP_TIME	=			= ($MA_AX_VELO_LIMIT/60)/ $MA_MAX_AX_ACCEL
N36620 $MA_SERVO_DISABLE_DELAY_TIME	=			= $MA_AX_EMERGEN-CY_STOP_TIME+0.1

7.3 Drive machine data

7.3.1 Control Unit parameters

Machine data	Value	DS	RD	Comment
p108	'H4004'			Third-party motor commissioning

7.3.2 Drive parameters

Machine data	Value	DS	RD	Comment
p180 Number of drive datasets	2	X		Third-party motor commissioning
p304[0] Rated voltage				Third-party motor commissioning
p305[0] Rated current				Third-party motor commissioning
p307[0] Rated power				Third-party motor commissioning
p311[0] Rated speed				Third-party motor commissioning
p312[0] Rated torque				Third-party motor commissioning
p314[0] Number of pole pairs				Third-party motor commissioning
p316[0] Torque constant				Third-party motor commissioning
p317[0] Voltage constant				Third-party motor commissioning
p318[0] Stall current				Third-party motor commissioning
p319[0] Static torque				Third-party motor commissioning
p322[0] Max. speed				Third-party motor commissioning
p323[0] Maximum current				Third-party motor commissioning
P329[0] Pole position identification current (p1520 < p329 < 0.35*p323)	0.35*p323			Third-party motor commissioning
p338[0] Maximum current				Third-party motor commissioning
p341[0] Moment of inertia				Third-party motor commissioning

Machine data	Value	DS	RD	Comment
p350[0] Stator resistance cold (20 °C)				Third-party motor commissioning
p356[0] Stator leakage inductance (20 °C)				Third-party motor commissioning
p600[0] Selection temperature sensor				Third-party motor commissioning
p601[0] Selection temperature sensor				Third-party motor commissioning
p611[0] Therm. time constant				Third-party motor commissioning
p612[0] Activation temp. model				Third-party motor commissioning
p613[0] Ambient temperature during operation				Third-party motor commissioning
p625[0] Ambient temperature during commissioning				Third-party motor commissioning
p627[0] Overshoot temperature motor winding	185			Third-party motor commissioning
p553 Rated braking torque				For information
p5350[0] Overload temp./motor winding stationary	2			Third-party motor commissioning
p5390[0] Warning threshold I²T				Third-party motor commissioning
p5391[0] Fault threshold I²T				Third-party motor commissioning
p1082[0] Maximum speed (gearbox)		X		Third-party motor commissioning
p1082[1] Maximum speed (gearbox)		X		Third-party motor commissioning
p1121[0] Ramp-function generator ramp-down time (OFF1)				Third-party motor commissioning
p1121[1] Ramp-function generator ramp-down time (OFF1)				Third-party motor commissioning
p1135[0] Ramp-down time (OFF3)				Third-party motor commissioning
p1135[1] Ramp-down time (OFF3)				Third-party motor commissioning
p1216 Opening time holding brake				Third-party motor commissioning
p1217 Closing time holding brake				Third-party motor commissioning
p1228 Delay time pulse cancellation				Third-party motor commissioning
p1278 Brake control				Third-party motor commissioning
p1520[0] Upper torque limit (gearbox)		X		Third-party motor commissioning

Machine data	Value	DS	RD	Comment
p1520[1] Upper torque limit (gearbox)		X		Third-party motor commissioning
p1521[0] Lower torque limit (gearbox)		X		Third-party motor commissioning
p1521[1] Lower torque limit (gearbox)		X		Third-party motor commissioning
p1810[0] Increase bandwidth of current controller				Third-party motor commissioning (Bit11=1)
p1980[0] Pole ID procedure	1			Third-party motor commissioning
p1981[0] Max. path with pole ID procedure	1			Third-party motor commissioning
p1498[0] Load moment of inertia			X	
p1498[1] Load moment of inertia			X	
p1400[0] Speed control configuration			X	
p1400[1] Speed control configuration			X	
p1433[0] Speed controller reference model natural frequency			X	
p1433[1] Speed controller reference model natural frequency			X	
p1434[0] Speed controller reference model damping			X	
p1434[1] Speed controller reference model damping			X	
p1435[0] Speed controller reference model dead time			X	
p1435[1] Speed controller reference model dead time			X	
p1460[0] Speed controller P gain lower adaptation speed			X	
p1460[1] Speed controller P gain lower adaptation speed			X	
p1462[0] Speed controller integral time lower adaptation speed			X	
p1462[1] Speed controller integral time lower adaptation speed			X	
p1494[0] Speed controller integrator feedback time constant			X	
p1494[1] Speed controller integrator feedback time constant			X	
p1656[0] Current setpoint filter activation			X	
p1656[1] Current setpoint activation			X	
p1657[0] Current setpoint filter 1 type			X	
p1657[1] Current setpoint filter 1 type			X	
p1658[0] Current setpoint filter 1 denominator natural frequency			X	
p1658[1] Current setpoint filter 1 denominator natural frequency			X	
p1659[0] Current setpoint filter 1 denominator damping			X	
p1659[1] Current setpoint filter 1 denominator damping			X	
p1660[0] Current setpoint filter 1 counter natural frequency			X	
p1660[1] Current setpoint filter 1 counter natural frequency			X	
p1661[0] Current setpoint filter 1 numerator damping			X	
p1661[1] Current setpoint filter 1 numerator damping			X	
p1662[0] Current setpoint filter 2 type			X	

Machine data	Value	DS	RD	Comment
p1662[1] Current setpoint filter 2 type			X	
p1663[0] Current setpoint filter 2 denominator natural frequency			X	
p1663[1] Current setpoint filter 2 denominator natural frequency			X	
p1664[0] Current setpoint filter 2 denominator damping			X	
p1664[1] Current setpoint filter 2 denominator damping			X	
p1665[0] Current setpoint filter 2 counter natural frequency			X	
p1665[1] Current setpoint filter 2 counter natural frequency			X	
p1666[0] Current setpoint filter 2 numerator damping			X	
p1666[1] Current setpoint filter 2 numerator damping			X	
p1667[0] Current setpoint filter 3 type			X	
p1667[1] Current setpoint filter 3 type			X	
p1668[0] Current setpoint filter 3 denominator natural frequency			X	
p1668[1] Current setpoint filter 3 denominator natural frequency			X	
p1669[0] Current setpoint filter 3 denominator damping			X	
p1669[1] Current setpoint filter 3 denominator damping			X	
p1670[0] Current setpoint filter 3 counter natural frequency			X	
p1670[1] Current setpoint filter 3 counter natural frequency			X	
p1671[0] Current setpoint filter 3 numerator damping			X	
p1671[1] Current setpoint filter 3 numerator damping			X	
p1672[0] Current setpoint filter 4 type			X	
p1672[1] Current setpoint filter 4 type			X	
p1673[0] Current setpoint filter 4 denominator natural frequency			X	
p1673[1] Current setpoint filter 4 denominator natural frequency			X	
p1674[0] Current setpoint filter 4 denominator damping			X	
p1674[1] Current setpoint filter 4 denominator damping			X	
p1675[0] Current setpoint filter 4 counter natural frequency			X	
p1675[1] Current setpoint filter 4 counter natural frequency			X	
p1676[0] Current setpoint filter 4 numerator damping			X	
p1676[1] Current setpoint filter 4 numerator damping			X	
p1413[0] Actual speed value filter activation			X	
p1413[1] Actual speed value filter activation			X	
p1446[0] Actual speed value filter type			X	
p1446[1] Actual speed value filter type			X	
p1447[0] Actual speed value filter denominator natural frequency			X	
p1447[1] Actual speed value filter denominator natural frequency			X	
p1448[0] Actual speed value filter denominator damping			X	

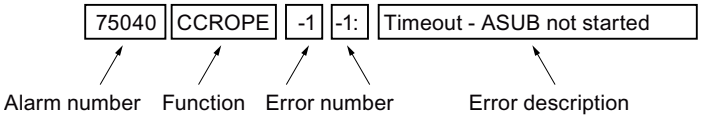
Machine data	Value	DS	RD	Comment
p1448[1] Actual speed value filter denominator damping			X	
p1449[0] Actual speed value filter counter natural frequency			X	
p1449[1] Actual speed value filter counter natural frequency			X	
p1450[0] Actual speed value filter counter damping			X	
p1450[1] Actual speed value filter counter damping			X	
p1441[0] Actual speed value smoothing time			X	
p1441[1] Actual speed value smoothing time			X	
p1414[0] Actual speed value filter activation			X	
p1414[1] Speed setpoint filter activation			X	
p1415[0] Speed setpoint filter 1 type			X	
p1415[1] Speed setpoint filter 1 type			X	
p1416[0] Speed setpoint filter 1 time constant			X	
p1416[1] Speed setpoint filter 1 time constant			X	
p1417[0] Speed setpoint filter 1 denominator natural frequency			X	
p1417[1] Speed setpoint filter 1 denominator natural frequency			X	
p1418[0] Speed setpoint filter 1 denominator damping			X	
p1418[1] Speed setpoint filter 1 denominator damping			X	
p1419[0] Speed setpoint filter 1 numerator natural frequency			X	
p1419[1] Speed setpoint filter 1 numerator natural frequency			X	
p1420[0] Speed setpoint filter 1 numerator damping			X	
p1420[1] Speed setpoint filter 1 numerator damping			X	
p1421[0] Speed setpoint filter 2 type			X	
p1421[1] Speed setpoint filter 2 type			X	
p1422[0] Speed setpoint filter 2 time constant			X	
p1422[1] Speed setpoint filter 2 time constant			X	
p1423[0] Speed setpoint filter 2 denominator natural frequency			X	
p1423[1] Speed setpoint filter 2 denominator natural frequency			X	
p1424[0] Speed setpoint filter 2 denominator damping			X	
p1424[1] Speed setpoint filter 2 denominator damping			X	
p1425[0] Speed setpoint filter 2 numerator natural frequency			X	
p1425[1] Speed setpoint filter 2 numerator natural frequency			X	
p1426[0] Speed setpoint filter 2 numerator damping			X	
p1426[1] Speed setpoint filter 2 numerator damping			X	
p1428[0] Speed pre-control balancing dead time			X	
p1428[1] Speed pre-control balancing dead time			X	
p1429[0] Speed pre-control balancing time constant			X	
p1429[1] Speed pre-control balancing time constant			X	

Alarm, fault and system events

8

8.1 CC ROPE

The compile cycle ROPE generates an alarm with the number 75040. This requires a PowerOn. The alarm has two parameters with the following meanings:



75042 CCROPE: Part program/ASUB start, before ROPE has been configured	
Reason:	• The user attempted to start a part program before ROPE_MAIN configured the ROPE compile cycle. • The ASUB for configuring ROPE has not been started (e.g. because an alarm with the response "No mode group ready" is pending after the ramp-up of the controller).
Response:	SelfClear alarm + missing axis release
Remedy:	• Start the ASUB ROPE_MAIN.cpf in a channel in which the ROPE compile cycle is active. • Ensure that the drives are not in emergency off mode. • Ensure that the processing of the ASUBs is not interrupted.

75040 CCROPE -4 -4: The run-up ASUB of ROPE_MAIN/ROPE_xxx.spf was not executed successfully	
Reason:	• An unexpected error occurred during the processing of the part program ROPE_MAIN or ROPE_xxx. • The ASUB was aborted with NCRESET. • An alarm with the alarm response "No mode group ready" is pending after the run-up of the controller, which means that the ASUP (ROPE_MAIN) has been interrupted. • Drive not correctly run up.
Response:	PowerOn alarm
Remedy:	• Ensure that the ROPE_MAIN is started as the first ASUB during run-up. • Ensure that the drives are not in emergency off mode. • Ensure that the processing of the ASUBs is not interrupted. • Acknowledge all of the alarms with the alarm response "No mode group ready" or eliminate their cause and then perform a reset (PO).

75040 CCROPE 1520 1: Both parameters are positive	
Reason:	• Parameter 1 addresses the index in the MD $MN_AXCONF_LOGIC_MACHAX_TAB[n], Index n = 1 addresses axis 2 • A drive parameter to be monitored (e.g. p1520) in axis 2 cannot be read or has been changed. • The drive (i.e. the drive DO behind NCK axis 2) does not respond to the query from CC ROPE. • You impermissibly increased the value of a drive parameter to be checked.
Response:	PowerOn alarm
Remedy:	• Ensure that the drives have all correctly started up and are in cyclic mode. • Resetting the parameter (e.g. p1520) to the initial value.

75040 CCROPE 1 1: Number of channels > 3	
Reason:	The maximum number of robots to be installed on an NCU is 3.
Response:	PowerOn alarm
Remedy:	Re-installation with the robot configurator.

75040 CCROPE 2 1: $MN_AXCONF_MACHAX_NAME_TAB changed	
Reason:	The machine data $MN_AXCONF_MACHAX_NAME_TAB must not be changed.
Response:	PowerOn alarm
Remedy:	Set the MD to the original value after the installation using the robot configurator (RA1_1, RA2_1, etc.).

75040 CCROPE 3 1: ROPE_xxx.cpf not available	
Reason:	The file belonging to the installed robot type, ROPE_xxx.cpf, is not available in the "Manufacturer cycles" folder.
Response:	PowerOn alarm
Remedy:	Perform a re-installation using the robot configurator or copy the file ROPE_xxx.cpf to the "Manufacturer cycles" folder.

75040 CCROPE 4 1: Call ROPE_MAIN.cpf, not ROPE_xxx.cpf	
Reason:	In the prog event CYCPE_MA.spf or PROGEVENT.spf, the cycle ROPE_xxx.cpf was called instead of ROPE_MAIN.cpf.
Response:	PowerOn alarm
Remedy:	In the prog event CYCPE_MA.spf or PROGEVENT.spf, only call the cycle ROPE_MAIN.cpf.

75040 CCROPE 5 1: incorrect ROPE_xxx loaded in the nth channel	
Reason:	The ID of the respective robot type in the MD $MN_USER_DATA_INT[0-9] does not match the file ROPE_xxx.
Response:	PowerOn alarm
Remedy:	Perform a re-installation using the robot configurator or copy the suitable ROPE_xxx.cpf file for the MD $MN_USER_DATA_INT[0-9] to the "Manufacturer cycles" folder.

75040 CCROPE 6 1: At least 1 drive object reports no response – ACCESS_Status = -1	
Reason:	A least 1 drive reports no response to CC ROPE.
Response:	PowerOn alarm
Remedy:	Check to see whether all of the drives are in cyclic mode. Check to see whether the DO No., DO variables and axis drive assignment have been set as described in Chapter Generating the user-specified topology in Create MyConfig Topo (Page 31).

75040 CCROPE 7 1: At least 1 DO of the robot is not put into operation - start drive macro	
Reason:	At least 1 DO of the robot is not put into operation
Response:	PowerOn alarm
Remedy:	Check the topology (see Section Generating the user-specified topology in Create MyConfig Topo (Page 31)) or perform drive commissioning (see Section Manual steps after installation (Page 42)).

75040 CCROPE 8 1: DO xx deactivated and/or not available	
Reason:	The DO xx to be monitored by CC ROPE is deactivated and/or is not available.
Response:	Response: PowerOn alarm
Remedy:	Activate the corresponding robot axis DO (p105=). All of the robot axis DOs must be active DOs.

8.2 ROBX_AR

75330 ROBX_AR: Incorrect ID in MD18040[6]	
Reason:	The ID in MD18040[6] is not ROBX_AR_MD.
Response:	PowerOn alarm
Remedy:	Use the robot configurator for commissioning.

75331 ROBX_AR: Compile cycle CCROPE is not loaded	
Reason:	In connection with CCROBX_AR and active data protection, the compile cycle CCROPE must also be loaded.
Response:	PowerOn alarm
Remedy:	Load and activate the compile cycle CCROPE (for boundary conditions, see Section Data protection concept (Page 57))

75332 ROBX_AR: Compile cycle CCROPE is not active in the channel	
Reason:	The compile cycle CCROPE is not active in the current channel-
Response:	PowerOn alarm
Remedy:	Activate the compile cycle CCROPE in the same channel as ROBX_AR.

Troubleshooting/FAQs

9

9.1 Boundary conditions when creating an archive

When you create an archive, back up the archive in "JOG REF" mode (transformation is suppressed - TRAFOOF). This ensures that the existing zero offsets (G54, etc.) are also imported when the archive is read in again.

9.2 Archive import SinuTrain

When you create a commissioning archive for importing into SinuTrain, ensure that you also back up the "compile cycles". ROBX_AR is necessary for the robot to operate correctly in SinuTrain and is also imported.

Observe correct naming for the compile cycles, because the import into SinuTrain will fail if the naming convention is incorrect. Specifications for the correct written format can be found in the SinuTrain documentation.

9.3 Reading in a series commissioning archive

Proceed as follows to read in a series commissioning archive:

1. Copy the file "ccscale.acx" to the folder "oem/sinumerik/nck" on the CF card.
2. Set the rights via WinSCP (executable of Group Manufact) as follows:

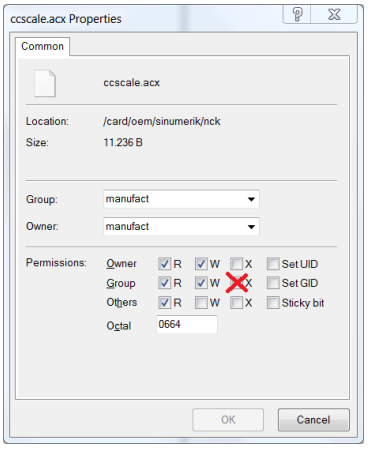


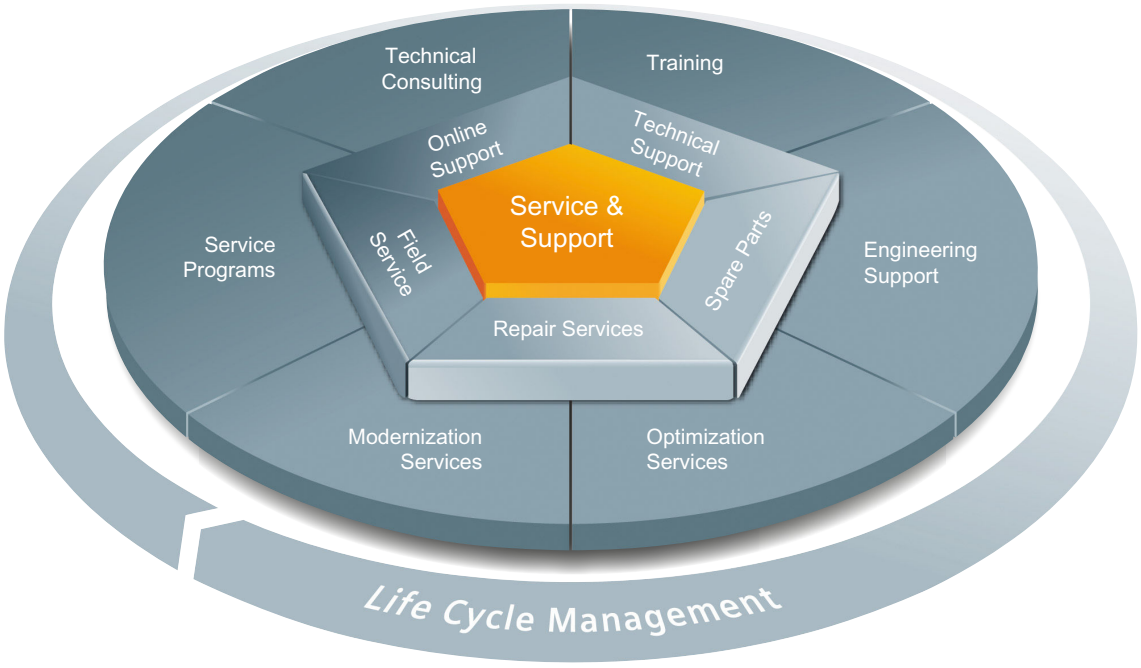
Figure 9-1 Setting the rights via WinSCP

3. Read in the series commissioning archive.

Note

If you do not execute the first step, this leads to an error when reading in the archive.

Service & Support



A unique and complete range of services over the entire life cycle

Irrespective whether you are a machine manufacturer, solution provider or plant operator: The service offering from Siemens Industry Automation and Drive Technologies includes comprehensive services for a wide range of different users in all sectors of the manufacturing and process industry.

To accompany our products and systems, we offer integrated and structured services that provide valuable support in every phase of the life cycle of your machine or plant – from planning and implementation through commissioning to maintenance and modernization.

Our Service & Support accompanies you worldwide in all matters concerning automation and drives from Siemens. We provide direct on-site support in more than 100 countries through all phases of the life cycle of your machines and plants.

An experienced team of specialists provides you with active support and bundled know-how. Regular training courses and intensive contact among our employees – even across continents – ensure reliable service in the most diverse areas

Technical consulting

Support with the planning and design of your project: From detailed analysis of the current situation and definition of objectives through advice on products and systems through to designing the automation solution.

Technical Support

Competent advice for technical questions with a broad spectrum of carefully tailored services for all our products and systems. The technical support can be found at the following Internet (https://support.industry.siemens.com/My/ww/en/requests#createRequest) address.

Training

Extend your market lead – with practice-oriented know-how directly from the manufacturer. Your local SIEMENS office will provide you with information about the training courses that are available.

Engineering support

Support with project engineering and development with services tailored to requirements from configuration through to implementation of an automation project.

Field service

Our field service offers you services for commissioning and maintenance to ensure that your machines and plants are always available.

Spare parts

In every sector worldwide, plants and systems are required to operate with ever increasing availability. We will provide you with the support you need to prevent a standstill from occurring in the first place: with a worldwide network and optimum logistics chains.

Repairs

Downtimes cause problems in the plant as well as unnecessary costs. We can help you to reduce both to a minimum – with our worldwide repair facilities.

Tuning

Over the operating life of machines or plants, considerable potential arises for increasing productivity or saving costs. In order to track these down for you, we offer you a whole range of services for optimization.

Modernization

You can also rely on our support when it comes to modernization – with comprehensive services from the planning phase all the way to commissioning.

Service programs

Our service programs are selected service packages for an automation and drives system or product group. The individual services are coordinated with each other to ensure smooth coverage of the entire life cycle, and support optimum use of your products and systems.

The services of a service program can be flexibly adapted at any time and used independently of each other.

Examples of service programs:

- Service contracts
- Plant IT Security Services
- Life Cycle Services for Drive Engineering
- SIMATIC PCS 7 Life Cycle Services
- SINUMERIK Manufacturing Excellence
- SIMATIC Remote Support Services

The advantages at a glance:

- Minimized downtimes for increased productivity
- Optimized maintenance costs due to a tailored scope of services
- Costs that can be calculated and therefore planned
- Service reliability thanks to guaranteed response times and spare part delivery times
- Customer service personnel supported and relieved of additional tasks
- Comprehensive service from a single source, fewer interfaces and improved know-how

Contact persons

For you on-site, worldwide: Partner for consulting, sales, training, service, support, spare parts, etc. for the complete offering from Industry Automation and Drive Technologies. You can find your personal contact in our contact database in the Internet.