SIEMENS

SINUMERIK

SINUMERIK ONE
SINUMERIK Run MyRobot /Direct Control

Commissioning Manual

Valid for

control system
SINUMERIK ONE
Software version
NCU system software for ONE 6.15

01/2022
A5E51375435B AA

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
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

A5E51375435B AA
Ⓟ 01/2022 Subject to change

Table of contents

Introduction 1

1.1 About SINUMERIK

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

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

1.2 About this document

Target group

This documentation is intended for commissioning personnel.

Note

Requirements

The following knowledge and skills are required:

- TIA Portal V17
- Commissioning of SINUMERIK and SINAMICS

Purpose

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

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

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

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

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

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

Websites of third-party companies

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

1.3 Documentation on the Internet

1.3.1 Documentation overview SINUMERIK ONE 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
- Commissioning Manual SINUMERIK ONE Safety Integrated
- Commissioning Manual SINUMERIK ONE steps when configuring and commissioning
- Operating Manual SINUMERIK ONE Create MyConfig - Diff, Expert, Topo
- SIMATIC Safe Kinematics V17 Function Manual
- PLC model project (https://support.industry.siemens.com/cs/document/109758486)

Robot manufacturer

The following manuals are provided by the robot manufacturer:

- Technical specification
- Maintenance
- Transport and installation

See also

TIA Safe Kinematics (https://support.industry.siemens.com/cs/document/109781152/sales-and-delivery-release-simatic-safe-kinematics-v2-0?dti=0&lc=en-WW)

Comau (http://www.comau.com/en/our-competences/robotics/robot-team)

MABI (https://www.mabi-robotic.com/home/intro/)

Autonox (https://www.autonox24.de/)

1.3.2 Documentation overview SINUMERIK ONE

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

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

The documentation is divided into the following categories:

- User: Operating
- User: Programming
- Manufacturer/Service: Functions
- Manufacturer/Service: Hardware
- Manufacturer/Service: Configuration/Setup
- Manufacturer/Service: Safety Integrated

- Information and training
- Manufacturer/Service: SINAMICS

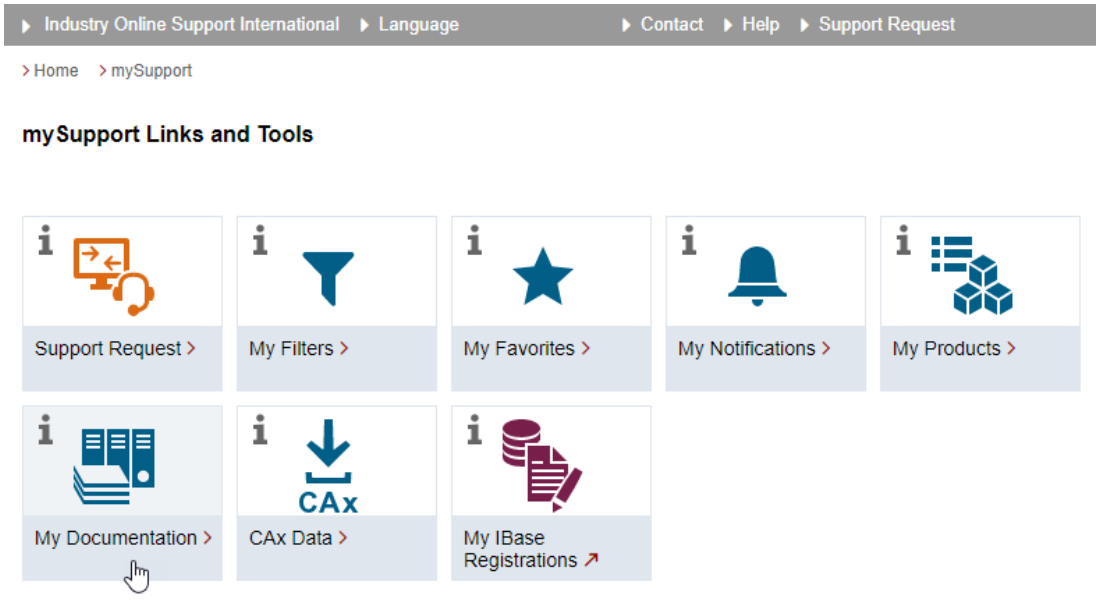
1.4 Feedback on the technical documentation

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

1.5 mySupport documentation

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

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



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

Note

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

1.6 Service and Support

Product support

You can find more information about products on the internet:

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

The following is provided at this address:

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

Technical support

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

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

Training

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

Siemens support on the go

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

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

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

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

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

Data matrix code on the nameplate

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

1.7 Important product information

Using OpenSSL

This product can contain the following software:

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

You can find more information on the internet:

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

Compliance with the General Data Protection Regulation

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

For this product, this means:

The product does not process or store any personal data, only technical function data (e.g. time stamps). If the user links this data with other data (e.g. shift plans) or if he/she stores person-

related data on the same data medium (e.g. hard disk), thus personalizing this data, he/she must ensure compliance with the applicable data protection stipulations.

Fundamental safety instructions 2

2.1 General safety instructions

⚠ WARNING

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 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. Contact with hazardous voltage can result in severe 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.

NOTICE

Damage to equipment due to unsuitable tightening tools.

Unsuitable tightening tools or fastening methods can damage the screws of the equipment.

- Be sure to only use screwdrivers which exactly match the heads of the screws.
- Tighten the screws with the torque specified in the technical documentation.
- Use a torque wrench or a mechanical precision nut runner with a dynamic torque sensor and speed limitation system.

⚠ 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

Using radio devices or mobile telephones in the immediate vicinity of the components can result in equipment malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- Therefore, if you move closer than 20 cm to the components, be sure to switch off radio devices or mobile telephones.
- 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.

NOTICE

Overheating due to inadmissible mounting position

The device may overheat and therefore be damaged if mounted in an inadmissible position.

- Only operate the device in admissible mounting positions.

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

2.2 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).

2.3 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.

2.4 Security information

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

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

Customers are responsible for preventing unauthorized access to their plants, systems, machines and networks. Such systems, machines and components should only be connected to an enterprise network or the internet if and to the extent such a connection is necessary and only when appropriate security measures (e.g. firewalls and/or network segmentation) are in place.

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

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

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

Further information is provided on the Internet:

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

⚠ WARNING

Unsafe operating states resulting from software manipulation

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

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

2.5 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.

Requirements for commissioning 3

3.1 Software and hardware preconditions

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

The components differ, depending on the type of robot. You will get a complete description of the necessary components for the corresponding type of robot when you configure the system using SIZER (see Configuration Manual SINUMERIK Run MyRobot /Direct Control (https://support.industry.siemens.com/cs/document/109757564)).

Hardware

Table 3-1 Hardware components

Component	Number	Article number	Comment
SINUMERIK NCU 1760 or SINUMERIK NCU 1750 or SINUMERIK NCU 1740	1	See catalog or Mall	• NCU selection is application-specific • SINUMERIK NCU 1740 for handling only
Smart Line Module	1	See catalog or Mall	
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	Article number	Comment
CNC software Software version 6.15	1	See catalog or Mall	
TIA Portal V17 with SIMATIC STEP 7 Professional V17 and SINUMERIK STEP 7 Toolbox V17	1	See catalog or Mall	
SIMATIC STEP 7 Safety Advanced V17	1	See catalog or Mall	
SIMATIC Safe Kinematics V17	1		
SI axes	6		
Additional NC axes	3	[1)]	

Component	Number	Article number	Comment
SINUMERIK ONE multi-axis interpolation (>4 interpolating axes)	1	1)	
SINUMERIK ONE SINUMERIK Operate /NCU	1	1)	
SINUMERIK ONE cross-mode actions (ASUB and synchronized actions)	1	1)	
SINUMERIK Run MyCC /ROBX_AR	1	1)	Installation with SINUMERIK Integrate Create MyConfig
SINUMERIK Run MyCC /ROPE	1		Installation with SINUMERIK Integrate Create MyConfig included in option ROBX_AR
SINUMERIK Integrate Create MyConfig	1	1)	PC license: Only needed once, not for each robot
Alternatively: SINUMERIK Run MyRobot /Direct Handling (package license) It contains the following licenses: • 6FC5800-0BR05-0YB0 - Robot transformation (ROBX_AR) • 6FC5800-0BS60-0YB0 - Safety Integrated Plus • 7 x 6FC5800-0BK00-0YB0 - SI axes • 6FC5800-0BM15-0YB0 - Interpolations, multi-axis interpolation (>4 axes) (M15) • 4 x 6FC5800-0BA00-0YB0 - Controllable interpolation axes, extension • 6FC5800-0BM43-0YB0 - Synchronized actions, cross-mode actions (M43) • 6FC5800-0BS00-0YB0 - Operation, SINUMERIK Operate on NCU (S00)	1	6FC5800-0BP84-0YB0	The following restrictions apply: • No spindle • No tool offsets • No COMPCAD / COMPSURF Recommendation: Use of the NCU 1740

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

Quantity structure

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

Example of a system configuration

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

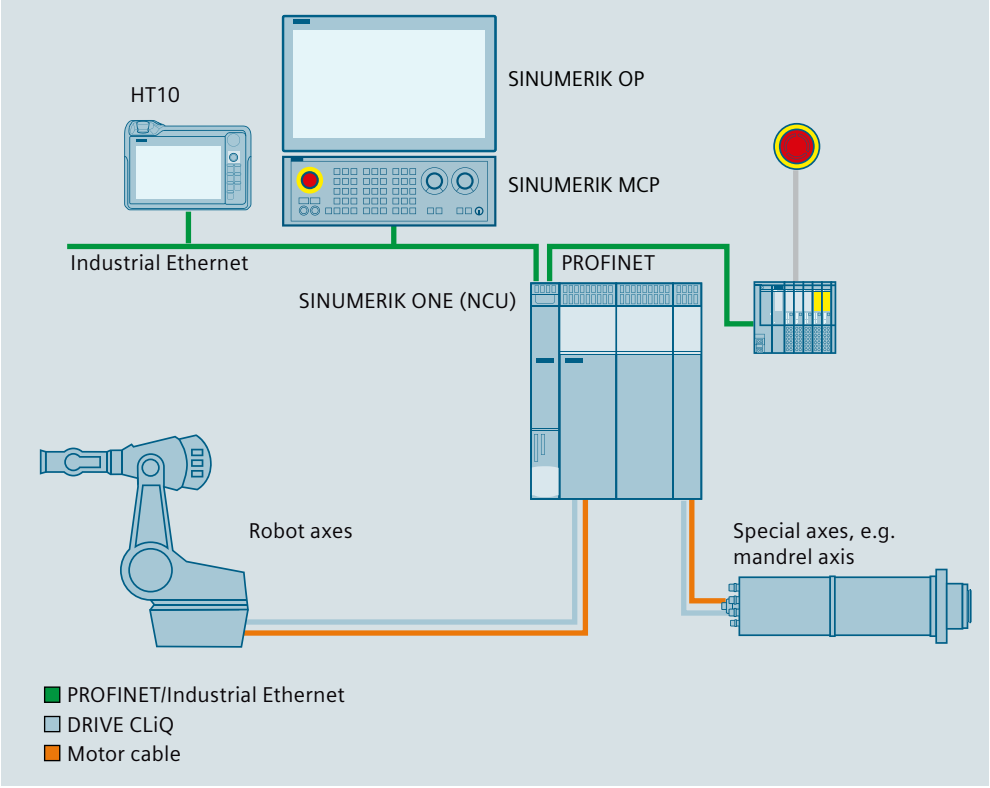


Figure 3-1 Example of a system configuration

Commissioning

4

4.1 General procedure

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

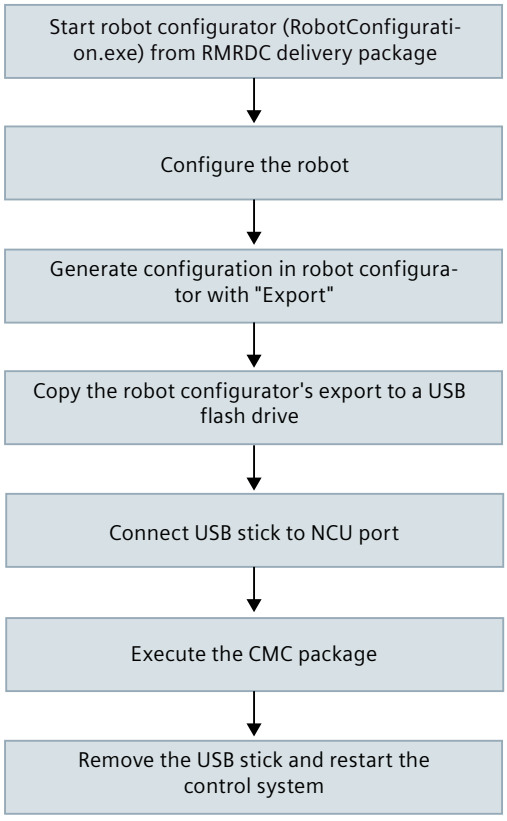


Figure 4-1 Commissioning SINUMERIK Run MyRobot /Direct Control

4.2 Requirements

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

- The robot is correctly mounted and wired. Refer to the documentation provided by the robot manufacturer for this purpose.
- The HW configuration has been created in the TIA Portal and loaded into the NCU.

- Observe the following rules when creating the HW configuration in the TIA Portal:
  - Activate "Safety Integrated" as shown in the following figure.
  - In the HW configuration, first drag the SINUEMRIK ONE and, if applicable, NX modules into the project. Thereby the standard F-addresses are created, which in the following the robot configurator generates based on the drive topology in the "mclist.mcl" file. A subsequent change of the F-addresses in the "mclist.mcl" file is not possible.
  - Then add all other components in the HW Config in TIA (devices on BUS1/4 (CU320, I/O, etc.)).

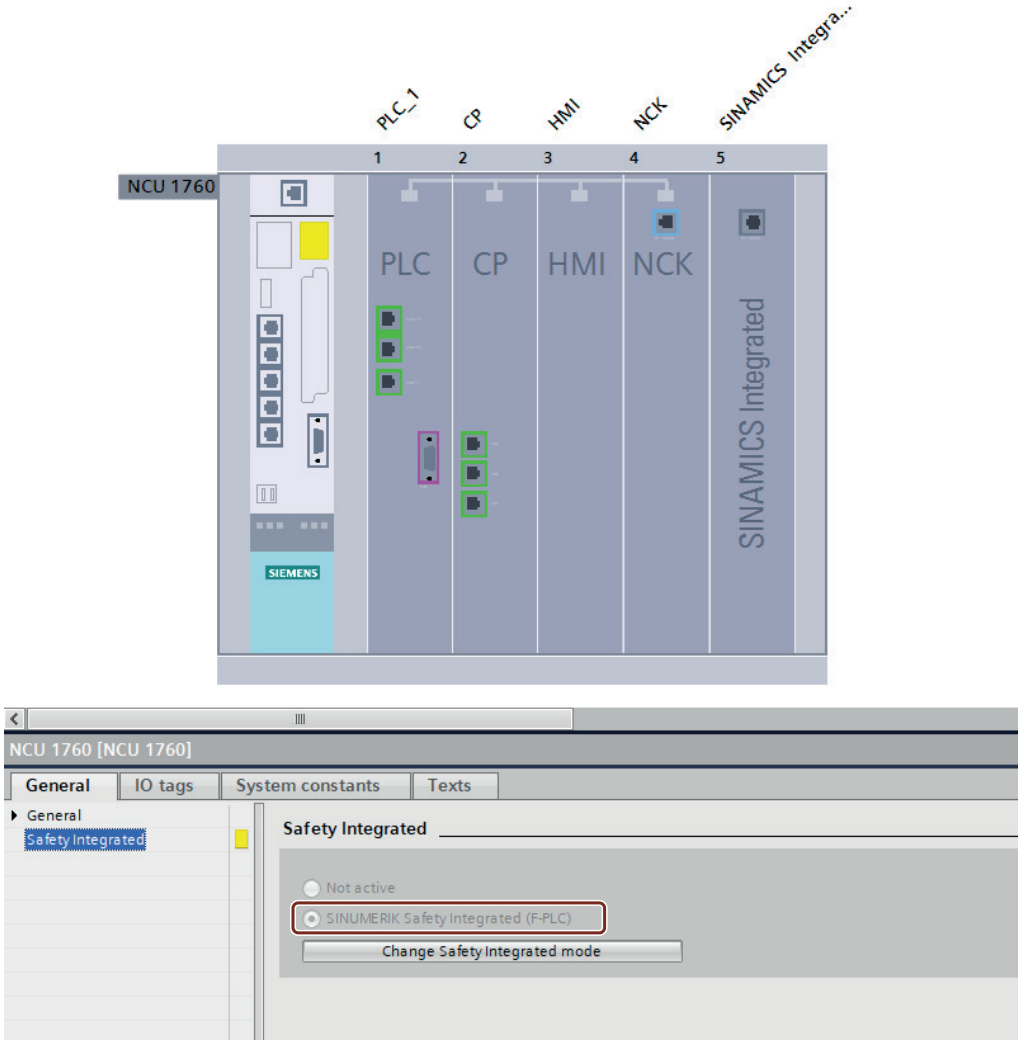


Figure 4-2 HW configuration in the TIA Portal (with Safety Integrated)

- 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 27))

- RMRDC - Run MyRobot /Direct Control (package) is downloaded from PridaNet.
- Optional: PLC model project is downloaded from SIOS Portal (https://support.industry.siemens.com/cs/document/109758486).

4.3 Generating the user-specified topology in Create MyConfig Topo

Requirement for ONE

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: "*.utz2").

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. Examples of standard topologies are contained in a topo project "*.uptz" in the "cmc" folder of the delivery package. You can use these as the basis for expansions.

Alternatively, or for complex DQ topologies, you can also determine the currently installed DQ topology by means of an automatic device configuration in Sinumerik Operate. The procedure is described in the Commissioning Manual "SINUMERIK ONE work steps for configuring and commissioning" in Section "Automatic first commissioning".

After the device configuration, you must create a setup archive with drive data in ASCII format in the operating area Setup -> Setup archive. You can copy this archive to a USB flashdrive, for example, and open it via CMC Topo to import the DQ topology.

Comply with the known 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 for third-party motors.

- The physical order of the SINAMICS axes must be arranged and wired in ascending order to guarantee error-free processing of the drive macro for third-party motors.
  Examples:
  - Motor module sequence (DRIVE-CLiQ) 1,2,3,4,5,6 corresponds to RA1 to RA6
  - Motor module sequence (DRIVE-CLiQ) 1,2,3,6,4,5 is not permitted

- The infeed (SLM with DRIVE-CLiQ) must be connected as follows when performing physical wiring of the DRIVE-CLiQ cable:
  - After the last motor module on axis 6:

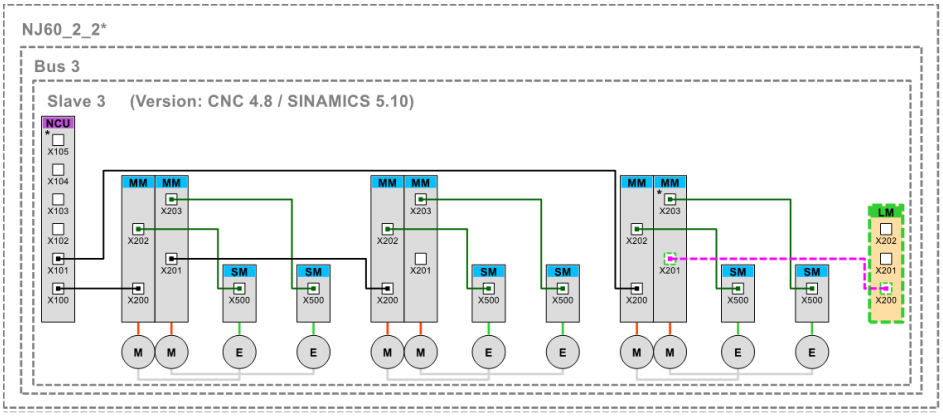


Figure 4-3 Example topology for the NJ60 with infeed on axis 6

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

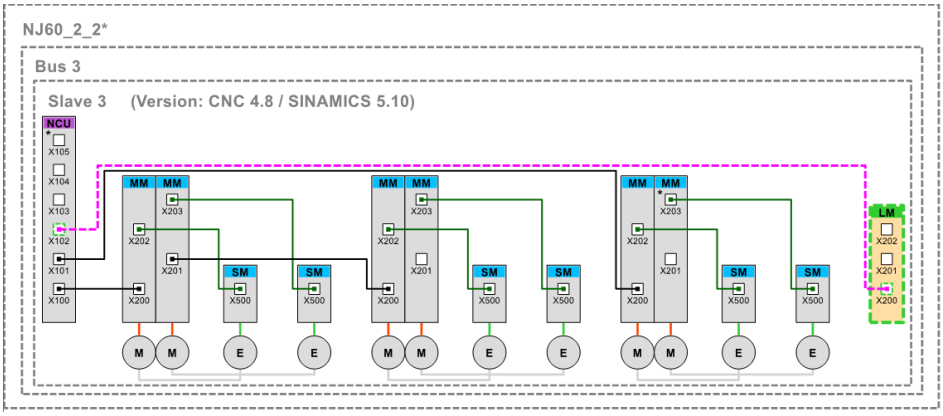


Figure 4-4 Example topology for the NJ60 with infeed at port X102 of the Control Unit

– 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:

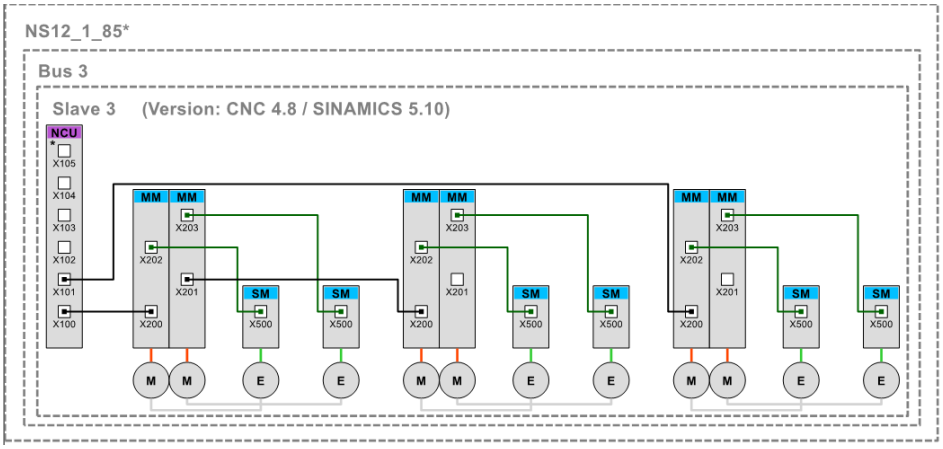


Figure 4-5 Example topology for the NS12 with infeed without DRIVE-CLiQ connection

Observe this physical wiring specification to ensure that the drive macros run correctly for third-party motors.
Apply these specifications in an analogous manner for a drive line-up on an NX.

- The DO variables and DO no. must be named or addressed as follows. Compliance with the rules is necessary to ensure the correct execution of the drive macro for third-party motors and to correctly import the controller data of the respective robot axis for Siemens motors. The robot configurator checks the correct assignment of the DO variables according to this scheme and indicates a necessary change.
  Naming convention for one-channel use with a robot:
  - Robot axis RA1_1 has DO no. 2 for the 1st robot
  - Robot axis RA2_1 has DO no. 3 for the 1st robot
  - ...
  - Robot axis RA6_1 has DO no. 7 for the 1st robot

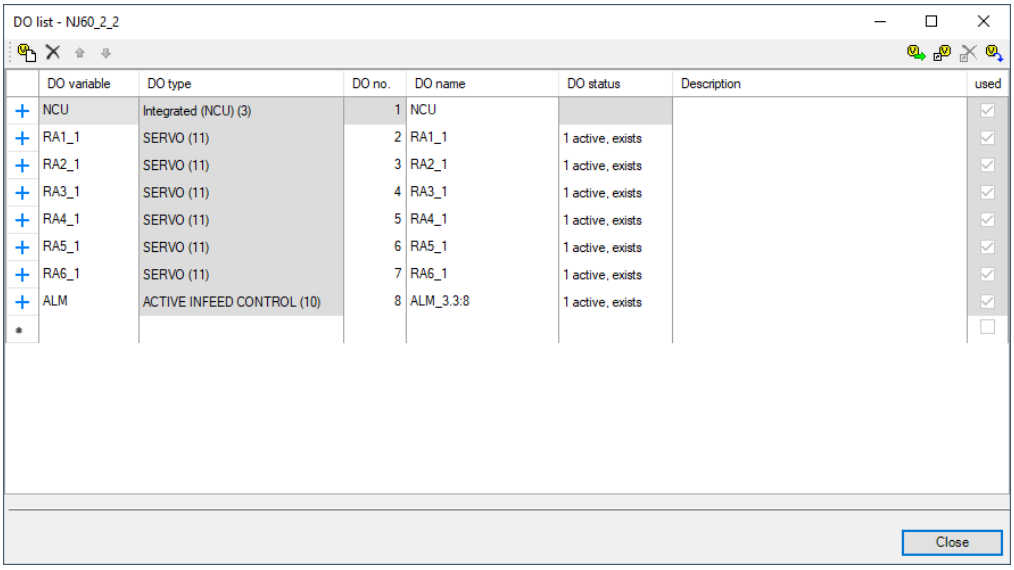


Figure 4-6 DO list - one-channel use with a robot

Naming convention for one-channel use with a robot and special axes:

- Robot axis RA1_1 has DO no. 2 for the 1st robot
- Robot axis RA2_1 has DO no. 3 for the 1st robot
- ...
- Robot axis RA6_1 has DO no. 7 for the 1st robot
- Linear axis LA1_1_1 has the DO No.2 for the 1st axis of the 1st additional kinematics of the 1st robot
- Table axis TA1_2_1 has the DO No. 3 for the 1st axis of the 2nd additional kinematics of the 1st robot
- Table axis TA2_2_1 has the DO No. 4 for the 2nd axis of the 2nd additional kinematics of the 1st robot

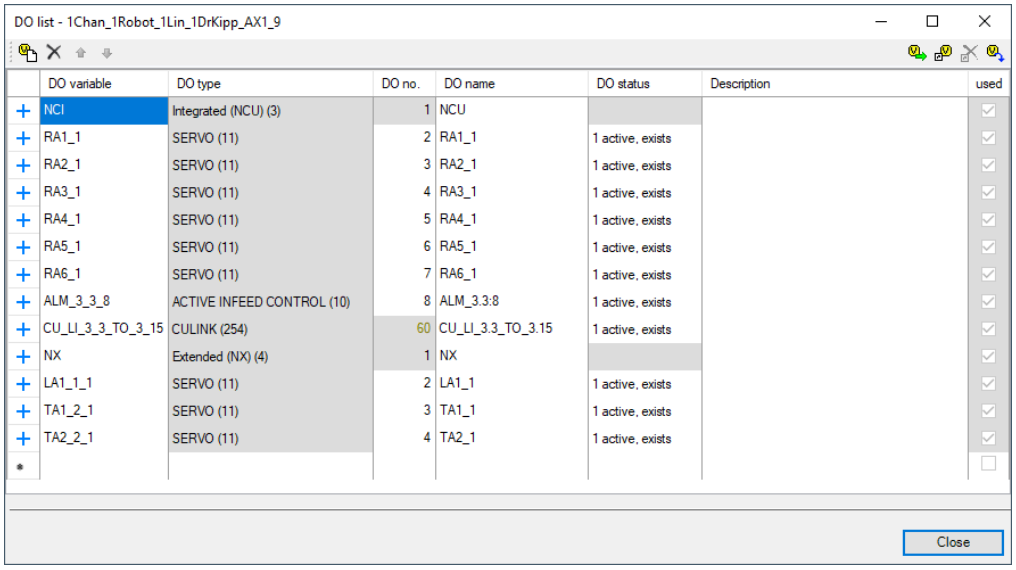


Figure 4-7 DO list - one-channel use with a robot and special axes

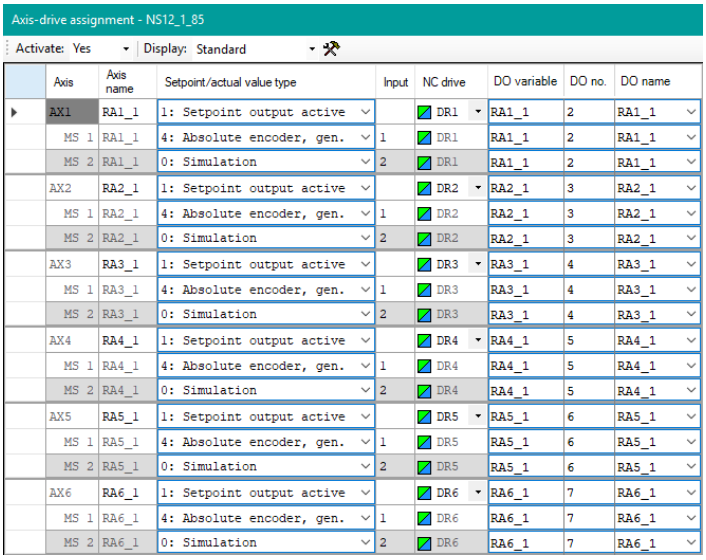
Naming convention for one-channel use:

- Robot axis RA1_2 has DO no. 2 for the 2nd robot
- Robot axis RA2_2 has DO no. 3 for the 2nd robot
- ...
- Robot axis RA6_2 has the DO no. 7 for the 2nd robot
- Linear axis LA1_1_2 has the DO No.2 for the 1st axis of the 1st additional kinematics of the 2nd robot
- Table axis TA1_2_2 has the DO No. 3 for the 1st axis of the 2nd additional kinematics of the 2nd robot
- Table axis TA2_2_2 has the DO No. 4 for the 2nd axis of the 2nd additional kinematics of the 2nd robot
- ...
- Robot axis RA1_x has the DO no. 2 for the xth robot
- Robot axis RA2_x has DO no. 3 for the xth robot
- ...
- Robot axis RA6_x has DO no. for the xth robot
- Linear axis LA1_1_x has the DO No.2 for the 1st axis of the 1st additional kinematics of the xth robot
- Table axis TA1_2_x has the DO No. 3 for the 1st axis of the 2nd additional kinematics of the xth robot
- Table axis TA2_2_x has the DO No. 4 for the 2nd axis of the 2nd additional kinematics of the xth robot

The assignment of the robot numbers "x" refers to the order of the robots selected in the respective robot project of the robot configurator.

You call the DO list in "CMC Topo" via the menu command "Data" > "Manage DO list".

- Carry out the axis-drive assignment. The robot configurator checks the correct axis-drive assignment and issues a warning, if applicable. An example assignment for robot type NS12 1.85 is shown 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	4: Absolute encoder, gen.	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	4: Absolute encoder, gen.	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	4: Absolute encoder, gen.	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	4: Absolute encoder, gen.	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 4-8 Axis-drive assignment

- You must transfer the topology as a user-specified topology (mode: User-specified topology, transfer version: "*.utz2").

References

Operating Manual SINUMERIK ONE Create MyConfig - Diff, Expert, Topo

Commissioning Manual SINUMERIK ONE steps when configuring and commissioning

4.4 Robot configurator

4.4.1 Starting the robot configurator

With the Run MyRobot /Direct Control robot configurator you can select the robot type to be installed, including the channel, the machine axes and the drive topology.

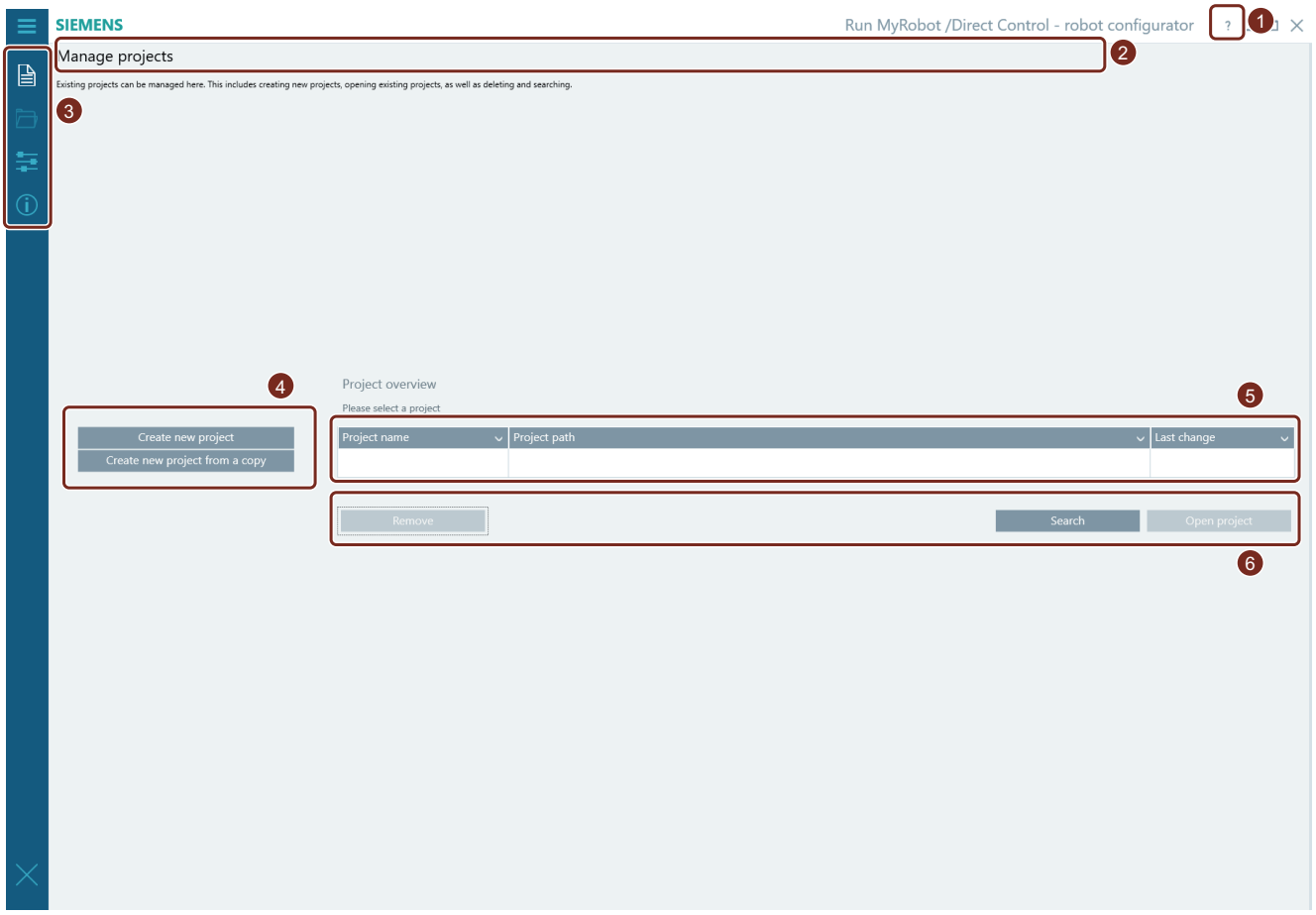
Starting the robot configurator

1. Double-click on the icon "RobotConfiguration.exe" from the download package "rmrdc" from PridaNet.
   The project management of the robot configurator is opened.

4.4.2 Operating the robot configurator

4.4.2.1 Project management

The Run MyRobot /Direct Control robot configurator application starts in the "Project management" operating area.



① Help: Display of the documentation

② Title: Display of the current operating area of the robot configurator

③ Basic functions:

- Managing projects
- Processing a project
- Settings
- Information on the software version of the robot configurator
- Exiting the robot configurator

④
- Create new project
- Clone an existing project: Create a new project from an existing project

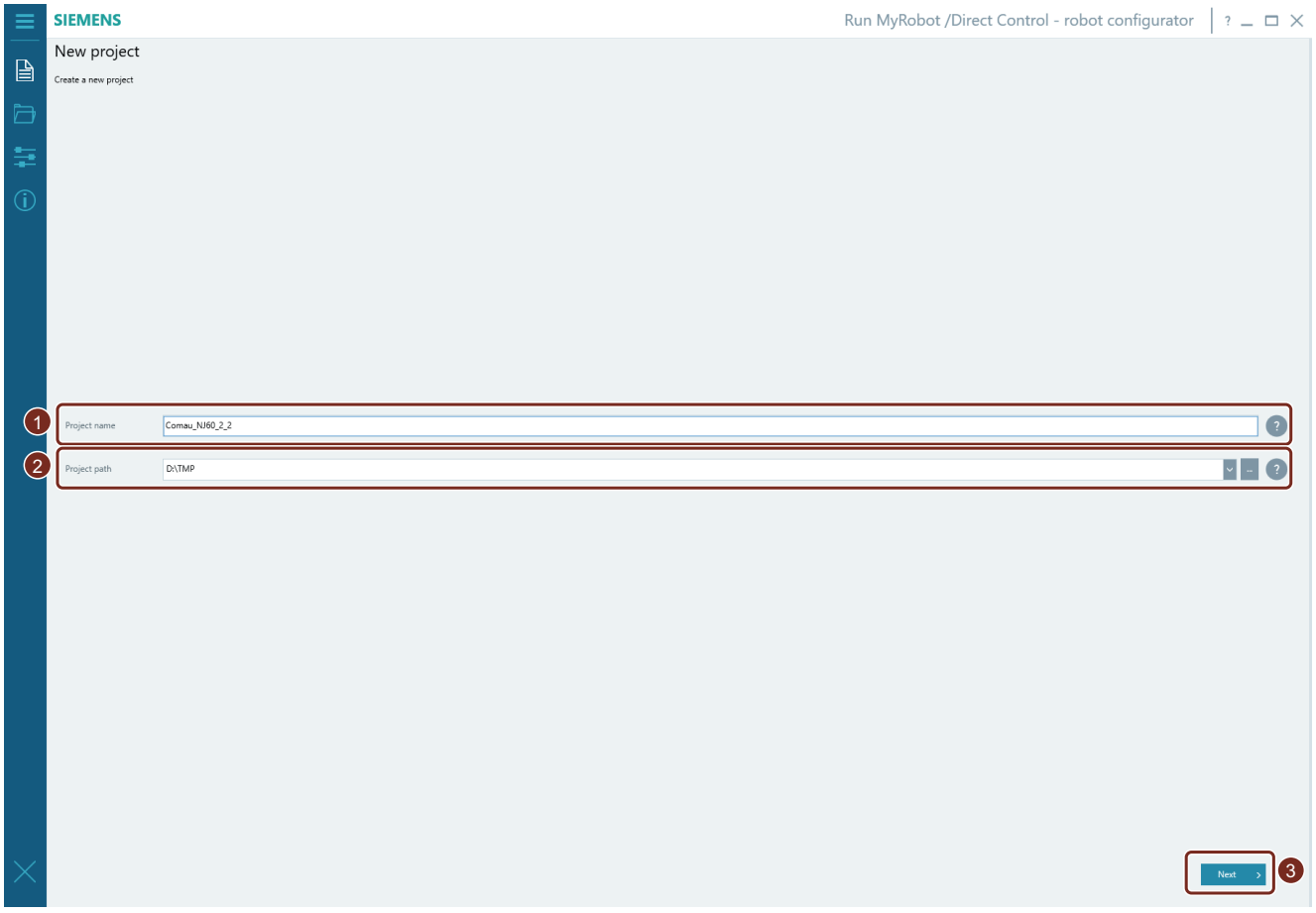
⑤ Project overview: Overview of the last opened robot configurations with project name, project path, and date of the last project change

⑥
- Remove
  Remove project from the project overview. The robot project is only deleted from the overview and is retained on the data storage medium.
- Search
  Searches for projects on the data storage medium and insert them in the overview. The project is then opened.
- Open project
  Open a selected robot project from the overview.

Figure 4-9 Robot configurator - Managing projects

4.4.2.2 Create a project

In the "Project management" operating area, create a new project with the "Create new project" button.



① Enter the project name.

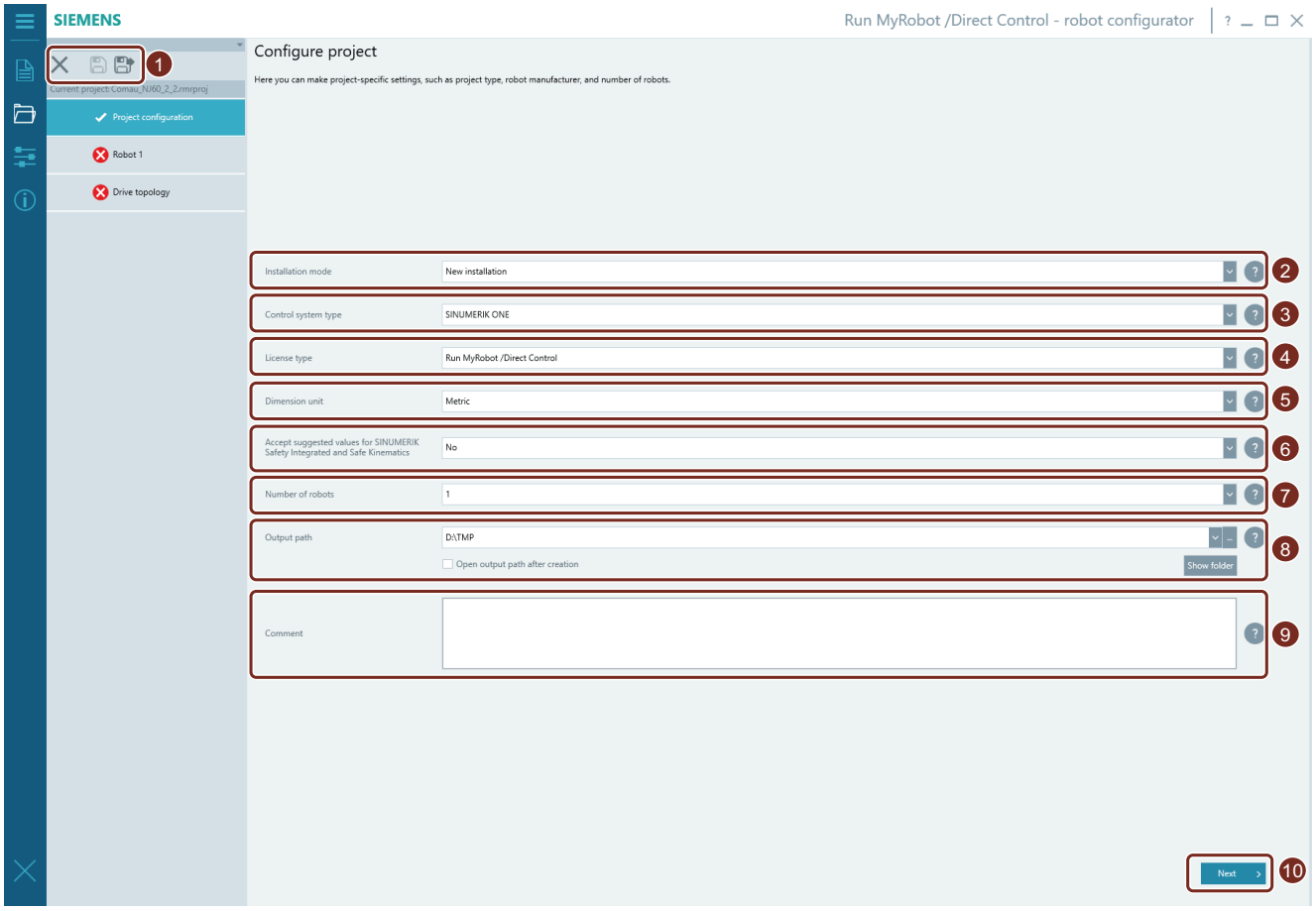
② Select the storage location of the project.

③ Continue to next configuration step.

Figure 4-10 Robot configurator - Creating a new project

4.4.2.3 Configuring a project

In the "Project configuration" operating area, you can adapt the settings for the currently open project, including the installation type, robot manufacturer, and number of robots.



① Basic functions:

 Close project

 Save project

 Save project as

② Set the installation type:

- First commissioning:
  Installation of a robot on a generally reset controller.
- First commissioning with machine tool:
  The 1st channel is reserved for the machine tool. The robot can be installed in a channel ≥ 2. In the NC, the number of axes configured in the robot configurator is created in the 1st channel. Following the installation with the CMC package ("*.usz"), you have to configure the machine tool-specific settings individually.

③ Select the control type

④ Select the license type

- Run MyRobot /Direct Control
- Run MyRobot /Direct Handling

⑤ Set the measuring unit (metric or inches)

⑥ Accept the recommended values for SINUMERIK ONE Safety Integrated and SIMATIC Safe Kinematics.

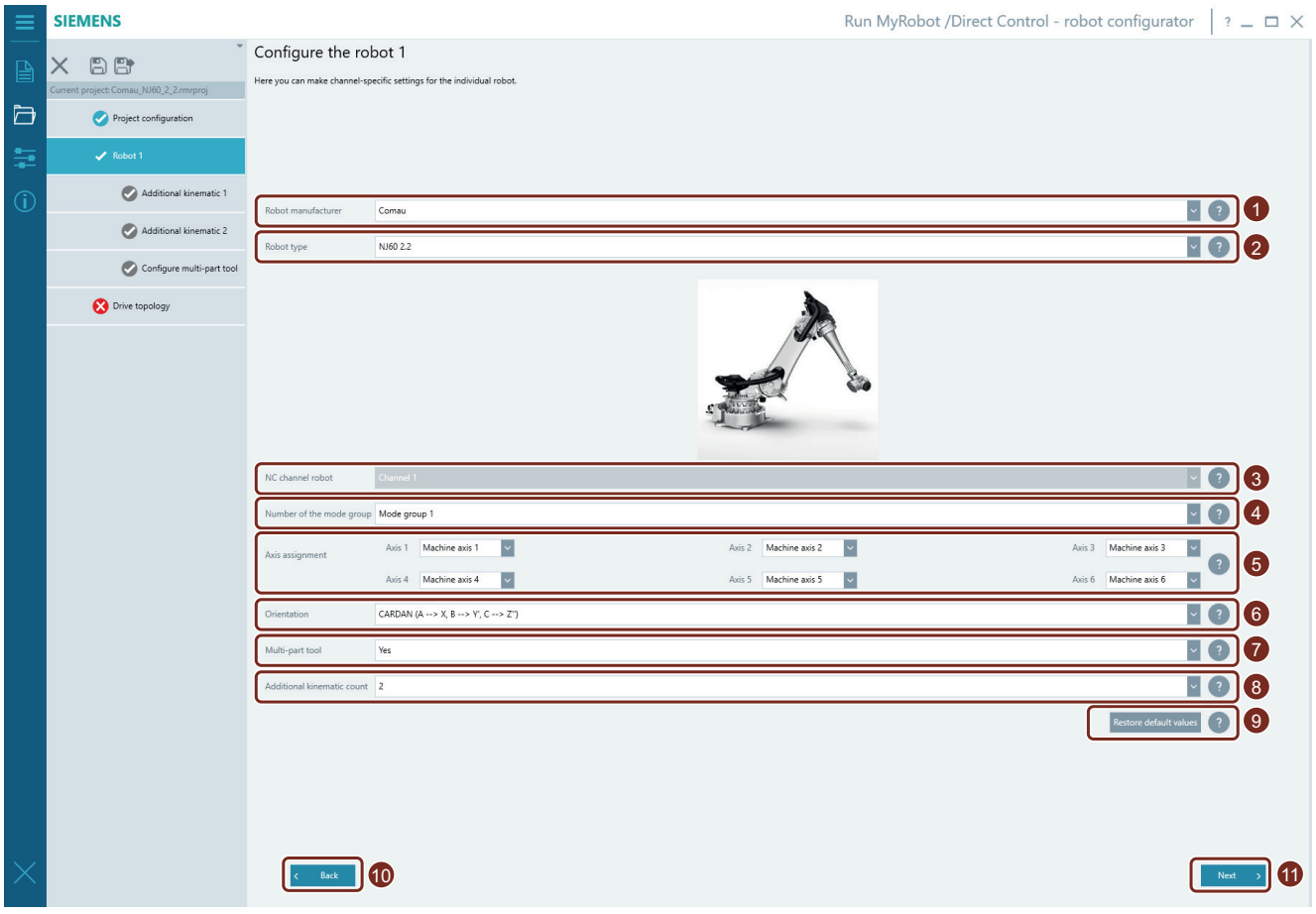
Note: Section Recommended values for SINUMERIK ONE Safety Integrated (Page 53) describes which Safety functions are activated and which Safety data are set.

⑦ Specify the number of robots
⑧ Specify the storage location of the control project to be created and selection option to access the storage location automatically after creating the control project.
⑨ Input field for any descriptions or comments on the project.
⑩ Continue to next configuration step

Figure 4-11 Robot configurator - Project configuration

4.4.2.4 Configure the robot

In the "Configure robot n" operating area, you can make channel-specific settings for individual robots.



① Selection of the robot manufacturer

② Selection of the type of robot

③ Selection of the installation channel of the robot

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

④ Selection of the mode group (BAG)

⑤ Assignment of the robot axes (channel axes) to the corresponding machine axes.

Note: If the default assignment has been changed, you must adapt the axis-drive assignment in the topology project ("*.uptz").

⑥ Setting of the rotation sequence in orientation programming:

- RPY: Standard for robotics (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

⑦ Multi-part tool

Note: Configuration is performed in a separate step for multi-part tools

⑧ Number of additional kinematics

- 0 to up to 5 per robot

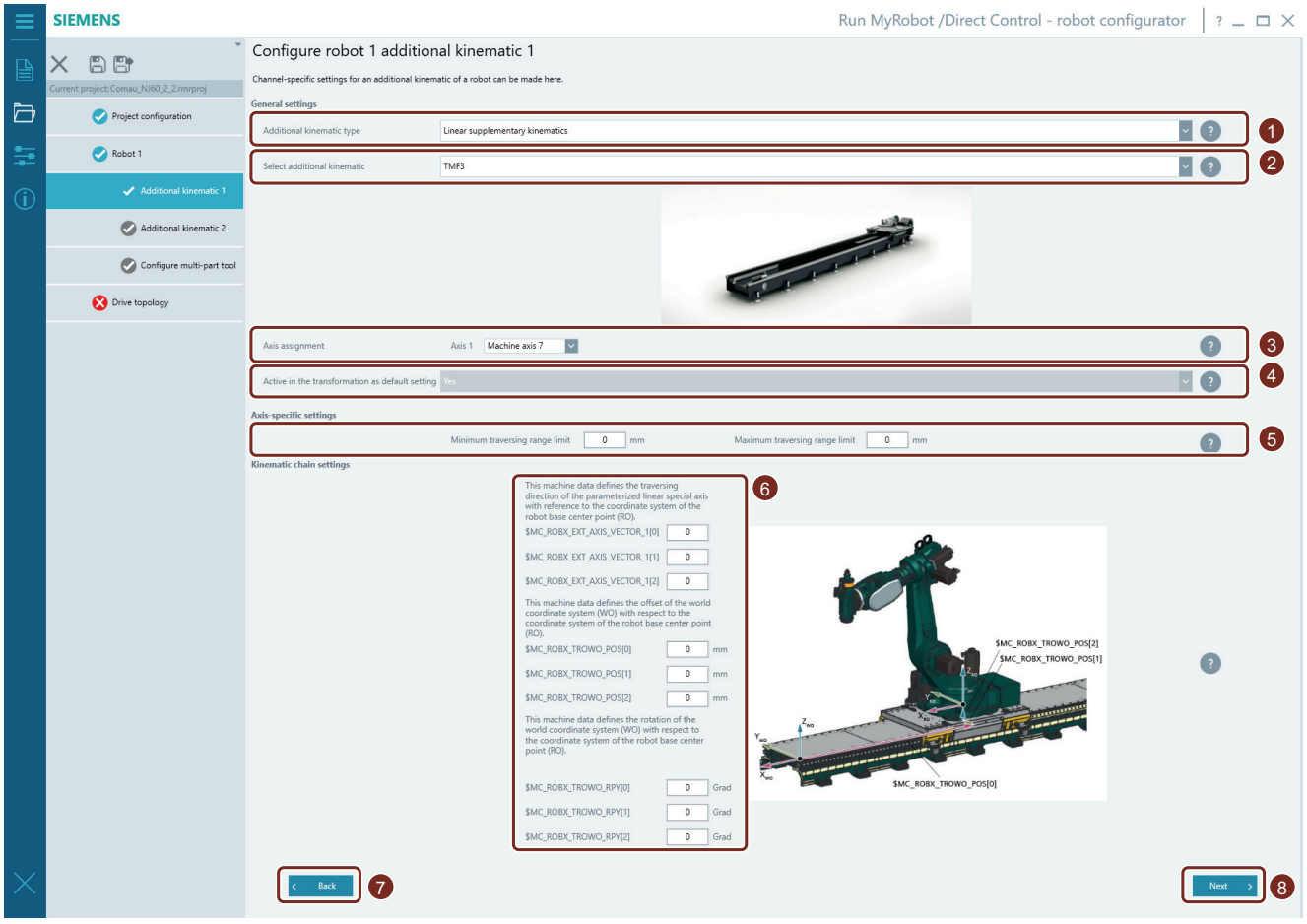
⑨ Restore default values
⑩ Back to previous configuration step
⑪ Continue to next configuration step

Figure 4-12 Robot configurator - Configure robot n

4.4.2.5 Configuring additional kinematics

In the "Configure robot n additional kinematics n" operating area, you can make channel-specific settings for the additional kinematics.

Linear axis



① Select the kinematic type
- Linear axis
- Rotary axis

② Select the kinematic model

③ Assign the axes (channel axes) to the corresponding machine axes

Note: If the default assignment has been changed, you must adapt the axis-drive assignment in the topology project ("*.uptz").

④ Selection or deselection of the linear axis in the transformation

⑤ Entry of the minimum and maximum traverse path (software limit switch) of the linear axis

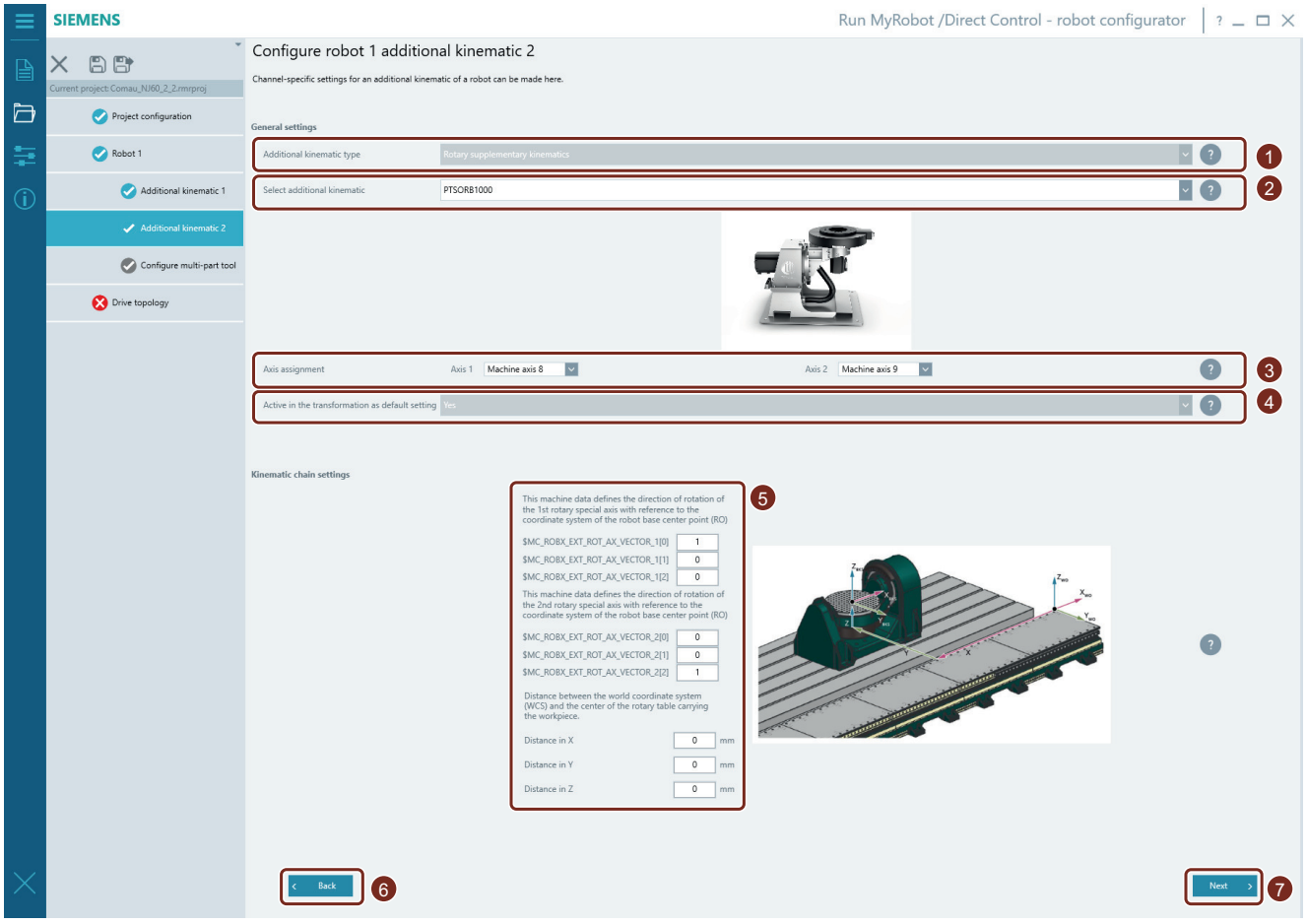
⑥ Entry of the kinematic data for the linear axis

⑦ Back to previous configuration step

⑧ Continue to next configuration step

Figure 4-13 Robot configurator - Linear axis

Rotary tilting table



① Select the kinematic type
- Linear axis
- Rotary axis

② Select the kinematic model

③ Assign the axes (channel axes) to the corresponding machine axes

Note: If the default assignment has been changed, you must adapt the axis-drive assignment in the topology project ("*.uptz").

④ Selection or deselection of the linear axis in the transformation

⑤ Enter the kinematic data for the rotary axis

⑥ Back to previous configuration step

⑦ Continue to next configuration step

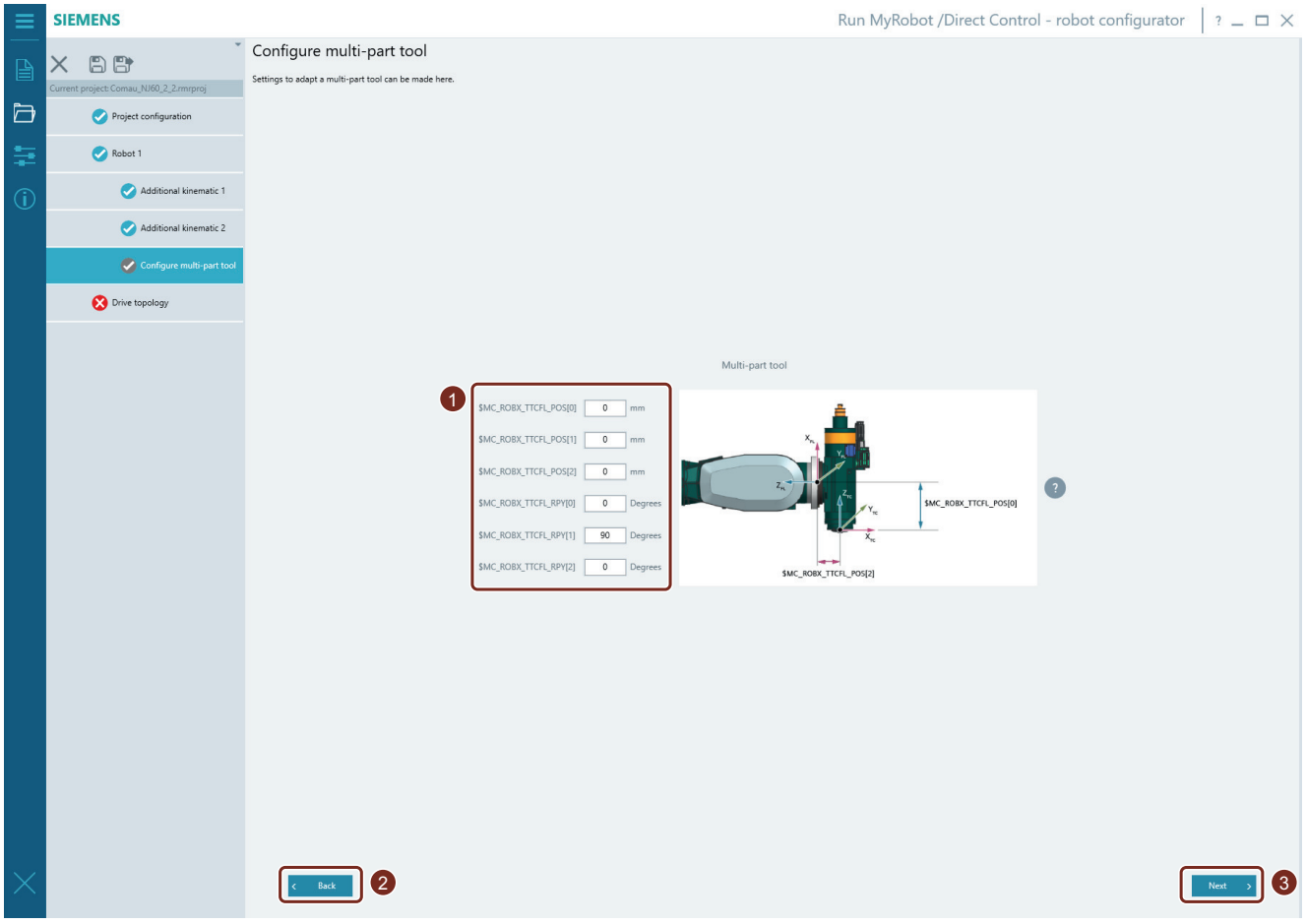
Figure 4-14 Robot configurator - Rotary axis

4.4.2.6 Configure multi-part tool

In the "Configure multi-part tool" operating area, you can make the settings for a multi-part tool, e.g. for a spindle.

Note

- The "Configure multi-part tool" operating area is only displayed if you have selected "Yes" in the "Configure robot n" operating area under Multi-part tool.
- Depending on the choice of orientation in the "Configure n robot" operating area, the MD $MC_ROBX_TTCRL_RPY[1] has the default value 90 degrees for "CARDAN" and -90 degrees for "RPY".



① Enter the configuration data for a multi-part tool
② Back to previous configuration step
③ Continue to next configuration step

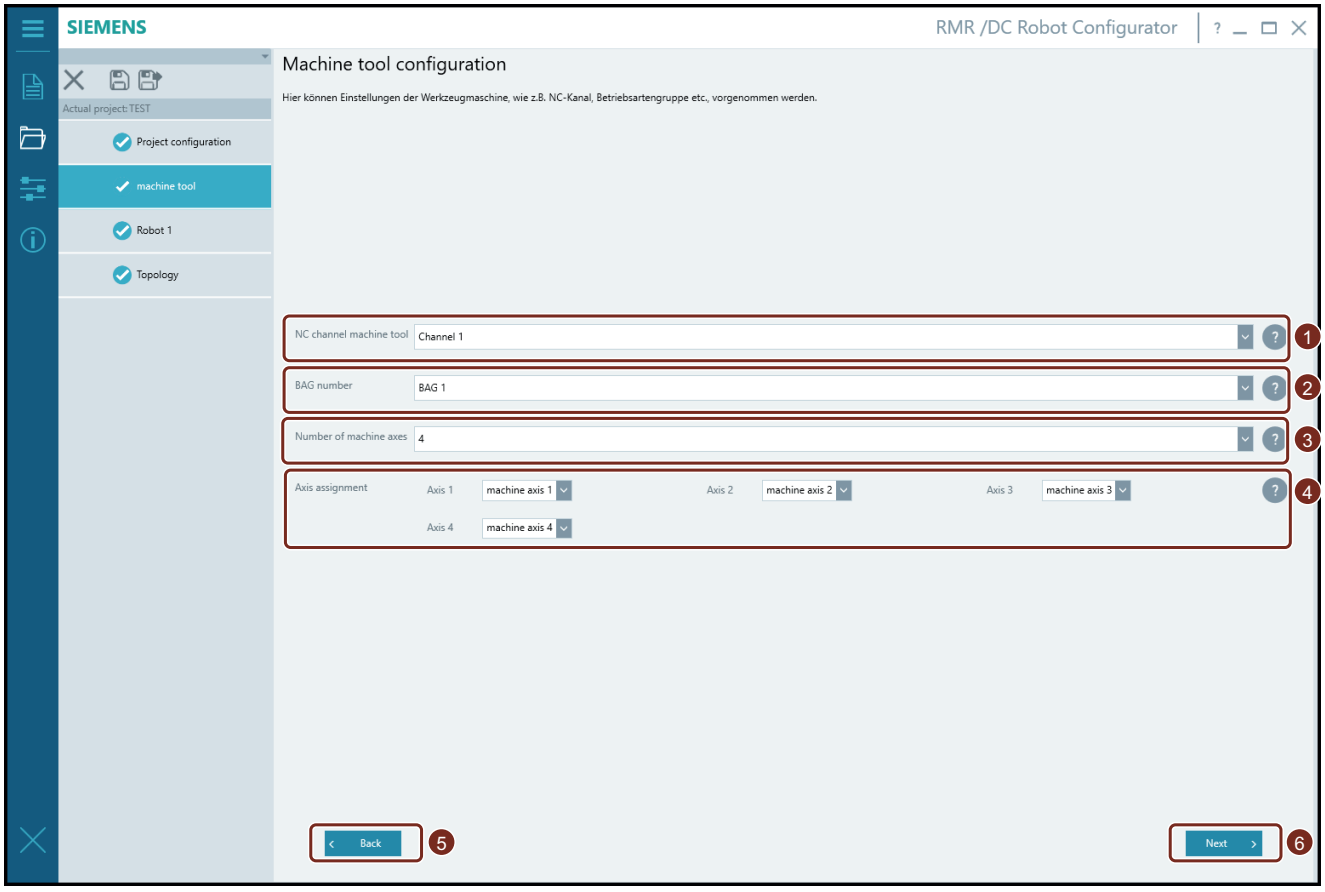
Figure 4-15 Robot configurator - Multi-part tool

4.4.2.7 Machine tool configuration

In the "Machine tool" operating area, you can make settings such as NC channel and axis assignment.

Note

The "Machine tool" operating area is only displayed if you have selected the "First commissioning with machine tool" entry in the "Mode" field in the "Configure project" operating area.



① Selection of the NC channel of the machine tool.

Note: The 1st channel must be occupied. The machine tool must be defined in the first channel. It is not permissible to leave the first channel free.

② Selection of the mode group (BAG)

③ Selection of the number of machine axes.

Note: All axes used in the machine tool channel must be taken into account here.

④ Assignment of the machine axis to the channel axis of the machine tool.

Note: The assignment of the machine tool axes must be considered in the topology project ("*.uptz").

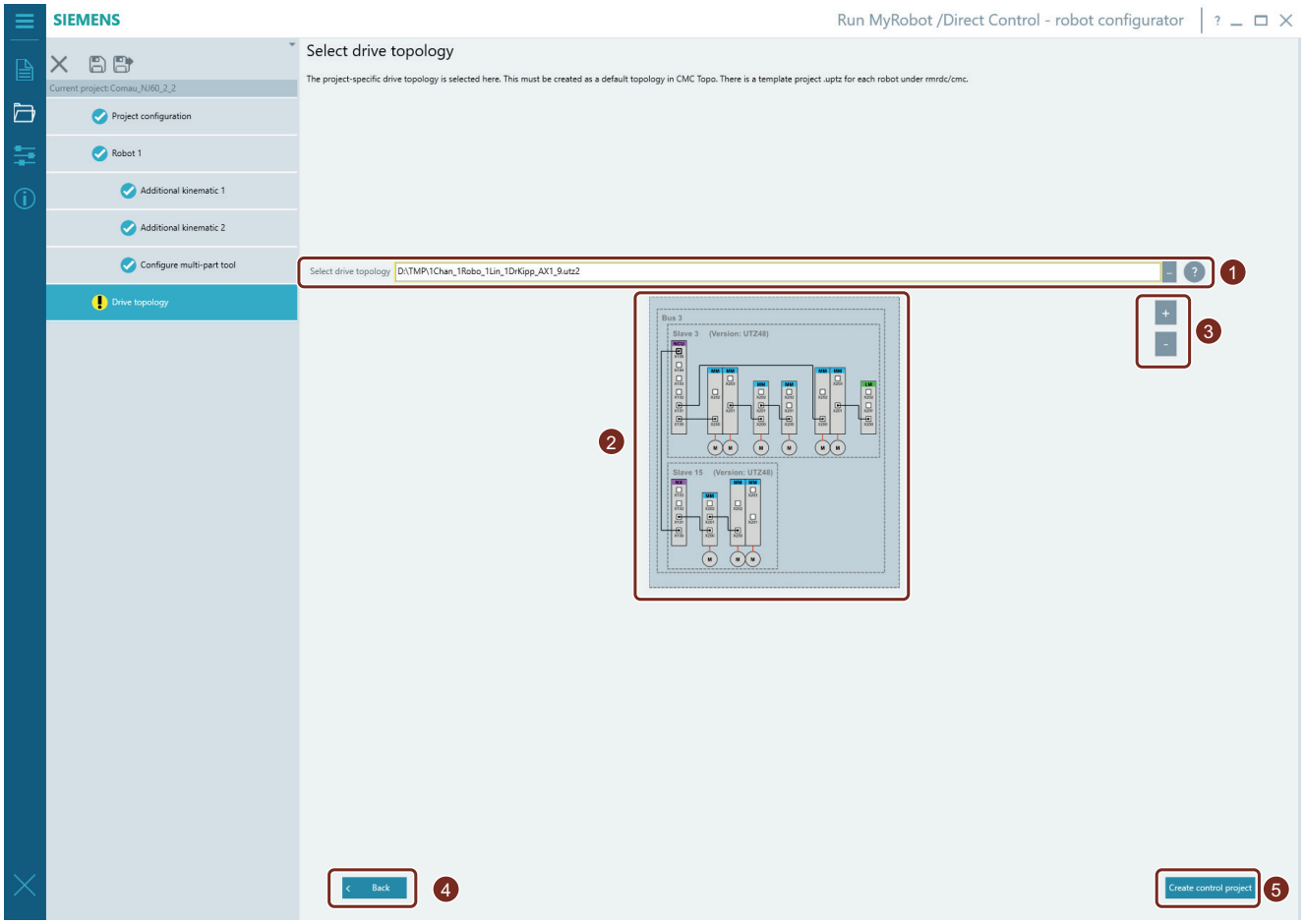
⑤ Back to previous configuration step

⑥ Continue to next configuration step

Figure 4-16 Robot configurator - Configuring a machine tool

4.4.2.8 Drive topology

You select the project-specific drive topology in the "Topology" operating area.



① Selection of the storage location for the drive topology folder ("*.utz2").

② Display the selected drive topology.

The following plausibility checks are performed on the basis of the selected drive topology:

- Warning: The selected topology does not include an axis-drive assignment.
- Warning: No more than 4 motor modules are allowed on one DRIVE-CLiQ port of the CU to be able to use Safety Integrated.
- Warning: The axis-drive assignment in the topology is not complete.
- Warning: The topology contains axes with simulated measuring systems.
- Error: Not all DO variables expected in the robot configurator are present. The DO variables must conform to the specified syntax (see Section Creating a user-specified topology in Create MyConfig Topo (Page 27)).
- Error: The SLM may only be the last DO on the NCU/NX of the robot or must be plugged into a separate DQ port of the NCU/NX
- Error: Drives (DO variables) belonging to kinematics inserted in several CUs.
- Error: The axis-drive assignment in the topology does not match the configuration.
- Verification of the topology file ("*.utz2")

③ Zooming in or out of the topology display

④ Back to previous configuration step

⑤ Export of the configuration files. The files are saved under the storage path specified in the Project configuration (Page 36) chapter.

For more information about creating configuration files, see Creating configuration files (Page 50).

Figure 4-17 Robot configurator - Drive topology

Notes on the topology

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

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

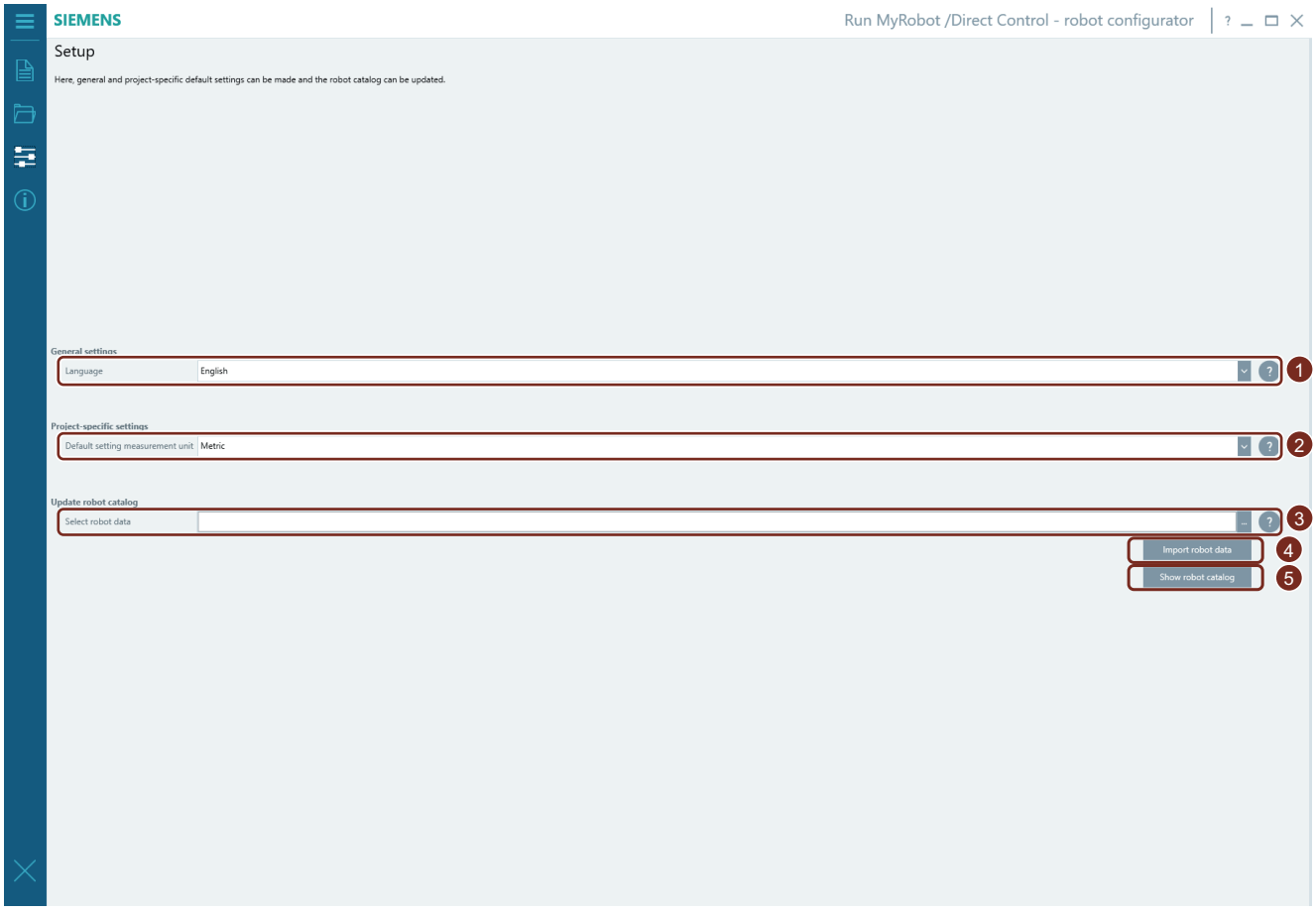
- Standard cabling changed (unlike SIZER projects)
- Axis assignment changed (see Robot configuration (Page 39), restoring default values ⑦)
- The number of robots or additional kinematics to be installed has changed

Procedure:

1. Derive the drive topology from CMC Topo.
2. Select the generated or adapted topology ("*.utz2") under Select drive topology (see ① figure above).

4.4.2.9 Settings

In the "Setup" operating area, you can make project-specific default settings and display or update the robot catalog.



① Select the display language (German/English)

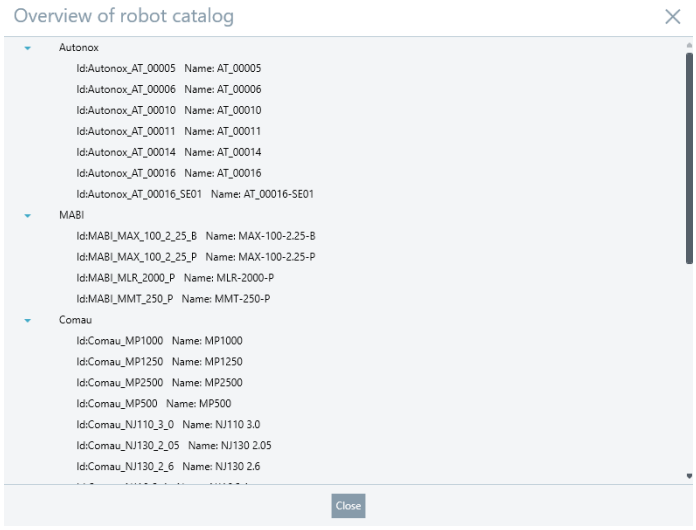
② Set the default measurement unit (metric / inch)

③ Selection of the "Customer.zip" file to import a new/updated robot type.

The "Customer.zip" file for a new robot type is provided via the SIOS website (https://support.industry.siemens.com/cs/document/109757564) or by Siemens Service.

④ Import of a new robot type into the robot configurator.
After successful import, you can select the new/updated robot type just like a robot included in the basic delivery package. The new robot type is displayed in the robot catalog.

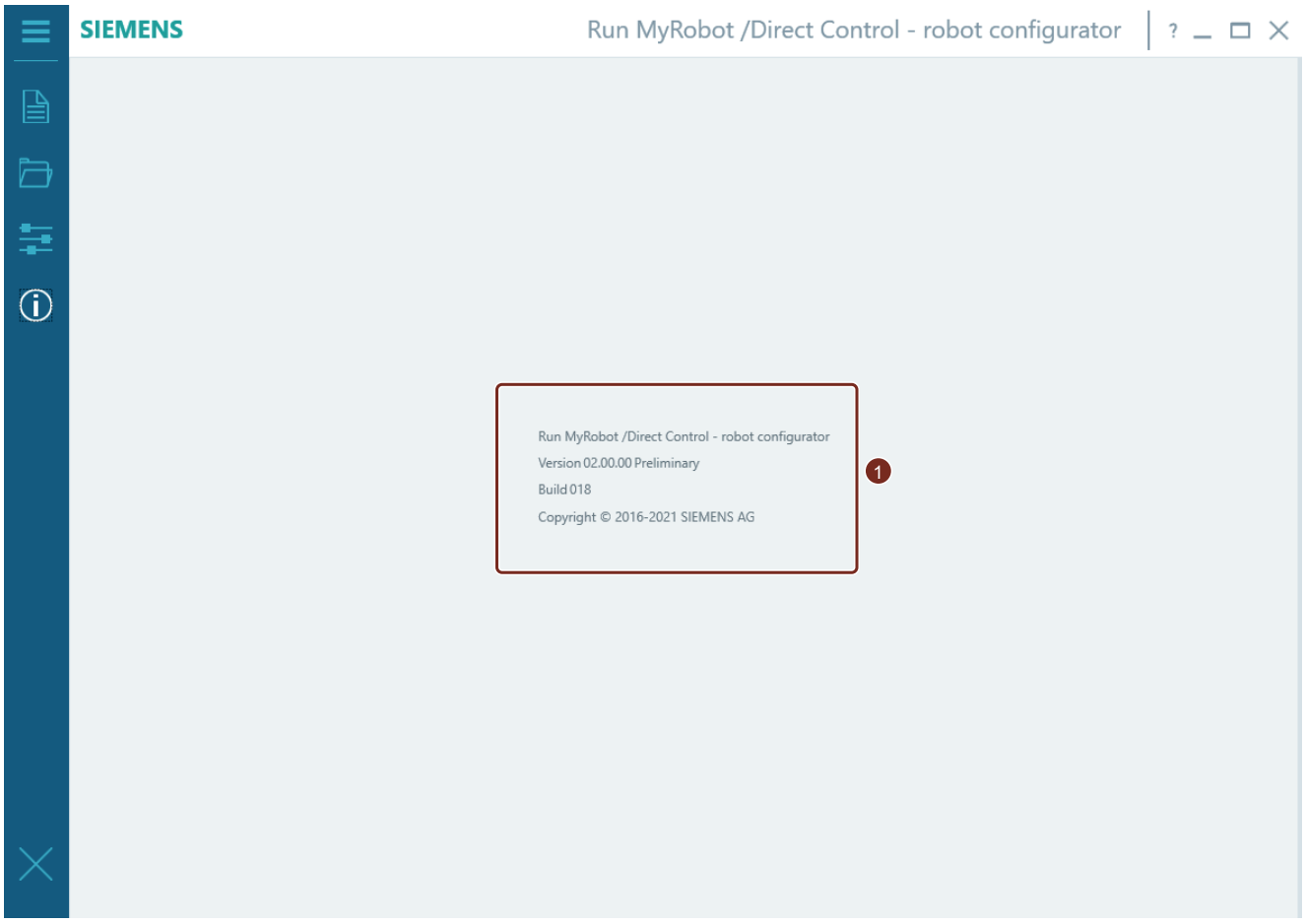
⑤ Display of the current robot catalog with associated robot IDs:



Note: For these robot types, the data is available in the software as standard. Further robot types are provided in the SIOS portal and can be installed via the selection box "Source file" in the settings of the robot configurator.

Figure 4-18 Robot configurator - Settings

4.4.2.10 Info



① Display of the Run MyRobot /Direct Control software version used

Figure 4-19 Robot Configurator - Info

4.4.3 Creating configuration files

The configuration (control project) is created in the "Drive topology (Page 46)" operating area. You can only generate the configuration if it is complete and consistent. If the configuration is incorrect, a context-related error message is displayed.

Procedure

1. Open the "Topology" operating area in the robot configurator.
2. Press the button "Create". The CMC script ("*.usz") and the "RobotInstallation" folder with the following files and subfolders are generated and set up. Define the path for storage in Project configuration (Page 36) under point ⑧.

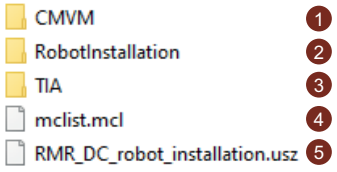


Figure 4-20 Configuration files SINUMERIK ONE

①	"CMVM" folder	
		In the "CMVM" folder, 3D data ("*.stl" / "*.xml") are provided for visualization in Create MyVirual Machine. You can find more extensive information in the System Manual SINUMERIK ONE Create MyVirual Machine

②	"Robot installation" folder	
		• "Config" folder Contains the robot-specific settings for the created robot project from the robot configurator. • File " robot_install_1.upscr" The file "robot_install_1.upscr" in the directory "xxx\Robotinstallation\Config" contains the configuration created in the robot configurator. You must not edit or manipulate this file, because it controls the sequence of the CMC script! The number of robots determines the number of configuration files.
		"NC" folder Contains the following files for commissioning the NC: • One file "robot_md_x.upscr" is generated for each robot. • With the "md_cust.upscr" file from the directory xxx\Robotinstallation\NC you can insert your own NC machine data. The CMC expert script is used for installation. Applications: e.g. for the parameterization of special axes or other application-specific settings. The file "md_cust.upscr" is loaded with an Extcall command from the CMC Expert-ScriptShield package ("*.usz"). **Notice:** You are responsible for the content of the "md_cust.ini" file and its syntactical and semantic correctness. For the scope of language commands (to supplement your own machine data, script commands, etc.), refer to the CMC documentation.
		"SINAMICS" folder The following files are stored in this folder: • Drive macros ("*.acx") for third-party motors or drive data ("*.init") to be imported from the CMC script for Siemens motors. • Selected drive topology "*.utz" In addition to the "RobotInstallation" folder, a CMC package ("*.usz") is automatically saved. **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 location of the files! • All of the files are correctly stored and do not have to be further edited.

③	"Safe Kinematics" folder **Note:** The "TIA" folder is only created if you have activated "Recommended values for SINUMERIK ONE Safety Integrated and SIMATIC Safe Kinematics" (see section Configuring a project (Page 36)).	
		The folder "Safe Kinematics" contains 3D and configuration data for the 3D visualization in the TIA Portal (as of TIA V17). The 3D visualization supports you with configuration, commissioning and the acceptance test of Safe Kinematics. You can find more extensive information in the Function Manual SIMATIC S7-1500 Safe Kinematics
④	mclist.mcl	
⑤	RMR_DC_robot_installation.usz	

4.5 Suggested values for SINUMERIK ONE Safety Integrated

NOTICE
Acceptance test All recommended values must be checked/verified by the manufacturer in an acceptance test.

As part of commissioning a robot and special axes, all relevant axis, motor and controller data are set in the machine data. If you have activated "Recommended values for SINUMERIK ONE Safety Integrated and SIMATIC Safe Kinematics", the recommended values of the drive-integrated safety functions are also set in the machine data. The Safety-relevant machine data are selected specifically for each robot and axis so that the payloads and additional loads are taken into account within the scope of the technical specification of the respective robot type. The following functions are activated for this in the axes and preassigned to recommended values. The functions and the associated recommended values are used for orientation only and must be verified by the manufacturer.

You will find the machine data relevant to Safety in the following sections:

- "Machine data" > "NC machine data" > "SINUMERIK ONE Safety parameters" (Page 92)
- "Machine data" > "Drive machine data" > "SINUMERIK ONE Safety parameters" (Page 98)

In the following, the safety functions are described, which are activated and parameterized with the selection "Recommended values for SINUMERIK ONE Safety Integrated and SIMATIC Safe Kinematics" in the robot configurator.

SS1

The "Safe Stop 1" function (SS1) causes a drive-autonomous deceleration of the motor and initiates the "Safe Torque Off" (STO) function after a predefined time interval has elapsed. This function corresponds to stop category 1 to EN 60204-1 (stop category B).

SS2

The "Safe Stop 2" (SS2) function brings the motor to a standstill with subsequent safe monitoring of the standstill position. If SS2 is selected, the drive brakes the motor along a braking ramp. This function corresponds to stop category 2 to EN 60204-1 (stop category C).

SS2E

This function corresponds to stop category 2 to EN 60204-1 (stop category D). The function is deactivated by default and must be activated by the manufacturer before use. The function must be set in p9501 for every axis that requires this safety function. The parameters for each axis are taken over from the "weakest" axis.

SS2ESR

Note

The recommended values do not contain times for retraction. These must be defined by the manufacturer and then added to the values for the axes in question.

This function corresponds to stop category 2 to EN 60204-1 (stop category E). This function is deactivated by default and must be activated by the manufacturer before use. The function must be set in p9501 for every axis that requires this safety function. The parameters for each axis are taken over from the function SS2E.

SOS

The "Safe Operating Stop" (SOS) function is used for safe monitoring of the standstill position of a drive.

SLS

The "Safe Limited Speed" (SLS) function prevents the motor from exceeding the defined speed limit. The SLS speed is automatically calculated for the effective length of the axis and is limited to 15 m/min or 250 mm/s. The SLS level 1 to 4 of each axis is set to the same value.

SAM

The "Safe Acceleration Monitor" (SAM) function is used to safely monitor braking along the OFF3 ramp. The function is active for SS1, SS2 or STOP B, STOP C.

SBT

Diagnostic function "Safe Brake Test (SBT)" checks the required holding torque of a brake (operating or holding brake). The set holding torque corresponds to the rated torque of the motor of each axis.

Safe referencing

The "Safe referencing" function allows a safe absolute position to be defined. This function is activated for using the "Cartesian Safety" application. The exact positions of the axes can be read out and the axes are controlled reliably.

Forced checking procedure

The functions and switch-off signal paths must be tested to ensure that they are functioning correctly at least once within a defined period in order to meet the requirements of EN ISO 13849-1 and IEC 61508 for timely error detection.

The maximum permissible interval for forced dormant error detection/forced checking procedure for "basic functions" and "extended functions" is 8760 hours. This means that the forced checking procedure must be performed at least once per year.

The recommended value for requesting the function is set to 24 hours by default, i.e. the forced checking procedure is requested once per day.

References

You can find more extensive information in the Commissioning Manual "SINUMERIK ONE Safety Integrated".

You can find more extensive information on safety requirements for industrial robots in the standard DIN EN ISO 10218.

4.6 CMC script

A CMC script is processed within the CMC package. 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, with or without special axes.

The CMC script has the following tasks:

- Setting the machine data (general, channel, axis and CC), see Section Machine data (Page 71)
- Copying and activating the scaling file ("*.acx") for data protection
- Copying and running the drive macros
  - For third-party motors: commissioning of third-party motors and import of optimized controller data
  - For SIEMENS motors: import of optimized controller data
- Copying and confirming Safety data
- Copying and activating the compile cycles, including machine data description and associated alarm texts

Note

If you activated the option "Accept recommended values for SINUMERIK Safety Integrated and Safe Kinematics" in the robot configurator, these values will be written by the CMC script.

See Section "Recommended values for SINUMERIK ONE Safety Integrated (Page 53)".

Procedure

Start the CMC script as described below:

1. Insert the USB flash drive (not a boot drive!) with the "*.usz" file in the root directory into USB port X125 or X135 of the NCU.
2. Perform a POWER ON (cold restart) 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 flash drive from the NCU. Then switch on the system again.

4.7 Sample PLC application

For a quick and uncomplicated start, in the SIOS portal under SINUMERIK Run MyRobot /Direct Control - PLC (https://support.industry.siemens.com/cs/document/109758486/sinumerik-run-myrobot-direct-control-plc?dti=0&lc=en-DE)

you can download a PLC application example.

The most important blocks are included and pre-parameterized in this example.

References

You can find more extensive information on PLC programming in the Commissioning Manual SINUMERIK ONE works steps for configuring and commissioning.

4.8 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.

The manual steps after installation are described separately for robots with Siemens motors and robots with third-party motors.

Depending on the type of robot, carry out the steps described in the corresponding section.

See also

Controller data (Page 64)

4.8.1 Manual steps after installation for third-party motors

After installation, you must manually perform the following steps:

1. Load the system-specific PLC blocks.
2. Start up the infeed SLM.
3. Activate at least the following Safety functions provided by SINUMERIK ONE Safety Integrated:
   - SS1/STO (emergency stop)
   - Axial SLS

   Note

   If you activated the option "Accept recommended values for SINUMERIK ONE Safety Integrated and SIMATIC Safe Kinematics" in the robot configurator, these and other values will be written by the CMC script. See Section "Recommended values for SINUMERIK ONE Safety Integrated (Page 53)".

4. Determine the angular commutation 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 pole position angle 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.

5. Check the current controller 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".

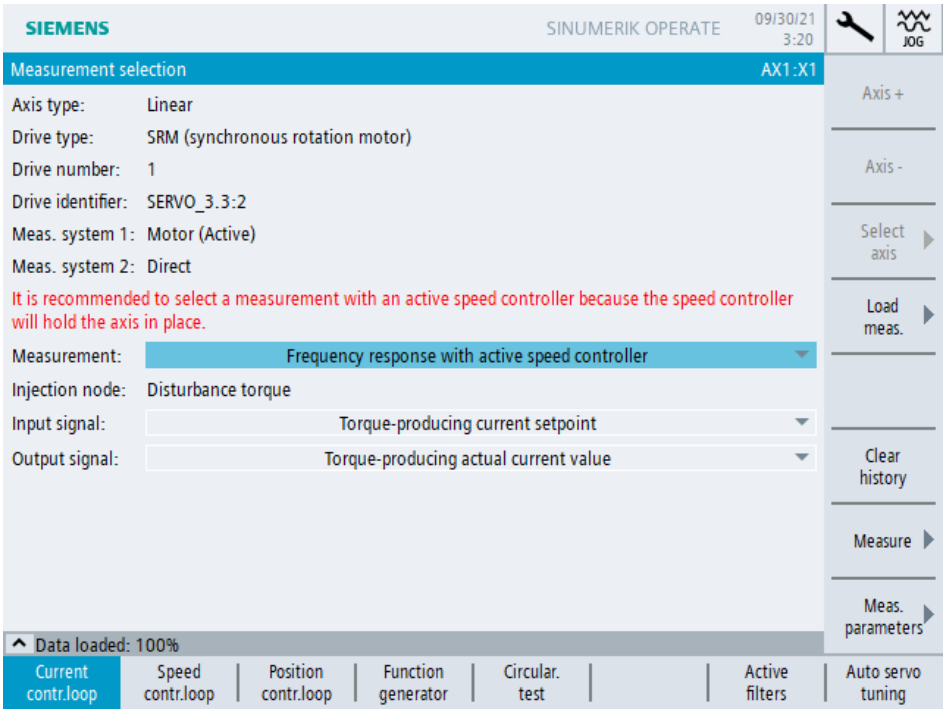


Figure 4-21 Selecting the measurement function

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

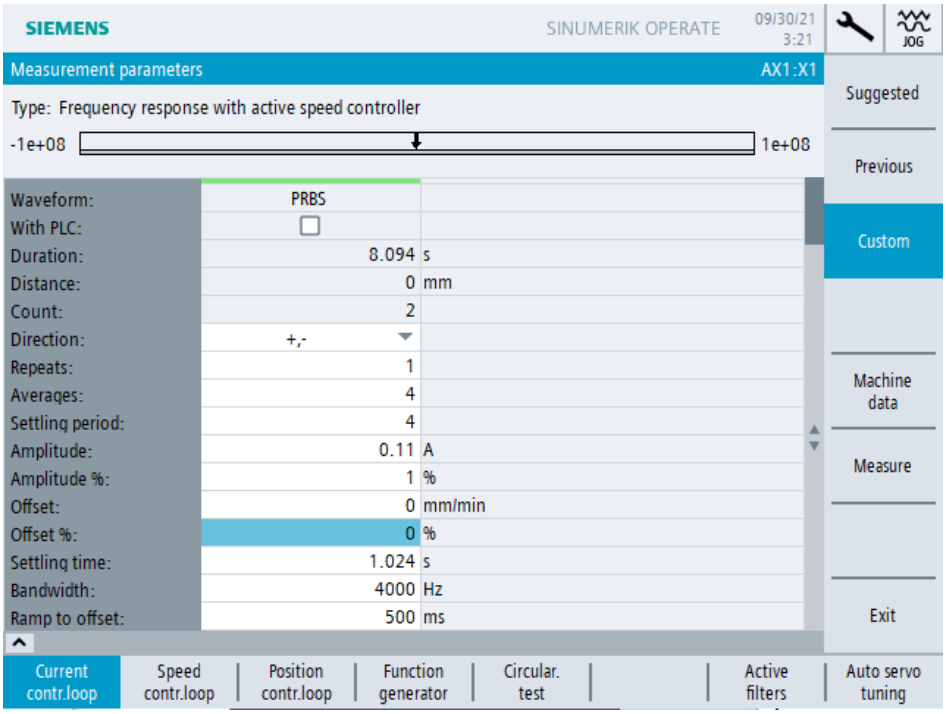


Figure 4-22 Measurement parameters

– 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:

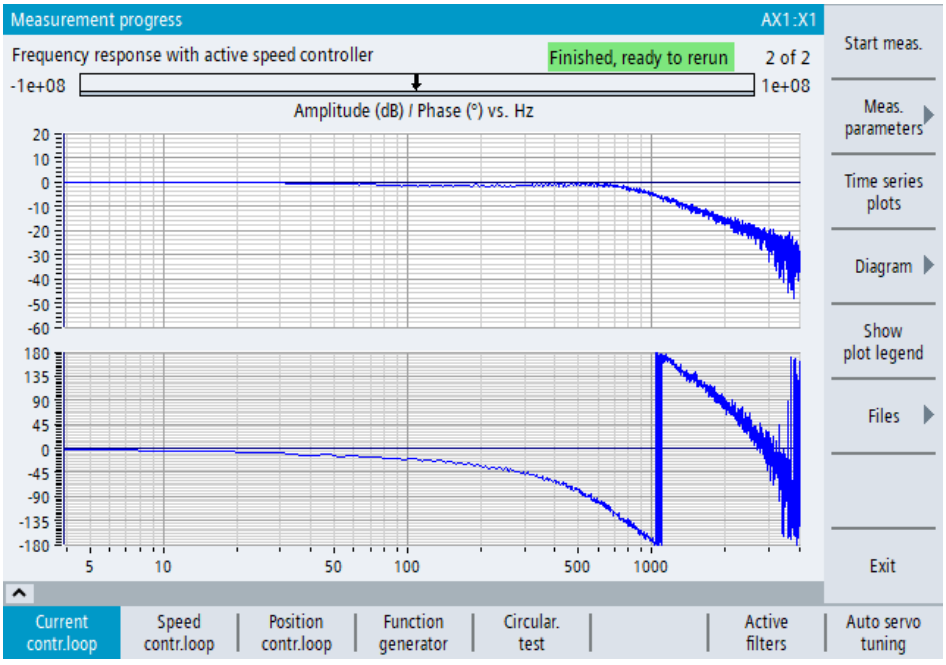


Figure 4-23 Frequency response p1715, ok

– 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.

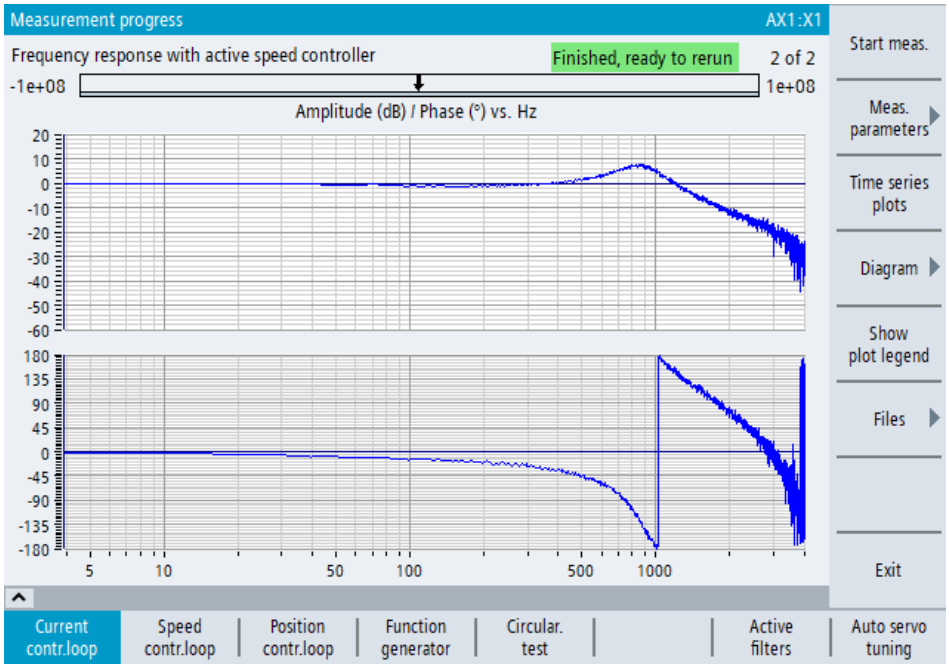


Figure 4-24 Frequency response p1715, too high

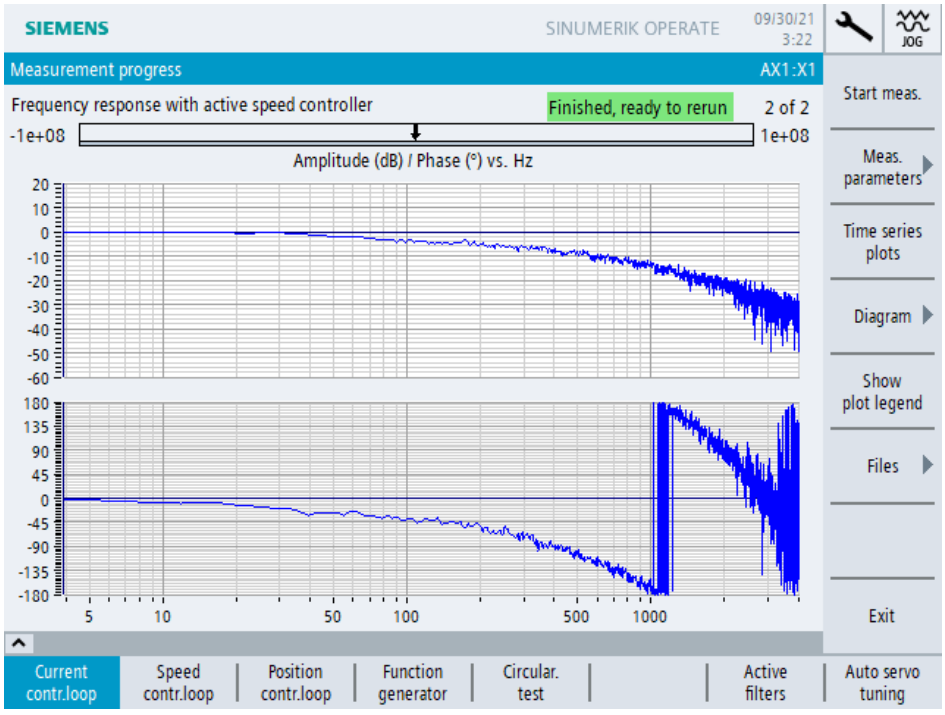


Figure 4-25 Frequency response p1715, too low

6. Check whether the direction of axis rotation ($MA_AX_MOTION_DIR) meets the "Technical Specification" of the manufacturer of the robot type in question. If necessary, adjust it.

   Note

   $MC_ROBX_AXES_DIR must not be changed!

7. Set the adjustment/calibration values for all of the robot axes. The calibration position of each robot axis is also part of the "Technical Specification" of each robot type. Move the RA1-RA6 robot axes to the calibration position and check this visually or use the calibration tool offered by the manufacturer for your robot type. To ensure that the actual values to be set in the adjustment position are correct, the machine data $MA_REFP_SET_POS for each robot axis is preset by the CMC script depending on the robot type.
   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 operating area 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.
8. If required, activate further Safety functions provided by SINUMERIK ONE Safety Integrated. Carry out the commissioning of SIMATIC Safe Kinematics as needed.
9. Select a suitable controller data set (DDS) for your application via the PLC interface and, if necessary, optimize the vibration behavior of the robot (see Section Controller data (Page 64)).

References

- Commissioning Manual SINUMERIK ONE Safety Integrated
- Technical specification of the robot manufacturer

4.8.2 Manual steps after installation for Siemens motors

After installation, you must manually perform the following steps:

1. Load the system-specific PLC blocks.
2. Start up the infeed SLM.
3. Confirm the encoder serial number (p440=1) for all of the robot axes.

4. Activate at least the following Safety functions provided by SINUMERIK ONE Safety Integrated:
   - SS1/STO (emergency stop)
   - Axial SLS

   Note

   If you activated the option "Accept recommended values for SINUMERIK Safety Integrated and Safe Kinematics" in the robot configurator, these values will be written by the CMC script. See Section "Recommended values for SINUMERIK ONE Safety Integrated (Page 53)".

5. Set the adjustment/calibration values for all of the robot axes. The calibration position of each robot axis is also part of the technical specification of each robot type. Move the RA1-RA6 robot axes to the calibration position and check this visually or use the calibration tool offered by the manufacturer for your robot type. 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.
   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 operating area 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.

6. If required, activate further Safety functions provided by SINUMERIK ONE Safety Integrated. Carry out the commissioning of SIMATIC Safe Kinematics as needed.

7. Select a suitable controller data set (DDS) for your application via the PLC interface and, if necessary, optimize the vibration behavior of the robot (see Section Controller data (Page 64)).

References

- Commissioning Manual SINUMERIK ONE Safety Integrated

4.9 Controller data

4.9.1 Controller data - default setting

During commissioning of a robot, the controller data (speed and position controller, feedforward control and interpolation) are set in addition to all relevant axis and motor data. The controller parameters used are robot and axis-specific and selected in such a way that the following constraints must be observed:

- The control loops are stable in the entire working area of the robot.
- The control loops are stable for any payloads and additional loads within the scope of the technical specification of the respective robot type.

However, the "character" of the axis can be influenced via the parameterization of the controller. If a rather "stiff" parameterization of the controller is applied, faults on the axis (e.g. process forces) are optimally suppressed. A rather "soft" parameterization will provide more damping and a reduction of the tendency to oscillate.

Which controller behavior is best suited depends on the application and technology. To enable you to find the controller setting best suited to your technology during commissioning, three controller data sets with different properties are generally stored for each axis:

- Axis parameter set 0/3 / drive DDS 0/3:
  Balanced setting, between stiff and damping.
- Axis parameter set 1 / drive DDS 1:
  Damping-optimized parameterization of the control loops. This data set is optimized for high damping of natural frequencies and is best suited for applications with high speed and low process forces (e.g. handling).
- Axis parameter set 2 / drive DDS 2:
  Fault-optimized parameterization of the control loops. This data set is optimized for a high stiffness of the control loops and is well suited for technologies with high process forces (e.g. milling).

4.9.2 Selection of the data set

You select the suitable controller data set during commissioning (see chapter Manual steps after installation). In general, you must observe the following:

- With Sinumerik, the axis parameter sets and drive data sets can in principle be parameterized separately. However, the parameter sets preassigned within the scope of Run MyRobot / Direct Control stipulate that the axis parameter sets and drive data sets for all 6 robot axes belong together. Cross-combinations are not intended and have not been tested.
- Use the same parameter set for all axes. This is the only way to guarantee that the robot axes interpolate correctly with each other.

If you observe these rules, you can select a fixed parameter set or change it during operation (e.g. switching between milling and fast handling motion).

During commissioning, a fourth data set is additionally created (Index 3/DDS3), into which the parameter assignment from data set 0 is initially transferred. The fourth data set has no

functional relevance, it serves exclusively as a user-defined data set, if for example an optimization is carried out by the "Auto-Servo-Tuning" function.

References

Function Manual SINUMERIK ONE Basic Functions, section Switching over motor/drive data sets

4.9.3 Parameterization of the jerk limit and the jerk filter

Independent of the controller data sets in the drive, there is a further optimization option for the robot axis using the following parameters:

- 32431 MAX_AX_JERK: Axial jerk limit. Maximum jerk value for building up acceleration. An increase of the jerk limit improves the productivity of the plant. At the same time, however, the natural frequencies are excited more strongly.
- 32410 MA_AX_JERK_TIME: Time constant for smoothing the position setpoint. Increasing the time constant amplifies the smoothing of the setpoint curve and reduces the excitation of the natural frequencies, with the same jerk limit. However, this is accompanied by a deterioration in contour accuracy.

The influence of the individual parameters is shown in the following diagram.

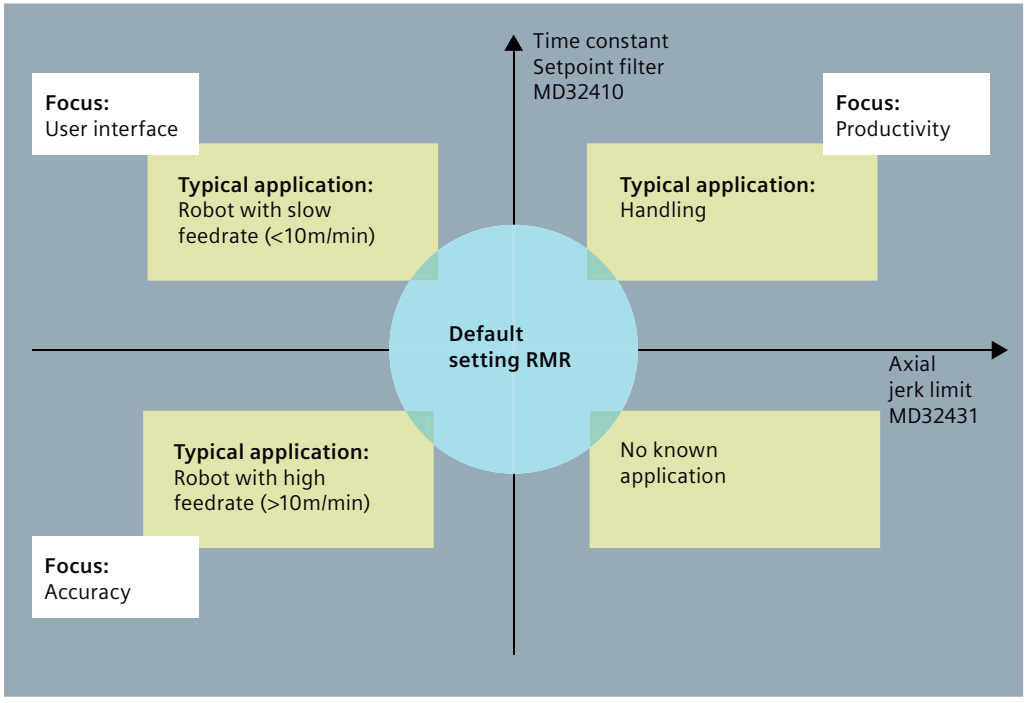


Figure 4-26 Graphic jerk filter

Depending on the application, you can change both parameters without hesitation by a factor of up to 3.

Since the filter time constant MD32410 is relevant for interpolation, it is important to enter the same value in all interpolating axes.

Example 1

The default setting for both parameters in axis 1 is as follows:
MA_MAX_AX_JERK = 1 rev./s^3
MA_AX_JERK_TIME = 0.1s
For handling movements, the parameters can be changed as follows, for example:
MA_MAX_AX_JERK = 3 U/s^3
MA_AX_JERK_TIME = 0.25s
The higher jerk limit results in increased productivity. The increased excitation of the natural frequencies is compensated with a stronger filter. The contour deviation is not the main focus of handling tasks.

Example 2

The default setting for both parameters in axis 1 is as follows:
MA_MAX_AX_JERK = 1 rev./s^3
MA_AX_JERK_TIME = 0.1s

Very high feed rates are applied for tape layering. Nevertheless, great importance is attached to contour accuracy. A possible parameter assignment would be in this case:

MA_MAX_AX_JERK = 0.5 rev./s^3

MA_AX_JERK_TIME = 0.05s

4.9.4 Auto Servo Tuning (AST) for the robot axes

With Auto Servo Tuning (AST) in SINUMERIK Operate, 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 67)).

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.

For automatic controller optimization by AST, the pole and zero points of the axis are identified. For this, there is a lower limit below which the points are not searched for. This lower limit is 15 Hz by default and should be reduced to 3 Hz for robot axes. The new lower limit is specified in the form for parameterizing the strategy for optimization of the speed controller.

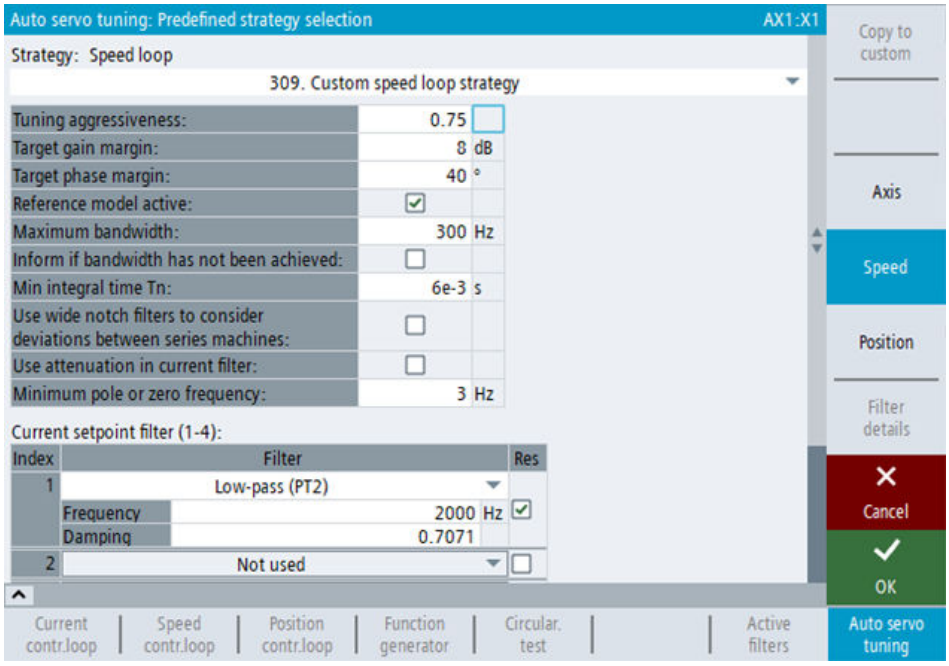


Figure 4-27 Automat. servo tuning - Speed

4.9.5 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, tilting rotary 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. Perform the basic optimization of the special axis with AST.
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

Data protection concept

5

5.1 Warranty claim

For the robot manufacturer's warranty to be valid, you must operate the machine only within specified parameters (e.g. maximum speed or maximum torque of the gearbox, etc.). The warranty period depends on the robot manufacturer.

The data protection concept therefore prescribes that you cannot change some of the NC machine data and drive 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 4 DDS are supported (index 0 - 3).

5.2 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.

5.3 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 calls the suitable ROPE_XXX.cpf cycle for the respective type of robot.
- The file ROPE_XXX.cpf (e.g. ROPE_106001.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 71). Changing this machine data is prohibited or may lead to NC start-inhibiting alarms (see Alarm, fault and system events (Page 105)).

Assignment of the type of robot to the channel, taking NJ60_2_2 as an example

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

Robot ID: Comau_NJ60_2_2

This identifier is entered into the MD 17410 $MN_RMR_ID_INFO[0-9] depending on the channel to be installed. For example, if robot type NJ60 2.2 is installed in the first channel (Index 0), $MN_RMR_ID_INFO[0]="Comau_NJ60_2_2" will be 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

6

6.1 Overview

The following machine data is set by the CMC script (see Section NC machine data (Page 71)) or by the drive macro (see Section Drive machine data (Page 93)).

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 55)

6.2 NC machine data

6.2.1 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

Machine data	Value	DS	RD	Comment
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			
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'
N17410 $MN_RMR_ID_INFO[0]		X		
N17410 $MN_RMR_ID_INFO[1]		X		
N17410 $MN_RMR_ID_INFO[2]		X		
N17410 $MN_RMR_ID_INFO[3]		X		
N17410 $MN_RMR_ID_INFO[4]		X		
N17410 $MN_RMR_ID_INFO[5]		X		

Machine data	Value	DS	RD	Comment
N17410 $MN_RMR_ID_INFO[6]		X		
N17410 $MN_RMR_ID_INFO[7]		X		
N17410 $MN_RMR_ID_INFO[8]		X		
N17410 $MN_RMR_ID_INFO[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'			
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			

Machine data	Value	DS	RD	Comment
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]				
N60959 $MN_CC_ACTIVE_IN_CHAN_ROBX[1]				
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]				

6.2.2 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		

Machine data	Value	DS	RD	Comment
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"			
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			

Machine data	Value	DS	RD	Comment
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			
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

Machine data	Value	DS	RD	Comment
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
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

Machine data	Value	DS	RD	Comment
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
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

Machine data	Value	DS	RD	Comment
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
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

Machine data	Value	DS	RD	Comment
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
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

Machine data	Value	DS	RD	Comment
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'			
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			

Machine data	Value	DS	RD	Comment
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			
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			

Machine data	Value	DS	RD	Comment
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			
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			

Machine data	Value	DS	RD	Comment
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
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			

Machine data	Value	DS	RD	Comment
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			
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				

Machine data	Value	DS	RD	Comment
N62901 $MC_ROBX_AXES_TYPE[0]				
N62901 $MC_ROBX_AXES_TYPE[1]				
N62901 $MC_ROBX_AXES_TYPE[2]				
N62901 $MC_ROBX_AXES_TYPE[3]				
N62901 $MC_ROBX_AXES_TYPE[4]				
N62901 $MC_ROBX_AXES_TYPE[5]				
N62902 $MC_ROBX_SPECIAL_KIN				
N62903 $MC_ROBX_MAIN_AXES				
N62904 $MC_ROBX_WRIST_AXES				
N62905 $MC_ROBX_NUM_AXES				
N62906 $MC_ROBX_A4PAR				
N62907 $MC_ROBX_MAIN_LENGTH_AB[0]				
N62907 $MC_ROBX_MAIN_LENGTH_AB[1]				
N62908 $MC_ROBX_TX3P3_POS[0]				
N62908 $MC_ROBX_TX3P3_POS[1]				
N62908 $MC_ROBX_TX3P3_POS[2]				
N62909 $MC_ROBX_TX3P3_RPY[0]				
N62909 $MC_ROBX_TX3P3_RPY[1]				
N62909 $MC_ROBX_TX3P3_RPY[2]				
N62910 $MC_ROBX_TFLWP_POS[0]				
N62910 $MC_ROBX_TFLWP_POS[1]				

Machine data	Value	DS	RD	Comment
N62910 $MC_ROBX_TFLWP_POS[2]				
N62911 $MC_ROBX_TFLWP_RPY[0]				
N62911 $MC_ROBX_TFLWP_RPY[1]				
N62911 $MC_ROBX_TFLWP_RPY[2]				
N62912 $MC_ROBX_TIRORO_POS[0]				
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]				

Machine data	Value	DS	RD	Comment
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]				
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]				Optional
N62651 $MC_CC_AXCO_DENOMINATOR[4]				Optional
N62652 $MC_CC_AXCO_NUMERATOR[3]				Optional
N62652 $MC_CC_AXCO_NUMERATOR[4]				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]				Optional
N62661 $MC_CC_AXCO_NUMERATOR_2[3]				Optional
N62662 $MC_CC_AXCO_ACTIVE_2[3]				Optional

6.2.3 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
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

Machine data	Value	DS	RD	Comment
N42676 $SC_ORI_SMOOTH_TOL				According to adjustment specification Advanced Surface
N42678 $SC_ORISON_TOL				According to adjustment specification Advanced Surface

6.2.4 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]		X		
N31050 $MA_DRIVE_AX_RATIO_DENOM[1]		X		
N31050 $MA_DRIVE_AX_RATIO_DENOM[2]		X		
N31050 $MA_DRIVE_AX_RATIO_DENOM[3]		X		
N31050 $MA_DRIVE_AX_RATIO_DENOM[4]		X		
N31050 $MA_DRIVE_AX_RATIO_DENOM[5]		X		
N31060 $MA_DRIVE_AX_RATIO_NUMERA[0]		X		
N31060 $MA_DRIVE_AX_RATIO_NUMERA[1]		X		
N31060 $MA_DRIVE_AX_RATIO_NUMERA[2]		X		
N31060 $MA_DRIVE_AX_RATIO_NUMERA[3]		X		
N32200 $MA_POSCTRL_GAIN			X	
N32000 $MA_MAX_AX_VELO				
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]				
N32300 $MA_MAX_AX_ACCEL[1]				
N32300 $MA_MAX_AX_ACCEL[2]				
N32300 $MA_MAX_AX_ACCEL[3]				

Machine data	Value	DS	RD	Comment
N32300 $MA_MAX_AX_ACCEL[4]				
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
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	

Machine data	Value	DS	RD	Comment
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			
N36010 $MA_STOP_LIMIT_FINE	0.005			
N36100 $MA_POS_LIMIT_MINUS		X		
N36110 $MA_POS_LIMIT_PLUS		X		
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	=			
N36620 $MA_SERVO_DISABLE_DELAY_TIME	=			

6.2.5 SINUMERIK ONE Safety parameters

Machine data	Value	DS	RD	Comment
N37950 $MA_SAFE_INFO_ENABLE[x]				Recommended values for safety functions integrated in the drive
N37954 $MA_SAFE_INFO_MODULE_NR[x]				Recommended values for safety functions integrated in the drive

6.3 Drive machine data

6.3.1 Control Unit parameters

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

6.3.2 Drive parameters

Machine data	Value	DP	CD	Comment
p180 Number of drive data sets	4	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	DP	CD	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 I^2T				Third-party motor commissioning
p5391[0] Fault threshold I^2T				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)				Third-party motor commissioning

Machine data	Value	DP	CD	Comment
p1520[1] Upper torque limit (gearbox)				Third-party motor commissioning
p1521[0] Lower torque limit (gearbox)				Third-party motor commissioning
p1521[1] Lower torque limit (gearbox)				Third-party motor commissioning
r1526 active upper torque limit		X		
r1527 active lower torque limit		X		
p1551 BI: Variable torque limit	r899.5			Third-party motor commissioning
p1522 CI: Torque limit, upper/motoring / M_max upper/mot	2900.0			Third-party motor commissioning
p1523 CI: Torque limit, upper/motoring / M_max upper/mot	2900.1			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	

Machine data	Value	DP	CD	Comment
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	
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	

Machine data	Value	DP	CD	Comment
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	
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	

Machine data	Value	DP	CD	Comment
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	

6.3.3 SINUMERIK ONE Safety parameters

Machine data	Value	DS	RD	Comment
p9500 SI Motion monitoring cycle	2			Recommended values for safety functions integrated in the drive
p9501 SI Motion enable safety functions	'HA000005'			Recommended values for safety functions integrated in the drive
p9502 SI Motion axis type				Recommended values for safety functions integrated in the drive
p9505 SI Motion SP modulo value	0			Recommended values for safety functions integrated in the drive
p9507 SI Motion function configuration	'H2'			Recommended values for safety functions integrated in the drive
p9509 SI Motion response during pulse inhibit	'HFF'			Recommended values for safety functions integrated in the drive
p9511 SI Motion actual value sensing cycle	2			Recommended values for safety functions integrated in the drive
p9512 SI Motion select safety functions without selection	'H10'			Recommended values for safety functions integrated in the drive
p9520 SI Motion leadscrew pitch				Recommended values for safety functions integrated in the drive
p9521[0] SI Motion gearbox encoder/load denominator				Recommended values for safety functions integrated in the drive
p9521[1] SI Motion gearbox encoder/load denominator				Recommended values for safety functions integrated in the drive
p9521[2] SI Motion gearbox encoder/load denominator				Recommended values for safety functions integrated in the drive
p9521[3] SI Motion gearbox encoder/load denominator				Recommended values for safety functions integrated in the drive

Machine data	Value	DS	RD	Comment
p9522[0] SI Motion gearbox encoder/load numerator				Recommended values for safety functions integrated in the drive
p9522[1] SI Motion gearbox encoder/load numerator				Recommended values for safety functions integrated in the drive
p9522[2] SI Motion gearbox encoder/load numerator				Recommended values for safety functions integrated in the drive
p9522[3] SI Motion gearbox encoder/load numerator				Recommended values for safety functions integrated in the drive
p9526 SI Motion encoder assignment second channel	1			Recommended values for safety functions integrated in the drive
p9530 SI Motion standstill tolerance	1			Recommended values for safety functions integrated in the drive
p9531[0] SI Motion SLS (SG) limit values				Recommended values for safety functions integrated in the drive
p9531[1] SI Motion SLS (SG) limit values				Recommended values for safety functions integrated in the drive
p9531[2] SI Motion SLS (SG) limit values				Recommended values for safety functions integrated in the drive
p9531[3] SI Motion SLS (SG) limit values				Recommended values for safety functions integrated in the drive
p9533 SI Motion SLS setpoint velocity limiting	100			Recommended values for safety functions integrated in the drive
p9534[0] SI Motion SLP (SE) upper limit values				Recommended values for safety functions integrated in the drive
p9534[1] SI Motion SLP (SE) upper limit values				Recommended values for safety functions integrated in the drive
p9535[0] SI Motion SLP (SE) lower limit values				Recommended values for safety functions integrated in the drive
p9535[1] SI Motion SLP (SE) lower limit values				Recommended values for safety functions integrated in the drive
p9542 SI Motion actual value comparison tolerance (cross-wise)	0.1			Recommended values for safety functions integrated in the drive

Machine data	Value	DS	RD	Comment
p9543 SI Motion gearbox switching position tolerance factor	1			Recommended values for safety functions integrated in the drive
p9544 SI Motion actual value comparison tolerance (referencing)	0.1			Recommended values for safety functions integrated in the drive
p9548 SI Motion SAM actual velocity tolerance				Recommended values for safety functions integrated in the drive
p9549 SI Motion slip velocity tolerance	6			Recommended values for safety functions integrated in the drive
p9550 SI Motion SGE switchover tolerance time	500			Recommended values for safety functions integrated in the drive
p9551 SI Motion SLS(SG) switchover/SOS(SBH) delay time				Recommended values for safety functions integrated in the drive
p9552 SI Motion transition time STOP C to SOS (SBH)				Recommended values for safety functions integrated in the drive
p9553 SI Motion transition time STOP D to SOS (SBH)				Recommended values for safety functions integrated in the drive
p9554 SI Motion transition time STOP E to SOS (SBH)				Recommended values for safety functions integrated in the drive
p9555 SI Motion transition time STOP F to STOP B				Recommended values for safety functions integrated in the drive
p9556 SI Motion STOP A delay time				Recommended values for safety functions integrated in the drive
p9557 SI Motion STO test time	1000			Recommended values for safety functions integrated in the drive
p9558 SI Motion acceptance test mode time limit	40000			Recommended values for safety functions integrated in the drive
p9559 SI Motion forced checking procedure timer	24			Recommended values for safety functions integrated in the drive
p9560 SI Motion STO shutdown velocity	0			Recommended values for safety functions integrated in the drive
p9561 SI Motion SLS (SG) stop response	5			Recommended values for safety functions integrated in the drive

Machine data	Value	DS	RD	Comment
p9562[0] SI Motion SLP (SE) stop response	2			Recommended values for safety functions integrated in the drive
p9562[1] SI Motion SLP (SE) stop response	2			Recommended values for safety functions integrated in the drive
p9563[0] SI Motion SLS(SG)-specific stop response	2			Recommended values for safety functions integrated in the drive
p9563[1] SI Motion SLS(SG)-specific stop response	2			Recommended values for safety functions integrated in the drive
p9563[2] SI Motion SLS(SG)-specific stop response	2			Recommended values for safety functions integrated in the drive
p9563[3] SI Motion SLS(SG)-specific stop response	2			Recommended values for safety functions integrated in the drive
p9568 SI Motion SAM/SBR velocity limit	0.01			Recommended values for safety functions integrated in the drive
p9569 transition time to SOS after standstill	100			Recommended values for safety functions integrated in the drive
p9574 SI Motion safe position scaling	1000			Recommended values for safety functions integrated in the drive
P9601 SI enable of drive-integrated functions	'HC'			Recommended values for safety functions integrated in the drive
p9602 SI enable safe brake control				Recommended values for safety functions integrated in the drive
p9610 SI PROFIsafe address				Recommended values for safety functions integrated in the drive
p9611 SI PROFIsafe telegram selection	902			Recommended values for safety functions integrated in the drive
p9612 SI PROFIsafe failure response	1			Recommended values for safety functions integrated in the drive
p9659 SI forced checking procedure timer	24			Recommended values for safety functions integrated in the drive
p10201 SI Motion SBT enable				Recommended values for safety functions integrated in the drive

Machine data	Value	DS	RD	Comment
p10202[0] SI Motion SBT brake selection	1			Recommended values for safety functions integrated in the drive
p10202[1] SI Motion SBT brake selection	0			Recommended values for safety functions integrated in the drive
p10203 SI Motion SBT control selection	0			Recommended values for safety functions integrated in the drive
p10204 SI Motion SBT motor type				Recommended values for safety functions integrated in the drive
p10208[0] SI Motion SBT test torque ramp time	1000			Recommended values for safety functions integrated in the drive
p10208[1] SI Motion SBT test torque ramp time	1000			Recommended values for safety functions integrated in the drive
p10209[0] SI Motion SBT brake holding torque				Recommended values for safety functions integrated in the drive
p10209[1] SI Motion SBT brake holding torque	10			Recommended values for safety functions integrated in the drive
p10210[0] SI Motion SBT test torque factor sequence 1	0.5			Recommended values for safety functions integrated in the drive
p10210[1] SI Motion SBT test torque factor sequence 1	1			Recommended values for safety functions integrated in the drive
p10211[0] SI Motion SBT test duration sequence 1	1000			Recommended values for safety functions integrated in the drive
p10211[1] SI Motion SBT test duration sequence 1	1000			Recommended values for safety functions integrated in the drive
p10212[0] SI Motion SBT position tolerance sequence 1	1			Recommended values for safety functions integrated in the drive
p10212[1] SI Motion SBT position tolerance sequence 1	1			Recommended values for safety functions integrated in the drive
p10218 SI Motion SBT test torque sign	0			Recommended values for safety functions integrated in the drive
p10220[0] SI Motion SBT test torque factor sequence 2	1			Recommended values for safety functions integrated in the drive

Machine data	Value	DS	RD	Comment
p10220[1] SI Motion SBT test torque factor sequence 2	1			Recommended values for safety functions integrated in the drive
p10221[0] SI Motion SBT test duration sequence 2	1000			Recommended values for safety functions integrated in the drive
p10221[1] SI Motion SBT test duration sequence 2	1000			Recommended values for safety functions integrated in the drive
p10222[0] SI Motion SBT position tolerance sequence 2	1			Recommended values for safety functions integrated in the drive
p10222[1] SI Motion SBT position tolerance sequence 2	1			Recommended values for safety functions integrated in the drive
p60022 PROFIsafe telegram selection	902			Recommended values for safety functions integrated in the drive
p60122 IF1 PROFIdrive SIC/SCC telegram selection	701			Recommended values for safety functions integrated in the drive

Alarm, fault and system events

7

7.1 CC ROPE

The ROPE compile cycle generates the following alarms.

75040 channel 1%, CCROPE, error ID 1: %3, error ID 2: %4	
Reason:	• Error ID 1: -2, error ID 2: -2: – An internal error occurred while executing CCROPE. • Error ID 1: -3, error ID 2: -3 – An internal error occurred while executing CCROPE. • Error ID 1: -4, error ID 2: -4: – The run-up ASUB ROPE_MAIN/ROPE_xxx.spf did not run successfully. An unexpected error occurred during the processing of the part program ROPE_MAIN or ROPE_xxx. – The ASUB was aborted with NCRESET. – Following the run-up of the controller, there is an alarm with alarm response "No mode group ready", and the ASUB (ROPE_MAIN) was therefore interrupted. – Drive not correctly run up. • Error ID 1: > 0, Error ID 2: >= 0 – Error ID 1 refers to the drive parameter (e.g. "error ID: 1520" corresponds to p1520) – Error ID 2 addresses the index of the MD $MN_AXCONF_LOGIC_MACHAX_TAB[n], index n = 1 addresses axis 2, in which the drive parameter was changed from error ID 1. – Example: A drive parameter to be monitored (e.g. p1520) cannot be read in axis 2 or was inadmissibly altered. – The drive (that is to say the drive DO behind NC axis 2) is not responding to the request from CC ROPE. – You have inadmissibly increased the value of a drive parameter that is to be monitored. • Error ID 1: 1, error ID 2: 1 – Number of channels > 3: The maximum number of robots to be installed on an NCU is 3. • Error ID 1: 2, error ID 2: 1 – The machine data $MN_AXCONF_MACHAX_NAME_TAB must not be changed. • Error ID 1: 3, error ID 2: 1 – The ROPE_xxx.cpf file belonging to the type of robot installed is not present in the "Manufacturer cycles" folder. • Error ID 1: 4, error ID 2: 1 – The ROPE_xxx.cpf cycle was called in the progevent CYCPE_MA.spf or PROGEVENT.spf instead of ROPE_MAIN.cpf. • Error ID 1: 5, error ID 2: 1 – The identifier of the type of robot concerned in MD $MN_USER_DATA_INT[0-9] does not match the ROPE_xxx file. • Error ID 1: 6, error ID 2: 1 – At least 1 drive sends no response to CC ROPE. • Error ID 1: 7, error ID 2: 1

75040 channel 1%, CCROPE, error ID 1: %3, error ID 2: %4	
	– At least 1 robot DO has not been started up • Error ID 1: 8, error ID 2: 1 – The DO xx to be monitored by CC ROPE is deactivated and/or not present.
Response:	PowerOn alarm

75040 channel 1%, CCROPE, error ID 1: %3, error ID 2: %4	
Remedy:	• Error ID 1: -2, error ID 2: -2: – Perform a Power On. – Contact the Siemens service team. • Error ID 1: -3, error ID 2: -3: – Perform a Power On. – Contact the Siemens service team. • Error ID 1: -4, error ID 2: -4: – 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 processing of the ASUB 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). • Error ID 1: > 0, Error ID 2: >= 0 – Ensure that the drives have all correctly started up and are in cyclic mode. – Resetting the drive parameter (e.g. p1520) to the initial value. • Error ID 1: 1, error ID 2: 1 – Re-installation with the robot configurator. • Error ID 1: 2, error ID 2: 1 – Set the MD to the original value after the installation using the robot configurator (RA1_1, RA2_1, etc.). • Error ID 1: 3, error ID 2: 1 – Perform a re-installation using the robot configurator or copy the file ROPE_xxx.cpf to the "OEM cycles" folder. • Error ID 1: 4, error ID 2: 1 – In the prog event CYCPE_MA.spf or PROGEVENT.spf, only call the cycle ROPE_MAIN.cpf. • Error ID 1: 5, error ID 2: 1 – 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 "OEM cycles" folder. • Error ID 1: 6, error ID 2: 1 – Check to see whether all of the drives are in cyclic mode. Check whether the DO No., DO variables and axis-drive assignment were set as in the section "Creating a user-specified topology in Create MyConfig Topo" (page 31). • Error ID 1: 7, error ID 2: 1 – Check the topology (see section "Creating a user-specified topology in Create MyConfig Topo" (page 31)) or perform drive commissioning (see section "Manual steps following installation" (page 42)). • Error ID 1: 8, error ID 2: 1 – Activate the corresponding robot axis DO (p105=). All robot axis DOs must be active DOs.

75041 channel 1% CCROPE error ID: %3	
Reason:	An internal error occurred while executing CCROPE.
Response:	ResetClear alarm
Remedy:	• Perform a Power On. • Contact the Siemens service team.

75042 ROPE is preventing enabling of the axis	
Reason:	ROPE is preventing enabling of the axis as there was no configuration following run-up. Case 1: The alarm is displayed during processing of the ASUB ROPE_MAIN (self-clearing after the end of the ASUB). Case 2: The user tried to start a part program before ROPE_MAIN configured the ROPE compile cycle.
Response:	SelfClear alarm + no enabling of axis
Remedy:	• Ensure that the ASUB ROPE_MAIN.cpf is started in the 1st channel. • Ensure that the drives are not in emergency off mode. • Ensure that processing of the ASUB is not interrupted.

See also

Manual steps after installation (Page 56)

7.2 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 CCROPE compile cycle (see section Data protection concept (Page 69) for constraints).

75332 ROBX_AR: Compile cycle CCROPE is not active in the channel	
Reason:	The CCROPE compile cycle 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

8

8.1 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.

8.2 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.

8.3 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:

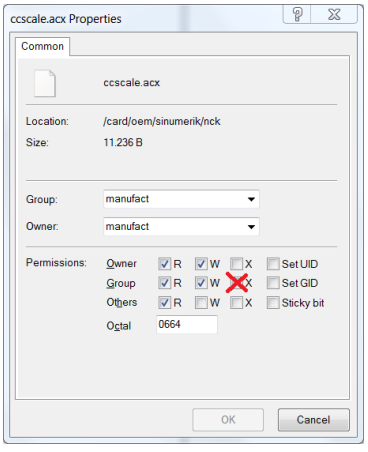


Figure 8-1 Setting the rights via WinSCP

3. Read in the series commissioning archive.

Note

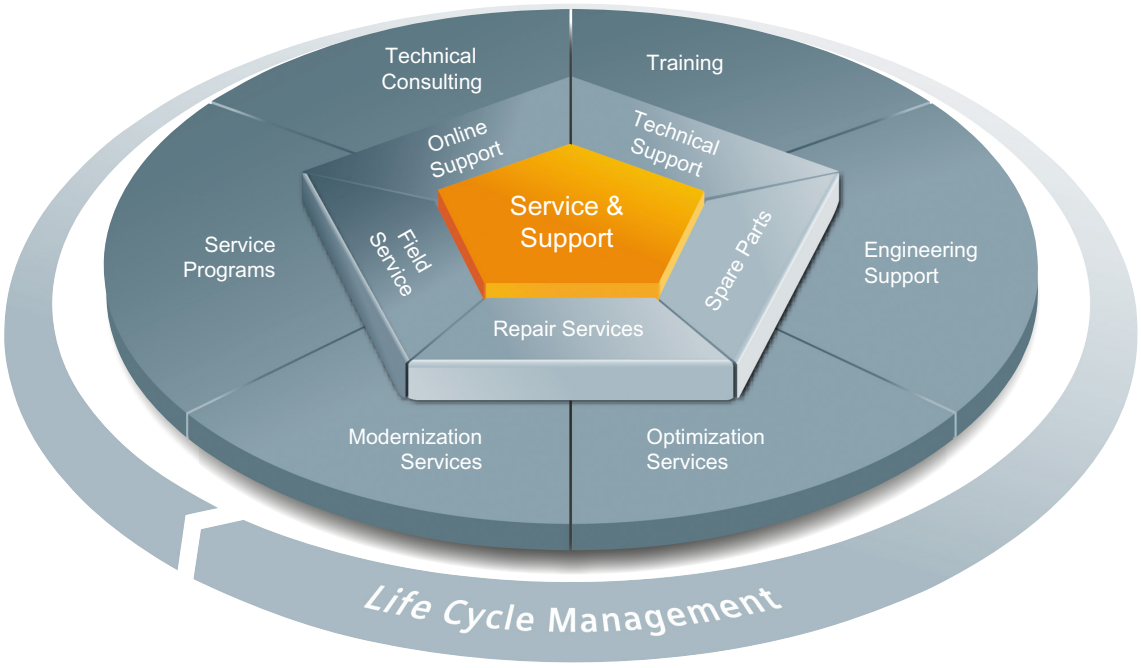
If you do not execute the first step, this leads to an error when reading in the archive.

8.4 Digital twin - NX model machines

If you use model robots from the Siemens PLM download portal, please note the following:

From the base point MD62912 $MC_ROBX_TIRORO_POS to the flange coordinate system MD62910 $MC_ROBX_TFLWP_POS, the ROBX transformation machine data on the controller should not deviate from the supplied standard installed by the CMC package. This prevents extensive, time-consuming adaptations to the NX model machine / digital twin.

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.

Index