SIEMENS

SINUMERIK
SINUMERIK 808D ADVANCED
Commissioning Manual

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.

Preface

Applicable products

This manual is applicable to the following control systems:

Control system	Software version
SINUMERIK 808D ADVANCED T (Turning)	V4.6.2
SINUMERIK 808D ADVANCED M (Milling)	V4.6.2

Documentation components and target groups

Document	Recommended target group
Programming and Operating Manual (Turning)	Programmers and operators of turning machines
Programming and Operating Manual (Milling)	Programmers and operators of milling machines
Programming and Operating Manual (ISO Turning/Milling)	Programmers and operators of turning/milling machines
Programming and Operating Manual (Manual Machine Plus (MM+), Turning)	Programmers and operators of turning machines
Diagnostics Manual	Mechanical and electrical designers, commissioning engineers, machine operators, and service and maintenance personnel
Manufacturer/service documentation	
Commissioning Manual	Installation personnel, commissioning engineers, and service and maintenance personnel
Function Manual	Mechanical and electrical designers, technical professionals
Parameter Manual	Mechanical and electrical designers, technical professionals
Service Manual	Mechanical and electrical designers, technical professionals, commissioning engineers, and service and maintenance personnel

My Documentation Manager (MDM)

Under the following link you will find information to individually compile your documentation based on the Siemens content:

www.siemens.com/mdm

Standard scope

This manual only describes the functionality of the standard version. Extensions or changes made by the machine tool manufacturer are documented by the machine tool manufacturer.

Technical support

Country	Hotline [1]	Further service contact information:
Germany	+49 911 895 7222	• Global Web site: https://support.industry.siemens.com/sc/us/en/sc/list-of-countries/oid2044
China	+86 400 810 4288	• Chinese Web site: http://www.siemens.com.cn/808D

[1] You can find more hotline information at the global Web site given above.

EC Declaration of Conformity

The EC Declaration of Conformity for the EMC Directive can be found on the Internet at http://www.siemens.com/automation/service&support.

Here, enter the number **67385845** as the search term or contact your local Siemens office.

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1 Safety instructions

1.1 Fundamental safety instructions

1.1.1 General safety instructions

⚠ DANGER
Danger to life due to live parts and other energy sources
Death or serious injury can result when live parts are touched.
• Only work on electrical devices when you are qualified for this job.
• Always observe the country-specific safety rules.
Generally, six steps apply when establishing safety:
1. Prepare for shutdown and notify all those who will be affected by the procedure.
2. Disconnect the machine from the supply.
– Switch off the machine.
– Wait until the discharge time specified on the warning labels has elapsed.
– Check that it really is in a no-voltage condition, from phase conductor to phase conductor and phase conductor to protective conductor.
– Check whether the existing auxiliary supply circuits are de-energized.
– Ensure that the motors cannot move.
3. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems, or water.
4. Isolate or neutralize all hazardous energy sources by closing switches, grounding or short-circuiting or closing valves, for example.
5. Secure the energy sources against switching on again.
6. Ensure that the correct machine is completely interlocked.
After you have completed the work, restore the operational readiness in the inverse sequence.

⚠ WARNING
Danger to life through a hazardous voltage when connecting an unsuitable power supply
Touching live components can result in death or severe injury.
• 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
Danger to life when live parts are touched on damaged motors/devices
Improper handling of motors/devices can damage them.
For damaged motors/devices, hazardous voltages can be present at the enclosure or at exposed components.
• Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
• Do not use any damaged motors/devices.

⚠ WARNING
Danger to life through 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
> **Danger to life due to electric shock when not grounded**
>
> For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.
> - Ground the device in compliance with the applicable regulations.

> ### ⚠ WARNING
> **Danger to life due to electric shock when opening plug connections in operation**
>
> When opening plug connections in operation, arcs can result in severe injury or death.
> - Only open plug connections when the equipment is in a no-voltage state, unless it has been explicitly stated that they can be opened in operation.

> ### ⚠ WARNING
> **Danger to life due to fire spreading if housing is inadequate**
>
> Fire and smoke development can cause severe personal injury or material damage.
> - Install devices without a protective housing in a metal control cabinet (or protect the device by another equivalent measure) in such a way that contact with fire is prevented.
> - Ensure that smoke can only escape via controlled and monitored paths.

> ### ⚠ WARNING
> **Danger to life through unexpected movement of machines when using mobile wireless devices or mobile phones**
>
> Using mobile wireless devices or mobile phones with a transmit power > 1 W closer than approx. 2 m to the components may cause the devices to malfunction, influence the functional safety of machines therefore putting people at risk or causing material damage.
> - Switch the wireless devices or mobile phones off in the immediate vicinity of the components.

> ### ⚠ WARNING
> **Danger to life due to the motor catching fire in the event of insulation overload**
>
> There is higher stress on the motor insulation through a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.
> - Use a monitoring device that signals an insulation fault.
> - Correct the fault as quickly as possible so the motor insulation is not overloaded.

> ### ⚠ WARNING
> **Danger to life due to fire if overheating occurs because of insufficient ventilation clearances**
>
> Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.
> - Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

> ### ⚠ WARNING
> **Danger of an accident occurring due to missing or illegible warning labels**
>
> Missing or illegible warning labels can result in accidents involving death or serious injury.
> - Check that the warning labels are complete based on the documentation.
> - Attach any missing warning labels to the components, in the national language if necessary.
> - Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

⚠ **WARNING**

Danger to life when safety functions are inactive

Safety functions that are inactive or that have not been adjusted accordingly can cause operational faults on machines that could lead to 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**

Danger to life or malfunctions of the machine as a result of incorrect or changed parameterization

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

- Protect the parameterization (parameter assignments) against unauthorized access.
- Respond to possible malfunctions by applying suitable measures (e.g. EMERGENCY STOP or EMERGENCY OFF).

⚠ **WARNING**

Danger to life from permanent magnet fields

Even when switched off, electric motors with permanent magnets represent a potential risk for persons with heart pacemakers or implants if they are close to converters/motors.

- If you are such a person (with heart pacemaker or implant) then keep a minimum distance of 2 m.
- When transporting or storing permanent magnet motors always use the original packing materials with the warning labels attached.
- Clearly mark the storage locations with the appropriate warning labels.
- IATA regulations must be observed when transported by air.

⚠ **WARNING**

Injury caused by moving parts or those that are flung out

Touching moving motor parts or drive output elements and loose motor parts that are flung out (e.g. feather keys) in operation can result in severe injury or death.

- Remove any loose parts or secure them so that they cannot be flung out.
- Do not touch any moving parts.
- Safeguard all moving parts using the appropriate safety guards.

⚠ WARNING
Danger to life due to fire if overheating occurs because of insufficient cooling
Inadequate cooling can cause overheating resulting in death or severe injury as a result of smoke and fire. This can also result in increased failures and reduced service lives of motors.
• Comply with the specified coolant requirements for the motor.

⚠ WARNING
Danger to life due to fire as a result of overheating caused by incorrect operation
When incorrectly operated and in the case of a fault, the motor can overheat resulting in fire and smoke. This can result in severe injury or death. Further, excessively high temperatures destroy motor components and result in increased failures as well as shorter service lives of motors.
• Operate the motor according to the relevant specifications.
• Only operate the motors in conjunction with effective temperature monitoring.
• Immediately switch off the motor if excessively high temperatures occur.

⚠ CAUTION
Risk of injury due to touching hot surfaces
In operation, the motor can reach high temperatures, which can cause burns if touched.
• Mount the motor so that it is not accessible in operation.
• When maintenance is required, allow the motor to cool down before starting any work.
• Use the appropriate personnel protection equipment, e.g. gloves.

⚠ WARNING
Danger to life from electromagnetic fields
Electromagnetic fields (EMF) are generated by the operation of electrical power equipment such as transformers, converters or motors.
People with pacemakers or implants are at a special risk in the immediate vicinity of these devices/systems.
• Ensure that the persons involved are the necessary distance away (minimum 2 m).

1.1.2   Handling electrostatic sensitive devices (ESD)

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

NOTICE
Damage through electric fields or electrostatic discharge
Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.
• Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g conductive foam rubber of aluminum foil.
• Only touch components, modules and devices when you are grounded by one of the following methods:
– Wearing an ESD wrist strap
– Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
• Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

1.1.3 Industrial security

Note

Industrial security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit this address (http://www.siemens.com/industrialsecurity).

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit this address (http://support.automation.siemens.com).

⚠ **WARNING**

Danger as a result of unsafe operating states resulting from software manipulation

Software manipulation (e.g. by viruses, Trojan horses, malware, worms) can cause unsafe operating states to develop in your installation which can result in death, severe injuries and/or material damage.

- Keep the software up to date.

  You will find relevant information and newsletters at this address (http://support.automation.siemens.com).

- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.

  You will find further information at this address (http://www.siemens.com/industrialsecurity).

- Make sure that you include all installed products into the holistic industrial security concept.

1.1.4 Residual risks of power drive systems

The control and drive components of a drive system are approved for industrial and commercial use in industrial line supplies. Their use in public line supplies requires a different configuration and/or additional measures.

These components may only be operated in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used.

These components may only be handled by qualified and trained technical personnel who are knowledgeable and observe all of the safety instructions on the components and in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer 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 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 the control system
   - External influences/damage

2. In the event of a fault, exceptionally high temperatures, including an open fire, as well as emissions of light, noise, particles, gases, etc. can occur inside and outside the inverter, e.g.:
   - Component failure
   - Software errors
   - Operation and/or environmental conditions outside the specification
   - External influences/damage

   Inverters of the Open Type/IP20 degree of protection must be installed in a metal control cabinet (or protected by another equivalent measure) such that contact with fire inside and outside the inverter is not possible.

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

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Note

The components must be protected against conductive contamination (e.g. by installing them in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12).

Assuming that conductive contamination at the installation site can definitely be excluded, a lower degree of cabinet protection may be permitted.

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

1.1.5   Residual risks during the operation of electric motors

The motors may be operated only when all protective equipment is used.

Motors may be handled only by qualified and instructed qualified personnel that knows and observes all safety instructions for the motors that are explained in the associated technical user documentation.

When assessing the machine's risk in accordance with the respective local regulations (e.g., EC Machinery Directive), the machine manufacturer 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 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
   - Errors during the assembly, installation, programming and parameterization
   - Use of wireless devices/mobile phones in the immediate vicinity of the control system
   - External influences/damage

2. In case of failure, unusually high temperatures inside and outside the motor, including open fire as well as the emission of light, noise, particles, gases, etc. can result, for example in
   - Component failure
   - Software errors in converter operation
   - 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 noxious substances and emissions in the case of improper operation and/or improper disposal of components

1.2 Carrying out of repairs

⚠ **DANGER**

Carrying out of repairs

Anywhere in the automation equipment where faults might cause physical injury or major material damage, in other words, where faults could be dangerous, additional external precautions must be taken, or facilities must be provided, that guarantee or enforce a safe operational state, even when there is a fault (e.g. using an independent limit value switch, mechanical locking mechanisms, EMERGENCY STOP/EMERGENCY OFF devices).

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2 Scope of delivery

2.1 System overview

The SINUMERIK 808D ADVANCED control system is an economic numerical control system for milling or turning machines. The SINUMERIK 808D ADVANCED controller, coupled with the high performance SINAMICS V70 drive and the SIMOTICS S-1FL6 motor, is able to control up to five axes including one spindle.

Control system versions

- SINUMERIK 808D ADVANCED T (turning version)
    - The SINUMERIK 808D ADVANCED T control system is able to control up to two feed axes, two additional axes (software licenses required), and one spindle.
- SINUMERIK 808D ADVANCED M (milling version)
    - The SINUMERIK 808D ADVANCED M control system is able to control up to three feed axes, one additional axis (software licenses required), and one spindle.

Controller versions

Both the SINUMERIK 808D ADVANCED T and SINUMERIK 808D ADVANCED M controllers are available in the following versions:

- PPU161.2 (horizontal operator panel, English version)
- PPU161.2 (horizontal operator panel, Chinese version)
- PPU160.2 (vertical operator panel, English version)
- PPU160.2 (vertical operator panel, Chinese version)

Configurable MCPs are available in the following versions:

- Horizontal MCP (English version)
- Horizontal MCP (Chinese version)
- Vertical MCP with a reserved slot for the handwheel (English version)
- Vertical MCP with a reserved slot for the handwheel (Chinese version)
- Vertical MCP with an override switch for the spindle (English version)
- Vertical MCP with an override switch for the spindle (Chinese version)

System configuration

The following configuration shows a typical example of the SINUMERIK 808D ADVANCED M controller with the SINAMICS V70 servo system. Note that the devices with an asterisk ("*") are not included in the scope of delivery.
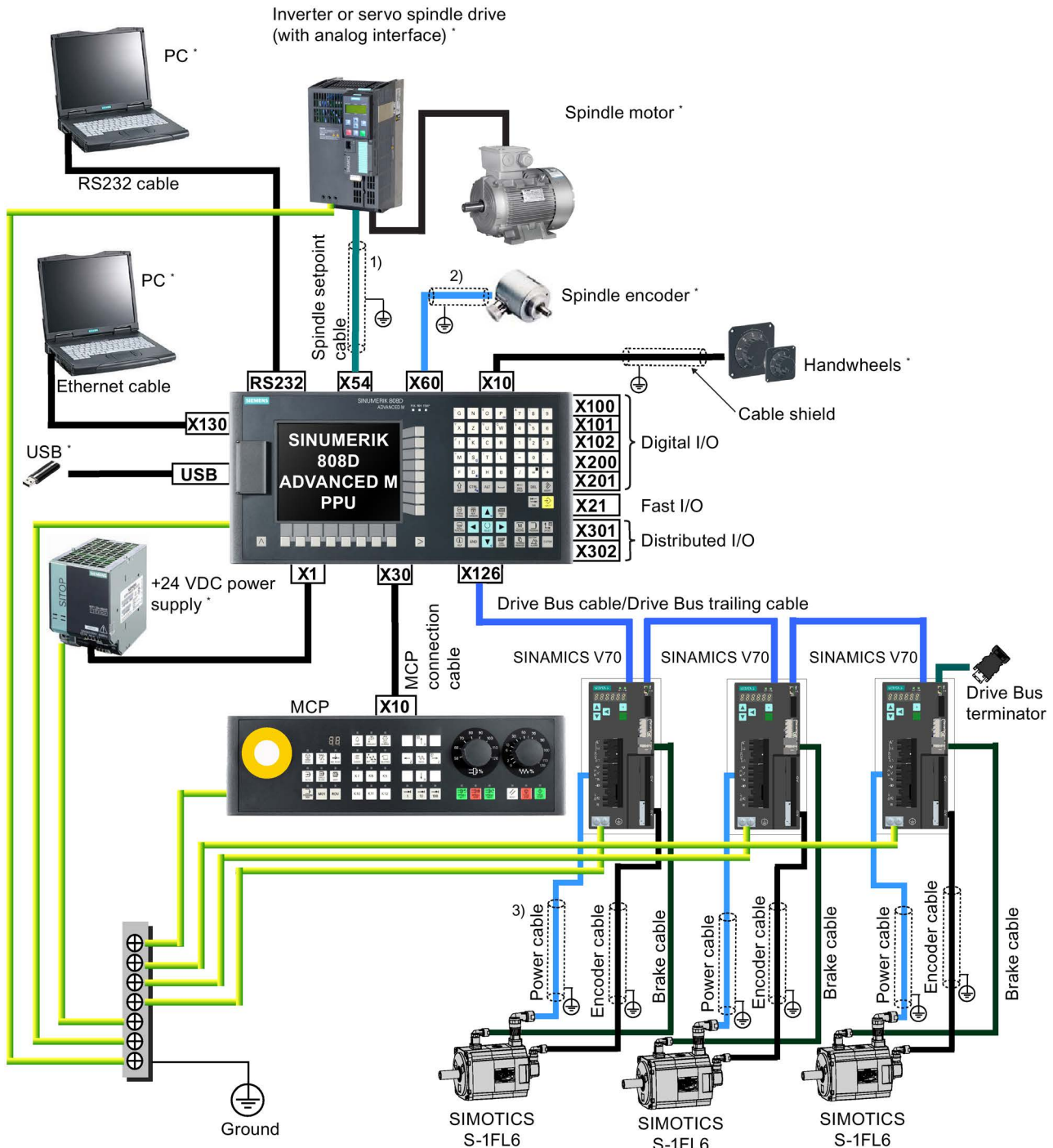
1), 2): For detailed information on cable shield connection, refer to Section "Analog spindle interface - X54, spindle encoder interface - X60 (Page 51)".

3): For detailed information on cable shield connection, refer to Section "Connecting the drive and motor (Page 67)".

> **⚠ CAUTION**
>
> **Personal injury and damage to property from inadequate protection**
>
> Inadequate protection may cause minor personal injury or damage to property.
>
> - Using a copper protective earth conductor with a cross section of 10 mm^2 to connect the PE terminal of V70 to the protective earth. For the NC and 24 VDC power supply, there are no special requirements of the cross section of the copper protective earth conductor. For the inverter or servo spindle drive, it is recommended to refer to the relevant specifications to confirm the cross section of the copper protective earth conductor.
> - Terminals for equipotential bondings that exist in addition to terminals for PE conductors must not be used for looping-through the PE conductors.
> - To ensure protective separation, an isolating transformer must be used for the 380 VAC line supply system.

Cabinet grounding guide
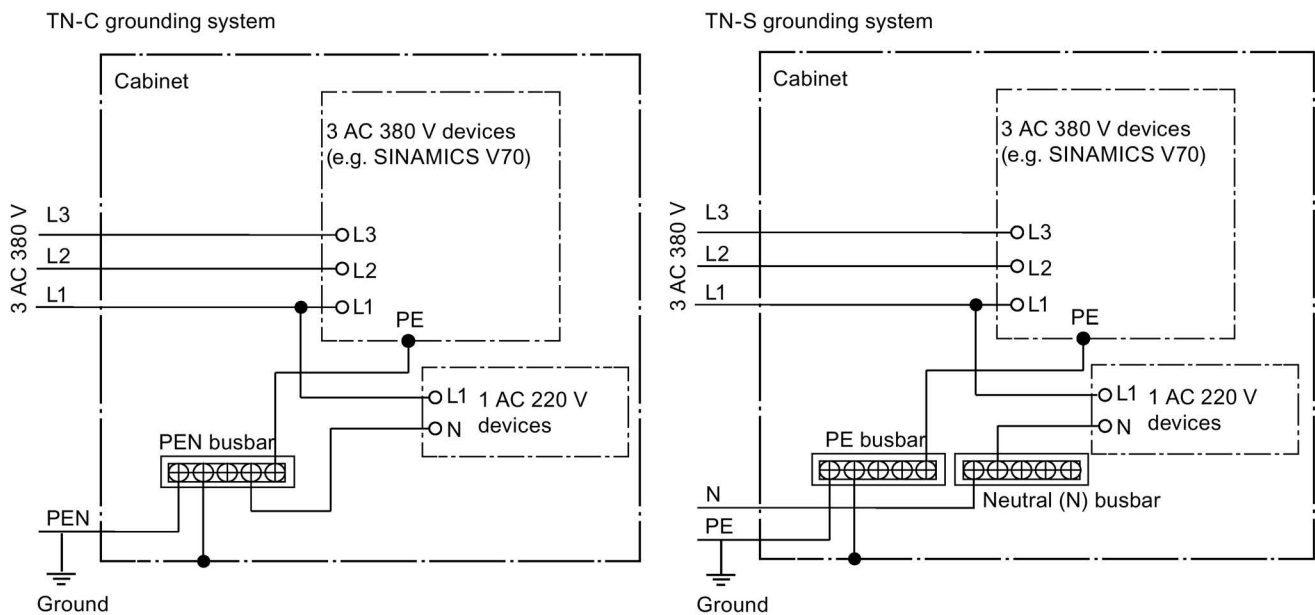
Note that the PE/PEN busbar in the cabinet must connect to the ground through a grounding cable with a cross section ≥ 10 mm^2 as illustrated below.
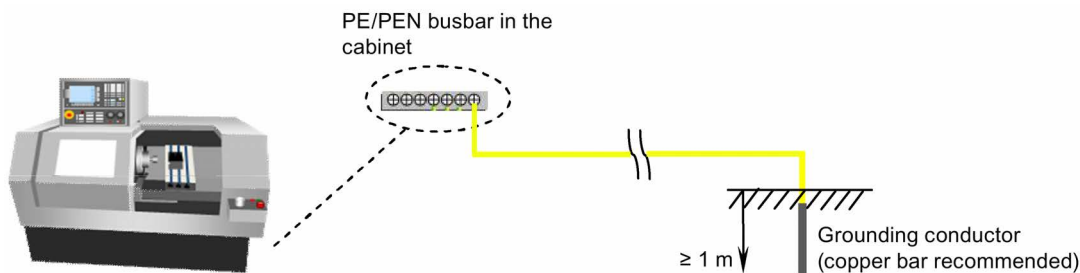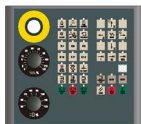
2.2 PPU and MCP

Components in the panel processing unit (PPU) package

Component	Quantity (pieces)	Illustration			Order number	
PPU (PPU161.2/PPU160.2)	1	Horizontal variant (PPU161.2)		Turning	6FC5370-2AT02-0AA0 (English)	
					6FC5370-2AT02-0CA0 (Chinese)	
				Milling	6FC5370-2AM02-0AA0 (English)	
					6FC5370-2AM02-0CA0 (Chinese)	
		Vertical variant (PPU160.2)		Turning	6FC5370-2BT02-0AA0 (English)	
					6FC5370-2BT02-0CA0 (Chinese)	
				Milling	6FC5370-2BM02-0AA0 (English)	
					6FC5370-2BM02-0CA0 (Chinese)	
Drive Bus terminator	1				6FC5548-0BA21-0AA0	
Mounting clamps with screws	• PPU161.2: 8 • PPU160.2: 10					
Connectors	• I/O connectors: 7 • 24 V power input connector: 1					
User documentation	1	SINUMERIK 808D ADVANCED Operating and Programming - Turning (Chinese)				
		SINUMERIK 808D ADVANCED Operating and Programming - Milling (Chinese)				
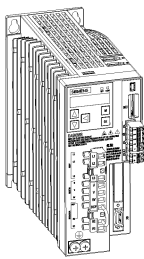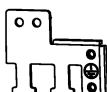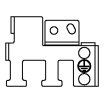
Components in the machine control panel (MCP) package

Component	Quantity (pieces)	Illustration		Order number
MCP	1	Horizontal MCP		6FC5303-0AF35-0AA0 (English)
				6FC5303-0AF35-0CA0 (Chinese)
		Vertical MCP, with an override switch for the spindle		6FC5303-0AF35-2AA0 (English)
				6FC5303-0AF35-2CA0 (Chinese)
		Vertical MCP, with a reserved slot for the handwheel		6FC5303-0AF35-3AA0 (English)
				6FC5303-0AF35-3CA0 (Chinese)
MCP connection cable	1 (for connecting the MCP to the PPU)			
Mounting clamps with screws	• Horizontal MCP: 6 • Vertical MCP: 8			

Component	Quantity (pieces)	Illustration	Order number
Pre-printed MCP strip, Milling	1		
Blank strip paper, A4 size	1		
User documentation	1	Product Information for the MCP	

2.3 Drives and motors

Components in the drive package

Component	Quantity (pieces)	Illustration	Outline dimension (Width x Height x Depth, mm)	Frame size [1]	Rated output current (A)	Order number
SINAMICS V70 drive	1		80 x 180 x 200	FSA	1.2	6SL3210-5DE12-4UA0
					3.0	6SL3210-5DE13-5UA0
			100 x 180 x 220	FSB	4.6	6SL3210-5DE16-0UA0
					5.3	6SL3210-5DE17-8UA0
					7.8	6SL3210-5DE21-0UA0
			140 x 260 x 240	FSC	11.0	6SL3210-5DE21-4UA0
					13.2	6SL3210-5DE21-8UA0
Shielding plate	1	FSA: FSB/FSC:				
Cable clamp (FSB and FSC only)	1					
Connectors	• FSA: 4 • FSB/FSC: 2					
User documentation	1	Safety Instructions				

[1] For more information about the different fame sizes, see Section "Drill patterns and outline dimensions (Page 32)".

Drive rating plate

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Label	Value
Drive name	SINAMICS V70
Mains input	INPUT: 3AC 380-480V 1.5A 50/60Hz
Motor output	OUTPUT: 3AC 0-input V 1.2A 0-330Hz
Rated motor power and IP protection class	IP CLASS: IP20 MOTOR: 0.4kW FS: 01
Order number	1P 6SL3210-5DE12-4UA0
Product serial number	S ZVXXXXXXXXXXX
Part number	SNC-A5E03662004

EAC

CE ✓ KCC-REM-S49-SINAMICS

Refer to user manual   Made in China
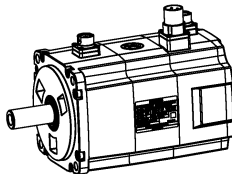
Siemens Numerical Control Ltd.

No. 18 Siemens Rd, Jiangning Dev. Zone, Nanjing, 211100, P.R.C

Explanation of drive order numbers

Data position of the order number	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Order number	6	S	L	3	2	1	0	-	5	D	●	❑	❑	-	❑	U	A	0
Mains voltage: 3 AC 380 V to 480 V										E							
Motor output power																		
0.4 kW												1	2		4			
0.75 kW/1 kW												1	3		5			
1.5 kW												1	6		0			
1.75 kW												1	7		8			
2 kW/2.5 kW												2	1		0			
3.5 kW												2	1		4			
5 kW/7 kW												2	1		8			

Components in the motor package

Component	Illustration	Shaft height (mm)	Stall torque (Nm)	Order number [1]
SIMOTICS S-1FL6 motor		45	1.9	1FL6042-1AF61-0❑❑1
			3.5	1FL6044-1AF61-0❑❑1
		65	4	1FL6061-1AC61-0❑❑1
			6	1FL6062-1AC61-0❑❑1
			8	1FL6064-1AC61-0❑❑1
			11	1FL6066-1AC61-0❑❑1
			15	1FL6067-1AC61-0❑❑1
		90	15	1FL6090-1AC61-0❑❑1
			22	1FL6092-1AC61-0❑❑1
			30	1FL6094-1AC61-0❑❑1
			40	1FL6096-1AC61-0❑❑1
User documentation	SIMOTICS S-1FL6 Servo Motors Installation Guide			

[1] For more information about order numbers, see motor order number explanation described later in this section.

Motor rating plate

SIEMENS

SIMOTICS S-1FL6   3~Servo Motor
1P 1FL6067-1AC61-0AH1
1S LMH/NA0388899301

M_N 9.55 Nm	I_N 5.9 A	n_N 2000 r/min	
M_0 15 Nm	I_0 8.8 A	n_{max} 3000r/min	
U_N 206 V	IP65 S1	16.6 kg	
P_N 2 kW	Th.CL130(B) ID 31		
ENCODER INC. 2500 ppr	BRAKE 24VDC		

Siemens Standard Motors Ltd.   Made in China
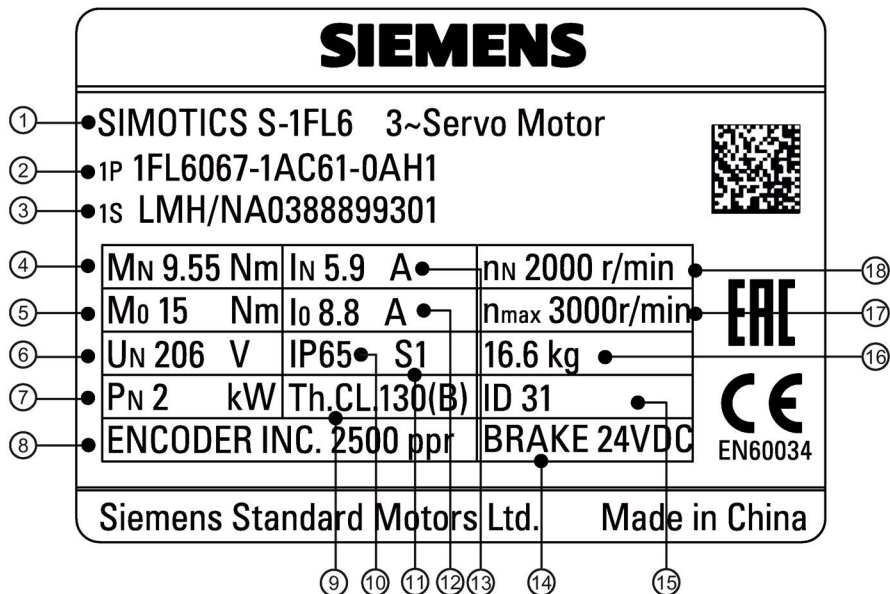
①	Motor type	⑦	Rated power	⑬ Rated current
②	Order number	⑧	Encoder type and resolution	⑭ Holding brake
③	Serial number	⑨	Thermal class	⑮ Motor ID
④	Rated torque	⑩	Degree of protection	⑯ Weight
⑤	Stall torque	⑪	Motor operating mode	⑰ Maximum speed
⑥	Rated voltage	⑫	Stall current	⑱ Rated speed

Explanation of motor order numbers

Data position of the order number	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
Order number	1	F	L	6	❑	❑	❑	-	•	•	❑	•	•	-	•	❑	❑	•
Shaft height																		
45 mm					0	4												
65 mm					0	6												
90 mm					0	9												
Stall torque																		
15 Nm, SH90							0											
4 Nm, SH65							1											
1.9 Nm, SH45; 6 Nm, SH65; 22 Nm, SH90							2											
3.5 Nm, SH45; 8 Nm, SH65; 30 Nm, SH90							4											
11 Nm, SH65; 40 Nm, SH90							6											
15 Nm, SH65							7											
High inertia variant								1										
Natural cooling									A									

Rated speed													
2000 rpm									C				
3000 rpm									F				
400 V supply voltage										6			
IM B5, flange mounting											1		
Straight connectors with a fixed outlet direction												0	
Encoder type													
Incremental encoder, 2500 ppr												A	
Absolute encoder, 20 bit single turn + 12 bit multi-turn												L	
Mechanics													
Plain shaft, without brake												G	
Plain shaft, with brake												H	
Shaft with key, without brake												A	
Shaft with key, with brake												B	
Protection level IP65, with a shaft oil seal													1
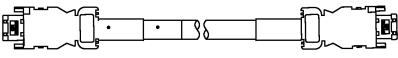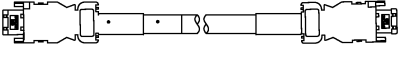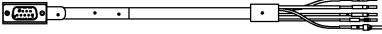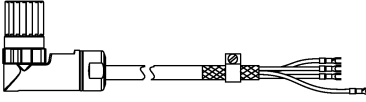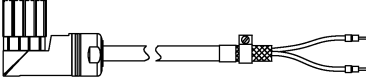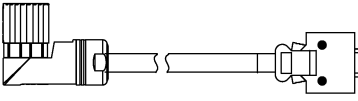
Device combination
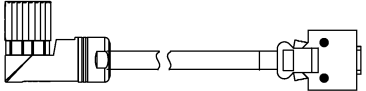
The table below lists ordering data of drives and configurable motors. You can select the desired servo drive according to the motor configured:

SIMOTICS S-1FL6 servo motor				SINAMICS V70 servo drive	
Stall torque (Nm)	Rated speed (rpm)	Shaft height (mm)	Order number	Order number	Frame size
1.9	3,000	45	1FL6042-1AF61-0❏❏1	6SL3210-5DE12-4UA0	FSA
3.5			1FL6044-1AF61-0❏❏1	6SL3210-5DE13-5UA0	
4	2,000	65	1FL6061-1AC61-0❏❏1	6SL3210-5DE13-5UA0	
6			1FL6062-1AC61-0❏❏1	6SL3210-5DE13-5UA0	
8			1FL6064-1AC61-0❏❏1	6SL3210-5DE16-0UA0	FSB
11			1FL6066-1AC61-0❏❏1	6SL3210-5DE17-8UA0	
15			1FL6067-1AC61-0❏❏1	6SL3210-5DE21-0UA0	
15	2,000	90	1FL6090-1AC61-0❏❏1	6SL3210-5DE21-0UA0	
22			1FL6092-1AC61-0❏❏1	6SL3210-5DE21-4UA0	FSC
30			1FL6094-1AC61-0❏❏1	6SL3210-5DE21-8UA0	
40			1FL6096-1AC61-0❏❏1	6SL3210-5DE21-8UA0	

2.4 Cables

Component	Used for	Order number	Length (m)
Drive Bus cable	PPU to SINAMICS V70 drive	6FC5548-0BA20-1AA2	0.25
		6FC5548-0BA20-1AA3	0.35
		6FC5548-0BA20-1AD0	3
		6FC5548-0BA20-1AF0	5
		6FC5548-0BA20-1AH0	7
		6FC5548-0BA20-1BA0	10
		6FC5548-0BA20-1BF0	15
		6FC5548-0BA20-1CA0	20
Drive Bus trailing cable		6FC5548-0BA21-1AD0	3
		6FC5548-0BA21-1AF0	5
		6FC5548-0BA21-1AH0	7
		6FC5548-0BA21-1BA0	10
		6FC5548-0BA21-1BF0	15
		6FC5548-0BA21-1CA0	20
Spindle setpoint cable	PPU (analog spindle interface) to Siemens inverter or third-party drive (with analog input)	6FC5548-0BA05-1AD0	3
		6FC5548-0BA05-1AE0	4
		6FC5548-0BA05-1AF0	5
		6FC5548-0BA05-1AH0	7
		6FC5548-0BA05-1BA0	10
		6FC5548-0BA05-1BF0	15
		6FC5548-0BA05-1CA0	20
MOTION-CONNECT 300 power cable	SINAMICS V70 FSA to motor	6FX3002-5CL01-1AD0	3
		6FX3002-5CL01-1AF0	5
		6FX3002-5CL01-1AH0	7
		6FX3002-5CL01-1BA0	10
		6FX3002-5CL01-1BF0	15
		6FX3002-5CL01-1CA0	20
	SINAMICS V70 FSB/FSC to motor	6FX3002-5CL11-1AD0	3
		6FX3002-5CL11-1AF0	5
		6FX3002-5CL11-1AH0	7
		6FX3002-5CL11-1BA0	10
		6FX3002-5CL11-1BF0	15
		6FX3002-5CL11-1CA0	20
MOTION-CONNECT 300 brake cable	SINAMICS V70 to motor holding brake interface	6FX3002-5BL02-1AD0	3
		6FX3002-5BL02-1AF0	5
		6FX3002-5BL02-1AH0	7
		6FX3002-5BL02-1BA0	10
		6FX3002-5BL02-1BF0	15
		6FX3002-5BL02-1CA0	20
MOTION-CONNECT 300 incremental encoder cable	SINAMICS V70 to incremental encoder interface of the motor	6FX3002-2CT10-1AD0	3
		6FX3002-2CT10-1AF0	5
		6FX3002-2CT10-1AH0	7
		6FX3002-2CT10-1BA0	10
		6FX3002-2CT10-1BF0	15
		6FX3002-2CT10-1CA0	20

Component	Used for	Order number	Length (m)
MOTION-CONNECT 300 absolute encoder cable	SINAMICS V70 to absolute encoder interface of the motor	6FX3002-2DB10-1AD0	3
		6FX3002-2DB10-1AF0	5
		6FX3002-2DB10-1AH0	7
		6FX3002-2DB10-1BA0	10
		6FX3002-2DB10-1BF0	15
		6FX3002-2DB10-1CA0	20

Note

The MOTION-CONNECT 300 cable, spindle setpoint cable, and Drive Bus trailing cable given above are suitable for use in drag chains. For more information on how to lay cables properly in drag chains, see Section "Notes on the laying of cables in drag chains (Page 40)".

2.5 Options

External 24 VDC power supply

A 24 VDC power supply is used to supply the 808D ADVANCED and V70 servo drive. Consider the following technical specification requirements when selecting a 24 VDC power supply:

- 24 VDC supplying the SINUMERIK 808D ADVANCED:
  - Rated input voltage: 24 V
  - Max. input voltage: 28.8 V
  - Min. input voltage without output derating: 20.4 V
  - Rated input current: 2.25 A

- 24 VDC supplying the SINAMICS V70 drive:

Without a holding brake		With a holding brake	
Rated voltage (V)	Maximum current (A)	Rated voltage (V)	Maximum current (A)
24 (-15% to +20%)	1	24 (-10% to +10%) [1]	3

[1] The minimum voltage of 24 VDC -10% must be available at the connector on the motor side in order to guarantee that the brake reliably opens. If the maximum voltage of 24 VDC +10% is exceeded, then the brake could re-close. The voltage drop along the brake feeder cable must be taken into consideration. The voltage drop ΔU for copper cables can be approximately calculated as follows:

ΔU [V] = 0.042 • (l/q) • I_{Brake}
Where: l = Cable length [m], q = Brake core cross section [mm^2], I_{Brake} = DC current of brake [A]

Fuse/circuit breaker

The fuse/circuit breaker is used to protect the control system. Refer to the table below for the selection of fuses and circuit breakers:

SINAMICS V70		Standard fuse		Circuit breaker
Frame size	Order number	Rated current (A)	Order number	Order number
FSA	6SL3210-5DE12-4UA0	6	3NA3 801-6	3RV 1021-1DA10
	6SL3210-5DE13-5UA0	10	3NA3 803-6	3RV 1021-1FA10
FSB	6SL3210-5DE16-0UA0	10	3NA3 803-6	3RV 1021-1JA10
	6SL3210-5DE17-8UA0	16	3NA3 805-6	3RV 1021-1JA10
	6SL3210-5DE21-0UA0	16	3NA3 805-6	3RV 1021-4AA10
FSC	6SL3210-5DE21-4UA0	20	3NA3 807-6	3RV 1021-4BA10
	6SL3210-5DE21-8UA0	25	3NA3 810-6	3RV 1021-4DA10

Braking resistor
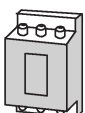
A braking resistor is used for the SINAMICS V70. When the internal braking resistor cannot meet the braking requirements, an external braking resistor can be used to "dump" the regenerative energy produced by the motor, thus giving greatly improved braking and deceleration capabilities. Select a standard braking resistor according to the table below:

Frame size	Illustration	Resistance (Ω)	Max. power (kW)	Rated power (W)	Max. energy (kJ)
FSA		160	4	100	8
FSB		70	9.1	229	18.3
FSC		27	23.7	1185	189.6

Filter

Siemens recommends you to use a filter to protect the system from high frequency noise.

The table below lists all the filters recommended by Siemens:

Frame size	Illustration	Rated current (A)	Protection class	Order number
FSA		5	IP20	6SL3203-0BE15-0VA0
FSB		12	IP20	6SL3203-0BE21-2VA0
FSC		20	IP20	6SL3203-0BE22-0VA0

Outline dimensions
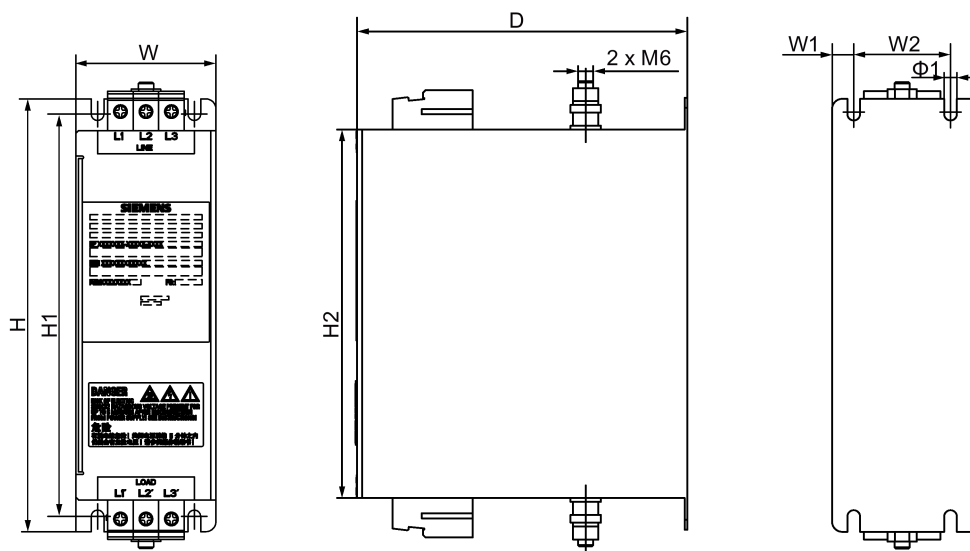
Rated current (A)	W	D	W2	H1	H	H2	W1	Ø1	Screw
5	55	130	38	158	170	145	8.5	5	M6
12	75	140	58	158	170	145	8.5	5	M6
20	60	130	40	240	250	220	10	5.5	M6

Basic technical data

Rated current	5 A	12 A	20 A
Rated voltage	3-phase 380 VAC to 480 VAC (-15% to +10%)		
Line frequency	50/60 Hz (-10% to +10%)		
Product standard	IEC 61800-5-1		

Insertion loss

Rated current	5 A						12 A						20 A					
Noise frequency (MHz)	0.15	0.5	1.0	5.0	10	30	0.15	0.5	1.0	5.0	10	30	0.15	0.5	1.0	5.0	10	30
CM (dB)	60	65	55	45	35	20	60	70	70	55	45	15	60	60	60	55	35	15
DM (dB)	50	60	55	50	50	40	60	65	60	50	45	30	40	55	55	50	45	30

Connecting

The figure below provides a connection example. It shows how to connect a line filter to a SINAMICS V70 drive.
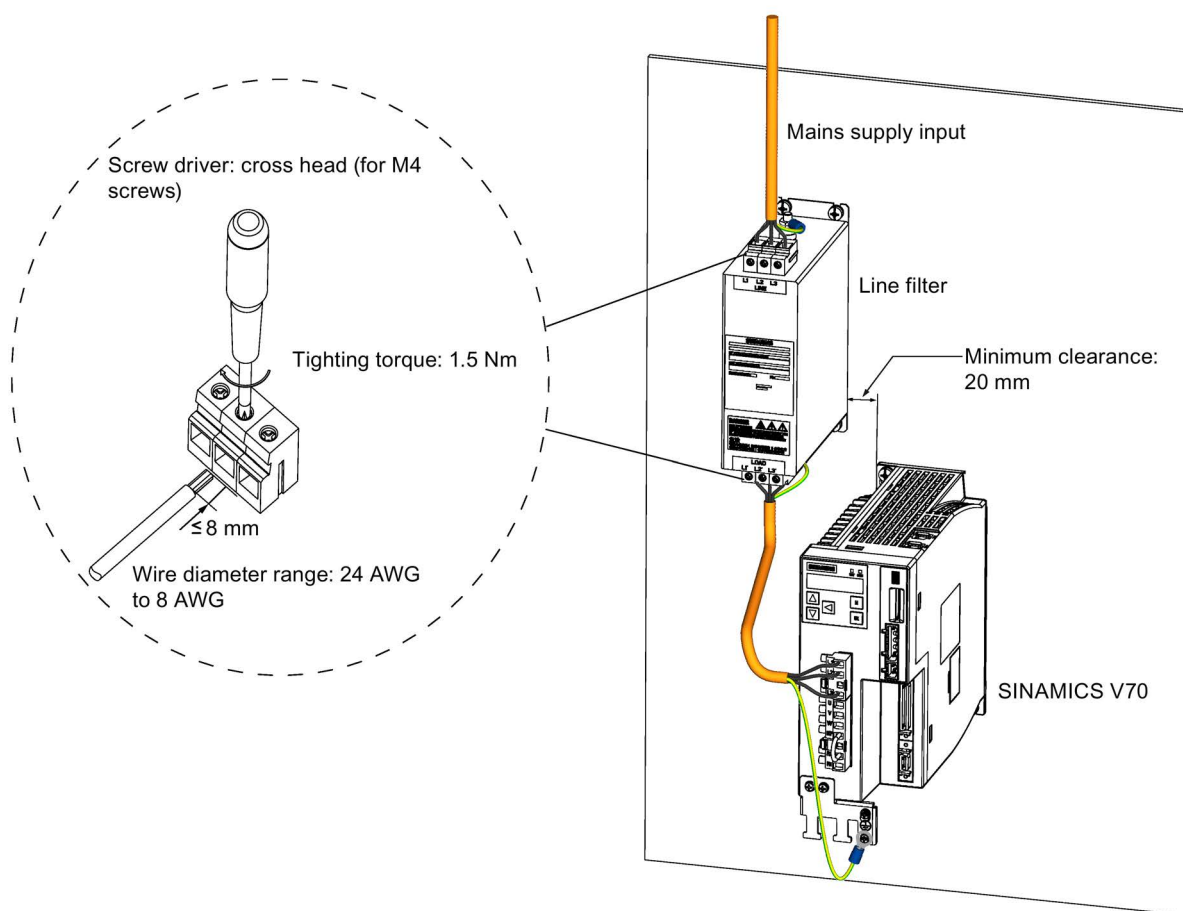
SD card

An SD card can be used to copy drive parameters or perform a firmware update. You are recommended to use the Siemens SD card (order number: **6ES7954-8LB01-0AA0**).

You can also select other high quality SD cards with a maximum capacity of 2 GB from manufacturers such as KINGMAX, Kingston or SanDisk, which are not tested by Siemens.

Toolbox DVD

Under the Toolbox DVD root directory, it contains a file setup.exe. After starting this file the program guides you installing the following software to the PC:

● SinuComPCIN

  – SinuComPCIN is a tool that allows the commissioning engineer to exchange files between the PC and the control through RS232 interface.

● Access MyMachine

  – Access MyMachine (AMM) is a tool that allows the commissioning engineer to exchange files between the PC and the control very easily through the Ethernet interface. For data transmission, the control can be connected to the PC directly or via the local network.

● PLC Programming Tool

  – PLC Programming Tool makes a connection between the programming tool and the control system. The commissioning engineer can program and debug the PLC inside the SINUMERIK 808D ADVANCED.

● Config DATA

  – Config_DATA contains the configuration data setup. The setup will install the configuration data for SINUMERIK 808D ADVANCED to your PC. The configuration data consist of the Siemens examples, and the user documents.

Note

For more information about the connection of the filter, fuse/circuit breaker, and braking resistor, see Section "Connecting the drive and motor (Page 67).

Note

Non-Siemens products

This document contains recommendations relating to non-Siemens products. The fundamental suitability of the non-Siemens products is familiar to us. It goes without saying that equivalent products from other manufacturers may be used. Our recommendations are to be seen as helpful information, not as requirements or dictates. We cannot accept any liability for the quality and properties/features of non-Siemens products.

3 Mounting

⚠ **DANGER**

Danger to life when live parts are touched

Death or serious injury can result when live parts are touched.

● Only work on electrical devices when you are qualified for this job.

● Always observe the country-specific safety rules.

Before installing or removing the components of the control system, make sure that the system is disconnected from the mains.

⚠ **DANGER**

Death or serious injury from fire or electric shock

If the equipment operates in an area subject to inflammables or combustibles, water or corrosion hazards, it contains high risk of fire or electric shock.

The fire or electric shock may lead to death or serious injury.

Make sure that the control system is installed in a control cabinet with an adequate protection class.

Note

When dimensioning the control cabinet, make sure that the installed components do not exceed the permissible surrounding air temperature, even if the outside temperature is high.

3.1 Mounting the PPU and MCP

Cut-out dimensions and mounting clearance (mm)

To make maintenance easy, keep sufficient clearance (recommended distance: 80 mm) between the maintenance door on the PPU and the cabinet wall. The recommended depth of the cabinet is greater than 155 mm.

Horizontal PPU and MCP
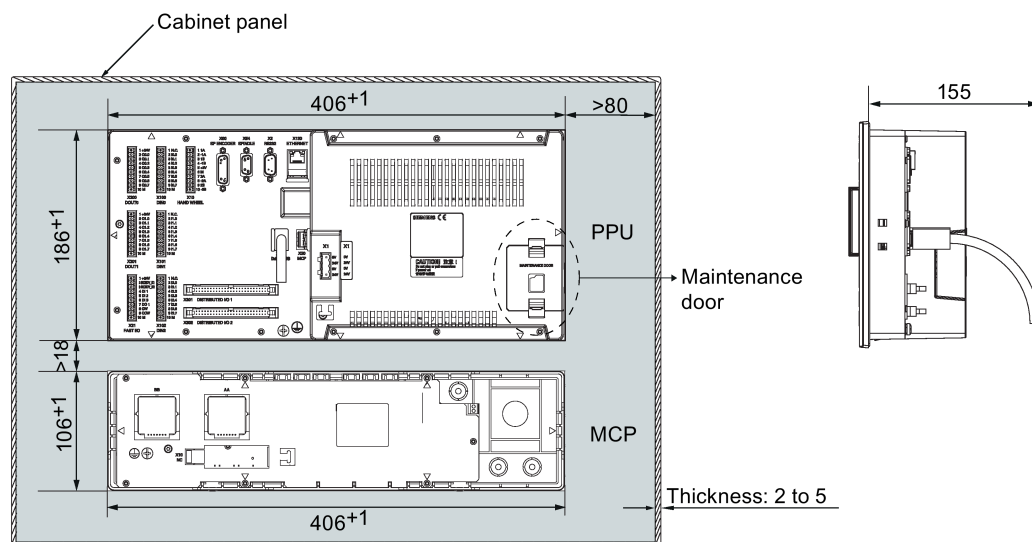
Vertical PPU and MCP
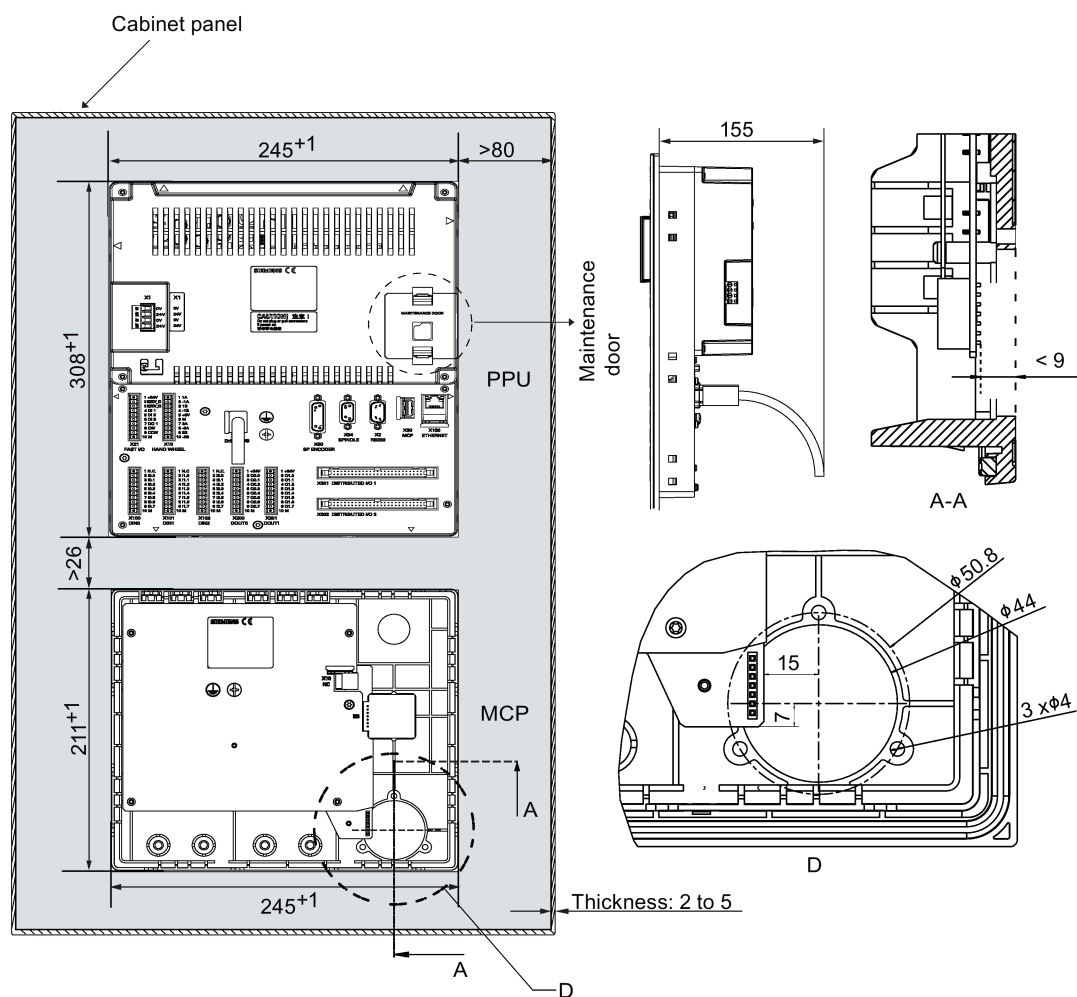
Note

Make sure there is enough space around the PPU and the MCP for tightening the screws in the control cabinet.

Note

All vertical MCP versions share the same requirements for cut-out dimensions and mounting clearance. The illustration above takes the MCP with a reserved slot for the handwheel for example.

Note

When mounting a horizontal PPU together with a vertical MCP or vice versa, follow the requirement for the clearance between a vertical PPU and a vertical MCP shown above.

Outline dimensions (mm)

PPU161.2
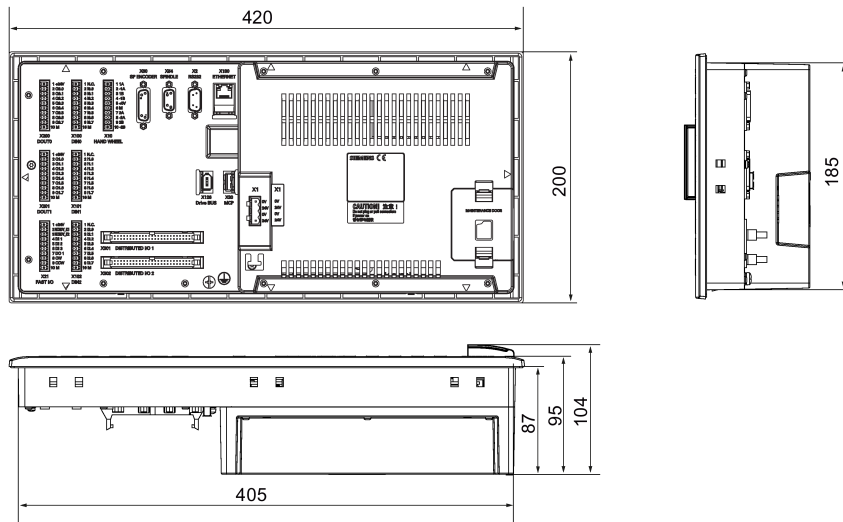
PPU160.2
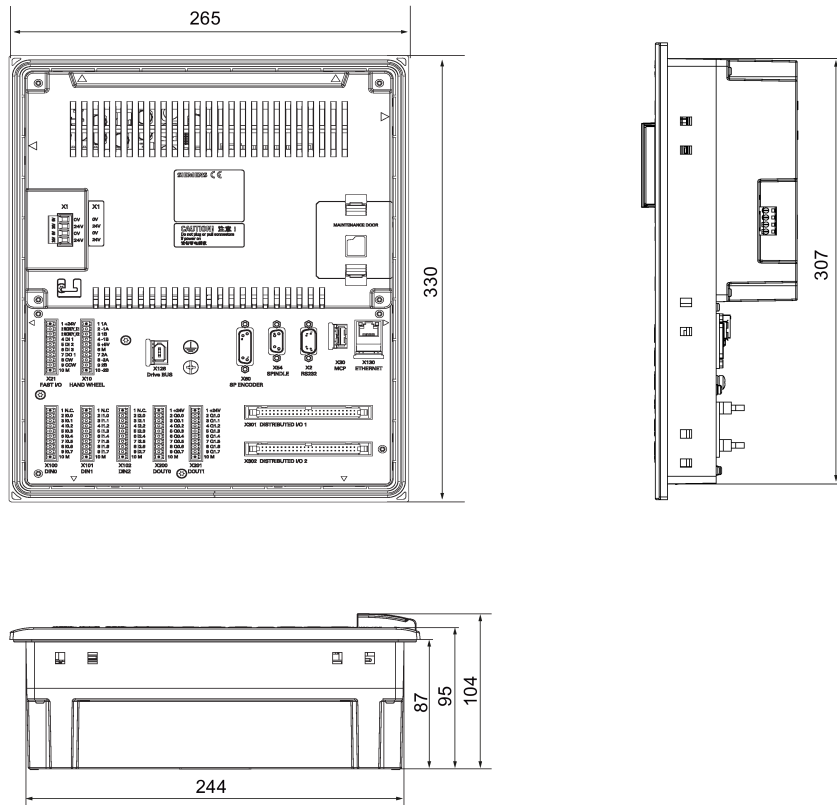
Horizontal MCP
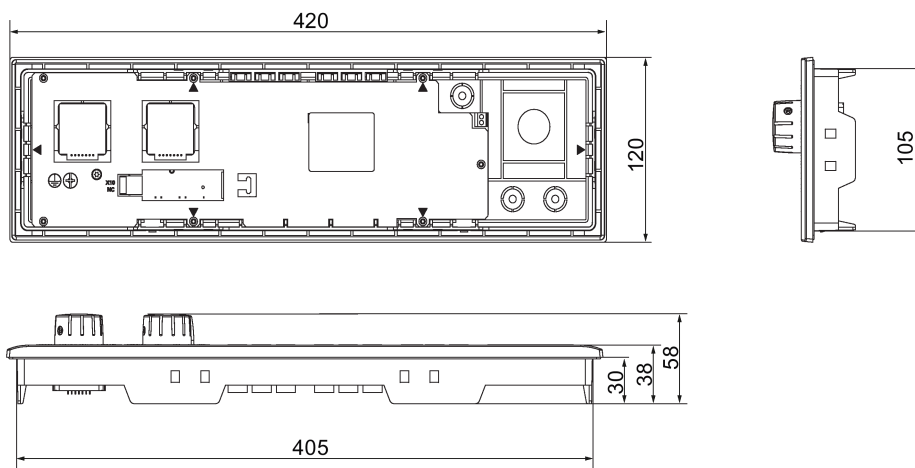
Vertical MCP (Example: MCP variant with an override switch for the spindle)
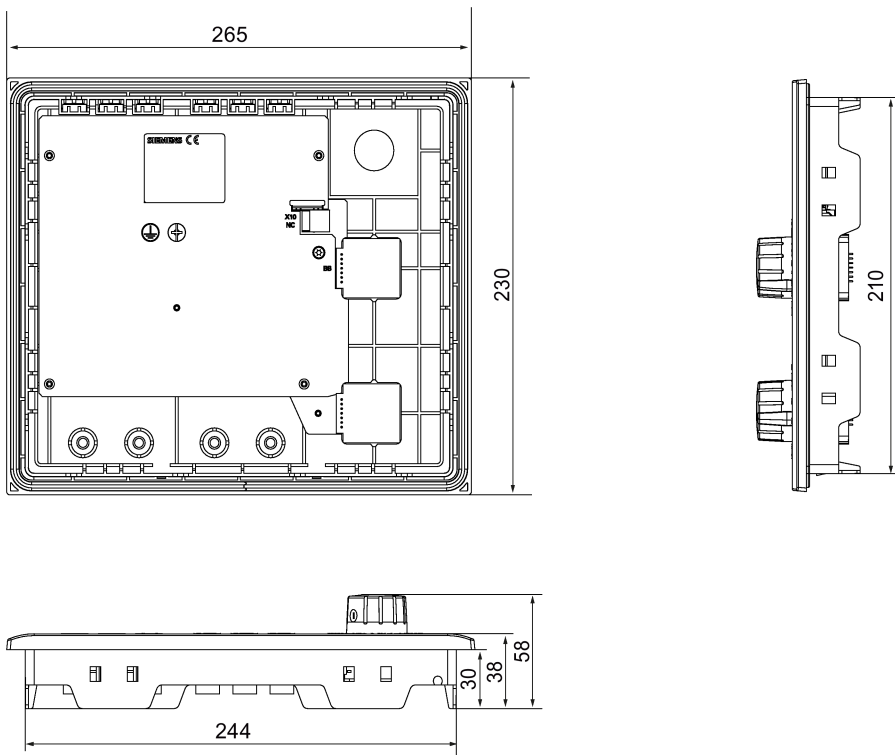
Note

All vertical MCP versions have the same outline dimensions.

Mounting the PPU and MCP with the companion clamps

Use the companion clamps (8 for PPU161.2, 10 for PPU160.2, 6 for the horizontal MCP, and 8 for the vertical MCP) to fix the PPU and MCP to the cabinet panel. You can find the mounting position marks (black triangles) on the back of the PPU and MCP. See the mounting illustration below:

The following figures show all mounting position marks on the back of the PPU and the MCP. They also show distances between a clamp and the edge of the PPU or MCP and between two holes of a clamp to make a hole for fixing the screw of a clamp.

Horizontal PPU and MCP
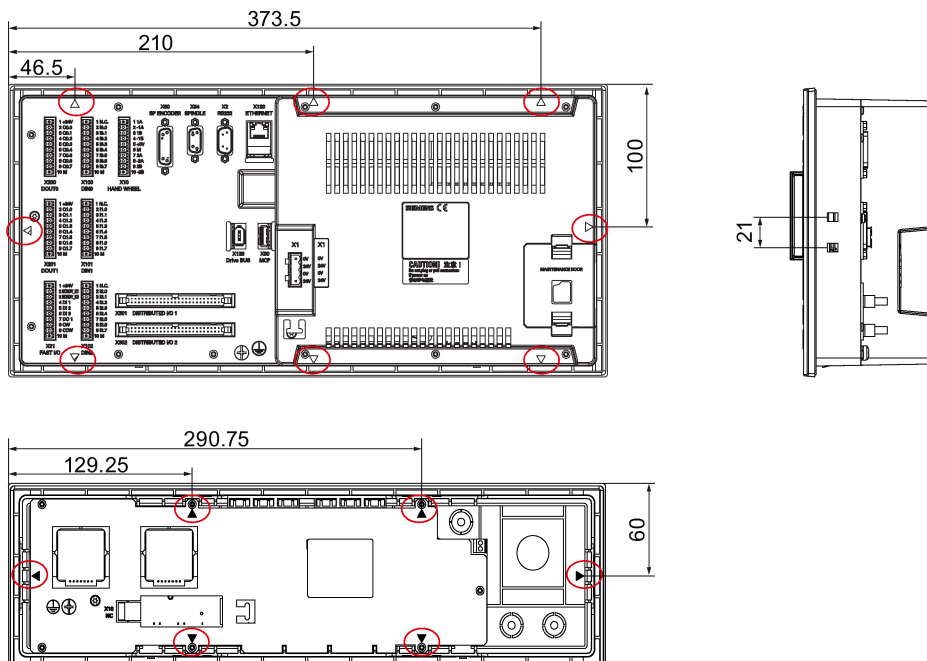
Vertical PPU and MCP
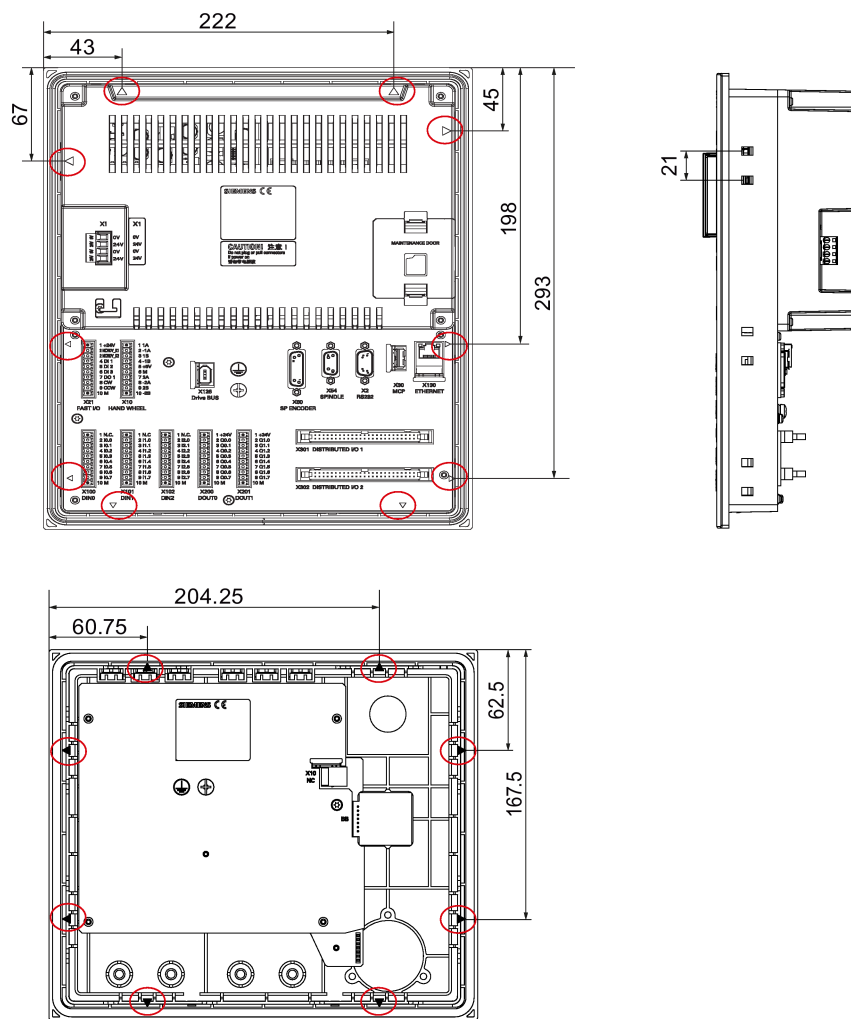
Note

The clamp mounting position marks on the back of all vertical MCP versions are the same. The figure above takes the MCP version with a reserved slot for the handwheel for example.

3.2 Mounting the drive

⚠ WARNING
Death or severe personal injury from harsh installation environment
A harsh installation environment will jeopardize personal safety and equipment. Therefore,
• Do not install the drive and the motor in an area subject to inflammables or combustibles, water or corrosion hazards.
• Do not install the drive and the motor in an area where it is likely to be exposed to constant vibrations or physical shocks.
• Do not keep the drive exposed to strong electro-magnetic interference.

⚠	⚠ WARNING
	Hot surface
	During operation and for a short time after switching-off the drive, the surfaces of the drive can reach a high temperature. Avoid coming into direct contact with the drive surface.

Note

For mounting conditions, see Section "Technical data -servo drives".

3.2.1 Mounting orientation and clearance

Mount the drive vertically to the back plate of a shielded cabinet (non-painted) and observe the mounting clearances specified in the illustration below:
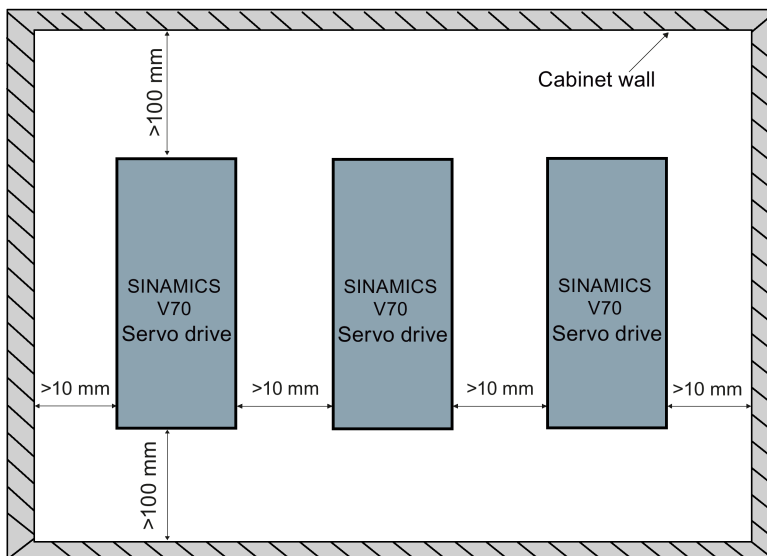
3.2.2 Drill patterns and outline dimensions

Frame size A (unit: mm)

FSA
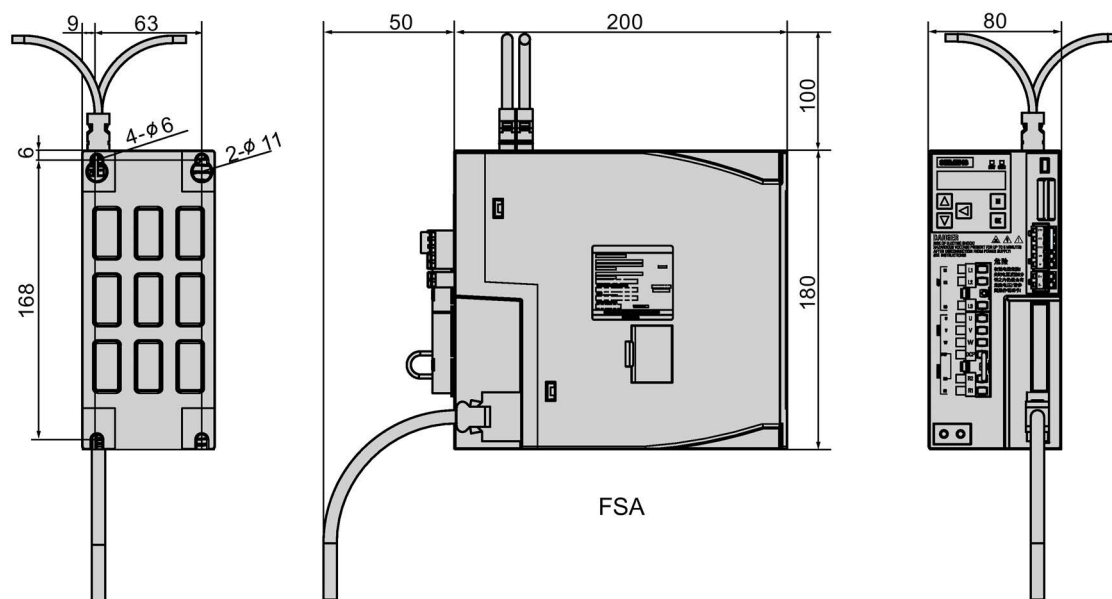
Frame size B (unit: mm)

FSB
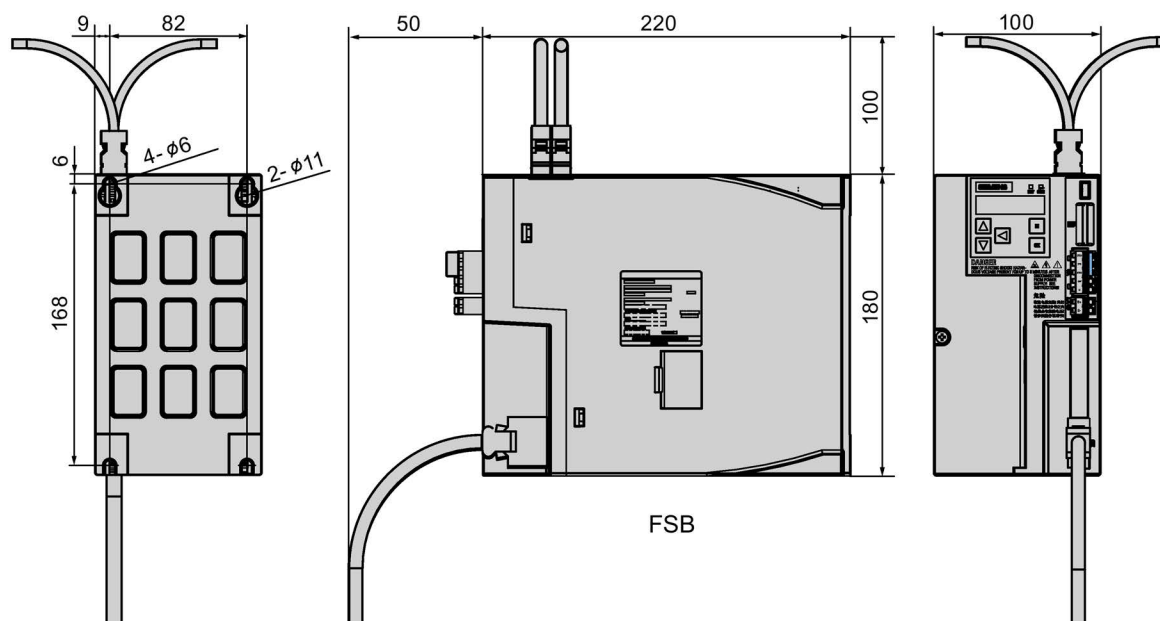
Frame size C (unit: mm)

FSC
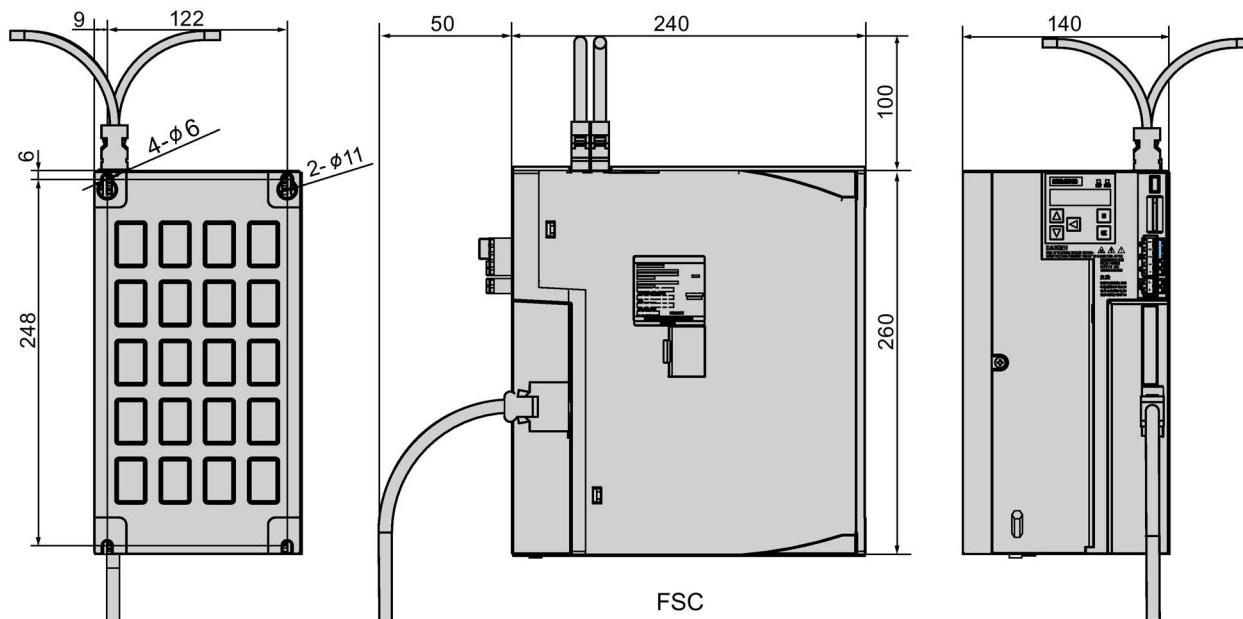
3.2.3 Mounting the drive

Tightening torque: max. 2.0 Nm
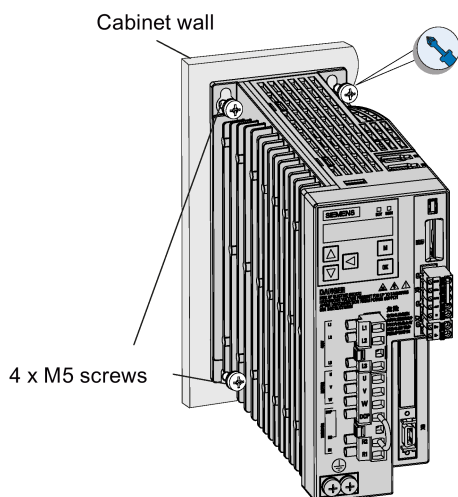
Note

EMC instructions

- To comply with the EMC standards, all cables connected with the SINAMICS V70 system must be shielded cables, which include cables from the line supply to the line filter and from the line filter to the SINAMICS V70 drive.

- The SINAMICS V70 drives have been tested in accordance with the emission requirements of the category of C2 (domestic) environment. The conducted emissions and radiated emissions are in compliance with the standard of EN 55011 and reached Class A.

- In a residential environment, this product can cause high-frequency interferences that may necessitate suppression measures.

- For a radiated emission test, an external AC filter (between the 380 VAC power supply and the drive) will be used to meet the EMC requirement and the drive will be installed inside the shielded metallic chamber, other parts of the motion control system (including the PLC, DC power supply, spindle drive, motor) will be put inside the shielded chamber.

- For a conductive emission test, an external AC filter (between the 380 VAC power supply and the drive) will be used to meet the EMC requirement.

- For the radiated emission and conductive emission test, the length of the line supply cable between the line filter and the drive must be shorter than 1 m.

Screw tightening

Make sure you fix the screw to the terminal door of the drive after you have completed the installation work.

3.2.4 Electrical cabinet design

It may be preferable to always use cooling units as this allows the cabinet to be sealed which is the best option for stopping the entry of contaminants. Within the cabinets it may also be necessary to install fans to ensure the air is circulated and prevent "hot spots" from forming.

The technical specifications of the individual hardware component will provide details of the power loss measured in Watts.

Calculations are made to see if the cabinet can dissipate the heat naturally.

The cabinet manufacturer can supply details of the heat-loss of the cabinet.

Natural heat dissipation occurs through the cabinet walls providing the wall is in free air and not against a wall for example.

A general rule is that the energy dissipated is approximately 50 Watts/m² of free cabinet wall assuming a 10 °C temperature difference between the cabinet and the outside air.

3.2.4.1 Correct installation of fans

For cabinets it is possible that the cooling can be achieved with fans drawing air from the outside via a filter. Natural convection causes the warm air to exit via a filter.

The fact that air is being drawn directly from the outside means that this system can never be airtight. Having a fan for the inlet side only ensures that the cabinet is positively pressurized which helps keep contaminants from entering.

It is extremely important that the filters are service regularly to avoid ingress of contaminants and to maintain the efficiency of the cooling process.
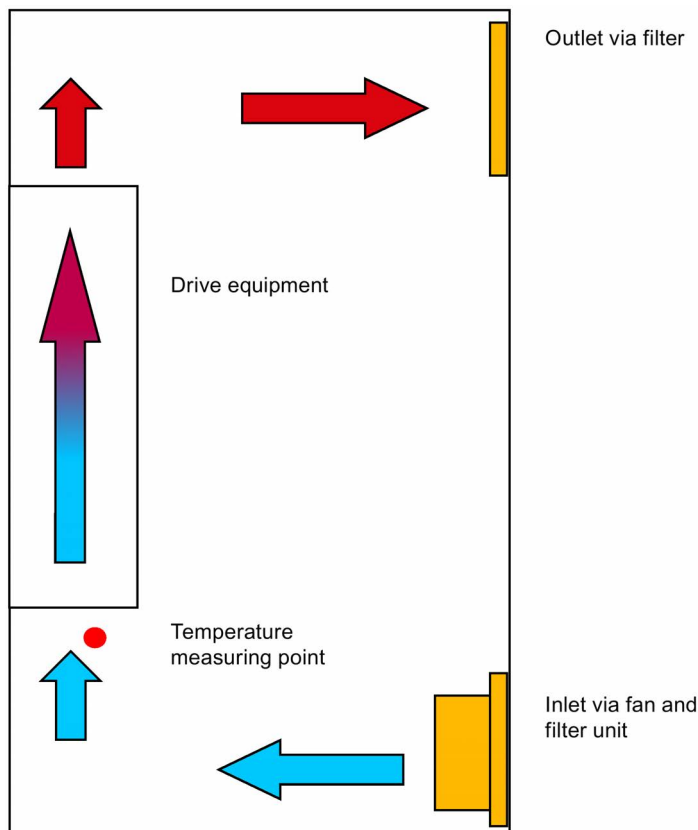
3.2.4.2 Correct installation of cooling units

The cool air should be directed to the bottom of the drive. The natural convection will draw the air through the drives.

The cool air from the cooling unit should not be directed straight onto/into the drives, it should be allowed to mix with the warmer air already in the cabinet, this will minimise the risk of condensation forming.

Cabinet top mounted cooling units require a method of directing the cool air from the cooling unit to the bottom of the drives.

In the case of a door mounted unit it may be necessary to direct the cool air with the use of a baffle.
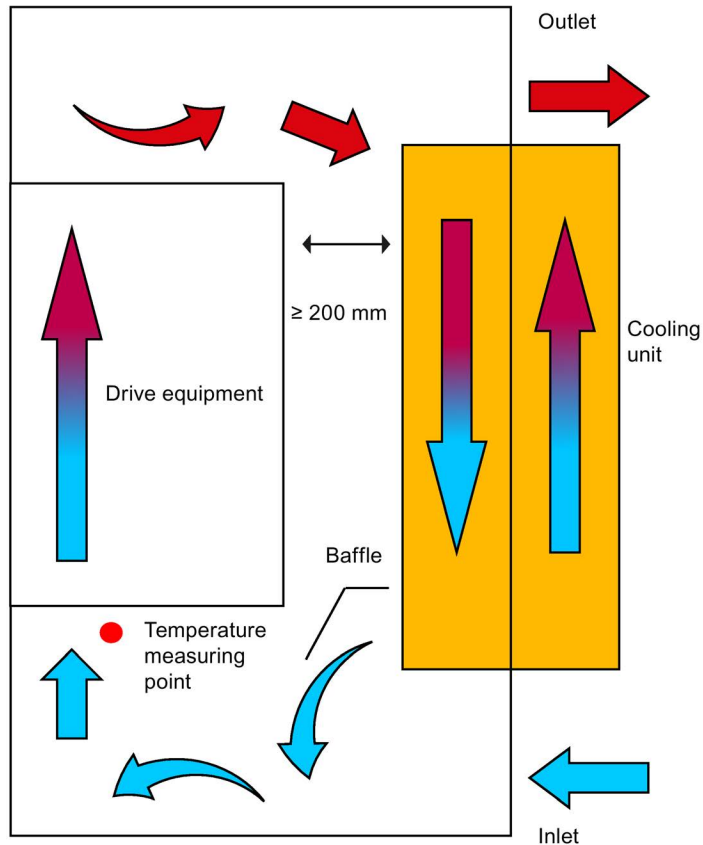
3.3 Mounting the motor

Note
For more information about the mounting conditions, see Section "Technical data - servo motors".

3.3.1 Mounting orientation and outline dimensions

Mounting orientation

The SIMOTICIS S-1FL6 motor supports flange mounting only and it can be used in the following three types of construction:

Note
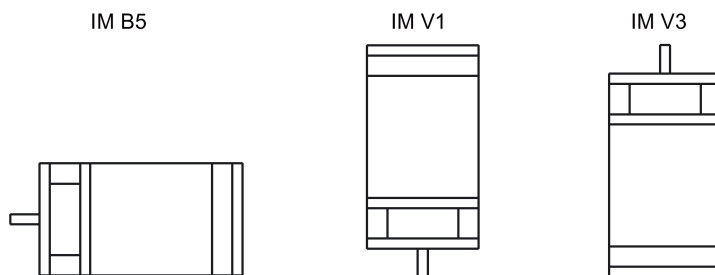
When configuring the IM V3 type of construction, pay particular attention to the permissible axial force (weight force of the drive elements) and the necessary degree of protection.

Motor dimensions

Shaft height 45 mm, with incremental encoder (unit: mm)

Stall torque	k	k1	a	b	b1
1.9 Nm	154.5	201	169.5	15	61.5
3.5 Nm	201.5	248	216.5		

Shaft height 45 mm, with absolute encoder (unit: mm)
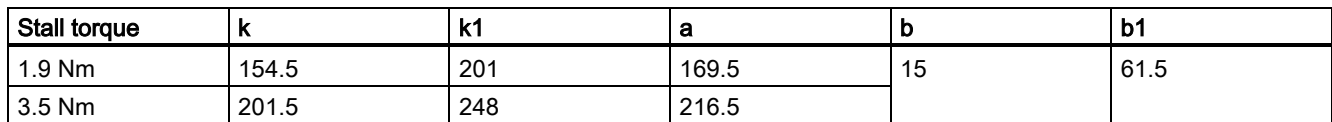
Stall torque	k	k1	a	b	b1
1.9 Nm	157	203.5	172	15	61.5
3.5 Nm	204	250.5	219		

Shaft height 65 mm, with incremental encoder (unit: mm)

Stall torque	k	k1	a	b	b1
4 Nm	148	202.5	163	15	69.5
6 Nm	181	235.5	196		
8 Nm	181	235.5	196		
11 Nm	214	268.5	229		
15 Nm	247	301.5	262		

Shaft height 65 mm, with absolute encoder (unit: mm)

Stall torque	k	k1	a	b	b1
4 Nm	151	205.5	166	15	69.5
6 Nm	184	238.5	199		
8 Nm	184	238.5	199		
11 Nm	217	271.5	232		
15 Nm	250	304.5	265		
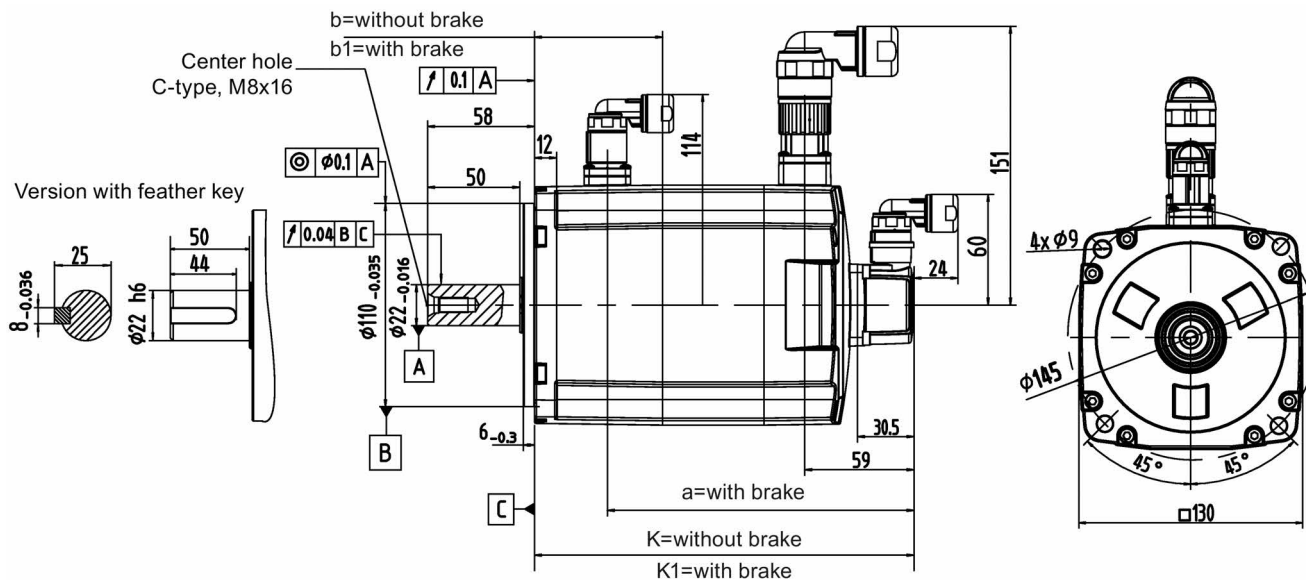
Shaft height 90 mm, with incremental encoder (unit: mm)
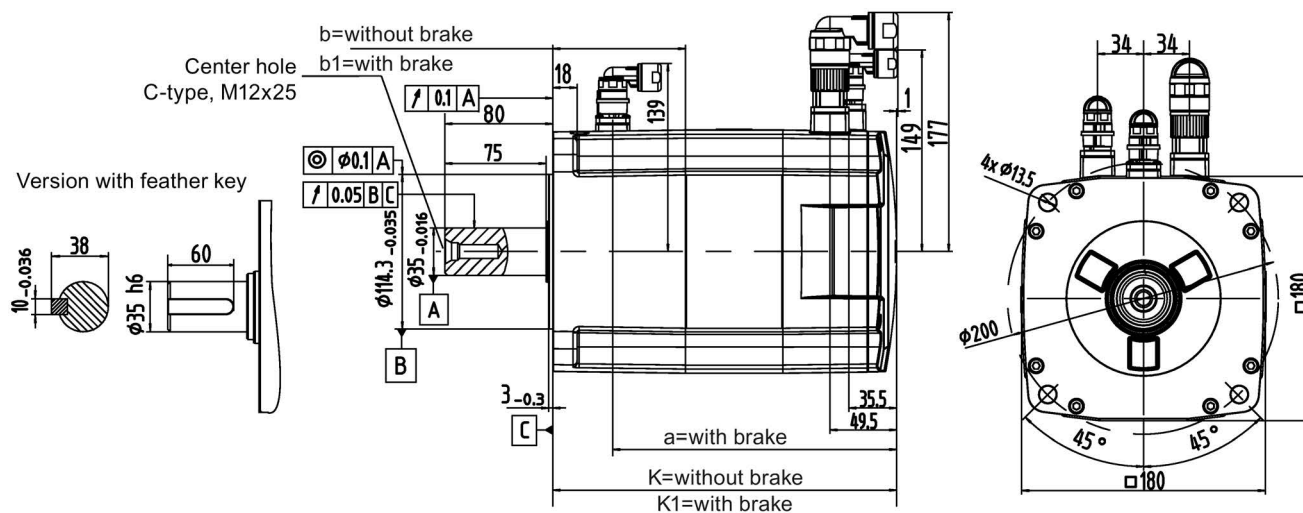
Stall torque	k	k1	a	b	b1
15 Nm	189.5	255	210.5	33	98.5
22 Nm	211.5	281	236.5		
30 Nm	237.5	307	262.5		
40 Nm	289.5	359	314.5		

Shaft height 90 mm, with absolute encoder (unit: mm)
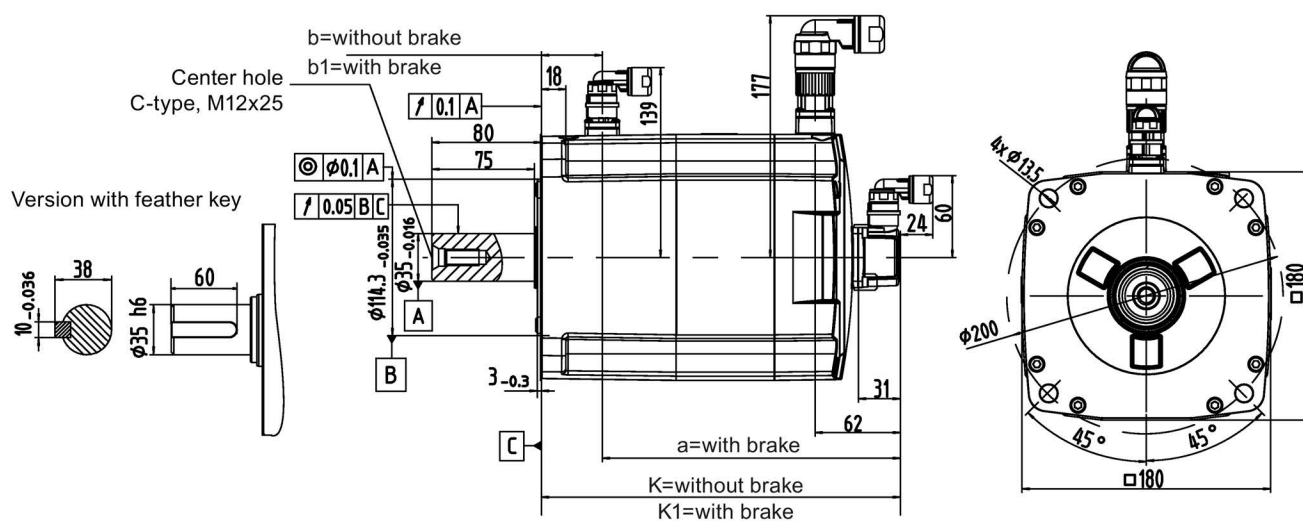
Stall torque	k	k1	a	b	b1
15 Nm	197	263	218	33	98.5
22 Nm	223	289	244		
30 Nm	249	315	270		
40 Nm	301	367	322		

3.3.2 Mounting the motor

⚠ WARNING
Personal injury and material damage
Some motors, especially the 1FL609❏ are heavy. The excessive weight of the motor should be considered and any necessary assistance required for mounting should be sought.
Otherwise, the motor can fall down during mounting. This can result in serious personal injury or material damage.

NOTICE
Damage to the motor
If the liquid enters the motor, the motor may be damaged
During motor installation or operation, make sure that no liquid (water, oil, etc.) can penetrate into the motor. Besides, when installing the motor horizontally, make sure that the cable outlet faces downward to protect the motor from ingress of oil or water.

NOTICE
Damage to the encoder
🚫 Do not exert any shock at the shaft end; otherwise, the encoder may be damaged.

Note

Using the eyebolts

The 1FL609❏ motor (90 mm shaft height) has two M8 screw holes for screwing in two eyebolts. Lift the 1FL609❏ motor only at the eyebolts.

Eyebolts that have been screwed in must be either tightened or removed after mounting.

To ensure better heat dissipation, install a flange between the machine and the motor. You can install the motor onto the flange with four screws as shown in the following figure.
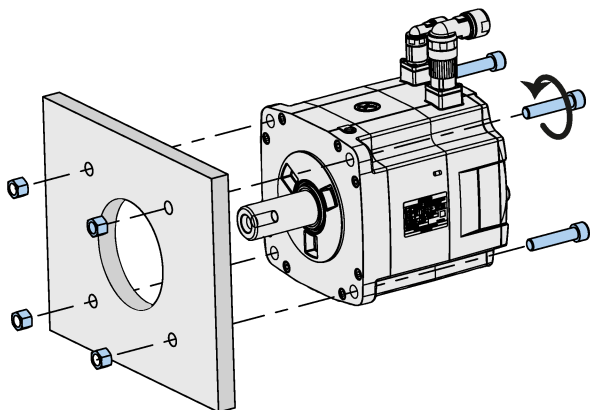
Motor	Screw	Recommended flange size (mm)	Tightening torque (Nm)	Flange material
1FL604❏	4 x M6	270 x 270 x 10	8	Aluminum alloy
1FL606❏	4 x M8	390 x 390 x 15	20	
1FL609❏	4 x M12	420 x 420 x 20	85	

3.4 Notes on the laying of cables in drag chains

The MOTION-CONNECT cables between the drive and the motor, and setpoint cables and Drive Bus trailing cables between the drive and the controller satisfy requirements for use in drag chains.

Observe the following notes when laying these cables in drag chains:

Laying cables separately in the drag chain

- To ensure a long service life of the drag chain and cable, lay cables made of different materials separately with separating webs in the drag chain.
- Fill the webs evenly to ensure that the position of cables does not change during operation.
- Distribute cables as symmetrically as possible according to their weights and dimensions.
- Use webs to separate cables with different outer diameters.
- Keep cables untwisted in the drag chain.
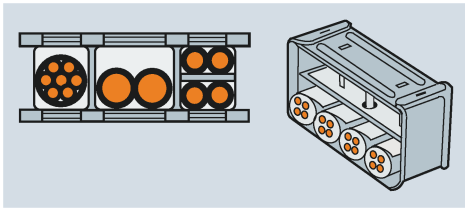
Observing minimum bending radius requirements

- Cables must be able to move without constraint, especially in the bending radii of the chain.
- Observe the specified minimum bending radii.
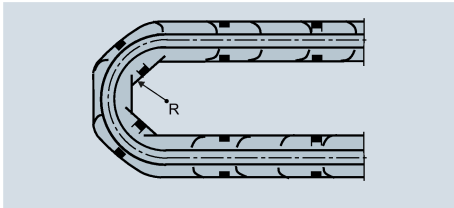
Fixing cables

- Make sure that cables in the drag chain are unattached and movable.
- Place the cable fixture in a "dead" zone at each end, suitably far away from each end point of the moving parts.
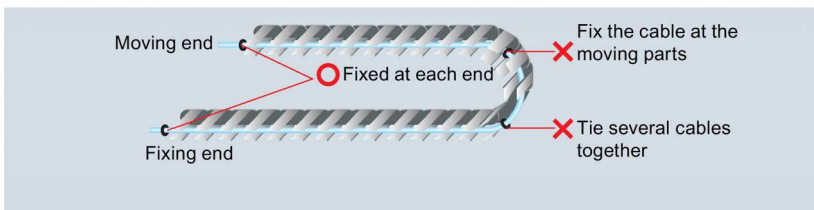
4 Connecting

NOTICE
Damage to the control system
The high-voltage components have strong interference on 24 VDC power supplies.
If the 24 VDC power supply is not isolated from high-voltage components, the control system may be damaged.
The 24 VDC protective extra-low voltage **must** be generated as a protective extra-low voltage with safe electrical isolation (according to IEC 204-1, Section 6.4, PELV), and grounded by with a PELV M signal connection to the central grounding point of the system.

4.1 Interfaces on the PPU and MCP

NOTICE
Failing to connect PE terminals to the ground will cause safety problems
The PE terminals on the PPU and MCP must be connected to the ground; otherwise, it will cause safety problems and unexpected system conditions.

Interfaces on the PPU
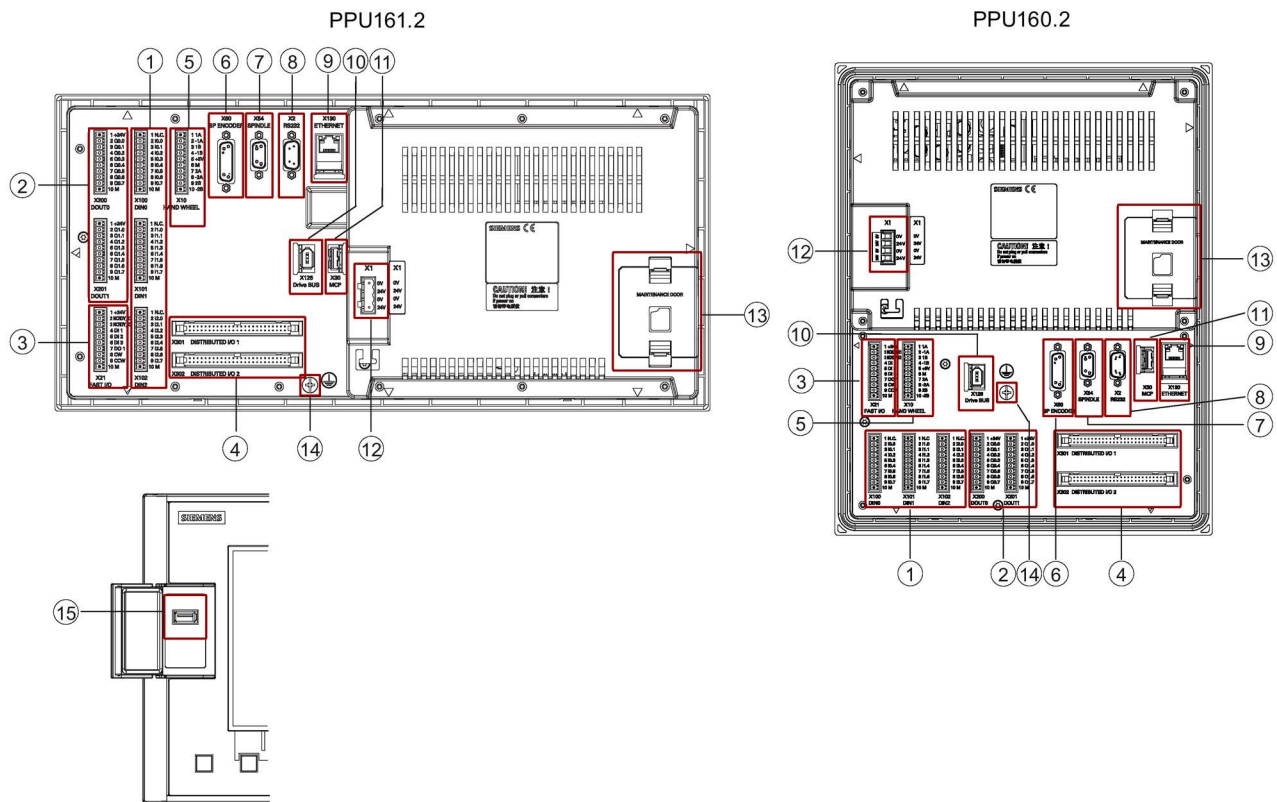
Legend	Interface	Description
PPU back		
①	X100, X101, X102	Digital inputs
②	X200, X201	Digital outputs
③	X21	FAST I/O
④	X301, X302	Distributed I/O
⑤	X10	Handwheel inputs

⑥	X60	Spindle encoder interface
⑦	X54	Analog spindle interface
⑧	X2	RS232 interface
⑨	X130	Ethernet interface
⑩	X126	Drive Bus interface
⑪	X30	USB interface, for connection with the MCP
⑫	X1	Power supply interface, +24 VDC power supply
⑬	-	Slot for the system CompactFlash Card (CF card)
⑭	-	PE terminal, for connection with the ground

PPU front

| ⑮ | - | USB interface |

Interfaces on the MCP
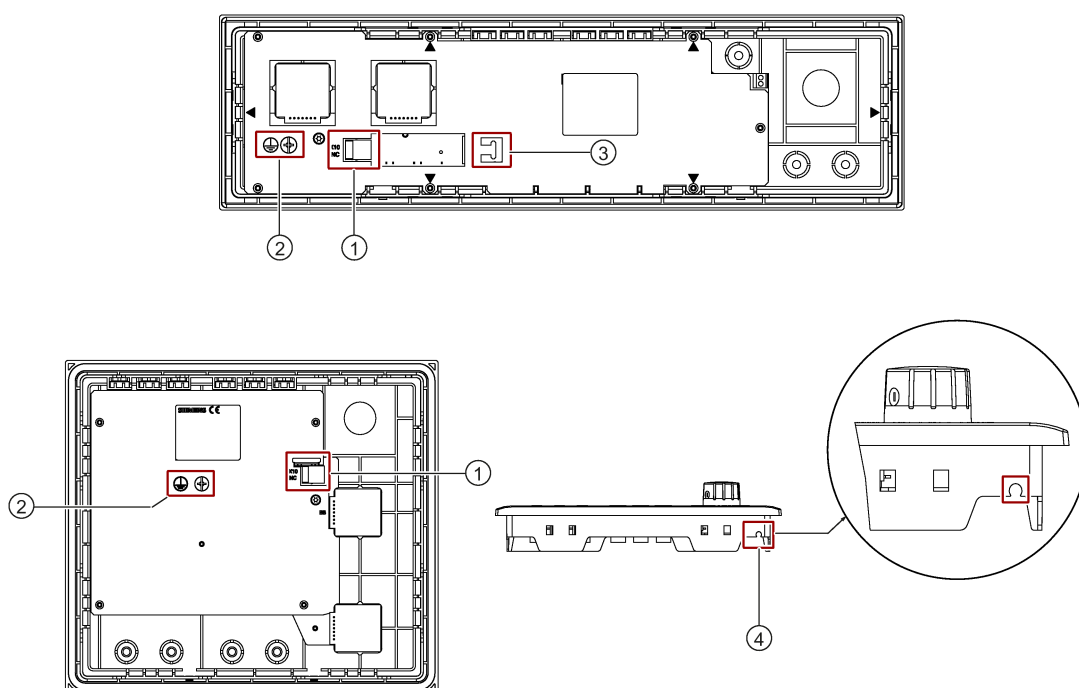
Legend	Interface	Description
①	X10	USB interface, for connection with the PPU
②	-	PE terminal, for connection with the ground
③	-	Reserved hole for plastic tie which is used to fix the USB cable connecting the PPU with the MCP
④	-	Reserved hole for fixing the USB cable connecting the PPU and the MCP

Note

The two kinds of vertical MCP, with a reserved hole for the handwheel and with an override switch for the spindle, have the same mechanical interfaces design for the USB cable, PE terminal and reserved hole for fixing the USB cable on the back. The illustration above takes the version with a spindle override switch for example.

4.1.1 Digital input interfaces - X100, X101, X102

Pin assignment

Type	Mini Combicon 10-pin
Cable	Max. length: 10 m
	Max. cross-section: 1.5 mm² (when using one cable per connection)
Inputs	Permissible level (including ripple)
	High level: 20.4 V to 28.8 V Low level: -3 V to +5 V

Pin	X100 (DIN0)	X101 (DIN1)	X102	Remarks
1	N.C.	N.C.	N.C.	Not assigned
2	I0.0	I1.0	I2.0	Digital input
3	I0.1	I1.1	I2.1	Digital input
4	I0.2	I1.2	I2.2	Digital input
5	I0.3	I1.3	I2.3	Digital input
6	I0.4	I1.4	I2.4	Digital input
7	I0.5	I1.5	I2.5	Digital input
8	I0.6	I1.6	I2.6	Digital input
9	I0.7	I1.7	I2.7	Digital input
10	M	M	M	External ground
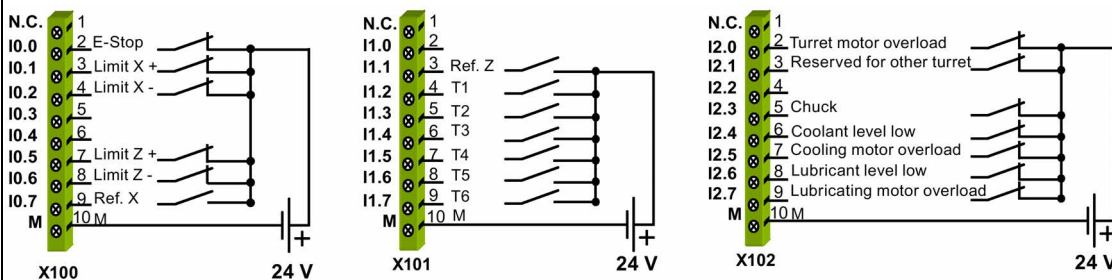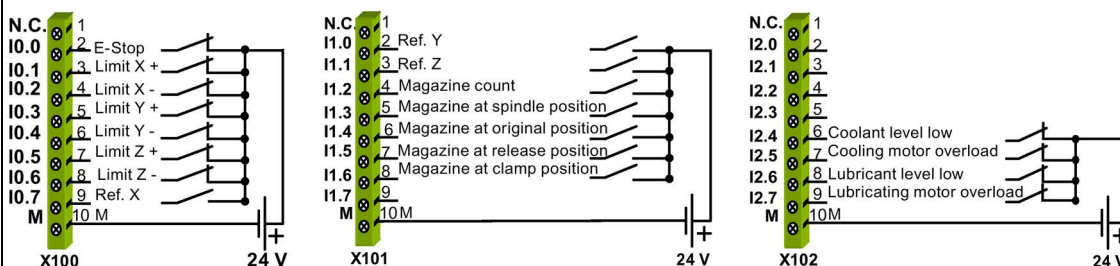
Connecting according to the default PLC program

Turning

Milling

Note

End sleeves are necessary if you use two cables per connection.

Fasten the cables to the screw terminals and plug the terminals into interfaces X100, X101 and X102 correctly.

4.1.2 Digital output interfaces - X200, X201

Pin assignment

Type	Mini Combicon 10-pin
Cable	Max. length: 10 m
	Max. cross-section: 1.5 mm² (when using one cable per connection)
Outputs	Rated digital output current: 250 mA

Pin	X200 (DOUT0)	X201 (DOUT1)	Remarks
1	+24 V	+24 V	+24 V input (20.4 V to 28.8 V)
2	Q0.0	Q1.0	Digital output
3	Q0.1	Q1.1	Digital output
4	Q0.2	Q1.2	Digital output
5	Q0.3	Q1.3	Digital output
6	Q0.4	Q1.4	Digital output
7	Q0.5	Q1.5	Digital output
8	Q0.6	Q1.6	Digital output
9	Q0.7	Q1.7	Digital output
10	M	M	External ground
Connecting according to the default PLC program			
Turning			
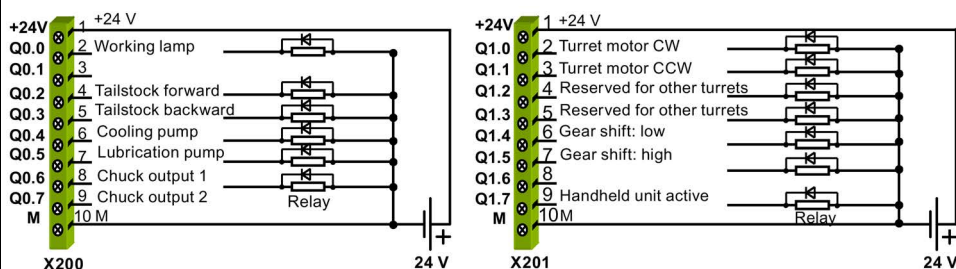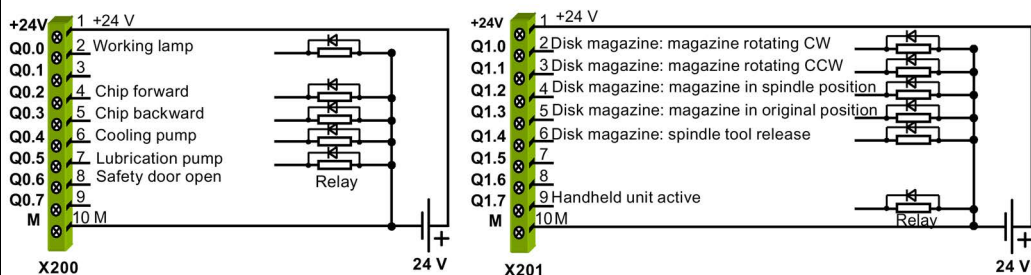
| **Milling** | | | |

Note

End sleeves are necessary if you use two cables per connection.
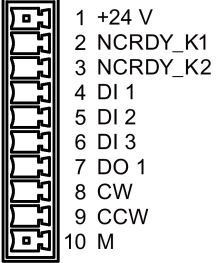
Fasten the cables to the screw terminals and plug the terminals into interfaces X200, X201 correctly.

4.1.3   Fast input/output - X21

Pin assignment

Type   Mini Combicon 10-pin

Cable   Shielded cable

                Max. length: 10 m

                Max. cross-section: 1.5 mm² (when use one cable per connection)

Inputs   Permissible level (including ripple)

                High level: 20.4 V to 28.8 V   Low level: -3 V to +5 V

Illustration	Pin	Signal	Comment
1 +24 V 2 NCRDY_K1 3 NCRDY_K2 4 DI 1 5 DI 2 6 DI 3 7 DO 1 8 CW 9 CCW 10 M X21 FAST I/O	1	+24 V	+24 V input (20.4 V to 28.8 V)
	2	NCRDY_1	NC ready signal contact 1
	3	NCRDY_2	NC ready signal contact 2
	4	DI1	Digital input, for connection to probe 1
	5	DI2	Digital input, for connection to probe 2
	6	BERO_SPINDLE or DI3	Spindle bero or digital input
	7	DO1	Fast output
	8	CW	Spindle rotating clockwise
	9	CCW	Spindle rotating counter-clockwise
	10	M	Ground

Connecting

You can connect the fast I/O to the inverter to control the spindle rotating direction (unipolar):
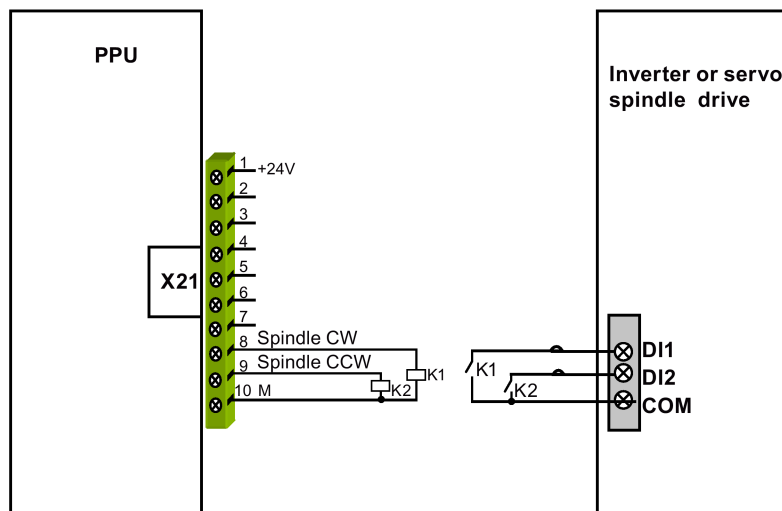
NC readiness is in the form of a relay contact (NO). It must be integrated into an EMERGENCY STOP circuit. The connection diagram is shown as follows:
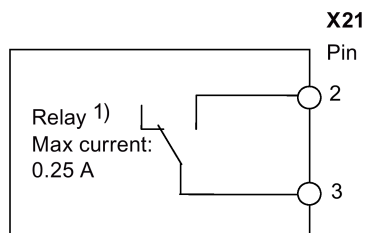
[1] When the NC is not ready, the contact is open; otherwise, the contact is closed.

Connection cables

End sleeves are necessary if you use two cables per connection.

Fasten the cables to the screw terminals and plug the terminal into the interface X21.

You can buy the shielded cables from a third-party manufacturer.

Note

To ensure optimum interference immunity, use only the shielded cable to connect the FAST I/O terminals (X21).

4.1.4 Distributed I/O - X301, X302

Pin assignment

Type	50-pin socket
Inputs	Permissible level (including ripple)
	High level: 20.4 V to 28.8 V
	Low level: -3 V to +5 V
Outputs	Rated digital output current: 250 mA

Pin	Signal	Comment	Pin	Signal	Comment
X301 DISTRIBUTED I/O 1					
1	M	External ground	26	I5.7	Digital input
2	+24 V	+24 V output [1]	27	-	Not assigned
3	I3.0	Digital input	28	-	Not assigned
4	I3.1	Digital input	29	-	Not assigned
5	I3.2	Digital input	30	-	Not assigned
6	I3.3	Digital input	31	Q2.0	Digital output
7	I3.4	Digital input	32	Q2.1	Digital output
8	I3.5	Digital input	33	Q2.2	Digital output
9	I3.6	Digital input	34	Q2.3	Digital output
10	I3.7	Digital input	35	Q2.4	Digital output
11	I4.0	Digital input	36	Q2.5	Digital output
12	I4.1	Digital input	37	Q2.6	Digital output
13	I4.2	Digital input	38	Q2.7	Digital output
14	I4.3	Digital input	39	Q3.0	Digital output
15	I4.4	Digital input	40	Q3.1	Digital output
16	I4.5	Digital input	41	Q3.2	Digital output
17	I4.6	Digital input	42	Q3.3	Digital output
18	I4.7	Digital input	43	Q3.4	Digital output
19	I5.0	Digital input	44	Q3.5	Digital output
20	I5.1	Digital input	45	Q3.6	Digital output
21	I5.2	Digital input	46	Q3.7	Digital output
22	I5.3	Digital input	47	+24 V	+24 V input
23	I5.4	Digital input	48	+24 V	+24 V input
24	I5.5	Digital input	49	+24 V	+24 V input
25	I5.6	Digital input	50	+24 V	+24 V input

Pin	Signal	Comment	Pin	Signal	Comment

X302   DISTRIBUTED I/O 2

Pin	Signal	Comment	Pin	Signal	Comment
1	M	External ground	26	I8.7	Digital input
2	+24 V	+24 V output [1]	27	-	Not assigned
3	I6.0	Digital input	28	-	Not assigned
4	I6.1	Digital input	29	-	Not assigned
5	I6.2	Digital input	30	-	Not assigned
6	I6.3	Digital input	31	Q4.0	Digital output
7	I6.4	Digital input	32	Q4.1	Digital output
8	I6.5	Digital input	33	Q4.2	Digital output
9	I6.6	Digital input	34	Q4.3	Digital output
10	I6.7	Digital input	35	Q4.4	Digital output
11	I7.0	Digital input	36	Q4.5	Digital output
12	I7.1	Digital input	37	Q4.6	Digital output
13	I7.2	Digital input	38	Q4.7	Digital output
14	I7.3	Digital input	39	Q5.0	Digital output
15	I7.4	Digital input	40	Q5.1	Digital output
16	I7.5	Digital input	41	Q5.2	Digital output
17	I7.6	Digital input	42	Q5.3	Digital output
18	I7.7	Digital input	43	Q5.4	Digital output
19	I8.0	Digital input	44	Q5.5	Digital output
20	I8.1	Digital input	45	Q5.6	Digital output
21	I8.2	Digital input	46	Q5.7	Digital output
22	I8.3	Digital input	47	+24 V	+24 V input
23	I8.4	Digital input	48	+24 V	+24 V input
24	I8.5	Digital input	49	+24 V	+24 V input
25	I8.6	Digital input	50	+24 V	+24 V input

[1] Make sure that the current at pin 2 of X301 or X302 does not exceed the maximum current I_{out} = 0.25 A; otherwise, the controller could be damaged.

Connecting

⚠ **DANGER**

The 24 V power supply must be protective extra-low voltage in accordance with EN60204-1, Section 6.4, PELV (with M ground).

⚠ **CAUTION**

Be sure not to connect the pin 2 of X301/302 to ground; otherwise, the CNC controller of the power supply could be damaged!

Note

The 24 V output of X301/302 pin 2 comes from pins 47 to 50.

Note

Addressing ranges

X301: IB3, IB4, IB5, QB2, QB3

X302: IB6, IB7, IB8, QB4, QB5

Note

The connecting cable between the power source, load current supply connection, and associated reference potential M must **not** exceed the maximum permissible length of 10 m.

Digital inputs

The diagram below shows you how to connect the connector pins of the digital inputs at interface X301 (example). You can connect connector X302 in the same way.
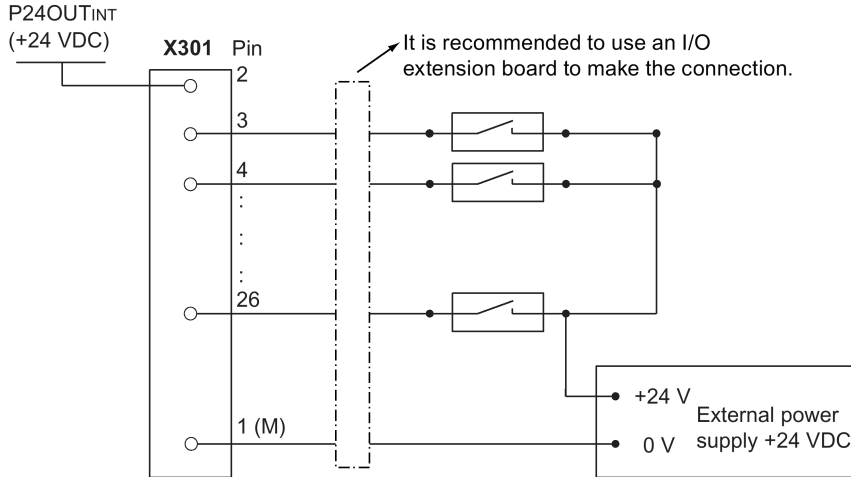
Note

When using an external power supply, you must connect the 24 V (permissible range: 20.4 V to 28.8 V) power supply for the digital outputs to **all the four power input pins** (X301, X302: **pins 47, 48, 49, 50**).

Digital outputs

The diagram below shows you how to connect the connector pins of the digital outputs at interface X301 (example). You can connect connector X302 in the same way.
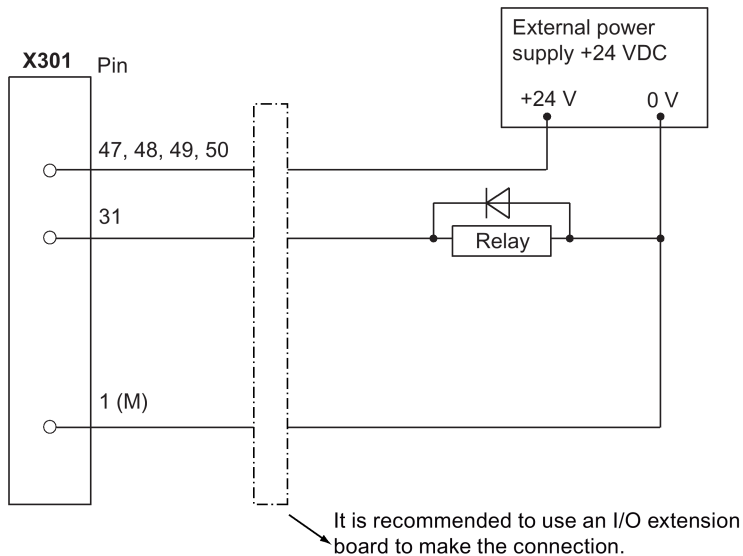
To supply the digital outputs, you must connect an external 24 VDC power supply (X301, X302: pins 47, 48, 49, 50).

You must also connect the reference ground of the external power supply to X301, X302: Pin 1 (M).

> ⚠ **CAUTION**
>
> You must ensure that the max. current consumption at pin 47, pin 48, pin 49 or pin 50 does **not** exceed 1 A.

Note

You must connect the 24 V power supply for the digital outputs to **all the four power input pins** (X301, X302: **pins 47, 48, 49, 50**).

External power supply

When using an external power supply for the digital inputs, you must connect the reference ground to X301, X302: Pin 1 (M).

Connecting according to the default PLC program

The control system has integrated with a default PLC application. If you perform the commissioning work with the default PLC application, arrange wiring as follows.

X301   Milling   X301   Turning
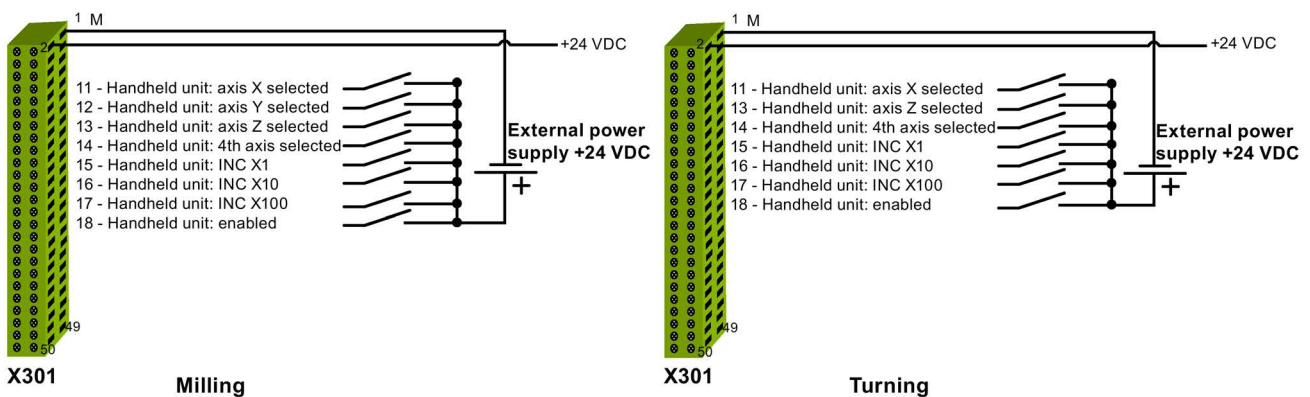
4.1.5   Handwheel inputs - X10

Pin assignment

Type	Mini Combicon 10-pin
Cable	Max. length: 3 m

Illustration	Pin	Signal	Comment
1 1A 2 -1A 3 1B 4 -1B 5 +5V 6 M 7 2A 8 -2A 9 2B 10 -2B X10 HAND WHEEL	1	1A	Track A, handwheel 1
	2	-1A	Negative Track A, handwheel 1
	3	1B	Track B, handwheel 1
	4	-1B	Negative Track B, handwheel 1
	5	+5 V	+5 V power output
	6	M	Ground
	7	2A	Track A, handwheel 2
	8	-2A	Negative Track A, handwheel 2
	9	2B	Track B, handwheel 2
	10	-2B	Negative Track B, handwheel 2

Connecting

You are allowed to connect at most two electronic handwheels at connector X10 on the PPU.
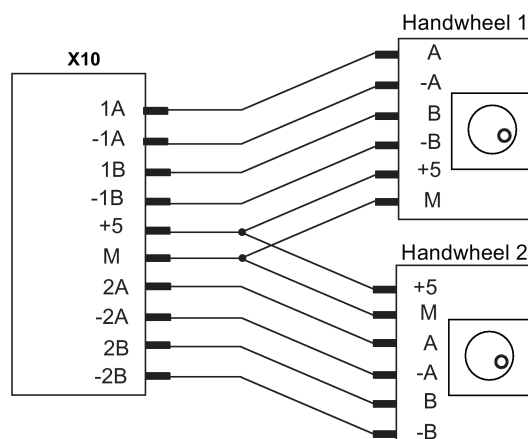
The handwheels must meet the following requirements:

Transmission procedure	5 V square wave signals (TTL level or RS422)
Signals	Track A as a true and negative signal ($U_{a1}\overline{U_{a1}}$)
	Track B as a true and negative signal ($U_{a2}\overline{U_{a2}}$)
Max. input frequency	500 kHz
Phase shift between Track A to Track B	$90° \pm 30°$
Supply	5 V, max. 250 mA
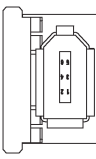
4.1.6   Drive Bus interface - X126

Pin assignment

Type	IEEE 1394, 6-pin, female
Cable	Type: Drive Bus cable/Drive Bus trailing cable
	Max. length: 20 m
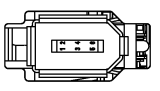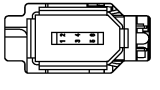
Illustration	Pin	Signal	Comment
	1	PB_N	Negative RxD/TxD of Drive Bus
	2	1P5	+5 V
	3	PB	Positive RxD/TxD of Drive Bus
	4	NULL	Not connected
X126	5	PB_RTS	Request to send
Drive BUS	6	1M5	Ground

Connecting

Drive Bus interfaces on the SINAMICS V70 - X10, X11

Illustration	Pin No.	Signal	Description
	1	A	Differential signal A
X11	2	P5PB	+ 5 V
	3	B	Differential signal B
	4	NC	Not assigned
X10	5	RTS	Request to send
	6	MPB	0 V

Connecting example

> The Drive Bus terminator must be installed on the last Drive Bus interface.
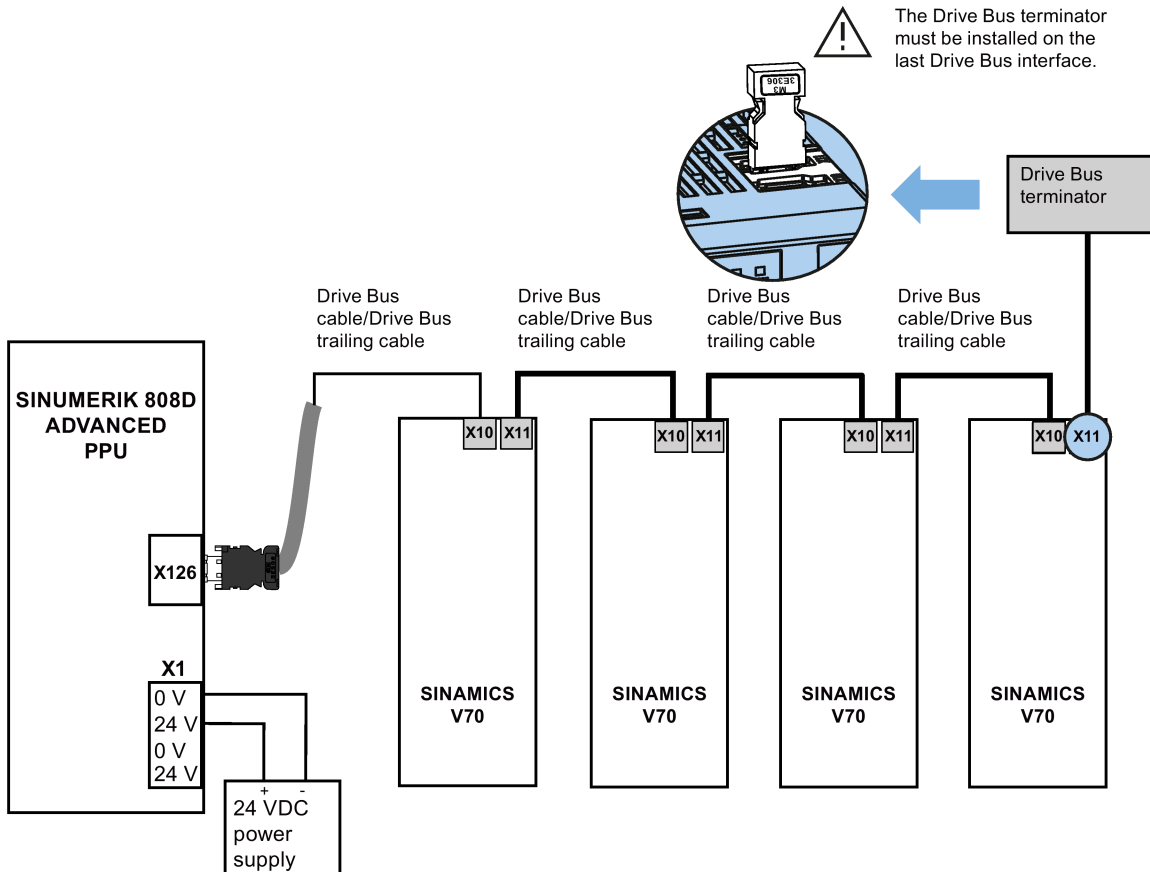
Note
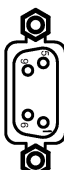
You must install the Drive Bus terminator (that ships with the PPU) on X11 of the last servo drive; otherwise, the servo system cannot work properly.

4.1.7 Analog spindle interface - X54, spindle encoder interface - X60

Interface X54 is for connecting the PPU to the inverter or servo spindle drive. Interface X60 is for connecting the PPU to the spindle encoder.

Pin assignment - X54

| Type | Sub-D, 9-pin, female |
| Cable | Max. length: 10 m |

Illustration	Pin	Signal	Comment
X54 SPINDLE	1	AO	Analog voltage
	2	-	not assigned
	3	-	not assigned
	4	-	not assigned
	5	SE1	Analog drive enable (contact: electrically isolated n.o. contact)
	6	SE2	Analog drive enable (contact: electrically isolated n.o. contact)
	7	-	not assigned
	8	-	not assigned
	9	AGND	Ground

Pin assignment - X60

Type   Sub-D, 15-pin, female
Cable   Type: encoder cable
              Max. length: 10 m

Illustration	Pin	Signal	Comment
X60 SP ENCODER	1	-	Not assigned
	2	-	Not assigned
	3	-	Not assigned
	4	+5 V	+5 V power supply
	5	-	Not assigned
	6	+5 V	+5 V power supply
	7	M	Ground
	8	-	Not assigned
	9	M	Ground
	10	Z	Zero mark
	11	Z_N	Zero mark, negative
	12	B_N	Track B, negative
	13	B	Track B
	14	A_N	Track A, negative
	15	A	Track A

Connecting

Connecting the inverter or servo spindle drive (unipolar)
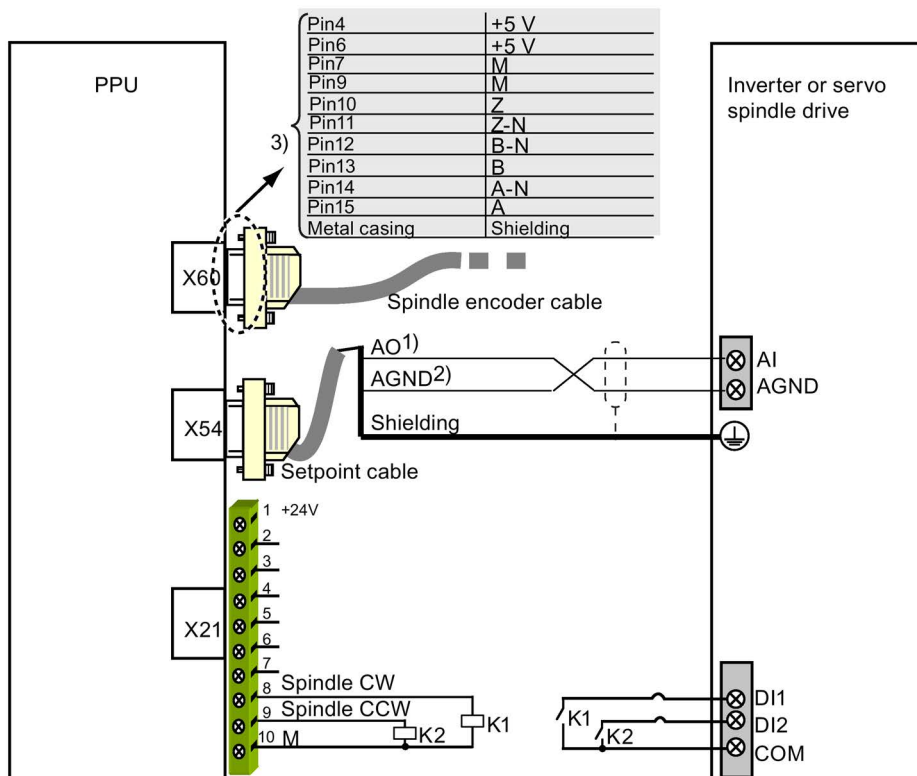
1) 10 V analog voltage

2) 0 V signal

3) Use twisted pair cables for signals A/A_N, B/B_N, Z/Z_N, and +5 V/M.

Connecting the inverter or servo spindle drive (bipolar)

Pin4	+5 V
Pin6	+5 V
Pin7	M
Pin9	M
Pin10	Z
Pin11	Z-N
Pin12	B-N
Pin13	B
Pin14	A-N
Pin15	A
Metal casing	Shielding
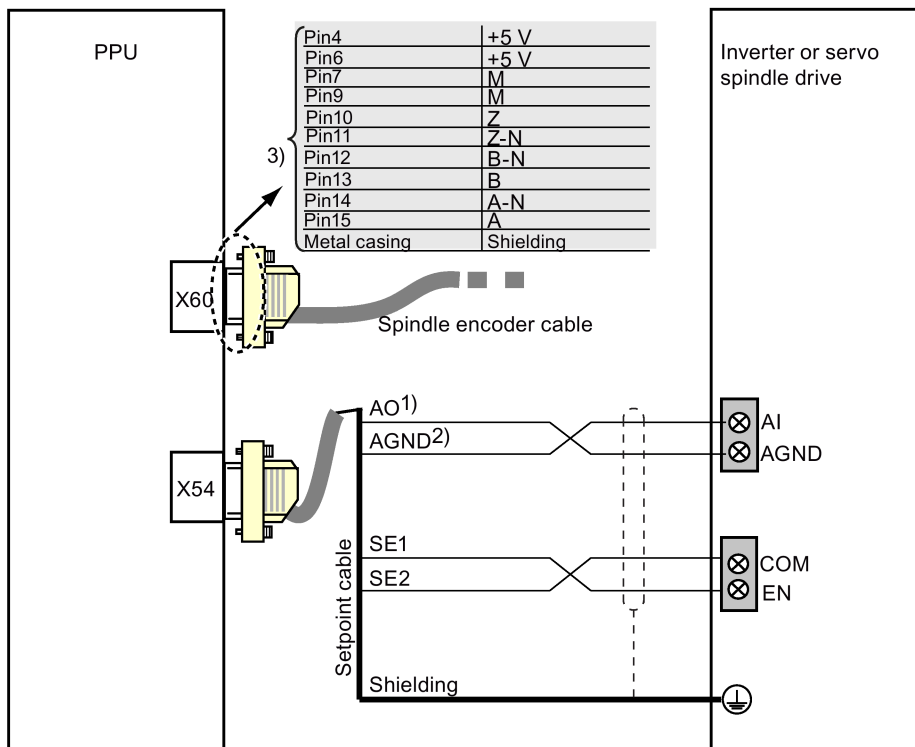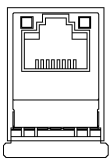
1) +/- 10 V analog voltage

2) 0 V signal

3) Use twisted pair cables for signals A/A_N, B/B_N, Z/Z_N, and +5 V/M.

4.1.8   Ethernet interface - X130

Pin assignment

Type   8-pin RJ45 socket
Cable   Type: Ethernet cable

Illustration	Pin	Signal	Comment
X130 ETHERNET	1	MX1+	Data 1
	2	MX1-	Data 1
	3	MX2+	Data 2
	4	MX3+	Data 3
	5	MX3-	Data 3
	6	MX2-	Data 2
	7	MX4+	Data 4
	8	MX4-	Data 4

Note
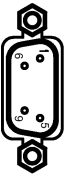
The length of the Ethernet cable must be less than 30 m or the communication will be unstable.

4.1.9   RS232 interface - X2

You can connect a PC to the PPU version 161.2/160.2 via an RS232 port to establish communication between the PC and the control system.

Pin assignment

Type   Sub-D, 9-pin, male

Cable   Type: RS232

              Max. length: 10 m

Illustration	Pin	Signal name	Signal type	Comment
X2 RS232	1	-	-	Not assigned
	2	RxD	I	Receive data
	3	TxD	O	Transmit data
	4	DTR	O	Data terminal ready
	5	M	VO	Ground
	6	DSR	I	Request set ready
	7	RTS	O	Request to send
	8	CTS	I	Clear to send
	9	-	-	Not assigned

PPU (9-pin Sub-D)   PC (9-pin Sub-D)

PPU (9-pin Sub-D)   PC (25-pin Sub-D)
                                           Field PG P3 (6ES7710-xx....)

Note
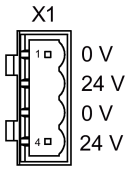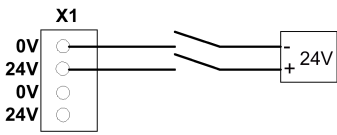
Use only shielded twisted pair cables; You must connect the cable shield to the metal or metalized connector casing of the control system.

4.1.10   Power supply interface - X1

The PPU uses a 24 VDC power supply. You can connect the 24 VDC power supply via interface X1. For more information about the 24 VDC power supply, see Section "Options (Page 22)".

Pin assignment
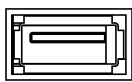
Type   Combicon 4-pin

Cable   Max. length: 10 m

Illustration	Pin1	Signal	Name	Comment
	1	0 V	M24	0 V
	2	24 V	P24	+24 V
	3	0 V	M24	0 V
	4	24 V	P24	+24 V
	Note: The 0 V terminals as well as the 24 V terminals are internally connected in parallel. This means that you can connect the 24 V power supply to either of the terminal pairs.			

4.1.11   USB interface on the front cover of the PPU

Pin assignment

Type   USB socket, type A

Cable   Type: USB 1.1 cable

                    Max. length: 3 m
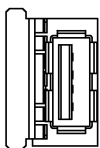
Illustration	Pin	Signal name	Signal type	Comment
	1	P5_USB0	VO	5 V power supply
	2	DM_USB0	I/O	USB data-
	3	DP_USB0	I/O	USB data+
	4	M	VO	Ground

4.1.12   USB interface - X30

There is a USB interface on the back of the PPU. This USB interface is used for connecting with the MCP.

Pin assignment

Type   USB socket, type A Combicon 4-pin

Cable   Type: USB cable (0.5 m)

Illustration	Pin	Signal name	Signal type	Comment
	1	P5_USB0	VO	5 V power supply
	2	DM_USB0	I/O	USB data-
	3	DP_USB0	I/O	USB data+
X30 MCP	4	M	VO	Ground

Connecting

The illustration below shows the connection between the PPU and the MCP with the MCP connection cable.
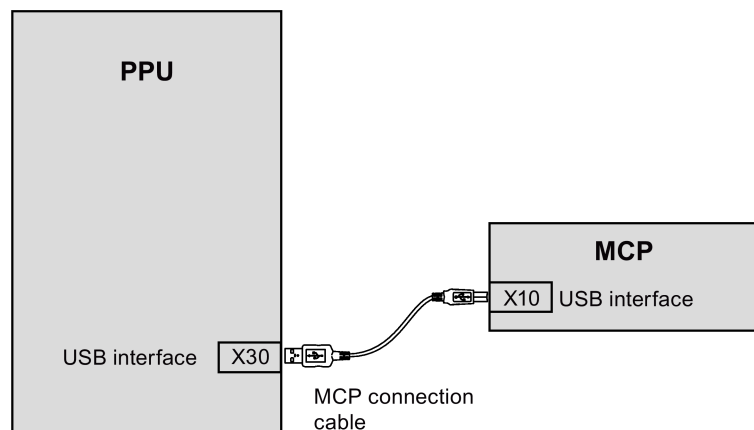
4.1.13   Slot for the system CF card

The system CF card is installed on the PPU at the factory.

①   Maintenance door   ②   CF card
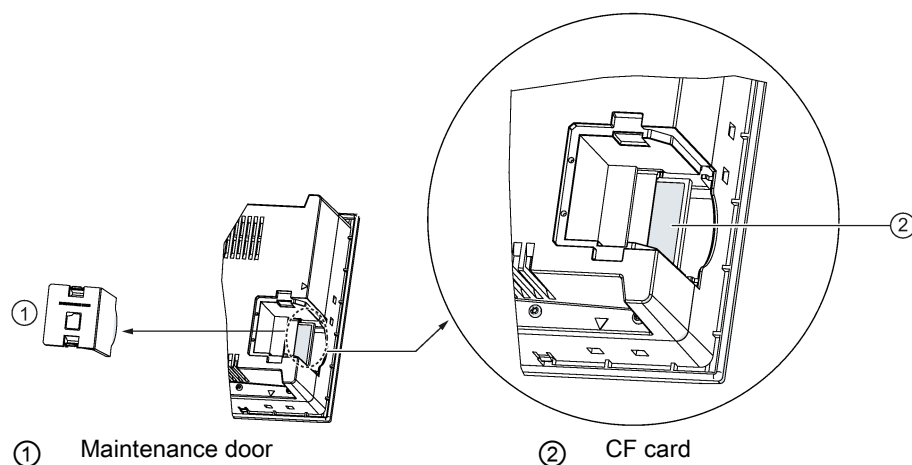
Note

The maintenance door is accessible only by the Siemens service personnel.

Do not touch or remove the system CF card under any conditions.

4.2 Interfaces on the SINAMICS V70 servo system

The SINAMICS V70 servo system, consisting of the SINAMICS V70 servo drive and SIMOTICS S-1FL6 servo motor, is an economical closed-loop servo drive solution for machine tool applications. It is designed to be used with the SINUMERIK 808D ADVANCED controller. The SINAMICS V70 is available in three frame sizes (FS) including FSA, FSB, and FSC.

Interfaces on the SINAMICS V70 FSA (with detachable terminal blocks)
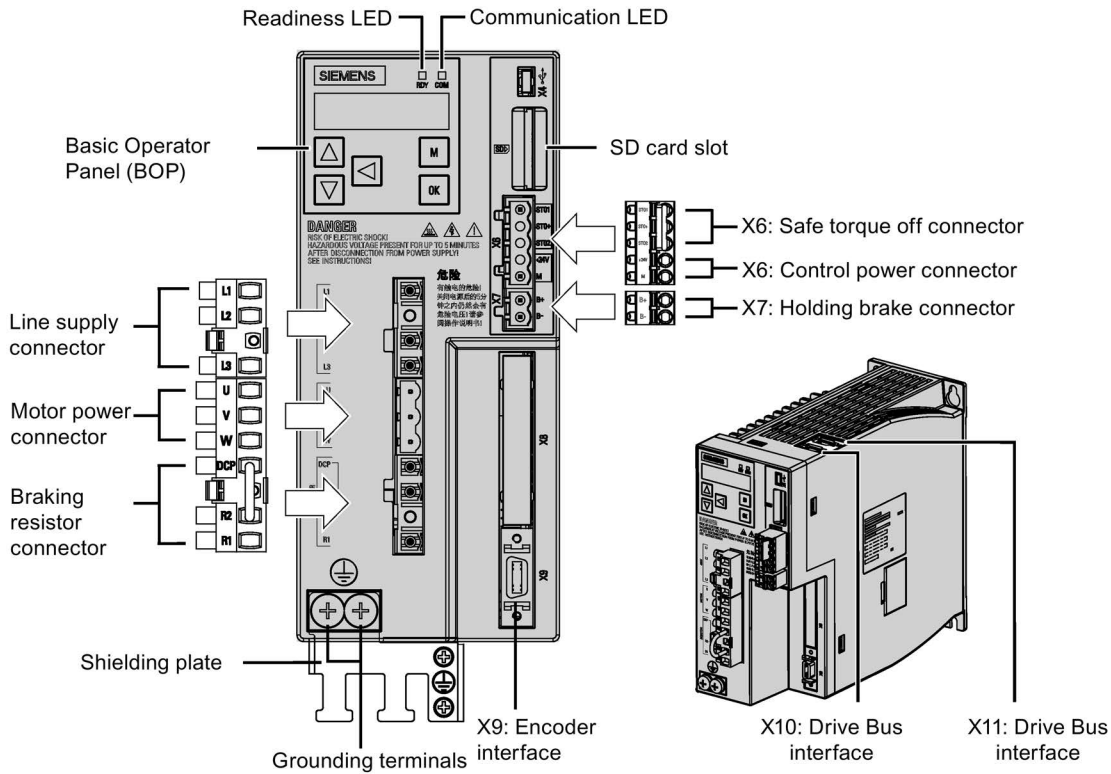
Interfaces on the SINAMICS V70 FSB/FSC (with screw terminals)

Readiness LED — Communication LED

Grounding terminal

Cable clamp

Basic Operator Panel (BOP)

Line supply terminals

Motor power terminals

Braking resistor connector

Cable clamp

Shielding plate

SD card slot

X6: Safe torque off connector

X6: Control power connector

X7: Holding brake connector

X9: Encoder interface

Grounding terminals

Terminal door   X10: Drive Bus interface   X11: Drive Bus interface

---
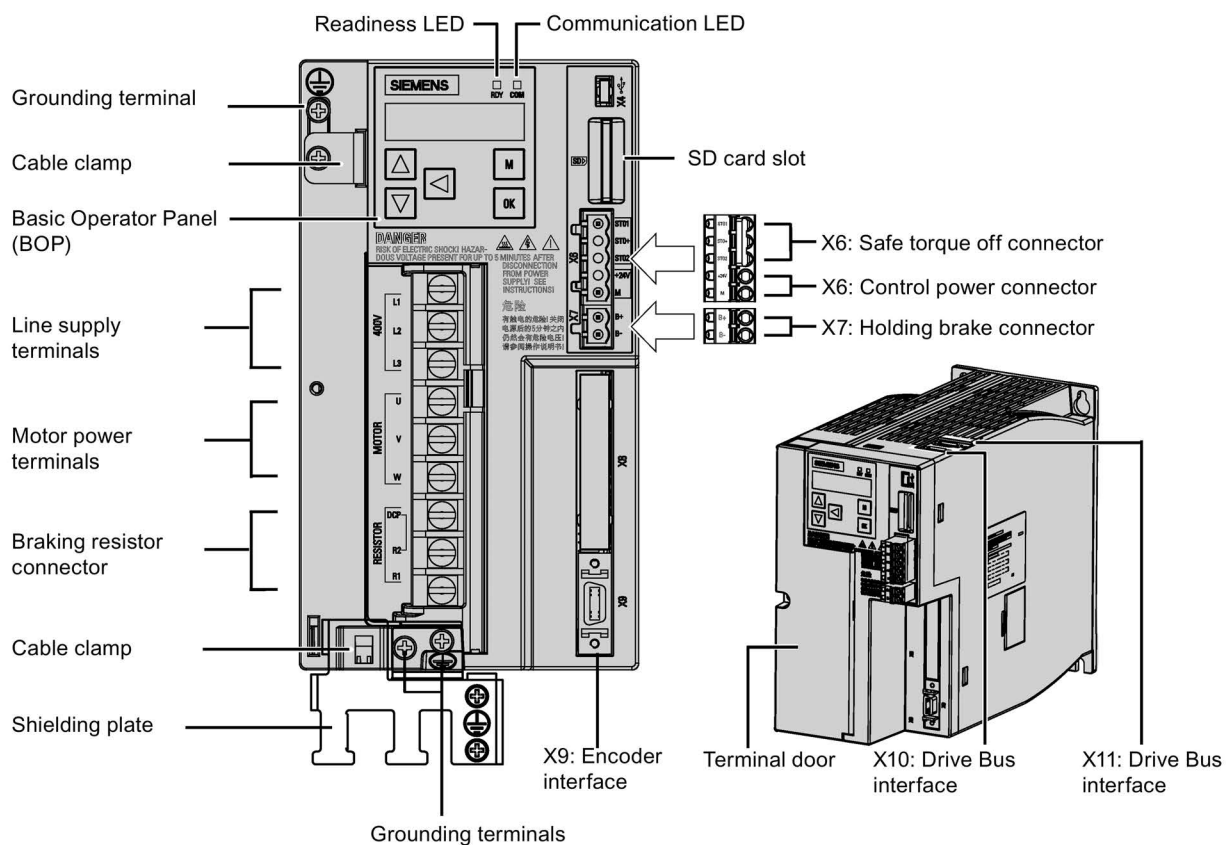
Note

For more information about the connection of the X10 and X11, see Section "Drive Bus interface - X126 (Page 50)".
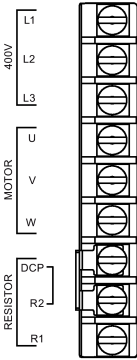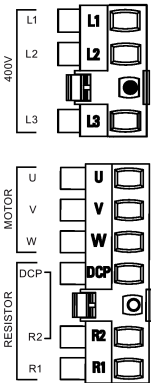
Interfaces on the SIMOTICS S-1FL6 motor

Power connector

Brake connector

Incremental encoder connector

Flange

Oil seal

Shaft

Motor with incremental encoder

Power connector

Brake connector

Flange

Oil seal

Absolute encoder connector

Shaft

Motor with absolute encoder
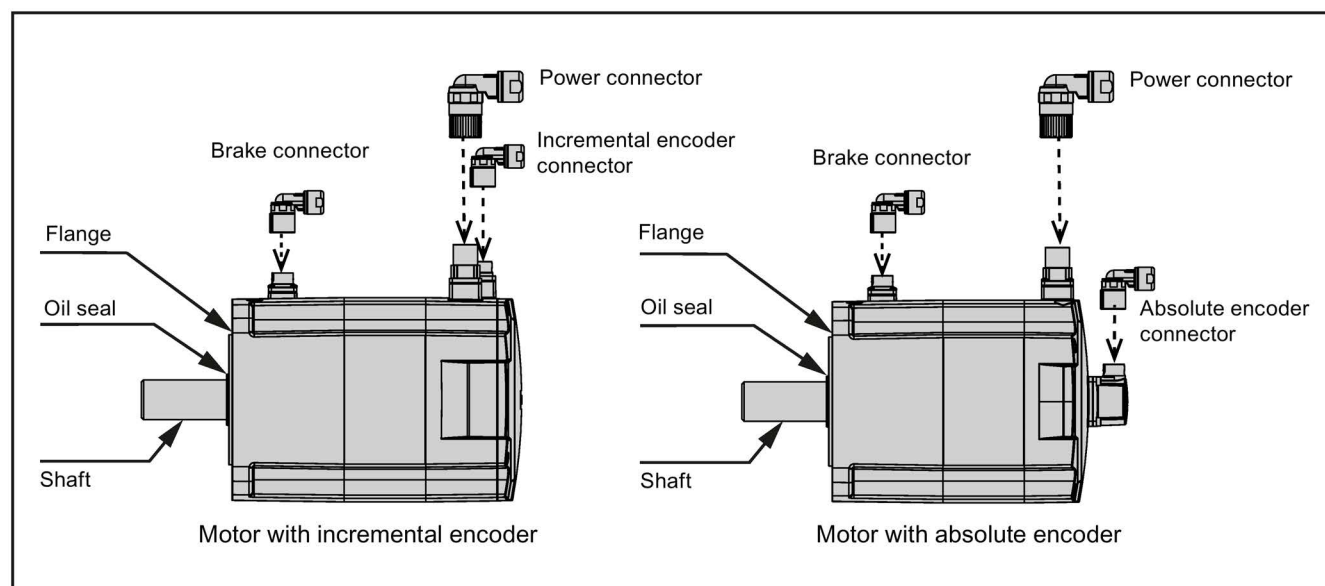
4.2.1 Main circuit wiring

4.2.1.1 Main circuit interfaces
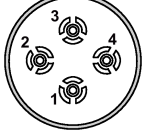
Main circuit interfaces (drive side)

Type	Illustration		Signal	Description
Line supply input interface	FSB, FSC [1]:	FSA [2]:	Line phase L1 Line phase L2 Line phase L3	3 phase 380 VAC to 480 VAC
Motor power interface			Motor phase U Motor phase V Motor phase W	Connects to the SIMOTICS S-1FL6 motor
Internal/external braking resistor interface			Digitally controlled potentiometer (DCP) Resistor 2 (R2) Resistor 1 (R1)	DCP is connected to R2 at the factory
Grounding connector			-	For connecting the power supply grounding connector and the servo motor grounding connector
Maximum cable cross-section: 2.5 mm^2				

[1] The screw type for FSB and FSC is M4 and the recommended tightening torque is 2.25 Nm.

[2] The screw type for FSA is M2.5 and the recommended tightening torque is 0.4 Nm to 0.5 Nm.

Main circuit interface (motor side)

Type	Illustration	Signal	Description
Power connector		1: U	Phase U
		2: V	Phase V
		3: W	Phase W
		4: PE	Protective earthing

4.2.1.2   Main circuit wiring

Wiring diagram for SINAMICS V70 main circuit (example):
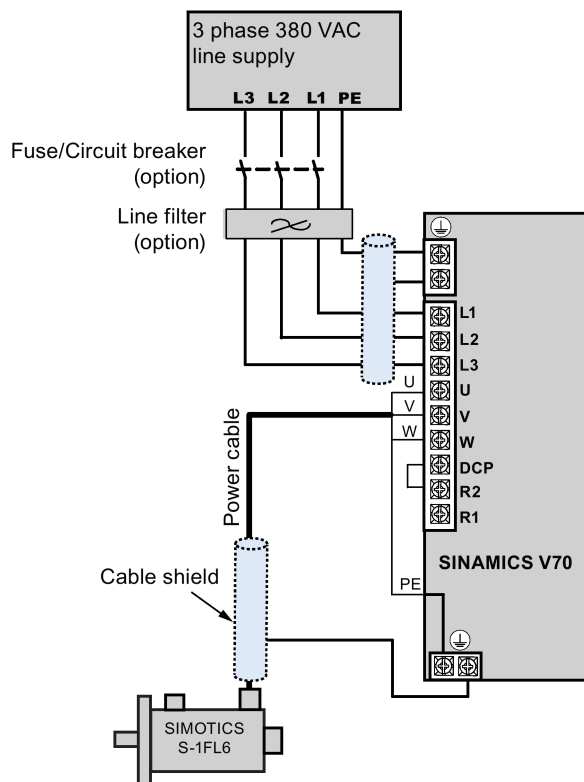
Note

For more information about the wiring of the external braking resistor, see Section "Connecting an external braking resistor - DCP, R1 (Page 65)".

Note

Filter

A line filter is required so that the system can pass the CE certification (radiated emission test or conducted emission test).
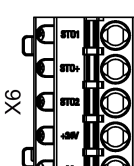
Circuit breaker

You can install a circuit breaker to protect the system.

For more information about the order number of Siemens recommended filters and circuit breakers, see Section "Options (Page 22)".

4.2.2   Connecting the 24 V power supply/STO - X6

Control circuit interfaces - drive side

Type	Illustration
Safe Torque Off (STO) interfaces	
Control power input interfaces[1]	
Maximum connectable cross-section: 1.5 mm²	

[1]   Maximum current consumption values without a brake power supply and with a brake power supply are respectively 1 A and 3 A.

For more information about the 24 VDC power supply, see Section "Options (Page 22)".

Wiring

> ⚠️ **WARNING**
>
> **Material damages and personal injuries by the drop of a hanging axis**
>
> When the servo system is used as a hanging axis, the axis will drop if the positive and negative poles of the 24 V power supply are connected inversely. Unexpected drop of the hanging axis may cause material damages and personal injuries.
>
> Make sure that the 24 V power supply is correctly connected.

> ⚠️ **WARNING**
>
> **Material damages and personal injuries by the drop of a hanging axis**
>
> It is not allowed to use the STO with a hanging axis because the axis may drop. Unexpected drop of the hanging axis may cause material damages and personal injuries.

Note

Using the STO function

The STO1, STO+ and STO2 are short-circuited at the factory.

When the STO function is to be used, you must remove the short-circuit stick before connecting the STO interfaces. The safety function of the servo drive is SIL 2 (EN61800-5-2). If you do not need to use it any more, you must reinsert the short-circuit stick. Otherwise, the motor will not run.

The wiring for factory setting and using the STO function is shown as follows:
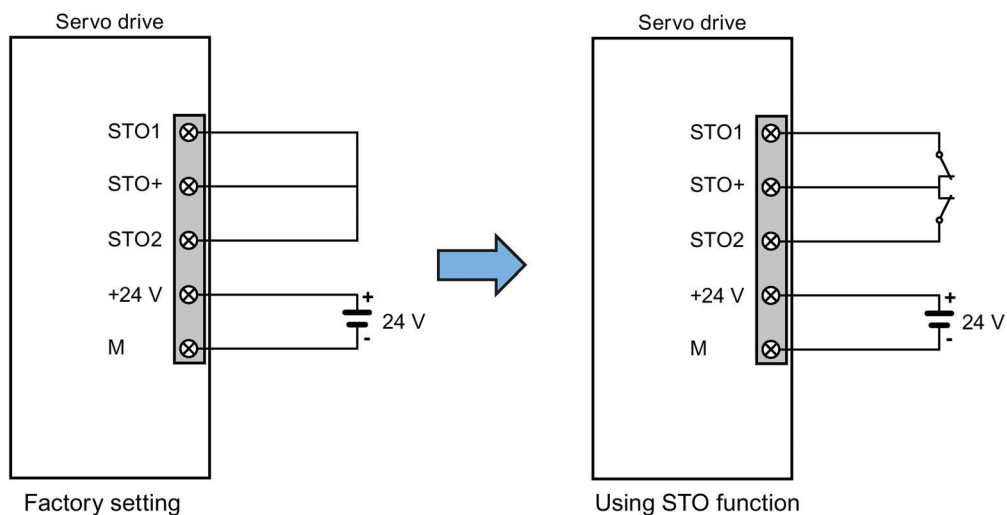
If you use the STO function with the SINUMERIK 808D ADVANCED control system, perform the wiring as illustrated below:
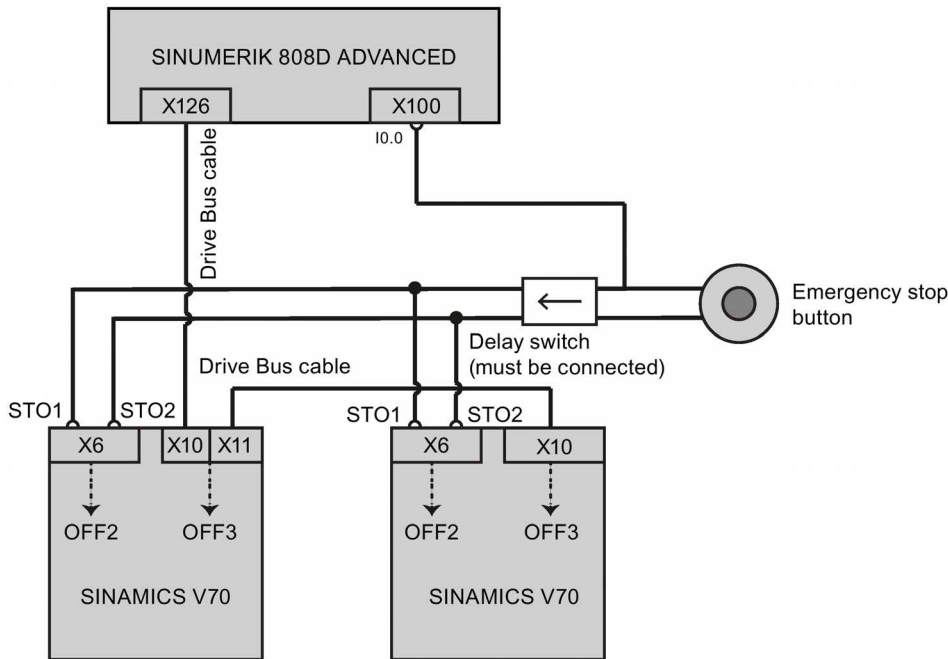
STO function

In conjunction with a machine function or in the event of a fault, the "Safe Torque Off" (STO) function is used to safely disconnect the torque-generating energy feed to the motor.

When the function is selected, the drive unit is in a "safe status". The switching on inhibited function prevents the drive unit from being restarted.

The two-channel pulse suppression function integrated in the module is a basis for this function.

Functional features of "Safe Torque Off"

- This function is integrated in the drive; this means that a higher-level controller is not required.

- The function is drive-specific, i.e. it is available for each drive and must be individually commissioned.

- When the "Safe Torque Off" function is selected, the following applies:

  – The motor cannot be started accidentally.

  – The pulse suppression safely disconnects the torque-generating energy feed to the motor.

  – The power unit and motor are not electrically isolated.

- By selecting/deselecting STO, in addition to the fault messages, the safety messages are also automatically withdrawn.

The STO function can be used wherever the drive naturally reaches a standstill due to load torque or friction in a sufficiently short time or when "coasting down" of the drive will not have any relevance for safety.

Note

Closing delay of the holding brake

The closing signal (low level) of the holding brake is output 30 ms after the STO is triggered.

Preconditions for using the STO function

When use the STO function, the following preconditions should be fulfilled:

- Each monitoring channel (STO1 and STO2) triggers safe pulse suppression with its switch off signal path.

- If a motor holding brake is connected and configured, the connected brake is not safe because there is no safety function for brake, such as safe brake.
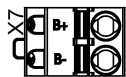
Behaviors of the STO function

Terminal		State	Action
STO1	STO2		
High level	High level	Safe	The servo motor can normally run when you power on the servo drive.
Low level	Low level	Safe	The servo drive starts up normally but the servo motor cannot run.
High level	Low level	Unsafe	Alarm occurs and servo motor coasts down.
Low level	High level	Unsafe	Alarm occurs and servo motor coasts down.

For more information about the STO function, see the SINUMERIK 808D ADVANCED Function Manual.

4.2.3 Connecting the holding brake - X7

Holding brake (drive side)

Type	Illustration	Signal	Description
Brake interfaces		Phase B+	B+: + 24 V, motor brake voltage positive
		Phase B-	B-: 0 V, motor brake voltage negative
Maximum cable cross-section: 1.5 mm² Input voltage tolerance: 24 V ± 10%			

Holding brake (motor side)

Type	Illustration	Signal	Description
Brake connector		1: B+	Phase Brake +
		2: B-	Phase Brake -

Wiring

Drive side
(Terminal strip)

Motor side
(Socket connector)
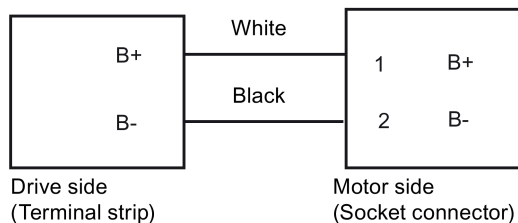
4.2.4 Connecting the encoder - X9

The SINAMICS V70 servo drive supports two types of encoders:

- Incremental encoder

- Absolute encoder

NOTICE
Cable shielding
The encoder cable must be shielded to meet the EMC requirements.

Encoder connector - drive side

14-pin socket connector, incremental/absolute encoder feedback interface X9
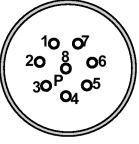
Illustration	Pin No.	Signal	Description
X9	1	Biss_DataP	Absolute encoder data signal, positive
	2	Biss_DataN	Absolute encoder data signal, negative
	3	Biss_ClockN	Absolute encoder clock signal, negative
	4	Biss_ClockP	Absolute encoder clock signal, positive
	5	P5V	Encoder power supply, +5V
	6	P5V	Encoder power supply, +5V
	7	M	Encoder power supply, grounding
	8	M	Encoder power supply, grounding
	9	Rp	Encoder R phase positive signal
	10	Rn	Encoder R phase negative signal
	11	Bn	Encoder B phase negative signal
	12	Bp	Encoder B phase positive signal
	13	An	Encoder A phase negative signal
	14	Ap	Encoder A phase positive signal

Note

The screw type is UNC 4-40 (plug-in terminal block) and the recommended tightening torque is 0.5 Nm to 0.6 Nm.

Encoder connector - motor side

8-pin connector, incremental encoder and absolute encoder

Illustration	Pin No.	Incremental encoder		Absolute encoder	
		Signal	Description	Signal	Description
	1	P_Supply	Power supply 5 V	P_Supply	Power supply 5 V
	2	M	Power supply 0 V	M	Power supply 0 V
	3	A+	Phase A+	n. c.	Not connected
	4	A-	Phase A-	Clock_N	Inverted clock
	5	B+	Phase B+	Data_P	Data
	6	B-	Phase B-	Clock_P	Clock
	7	R+	Phase R+	n. c.	Not connected
	8	R-	Phase R-	Data_N	Inverted data

Wiring

Incremental encoder
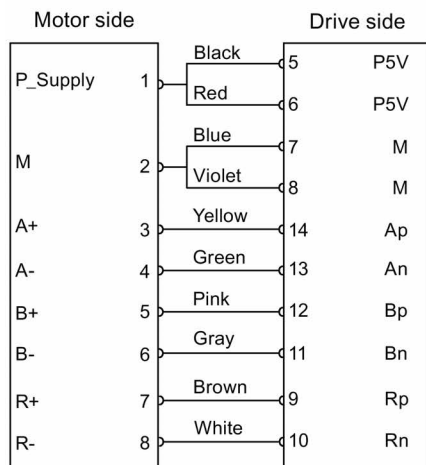
Absolute encoder
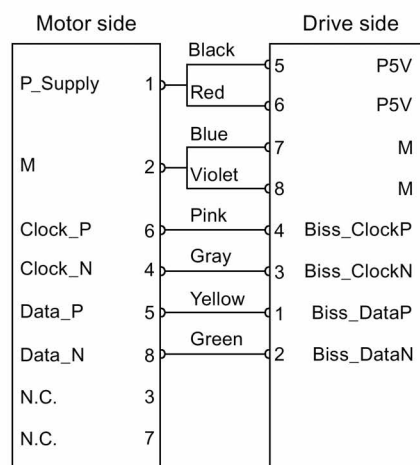
Shielded encoder cable grounding

When making an encoder cable, you should strip the outer insulation sheath for a maximum distance of 3 cm and connect the cable shield to ground, as shown in the following figure:
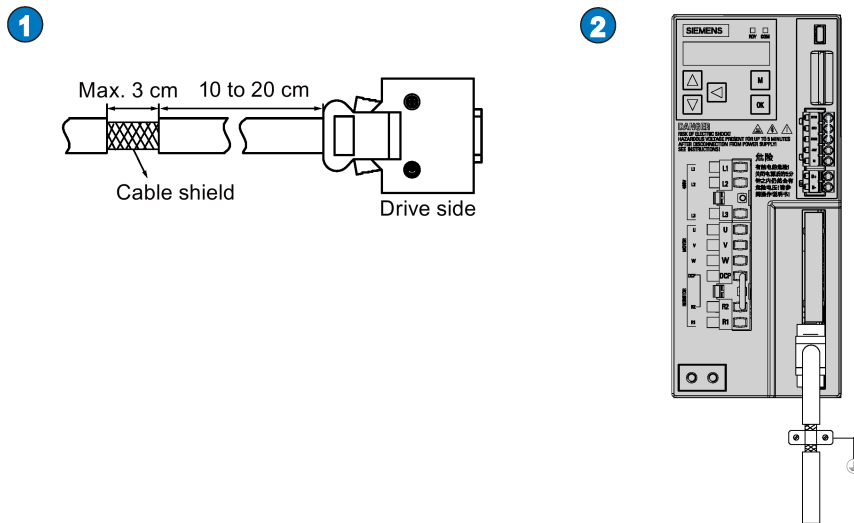
4.2.5 Connecting an external braking resistor - DCP, R1

The SINAMICS V70 has been designed with an internal braking resistor to absorb regenerative energy from the motor. When the internal braking resistor cannot meet the braking requirements, you can connect an external braking resistor. For more information about the selection of braking resistors, see Section "Options (Page 22)".

Connecting an external braking resistor

NOTICE
Damage to the drive
Before connecting an external resistor to DCP and R1, remove the connection between terminals DCP and R2; otherwise, the drive may be damaged.

Connect the external braking resistor as follows:

External braking resistor
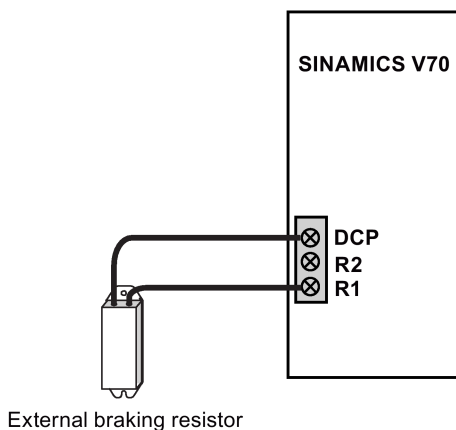
4.3 System connection overview

4.3.1 Connecting the CNC controller
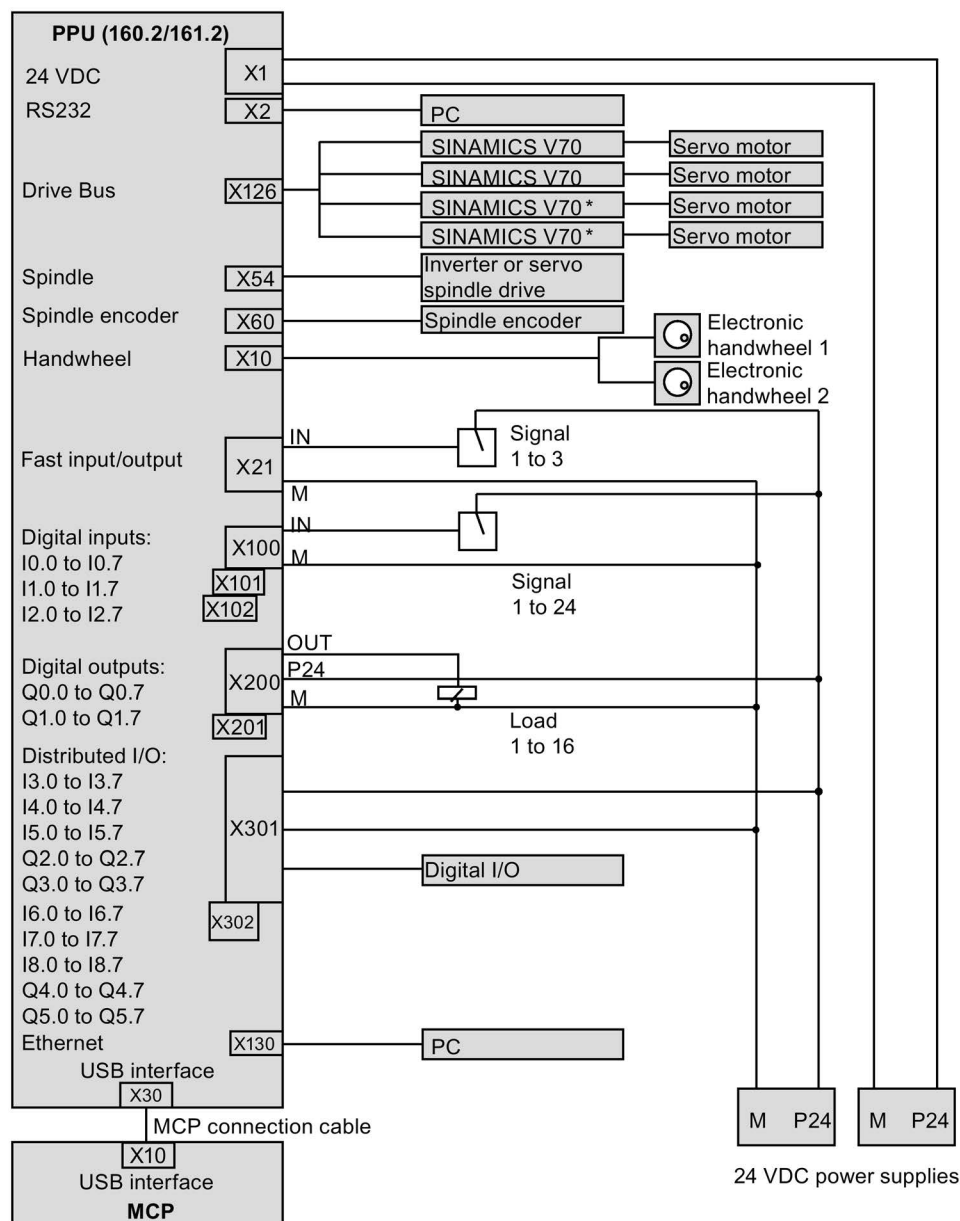
* For the SINUMERIK 808D ADVANCED T control system, connecting to the third and fourth drives is optional and depends upon whether you activate the software option "additional axis". If you desire to configure the control system to control an additional linear axis, connect the additional axis to the third or fourth SINAMICS V70 which connects to a servo motor. For the SINUMERIK 808D ADVANCED M control system, connecting to the fourth drive is optional and depends upon whether you activate the software option "additional axis". If you desire to configure the control system to control an additional linear axis, connect the additional axis to the fourth SINAMICS V70 which connects to a servo motor.

4.3.2 Connecting the drive and motor

Connection overview

The connection illustration below shows you a system connection example where the SINUMERIK 808D ADVANCED controls one drive.
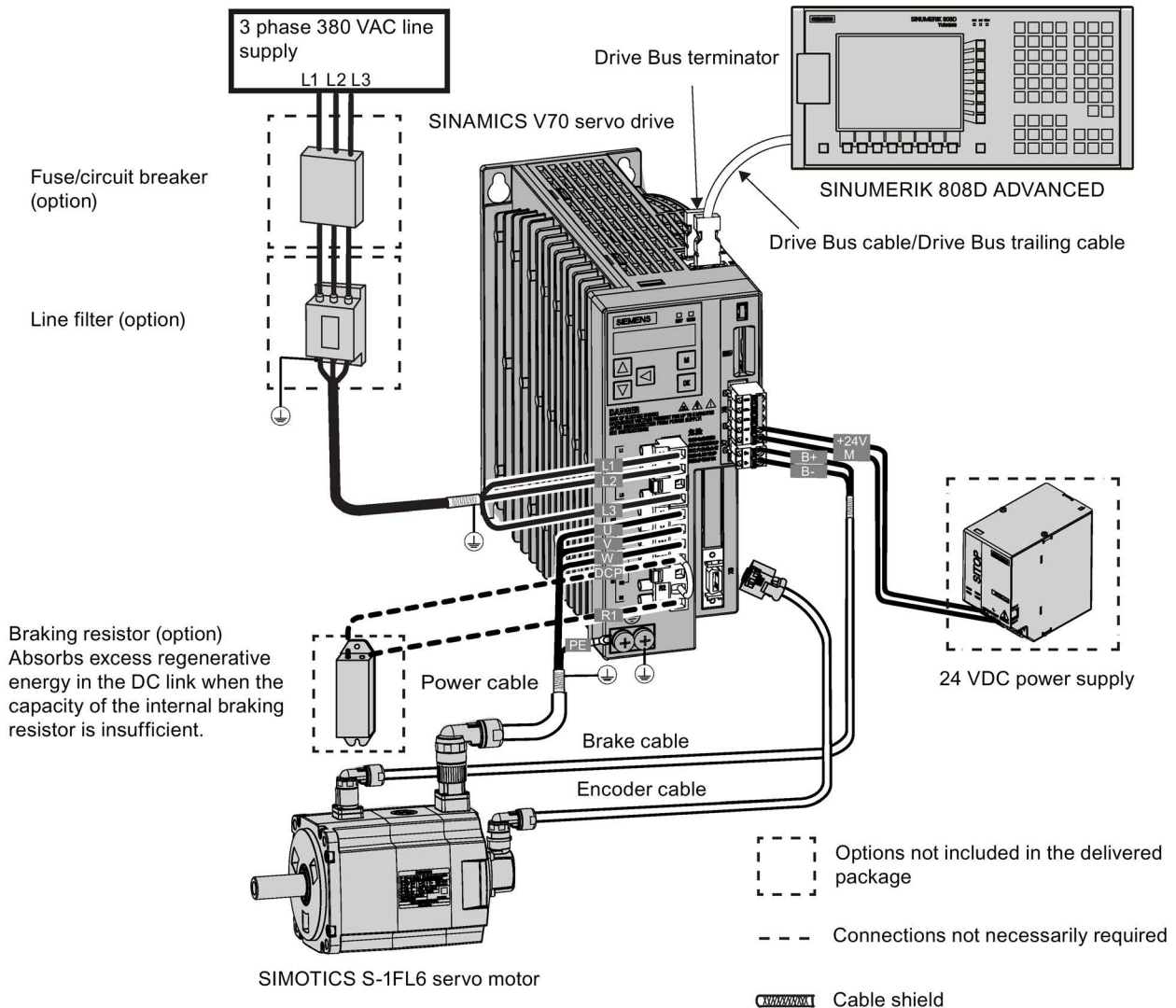
Note

- The line supply cable, Drive Bus cable/Drive Bus trailing cable, power cable, and encoder cable are shielded.
- The part of the line supply cable between the line filter and the drive must be shielded and shorter than 1 m.
- The maximum length for all cables must be shorter than 30 m.
- For more information about the connection of the external braking resistor, see Section "Connecting an external braking resistor - DCP, R1 (Page 65)".
- For more information about the connection of the STO terminals, see Section "Connecting the 24 V power supply/STO - X6 (Page 60)".

> ⚠ **WARNING**
>
> **Personal injury and damage to property from improper connections**
>
> Improper connections have high risks of electrical shock and short circuit, which will jeopardize personal safety and equipment.
>
> - The drive must be directly connected with the motor. It is not permissible to connect a capacitor, inductor or filter between them.
> - The line supply voltage must be within the allowable range (refer to the drive rating plate). Never connect the line supply cable to the motor terminals U, V, W or connect the motor power cable to the line input terminals L1, L2, L3.
> - Never wire up the U, V, W terminals in an interchanged phase sequence.
> - If the CE marking for cables is mandatory in some cases, the motor power cable, line supply cable and brake cable used must all be shielded cables.
> - For terminal box connection, make sure that the clearances between non-insulated live parts are at least 5.5 mm.
> - Route signal cables and power cables separately in different cable conduits. The signal cables shall be at least 10 cm away from the power cables.
> - Cables connected may not come into contact with rotating mechanical parts.

Connecting the cable shields with the shielding plate

To achieve EMC-compliant installation of the drive, use the shielding plate that is shipped with the drive to connect the cable shields. See the following example for steps to connect cable shields with the shielding plate:

① Mount the shielding plate with two M4 screws.

② Connect the line supply cable, the power cable and the brake cable.
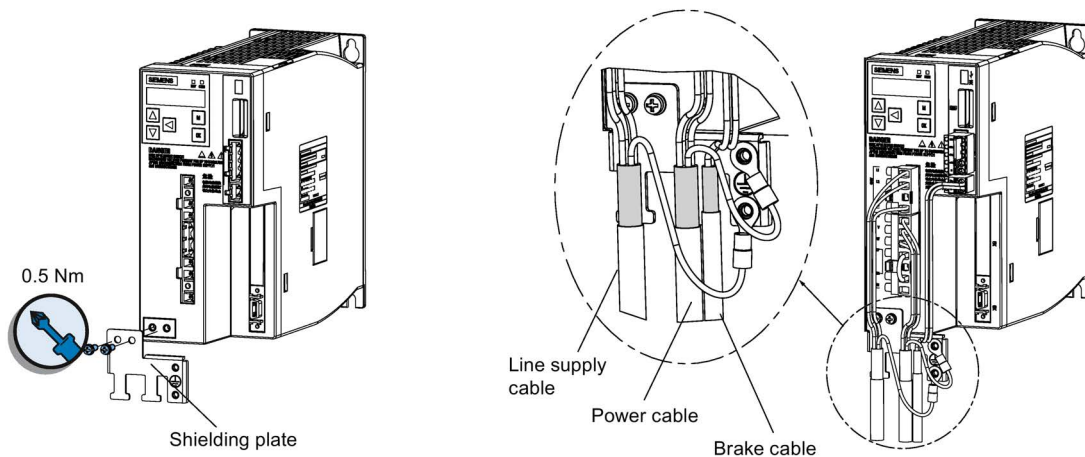
③ Fix the cables.
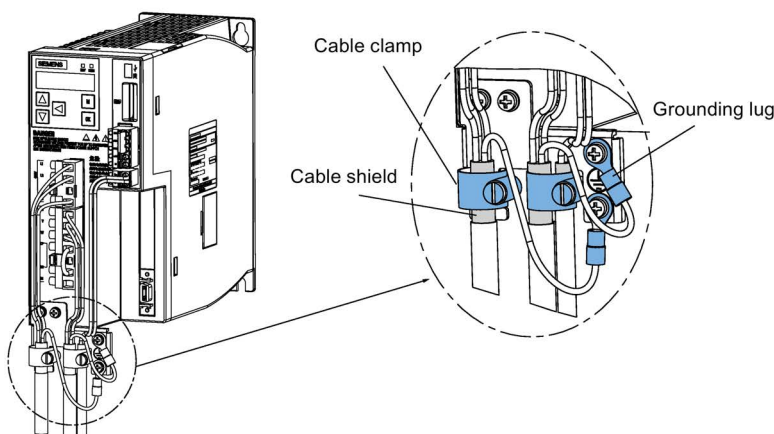
⚠ WARNING
Danger to life due to fire or electric shock when using unsuitable residual current protection devices
The drive can cause a current to flow in the protective conductor.
This current can cause the residual current device (RCD) or residual current monitoring (RCM) to incorrectly trip (nuisance trip).
In the case of a fault (ground fault), the fault current can contain a DC component, which prevents the RCD/RCM from tripping, with the risk of subsequent fault or electric shock.
Use only the type B RCD in the supply system for the SINAMICS V70 drive.

⚠ DANGER
Death or severe personal injury from electrical shock
The earth leakage current for the drive can be greater than AC 3.5 mA, which may cause death or severe personal injury due to electrical shock.
A fixed earth connection is required to eliminate the dangerous leakage current. In addition, the minimum size of the protective earth conductor shall comply with the local safety regulations for high leakage current equipment.

Adjusting cable orientations from the motor side

From the motor side, you can adjust the orientation of the power cable, encoder cable, and brake cable to facilitate cable connection.

Note: Before adjusting the power cable orientation, keep this part loosely tightened.

| ❶ Rotate the screw rings clockwise to loosen the connectors. | ❷ Rotate the connectors to adjust the cable orientations. | ❸ Rotate the screw rings counter-clockwise to tighten the connectors. |
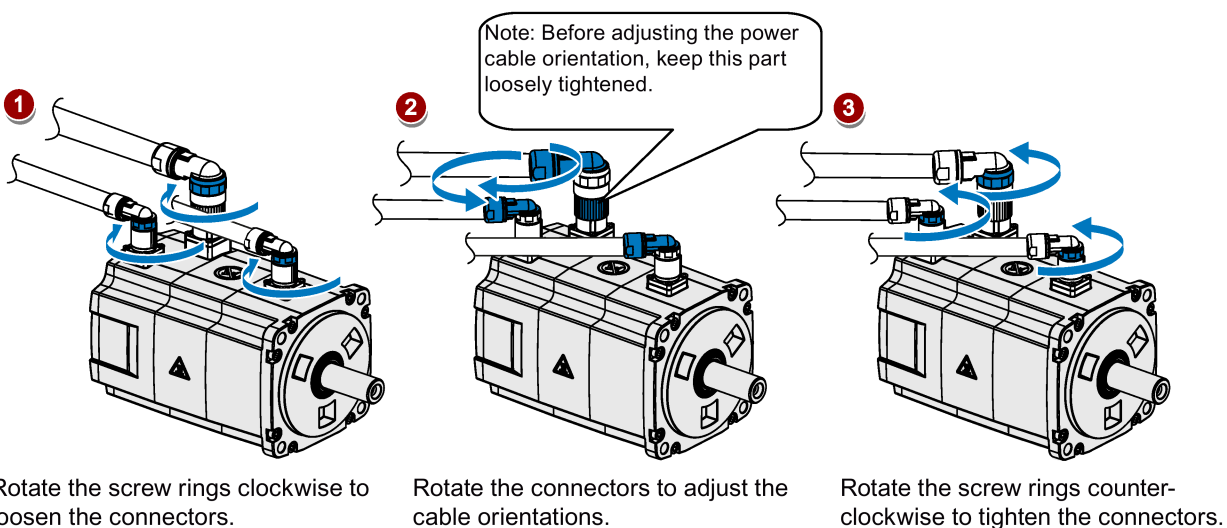
Note

Rotating the connectors

All the three motor-side connectors can be rotated only within 360°.

5 Toolbox software

5.1 Installing the software tools

Software components

In order to integrate the control system into a machine tool, software tools are required. These tools, including service tools are supplied on a DVD. The DVD is called the Toolbox DVD and is provided at delivery.

The following software tools are included on the Toolbox DVD:

Software	Description	See-also
AccessMyMachine (AMM)	AMM is a multifunctional tool used for data transfer, service, commissioning tasks and remote control.	AMM communication tool (Page 287)
PLC Programming Tool	The tool provides a user-friendly environment for commissioning the PLC. With this tool, you can develop, edit, and observe the logic to control your applications.	PLC Programming Tool (Page 181)
SinuComPCIN	SinuComPCIN is a tool that allows you to transfer data between the PC and the control system through RS232 interface.	For more information, see Section "Executing/transferring a part program through the RS232 interface" in the SINUEMRIK 808D ADVANCED Programming and Operating Manual (Turning)/(Milling).
Config DATA	Config DATA contains some PLC example files including default PLC programs for turning/milling machines.	-

Supported operating systems

The software tools above support the following operating systems:

- Windows Vista (both 32-bit and 64-bit versions)
- Windows 7 (both 32-bit and 64-bit versions)

Installing the software

To install the software on your PC, proceed through the following steps:

1. Double-click the "Setup.exe" in the folder.

2. Read the welcome information and continue with "Next".

Welcome to the installation of Toolbox 808D.
V04.06.02.00

It is strongly recommended that you exit all Windows programs before running this Setup program.

Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.

WARNING: This program is protected by copyright law and international treaties.

Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.

SIEMENS

| < Back | Next > | Cancel |

3. You can click the "Readme" button to read the indication information then close it and continue with "Next" or you can skip the reading and click "Next" directly.

Product Notice

Product notes display

The product notes contain important information on installing and using this product.

We recommend you read these notes before installing.

Readme

| < Back | Next > | Cancel |
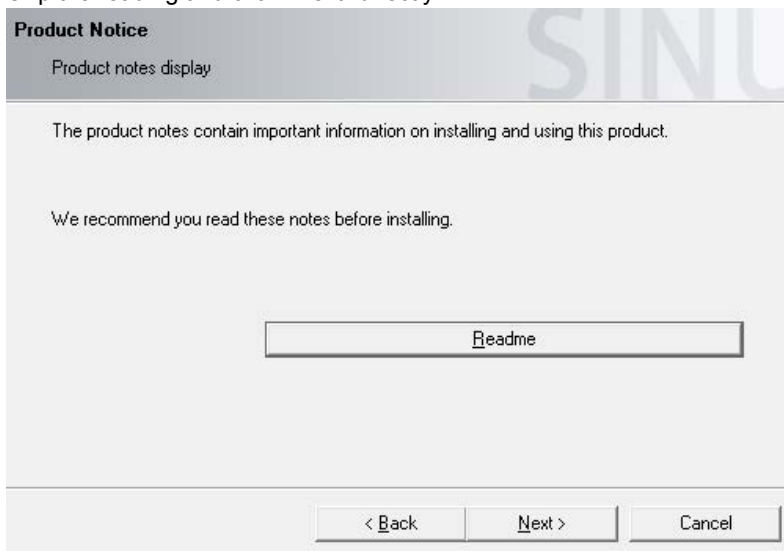
4. Accept the software license agreement and continue with "Next".

License agreements

Please read the following license agreement carefully.

Please note:

This software is protected under German and/or US American Copyright Laws and provisions in international treaties. Unauthorized reproduction and distribution of this software or parts of it is liable to prosecution. It will be prosecuted according to criminal as well as civil law and may result in severe punishment and/or damage claims.
Please read all license provisions applicable to this software before installing and using this software. You will find them after this note.

If you purchased this software on a CD marked as "Trial-Version" or together with another licensed software for you, this software may only be used for test and validation purposes according to the provisions of this Trial License stated after this note. A prerequisite for this kind of use is the

(•) I accept the conditions of this license agreement

( ) I reject the conditions of this license agreement

| < Back | Next > | Cancel |

5. Select desired languages you want to install.

Product languages

Please select the language you want to install.

- [ ] German
- [x] English
- [ ] French
- [ ] Spanish
- [ ] Italian
- [x] Chinese

Attention, not all products support all installation languages. In this case the concerned products are installed in your default installation language. Information on which products support these installation languages can be found in the readme.

| Readme | | < Back | Next > | Cancel |

6. If you have installed an earlier version of a program, un-install the program first, then start the installation again and select the required software from the list.

Programs

Programs to be installed

- [x] Config Data 808D
- [x] Config Data 808D ADVANCED
- ✔ [x] PLC Programming Tool
- [x] SINUCOM PCIN
- [x] Access MyMachine

Access MyMachine /P2P (PC)
V04.06.01.01.002

Required: 606 MB
Available on C: 27.2 GB

| Help | | < Back | Next > | Cancel |

7. During the installation, various dialog boxes will appear. Acknowledge the dialog boxes and enter and confirm the installation information where necessary. Installing all the software packages will take approximately 30 minutes. When the installation finishes, shortcuts will be created on the desktop.

5.2 Overview of PLC Programming Tool

In order to edit the PLC program, use PLC Programming Tool V3.2.4 or higher.

By using PLC Programming Tool, you can perform the following operations:

- Creating the PLC program
- Editing the PLC program
- Making a connection between the programming tool and the system
- Compiling the PLC program
- Downloading the PLC program
- Uploading the PLC program
- Monitoring the PLC

PLC instructions

Various instructions are available in PLC Programming Tool. You can view them in the instruction branch of the instruction tree.
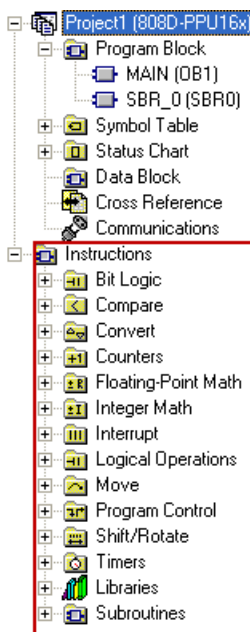
You can right-click an instruction or directly press the F1 key to view its help information.
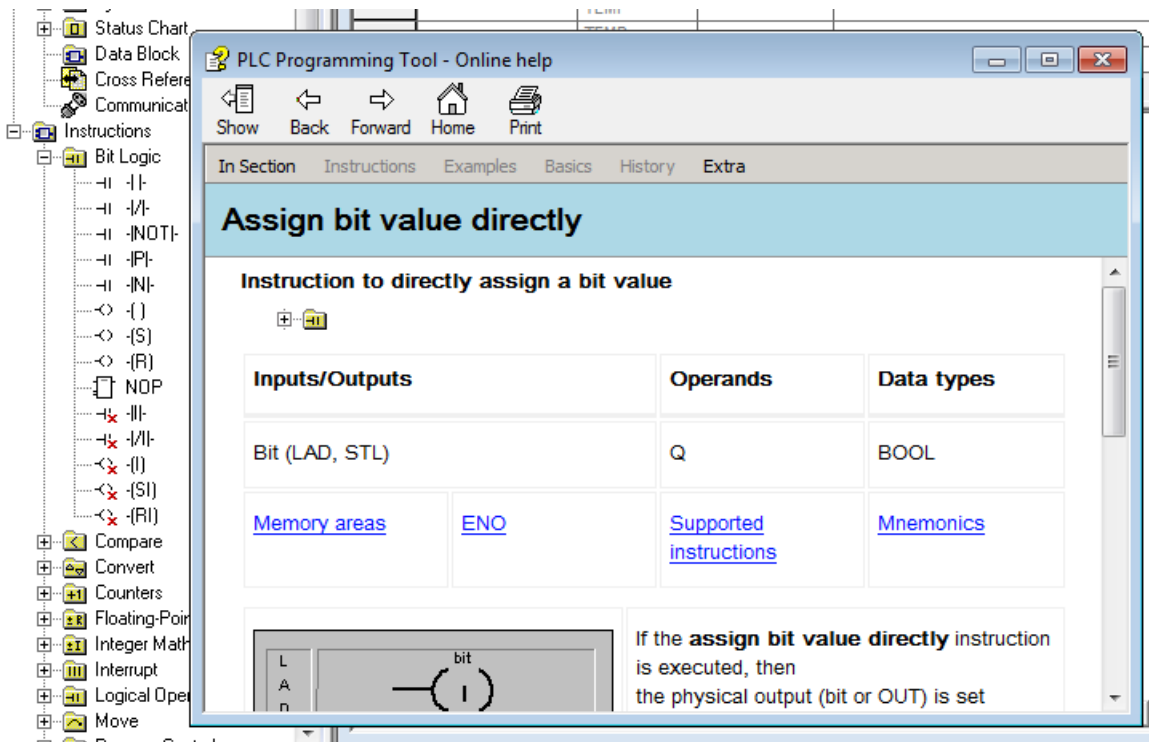
The address of each instruction can be edited at any time by highlighting the instruction.
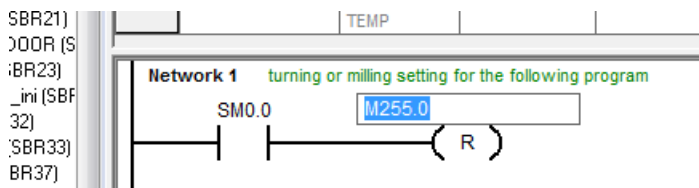
Data management

The data can be broken down into three areas:

- Non-retentive data
- Retentive data
- Machine data for the PLC (all active at POWER ON)

Most data, such as the process image, timer, and counter, is non-retentive and cleared each time the control system is restarted.

For the retentive data, there is a data range of 1400 0000 to 1400 0127. This location can be used to save all the data which is to remain valid after POWER OFF/ON.

With the aid of the PLC machine data (see the user interface), you can pre-assign your program with data or parameterize various parts of the program.

Program organization

During the PLC programming, you must structure your program into finished program parts (subroutines). The programming language for the S7-200 offers you the capability to set up your user program in a structured manner.

There are the following two types of programs:

- Main program
- Subroutine

Eight levels of programming are possible.

6 Initial commissioning

NOTICE
Plugging or unplugging the SD card will cause startup failure.
Do not plug or unplug the SD card during startup; otherwise, the drive will fail to start up.

NOTICE
Firmware damage due to drive power-off during data transfer
Switching off the 24 VDC power supply for the drive during data transfer from the SD card to the drive can cause damage to the drive firmware.
• Do not switch off the drive power supply when the data transfer from the SD card to the drive is in process.

NOTICE
Existing setting data may be overwritten by the setting data on the SD card during startup.
• When a drive is switched on with an SD card containing user setting data, the existing setting data on the drive will be overwritten.
• When a drive is switched on with an SD card containing no user setting data, the drive will automatically save the existing user setting data onto the SD card.
Before starting up the drive with an SD card, check whether the SD card contains user setting data. Otherwise, the existing data on the drive may be overwritten.

Note

- Make sure that all cables are correctly connected and the connected servo system is in good condition with no faults before switching on.
- Prior to commissioning or operation, read carefully "Safety instructions (Page 7)" and "Operating the SINAMICS V70 Basic Operator Panel (BOP) (Page 138)".
- See Chapters "Diagnostics (Page 169)" and "Parameter list (Page 157)" for detailed information about any possible alarms and parameters used during commissioning.

6.1 Switching on the SINAMICS V70 drive

6.1.1 Jog test

To implement Jog test for the SINAMICS V70 drive, proceed through the following steps:

1. Switch on the 24 VDC power supply to the drive.

2. Switch on the 3 phase 380 VAC line supply to the drive.

3. To configure a motor with an incremental encoder, proceed as follows; otherwise, skip Steps 3 and 4 and go to Step 5 directly.
   Configure the motor ID p29000 = 18 or 19. You can find the motor ID of the connected motor on its rating plate.

Operating display
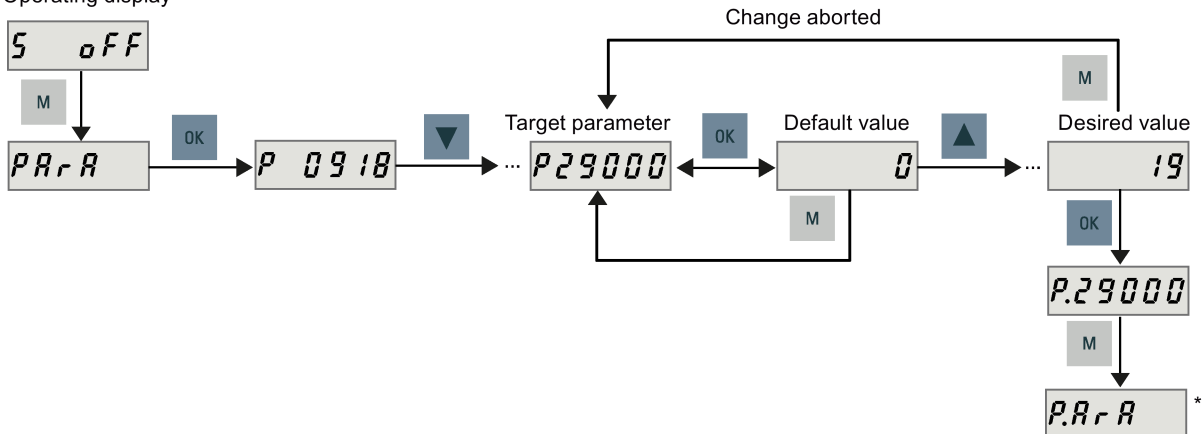
* The dot means that at least one parameter is changed without saving. To save the parameter changes, see Step 6.

4. Configure the motor brake p1215 as follows. For a motor without a holding brake, skip this step and go to Step 5 directly.

   – = 0 (default): No motor holding brake available

   – = 1: Motor holding brake under sequence control

   – = 2: Motor holding brake always open

   – = 3: Motor holding brake under sequence control by the SINUMERIK 808D ADVANCED

Operating display
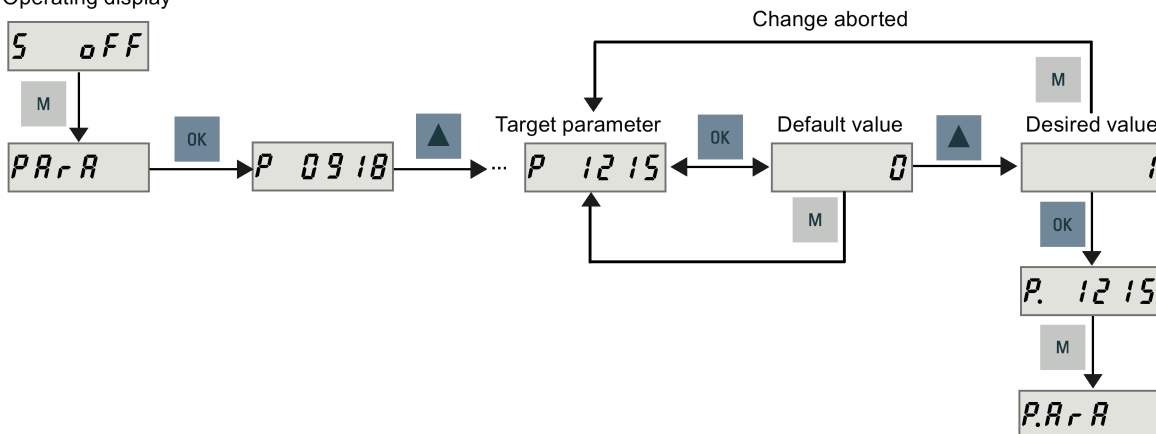
Note

For a motor with incremental encoder, the operating principle of the holding brake is configured during motor selection; for a motor with absolute encoder, it is configured automatically.

NOTICE
Shortening the service life of motor brake
The motor brake is used for holding the load in position only. Frequent emergency stops with the motor brake can shorten its service life.
Unless absolutely necessary, do not apply the motor brake as an emergency stop or deceleration mechanism.

5. Set the Jog speed p1058 with a value between 0 and the rated speed of the connected motor. If you want to use the default Jog speed (100 rpm), skip this step.

Operating display
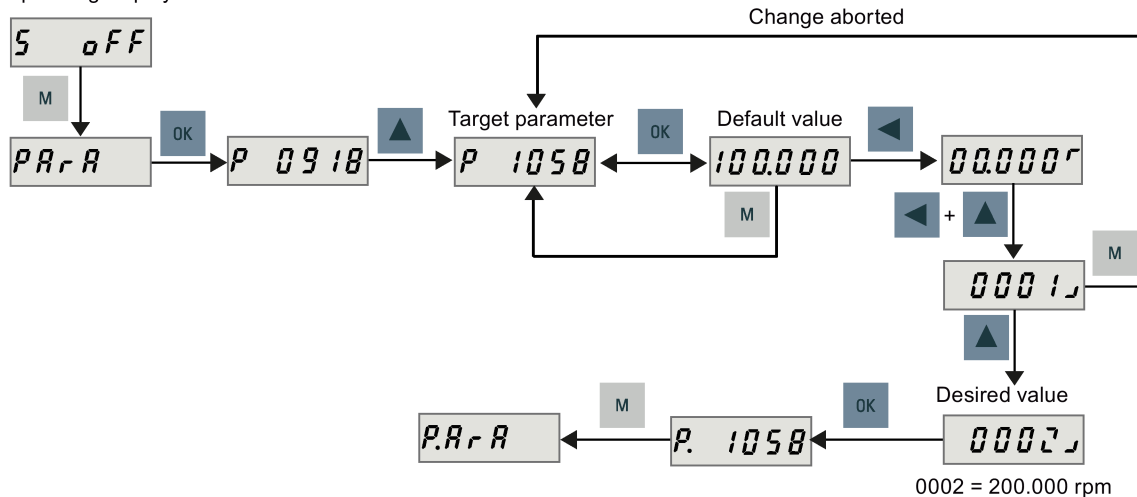
Note

For more information about the rated speed of a motor, see section "SIMOTICS S-1FL6 servo motors (Page 130)".

6. Save the parameter settings as follows. For a motor with an absolute encoder and without a holding brake, if you use the default Jog speed (100 rpm), you can skip this step.

Operating display
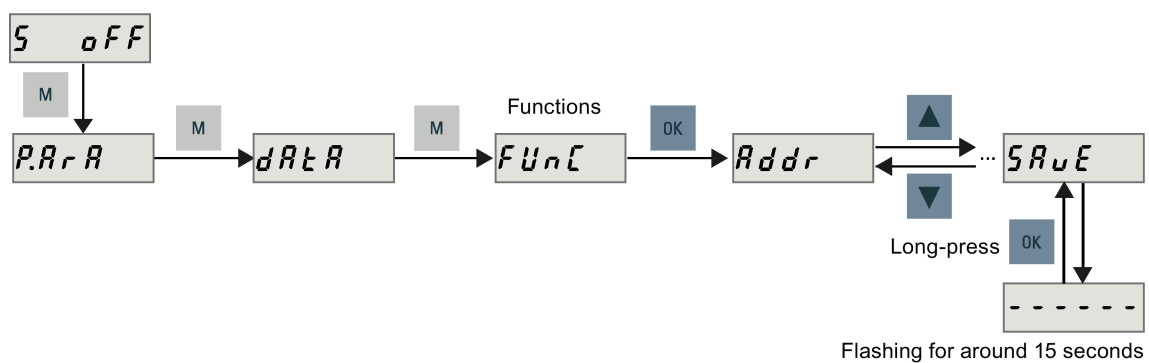
7. Run the connected motor with the Jog function and check the Jog speed or Jog torque.
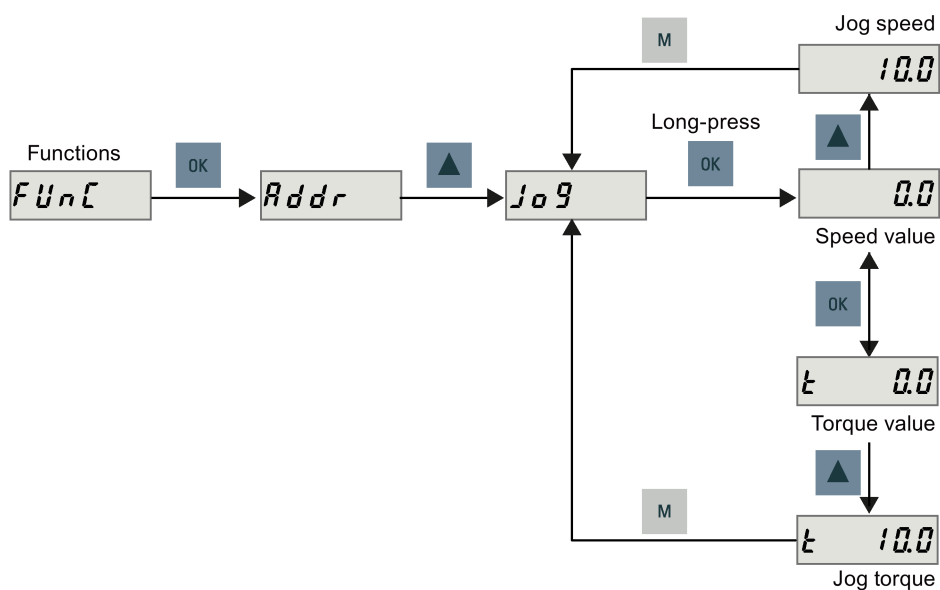
6.1.2 Configuring Drive Bus addresses

To configure the Drive Bus addresses on the SINAMICS V70 drive, set parameter p0918 (default = 10) with the drive BOP as required. You must set a proper address according to the actual application of the drive.

- 11: X axis

- 12: Y axis (or additional axis for the turning variant of the control system)

- 13: Z axis

- 15: Additional axis

You must perform a save operation to remove the dot.

6.2 Switching on the control system

Preparation before switch-on

Make sure the following before switching on the control system:

- You have finished the mechanical installation of the whole system based on the information included in Chapter "Mounting (Page 25)".

- You have completed the wiring of the whole system according to the information included in Chapter "Connecting (Page 41)" (if you use the default PLC program).

Operating sequence

1. Switch on the 24 VDC power supply for the control system.

   When the control system starts up for the first time, the following two alarms appear.
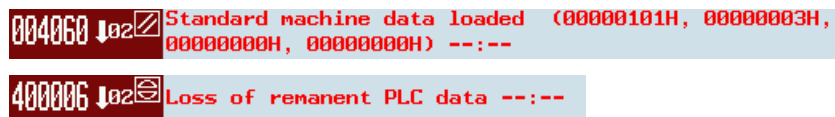
2. Press this key or the key combination to clear the alarms. For more information about the alarms and system responses, refer to the SINUMERIK 808D ADVANCED Diagnostics Manual.

3. When the control system enters the main screen, check the status LEDs on the PPU.
   - **POK**: green
   - **RDY**: green
   - **TEMP**: off

4. Check the status LEDs on the SINAMICS V70 drive:
   - **RDY**: green
   - **COM**: slow flashing green every two seconds

Note

The control system constantly creates restoring points during operation. In case of data loss due to power failure or other problems, the control system automatically restores the last autosaved system data upon startup with an alarm appearing on the screen.

6.3 Synchronizing drive data files between NC and drive

The NC always compares its data backup with the drive data upon every startup.

- If no data backup files can be found, the NC creates a new backup file automatically with the following dialog displaying on the screen:
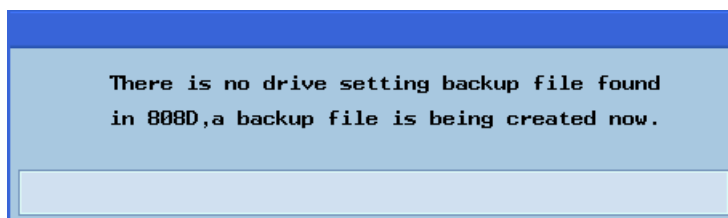
- If the drive data differs from the NC data backup, a data synchronization is required for synchronizing the drive data files between the NC and the drives.

Operating sequence

OK

1. Press this softkey to enter the setting window when the following data synchronization dialog appears.

> **!**
> Difference were found between the parameter setings in the drive and the ones in 808D backup file.Please create a new backup or restore your drive setting from the existing one.
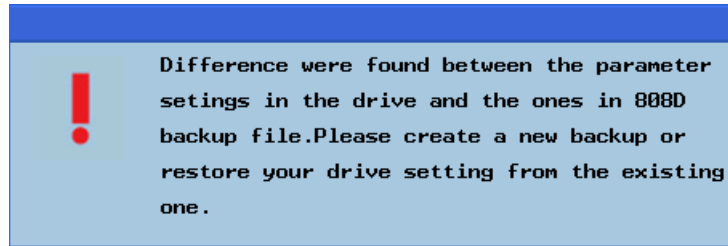
Note: a password input field appears in this dialog if you have not set an access level on the control system. For more information, see Section "Setting the password (Page 81)".

If you cancel the data synchronization with the following softkey, this dialog appears again on next NC startup.

Cancel

2. Select a drive for which you desire to perform the data synchronization.

▲ ▼

3. Press this key to choose a synchronization method for the selected drive.

SELECT

> Please choose to create a new backup file in 808D or use the existing backup to restore the drive setting for the following drives.
> Caution! Using backup file to restore the drive setting might change your current settings in drive.
> MX1 (Drive 11) Restore drive setting from the backup in 808D ↻
>
> MZ1 (Drive 13) Create a new backup in 808D ↻
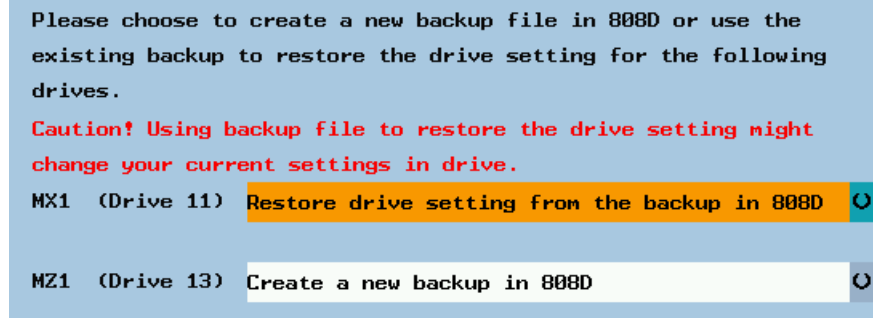
Accept all

4. Press this softkey to confirm your settings and start the data synchronization.

5. After the synchronization finishes successfully, the following dialog displays on the screen.

> Please don't forget to change your password back to the operator's level!

OK
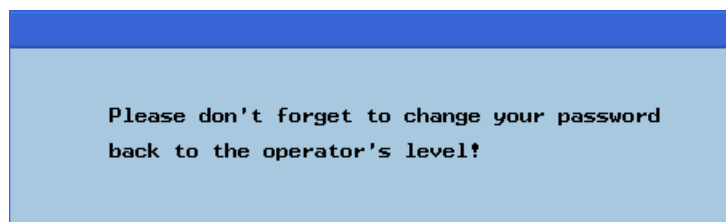
6. Press this softkey to exit the dialog.

Checking the status LEDs on the SINAMICS V70 drives

When the data synchronization is completed, the LEDs on the drive indicate the drive is in ready state (**RDY**: green; **COM**: slow flashing green every two seconds). The drive BOP displays S-off or a fault depending on the type of connected encoder.
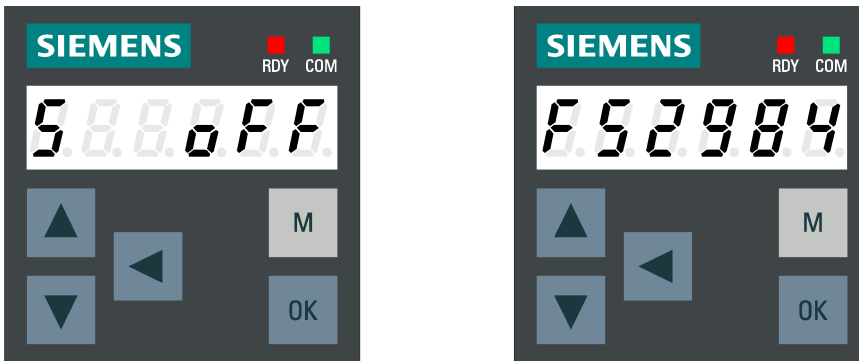
6.4 Setting the password

The control system provides a concept of protection levels for enabling data areas. Different protection levels control different access rights.

The control system delivered from Siemens is set by default to the lowest protection level 7 (without password). If the password is no longer known, you must reinitialize the control system with the default machine/drive data. All passwords are then reset to default passwords for this software release.

Note

Before you boot the control system with default machine/drive data, make sure that you have backed up your machine/drive data; otherwise, all data are lost after rebooting with default machine/drive data.

Protection level	Locked by	Area	Access right
0	Siemens password	Siemens, reserved	-
1	Manufacturer password (Default password: "SUNRISE")	Machine manufacturers	• Entering or changing part of the machine data and drive data • Conducting NC and drive commissioning
2	Reserved	-	-
3-6	End user password (Default password: "CUSTOMER")	End users	• Entering or changing part of the machine data • Editing programs • Setting offset values • Measuring tools
7 *	No password	End users	-

* Protection level 7 is set automatically if no password is set and no protection level interface signal is set. The protection level 7 can be set from the PLC user program by setting the bits in the user interface.

The number of machine data and drive data which can be read or modified depends on the protection level. You can set the protection level for these function areas with the display machine data (**USER_CLASS**...).

The control system is delivered with no password. You must set the factory default manufacturer password **"SUNRISE"** to perform the commissioning work. Perform the following steps to enter the password:

1. Select the desired operating area.

2. Press this vertical softkey to open the following dialog.

Please enter password !
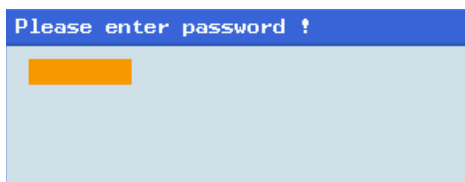
3. Enter "SUNRISE" with the PPU keyboard and press this softkey.

    A message now shows at the bottom of the screen, which indicates that you have successfully set the password.

    Access level:Manufacturer

The following password operations are also available in this operating area:

To change the default password of the control system

To delete the current password

Note

Clear the password before the machine is delivered; otherwise, end users can start the controller with the standard data, which can initialize the control system. As a consequence, the machine will not run.

6.5 Setting the date and time

At delivery, the system date and time remain at the factory settings, and thus you must manually modify the date and time.

Operating sequence

1. Select the desired operating area on the PPU.

2. Open the date and time setting window through the following softkey operations:

    HMI → Date time
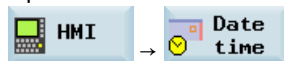
3. Enter the date and time in the specified format.

Current	2004/07/01	01:59:23
Format	YYYY/MM/DD	HH:MM:SS
New	2015 /02 /02	14 :50 :22

4. Press this softkey to confirm your settings.

6.6 Activating the optional functions

The following optional functions can be purchased for the control system:

- Additional axes
- Contour handwheel
- Bidirectional leadscrew error compensation
- Manual Machine Plus (for turning variant only)
- Transmit/Tracyl
- Gantry (BASIC)

To use a purchased option, you must first activate it with a license key on the control system.

Note

The control system supports up to two additional axes for the turning variant and one for the milling variant.

After you purchase the desired option(s), you can obtain the corresponding license key from the Web License Manager.

For more information about how to generate a license key via the Web License Manager, refer to the SINUMERIK 808D ADVANCED Function Manual.

Operating sequence
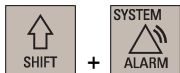
SHIFT + SYSTEM ALARM	1.	Select the desired operating area.
>	2.	Press this key to view the extended softkeys.
	3.	Open the dialog for entering the license key through the following softkey operations:
		Serv. displ. → Version → License key
	4.	Enter the license key generated by the Web License Manager in the following dialog:

```
License key

        Enter the licence key to activate the option!
        The option is activated after Restart!




        CF card serial number:          SPG2012061600398
        Order No. of the NCU module:    6FC5812-1GY46-0YA0
```
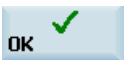
OK ✓	5.	Press this softkey to confirm your entry.

Options

6. Press this softkey to enter the window of available options. You can find the licensing status in this window, for example:

Options		
Option	**Set**	**Licensed**
Additional axis, basic 6FC5800-0AK70-0YB0	1	2
Contour handwheel 6FC5800-0AM08-0YB0	☑	☑
Bidir. lead screw error comp. 6FC5800-0AM54-0YB0	☑	☑
Manual Machine Plus 6FC5800-0AP07-0YB0	☑	☑
Transmit/Tracyl 6FC5800-0AS50-0YB0	☑	☑
Gantry (BASIC) 6FC5800-0AS51-0YB0	☑	☑

If you have licensed one or two additional axes, you can find a figure of "1" or "2" in the column of licensing status. For other licensed options, a "☑" symbol displays in this column.

Note: The last option displayed in this window indicates the variant information and the licensing status of your control system, for example:

System software PPU16x Turning (Export) 6FC5812-1GYxx-xYA0	☑	☑

In case of any problems with respect to the licensing status of your control system, contact Siemens service personnel.

7. Set the licensed options.

• For the additional axes, enter "1" or "2" in the setting column and press the following key:

INPUT

• For the other options, press the following key to select:

SELECT

NCK reset (po)

8. Press this softkey to restart the NCK, so that the licensed options are activated.

6.7 Loading system languages

You can load a new system language or update an existing language on the control system. Siemens will provide each language in the form of an archive file. The file name format is as follows:

808_lang_<LANG>_04060200yyy.arc

Where, <LANG> stands for the language code, for example, <chs> for Chinese, <eng> for English. "yyy" refers to the version code.

The following table provides different language codes for your reference.

Language	Code	Language	Code
Simplified Chinese	chs [1]	Italian	ita
Traditional Chinese	cht	Korean	kor
Czech	csy	Dutch	nld
Denish	dan	Polish	plk
German	deu	Portuguese	ptb
English	eng [1]	Rumanian	rom
Spanish	esp	Russian	rus
Finnish	fin	Swedish	sve
French	fra	Turkish	trk
Hungarian	hun		

[1] Factory default system languages that are already loaded on the control system at delivery.

Operating sequence

Proceed through the following steps to load a system language:

1. Copy the system language file to a USB stick.
2. Insert the USB stick into the USB interface at the front of the PPU.
3. Select the desired operating area on the PPU.

4. Press this softkey to open the start-up archive window.

5. Use the cursor keys to select the following option to restore a start-up archive.

```
Start-up archive
Create series start-up archive
Create start-up archive
Create start-up archive in the default directory
Restore start-up archive
```
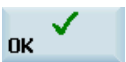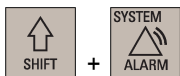
6. Press this softkey to confirm, and the file opening dialog appears.

7. Select the USB folder and press this key to enter it.

```
Open file ...
Start-up archive
OEM files
USB
User files
```
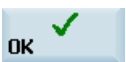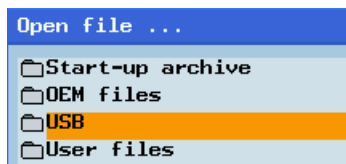
8. Navigate to the system language file you desire to load and press this softkey to confirm.

OK ✓

9. Press this softkey to confirm the archive information, and then the following message appears:

```
Do you want to read in start-up data?
Notes:
Please block all enables!
After the read-in, the control is booted as usual!
⚠
```

OK ✓
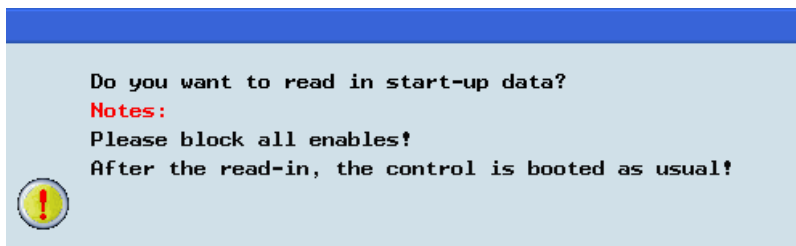
10. Press this softkey to confirm and start loading the archive. The control system restarts to complete restoring the system language archive.

11. Power off/on the control system to activate the loaded language. Then you can find the new system language and select it through the following operations:

⇧ SHIFT + SYSTEM ALARM → **Change language**
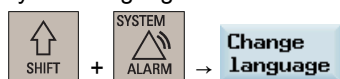
6.8   Overview on commissioning and operation wizards

The control system has two commissioning wizards and one operation wizard.

● The commissioning wizards require a manufacturer access level. They are designed to help you commission the basic machine tool functions on the prototype machine and series machines.

● The operation wizard requires an end user access level. It is designed to help you learn about the basic operations of the machining process.

Three machine data areas are used in the wizards to commission the prototype machine: general machine data, axis machine data and NC basic list.

Softkey functions

MENU FUNCTION

Pressing this key on the PPU allows you to enter the main screen of the wizards.
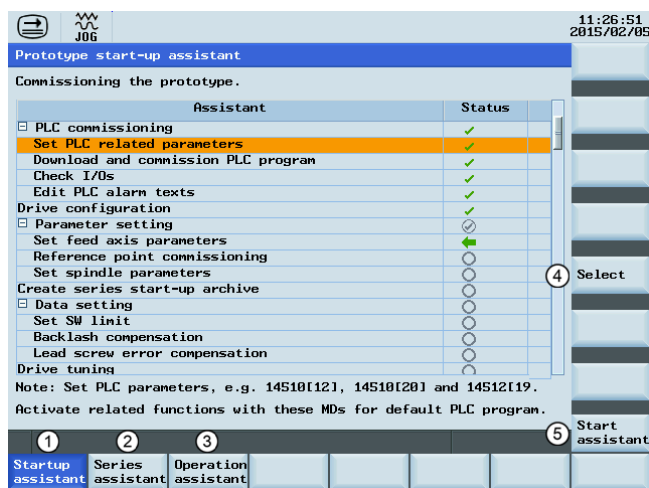
① Calls the commissioning wizard for the prototype machine

② Calls the commissioning wizard for series machines

③ Calls the operation wizard

④ Enters the currently selected task.
   Note: This softkey becomes active when you move the cursor key to a completed or current task.

⑤ Starts commissioning from the current task

Pressing any operating area key on the PPU allows you to exit the wizard.

Commissioning status

You can check the commissioning status via the status symbols from the main screens of the commissioning wizards.

Status symbol	Meaning
✔	Completed task
←	Current task
⊘	Partially completed task group
○	Uncompleted task

Commissioning diagram

The diagram below shows the general commissioning procedure for the NC.

①   Commissioning the prototype machine   ②   Series production
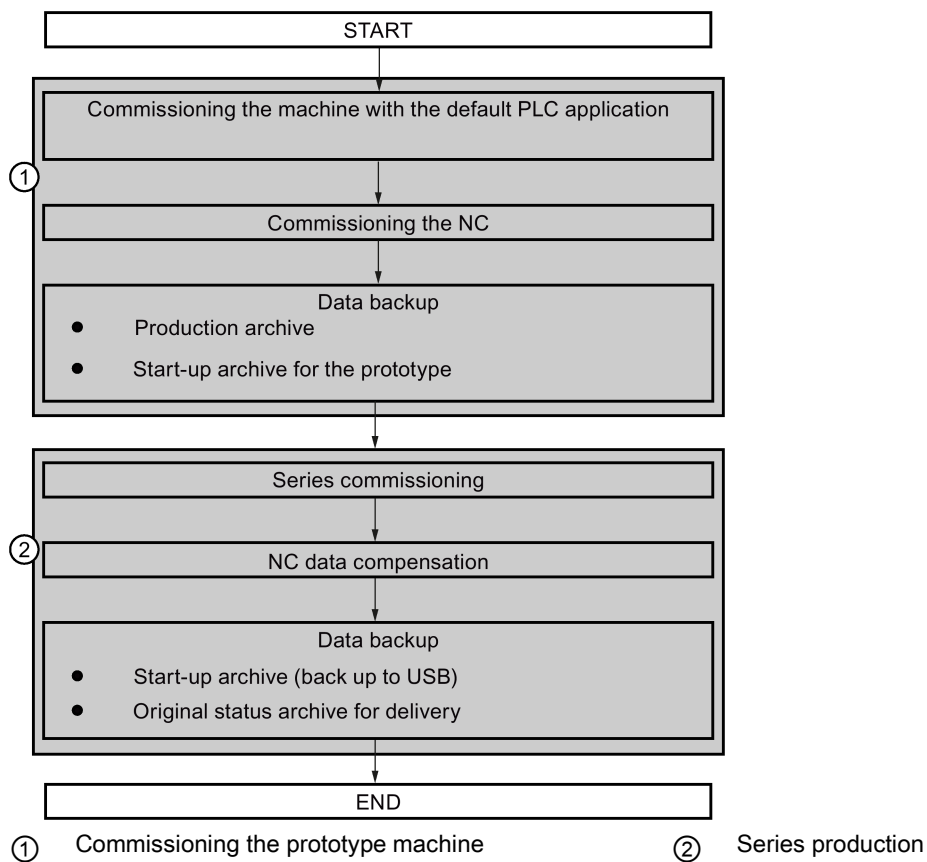
7 Commissioning the prototype machine

Note

The control system constantly creates restoring points during operation. In case of data loss due to power failure or other problems, the control system automatically restores the last autosaved system data upon startup with an alarm appearing on the screen.

Overview of commissioning procedure

The following shows you the basic commissioning procedure for prototype machines using the sample PLC:

Step 1   →   Checking the scope of delivery (Page 13)
Step 2   →   Mounting (Page 25)
Step 3   →   Wiring (Page 41)
Step 4   →   Installing the Toolbox software (Page 70)
Step 5   →   Switching on and preparation (Page 75)
Step 6   →   Activating software options (Page 83)
Step 7   →   Commissioning the prototype (Page 88)
Step 8   →   Cabinet design (Page 34)

7.1 Commissioning the PLC

7.1.1 Setting PLC related parameters

Use either of the following softkeys on the main screen of prototype commissioning wizard to enter the window for setting the PLC related parameters:
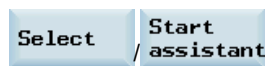
Softkey functions
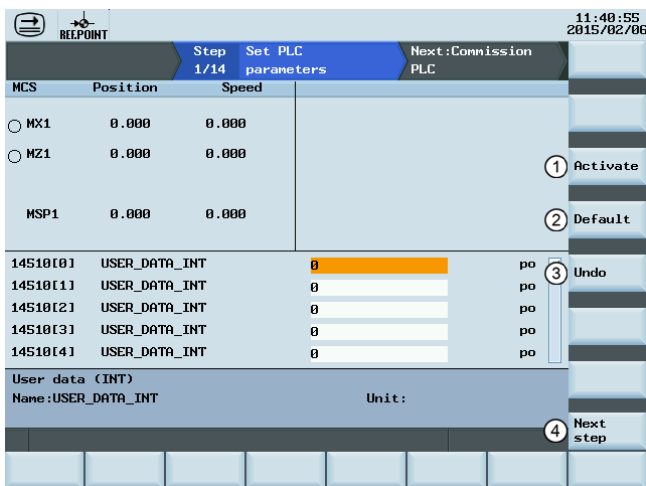
①   Activates the parameter changes. Note that the control system restarts to accept the new values.

②   Resets the value of the selected parameter to default

③   Cancels the last change to the parameter

④   Proceeds to the next step

PLC related parameters

MD14510 Machine data - Integer	PLC interface	Unit	Range	Function
14510[12]	DB4500.DBW24	-	0 to 1	Layout of the traverse keys
14510[13]	DB4500.DBW26	0.1 s	5 to 200	Time for spindle braking

MD14510 Machine data - Integer	PLC interface	Unit	Range	Function
14510[15]	DB4500.DBW30	0.1 s	5 to 30	Spindle override 50% key holding on time defined
14510[16]	DB4500.DBW32	0.1 s	1 to 30	Spindle override 100% key holding on time defined
14510[20]	DB4500.DBW40	-	2 to 64	Maximum number of tools
14510[21]	DB4500.DBW42	0.1 s	5 to 30	Turret clamping time
14510[22]	DB4500.DBW44	0.1 s	30 to 200	Monitoring time when searching for tools
14510[24]	DB4500.DBW48	1 min	5 to 300	Lubrication interval
14510[25]	DB4500.DBW50	0.01 s	100 to 2000	Lubrication duration

MD14512 Machine data - Hex	Function
14512[16]	Bit 1: function of chip conveyor (milling)
	Bit 2: function of safety door (milling)
	Bit 3: when the function of safety door is active, it can be triggered by M01/M02 (milling)
	Bit 7: handwheel assignment with the MCP/HMI
14512[17]	Bit 0: turret (turning); tool magazine (milling)
	Bit 1: clamping function (turning)
	Bit 2: tail stock function (turning)
	Bit 3: selection between handwheel and hand-held unit (0: handwheel; 1: hand-held unit)
14512[18]	Special configurations for machines
	Bit 2: automatic lubrication at power-on
	Bit 4: external signal for spindle stop
	Bit 5: fixed spindle direction
	Bit 6: the hardware limit is independent from a PLC program
	Bit 7: each feed axis has a hardware limit switch (activated when Bit 6 = 0)
14512[19]	Bit 1: function of spindle braking
	Bit 2: password clearing by power-on (0: delete the password; 1: do not delete the password)
	Bit 7: manual machine function (this function becomes active if you have installed licensed turning machine system and called it with a PLC subroutine)
14512[20]	Bit 0: grey coded switch (0: spindle override controlled by the grey code; 1: spindle override controlled by triggering user keys)
	Bit 1: spindle disable mode (0: disable by pressing the spindle stop key; 1: disable when detecting the standstill speed) [1]
	Bit 2: activate the first additional axis (0: disable the additional axis control; 1: enable the additional axis control)
	Bit 3: the first additional axis as the second spindle and does not need to be kept enabled (1: as the second spindle and does not need to be kept enabled)
	Bit 5: define the spindle override startup value (0: the startup spindle override is always 100%; 1: recode the spindle override value of the last machine turn off for the next startup)
	Bit 6/7: define the spindle override shift speed

Note:

When you set MD14512, you can use the following key to open the editor for bit setting:

[1]   When the position control mode is active, do not disable the spindle by detecting the standstill speed.

MD14514 Machine data - Float	PLC interface	Unit	Range	Function
14514[0]	DB4500.DBD2000	-	-3.40e38 to 3.40e38	Tool magazine: spindle poisoning angle
14514[1]	DB4500.DBD2004	-	-3.40e38 to 3.40e38	Tool magazine: preparation position of Z axis for tool change
14514[2]	DB4500.DBD2008	-	-3.40e38 to 3.40e38	Tool magazine: tool changing position of Z axis
14514[3]	DB4500.DBD2012	-	-3.40e38 to 3.40e38	Tool magazine: velocity of Z axis, go to tool changing position
14514[4]	DB4500.DBD2016	-	-3.40e38 to 3.40e38	Tool magazine: velocity of Z axis, back to tool change preparation position

Note

PLC interface signal addresses are represented with the V structure on the HMI while the manual shows them by the DB structure.

See the following table for the relationship between the two representations.

V Structure		DB Structure	
Access	Example	Example	Access
Bit	V38000002.1	DB3800.DBX2.1	Bit
Byte	VB38000002	DB3800.DBB2	Byte
Word	VW38000002	DB3800.DBW2	Word
Double Word	VD38000004	DB3800.DBD4	Double word

7.1.2   Downloading and commissioning PLC programs

To realize your own PLC functions, you can upload the default PLC program and edit it. With PLC Programming Tool installed on your PC, you can download customized PLC programs into the permanent memory of the control system. PLC Programming Tool is available in the Toolbox.

If you use the default PLC programs, you can skip this step and move to the next step.

Softkey functions
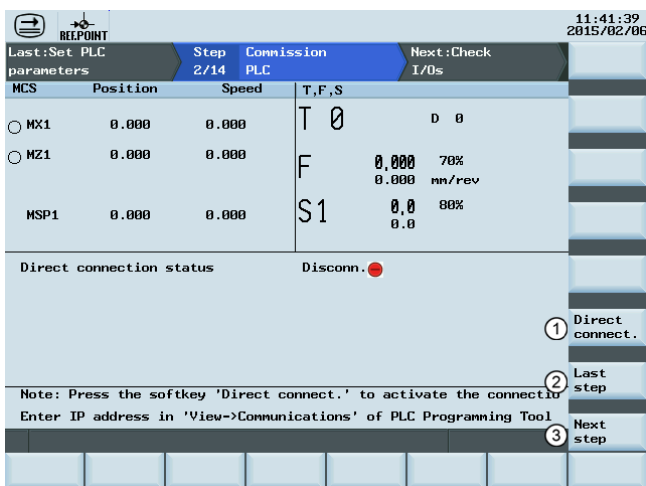
①   Activates/deactivates the direct connection with PLC Programming Tool via the Ethernet interface.

②   Returns to the previous step

③   Proceeds to the next step

For more information about the communication settings on the PC end as well as downloading and commissioning PLC programs with PLC Programming Tool, refer to Appendix "PLC Programming Tool (Page 181)".

Note

You should upload the sample PLC blocks to the PC first, then make the modifications to achieve the required functionality. Upon completion, you must put the PLC into stop and download the modified PLC into the PPU. Then you need to restart the PLC.

7.1.3 Checking I/O address assignment

You must check the I/O address assignment in this step to ensure correct wiring.

Softkey functions
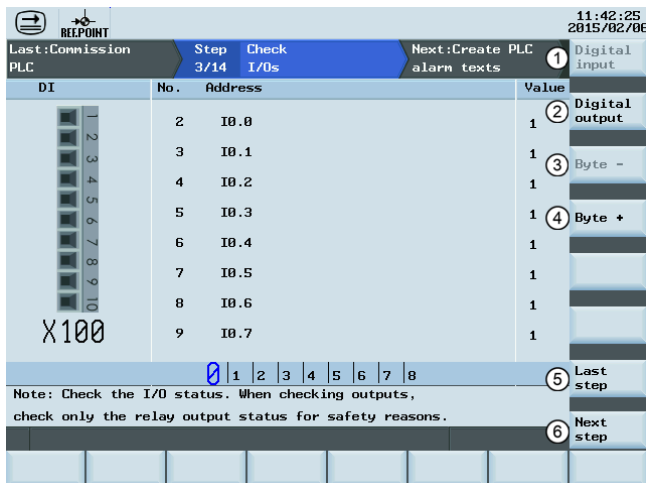
①	Selects the digital inputs	④	Shows the I/O addresses of the last byte
②	Selects the digital outputs	⑤	Returns to the previous step
③	Shows the I/O addresses of the next byte	⑥	Proceeds to the next step

7.1.4 Editing PLC alarm texts

PLC user alarms can be used as one of the most effective diagnosis methods. The control system provides 128 PLC user alarms (700xxx). You can edit the PLC alarm texts as required.

Operating sequence

1. Select the alarm text you desire to edit.
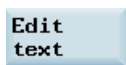
2. Press this softkey to activate the input field at the bottom of the screen and enter the desired text, for example:

Note that the text of each PLC user alarm must be limited to 50 characters; otherwise, the alarm cannot display properly.

3. Confirm your entry with this softkey or the following key:

Import

Export

4. You can also use these two softkeys to import / export the PLC user alarm texts from / to the following directories:

> Start-up archive
> OEM files
> USB
> User files

Next step

5. After you finish editing the alarm texts, press this softkey to move on to the next step.

Note

You can edit the alarm text either in English or in simplified Chinese. Editing in Chinese is only possible when the system language is simplified Chinese.

Pressing both the ALT key and the > S key on the PPU calls the Chinese character editor.

You can find the PLC alarm text files in different languages in the HMI data area through the following operation:

SHIFT + SYSTEM ALARM → Sys. data → HMI data

If you use a system language rather than the four default languages (Simplified Chinese, English, Portuguese, and Russian), the PLC alarm text file in that language is visible only after you edit the PLC alarm texts.

You can copy and paste these files for backup or other customized purposes.

7.2 Configuring the drives

Before starting the drive configuration, you must ensure the Drive Bus addresses are properly set (p0918) via the drive BOPs. For more information about setting the Drive Bus address, refer to Section "Configuring Drive Bus addresses (Page 78)".

Operating sequence

Start config.

1. Press this softkey on the main screen of drive configuration, and the controller starts to identify the drives and motors connected.

After the identification finishes, a drive list with motor information displays on the screen as follows:

Axis	Drive	Motor
MX1	11	not configured
MZ1	13	ID:10009(0.4KW/1.3A/3000r/min/Without brake)
MSP1	Ana. spindle	not configured

Note: For a motor with an absolute encoder, the motor ID can be identified automatically. For a motor with an incremental encoder, however, you must configure it manually.

2. Select the motor to be configured using the cursor keys.

Motor config.

3. Press this softkey to enter the motor configuration window.

4. Select the right motor ID according to the motor rating plate with the cursor keys.

Axis:MX1		Drive:11		
Motor ID	Power	Current	Speed	Brake type
18	0.4KW	1.3A	3000r/min	Without brake
19	0.4KW	1.3A	3000r/min	With brake

For example, you can find the motor ID on the following motor rating plate:

SIEMENS

SIMOTICS S-1FL6   3~Servo Motor
1P 1FL6042-1AF61-0AG1
1S LMH-C90388899302

M_N 1.27 Nm	I_N 1.2 A	n_N 2000 r/min
M_0 1.9 Nm	I_0 1.7 A	n_{max} 3000r/min
U_N 222 V	IP65 S1	3.3 kg
P_N 0.4 kW	Th.CL.130(B)	ID 18
ENCODER INC. 2500 ppr		BRAKE 24VDC

EAC   CE   EN60034

Siemens Standard Motors Ltd.   Made in China

Select

5. Press this softkey to confirm your selection. The selected motor information then displays in the drive list.

Axis	Drive	Motor
MX1	11	ID:18(0.4KW/1.3A/3000r/min/Without brake)
MZ1	13	ID:10009(0.4KW/1.3A/3000r/min/Without brake)
MSP1	Ana. spindle	not configured

Motor config.

6. For the analog spindle, you can use this softkey to set the relevant machine data as required.

32250[0]	RATED_OUTVAL	0	%	cf
32260[0]	RATED_VELO	3000	rpm	cf
36700	DRIFT_ENABLE	0		cf

Rated output voltage
Name:RATED_OUTVAL   Unit:%

It is recommended that you set the value of 32250 as 100%; otherwise, the spindle cannot rotate.

The following softkey operations are possible on this screen:

Resets the value of the selected parameter to default

Default

Cancels the last change to the parameter

Undo

Next step

7. After you finish configuring all motors, press this softkey to save the configuration results on both CNC and drives and proceed to the next step.

Note: The control system restarts after you press this softkey. In this case, for the drive connected to a motor with an incremental encoder, immediately after the "RDY" LED on the servo drive lights up green, the motor makes a short buzzing sound indicating that the motor is identifying the magnetic pole position of the rotor.

Note

You can change the motor direction of rotation by setting the drive parameter p1821. The parameter p1821 is accessible on the PPU through the following operations:

[SHIFT] + [SYSTEM ALARM] → [MD Mach. data] → [Drv basic list] /([Expert list] → [Drive MD])

Before changing the parameter p1821, first set the drive parameter p10 = 3 when the drive is in servo off state. Parameter p10 is accessible on the PPU through the following operations:

[SHIFT] + [SYSTEM ALARM] → [MD Mach. data] → [Expert list] → [Drive MD]
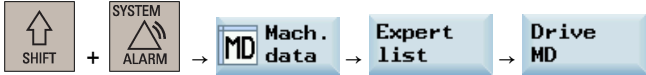
For detailed explanation about the drive parameters, you can call the online help by pressing the following key on the corresponding drive parameter screen:

[i HELP]

7.3 Setting basic parameters

7.3.1 Setting feed axis parameters

You can set the axis-specific machine data for each feed axis under this commissioning step.

Softkey functions

① Selects the next axis

② Selects the previous axis

③ Activates the modified values

④ Resets the value of the selected parameter to default

⑤ Cancels the last change to the parameter

⑥ Returns to the last step

⑦ Proceeds to the next step

Axis-specific parameters

No.	Name	Unit	Range	Description
30130[0]	CTRLOUT_TYPE	-	0 to 3	Output type of setpoint
30240[0]	ENC_TYPE	-	0 to 5	Encoder type
31020[0]	ENC_RESOL	-	-	Encoder lines per revolution
31030	LEADSCREW_PITCH	mm	≥ 0	Pitch of leadscrew
31050[0]	DRIVE_AX_RATIO_DENOM	-	1 to 2147000000	Number of the gearbox teeth at drive end (denominator of the deceleration ratio)

No.	Name	Unit	Range	Description
31060[0]	DRIVE_AX_RATIO_NUMERA	-	1 to 2147000000	Number of the gearbox teeth at leadscrew end (numerator of the deceleration ratio)
32000	MAX_AX_VELO	mm/min	-	Maximum axis velocity
32010	JOG_VELO_RAPID	mm/min	-	Rapid traverse in jog mode
32020	JOG_VELO	mm/min	-	Jog axis velocity
32100	AX_MOTION_DIR	-	-1 to 1	Traversing direction (not control direction) • = 1: Motor runs clockwise • = -1: Motor runs counter-clockwise
32260[0]	RATED_VELO	rpm	0	Rated motor speed
34200[0]	ENC_REFP_MODE	-	0 to 8	Referencing mode
36200[0]	AX_VELO_LIMIT	mm/min	-	Threshold value for velocity monitoring
36300[0]	ENC_FREQ_LIMIT	Hz	-	Encoder limit frequency = Motor rated velocity/60 × Encoder resolution

Note

The value of MD36200 should be 10% higher than that of MD32000; otherwise, alarm 025030 occurs.

7.3.2   Commissioning the referencing function

Principles for referencing

- Zero mark is away from the reference cam (MD34050: REFP_SEARCH_MARKER_REVERS = 0)
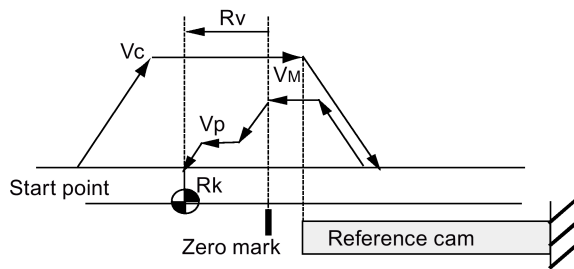
- Zero mark is above the reference point (MD34050: REFP_SEARCH_MARKER_REVERS = 1)
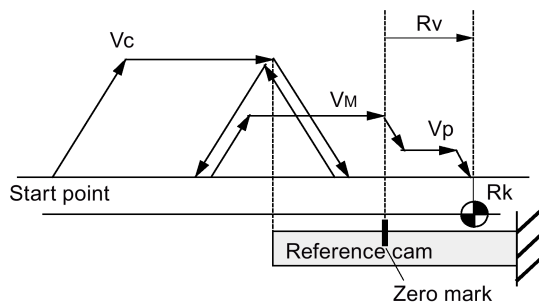
Vc	Velocity for searching for the reference cam (MD34020: REFP_VELO_SEARCH_CAM)
V_M	Velocity for searching for the zero mark (MD34040: REFP_VELO_SEARCH_MARKER)
Vp	Position velocity (MD34070: REFP_VELO_POS)
Rv	Shift of the reference point (MD34080: REFP_MOVE_DIST + MD34090: REFP_MOVE_DIST_CORR)
Rk	Set position of the reference point (MD34100: REFP_SET_POS [0])

Softkey functions

You can commission the axis referencing function and approach the reference point by setting relevant machine data in the following window:

①	Selects the next axis	
②	Selects the previous axis	
③	Activates the modified values	
④	Resets the value of the selected parameter to default	
⑤	Cancels the last change to the parameter	
⑥	Returns to the last step	
⑦	Proceeds to the next step	

Approaching the reference point

To approach the reference point, you must follow the instructions on the screen:

- For an axis driven by a motor with an incremental encoder, the following instructions are displayed:


```
Help
1.Set the MDs as required, and th
en press 'Activate' and 'RESET'.
2.Press the corresponding axis tr
aversing key for referencing.
```

- For an axis driven by a motor with an absolute encoder, the following instructions are displayed:


```
Help
1.Switch to 'JOG' mode. Traverse
the axis to a certain position.
2.Enter the reference position va
lue in 34100.
3.Enter '1' in 34210 to activate
the encoder debugging.
4.Press in order 'REF. POINT', 'A
ctivate' and 'RESET'.
5.Press the corresponding axis tr
aversing key for referencing.
```

If the axis is referenced, a symbol 🜨 appears next to the axis identifier, for example:

Relevant machine data

No.	Name	Unit	Default value	Description
20700	REFP_NC_START_LOCK	-	1	NC start disable without reference point
34010	REFP_CAM_DIR_IS_MINUS	-	0	Direction for approaching the reference point: • 0: + • 1: -
34020	REFP_VELO_SEARCH_CAM	mm/min	5000	Velocity for searching for the reference cam
34040[0]	REFP_VELO_SEARCH_MARKER	mm/min	300	Velocity for searching for the zero mark
34050[0]	REFP_SEARCH_MARKER_REVERSE	-	0	Direction for searching for the zero mark: • 0: + • 1: -
34060[0]	REFP_MAX_MARKER_DIST	mm	20	Checking the maximum distance from the reference cam
34070	REFP_VELO_POS	mm/min	10000	Positioning velocity for approaching the reference point
34080[0]	REFP_MOVE_DIST	mm	-2.0	Reference point distance (with marker)
34090[0]	REFP_MOVE_DIST_CORR	mm	0	Correction of reference point distance
34092[0]	REFP_CAM_SHIFT	mm	0	Shift of the reference cam
34093[0]	REFP_CAM_MARKER_DIST	mm	0	Distance between the reference cam and the first zero mark
34100[0]	REFP_SET_POS	mm	0	Reference point position for incremental system
34200[0]	ENC_REFP_MODE	-	1	Referencing mode
34210[0]	ENC_REFP_STATE	-	0	Adjustment status of absolute encoder
34220[0]	ENC_ABS_TURNS_MODULO	-	4096	Modulo range for rotary absolute encoder
34230[0]	ENC_SERIAL_NUMBER	-	0	Encoder serial number

Note

You must set the length of the reference cam based on the velocity set by MD34020. An axis can stop above the cam after it approaches the cam at the velocity set by MD34020 and then decelerates to "0".

7.3.3 Setting spindle parameters

The control system controls one analog spindle. You can commission the spindle by setting the relevant machine data under this commissioning step.

Softkey functions
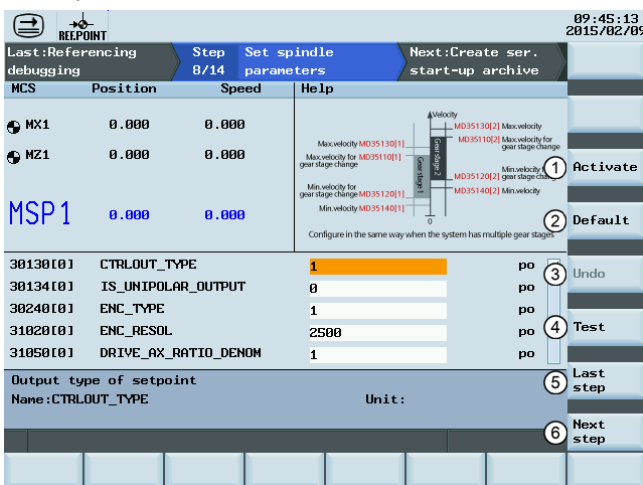
①	Activates the modified values	④	Switches to "MDA" mode for program test
②	Resets the value of the selected parameter to default	⑤	Returns to the last step
③	Cancels the last change to the parameter	⑥	Proceeds to the next step

Relevant machine data

No.	Name	Unit	Default value	Description
30130[0]	CTRLOUT_TYPE	-	0	Output type of setpoint
30134[0]	IS_UNIPOLAR_OUTPUT	-	0	Setpoint output is unipolar
30240[0]	ENC_TYPE	-	0	Encoder type of actual value sensing (actual position value)
31020[0]	ENC_RESOL	-	2048	Encoder lines per revolution
31050[1...5]	DRIVE_AX_RATIO_DENUM	-	1	Denominator load gearbox
31060[1...5]	DRIVE_AX_RATIO_NUMERA	-	1	Numerator load gearbox
32020	JOG_VELO	rpm	30	Jog axis velocity
32100	AX_MOTION_DIR	-	1	Traversing direction (not control direction)
32110[0]	ENC_FEEDBACK_POL	-	1	Sign actual value (control direction)
32260[0]	RATED_VELO	rpm	3000	Rated motor speed
34200[0]	ENC_REFP_MODE	-	1	Referencing mode
34210[0]	ENC_REFP_STATE	-	0	Adjustment status of absolute encoder
34220[0]	ENC_ABS_TURNS_MODULO	-	4096	Modulo range for rotary absolute encoder
34230[0]	ENC_SERIAL_NUMBER	-	0	Encoder serial number
35010	GEAR_STEP_CHANGE_ENABLE	-	0	Parameterize gear stage change
35100	SPIND_VELO_LIMIT	rpm	10000	Maximum spindle speed
35110[1...5]	GEAR_STEP_MAX_VELO	rpm	[1]: 500 [2]: 1000 [3]: 2000 [4]: 4000 [5]: 8000	Maximum speed for gear stage change
35120[1...5]	GEAR_STEP_MIN_VELO	rpm	[1]: 50 [2]: 400 [3]: 800 [4]: 1500 [5]: 3000	Minimum speed for gear stage change
35130[1...5]	GEAR_STEP_MAX_VELO_LIMIT	rpm	[1]: 500 [2]: 1000 [3]: 2000 [4]: 4000 [5]: 8000	Maximum speed of gear stage
35140[1...5]	GEAR_STEP_MIN_VELO_LIMIT	rpm	[1]: 5 [2]: 10 [3]: 20 [4]: 40 [5]: 80	Minimum speed of gear stage
36200[1...5]	AX_VELO_LIMIT	rpm	31944	Threshold value for velocity monitoring
36300[0]	ENC_FREQ_LIMIT	Hz	333000	Encoder limit frequency = Motor rated velocity / 60 × Encoder resolution

7.4 Creating series archives

Creating series startup archives is a prerequisite for series machine commissioning. The series startup archives contain data from the prototype machine commissioning which bring the series machine to the same state.

Operating sequence

1. Specify the properties of the archive as required:

2. Press this softkey to open the window for saving the archive file. You must select a directory from this window:

The default name of the data archive is "arc_product.arc". You can use your desired name for it.
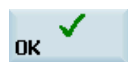
3. Press this softkey to create the archive.

Note

If you choose USB as the target directory, do not remove the USB stick during the data saving.

7.5 Setting compensation data

7.5.1 Setting software limit switch data

The software limit switches are used to limit the maximum traversing range on each individual axis.

You can set the software limit switches for each axis by configuring parameters 36100 and 36110 under this commissioning step.
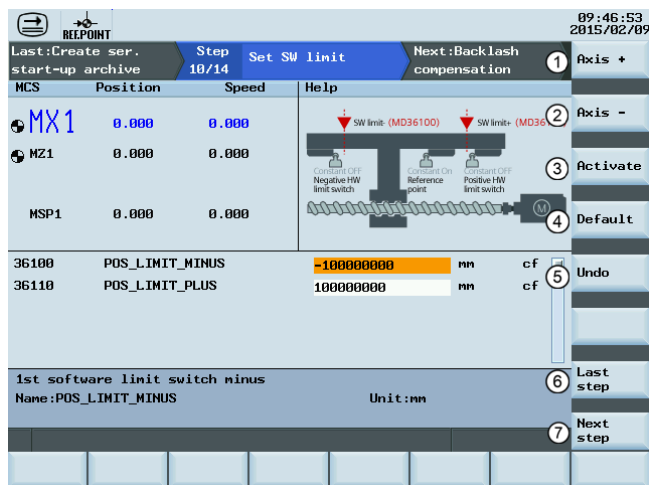
Softkey functions

① Selects the next axis

② Selects the previous axis

③ Activates the modified values

④ Resets the value of the selected parameter to default

⑤ Cancels the last change to the parameter

⑥ Returns to the last step

⑦ Proceeds to the next step

Setting parameters

No.	Name	Unit	Default value	Description
36100	POS_LIMIT_MINUS	mm	-100000000	- software limit switch
36110	POS_LIMIT_PLUS	mm	100000000	+ software limit switch

7.5.2 Setting backlash compensation data

In the case of axes/spindle with indirect measuring systems, mechanical backlash results in corruption of the traverse path, causing an axis, for example, to travel too much or too little by the amount of the backlash when the direction of movement is reversed.

You can set the backlash compensation by configuring the parameter 32450[0].

Softkey functions

①	Selects the next axis	⑤	Cancels the last change to the parameter
②	Selects the previous axis	⑥	Returns to the last step
③	Activates the modified values	⑦	Proceeds to the next step
④	Resets the value of the selected parameter to default		

Setting parameter

No.	Name	Unit	Default value	Description
32450[0]	BACKLASH	mm	0	Backlash compensation is active after reference point approach.

7.5.3 Setting leadscrew error compensation data

The principle of the leadscrew error compensation is to modify the axis-specific position actual value by the assigned compensation value at the particular compensation point and to apply this value to the machine axis for immediate traversal. A positive compensation value causes the corresponding machine axis to move in the negative direction.

Softkey functions
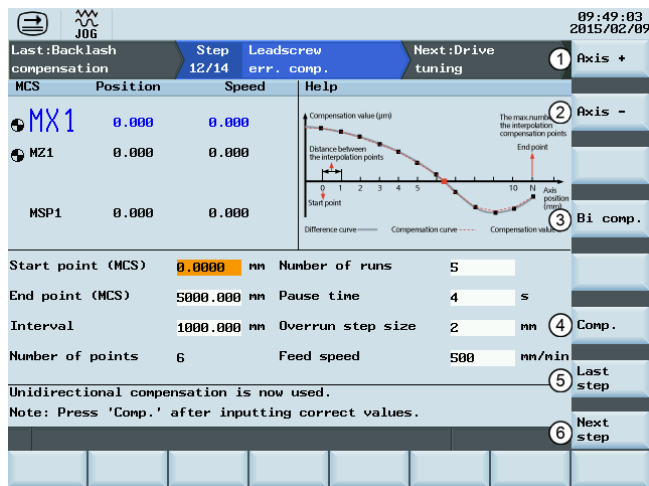
①	Selects the next axis	④	Opens the window for entering the compensation values
②	Selects the previous axis	⑤	Returns to the last step
③	Switches to bidirectional compensation	⑥	Proceeds to the next step

Operating sequence

Bi comp.	1.	You can press this softkey to switch to bidirectional compensation to realize more precise compensation, if required.
		The unidirectional compensation is used by default.
		Note: This softkey is active only if the optional bidirectional leadscrew error compensation has been activated with the license key. For more information about this software option, refer to the SINUMERIK 808D ADVANCED Function Manual.
Axis + **Axis -**	2.	Use these softkeys to select an axis.
	3.	Specify the following parameters as desired.
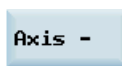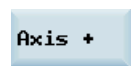
Comp.	4.	Press this softkey to enter the compensation screen.
	5.	Follow the instructions in the help window to perform the compensation for the selected axis.
« Back	6.	Press this softkey and repeat the above operations for the rest axis/axes until all axes are compensated.

7.6 Tuning drive performance

This commissioning step provides facilities to tune the drive performance for each axis by automatically modifying the control loop parameters. The tuning is performed based on frequency response measurements of the dynamic response of the machine.

Softkey functions
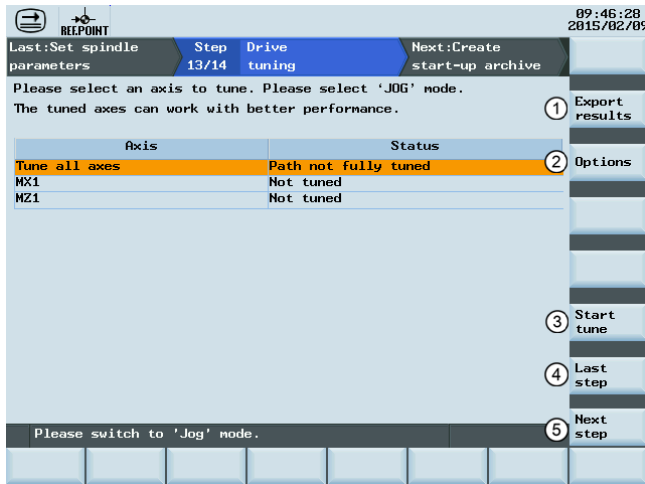
① Saves the trace files during the tuning process to a USB flash disk (if inserted)

② Enters the window for selecting the tuning strategy

③ Starts the drive tuning process

④ Returns to the last step

⑤ Proceeds to the next step

Operating sequence

1. Switch to "JOG" mode. Note that the drive tuning can be performed in "JOG" mode only.

2. You can select all axes or an individual axis for tuning.

3. Press this softkey to enter the window for selecting the tuning options.

4. Use this key to select a desired tuning objective. There are three objectives available for selection:

   - For less rigid axes with motor feedback:

   - For rigid axes and/or direct drive:

   - For large machines with direct feedback:

5. Move the cursor and select the desired measurement and interpolation options for each axis.

For the first tuning, only the following measurement option is available, which enables a new measurement with all preliminary measurement steps.

`New meas. with prelim. steps`

The following additional measurement options are available only if you have performed drive tuning for this axis:

- Performs a new measurement without carrying out the preliminary steps:

`New meas. with no prelim. steps`

- Uses the existing measurement results:

`Retune with existing results`

Besides, you can also specify the axis/axes for interpolation path tuning by selecting the corresponding interpolation option.

6. Press this softkey to confirm the selections and return to the main screen of drive tuning.

7. Press this softkey to enter the preparation screen before the tuning.

8. Use the axis traversing keys to move the axis/axes to be tuned to safe positions.

	Position	Direc.	Lim. -		Lim.
MX1	99.798	+,-	-1000	↓	1000
MZ1	200.002	+,-	-2000	↓	2000

9. Press this softkey and the drive tuning starts automatically.

10. Press this key on the MCP to start the measurement when the following message appears during the tuning process:

Start tuning

! Press this on MCP [CYCLE START] To start the measurement.

Press this on MCP [RESET] To cancel and return.

The axes move during the tuning.
Please clean up your workbench to avoid collision.
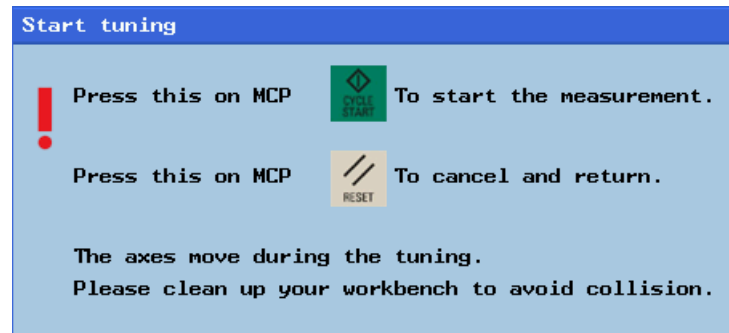
11. After the drive tuning finishes successfully, the tuning results appear on the screen in the form of a parameter list, for example:

MX1

	Data before tuning	Data after tuning	
P1433[0]	0.000000	111.905155	
P1434[0]	1.000000	0.707071	
P1460[0]	0.016902	0.160459	
P1462[0]	50.000000	10.000000	
P1656[0]	0H	1H	
P1657[0]	2	1	
P1659[0]	0.707000	0.707100	
P1660[0]	1999.000000	2000.000000	
MD32200[0]	0.139684	4.000000	
MD32640[0]	0	1	
MD32810[0]	0.003000	0.002237	
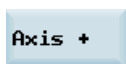
	You can check the tuning results of other tuned axis/axes (if any) with these softkeys.
Axis +	
Axis -	
✓ **Accept**	12. Press this softkey to save the tuning results and write the modified parameters into the drives.
✗ **Cancel**	Pressing this softkey aborts the tuning and deletes the results.
Next step	13. After it returns automatically to the main screen of drive tuning, press this softkey to proceed to the next step.
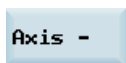
The following softkey operation is also available on this screen:
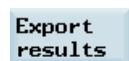
Export results	Saves the trace files during the tuning process to a USB flash disk (if inserted)

Note

For the machine data that are changeable only with a manufacturer password, the settings made during drive tuning cannot be restored after an NC restart in case of power failure or unexpected abortion of the tuning process.

7.7 Creating prototype machine commissioning archives

After commissioning the prototype machine, you must also create a commissioning archive for the data backup of the prototype itself.

To create a start-up archive for the prototype machine, proceed as follows:

1. Specify the properties of the archive as required:

Create archive [softkey]

2. Press this softkey to open the window for saving the archive file. Select a directory from this window using the cursor keys:

```
Save file ...
arc_startup.arc
☐ Start-up archive
☐ OEM files
☐ USB
```
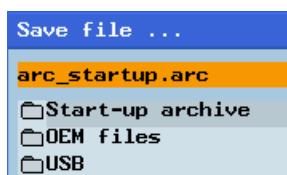
The default name of the data archive is "arc_startup.arc". You can use your desired name for it.

INPUT [key]

3. Press this key to open the selected directory. Select a folder using the cursor keys.

OK ✓ [softkey]

4. Press this softkey to create the archive.

Finish [softkey]

5. After the archive is created successfully, press this softkey to finish commissioning the prototype machine and return to the main screen of the wizard.

SHIFT + **SYSTEM ALARM** [keys]
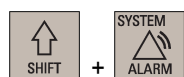
6. Select the desired operating area.

Save data [softkey]

7. Press this softkey to save data.
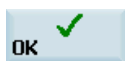
OK ✓ [softkey]

8. Press this softkey to complete the operation.

Note

If you choose USB as the target directory, do not remove the USB stick during the data saving.

---

8 Series machine commissioning

Note

The control system constantly creates restoring points during operation. In case of data loss due to power failure or other problems, the control system automatically restores the last autosaved system data upon startup with an alarm appearing on the screen.

8.1 Loading series commissioning archives

You can use the series commissioning archive to commission the machines for series production. The series archive is created during the commissioning of the prototype machine. For more information about creating a series archive, refer to Section "Creating series archives (Page 99)".

Operating sequence

Series assistant [softkey]

1. Press this horizontal softkey on the main screen of wizards to call the commissioning wizard for series machines.

Select [softkey]

2. Use either softkey to enter the window for loading the series commissioning archive.

Start assistant [softkey]
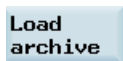
Load archive

3. Press this softkey to open the dialog for loading the series archive.

   Open file ...
   - Start-up archive
   - OEM files
   - USB
   - User files
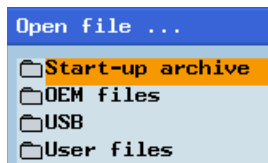
4. Enter the backup directory and select the desired archive file.

OK ✓

5. Press this softkey to confirm your selection, and the archive information displays on the screen.

OK ✓

6. Check the archive information and press this softkey to start loading the series commissioning archive.

Note

Successful loading of the data archive can delete the password. You must set the password again before proceeding. For more information about setting a password, refer to Section "Setting the password (Page 81)".

8.2 Setting software limit switch data

Refer to Section "Setting software limit switch data (Page 100)".

8.3 Setting backlash compensation data

Refer to Section "Setting backlash compensation data (Page 101)".

8.4 Setting leadscrew error compensation data

Refer to Section "Setting leadscrew error compensation data (Page 102)".

8.5 Tuning drive performance

Refer to Section "Tuning drive performance (Page 103)".

8.6 Backing up series machine archives

Refer to Section "Creating prototype machine commissioning archives (Page 105)".

9 Other frequently used functions

9.1 Playing a slide show

The control system has a function of playing a slide show. It supports multiple languages besides two standard ones, Simplified Chinese and English. After installing the language package of a non-standard language, you can create the slide show in this language.

Playing a slide show
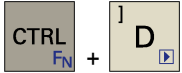
CTRL + D   You can press this key combination on the PPU to play a slide show and press the key combination again to exit the slide show.

Creating a slide show

By default, the slide show of Siemens product information is provided. You can create the desired slide show as follows:

1. Prepare your own slides and save them in the respective language folders on a USB stick. Name each folder according to the following convention.

   - Simplified Chinese: folder name = "chs";
   - English: folder name = "eng".

   The control system supports two kinds of image formats:

   - *.png
   - *.bmp

   The image size is recommended to be **640*480** pixels for the best display effect.

   Name each slide according to the following syntax:

   - **slide%u.png** or
   - **slide%u.bmp**

   Here "**%u**" is the number sequence starting with "**1**". For example, slide1.png, slide2.png, slide3.png ...

   If your slides include both PNG-format images and BMP-format images, number them separately. During the slide show, the PNG-format images will have a higher priority over the BMP-format images.

2. Insert the USB stick into the USB interface on the front panel of the PPU.

3. Enter the desired operating area.

   SHIFT + SYSTEM ALARM
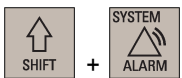
4. Locate the files on the USB stick through the following softkey operations:

   Sys data → USB

Name	Type	Length
chs	DIR	
eng	DIR	

5. Select all the language folders for slide shows by using this softkey; or you can select the desired language folder by moving the cursor up and down.

   Mark all

6. Copy the selected language folders with this softkey.

   Copy

	7.	Press this softkey to enter the main screen of HMI data.

808D data
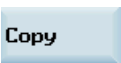
Name
📁 Start-up archive
📁 HMI data
📁 NCK/PLC data
📄 File for license key
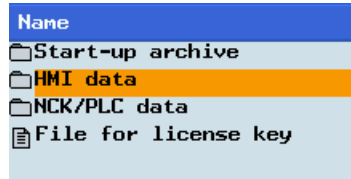
	8.	Enter the folder related to HMI data.

INPUT

	9.	Navigate to the folder highlighted as follows:

Name	Type	Length	Date
🔼 ..			
📁 Customized bitmaps			
📁 User cycle files			
📁 EasyXLanguage scripts			
📁 OEM online help (*.txt;*.png;*.bmp)			
📁 Extended user text file (almc....txt)			
📁 OEM MD description file (md_descr....txt)			
📁 OEM manual (oemmanual.pdf)			
📁 PLC alarm texts (alcu....txt)			
📁 OEM slideshow (*.bmp;*.png)			
📁 OEM R variable name file (rparam_name....txt)			
📁 Service planner task name file (svc_tasks....txt)			

	10.	Press this key to open the folder.

INPUT

	11.	Paste the copied language folders with this softkey.

Paste

	12.	Press this key combination to play the slide show.

CTRL F_N + **D**

Note

You can set the time interval between slides using MD9001 TIME_BTWEEN_SLIDES. This parameter can be found through the following operations:

SHIFT ⇧ + **SYSTEM ALARM** → **MD Mach. data** → **Expert list** → **Display MD**

For languages rather than Simplified Chinese and English, name the folder containing slide show files with the corresponding abbreviations. For more information, see Section "Loading system languages (Page 85)".

9.2   Defining the service planner

With the service planning function, you can specify the service timer and define your own service information. This section shows you how to define the OEM service planner.

Creating a new service task

To create a new service task, perform the following steps:

SHIFT + SYSTEM ALARM	1.	Enter the desired operating area.
>	2.	Press this key on the PPU to view the extended softkeys.
Serv. planr.	3.	Enter the main screen of service planning.
New task	4.	Create a new task. Enter values in the respective fields.

```
Create new task ...

Task description:
① TEST
② Interval [h]:          10
③ First warning [h]:     1
④ Number of warnings:    1
```

① The description of the service task set by the user.

② Maximum time until the next maintenance in hours; if this value ≠ 0, this data set is accepted by the PLC as a valid service task.

③ Time of the first warning is displayed since the user defined the task. This value must be less than that of the interval.

④ Number of warnings that are output by the PLC.
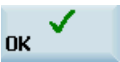
	5.	Confirm the above input to complete creating the new task.
OK ✓		

Viewing the service task

To view the created service task, proceed as follows:

SHIFT + SYSTEM ALARM	1.	Enter the desired operating area.
Sys. data	2.	Enter the main screen of HMI data.
INPUT	3.	Enter the folder related to HMI data.

```
Name
📁 Start-up archive
📁 HMI data
📁 NCK/PLC data
📄 File for license key
```

| 4. | Navigate to the highlighted folder shown below. |

Name	Type	Length	Date
..			
Customized bitmaps			
User cycle files			
EasyXLanguage scripts			
OEM online help (*.txt;*.png;*.bmp)			
Extended user text file (almc....txt)			
OEM MD description file (md_descr....txt)			
OEM manual (oemmanual.pdf)			
PLC alarm texts (alcu....txt)			
OEM slideshow (*.bmp;*.png)			
OEM R variable name file (rparam_name....txt)			
Service planner task name file (svc_tasks....txt)			

| 5. | Press this key to open the folder. |

Name	Type
..	
svc_tasks_eng.txt	
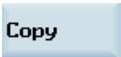
| 6. | Copy the desired service planner text. |

| 7. | Press this softkey to enter the screen form of user cycle. |

| 8. | Press this softkey to paste the copied text into the screen form of user cycle. |

| 9. | Press this key to view the service task. |

Editing the service task

To edit the created service task, proceed as follows:

| 1. | Enter the desired operating area. |

| 2. | Press this key on the PPU to view the extended softkeys. |

| 3. | Enter the main screen of service planning. |

| 4. | Press this softkey to enter the screen form of task change. |

5. Change the task description in the following box as desired.

6. Confirm the above input to complete changing the task.

Note

You can use the service planning function under different languages which are supported by the control system. For other languages, name the task files with the abbreviations corresponding to the languages. For example, the task files in Italian will be named as "svc_tasks_ita.txt". For more information about the language abbreviation, see Section "Loading system languages (Page 85)".

9.3 Using the machine manufacturer startup screen and machine logo

The control system uses the Siemens startup screen and machine logo by default. If necessary, you can use your own startup screen and machine logo.

Using the machine manufacturer startup screen

The default startup screen is shown below:

To change it to your own startup screen, proceed as follows:

1. Prepare the image of the startup screen and save it on a USB stick.

   The control system supports a startup screen image in the BMP format with a maximum size of **600×360** pixels (W×H).

   Name the image as "**startup.bmp**".

2. Insert the USB stick into the USB interface on the front panel of the PPU.

3. Locate the startup screen file in the USB stick through the following softkey operations:

Copy	4.	Copy the file with this softkey.
808D data	5.	Press this softkey to enter the main screen of HMI data.

Name
- Start-up archive
- HMI data
- NCK/PLC data
- File for license key

INPUT	6.	Enter the folder related to HMI data.
▼	7.	Navigate to the highlighted folder shown below.

Name	Type	Length	Date
..			
Customized bitmaps			
User cycle files			
EasyXLanguage scripts			
OEM online help (*.txt;*.png;*.bmp)			
Extended user text file (almc....txt)			
OEM MD description file (md_descr....txt)			
OEM manual (oemmanual.pdf)			
PLC alarm texts (alcu....txt)			
OEM slideshow (*.bmp;*.png)			
OEM R variable name file (rparam_name....txt)			
Service planner task name file (svc_tasks....txt)			

INPUT	8.	Enter the folder and the default startup screen and machine logo files are placed in this folder.

Name	Type	Length
..		
OEM machine logo (mtbico.bmp)		
OEM start-up splash screen (startup.bmp)		

Paste	9.	Press this softkey to replace the default startup screen file with your own file.
CTRL F_N + **' R**	10.	Press these two keys to restart the HMI. You can see your own startup screen during the startup of the control system.

70%

Start HMI Window Manager

Note

To restore the default startup screen, delete the customized bitmap file (startup.bmp) from the control system.

Using the machine manufacturer machine logo

The default machine logo is displayed in the following operating area:
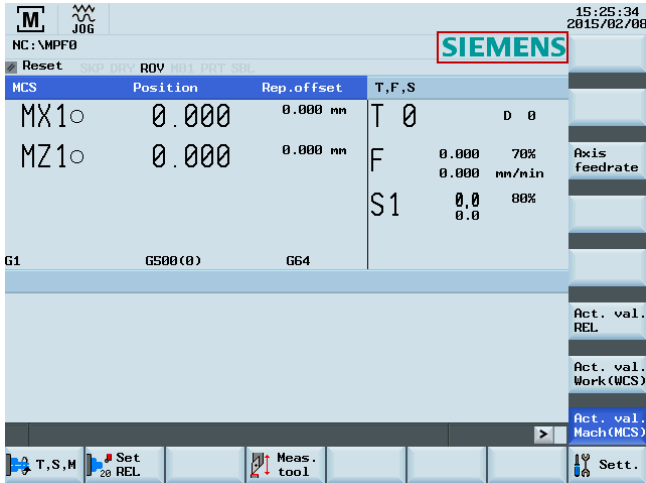
To use your own machine logo, proceed as follows:

1. Prepare your own machine logo and save it on a USB stick.

    The control system supports the machine manufacturer machine logo in the BMP format with a maximum size of **124×19** pixels (W×H).

    Name the image as "**mtbico.bmp**".

    Note that a machine logo with the size of 124×19 pixels can make the best effect.

2. Insert the USB stick into the USB interface on the front panel of the PPU.

3. Locate the machine logo file in the USB stick through the following softkey operations:
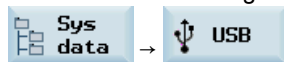
4. Copy the file with this softkey.

5. Press this softkey to enter the main screen of HMI data.

6. Enter the folder related to HMI data.

7. Navigate to the highlighted folder shown below.

Name	Type	Length	Date
..			
Customized bitmaps			
User cycle files			
EasyXLanguage scripts			
OEM online help (*.txt;*.png;*.bmp)			
Extended user text file (almc....txt)			
OEM MD description file (md_descr....txt)			
OEM manual (oemmanual.pdf)			
PLC alarm texts (alcu....txt)			
OEM slideshow (*.bmp;*.png)			
OEM R variable name file (rparam_name....txt)			
Service planner task name file (svc_tasks....txt)			

8. Enter the folder and the default startup screen and machine logo files are placed in the folder.

Name	Type	Length
..		
OEM machine logo (mtbico.bmp)		
OEM start-up splash screen (startup.bmp)		

9. Press this softkey to replace the default machine logo file with your own machine logo file.
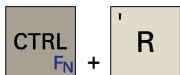
10. Press these two keys to restart the HMI. You can see your own machine logo in the following operating area.

Note

To restore the default "SIEMENS" logo display, delete the customized bitmap file (mtbico.bmp) from the control system.

9.4 Creating user cycles

The control system is integrated with standard Siemens cycles. If necessary, you can also create your own cycles.

To create a customized cycle, you must prepare the files shown below:

- User cycle file
- Extended user text file
- User cycle alarm file
- User cycle softkey index file
- User cycle parameter file
- User cycle bitmap file

9.4.1 Creating the extended user text file

The extended user text file is required for the display of respective screen texts, cycle messages and softkey texts.

Naming rule

almc_<LANG>.txt

Here "**<LANG>**" refers to the language denotation, for example, eng.

For details on how to name an extended user text file, see Section "Multi-language support for the machine manufacturer's HMI data".

Text definition rules

When defining the texts, you must follow the rule below:

<Identifier> "<Text>" // <# chars & lines>

- <Identifier>: here you define the identifier with a number. The number ranges from 83000 to 84999.
- <Text>: here you define the actual text.
- <# chars & lines>: here you specify the available space for the text in the GUI in number of characters and lines. You can start a new line by inserting the character of "**%n**". A maximum of 2 lines with 9 characters each are available for softkey texts.

Examples

83000 "User%nCycles" // 2*9 ⇒ two lines. Each line with nine characters space

83002 "CYCLE10" // 9 ⇒ one line with nine characters space

9.4.2 Creating the user cycle softkey index file

The user cycle softkey index file (cov.com) file is required to define the softkeys for the user cycle. You can create the cov.com file with a text editor like the WordPad or Notepad.

Text definition rules

Sx.y.z\$+identifier\bitmap(cycle)

Parameters	Value range	Significance
X	5	The fifth horizontal key.
Y	1 to 8	The first to eighth vertical key in the first level.
Z	1 to 8	The first to eighth vertical key in the second level.
\$+identifier\	-	Defined in the cycle text file.
bitmap(cycle)	-	The bitmap for the user cycle. The bitmap name must be followed with name of the user cycle.

Examples

S5.0.0\\$83000\\ **>** define a softkey (identifier: 83000) at the horizontal key 5.

S5.1.0\\$83001\\CN1(CYCLE100) **>** define a softkey (identifier: 83001) at the first vertical key of

 the first level when pressing the horizontal key 5.

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9.4.3 Creating the user cycle parameter file

The user cycle parameter file (sc.com) file is required to define the help information and the parameters for the user cycle. You can create the sc.com file with a text editor like the WordPad or Notepad.

Text definition rules

The "//" symbol indicates the beginning of a cycle description.

If you have created an image to display on the left of the screen at cycle start, call the image at the first line. The image is followed by the cycle name written in brackets.

Now define the parameters for the individual variables according to the format shown in the table below:

Line	Description of the parameters	Entry
1	Start of variable declaration	(
2	Variable type	R - REAL I - INTEGER C - CHAR S - STRING
3	Separator	/
4	• Minimum value + space + maximum value • * + different values for selection	• Minimum value + space + maximum value • * + different characters (use space to separate the different characters) Note that you can also define different pictures for the characters.
5	Separator	/
6	Default value	Value passed in the cycle if no entry is made.
7	Separator	/
8	Help information	$ + the identifier defined in the cycle text file
9	End of variable declaration	)
10	Start of description	[
11	Short text	The text displayed in the parameter screen form (defined in the cycle text file).
12	Separator	/
13	Text in the screen	Text preceding the input screen. A maximum of 5 characters in length.
14	End of description	]
15	Line-specific image	/B name.bmp

Note

Separators, start and end identifiers must always be entered.

The lines 4, 6 and 15 can be left blank.

If no texts are stored with the $identifier, three question marks appear in the associated fields on the screen.

Example

//CN1(CYCLE100)

(R/0 99999.999//$83002)[$83003/DIA]

(R/0 99999.999//$83004)[$83005/DIAF]

(R/-9999.999 99999.999//$83004)[$83004/STAP]

(R/-9999.999 99999.999//$83025)[$83005/ENDP]

(R/0 99999.999//$83026)[$83006/MID]

(R/0 99999.999//$83027)[$83007/UX]

(I/*0 1 2/0/$83028)[$83008/MACH]/B CN1

(R/1 99999.999/1/$83029)[$83009/VRT]

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9.4.4   Creating the user cycle file

You can create a user cycle file according to different machining functions. It is a subroutine program that can be used at calling a cycle.

Naming rule

CYCLExxx.SPF

Here "xxx" refers to the cycle number. It **must not** exceed four digits.

Note

The name of a user cycle **must not** be same with that of a standard Siemens cycle. It is recommend to use a cycle number with the range of 100 to 800.

Programming example

Create the program with a wordpad or notepad.

As a cycle screen always also transfers values as call parameters to the user cycle, the transfer interface is defined as follows.

```
PROC CYCLE100(REAL DIA,REAL DIAF,REAL STAP,REAL ENDP,REAL MID,REAL UX,INT MACH,REAL VRT) SAVE SBLOF
DISPLOF
```

PROC is a keyword followed by the cycle name with the cycle number. All the transfer parameters for the screen are contained within brackets with the data type and name separated by commas.

PROC CYCLE100(REAL DIA,REAL DIAF,REAL STAP,REAL ENDP,REAL MID,REAL

UX,INT MACH,REAL VRT) SAVE SBLOF DISPLOF

```
DEF REAL VAR1
IF $P_EP[X]<DIA GOTOF LL1
LL3:
IF DIAF>DIA GOTOF END2
START:
IF MACH==0 GOTOF ROUGHING1
IF MACH==1 GOTOF FINISHING
IF MACH==2 GOTOF ROUGHING1
DEF REAL VAR1
ROUGHING1:
R101=(DIA-DIAF)/2-UX
R102=R101/MID
R103=TRUNC(R102)
R104=0
VAR1=DIA
IF R103<=1 GOTOF ROUGHING2
LL2:
SBLON
G90 G0 X=VAR1 Z=STAP+2
```

```
G1 Z=ENDP
G91 X=MID
G0 G91 X=VRT Z=VRT
G90 G0 Z=STAP+2
SBLOF
VAR1=VAR1-2*MID
R104=R104+1
IF R104<=R103 GOTOB LL2
IF R104>R103 GOTOF ROUGHING2
ROUGHING2:
SBLON
G90 G0 X=DIAF+UX
G1 Z=ENDP
G0 G91X=VRT Z=VRT
G90 G0 X=DIA+2
Z=STAP+2
IF MACH==2 GOTOF FINISHING
SBLOF
RET
FINISHING:
SBLON
G0 X=DIAF
G1 Z=ENDP
G1 X=DIA+VRT
G0 G91X=VRT Z=VRT
G90 Z=STAP+2
SBLOF
RET
LL1:
IF $P_EP[Z]<STAP GOTOF END1
GOTOB LL3
END1:
SETAL(65000)
STOPRE
M0
RET
END2:
SETAL(65001)
STOPRE
M0
RET
```

9.4.5   Creating the user cycle alarm file

The user cycle alarm file is required to display alarm numbers and alarm messages for user cycles.

Naming rule

alc_<LANG>.txt

Here "**<LANG>**" refers to the language denotation, for example, eng.

For details on how to name a user cycle alarm file, see Section "Multi-language support for the machine manufacturer's HMI data".

Text definition rules

When defining the texts, you must follow the rule below:

<AlarmNumber> "<Text>" // <# chars & lines>

- <AlarmNumber>: here you define the alarm number. The number ranges from 65000 to 79999.

- <Text>: here you define the actual alarm text.

- <# chars & lines>: here you specify the available space for the text in the GUI in number of characters and lines. You can start a new line by inserting the character of "**%n**".

Examples

65000 "Current tool position is incorrect" // 34 ⇒ one lines with thirty-four characters space

65001 "DIAF is bigger than DIA" // 23 ⇒ one line with twenty-three characters space

9.4.6 Creating the user cycle bitmap file

The cycle icons **must** be stored as bitmap files (*.bmp) with a maximum size of **224 * 224** pixels in **16** colors.

The icon name **must** begin with an uppercase/lowercase "**C**" and its length **must not** exceed **32** characters including the file extension (e.g. CN1.bmp).

Note

If 16 colors are not sufficient for the display, you can also use 24-bit color depth bitmaps.

9.4.7 Transferring the desired files to the control system

Proceed as follows to transfer the required files to the control system.

Importing the cov.com file and sc.com file

1. Save the required file on a USB flash disk.
2. Insert the USB flash disk into the USB interface at the front of the PPU.
3. Select the desired operating area.

4. Press these two softkeys in succession.
   Then multi-select the cov.com and sc.com files with the following key:

   Finally, copy them with the following key:

5. Press this softkey and access the folder "HMI data" > "User cycle files".
   Replace the empty files with the following:

   →

   ```
   .. 
   User cycle bitmap file (*.bmp)
   User cycle alarm file (alc....txt)
   User cycle softkey index file (cov.com)
   User cycle parameter file (sc.com)
   ```
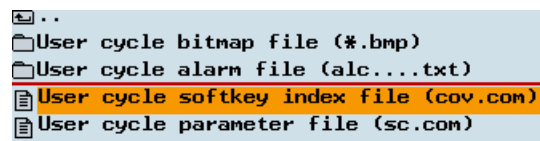
Importing the user cycle alarm file

1. Save the required file on a USB flash disk.
2. Insert the USB flash disk into the USB interface at the front of the PPU.
3. Select the desired operating area.
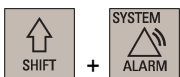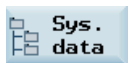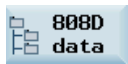
| | 4. | Press these two softkeys in succession.
Then select a user cycle alarm file (for example, alc_eng.txt) with the fllowing key: |

Sys. data

→

USB

SELECT

Finally, copy it with the following key:

Copy

808D data

5. Press this softkey and access the folder "HMI data" > "User cycle files" > "User cycle alarm file".

Then paste the file with the following:

Paste

→ ⤶ ..
  📄 alc_eng.txt

Importing the bitmap file
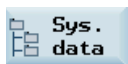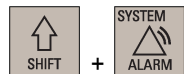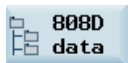
1. Save the required file on a USB flash disk.
2. Insert the USB flash disk into the USB interface at the front of the PPU.

SHIFT + SYSTEM ALARM

3. Select the desired operating area.

Sys. data

→

USB

4. Press these two softkeys in succession.
Then select a bitmap file (for example, cn1.bmp) with the following key:

SELECT

Finally, copy it with the following key:

Copy

808D data

5. Press this softkey and access the folder "HMI data" > "User cycle files" > "User cycle bitmap file".

Then paste the file with the following:

Paste

→

Name	Type	Length	Date	Time
⤶ ..				
📄 cn1	bmp	506.30 KB	11/04/19	03:16:43
📁 ico1024	DIR		12/01/06	03:11:39
📁 ico1280	DIR		12/01/06	03:11:39
📁 ico1600	DIR		12/01/06	03:11:39
📁 ico640	DIR		12/01/06	03:11:39
📁 ico800	DIR		12/01/06	03:11:39

Importing the user cycle file
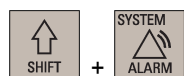
1. Save the required file on a USB flash disk.
2. Insert the USB flash disk into the USB interface at the front of the PPU.

SHIFT + SYSTEM ALARM

3. Select the desired operating area.
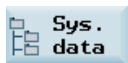
Sys. data	4.	Press these two softkeys in succession.
→		Then select a user cycle file (for example, CYCLE100) with the following key:
USB		

SELECT

Finally, copy it with the following key:

Copy
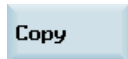
| User cycle | 5. | Press this softkey and then paste the file with the following: |

Paste

→

Name	Type	Length	Date	Time
CYCLE100	SPF	944 B	12/03/05	10:55:00

Importing the extended user text file
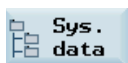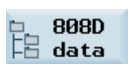
1. Save the required file on a USB flash disk.
2. Insert the USB flash disk into the USB interface at the front of the PPU.
3. Select the desired operating area.

SHIFT + SYSTEM ALARM

Sys. data	4.	Press these two softkeys in succession.
→		Then select an extended user text file (for example, almc_eng.txt) with the following key:
USB		

SELECT

Finally, copy it with the following key:

Copy
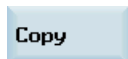
| 808D data | 5. | Press this softkey and access the folder "HMI data" > "Extended user text file". |
| | | Then paste the file with the following: |

Paste

→

..
almc_eng.txt
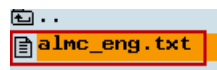
Note

After you import the cov.com file, sc.com file, alc_xxx.txt file, and almc_xxx.txt file into the control, a message appears, prompting you to restart the HMI. Then press the following key to restart the HMI so that the new data can be active:

OK ✔

9.4.8   Call the created user cycle

After you transfer all the files necessary for your own cycle to the control system, the cycle is created successfully. Then you can use the cycle in the <PROGRAM> operating area.

Proceed as follows to call the created cycle, for example, CYCLE888.

1.   Press this hardkey on the PPU, and the following horizontal softkey appears after you import the desired files into the control. Then press this softkey.

→
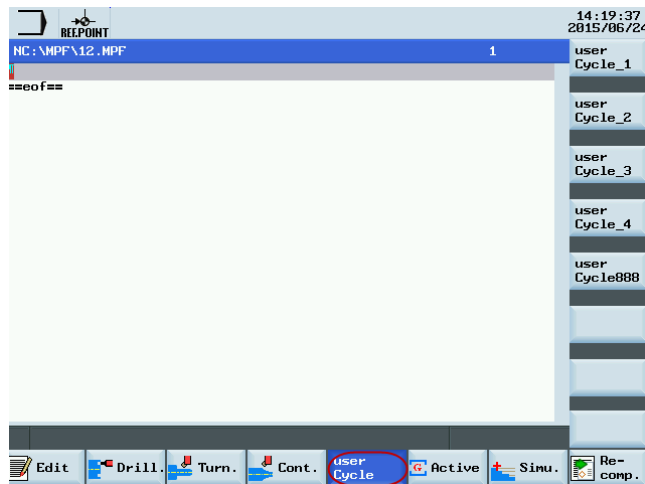
2.   Press this softkey to open the following window.
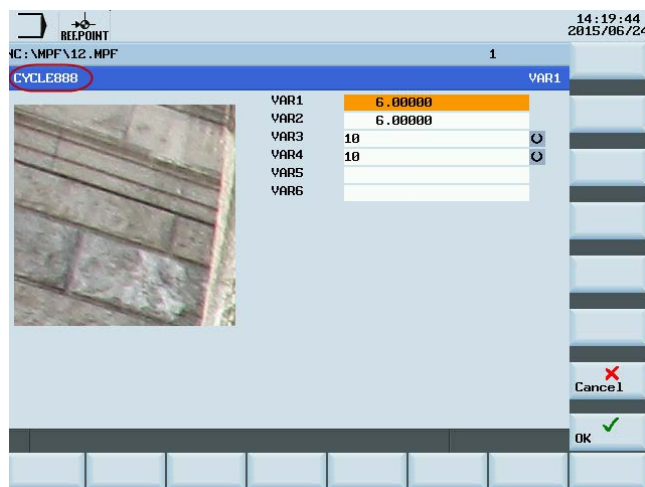
3.   Set the parameters as desired, and then press one of the following two softkeys.

Cancel : quit the cycle.

OK : save the settings. Then the following screen appears, indicating that the user cycle is saved.
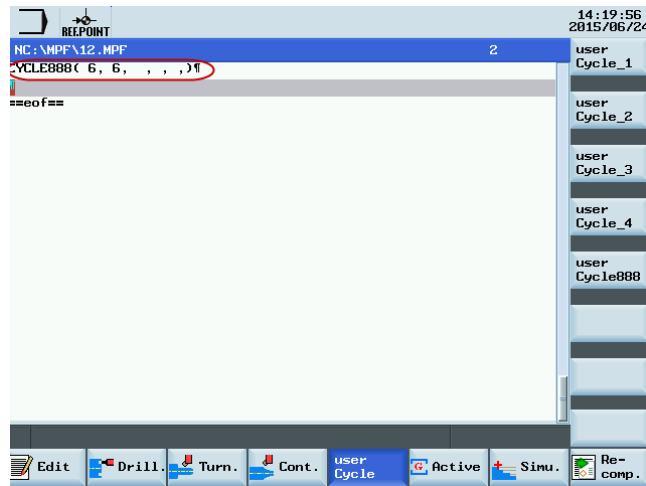
9.4.9 Editing the user cycle screens

You can edit the softkeys, identifiers, bitmaps or parameters for user cycles.

To do so, export the relevant files and edit them on a PC. After that, import them back to the respective folders and restart the control system.

9.5 Loading machine manufacturer's MD description files

Perform the following operations to access the "OEM MD description file" folder:

 → "HMI data" folder

→

 →

In the factory setting, the MD description files in the two default languages are prepared on the control but invisible to the machine manufacturer.

The machine manufacturer can load files of this type only after modifying the description of at least one of their MDs.

The detailed procedure is as follows:

1. Select the desired operating area.

→

2. Press these two softkeys in succession.
   Then select a certain MD with the cursor keys and then press the following:
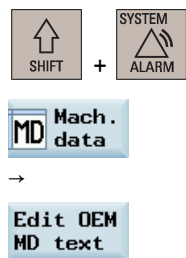
3. In the following dialog, edit the description text of the MD as desired, for example:

888

Name : USER_DATA_INT

Then save the modification with the following:

OK ✓

4. Access the "OEM MD description file" folder by performing the steps mentioned above.

At this time, a file containing the change log in the corresponding language exists in the folder.

Name
..
md_descr_eng.txt

Copy

→

User cycle

5. Press these two softkeys in succession to copy the file and then open the desired window.
In the opened window, paste the file with the following:

Paste

→

Name
CYCLE888
MD_DESCR_CHS
MD_DESCR_ENG
RPARAM_NAME_ENG

INPUT

6. Open the file with this hardkey.
Then you can view the change that you made.

NC:\CMA\MD_DESCR_ENG.TXT
T_MN_USER_DATA_HEX_IDX4 "888"   // 0¶
T_MN_USER_DATA_INT_IDX0 "111"   // 3¶
T_MN_USER_DATA_INT_IDX1 "888"   // 0¶
T_MN_USER_DATA_INT_IDX2 "User data (INT" // 0¶
==eof==

9.6 Loading machine manufacturer's R variable name files

Perform the following operations to access the "OEM R variable name file" folder:

[SHIFT] + [SYSTEM ALARM] → [Sys. data] → [808D data] → "HMI data" folder

→

Name	Type	Length	Date
..			
Customized bitmaps			
User cycle files			
EasyXLanguage scripts			
OEM online help (*.txt;*.png;*.bmp)			
Extended user text file (almc....txt)			
OEM MD description file (md_descr....txt)			
OEM manual (oemmanual.pdf)			
PLC alarm texts (alcu....txt)			
OEM slideshow (*.bmp;*.png)			
OEM R variable name file (rparam_name....txt)			
Service planner task name file (svc_tasks....txt)			

→ [INPUT]

In the factory setting, the R variable name files in the two default languages are prepared on the control but invisible to the machine manufacturer.

The machine manufacturer can load files of this type only after defining the name of at least one of their R variables.

The detailed procedure is as follows:

[OFFSET]

1. Select the desired operating area.

[R var.]

→

[Show R name]

2. Press these two softkeys in succession.
   Then select a certain R variable with the cursor keys.

3. In the following dialog, define the name of the R variable as desired, for example:

R variables		
No.	Name	Value
R0	111	111.000000
R1		0.000000

Then save your input with the following:

[INPUT]

4. Access the "OEM R variable name file" folder by performing the steps mentioned above.
   At this time, a file containing the change log in the corresponding language exists in the folder.

Name
..
rparam_name_eng.txt
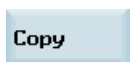
Copy

→

User cycle

5. Press these two softkeys in succession to copy the file and then open the desired window.
   In the opened window, paste the file with the following:

   Paste

   →

Name
CYCLE888
MD_DESCR_CHS
MD_DESCR_ENG
RPARAM_NAME_ENG

INPUT

6. Open the file with this hardkey.
   Then you can view the change that you made.

   ```
   NC:\CMA\RPARAM_NAME_ENG.TXT
   _RPARAMETER_NAME_0 "111" // 3¶
   ==eof==
   ```
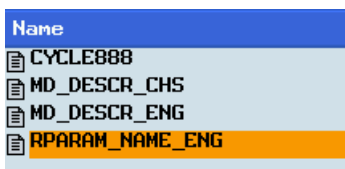
10 Technical data

10.1 SINUMERIK 808D ADVANCED
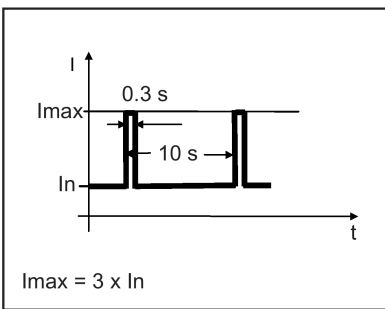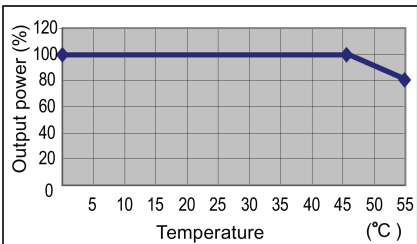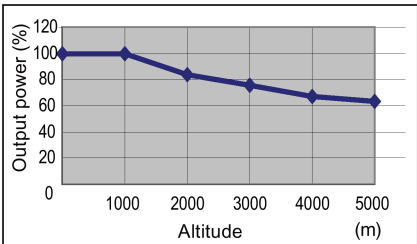
	PPU		MCP	
	Horizontal variant (161.2)	Vertical variant (160.2)	Horizontal variant	Vertical variant
Design data				
Dimensions (W x H x D) (in mm)	420 x 200 x 104	265 × 330 × 104	420 x 120 x 58	265 × 230 × 58
Weight (in kg)	2.985	2.865	0.86	0.795 (variant with a reserved slot for the handwheel)
				0.935 (variant with an override switch for the spindle)
Cooling method	Self-cooling		Self-cooling	
Degree of protection	Front side: IP65 Back side: IP20		Front side: IP65 Back side: IP00	
Electrical data				
Supply voltage	24 VDC (permissible range: 20.4...28.8 V)		Powered by PPU	
Ripple	3.6 Vpp		-	
Current consumption from 24 V	Basic configuration typically 1.5 A (inputs/outputs open)		-	
Non-periodic overvoltage	35 V (500 ms duration, 50 s recovery time)		-	
Total starting current	1 A		-	
Rated input current	2 A		0.5 A	
Power loss	max. 50 W		max. 5 W	
Interference immunity in accordance with EN 61800-3	≥ 20 µs		≥ 20 µs	
Overvoltage category	3		3	
Degree of pollution	2		2	

		PPU		MCP	
		Horizontal variant (161.2)	Vertical variant (160.2)	Horizontal variant	Vertical variant
Transport and storage conditions					
Temperature		-20 °C to +60 °C		-20 °C to +60 °C	
Vibration resistance (transport)		5 Hz to 9 Hz: 3.5 mm		5 Hz to 9 Hz: 3.5 mm	
		9 Hz to 200 Hz: 1g		9 Hz to 200 Hz: 1g	
Shock resistance (transport)		10 g peak value, 6 ms duration			
		100 shocks in each of the 3 axes vertical to one another			
Free fall		< 1 m		<1 m	
Relative humidity		5% to 95%, without condensation		5% to 95%, without condensation	
Atmospheric pressure		1060 hPa to 700 hPa (corresponds to an altitude of 3,000 m)			
Ambient operating conditions					
Temperature		0 °C to 45 °C			
Atmospheric pressure		From 1080 hPa to 795 hPa		From 1080 hPa to 795 hPa	
Vibration resistance (in operation)		10 Hz to 58 Hz: 0.35 mm		10 Hz to 58 Hz: 0.35 mm	
		58 Hz to 200 Hz: 1g		58 Hz to 200 Hz: 1g	
Shock resistance (in operation)		10 g peak value, 6 ms duration			
		6 shocks in each of the 3 axes vertical to each other			
Certification		CE, KCC [1], and EAC		CE and EAC	

[1] The KCC certification is released along with Siemens inverter G120 and currently valid only for PPU161.2.

10.2 SINAMICS V70 servo drives

Order No.	6SL3210-5DE...	12-4UA0	13-5UA0	16-0UA0	17-8UA0	21-0UA0	21-4UA0	21-8UA0
Rated output current (A)		1.2	3.0	4.6	5.3	7.8	11.0	13.2
Max. output current (A)		3.6	9.0	13.8	15.9	23.4	33.0	39.6
Max. supported motor power (kW)		0.4	1.0	1.5	1.75	2.5	3.5	7.0
Output frequency (Hz)		0 to 330						
Power supply	Voltage/frequency	3 phase 380 VAC to 480 VAC, 50/60 Hz						
	Permissible voltage fluctuation	-15% to +10%						
	Permissible frequency fluctuation	-10% to +10%						
	Rated input current (A)	1.5	3.8	5.8	6.6	9.8	13.8	16.5
	Power supply capacity (kVA)	1.7	4.3	6.6	7.6	11.1	15.7	18.9
	Inrush current (A)	8.0	8.0	4.0	4.0	4.0	2.5	2.5
24 VDC power supply	Voltage (V) [1]	24 (-15% to +20%)						
	Maximum current (A)	1 A (when using a motor without a brake)						
		3 A (when using a motor with a brake)						
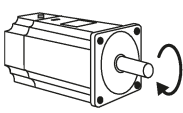
Order No.	6SL3210-5DE...			12-4UA0	13-5UA0	16-0UA0	17-8UA0	21-0UA0	21-4UA0	21-8UA0
Overload capability				300%						
Control system				Servo control						
Braking resistor				Built-in						
Protective functions				Earthing fault protection, output short-cut protection, overvoltage/undervoltage protection, I^2t detection, IGBT overtemperature protection						
Cooling method				Self-cooled		Fan-cooled				
Environmental conditions	Surrounding air temperature	Operation		0 °C to 45 °C: without power derating 45 °C to 55 °C: with power derating						
		Storage		-40 °C to +70 °C						
	Ambient humidity	Operation		< 90% (non-condensing)						
		Storage		90% (non-condensing)						
	Operating environment			Indoor (without direct sunlight), free from corrosive gas, combustible gas, oil gas, or dust						
	Altitude			< 1000 m (without derating)						
	Degree of protection			IP20						
	Degree of pollution			Class 2						
	Vibration	Operation	Shock:	Operational area II Peak acceleration: 5 g Duration of shock: 30 ms						
			Vibration:	Operational area II 10 Hz to 58 Hz: 0.075 mm deflection 58 Hz to 200 Hz: 1g vibration						

Order No.	6SL3210-5DE...		12-4UA0	13-5UA0	16-0UA0	17-8UA0	21-0UA0	21-4UA0	21-8UA0
	Transport & storage	Vibration:	5 Hz to 9 Hz: 7.5 mm deflection						
			9 Hz to 200 Hz: 2 g vibration						
			Vibration class: 2M3 transportation						
Certification	CE KC EAC ✓								
Mechanical design	Outline dimensions (W x H x D, mm)		80 x180 x200		100 x 180 x 220			140 x 260 x240	
Weight (kg)			1.85		2.45			5.65	

[1] When the SINAMICS V70 works with a motor with brake, the voltage tolerance of 24 VDC power supply must be -10% to +10% to meet the voltage requirement of the brake.

10.3 SIMOTICS S-1FL6 servo motors

General technical data

Parameter		Description
Type of motor		Permanent-magnet synchronous motor
Cooling		Self-cooled
Operating temperature [°C]		0 to 40 (without power derating)
Storage temperature [°C]		-15 to +65
Relative humidity [RH]		≤ 90% (non-condensing at 30°C)
Installation altitude [m]		≤ 1000 (without power derating)
Maximum noise level [dB]		1FL604❑: 65 1FL606❑ :70 1FL609❑: 70
Thermal class		B
Vibration severity grade		A (Acc. to IEC 60034-14)
Shock resistance [m/s^2]		25 (continuous in axial direction); 50 (continuous in radial direction); 250 (in a short time of 6 ms)
Holding brake	Rated voltage (V)	24 ± 10%		
	Rated current (A)	1FL604❑: 0.88	1FL606❑ : 1.44	1FL609❑: 1.88
	Holding brake torque [Nm]	1FL604❑: 3.5	1FL606❑ : 12	1FL609❑: 30
	Maximum brake opening time [ms]	1FL604❑: 60	1FL606❑ : 180	1FL609❑: 220
	Maximum brake closing time [ms]	1FL604❑: 45	1FL606❑ : 60	1FL609❑: 115
	Maximum number of emergency stops	2000 [1]		
Bearing lifetime [h]		> 20000 [2]
Oil seal lifetime [h]		5000
Encoder lifetime [h]		20000 to 30000 (when load factor ≤ 80% and at 30 °C) [3]
Paint finish		Black
Degree of protection		IP65, with shaft oil seal
Type of construction		IM B5, IM V1 and IM V3
Positive rotation		Clockwise (default setting in SINAMICS V70 servo drives)

Parameter	Description
Certification	CE EAC

[1] Restricted emergency stop operation is permissible. Up to 2000 braking operations can be executed with 300% rotor moment of inertia as external moment of inertia from a speed of 3000 RPM without the brake being subject to an inadmissible amount of wear.

[2] This lifetime is only for reference. When a motor keeps running at rated speed under rated load, replace its bearing after 20,000 hours to 30,000 hours of service time. Even if the time is not reached, the bearing must be replaced when unusual noise, vibration, or faults are found.

[3] This lifetime is only for reference. When a motor keeps running at 80% rated value and the surrounding air temperature is 30 °C, the encoder lifetime can be ensured.

Specific technical data

Order No.	1FL60...	42	44	61	62	64	66	67	90	92	94	96
Rated power [kW]		0.40	0.75	0.75	1.00	1.50	1.75	2.00	2.5	3.5	5.0	7.0 [1]
Stall torque [Nm]		1.9	3.5	4	6	8	11	15	15	22	30	40
Rated torque [Nm]		1.27	2.39	3.58	4.78	7.16	8.36	9.55	11.9	16.7	23.9	33.4
Maximum torque [Nm]		3.8	7.2	10.7	14.3	21.5	25.1	28.7	35.7	50.0	70.0	90.0
Rated speed [rpm]		3000		2000					2000			
Maximum speed [rpm]		4000		3000					3000		2500	2000
Rated frequency [Hz]		200		133					133			
Rated current [A]		1.2	2.1	2.5	3.0	4.6	5.3	5.9	7.8	11.0	12.6	13.2
Maximum current [A]		3.6	6.3	7.5	9.0	13.8	15.9	17.7	23.4	33.0	36.9	35.6
Stall current [A]		1.7	2.9	2.7	3.6	4.9	6.6	8.8	9.3	13.4	15	15
Moment of inertia [10^{-4} kgm^2]		2.7	5.2	8.0	15.3	15.3	22.6	29.9	47.4	69.1	90.8	134.3
Moment of inertia (with brake) [10^{-4} kgm^2]		3.2	5.7	9.1	16.4	16.4	23.7	31.0	56.3	77.9	99.7	143.2
Recommended load to motor inertia ration		< 1000%		< 500%					< 500%			
Weight of incremental encoder motor [kg]	With brake	4.6	6.4	8.6	11.3	11.3	14.0	16.6	21.3	25.7	30.3	39.1
	Without brake	3.3	5.1	5.6	8.3	8.3	11.0	13.6	15.3	19.7	24.3	33.2
Weight of absolute encoder motor [kg]	With brake	4.4	6.2	8.3	11.0	11.0	13.6	16.3	20.9	25.3	29.9	38.7
	Without brake	3.1	4.9	5.3	8.0	8.0	10.7	13.3	14.8	19.3	23.9	32.7

[1] When the surrounding air temperature is higher than 30 °C, the 1FL6096 motors with brake will have a power derating of 10%.

Note

The data of stall torque, rated power, and maximum torque in the above table allow a tolerance of 10%.

Power derating

For deviating conditions (surrounding air temperature > 40 °C or installation altitude > 1000 m above sea level), the permissible torque/power must be determined from the following table. Surrounding air temperatures and installation altitudes are rounded off to 5 °C and 500 m respectively.

Power derating as a function of the installation altitude and surrounding air temperature

Installation altitude above sea level (m)	Surrounding air temperature (°C)				
	< 30	30 to 40	45	50	55
1000	1.07	1.00	0.96	0.92	0.87
1500	1.04	0.97	0.93	0.89	0.84
2000	1.00	0.94	0.90	0.86	0.82
2500	0.96	0.90	0.86	0.83	0.78
3000	0.92	0.86	0.82	0.79	0.75
3500	0.88	0.82	0.79	0.75	0.71
4000	0.82	0.77	0.74	0.71	0.67

Torque-speed characteristics

1FL6042-1AF6
1FL6044-1AF6
1FL6061-1AC6
1FL6062-1AC6
1FL6064-1AC6
1FL6066-1AC6
1FL6067-1AC6
1FL6090-1AC6
1FL6092-1AC6
1FL6094-1AC6
1FL6096-1AC6

400 VAC supply voltage

A: Continuous operating area

B: Short-term operating area

380 VAC supply voltage
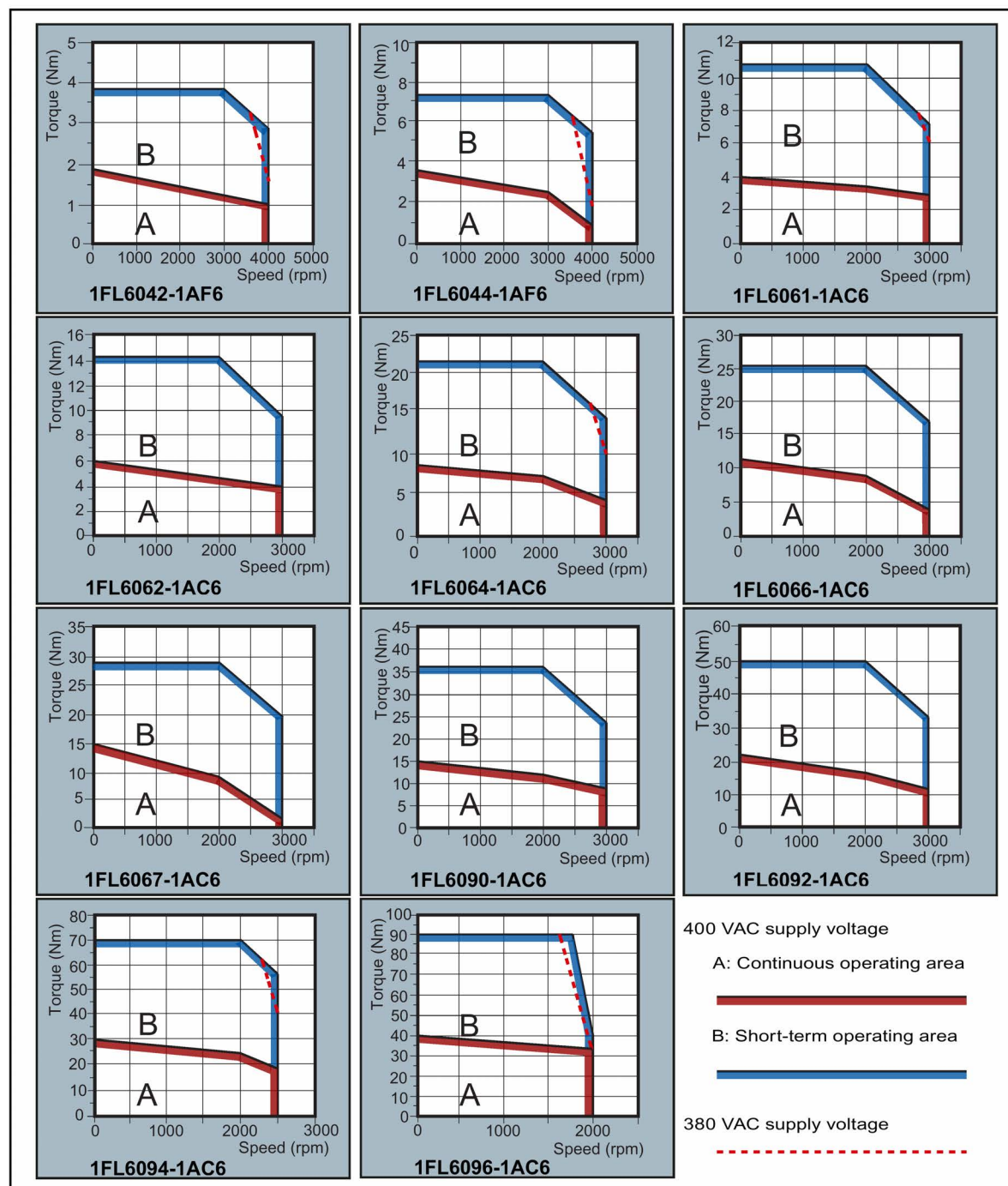
Note

1. Continuous operating area is a series of states when a motor can operate continuously and safely. The effective torque must be located in this area.

2. Short-term operating area is a series of states when a motor can operate in a short duration if its effective torque is smaller than the rated torque.

3. For the motors with different rated and maximum speeds, the output torque will decline at a faster rate after the speed exceeds the rated speed.

4. The feature in short-term operating area varies with power supply voltages.

5. The continuous operating area becomes smaller and the voltage drop grows larger when the cables in the major loop exceed 20 meters.

6. For 1FL6096 motors, the maximum speed can be ensured when the line supply voltage is higher than 380 V.

Permissible radial and axial forces
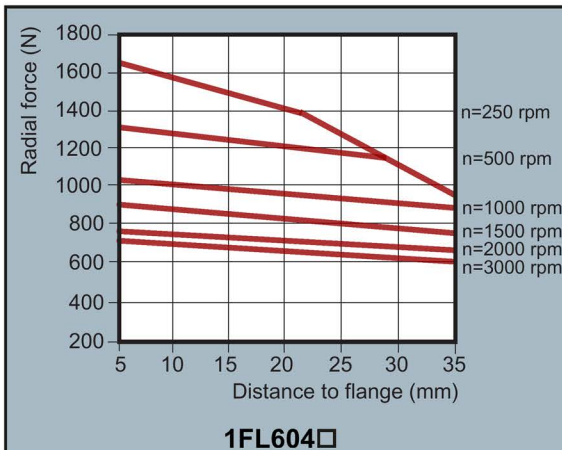
1FL604□
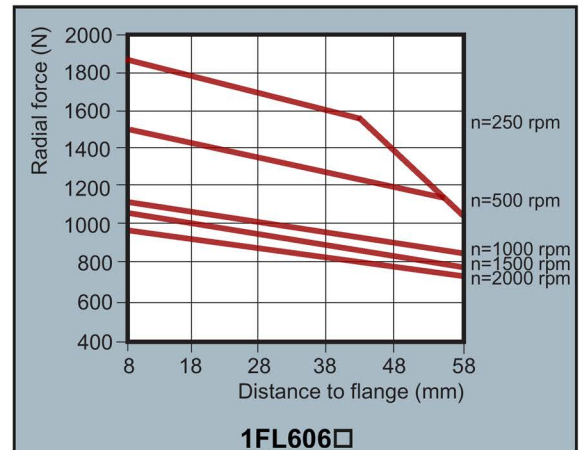
1FL606□
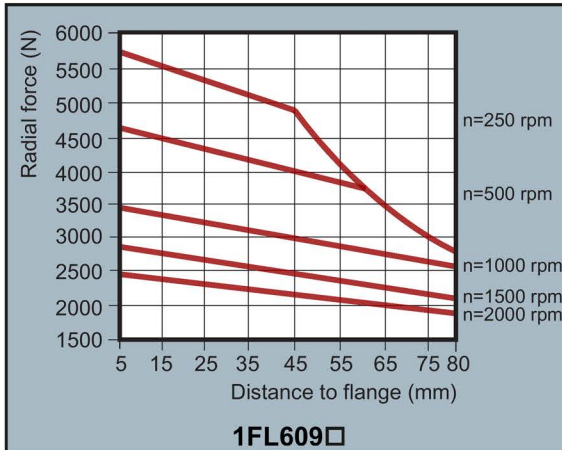
1FL609□

Axial force:
When using, for example, helical toothed wheels as drive element, in addition to the radial force, there is also an axial force on the motor bearings. For axial forces, the spring-loading of the bearings can be overcome so that the rotor moves corresponding to the axial bearing present (up to 0.2 mm).
The permissible axial force can be approximately calculated using the following formula:
$F_A = 0.35 \cdot F_Q$
Where F_A represents axial force and F_Q radial force.

Note

1FL604□ and 1FL609□ have a 5 mm of shaft sheltered in sleeves, and 1FL606□ has an 8 mm of shaft in sleeves. Therefore, the distances to flange in the above three figures begin respectively from 5 mm, 8 mm, and 5 mm.

10.4 Cables

10.4.1 Drive Bus cable/Drive Bus trailing cable for the SINUMERIK 808D ADVANCED

Parameter	Drive Bus cable	Drive Bus trailing cable
Jacket material	PVC	PUR
Degree of protection	IP20	IP20
Number of cores	2	2
Operation voltage (V)	100	100
Operation temperature, static (°C)	-40 to 80	
Operation temperature, dynamic (°C)	-	-25 to 80
Shielding	Yes	
Minimum bending radius, static (mm)	75	50
Minimum bending radius, dynamic (mm)	-	155
Bending cycles	-	3000000 (maximum acceleration: 5 m/s^2; maximum horizontal speed: 3 m/s)
Oil resistance	Limited mineral oil and fats resistance EN60811-2-1 fulfilled	
Flame-retardant	IEC60332-3-24 fulfilled	IEC60332-1-1 to 1-3 fulfilled
Certification	RoHS	

10.4.2 Technical data - cables for the SINAMICS V70 servo system

Parameter	MOTION-CONNECT 300 power cable	MOTION-CONNECT 300 encoder cable	MOTION-CONNECT 300 brake cable
Jacket material	PVC		
Degree of protection (motor-side only)	IP65		
Number of cores	4	10	2
Cross-section of cores (mm^2)	4 x 1.5 (for FSA) 4 x 2.5 (for FSB/FSC)	6 x 0.22 + 4 x 0.25	2 x 0.75
Operation voltage (V)	600/1000	30	30
Operation temperature (°C)	-25 to 80		
Shielding	Yes		
Minimum bending radius, static (mm)	6 x outer diameter		
Minimum bending radius, dynamic (mm)	155		
Bending cycles	1000000 (maximum acceleration: 2 m/s^2; maximum speed:15 m/min)		
Oil resistance	EN60811-2-1 fulfilled		
Flame-retardant	EN60332-1-1 to 1-3 fulfilled		
Certification	RoHS and CE	RoHS	RoHS

A   Appendix

A.1   Operation and display

A.1.1   Elements on the PPU

The PPU for the control system is available in the following variants:

PPU version	Panel layout	Applicable control system
PPU161.2	Horizontal, English version Horizontal, Chinese version	SINUMERIK 808D ADVANCED T (turning)/M (milling)
PPU160.2	Vertical, English version Vertical, Chinese version	SINUMERIK 808D ADVANCED T (turning)/M (milling)

Horizontal panel layout (PPU161.2)

Vertical panel layout (PPU160.2)

Elements on the PPU front

The following illustration uses PPU161.2 as an example to show control elements available on the PPU:
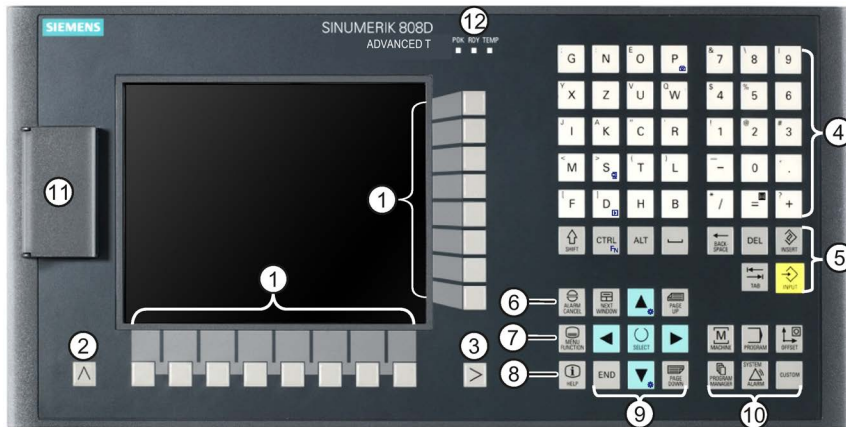
① **Vertical and horizontal softkeys**

Calls specific menu functions

② **Return key**

Returns to the next higher-level menu

③ **Menu extension key**

Opens the next lower-level menu

④ **Alphabetic and numeric keys**

⑤ **Control keys**

⑥ **Alarm cancellation key**

Cancels alarms and messages that are marked with this symbol

⑦ **On-board wizard key**

Provides step-by-step guides on basic commissioning and operation procedures

⑧ **Help key**

Calls help information

⑨ **Cursor keys**

⑩ **Operating area keys**

⑪ **USB interface**

⑫ **Status LEDs**

A.1.2 Elements on the MCP

The MCP for the control system is available in the following variants:

MCP version	Applicable control system
• Horizontal MCP, English version • Horizontal MCP, Chinese version • Vertical MCP with a reserved slot for the handwheel, English version • Vertical MCP with a reserved slot for the handwheel, Chinese version • Vertical MCP with an override switch for the spindle, English version • Vertical MCP with an override switch for the spindle, Chinese version	SINUMERIK 808D ADVANCED T (Turning)/M (Milling)

Horizontal MCP

Vertical MCP (left: version with an override switch for the spindle; right: version with a reserved handwheel slot)
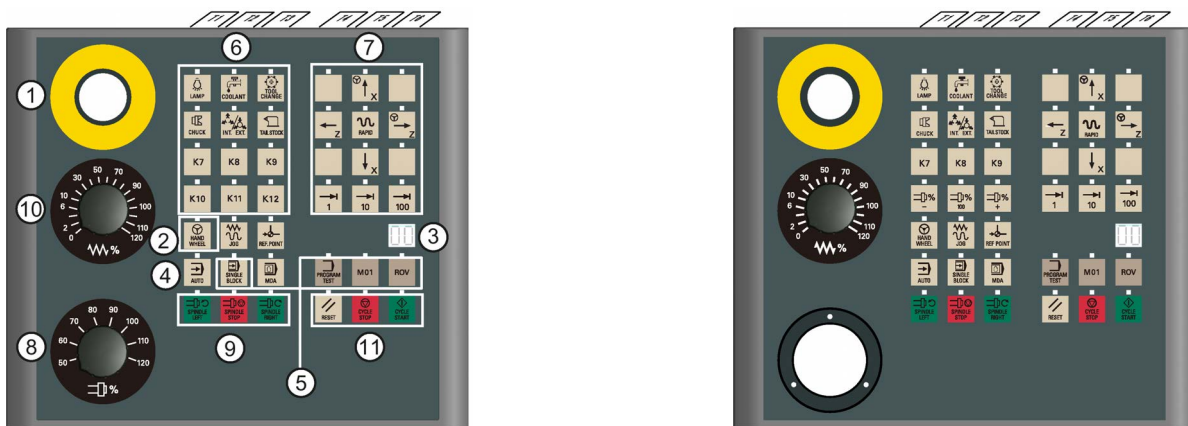
①	**Reserved hole for emergency stop button**
②	**Handwheel key**
	Controls the axis movement with external handwheels
③	**Tool number display**
	Displays the number of the currently active tool
④	**Operating mode keys**
⑤	**Program control keys**
⑥	**User-defined keys**
⑦	**Axis traversing keys**
⑧	**Spindle override switch**
	(unavailable for the vertical MCP with a reserved slot for the handwheel)
⑨	**Spindle state keys**
⑩	**Feedrate override switch**
	Traverses the selected axis at the specified feedrate override
⑪	**Keys for program start, stop, and reset**

A.1.3 Operating the SINAMICS V70 Basic Operator Panel (BOP)

A.1.3.1 BOP overview

The SINAMICS V70 servo drive has been designed with a Basic Operator Panel (BOP) located on the front of the drive:
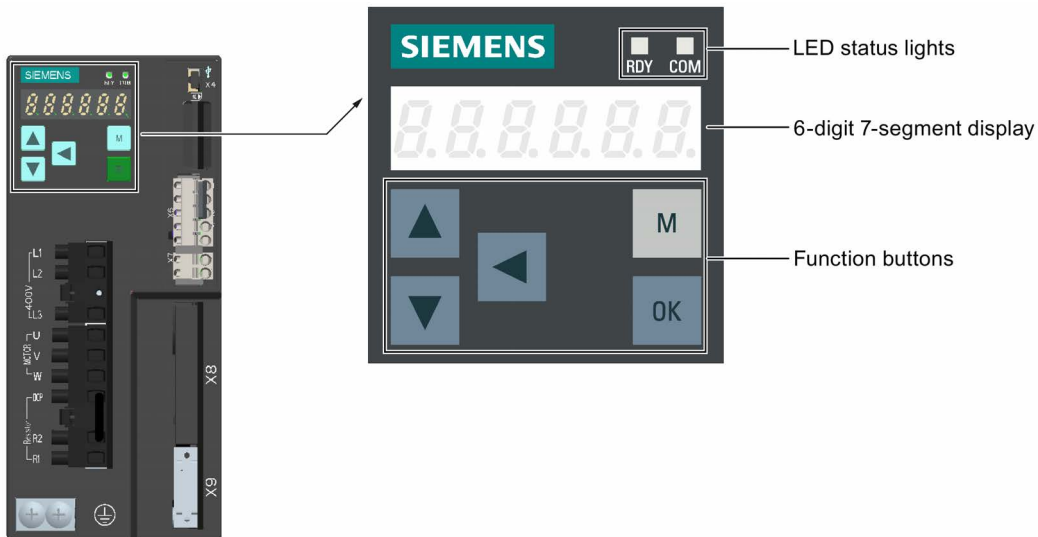
You can use the BOP for following operations:
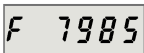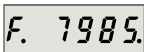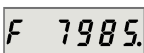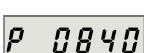
- Standalone commissioning
- Diagnosis
- Parameter access
- Parameter settings
- SD card operations
- Drive restart
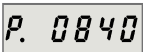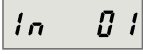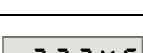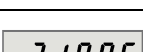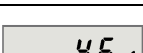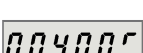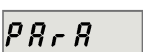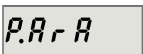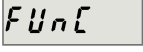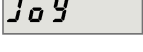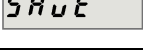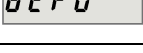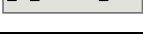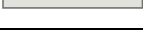
Button functions

Button	Description	Remarks
M	M button	• Exits from current menu • Switches between operating modes in the top level menu
OK	OK button	Short-pressing: • Confirms selection or input • Enters sub menu • Acknowledges faults Long-pressing: • Activates auxiliary functions • Sets Drive Bus address • Jog • Saves parameter set in drive (RAM to ROM) • Sets parameter set to default • Transfers data (drive to SD card) • Transfers data (SD card to drive) • Updates firmware

Button	Description	Remarks
▲	UP button	• Navigates to next item • Increases a value • JOG in CW (clockwise)
▼	DOWN button	• Navigates to previous item • Decreases a value • JOG in CCW (counter-clockwise)
◀	SHIFT button	Moves the cursor from digit to digit for single digit editing, including the digit of positive/negative signs
Button combinations		
OK + M		Press this button combination for four seconds to restart the drive.
▲ + ◀		Moves the current display to the left page when $\ulcorner$ is displayed at the upper right corner, for example $00.000\ulcorner$.
▼ + ◀		Moves the current display to the right page when $\lrcorner$ is displayed at the lower right corner, for example $0010\lrcorner$.

BOP display

Display	Example	Description	Remarks
8.8.8.8.8.8.	8.8.8.8.8.8.	Drive is in startup state	Takes 20 s to 30 s
------	- - - - - -	Drive is busy	In the case of a task being executed
Fxxxxx	F 7985	Fault code	In the case of a single fault
F.xxxxx.	F. 7985.	Fault code of the first fault	In the case of multiple faults
Fxxxxx.	F 7985.	Fault code	In the case of multiple faults
Axxxxx	A30016	Alarm code	In the case of a single alarm
A.xxxxx.	A.30016.	Alarm code of the first alarm	In the case of multiple alarms
Axxxxx.	A30016.	Alarm code	In the case of multiple alarms
Rxxxxx	r 0031	Parameter number	Read-only parameter
Pxxxxx	P 0840	Parameter number	Editable parameter

Display	Example	Description	Remarks
P.xxxxx	P. 0840	Parameter number	Editable parameter; the dot means that at least one parameter has been changed
In xx	In 01	Indexed parameter	Figure after "In" indicates the number of indices. For example, "In 01" means that this indexed parameter is 1.
xxx.xxx	-23.345	Negative parameter value	-
xxx.xx<>	-21005	Current display can be moved to left or right	-
xxxx.xx>	46	Current display can be moved to right	-
xxxx.xx<	00400	Current display can be moved to left	-
S Off	S oFF	Operating display: servo off	-
Para	PArA	Editable parameter group	-
P.ara	P.ArA	Editable parameter group	The dot means that at least one parameter has been changed without saving
Data	dAtA	Read-only parameter group	-
Func	FUnC	Function group	Refer to Auxiliary functions (Page 144).
Addr	Addr	Set Drive Bus address	Refer to Setting Drive Bus address (Page 145).
Jog	Jo9	Jog function	Refer to Jog (Page 145).
Save	SAuE	Save data in drive	Refer to Saving parameter set in drive (RAM to ROM) (Page 146).
defu	dEFU	Restore drive to default settings	Refer to Setting parameter set to default (Page 146).
dr--sd	dr - -Sd	Save data from drive to SD card	Refer to Transferring data (drive to SD card) (Page 147).
sd--dr	Sd- -dr	Upload data from SD card to drive	Refer to Transferring data (SD card to drive) (Page 147).
Update	UPdAtE	Update firmware	Refer to Updating firmware (Page 148).

Display	Example	Description	Remarks
Con	`Con`	The Drive Bus communication between the NC and the servo drive is established. In this case, the BOP is protected from any operations except clearing alarms and acknowledging faults.	-

A.1.3.2 Parameter structure

You can navigate through the parameter structure by pressing the keys as shown in the sequences below.
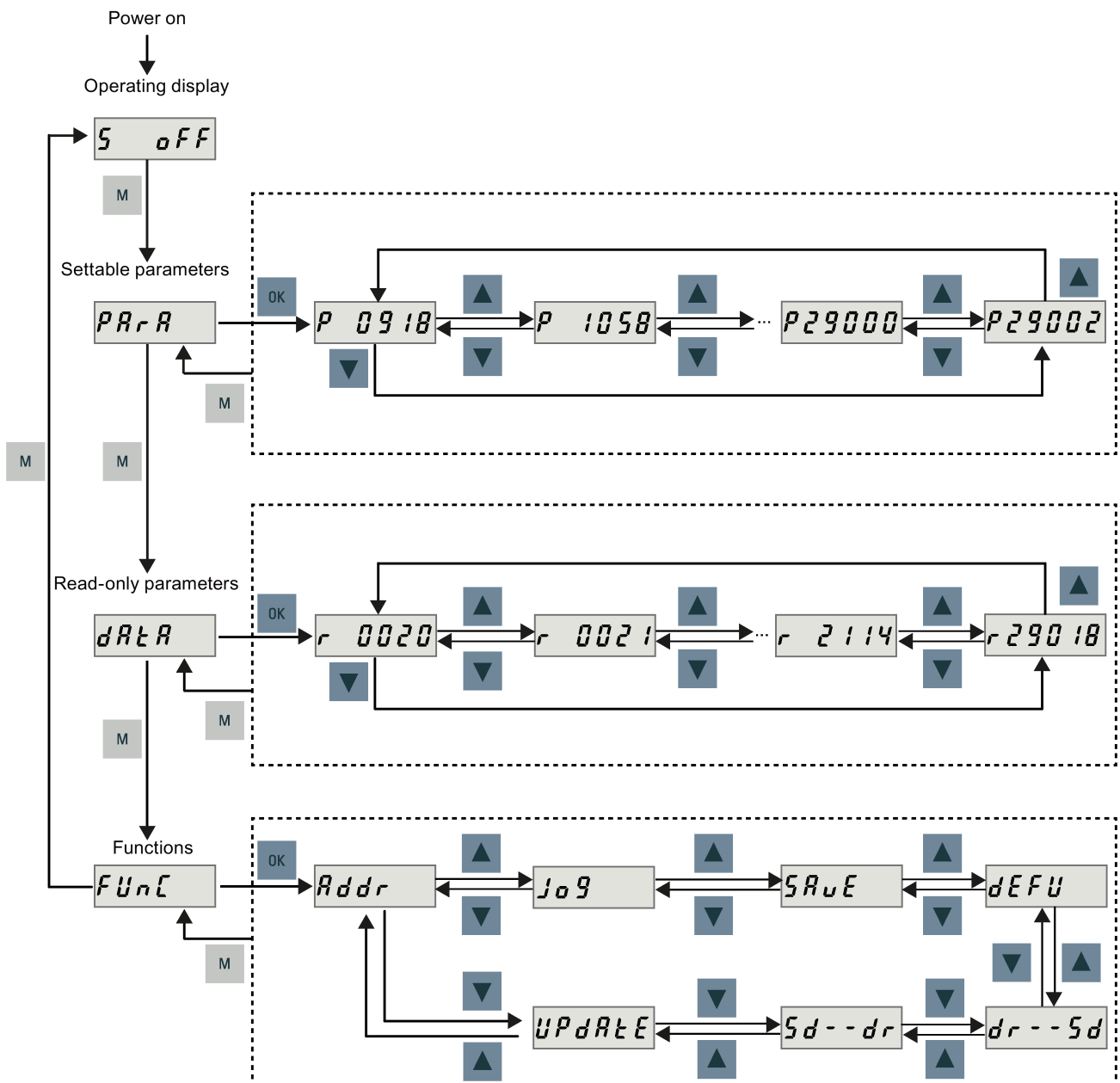
A.1.3.3   Actual status display

You can monitor the following drive states by using the operating panel after power-on:

- Servo off
- Actual speed
- Torque
- Voltage

If the servo enable signal is available, actual drive speed is displayed by default; otherwise, "**S OFF**" (servo off) is displayed.

With p29002, you define which of the following drive operating status data is to be displayed on the BOP.

Value	Meaning
0 (default)	Actual speed
1	DC voltage
2	Actual torque

Note

Make sure you save p29002 after modification.

A.1.3.4   Basic operations

Editable parameters

All **P** parameters under the "Para" menu are editable parameters.

Read-only parameters

All **r** parameters under the "Data" menu are read-only parameters.

Parameters with index

Some parameters have several indices. Each index has its own meaning and corresponding value.

Parameters without index

All parameters that do not have indices are parameters without index.

Editing parameters

You can edit a parameter value in two methods:

- Method 1: change the value directly with the **UP** or **DOWN** button
- Method 2: move the cursor to a digit with the **SHIFT** button, then change the digit value with the **UP** or **DOWN** button

If you change a parameter value with method 1, proceed as follows:

Operating display

If abort the change

```
 5  oFF
   │ M
   ▼
 PArA ──OK──▶ P 0918 ──▲▼──▶ ... P 1215 ◀──OK──▶ 0 ──▲▼──▶ 1
```

Target parameter   Default value   Desired value

```
 1
 │ OK
 ▼
 P. 1215
 │ M
 ▼
 P.ArA
 │ M
 ▼
 dAtA
 │ M
 ▼
 FUnC ──OK──▶ Addr ──▲▼──▶ ... SAuE ◀──OK (Long-press)──▶ - - - - - -
                                              Flash for around 15 s
```
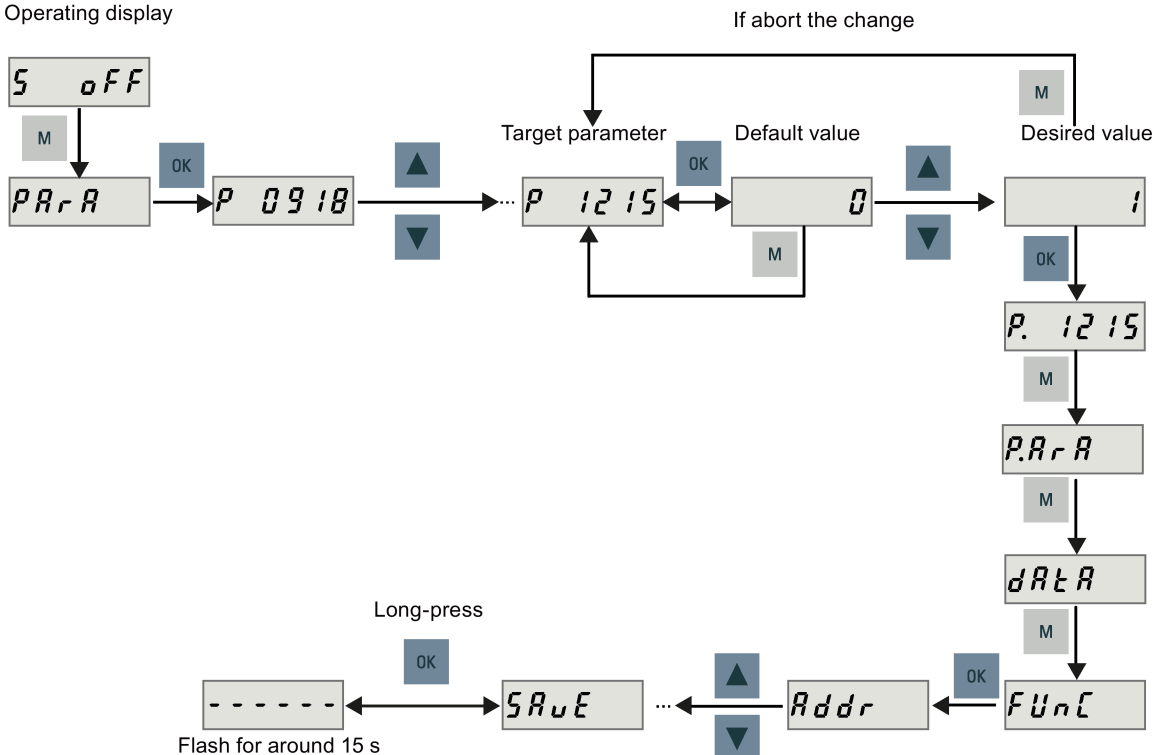
For more information, see Section "Jog test (Page 75)".

To change a parameter value digit by digit, proceed as follows:

Operating display

```
 5  oFF
   │ M
   ▼
 PArA ──OK──▶ P 0918 ──▲▼──▶ ... P 1417 ◀──OK──▶ 2000.0 ──◀──▶ 02 00.0 ──▲▼──▶ 02 00.0 ──OK──▶
```

Target parameter   Default value   Desired value

```
 P. 1417
 │ M
 ▼
 P.ArA
 │ M
 ▼
 dAtA
 │ M
 ▼
 FUnC ──OK──▶ Addr ──▲▼──▶ ... SAuE ◀──OK (Long-press)──▶ - - - - - -
                                              Flash for around 15 s
```
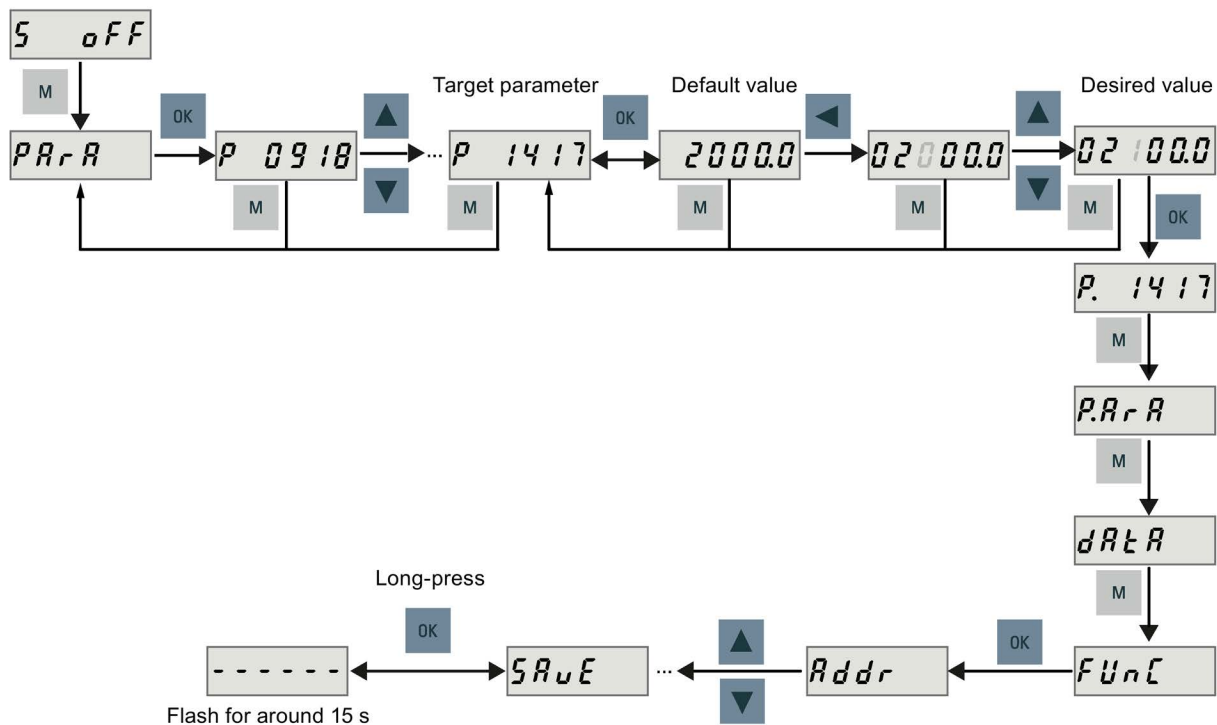
Note
You cannot change parameters p1414 and p1656 with the **SHIFT** button.

Viewing parameters

If a parameter has no index, view its value as follows:
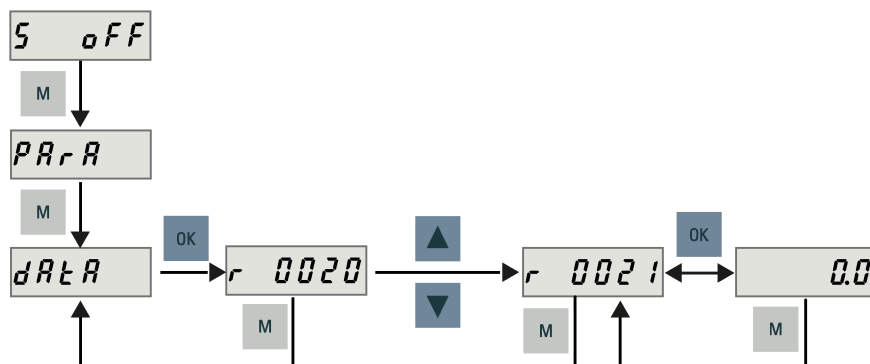
Operating display

If a parameter has indices, view its value as follows:

Operating display
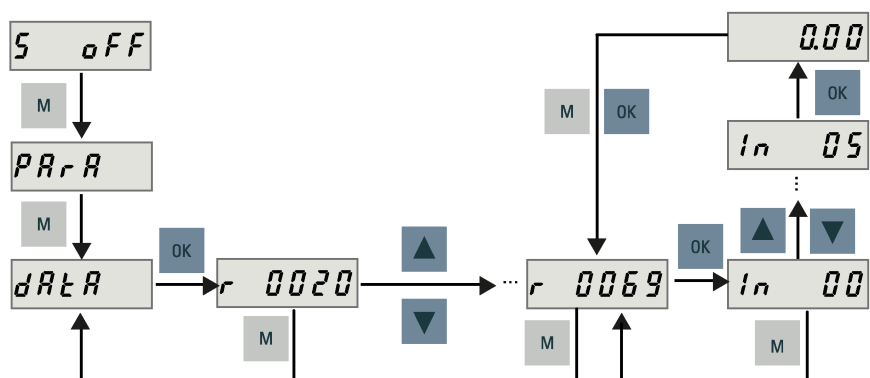
A.1.3.5 Auxiliary functions

Seven BOP functions in total are available:
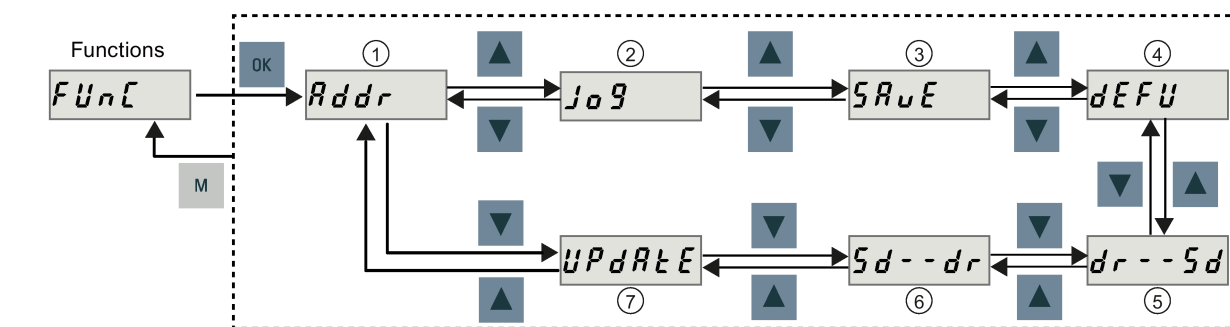
① Set Drive Bus address
② Jog
③ Save parameter set in drive
④ Set parameter set to default

⑤ Copy parameter set from drive to an SD card
⑥ Copy parameter set from an SD card to drive
⑦ Update firmware

Setting Drive Bus address

When connecting the SINAMICS V70 to the SINUMERIK 808D ADVANCED, you must set the Drive Bus address with the BOP. Four addresses in total are available:

- **11**: **X** axis
- **12**: **Y** axis (or additional axis for the turning variant of the control system)
- **13**: **Z** axis
- **15:** Additional axis

You must set a proper address according to the actual application of the drive.

To set Drive Bus address with the BOP, proceed as follows.
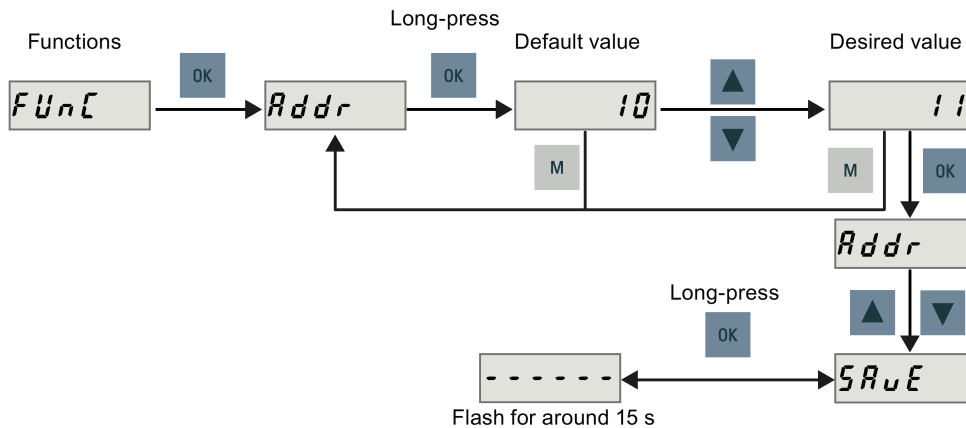
Note
After setting a proper address, you must restart the drive to apply your setting.

For more information, see Section "Configuring Drive Bus addresses (Page 78)".

Jog

To run the connected motor with the Jog function and view the Jog speed or Jog torque, proceed as follows:
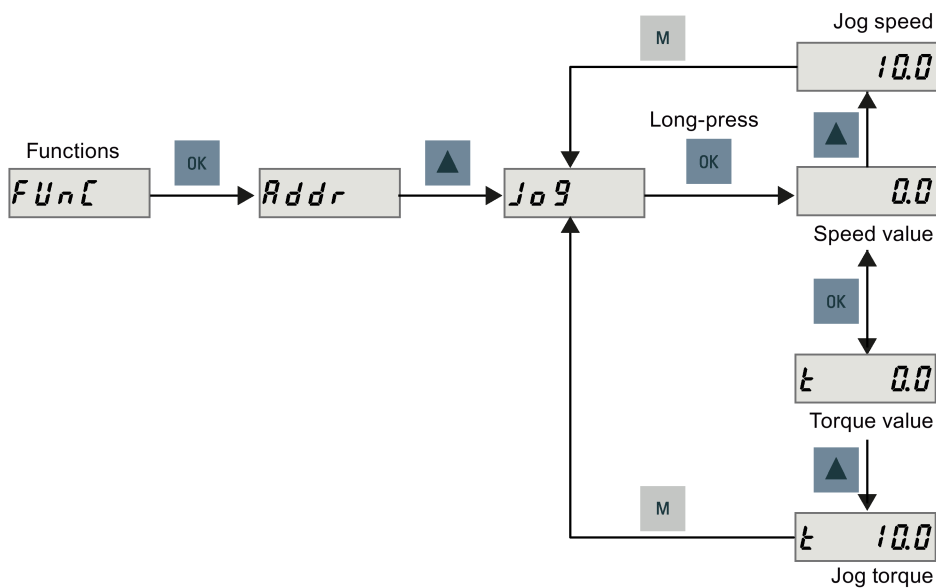
For more information, see Section "Jog test (Page 75)".

Saving parameter set in drive (RAM to ROM)

This function is used for saving a parameter set from drive RAM to drive ROM.

To use this function, proceed as follows:
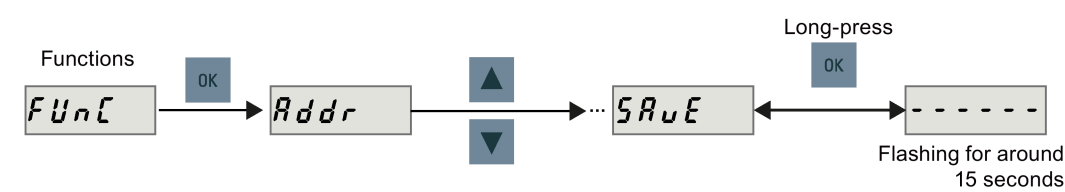
NOTICE
Plugging or unplugging the SD card will cause saving failure.
Do not plug or unplug the SD card during saving; otherwise, the saving operation will fail.

Note

If an SD card has been inserted, the parameter set will be saved onto the SD card simultaneously.

Reference

Editing parameters (Page 142)

Setting parameter set to default

This function is used to reset all parameters to their default values.

To reset all parameters to their default values, proceed as follows:
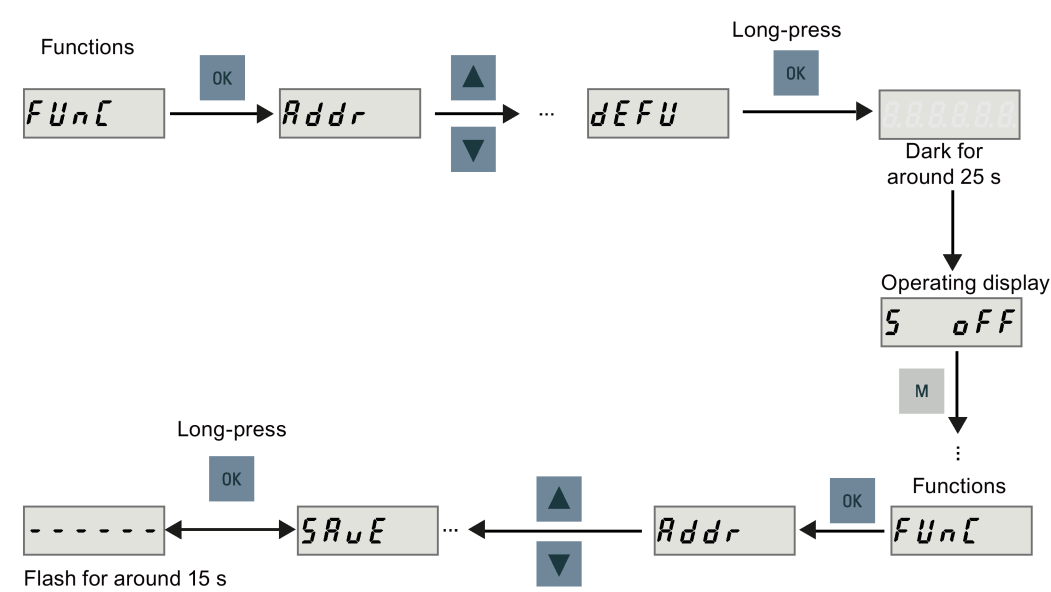
Note

You **must** save the parameter set after resetting it; otherwise, the default values will not be activated.

Reference

Saving parameter set in drive (RAM to ROM) (Page 146)

Transferring data (drive to SD card)

You can transfer the parameter set from the drive to an SD card with the BOP. To do this, proceed as follows:
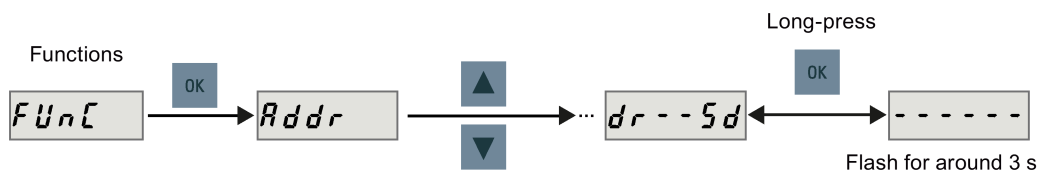
Functions ... Long-press ... Flash for around 3 s

`FUnC` → OK → `Addr` → ▲▼ → ... `dr - -Sd` ↔ OK → `- - - - - -`

NOTICE
It is forbidden to use this function when the servo is ON.
Use this function when the servo is OFF.

NOTICE
Plugging or unplugging the SD card will cause transferring failure.
Do not plug or unplug the SD card during transferring; otherwise, the transferring operation will fail.

Note

Write protection function is not supported by the SINAMICS V70. Data in the SD card will be overwritten even if the write protection function of the SD card is enabled.

Transferring data (SD card to drive)

You can also transfer the parameter set from an SD card to the drive. To do this, proceed as follows:
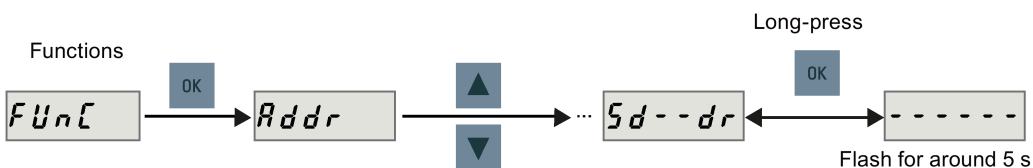
Functions ... Long-press ... Flash for around 5 s

`FUnC` → OK → `Addr` → ▲▼ → ... `Sd - -dr` ↔ OK → `- - - - - -`

NOTICE
It is forbidden to use this function when the servo is ON.
Use this function when the servo is OFF.

NOTICE
Plugging or unplugging the SD card will cause transferring failure.
Do not plug or unplug the SD card during transferring; otherwise, the transferring operation will fail.

Note

Parameter inconsistency

If the parameters on the SD card are inconsistent with existing parameters in the drive memory, you **must** save and restart the servo drive to apply the changes.

Updating firmware

With the firmware update function of the BOP, you can update drive firmware. To do this, you have to store proper firmware files on an SD card and insert it into the SD card slot. After that, proceed as follows:

Functions

Long-press

Wait for around 4 minutes until the two indicators flash red at 0.5 Hz, and then remove the SD card and re-power on the drive.
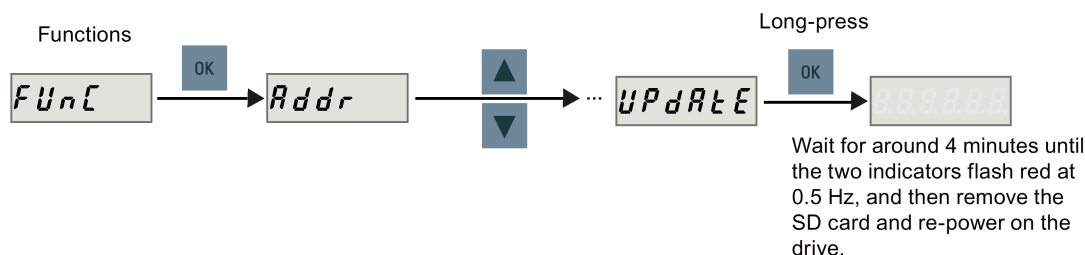
⚠ CAUTION
Improper firmware files will cause update failure.
When the update fails, the RDY indicator flashes red at 2 Hz and the COM indicator becomes red on. An update failure is probably caused by improper firmware files or files missing.
• If the firmware files on the SD card are corrupt, the servo drive **cannot** start up after power-on.
• If the firmware on the SD card is the same with the current firmware of the servo drive, **only** a restart is performed.
When a failure occurs, try to update the firmware again using proper firmware files. If the failure persists, contact your local distributor.

Note

Update the firmware by restarting the drive.

After inserting the SD card with proper firmware files, you can also update the firmware by restarting the drive.

A.1.4   Status indicators

Status LEDs on the SINAMICS V70 drive

Two LED status indicators (RDY and COM) are available to indicate drive readiness status and communication status respectively.

Off
Green
Flashing red
Red
Flashing orange

Off
Slow flashing
Fast flashing
Red
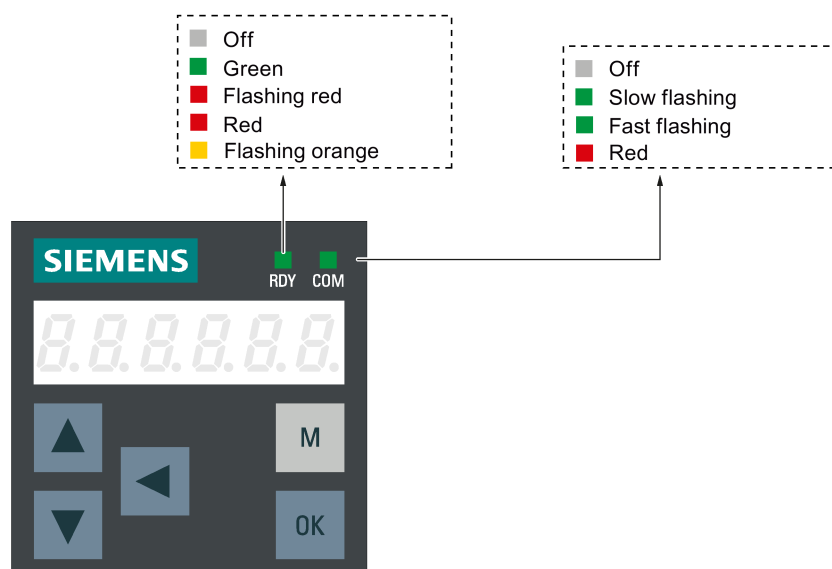
You can find detailed information about the status indications in the table below:

Status indicator	Color	Status	Description
RDY	-	Off	24V control board power supply is missing
	Green	Continuously lit	Drive is ready
	Red	Continuously lit	Enable signal is missing or drive is in startup states
		Flashing at 1 Hz	Alarms or faults occur
	Red and Orange	Flashing alternatively at an interval of 0.5 s	The servo drive is located
COM	-	Off	Communication with CNC is not active
	Green	Flashing at 0.5 Hz	Communication with CNC is active
		Flashing at 2 Hz	SD card operating (read or write)
	Red	Continuously lit	Communication with CNC is in error

Status LEDs on the PPU
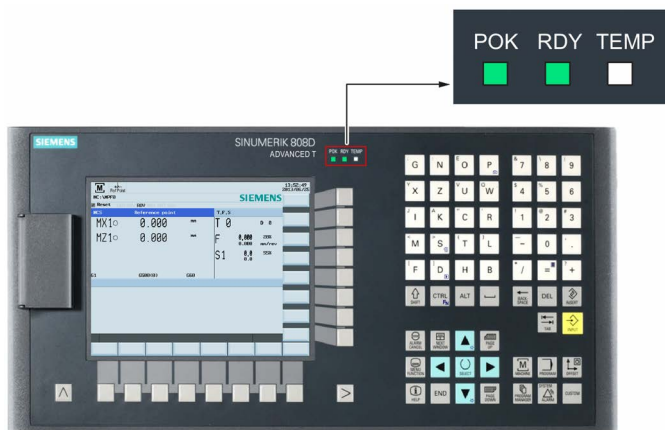
The individual LEDs and their functions are described in the table below:

LED	Color	Status	Description
POK	Green	Continuously lit	The power supply for the CNC is switched on.
RDY	Green	Continuously lit	The CNC is ready and the PLC is in run mode.
	Orange	Continuously lit	The PLC is in stop mode.
		Flashing	The PLC is in power-up mode.
	Red	Continuously lit	The CNC is in stop mode.
TEMP	Orange	Continuously lit	The CNC temperature is out of range.
	Unlit	Continuously lit	The CNC temperature is within the specified range.
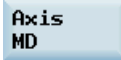
A.2 Configuring the additional axis

The control system with PPU16x.2 supports up to two additional axes for the turning variant and one for the milling variant. Before the configuration, you must first activate the option for additional axis (Page 83). However, you need to configure the additional axis manually as you cannot proceed with the wizards.

A.2.1 Setting parameters for the additional axis (turning)

Operating sequence

Proceed as follows to set the parameters for an additional axis (driven tooling axis):

SHIFT + SYSTEM ALARM	1. Select the desired operating area on the PPU.
	2. Open the channel machine data window through the following softkey operations: MD Mach. data → Expert list → Channel MD
Search	3. Use this softkey or the cursor keys to search for the following machine data and assign the desired values: • 20070[3] = 5 • 20080[3] = SP2
General MD	4. Open the general machine data window and make the following parameter settings: • 10000[4] = MSP2 • 19100 = 4
∧	5. Press this key to return to the next higher-level menu.
NC basic list	6. Open the basic machine data window.
Search	7. Use this softkey or the cursor keys to search for "14512 USER_DATA_HEX[20]".
SELECT	8. Select "Bit2" by using this key and the cursor keys.
OK ✓	9. Press this softkey to confirm your input.
Activate	10. Press this softkey to activate the value changes. Note that the control system restarts to accept the new values and the additional axis can be used in the system.
	11. Configure the additional drive in the system. For more information, refer to "Configuring the drive and motor (Page 152)".
SHIFT + SYSTEM ALARM	12. Select the desired operating area on the PPU.
	13. Open the axis machine data window through the following softkey operations: MD Mach. data → Expert list → Axis MD
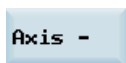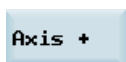
Axis +	14. Use these softkeys to set 35000 = 2 for the MSP2 axis.
Axis -	
Activate	15. Press this softkey to activate the value changes. Note that the control system restarts to accept the new values.

Note

The factory default PLC program only supports one additional axis.

A.2.2 Setting parameters for the additional axis (milling)

Operating sequence

Proceed as follows to set the parameters for an additional axis (rotary axis):
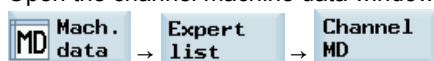
SHIFT + **SYSTEM ALARM**	1. Select the desired operating area on the PPU.
	2. Open the channel machine data window through the following softkey operations:
	MD Mach. data → **Expert list** → **Channel MD**
Search	3. Use this softkey or the cursor keys to search for the following machine data and assign the desired values: • 20070[4] = 5 • 20080[4] = A
General MD	4. Open the general machine data window and set 19100 = 5.
∧	5. Press this key to return to the next higher-level menu.
NC basic list	6. Open the basic machine data list.
Search	7. Use this softkey or the cursor keys to search for "14512 USER_DATA_HEX[20]".
SELECT	8. Select "Bit2" by using this key and the cursor keys.
OK ✓	9. Press this softkey to confirm your input.
Activate	10. Press this softkey to activate the value changes. Note that the control system restarts to accept the new values and the additional axis can be displayed in the system.

Note

The factory default PLC program only supports one additional axis.

A.2.3 Configuring the drive and motor

Before starting the drive and motor configuration, you must ensure the Drive Bus address is properly set (p0918) via the drive BOP. For more information about setting the Drive Bus address, see section "Configuring Drive Bus addresses (Page 78)".

The following steps are also applicable to configuring the feed axes or the analog spindle, if necessary.

Operating sequence

SHIFT + SYSTEM ALARM	1.	Select the desired operating area on the PPU.
Drive system	2.	Press this horizontal softkey to open the window for drive configuration.
Start config.	3.	Press this softkey and the control system starts to identify the drives and motors connected.

After the identification finishes, a drive list with motor information displays on the screen, for example:

Axis	Drive	Motor
MX1	11	ID:10009(0.4KW/1.3A/3000U/min/Without brake)
MZ1	13	ID:18(0.4KW/1.3A/3000U/min/Without brake)
MSP1	Analog	Custom
MC1	15	Not configured

Note: For a motor with an absolute encoder, the motor ID can be identified automatically. For a motor with an incremental encoder, however, you must configure it manually.
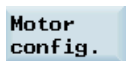
▲ ▼	4.	Select the additional axis using the cursor keys.
Motor config.	5.	Press this softkey to enter the motor configuration window.

6. Select the right motor ID according to the motor rating plate with the cursor keys.

Note: For a motor with an incremental encoder in this example, you need to select the right motor ID according to the motor rating plate.

Axis:MC1   Drive:15

Motor ID	Power	Current	Speed	Brake typ
18	0.4KW	1.3A	3000U/min	Without brake
19	0.4KW	1.3A	3000U/min	With brake

Select	7.	Press this softkey to confirm your selection. The selected motor information then displays in the drive list.
Finish	8.	After you finish the configuration, press this softkey to save the configuration results on both CNC and drive. **Note:** The control system restarts after you press this softkey.
OK ✓	9.	Press this softkey when the following dialog appears to exit the drive configuration window.

> ⚠ The drive and motor configuration have finished completely.
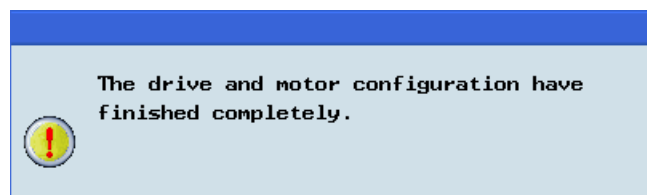
A.2.4 Tuning drive performance

The control system provides facilities to tune the drive performance for the additional axis by automatically modifying the control loop parameters. The tuning is performed based on frequency response measurements of the dynamic response of the machine.

The following steps are also applicable to tuning the feed axes, if necessary.

Operating sequence
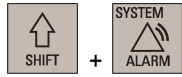
SHIFT + SYSTEM ALARM	1. Select the desired operating area on the PPU.
Tuning test	2. Press this horizontal softkey to open the window for drive tuning.
JOG	3. Switch to "JOG" mode. Note that the drive tuning can be performed in "JOG" mode only.
▲ ▼	4. Select the additional axis using the cursor keys.
Options	5. Press this softkey to enter the window for selecting the tuning options.
SELECT	6. Use this key to select a desired tuning objective and measurement and interpolation options for the additional axis. For more information about the options, see section "Tuning drive performance (Page 103)".
OK	7. Press this softkey to confirm the selections and return to the main screen of drive tuning.
Start tune	8. Press this softkey to enter the preparation screen before the tuning.
	9. Use the axis traversing keys to move the axis to a safe position.
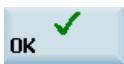
	Position	Direc.	Lim. –		Lim.
MX1	3.500	+,–	–1000	↓	1000
MZ1	0.000	+,–	–3000	↓	3000
MA1	6.001	+,–	–1e+08	↓	1e+08

Start tune	10. Press this softkey and the drive tuning starts automatically.
CYCLE START	11. Press this key on the MCP to start the measurement when the following message appears during the tuning process:

Start tuning

❗ Press this on MCP [CYCLE START] To start the measurement.

Press this on MCP [RESET] To cancel and return.

The axes move during the tuning.
Please clean up your workbench to avoid collision.
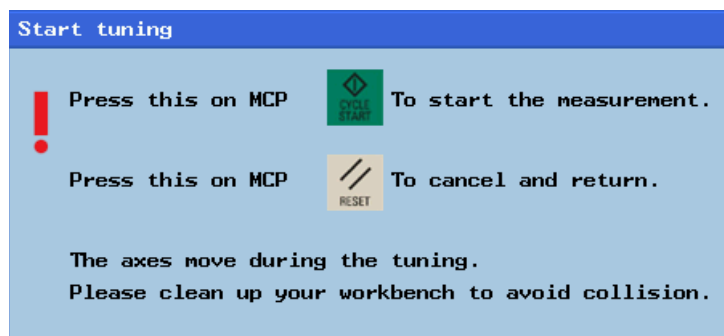
12. After the drive tuning finishes successfully, the tuning results appear on the screen in the form of a parameter list.

Axis +	You can check the tuning results of the additional axis with these softkeys.
Axis -	
Accept	13. Press this softkey to save the tuning results and write the modified parameters into the drives.
Cancel	Pressing this softkey aborts the tuning and deletes the results.
Export results	It returns automatically to the main screen of drive tuning after the tuning finishes. You can use this softkey to save the trace files during the tuning process to a USB flash disk (if inserted).

Note

For the machine data that are changeable only with a manufacturer password, the settings made during drive tuning cannot be restored after an NC restart in case of power failure or unexpected abortion of the tuning process.

A.3   Cutting reserved holes in the MCP

There are three kinds of MCP, a horizontal variant and two vertical variants. On the horizontal MCP, there are three reserved holes with a standard diameter of **16 mm** and on the vertical variant there are four holes with a standard diameter of **16 mm**. They are available for you to install necessary devices according to your own needs:

Reserved holes
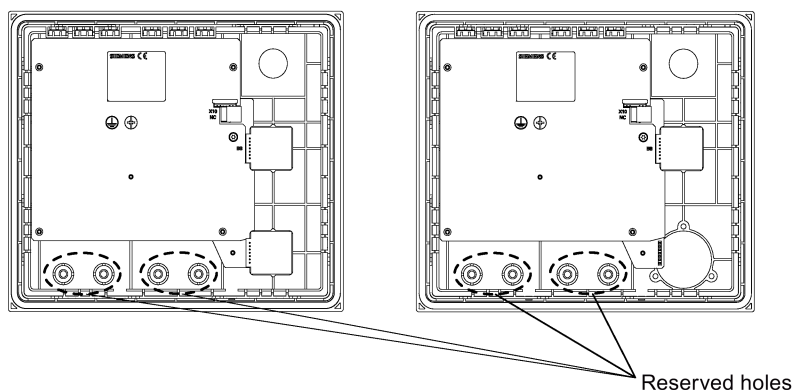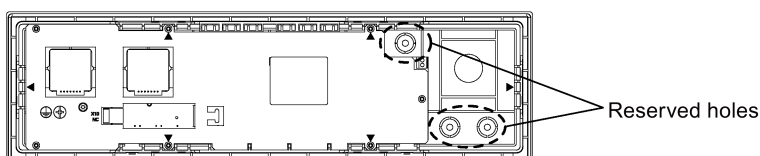
Reserved holes

To cut a reserved hole, proceed as follows:

①   Prise the plastic ring with a slotted screwdriver or cut it off with a diagonal cutting nippers.
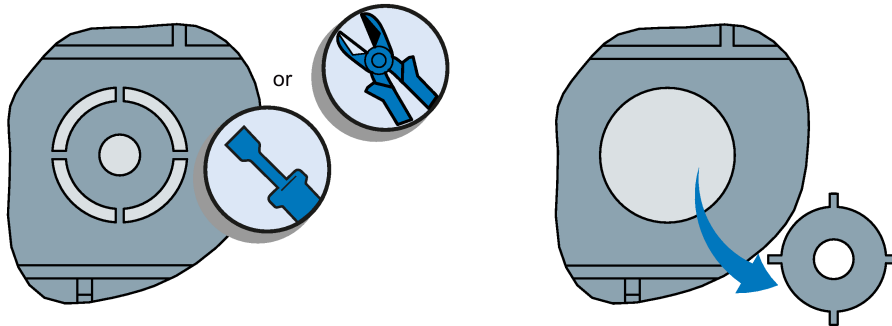
②   Cut the film off with a paper knife. It is recommended to cut the center firstly, then cut the film off right around the hole edge.

Paper knife
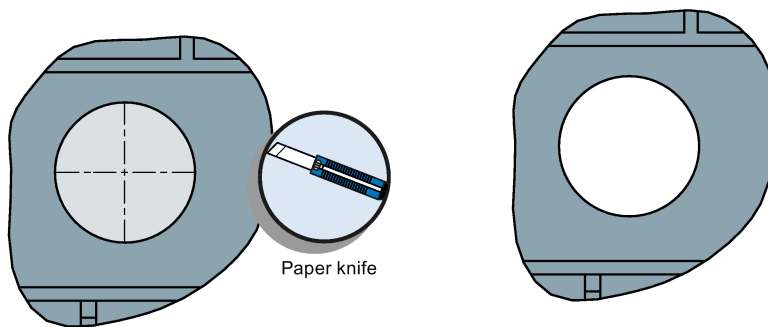
A.4   MCP strips

Inserting the MCP strips

The MCP strips of the turning version are already pre-assembled into the MCP. If you are using the control system of milling version, you need to take these pre-defined insertion strips out firstly, and then insert the MCP strips of the milling version delivered in MCP package into the MCP by yourself.

To insert the MCP strips, follow the order shown as follows with reference to the marks (M1 to M6, T1 to T6) on the strips:

T1 (M1)   T2 (M2)   T3 (M3)   T4 (M4)   T5 (M5)   T6 (M6)
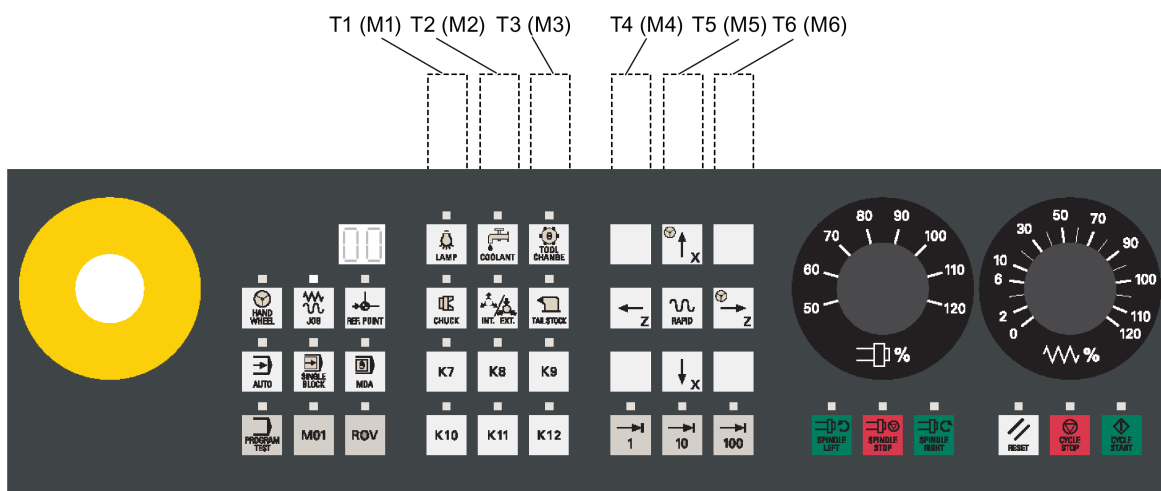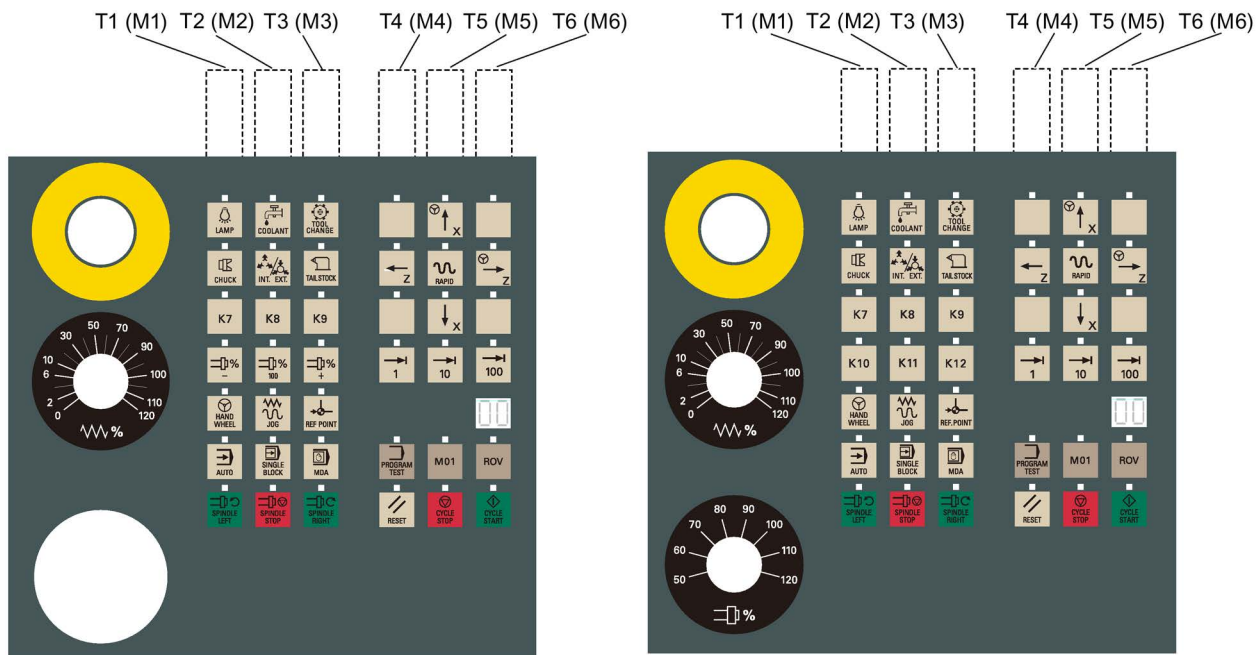
Printing customized MCP strips

Siemens provides you a symbol library for customized MCP keys. You can print customized strips with the A4-size blank paper included in the delivered MCP package. You can find the symbol library in the Toolbox (...\examples\SINUMERIK_808D_ADVANCED\MCP).

Siemens also provides you with a template file for printing customized strips. Key positions in the template accord with real key layout on the MCP. You can copy symbols from the symbol library and paste them to the key positions where you want to use customized symbols. You can find the template file in the Toolbox (...\examples\SINUMERIK_808D_ADVANCED\MCP).

Cutting customized MCP strips

The delivered A4-size paper has been pre-cut with boundaries. You just need to tear them off after printing customized symbols.

A.5 Parameter list

A.5.1 Recommended machine data

No.	Name	Default	Range	Type	Unit	Activating
11300	JOG_INC_MODE_LEVELTRIGGRD	1	-	BOOL	-	PO
	INC and REF in JOG mode					
14510 *	USER_DATA_INT[0] ... [31]	0	-62,768 to 32,767	DWORD	-	PO
	User data (INT)					
14512 *	USER_DATA_HEX[0] ... [31]	0H	0 to 0x0FF	BYTE	-	PO
	User data (HEX)					
14514 *	USER_DATA_FLOAT[0] ... [7]	0.000000	-3.4e+038 to 3.4e+038	DOUBLE	-	PO
	User data (float)					
20360	TOOL_PARAMETER_DEF_MASK	• Turning: 283H • Milling: 0H	0 to 0x1FFFFF	DWORD	-	PO
	Definition of tool parameters					
20700	REFP_NC_START_LOCK	1	-	BOOL	-	RE
	NC start disable without reference point					
30100	CTRLOUT_SEGMENT_NR[0]	-1	1 to 5	BYTE	-	PO
	Setpoint assignment: bus segment number					
30120	CTRLOUT_NR[0]	1		BYTE	-	PO
	Setpoint assignment: Setpoint output on drive submodule/module					
30130	CTRLOUT_TYPE	0	0 to 3	BYTE	-	PO
	Output type of setpoint					
30134	IS_UNIPOLAR_OUTPUT[0]	0	0 to 1	-	-	PO
	Setpoint output is unipolar					
30200	NUM_ENCS	-1	0 to 1	BYTE	-	PO
	Number of encoders					
30210	ENC_SEGMENT_NR[0]	-1	1 to 5	BYTE	-	PO
	Actual value assignment: Bus segment number					
30230	ENC_INPUT_NR[0]	-1	1 to 2	BYTE	-	PO
	Actual value assignment: Input on drive module/meas. circuit board					
30240	ENC_TYPE	0	0 to 5	BYTE	-	PO
	Encoder type of actual value sensing (actual position value)					
30350	SIMU_AX_VDI_OUTPUT	FALSE	-	BOOL	-	PO
	Axis signals output for simulation axes					

No.	Name	Default	Range	Type	Unit	Activating
30600	FIX_POINT_POS[0] ... [3]	0.000000	-	DOUBLE	mm, degrees	PO
	Fixed-value positions of axis with G75					
31020	ENC_RESOL[0]	10,000		DWORD	-	PO
	Encoder lines per revolution					
31030	LEADSCREW_PITCH	10.000000	≥ 0	DOUBLE	mm	PO
	Pitch of leadscrew					
31040	ENC_IS_DIRECT	FALSE, FALSE	-	BYTE	-	PO
	Direct measuring system (no compilation to load position)					
31050	DRIVE_AX_RATIO_DENOM[0] ... [5]	1	1 to 2,147,000,000	DWORD	-	PO
	Denominator load gearbox					
31060	DRIVE_AX_RATIO_NUMERA[0] ... [5]	1	1 to 2,147,000,000	DWORD	-	PO
	Numerator load gearbox					
32000	MAX_AX_VELO	10,000 (mm/min) 27.77 (rpm)	-	DOUBLE	mm/min, rpm	CF
	Maximum axis velocity					
32010	JOG_VELO_RAPID	10,000 (mm/min) 27.77 (rpm)	-	DOUBLE	mm/min, rpm	RE
	Rapid traverse in JOG mode					
32020	JOG_VELO	• Feed axis: 2,000 (mm/min) • Spindle: 100 (rpm)	-	DOUBLE	mm/min, rpm	RE
	Jog axis velocity					
32060	POS_AX_VELO	10,000 (mm/min) 27.77 (rpm)	-	DOUBLE	mm/min, rpm	RE
	Initial setting for positioning axis velocity					
32100	AX_MOTION_DIR	1	-1 to 1	DWORD	-	PO
	Traversing direction (not control direction)					
32110	ENC_FEEDBACK_POL[0]	1	-1 to 1	DWORD	-	PO
	Sign actual value (control direction)					
32200	POSCTRL_GAIN[0] ... [5]	1.000000	0.000000 to 2000.000000	DOUBLE	User defined	CF
	Servo gain factor					
32250	RATED_OUTVAL[0]	100	0.0 to 200	DOUBLE	%	CF
	Rated output voltage					

No.	Name	Default	Range	Type	Unit	Activating
32260	RATED_VELO[0]	2,000.0	-	DOUBLE	rpm	CF
	Rated motor speed					
32300	MAX_AX_ACCEL[0] ... [4]	• Feed axis: 1.0 • Spindle: – [0]...[2]: 10 – [3]...[4]: 2.778	≥ 0.001	DOUBLE	mm/s^2, rev/s^2	CF
	Maximum axis acceleration					
32450	Backlash[0]	0.0	-	DOUBLE	mm	CF
	Backlash					
32700	ENC_COMP_ENABLE[0]	0	-	BOOL	-	CF
	Encoder/spindle error compensation					
34000	REFP_CAM_IS_ACTIVE	1	-	BOOL	-	RE
	Axis with reference point cam					
34010	REFP_CAM_DIR_IS_MINUS	0	-	BOOL	-	RE
	Approach reference point in minus direction					
34020	REFP_VELO_SEARCH_CAM	5,000.0 (mm/min) 13.88 (rpm)	-	DOUBLE	mm/min, rpm	RE
	Reference point approach velocity					
34040	REFP_VELO_SEARCH_MARKER[0]	300.0 (mm/min) 0.833 (rpm)	-	DOUBLE	mm/min, rpm	RE
	Creep velocity					
34050	REFP_SEARCH_MARKER_REVERSE[0]	0	-	BOOL	-	RE
	Direction reversal to reference cam					
34060	REFP_MAX_MARKER_DIST[0]	20.0	-	DOUBLE	mm, degrees	RE
	Maximum distance to reference mark					
34070	REFP_VELO_POS	10,000.00 (mm/min) 27.77 (rpm)	-	DOUBLE	mm/min, rpm	RE
	Reference point positioning velocity					
34080	REFP_MOVE_DIST[0]	-2.0	-	DOUBLE	mm, degrees	RE
	Reference point distance					
34090	REFP_MOVE_DIST_CORR[0]	0.0	-	DOUBLE	mm, degrees	RE
	Reference point offset/absolute offset					
34092	REFP_CAM_SHIFT	0.000000	-	DOUBLE	mm	RE

No.	Name	Default	Range	Type	Unit	Activating
	Electronic cam offset for incremental measuring system					
34093	REFP_CAM_MARKER_DIST[0]	0	-	DOUBLE	mm	PO
	Reference cam/reference mark distance					
34100	REFP_SET_POS[0] ... [3]	0.0	-	DOUBLE	mm, degrees	RE
	Reference point for incremental system					
34200	ENC_REFP_MODE[0]	1	0 to 8	BYTE	-	PO
	Referencing mode					
34210	ENC_REFP_STATE[0]	0	0 to 3	BYTE	-	IM
	Adjustment status of absolute encoder					
34220	ENC_ABS_TURNS_MODULO[0]	-1	1 to 100000	DWORD	-	PO
	Modulo range for rotary absolute encoder					
34230	ENC_SERIAL_NUMBER[0]	0	-	DWORD	-	PO
	Encoder serial number					
35010	GEAR_STEP_CHANGE_ENABLE	0	-	BOOL	-	RE
	Parameterize gear stage change					
35100 *	SPIND_VELO_LIMIT	10,000.0	-	DOUBLE	rpm	PO
	Maximum spindle speed					
35110	GEAR_STEP_MAX_VELO[0] ... [5]	[0]...[1]: 500 [2]: 1,000 [3]: 2,000 [4]: 4,000 [5]: 8,000	-	DOUBLE	rpm	CF
	Maximum speed for gear stage change					
35120	GEAR_STEP_MIN_VELO[0] ... [5]	[0]...[1]: 50 [2]: 400 [3]: 800 [4]: 1,500 [5]: 3,000	-	DOUBLE	rpm	CF
	Minimum speed for gear stage change					
35130	GEAR_STEP_MAX_VELO_LIMIT[0] ... [5]	[0]...[1]: 500 [2]: 1,000 [3]: 2,000 [4]: 4,000 [5]: 8,000	-	DOUBLE	rpm	CF
	Maximum speed for gear stage					

No.	Name	Default	Range	Type	Unit	Activating
35140	GEAR_STEP_MIN_VELO_LIMIT[0] ... [5]	[0]...[1]: 5 [2]: 10 [3]: 20 [4]: 40 [5]: 80	-	DOUBLE	rpm	CF
	Minimum speed for gear stage					
36100	POS_LIMIT_MINUS	-100,000,000	-	DOUBLE	mm, degrees	RE
	1st software limit switch minus					
	Access level: Manufacturer					
36110	POS_LIMIT_PLUS	100,000,000	-	DOUBLE	mm, degrees	RE
	1st software limit switch plus					
36200	AX_VELO_LIMIT[0] ... [5]	11,500 (mm/min) 31,944 (rpm)	-	DOUBLE	mm/min, rpm	CF
	Threshold value for velocity monitoring					
36300	ENC_FREQ_LIMIT[0]	3.33e5	-	DOUBLE	-	PO
	Encoder limit frequency					
38000	MM_ENC_COMP_MAX_POINTS	• Turning: 125 • Milling: 200	-	DWORD	-	PO
	Number of intermediate for interpolar compensation (SRAM)					

The machine data followed by an asterisk (*) have the access level of "**Customer**", while those without an asterisk have the access level of "**Manufacturer**".

A.5.2   SINAMICS V70 parameters

This chapter lists the parameters displayed on the BOP only. For more parameters about the servo drive, see SINUMERIK 808D ADVANCED HMI.

All parameters beginning with "p" are editable parameters, for example, p29000.

All parameters beginning with "r" are read-only parameters, for example, r0018.

Effective

Indicates the conditions for making parameterization effective. Two conditions are possible:

- IM (**Im**mediately): Parameter value becomes effective immediately after changing.
- RE (**Re**set): Parameter value becomes effective after repower-on.

Can be changed

Indicates the state in which a parameter is changeable. Two states are possible:

- **U** (**R**u**n**): Can be changed in the "**Running**" state when the enable signal is available. The "RDY" LED indicator lights up green.
- **T** (**R**eady **t**o run): Can be changed in the "**Ready**" state when the enable signal is missing. The "RDY" LED indicator lights up red.

Note

When judging the state of the drive according to the "RDY" LED indicator, ensure that no faults or alarms exist.

Data type

Type	Description
I16	16-bit integer
I32	32-bit integer
U16	16 bits without sign
U32	32 bits without sign
Uint16	16-bit unsigned integer
Uint32	32-bit unsigned integer
Float	32-bit floating point number

Parameter list

The table below lists parameters visible on the BOP:

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
r0020	Speed setpoint smoothed	-	-	-	rpm	Float	-	-
	Description: Displays the currently smoothed speed setpoint at the input of the speed controller or U/f characteristic (after the interpolator). Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							
r0021	Actual speed smoothed	-	-	-	rpm	Float	-	-
	Description: Displays the smoothed actual value of the motor speed. Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							
r0026	DC link voltage smoothed	-	-	-	V	Float	-	-
	Description: Displays the smoothed actual value of the DC link voltage. Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							
r0027	Absolute actual current smoothed	-	-	-	Arms	Float	-	-
	Description: Displays the smoothed absolute actual current value. Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							
	Dependency: r0068							
r0029	Current actual value field-generating smoothed	-	-	-	Arms	Float	-	-
	Description: Displays the smoothed field-generating actual current. Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							
r0030	Current actual value torque-generating smoothed	-	-	-	Arms	Float	-	-
	Description: Displays the smoothed torque-generating actual current. Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							
r0031	Actual torque smoothed	-	-	-	Nm	Float	-	-
	Description: Displays the smoothed torque actual value. Smoothing time constant = 100 ms The signal is not suitable as a process quantity and may only be used as a display quantity.							

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
r0032	Active power actual value smoothed	-	-	-	kW	Float	-	-
	Description: Displays the smoothed actual value of the active power.							
	Significance for the drive: Power output at the motor shaft							
r0033	Torque utilization smoothed	-	-	-	%	Float	-	-
	Description: Displays the smoothed torque utilization as a percentage.							
	Smoothing time constant = 100 ms							
	The signal is not suitable as a process quantity and may only be used as a display quantity.							
r0037[0...19]	Servo drive temperatures	-	-	-	°C	Float	-	-
	Description: Displays the temperatures in the servo drive.							
	• [0] = Inverter, maximum value							
	• [1] = Depletion layer maximum value							
	• [2] = Rectifier maximum value							
	• [3] = Air intake							
	• [4] = Interior of servo drive							
	• [5] = Inverter 1							
	• [6] = Inverter 2							
	• [7] = Inverter 3							
	• [8] = Inverter 4							
	• [9] = Inverter 5							
	• [10] = Inverter 6							
	• [11] = Rectifier 1							
	• [12] = Rectifier 2							
	• [13] = Depletion layer 1							
	• [14] = Depletion layer 2							
	• [15] = Depletion layer 3							
	• [16] = Depletion layer 4							
	• [17] = Depletion layer 5							
	• [18] = Depletion layer 6							
	• [19] = Cooling system liquid intake							
	The value of -200 indicates that there is no measuring signal.							
	• r0037[0]: Maximum value of the inverter temperatures (r0037[5...10]).							
	• r0037[1]: Maximum value of the depletion layer temperatures (r0037[13...18]).							
	• r0037[2]: Maximum value of the rectifier temperatures (r0037[11...12]).							
	The maximum value is the temperature of the hottest inverter, depletion layer, or rectifier.							
r0068	Absolute current actual value	-	-	-	Arms	Float	-	-
	Description: Displays actual absolute current.							
	For A_INF, S_INF the following applies:							
	• The value is updated with the current controller sampling time.							
	The following applies for SERVO:							
	• The value is updated with a sampling time of 1 ms.							
	• Absolute current value = sqrt(Iq^2 + Id^2)							
	• The absolute current actual value is available smoothed (r0027) and unsmoothed (r0068).							
	Dependency: r0027							
r0069[0...6]	Phase current actual value	-	-	-	A	Float	-	-

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
]	Description: Displays the measured actual phase currents as peak value.							
	• [0] = Phase U							
	• [1] = Phase V							
	• [2] = Phase W							
	• [3] = Phase U offset							
	• [4] = Phase V offset							
	• [5] = Phase W offset							
	• [6] = Total U, V, W							
	In indices 3 ... 5, the offset currents of the 3 phases, which are added to correct the phase currents, are displayed.							
	The sum of the 3 corrected phase currents is displayed in index 6.							
r0079[0...1]	Torque setpoint total	-	-	-	Nm	Float	-	-
	Description: Displays the torque setpoint at the output of the speed controller (before clock cycle interpolation).							
	• [0]: Unsmoothed							
	• [1]: Smoothed							
r0632	Motor temperature model, stator winding temperature	-	-	-	°C	Float	-	-
	Description: Displays the stator winding temperature of the motor temperature model.							
p0918	Drive Bus address	10	15	10	-	U16	RE	T
	Description: Displays or sets the Drive Bus address for Drive Bus interface on the servo drive.							
	The address can be set as follows:							
	Using p0918							
	• Only if the address 00 hex, 7F hex, 80 hex, or FF hex has been set using the address switch.							
	• The address is saved in a non-volatile fashion using the function "copy from RAM to ROM".							
	• A change only becomes effective after a POWER ON.							
p1058	Jog 1 speed setpoints	0	210000.000	100	rpm	Float	IM	T
	Description: Sets the speed/velocity for jog 1. Jogging is level-triggered and allows the motor to be incrementally moved.							
p1082	Maximum speed	0.000	210000.000	1500.000	rpm	Float	IM	T
	Description: Sets the highest possible speed.							
	Dependency: p0322							
p1083	Speed limit in positive direction of rotation	0.000	210000.000	210000.000	rpm	Float	IM	T, U
	Description: Sets the maximum speed for the positive direction.							
p1086	Speed limit in negative direction of rotation	-210000.000	0.000	-210000.000	rpm	Float	IM	T, U
	Description: Sets the speed limit for the negative direction.							
p1120	Ramp-function generator ramp-up time	0.000	999999.000	10.000	s	Float	IM	T, U
	Description: The ramp-function generator ramps-up the speed setpoint from standstill (setpoint = 0) up to the maximum speed (p1082) in this time.							
	Dependency: p1082							
p1121	Ramp-function generator ramp-down time	0.000	999999.000	10.000	s	Float	IM	T, U

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
	Description: The ramp-function generator ramps-down the speed setpoint from the maximum speed (p1082) down to standstill (setpoint = 0) in this time. Further, the ramp-down time is always effective for OFF1.							
	Dependency: p1082							
p1215	Motor holding brake configuration	0	3	0	-	I16	IM	T
	Description: Sets the holding brake configuration. • 0: No motor holding brake being used • 1: Motor holding brake according to sequence control • 2: Motor holding brake always open • 3: Motor holding brake like sequence control							
	Dependency: p1216, p1217, p1226, p1227, p1228							
p1216	Motor holding brake, opening time	0	10000	100	ms	Float	IM	T, U
	Description: Sets the time to open the motor holding brake. After controlling the holding brake (opens), the speed/velocity setpoint remains at zero for this time. After this, the speed/velocity setpoint is enabled. This time should be set longer than the actual opening time of the brake, which ensures that the drive cannot accelerate when the brake is applied.							
	Dependency: p1215, p1217							
p1217	Motor holding brake closing time	0	10000	100	ms	Float	IM	T, U
	Description: Sets the time to apply the motor holding brake. After OFF1 or OFF3 and the holding brake is controlled (the brake closes), then the drive remains closed-loop controlled for this time stationary with a speed setpoint/velocity setpoint of zero. The pulses are suppressed when the time expires. This time should be set longer than the actual closing time of the brake, which ensures that the pulses are only suppressed after the brake has closed.							
	Dependency: p1215, p1216							
p1226	Threshold for zero speed detection	0.00	210000.00	20.00	rpm	Float	IM	T, U
	Description: Sets the speed threshold for the standstill identification. Acts on the actual value and setpoint monitoring. • When braking with OFF1 or OFF3, when the threshold is undershot, standstill is identified. The following applies when the brake control is activated: • When the threshold is undershot, the brake control is started and the system waits for the brake closing time in p1217. The pulses are then suppressed. If the brake control is not activated, the following applies: • When the threshold is undershot, the pulses are suppressed and the drive coasts down.							
	Dependency: p1215, p1216, p1217, p1227							
p1227	Zero speed detection monitoring time	0.000	300.000	4.000	s	Float	IM	T, U
	Description: Sets the monitoring time for the standstill identification. When braking with OFF1 or OFF3, standstill is identified after this time has expired, after the setpoint speed has fallen below p1226. After this, the brake control is started, the system waits for the closing time in p1217 and then the pulses are suppressed.							
	Dependency: p1215, p1216, p1217, p1226							
p1228	Pulse suppression delay time	0.000	299.000	0.000	s	Float	IM	T, U

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
	Description: Sets the delay time for pulse suppression.							
	After OFF1 or OFF3 and zero speed detection, the system waits for this time to expire and the pulses are then suppressed.							
	Standstill is identified in the following cases:							
	• The speed actual value falls below the speed threshold in p1226 and the time started after this in p1228 has expired.							
	• The speed setpoint falls below the speed threshold in p1226 and the time started after this in p1227 has expired.							
	Dependency: p1226, p1227							
p1414	Speed setpoint filter activation	-	-	0000 bin	-	U16	IM	T, U
	Description: Setting for activating/de-activating the speed setpoint filter.							
	If only one filter is required, filter 1 should be activated and filter 2 de-activated, to avoid excessive processing time.							
	Dependency: The individual speed setpoint filters are parameterized as of p1415.							
p1415	Speed setpoint filter 1 type	0	2	0	-	I16	IM	T, U
	Description: Sets the type for speed setpoint filter 1.							
	• 0: Low pass: PT1							
	• 1: Low pass: PT2							
	• 2: General 2nd-order filter							
	Dependency:							
	• PT1 low pass: p1416							
	• PT2 low pass: p1417, p1418							
	• General filter: p1417 ... p1420							
p1416	Speed setpoint filter 1 time constant	0.00	5000.00	0.00	ms	Float	IM	T, U
	Description: Sets the time constant for the speed setpoint filter 1 (PT1).							
	This parameter is only effective if the filter is set as a PT1 low pass.							
	Dependency: p1414, p1415							
p1417	Speed setpoint filter 1 denominator natural frequency	0.5	16000.0	1999.0	Hz	Float	IM	T, U
	Description: Sets the denominator natural frequency for speed setpoint filter 1 (PT2, general filter).							
	This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.							
	The filter is only effective if the natural frequency is less than half of the sampling frequency.							
	Dependency: p1414, p1415							
p1418	Speed setpoint filter 1 denominator damping	0.001	10.000	0.700	-	Float	IM	T, U
	Description: Sets the denominator damping for velocity setpoint filter 1 (PT2, general filter).							
	This parameter is only effective if the speed filter is parameterized as a PT2 low pass or as general filter.							
	Dependency: p1414, p1415							
p1419	Speed setpoint filter 1 numerator natural frequency	0.5	16000.0	1999.0	Hz	Float	IM	T, U
	Description: Sets the numerator natural frequency for speed setpoint filter 1 (general filter).							
	This parameter is only effective if the speed filter is set as a general filter.							
	The filter is only effective if the natural frequency is less than half of the sampling frequency.							
	Dependency: p1414, p1415							
p1420	Speed setpoint filter 1 numerator damping	0.000	10.000	0.700	-	Float	IM	T, U

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
	Description: Sets the numerator damping for speed setpoint filter 1 (general filter).							
	This parameter is only effective if the speed filter is set as a general filter.							
	Dependency: p1414, p1415							
p1460	Speed controller P gain adaptation speed, lower	0.000	999999.000	0.300	Nms/rad	Float	IM	T, U
	Description: Sets the P gain of the speed controller before the adaptation speed range.							
	This value corresponds to the basic setting of the P gain of the speed controller without adaptation.							
p1462	Speed controller integral time adaptation speed lower	0.00	100000.00	20.00	ms	Float	IM	T, U
	Description: Sets the integration time of the speed controller before the adaptation speed range.							
	This value corresponds to the basic setting of the integral time of the speed controller without adaptation.							
p1520	Torque limit upper/motoring	-1000000.00	20000000.00	0.00	Nm	Float	IM	T, U
	Description: Sets the fixed upper torque limit or the torque limit when motoring.							
	Note:							
	Negative values when setting the upper torque limit (p1520 < 0) can result in the motor accelerating in an uncontrollable fashion.							
	The maximum value depends on the maximum torque of the connected motor.							
	Dependency: p1521							
p1521	Torque limit lower/regenerative	-20000000.00	1000000.00	0.00	Nm	Float	IM	T, U
	Description: Sets the fixed lower torque limit or the torque limit when regenerating.							
	Note:							
	Positive values when setting the lower torque limit (p1521 > 0) can result in the motor accelerating in an uncontrollable fashion.							
	The maximum value depends on the maximum torque of the connected motor.							
	Dependency: p1520							
p1656	Activates current setpoint filter	-	-	0001 bin	-	U16	IM	T, U
	Description: Setting for activating/de-activating the current setpoint filter.							
	If not all of the filters are required, then the filters should be used consecutively starting from filter 1.							
	Dependency: The individual current setpoint filters are parameterized as of p1657.							
p1657	Current setpoint filter 1 type	1	2	1	-	I16	IM	T, U
	Description: Sets the current setpoint filter 1 as low pass (PT2) or as extended general 2nd-order filter.							
	• 1: Low pass: PT2							
	• 2: General 2nd-order filter							
	Dependency: Current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.							
p1658	Current setpoint filter 1 denominator natural frequency	0.5	16000.0	1999.0	Hz	Float	IM	T, U
	Description: Sets the denominator natural frequency for current setpoint filter 1 (PT2, general filter).							
	Dependency: Current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.							
p1659	Current setpoint filter 1 denominator damping	0.001	10.000	0.700	-	Float	IM	T, U
	Description: Sets the denominator damping for current setpoint filter 1.							
	Dependency: Current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.							

Par. No.	Name	Min	Max	Factory setting	Unit	Data type	Effective	Can be changed
p1660	Current setpoint filter 1 numerator natural frequency	0.5	16000.0	1999.0	Hz	Float	IM	T, U
	Description: Sets the numerator natural frequency for current setpoint filter 1 (general filter)							
	Dependency: Current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.							
p1661	Current setpoint filter 1 numerator damping	0.000	10.000	0.700	-	Float	IM	T, U
	Description: Sets the numerator damping for current setpoint filter 1.							
	Dependency: Current setpoint filter 1 is activated via p1656.0 and parameterized via p1657 ... p1661.							
r2114[0...1]	System runtime total	-	-	-	-	U32	-	-
	Description: Displays the total system runtime for the drive unit. The time comprises r2114[0] (milliseconds) and r2114[1] (days). After r2114[0] has reached a value of 86.400.000 ms (24 hours) this value is reset and r2114[1] is incremented. • [0] = Milliseconds • [1] = Days							
p2153	Speed actual value filter time constant	0	1000000	0	ms	Float	IM	T, U
	Description: Sets the time constant of the PT1 element to smooth the speed/velocity actual value. The smoothed actual speed/velocity is compared with the threshold values and is only used for messages and signals.							
p29000	Motor type selection	0	54251	-	-	U16	IM	T
	Description: Motor type number is printed on the motor rating plate as motor ID. For a motor with an incremental encoder, users need to manually input the parameter value, ranging from 18 to 39. For a motor with an absolute encoder, the drive automatically reads the parameter value, ranging from 10009 to 10048.							
p29002	BOP operating display selection	0	2	0	-	U16	IM	T, U
	Description: BOP operating display selection. • 0: Actual speed • 1: DC voltage • 2: Actual torque							
r29018	Firmware-Version	-	-	-	-	U32	-	-
	Description: Firmware version.							

A.6 Diagnostics

A.6.1 SINUMERIK 808D ADVANCED alarms

Some alarms may occur during the commissioning work. For more information about the alarms, see the SINUMERIK 808D ADVANCED Diagnostics Manual.

Calling help information for an alarm

You can call the help information for an alarm on the PPU by proceeding through the following steps:

	1. Select the desired operating area.
	2. Select the alarm using the cursor keys.
	3. Press this key to call the help information for the selected alarm.
	4. Pressing this softkey exits the help system.
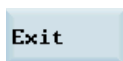
A.6.2 SINAMICS V70 faults and alarms

A.6.2.1 General information about faults and alarms

Differences between faults and alarms

The differences between faults and alarms are as follows:

Type	Description
Faults	**What happens when a fault occurs?** • If the servo motor is running, it stops running. • If the servo motor is not running, it cannot run. **How to eliminate a fault?** • Remove the cause of the fault. • Acknowledge the fault.
Alarms	**What happens when an alarm occurs?** • The servo motor can run normally. **How to eliminate an alarm?** • The alarm acknowledges itself. If the cause of the alarm is no longer present, it automatically resets itself.

Fault reactions

The following fault reactions are defined:

Reaction	Description
NONE	No reaction when a fault occurs.
OFF1	Servo motor ramps down to stop.
OFF2	Servo motor coasts down to stop.
OFF3	Servo motor stops quickly (emergency stop).
ENCODER	Encoder fault causes OFF2.

Fault acknowledgements

The acknowledgement methods for faults are specified as follows:

Acknowledgement	Description
POWER ON	The fault is acknowledged by a POWER ON (switch servo drive off and on again). **NOTE:** If this action has not eliminated the fault cause, the fault is displayed again immediately after power-on.
IMMEDIATELY	Faults disappear immediately after the fault causes have been eliminated. **NOTE:** • These faults can also be acknowledged by a POWER ON operation. • If this action has not eliminated the fault cause, the fault will continue to be displayed after acknowledgment.
PULSE INHIBIT	The fault can only be acknowledged with a pulse inhibit. The same options are available for acknowledging as described under acknowledgment with IMMEDIATELY.

A.6.2.2   List of faults and alarms

This section lists common faults and alarms that may occur on the SINAMICS V70.

Fault list

Fault	Cause	Remedy
F1000: Internal software error Reaction: OFF2 Acknowledgement: POWER ON	An internal software error has occurred.	• Evaluate fault buffer. • Carry out a POWER ON (power off/on) for all components. • Upgrade firmware to later version. • Contact the Hotline. • Replace the Control Unit.
F1001: Floating Point exception Reaction: OFF2 Acknowledgement: POWER ON	An exception occurred during an operation with the Floating Point data type.	• Carry out a POWER ON (power off/on) for all components. • Upgrade firmware to later version. • Contact the Hotline.
F1002: Internal software error Reaction: OFF2 Acknowledgement: IMMEDIATELY	An internal software error has occurred.	• Carry out a POWER ON (power off/on) for all components. • Upgrade firmware to the latest version. • Contact the Hotline.

Fault	Cause	Remedy
F1003: Acknowledgement delay when accessing the memory Reaction: OFF2 Acknowledgement: IMMEDIATELY	A memory area was accessed that does not return a "READY".	• Carry out a POWER ON (power off/on) for all components. • Contact the Hotline.
F1015: Internal software error Reaction: OFF2 Acknowledgement: POWER ON	An internal software error has occurred.	• Carry out a POWER ON (power off/on) for all components. • Upgrade firmware to the latest version. • Contact the Hotline.
F1018: Booting has been interrupted several times Reaction: NONE Acknowledgement: POWER ON	Module booting was interrupted several times. As a consequence, the module boots with the factory setting. Possible reasons for booting being interrupted: • Power supply interrupted. • CPU crashed. • Parameterization invalid. After this fault is output, then the module is booted with the factory settings.	• Carry out a POWER ON (power off/on). After switching on, the module reboots from the valid parameterization (if available). • Restore the valid parameterization. Examples: • Carry out a first commissioning, save, carry out a POWER ON (switch-off/switch-on). • Load another valid parameter backup (e.g. from the memory card), save, carry out a POWER ON (switch-off/switch-on). Note: If the fault situation is repeated, then this fault is again output after several interrupted boots.
F1030: Sign-of-life failure for master control Reaction: OFF3 Acknowledgement: IMMEDIATELY	For active PC master control, no sign-of-life was received within the monitoring time.	Contact the Hotline.
F1611: SI CU: Defect detected Reaction: OFF2 Acknowledgement: IMMEDIATELY	The drive-integrated "Safety Integrated" (SI) function on the Control Unit (CU) has detected an error and initiated an STO	• Carry out a POWER ON (power off/on) for all components. • Upgrade software. • Replace the Control Unit.
F1910: Drive Bus: Setpoint timeout Reaction: OFF3 Acknowledgement: IMMEDIATELY	The reception of setpoints from the Drive Bus interface has been interrupted. • Bus connection interrupted. • Controller switched off. • Controller set into the STOP state.	Restore the bus connection and set the controller to RUN.
F1911: Drive Bus clock cycle synchronous operation clock cycle failure Reaction: OFF1 Acknowledgement: IMMEDIATELY	The global control telegram to synchronize the clock cycles has failed - in cyclic operation - for several Drive Bus clock cycles or has violated the time grid specified in the parameterizing telegram over several consecutive Drive Bus clock cycles.	• Check the physical bus configuration (cable, connector, Drive Bus terminator, shielding, etc.). • Check whether communication was briefly or permanently interrupted. • Check the bus and controller for utilization level (e.g. bus cycle time was set too short).

Fault	Cause	Remedy
F1912: Clock cycle synchro-nous operation sign-of-life failure Reaction: OFF1 Acknowledgement: IMMEDIATELY	The maximum permissible number of errors in the controller sign-of-life (clock synchronous operation) has been exceed-ed in cyclic operation.	• Physically check the bus (cables, connect-ors, terminating resistor, shielding, etc.). • Correct the interconnection of the controller sign-of-life. • Check whether the controller correctly sends the sign-of-life. • Check the permissible telegram failure rate. • Check the bus and controller for utilization level (e.g. bus cycle time was set too short).
F7011: Motor overtempera-ture Reaction: OFF2 Acknowledgement: IMMEDIATELY	• Motor overloaded • Motor surrounding air temperature too high • Wire breakage or sensor not connect-ed • Motor temperature model incorrectly parameterized	• Reduce the motor load. • Check the surrounding air temperature and the motor ventilation. • Check the wiring and the connection. • Check the motor temperature model pa-rameters.
F7085: Open-loop/closed-loop control parameters changed Reaction: NONE Acknowledgement: IMMEDIATELY	Open-loop/closed-loop control parameters have had to be changed for the following reasons: • As a result of other parameters, they have exceeded the dynamic limits. • They cannot be used due to the fact that the hardware detected not having certain features.	It is not necessary to change the parameters as they have already been correctly limited.
F7403: Lower DC link volt-age threshold reached Reaction: OFF1 Acknowledgement: IMMEDIATELY	The DC link voltage monitoring is active and the lower DC link voltage threshold was reached in the "Operation" state.	• Check the line supply voltage. • Check the infeed. • Reduce the lower DC link threshold. • Switch out (disable) the DC link voltage monitoring.
F7404: Upper DC link volt-age threshold reached Reaction: OFF2 Acknowledgement: IMMEDIATELY	The DC link voltage monitoring is active and the upper DC link voltage threshold was reached in the "Operation" state.	• Check the line supply voltage. • Check the infeed module or the brake module. • Increase the upper DC link voltage thresh-old. • Switch out (disable) the DC link voltage monitoring.
F7410: Current controller output limited Reaction: OFF2 Acknowledgement: IMMEDIATELY	The condition "I_act = 0 and Uq_set_1 longer than 16 ms at its limit" is present and can be caused by the following: • Motor not connected or motor contac-tor open. • No DC link voltage present. • Motor Module defective.	• Connect the motor or check the motor contactor. • Check the DC link voltage. • Check the Motor Module.

Fault	Cause	Remedy
F7412: Commutation angle incorrect (motor model) Reaction: ENCODER Acknowledgement: IMMEDIATELY	An incorrect commutation angle was detected that can result in a positive coupling in the speed controller. Possible causes: • The motor encoder is incorrectly adjusted with respect to the magnet position. • The motor encoder is damaged. • Data to calculate the motor model has been incorrectly set. • Pole position identification might have calculated an incorrect value when activated. • The motor encoder speed signal is faulted. • The control loop is instable due to incorrect parameterization.	• If the encoder mounting was changed, re-adjust the encoder. • Replace the defective motor encoder. • Correctly set the motor stator resistance, cable resistance and motor-stator leakage inductance. Calculate the cable resistance from the cross-section and length, check the inductance and stator resistance using the motor data sheet, measure the stator resistance, e.g. using a multimeter - and if required, again identify the values using the stationary motor data identification. • With pole position identification activated, check the procedure for pole position identification and force a new pole position identification procedure by means of de-selection followed by selection.
F7414: Encoder serial number changed Reaction: ENCODER Acknowledgement: IMMEDIATELY	1. The encoder was replaced. 2. A third-party, build-in or linear motor was re-commissioned. 3. The motor with integrated and adjusted encoder was replaced. 4. The firmware was updated to a version that checks the encoder serial number.	Re causes 1, 2: Carry out an automatic adjustment using the pole position identification routine. Acknowledge the fault. Initiate the pole position identification routine. Then check that the pole position identification routine is correctly executed. SERVO: If a pole position identification technique is selected, and if p0301 does not contain a motor type with an encoder adjusted in the factory, then p1990 is automatically activated. Mechanically adjust the encoder. Accept the new serial number. Re causes 3, 4: Accept the new serial number with p0440 = 1.
F7420: Drive: Current setpoint filter natural frequency > Shannon frequency Reaction: NONE Acknowledgement: IMMEDIATELY	One of the filter natural frequencies is greater than the Shannon frequency(2KHz). Filter 1 (p1658, p1660) Filter 2 (p1663, p1665) Filter 3 (p1668, p1670) Filter 4 (p1673, p1675)	• Reduce the numerator or denominator natural frequency of the current setpoint filter involved at the control system side. • Switch out the filter involved (p1656).
F7450: Standstill monitoring has responded Reaction: OFF1 Acknowledgement: IMMEDIATELY	After the standstill monitoring time expired, the drive left the standstill window. • Position loop gain too low. • Position loop gain too high (instability/oscillation). • Mechanical overload. • Connecting cable, motor/drive converter incorrect (phase missing, interchange).	Check the causes and resolve.

Fault	Cause	Remedy
F7452: Following error too high Reaction: OFF1 Acknowledgement: IMMEDIATELY	The difference between the position set-point position actual value (following error dynamic model) is greater than the tolerance. • The drive torque or accelerating capacity exceeded. • Position measuring system fault. • Position control sense incorrect. • Mechanical system locked. • Excessively high traversing velocity or excessively high position reference value (setpoint) differences.	Check the causes and resolve.
F7801: Motor overcurrent Reaction: OFF2 Acknowledgement: IMMEDIATELY	The permissible motor limit current was exceeded. • Effective current limit set too low. • Current controller not correctly set. • Motor was braked with an excessively high stall torque correction factor. • Up ramp was set too short or the load is too high. • Short-circuit in the motor cable or ground fault. • Motor current does not match the current of Motor Module.	• Reduce the stall torque correction factor. • Increase the up ramp or reduce the load. • Check the motor and motor cables for short-circuit and ground fault. • Check the Motor Module and motor combination.
F7802: Infeed or power unit not ready Reaction: OFF2 Acknowledgement: IMMEDIATELY	After an internal power-on command, the infeed or drive does not signal ready because of one of the following reasons: • Monitoring time is too short. • DC link voltage is not present. • Associated infeed or drive of the signaling component is defective.	• Ensure that there is a DC link voltage. Check the DC link busbar. Enable the infeed. • Replace the associated infeed or drive of the signaling component.
F7815: Power unit has been changed Reaction: NONE Acknowledgement: IMMEDIATELY	The code number of the actual power unit does not match the saved number.	Connect the original power unit and power up the Control Unit again (POWER ON).
F7900: Motor blocked/speed controller at its limit Reaction: OFF2 Acknowledgement: IMMEDIATELY	The servo motor has been operating at the torque limit longer than 1s and below the speed threshold of 120 rpm . This signal can also be initiated if the speed actual value is oscillating and the speed controller output repeatedly goes to its limit.	• Check whether the servo motor can rotate freely or not. • Check the torque limit. • Check the inversion of the actual value. • Check the motor encoder connection. • Check the encoder pulse number.
F7901: Motor overspeed Reaction: OFF2 Acknowledgement: IMMEDIATELY	The maximum permissible speed has been exceeded.	Check and correct the maximum speed (p1082).
F7995: Pole position identification not successful Reaction: OFF2 Acknowledgement: IMMEDIATELY	The pole position identification routine was unsuccessful.	Contact the Hotline.

Fault	Cause	Remedy
F30001: Power unit: Over-current Reaction: OFF2 Acknowledgement: IMMEDIATELY	The power unit has detected an overcurrent condition. • Closed-loop control is incorrectly parameterized. • Motor has a short-circuit or fault to ground (frame). • Power cables are not correctly connected. • Power cables exceed the maximum permissible length. • Power unit defective. • Line phase interrupted.	• Check the motor data - if required, carry out commissioning. • Check the motor circuit configuration (star-delta) • Check the power cable connections. • Check the power cables for short-circuit or ground fault. • Check the length of the power cables. • Replace power unit. • Check the line supply phases. • Check the external braking resistor connection.
F30002: DC link voltage, overvoltage Reaction: OFF2 Acknowledgement: IMMEDIATELY	The power unit has detected overvoltage in the DC link. • Motor regenerates too much energy. • Device connection voltage too high. • Line phase interrupted.	• Increase the ramp-down time. • Activate the DC link voltage controller. • Use a braking resistor. • Increase the current limit of the infeed or use a larger module. • Check the device supply voltage. • Check the line supply phases.
F30003: DC link voltage, undervoltage Reaction: OFF2 Acknowledgement: IMMEDIATELY	The power unit has detected an undervoltage condition in the DC link. • Line supply failure • Line supply voltage below the permissible value. • Line supply infeed failed or interrupted. • Line phase interrupted.	• Check the line supply voltage. • Check the line supply infeed and observe the fault messages relating to it (if there are any). • Check the line supply phases. • Check the line supply voltage setting.
F30004: Drive heat sink overtemperature Reaction: OFF2 Acknowledgement: IMMEDIATELY	The temperature of the power unit heat sink has exceeded the permissible limit value. • Insufficient cooling, fan failure. • Overload. • Surrounding air temperature too high. • Pulse frequency too high.	• Check whether the fan is running. • Check the fan elements. • Check whether the surrounding air temperature is in the permissible range. • Check the motor load. • Reduce the pulse frequency if this is higher than the rated pulse frequency.
F30005: Power unit: Overload I^{2}t Reaction: OFF2 Acknowledgement: IMMEDIATELY	The power unit was overloaded. • The permissible rated power unit current was exceeded for an inadmissibly long time. • The permissible load duty cycle was not maintained.	• Reduce the continuous load. • Adapt the load duty cycle. • Check the motor and power unit rated currents.
F30011: Line phase failure in main circuit Reaction: OFF2 Acknowledgement: IMMEDIATELY	At the power unit, the DC link voltage ripple has exceeded the permissible limit value. Possible causes: • A line phase has failed. • The 3 line phases are inadmissibly unsymmetrical. • The fuse of a phase of a main circuit has ruptured. • A motor phase has failed.	• Check the main circuit fuses. • Check whether a single-phase load is distorting the line voltages. • Check the motor feeder cables.

Fault	Cause	Remedy
F30015: Phase failure motor cable Reaction: OFF2 Acknowledgement: IMMEDIATELY	A phase failure in the motor feeder cable was detected. The signal can also be output in the following case: The motor is correctly connected, however the closed-speed control is instable and therefore an oscillating torque is generated.	• Check the motor feeder cables. • Check the speed controller settings.
F30021: Ground fault Reaction: OFF2 Acknowledgement: IMMEDIATELY	Power unit has detected a ground fault. • Ground fault in the power cables. • Winding fault or ground fault at the motor.	• Check the power cable connections. • Check the motor.
F30027: Precharging DC link time monitoring Reaction: OFF2 Acknowledgement: IMMEDIATELY	• The power unit DC link was not able to be pre-charged within the expected time. There is no line supply voltage connected. • The line contactor/line side switch has not been closed. • The line supply voltage is too low. • The pre-charging resistors are over-heated as there were too many pre-charging operations per time unit • The pre-charging resistors are over-heated as the DC link capacitance is too high. • The pre-charging resistors are over-heated. • The pre-charging resistors are over-heated as the line contactor was closed during the DC link fast discharge through the Braking Module. • The DC link has either a ground fault or a short-circuit. • The pre-charging circuit is possibly defective.	Check the line supply voltage at the input terminals.
F30036: Internal over-temperature Reaction: OFF2 Acknowledgement: IMMEDIATELY	The temperature inside the drive converter has exceeded the permissible temperature limit. • Insufficient cooling, fan failure. • Overload. • Surrounding air temperature too high.	• Check whether the fan is running. • Check the fan elements. • Check whether the surrounding air temperature is in the permissible range. Notice: This fault can only be acknowledged once the permissible temperature limit minus 5 K has been fallen below.
F30050: 24 V supply over-voltage Reaction: OFF2 Acknowledgement: POWER ON	The voltage monitor signals an overvoltage fault on the module.	• Check the 24 V power supply. • Replace the module if necessary.

Fault	Cause	Remedy
F30074: Communication error between the Control Unit and Power Module Reaction: NONE Acknowledgement: IMMEDIATELY	Communications between the Control Unit (CU) and Power Unit (PU) via the interface no longer possible. The CU may have been withdrawn or is incorrectly inserted. Fault value (r0949, interpret hexadecimal): 0 hex: • a Control Unit with external 24 V supply was withdrawn from the Power Unit during operation. • with the Power Unit switched off, the external 24 V supply for the Control unit was interrupted for some time. 1 hex: The Control Unit was withdrawn from the Power Unit during operation, although the encoderless safe motion monitoring functions are enabled. This is not supported. After reinserting the Control Unit in operation, communications to the Power Unit no longer possible. 20A hex: The Control Unit was inserted on a Power Unit, which has another code number. 20B hex: The Control Unit was inserted on a Power Unit, which although it has the same code number, has a different serial number. 601 hex: The Control Unit was inserted on a Power Unit, whose power/performance class (chassis unit) is not supported.	Reinsert the Control Unit (CU) or the Control Unit adapter (CUAxx) onto the original Power Unit (PU) and continue operation. If required, carry out a POWER ON for the CU and/or the CUA.
F31100: Zero mark distance error Reaction: ENCODER Acknowledgement: PULSE INHIBIT	The measured zero mark distance does not correspond to the parameterized zero mark distance. For distance-coded encoders, the zero mark distance is determined from zero marks detected pairs. This means that if a zero mark is missing, depending on the pair generation, this cannot result in a fault and also has no effect in the system.	• Check that the encoder cables are routed in compliance with EMC. • Check the plug connections. • Check the encoder type (encoder with equidistant zero marks). • Replace the encoder or encoder cable.
F31110: Serial communications error Reaction: ENCODER Acknowledgement: PULSE INHIBIT	Serial communication protocol transfer error between the encoder and evaluation module.	• Check the encoder cable and shielding connection. • Replace the motor.
F31112: Error bit set in the serial protocol Reaction: ENCODER Acknowledgement: PULSE INHIBIT	The encoder sends a set error bit via the serial protocol.	• Check the encoder cable and shielding connection. • Replace the motor.

Fault	Cause	Remedy
F31117: Inversion error signals A/B/R Reaction: ENCODER Acknowledgement: PULSE INHIBIT	For a square-wave encoder (bipolar, double ended) signals A*, B* and R* are not inverted with respect to signals A, B and R.	• Check the encoder/cable. • Does the encoder supply signals and the associated inverted signals?
F31130: Zero mark and position error from the coarse synchronization Reaction: ENCODER Acknowledgement: PULSE INHIBIT	After initializing the pole position using track C/D, Hall signals or pole position identification routine, the zero mark was detected outside the permissible range. For distance-coded encoders, the test is carried out after passing 2 zero marks. Fine synchronization was not carried out.	• Check that the encoder cables are routed in compliance with EMC. • Check the plug connections. • If the Hall sensor is used as an equivalent for track C/D, check the connection. • Check the connection of track C or D. • Replace the encoder or encoder cable.
F31150: Initialization error Reaction: ENCODER Acknowledgement: PULSE INHIBIT	Encoder functionality is not operating correctly.	• Check the encoder type used (incremental/absolute) and the encoder cable. • If relevant, note additional fault messages that describe the fault in detail.
F52980: Absolute encoder motor changed Reaction: OFF1 Acknowledgement: IMMEDIATELY	The servo motor with absolute encoder is changed. Actual motor ID is different from commissioned motor ID.	The servo motor will be automatically configured after the acknowledgement of this fault.
F52981: Absolute encoder motor mismatched Reaction: OFF1 Acknowledgement: IMMEDIATELY	Connected absolute encoder motor cannot be operated. The servo drive in use does not support the Motor ID.	Use a suitable absolute encoder motor.
F52983: No encoder detected Reaction: OFF1 Acknowledgement: IMMEDIATELY	The servo drive in use does not support encoderless operation.	• Check the encoder cable connection between the servo drive and the servo motor. • Use a servo motor with encoder.
F52984: Incremental encoder motor not configured Reaction: OFF1 Acknowledgement: IMMEDIATELY	• Commissioning of the servo motor has failed. • The incremental encoder motor is connected but fails to commission.	Configure the motor ID by setting the parameter p29000.
F52985: Absolute encoder motor wrong Reaction: OFF1 Acknowledgement: IMMEDIATELY	• Motor ID is downloaded wrong during manufacture. • The software of the servo drive does not support the Motor ID.	• Update the software. • Use a correct absolute encoder motor.
F52987: Absolute encoder replaced Reaction: OFF1 Acknowledgement: IMMEDIATELY	Incorrect absolute encoder data.	Contact the Hotline.

A1009: Control module over-temperature	The temperature of the control module (Control Unit) has exceeded the specified limit value.	• Check the air intake for the Control Unit. • Check the Control Unit fan. Note: The alarm automatically disappears after the limit value has been undershot.
A1019: Writing to the re-movable data medium un-successful	The write access to the removable data medium was unsuccessful.	Remove and check the removable data medium. Then run the data backup again.
A1032: All parameters must be saved	The parameters of an individual drive object were saved, although there is still no backup of all drive system parameters. The saved object-specific parameters are not loaded the next time that the system powers up. For the system to successfully power up, all of the parameters must have been completely backed up.	Save all parameters.
A1045: Configuring data invalid	An error was detected when evaluating the parameter files saved in the non-volatile memory. Because of this, under certain circumstances, several of the saved pa-rameter values were not able to be ac-cepted.	Save the parameterization using the "SAVE" function on the BOP. This overwrites the incor-rect parameter files in the non-volatile memory and the alarm is withdrawn.
A1920: Drive Bus: Receive setpoints after To	Output data of Drive Bus master (set-points) received at the incorrect instant in time within the Drive Bus clock cycle.	• Check bus configuration. • Check parameters for clock cycle synchro-nization (ensure To > Tdx). Note: To: Time of setpoint acceptance Tdx: Data exchange time
A1932: Drive Bus clock cycle synchronization miss-ing for DSC	There is no clock synchronization or clock synchronous sign of life and DSC is se-lected. Note: DSC: Dynamic Servo Control	Set clock synchronization across the bus con-figuration and transfer clock synchronous sign-of-life.
A5000: Drive heat sink over-temperature	**Cause:** The alarm threshold for overtemperature at the inverter heat sink has been reached. If the temperature of the heat sink in-creases by an additional 5 K, then fault F30004 is initiated.	Check the following: • Is the surrounding air temperature within the defined limit values? • Have the load conditions and the load duty cycle been appropriately dimensioned? • Has the cooling failed?
A7012: Motor temperature model 1/3 overtemperature	The motor temperature model 1/3 identi-fied that the alarm threshold was exceed-ed.	• Check the motor load and reduce it if re-quired. • Check the motor surrounding air tempera-ture.
A7565: Encoder error in encoder interface	An encoder error was signaled for encoder via the encoder interface (G1_ZSW.15).	Acknowledge the encoder error using the en-coder control word (G1_STW.15 = 1).
A7576: Encoderless opera-tion due to a fault active	Encoderless operation is active due to a fault.	• Remove the cause of a possible encoder fault. • Carry out a POWER ON (power off/on) for all components.

A7965: Save required	The angular commutation offset was re-defined and has still not been saved. In order to permanently accept the new value, it must be saved in a non-volatile fashion.	This alarm automatically disappears after the data has been saved.
A7971: Angular commutation offset determination activated	The automatic determination of the angular commutation offset (encoder adjustment) is activated. The automatic determination is carried out at the next power-on command.	The alarm automatically disappears after determination.
A7991: Motor data identification activated	The motor data identification routine is activated. The motor data identification routine is carried out at the next power-on command.	The alarm automatically disappears after the motor data identification routine has been successfully completed. If a POWER ON or a warm restart is performed with motor data identification selected, the motor data identification request will be lost. If motor data identification is required, it will need to be selected again manually following ramp-up.
A30016: Load supply switched off	The DC link voltage is too low.	• Switch on the load supply. • Check the line supply if necessary.
A30031: Hardware current limiting in phase U	Hardware current limit for phase U responded. The pulsing in this phase is inhibited for one pulse period. • Closed-loop control is incorrectly parameterized. • Fault in the motor or in the power cables. • The power cables exceed the maximum permissible length. • Motor load too high. • Power unit defective. Note: Alarm A30031 is always output if, for a Power Module, the hardware current limiting of phase U, V or W responds.	Check the motor data. As an alternative, run a motor data identification. • Check the motor circuit configuration (star-delta). • Check the motor load. • Check the power cable connections. • Check the power cables for short-circuit or ground fault. • Check the length of the power cables.
A31411: Absolute encoder signals internal alarms	The absolute encoder fault word includes alarm bits that have been set.	Replace the encoder.
A31412: Error bit set in the serial protocol	The encoder sends a set error bit via the serial protocol.	• Carry out a POWER ON (power off/on) for all components. • Check that the encoder cables are routed in compliance with EMC. • Check the plug connections. • Replace the encoder.
A52900: Failure during data copying	• Copying is halted. • The SD card was plugged out. • The drive is not in the stop state.	• Re-plug in the SD card. • Make sure the drive is in the stop state.

A.7 PLC program design and adjustment

A.7.1 PLC Programming Tool

A.7.1.1 Renaming the default program

PLC Programming Tool contains a default PLC program. You can give this program a new name by performing the following operations:
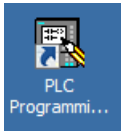
1. Start the software by double-clicking the icon on your desktop.

2. Click the button in the toolbar or select from the main window menu as follows to select and open the default PLC program from the Toolbox:
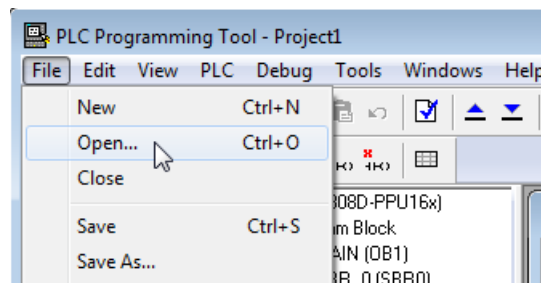
3. Select the following menu command to save this file under a new name to a desired folder so that the default program will not be overwritten:
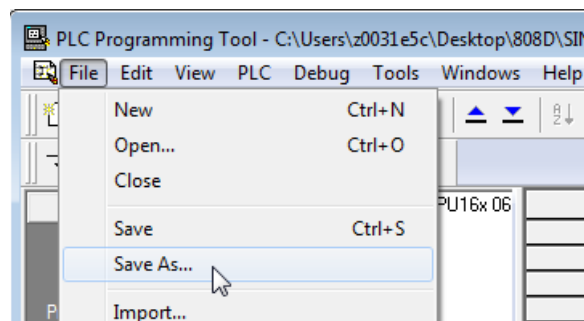
A.7.1.2   Changing the display language

You can select the languages to be installed when installing the software. Then you can change the display language as desired in PLC Programming Tool.

Perform the following steps to change the display language.

1.   Choose from the main menu as follows:
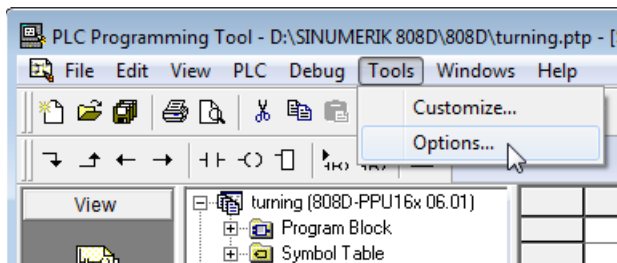
2.   In the appeared dialog, select the desired display language, and then click this button to confirm.
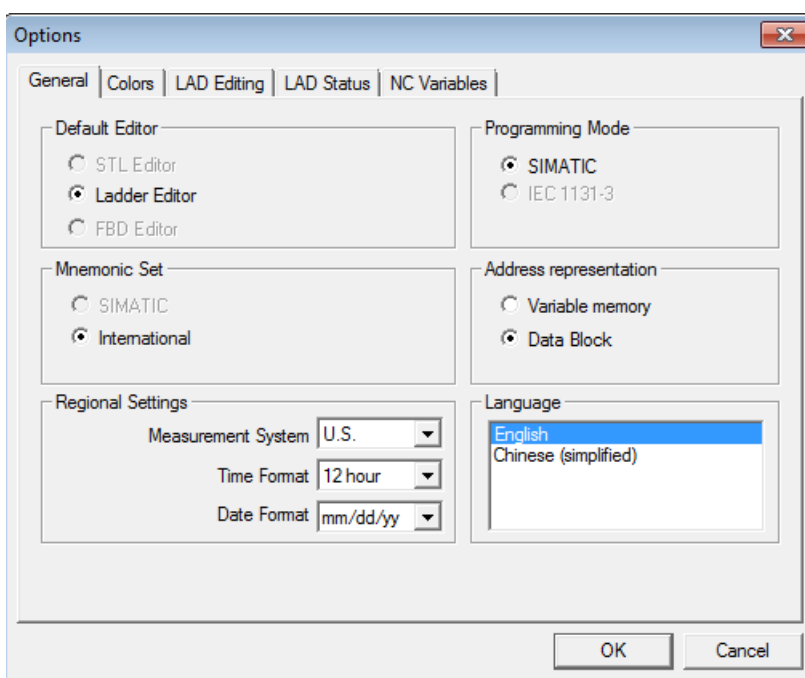
The following message box pops up, prompting that the software will restart to make the setting effective.
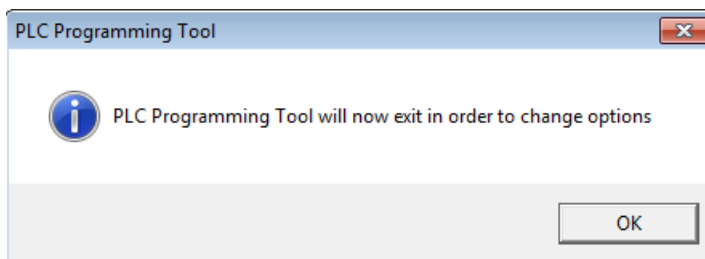
3.   Click this button to restart the software. Then the display language is changed successfully.

A.7.1.3 Selecting a target system

In PLC Programming Tool, you can select the PLC type as preset. In the instruction tree, the instructions that cannot be used for the target system are marked with a red × (for example,).

After the PLC type is preset, an error check of the program takes place when the program is written.

Operating sequence

1. Start PLC Programming Tool on your PC.

2. Choose from the main screen menu as follows:
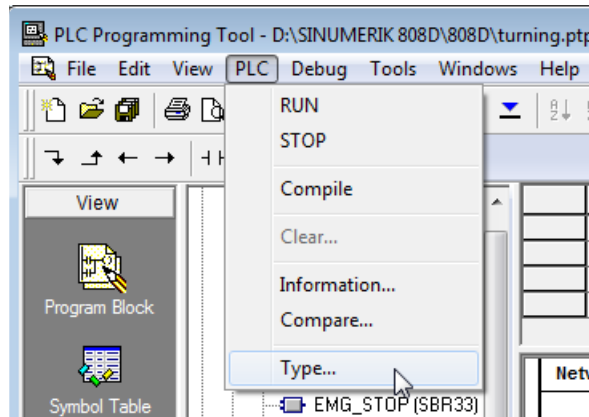
Then the following dialog opens:
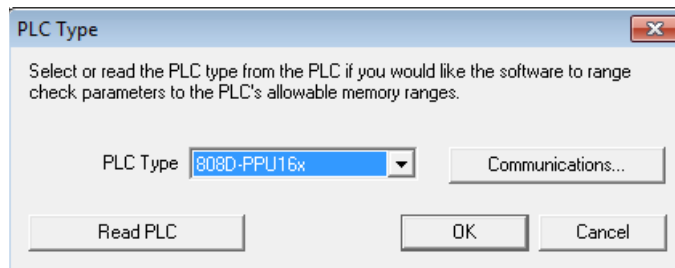
You can alternatively call this dialog by right-clicking the project name in the instruction tree and choosing from the context menu.
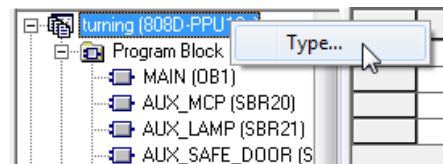
3. Select a desired target system from the drop-down list in the dialog.

If an active communication has been established between PLC Programming Tool and the control system, you can alternatively click the following button to read the information directly from the target system:
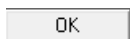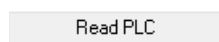
4. Click this button to exit the dialog.

A.7.1.4 Establishing a connection between the control system and the PC

Establishing a connection via the Ethernet interface

You can establish a connection between the control system and a PC installed with PLC Programming Tool via the Ethernet interface. The following Ethernet connections are possible:

- Direct connection: direct connection between the control system and a PC
- Network connection: integrating the control system into an existing Ethernet network

Establishing a direct connection

Proceed through the following steps to establish a direct connection:
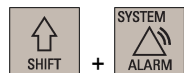
1. Connect the control system with the PC using an Ethernet cable.

2. Select the desired operating area on the PPU.

3. Press this key to view the extended softkeys.

4. Set up a direct connection on the control system through the following softkey operations:

   Serv. displ. → Service control → Direct connect.

   The following dialog pops up on the screen:

Link set up	
IP address:	169.254.11.22
Subnet mask:	255.255.0.0

5. Start PLC Programming Tool on your PC, and click this button in the navigation bar to open the following dialog:

Communications Links

Communications Setup

Double click the icon representing the PLC to communicate with.

Double click the interface icon to change communication parameters.

Double click the modem icon to setup the modem parameters or dial to start modem communications.

None Address: **0**

Double-Click to Refresh

Communication Parameters

Remote Address	2
Local Address	
Module	(COM 1)
Protocol	PPI
Transmission Rate	
Mode	11-bit

None Address: **0**

6. Double-click the access point symbol, and the following "Set PG/PC Interface" dialog is displayed.

Set PG/PC Interface

Access Path | LLDP / DCP | PNIO Adapter | Info |

Access Point of the Application:

PLC Programming Tool → Intel(R) 82579LM Gigabit Network Con ▾

(Standard for PLC Programming Tool)

Interface Parameter Assignment Used:

Intel(R) 82579LM Gigabit Network Connect

- Intel(R) 82579LM Gigabit Network C
- Intel(R) 82579LM Gigabit Network C
- Intel(R) 82579LM Gigabit Network C
- PC Adapter.Auto.1

(Parameter assignment of your NDIS-CP with TCP/IP protocol (RFC-1006))

Interfaces
Add/Remove: Select...

Properties...
Diagnostics...
Copy...
Delete

OK   Cancel   Help
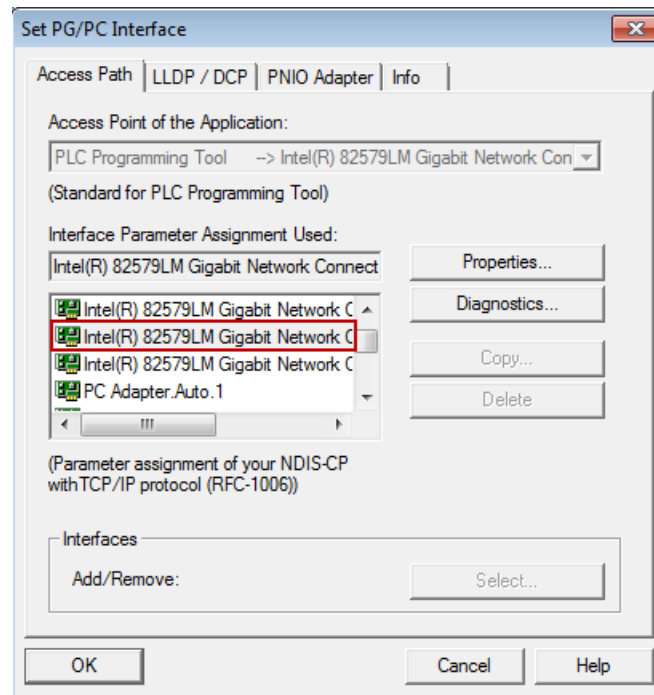
Select "TCP/IP" with the Ethernet card name of your PC and click the "OK" button.

Note: You can find the name of your Ethernet card in the local area connection status under Control Panel on your PC.

7. Enter the IP address for the control system that displays in the above link setup dialog in the communication settings dialog.

Communication Parameters

Remote Address   169 . 254 . 11 . 22

Double-Click to Refresh

8. Double-click this symbol in the communication setting window to establish a connection to the specified IP address.

Wait until the information of the connected control system is identified as follows, and then the connection is ready.

TCP/IP -> Intel(R) 82579LM Gigab...

808D-PPU16x

Establishing a network connection

Proceed through the following steps to establish a network connection:

1. Connect the control system with the local network using an Ethernet cable.

SHIFT + SYSTEM ALARM

2. Select the desired operating area on the PPU.

>

3. Press this key to view the extended softkeys.

Service network

Direct connect.

4. Enter the main screen of the service control options through the following softkey operations:

   🔧 Serv. displ. → Service control

5. Press this softkey to enter the window for the network configuration.

   Note: make sure the following vertical softkey is deactivated:

   Direct connect.

6. Configure the network as required in the following window:

Network configuration	
Local data	
Protocol:	TCP / IP
DHCP:	Yes
Cmpt. name:	NONAME_NCU
IP address:	176 16 202 200
Subnet mask	255 255 255 0
Gateway:	

   You can configure DHCP with the following key:

   SELECT

   Note: If you select "No" for DHCP, you must enter the IP address (which must belong to the same network as that of your PC) and subnet mask manually.

Save

7. Press this softkey to save the configuration. If you select "Yes" for DHCP, you also need to restart the control system to activate the network configuration.

8. Start PLC Programming Tool on your PC, and click this button in the navigation bar to open the following dialog:

   Communications Links

   Communications Setup

   Double click the icon representing the PLC to communicate with.

   Double click the interface icon to change communication parameters.

   Double click the modem icon to setup the modem parameters or dial to start modem communications.

   None Address: **0**

   Double-Click to Refresh

   Communication Parameters

Remote Address	2
Local Address	
Module	(COM 1)
Protocol	PPI
Transmission Rate	
Mode	11-bit

None Address: 0

9. Double-click the access point symbol, and the following "Set PG/PC Interface" dialog is displayed.
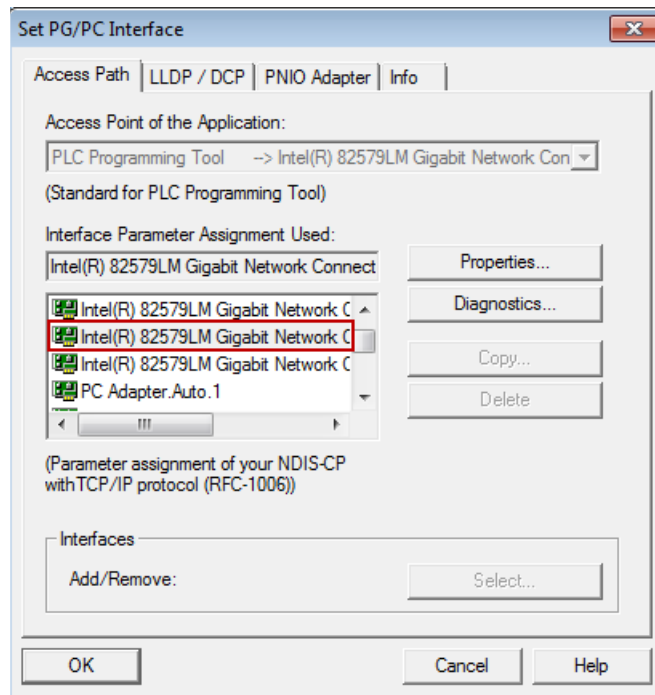
Select "TCP/IP" with the Ethernet card name of your PC and click the "OK" button.

Note: You can find the name of your Ethernet card in the local area connection status under Control Panel on your PC.

10. Enter the IP address for the control system in the communication setting window, for example:

Communication Parameters

Remote Address [172 . 16 . 202 . 200]

Note that the IP address entered here must be the same as that you have set on the PPU.

11. Double-click this symbol in the communication setting window to establish a connection to the specified IP address.

Double-Click to Refresh

Wait until the information of the connected control system is identified as follows, and then the connection is ready.

TCP/IP -> Intel(R) 82579LM Gigab...

808D-PPU16x
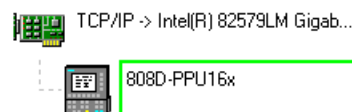
Establishing a connection via the RS232 interface

Proceed through the following steps to establish a connection between the control system and a PC:
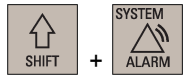
1. Connect the control system with the PC using an RS232 cable.

2. Select the desired operating area on the PPU.

3. Press these two softkeys in succession to open the following communication setting window.

Communication settings

Active communication parameter

Baud rate	38400
Stop bits	1
Parity	Even
Data bits	8
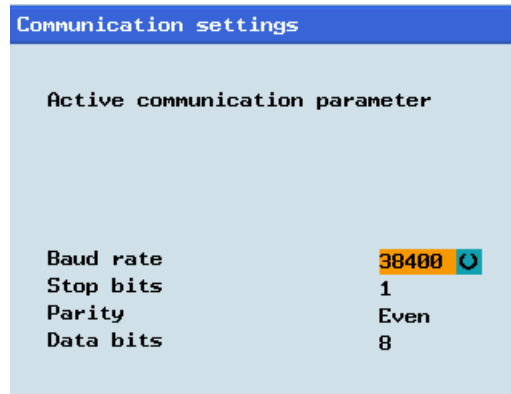
4. Use this softkey to select a communication baud rate. The control system supports the following baud rates:
   - 9.6 kbps
   - 19.2 kbps
   - 38.4 kbps
   - 57.6 kbps
   - 115.2 kbps

5. Activate the RS232 connection with this softkey.

   No modifications to the settings are possible in this state.

   The active or inactive state is retained even after a power-on (except when you start the system with the default data).

   In the lower right corner of the screen, the [icon] icon shows that the connection to the PC via the RS232 interface is active.

6. Start PLC Programming Tool on your PC, and click this button in the navigation bar to open the following dialog:
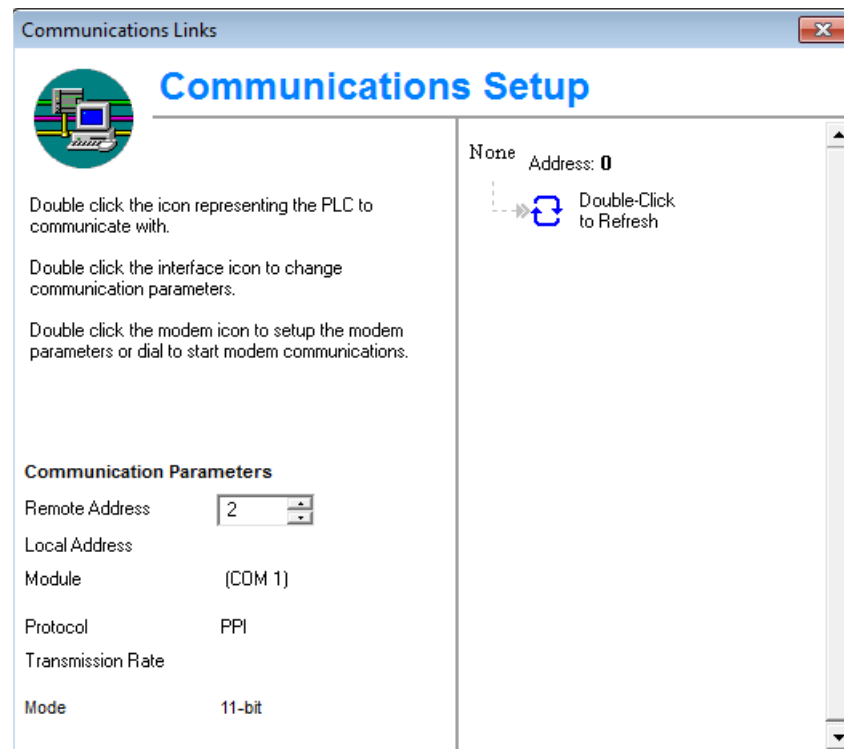
Alternatively, you can call this dialog by double-clicking the Communications icon in the project tree or choosing from the main screen menu:
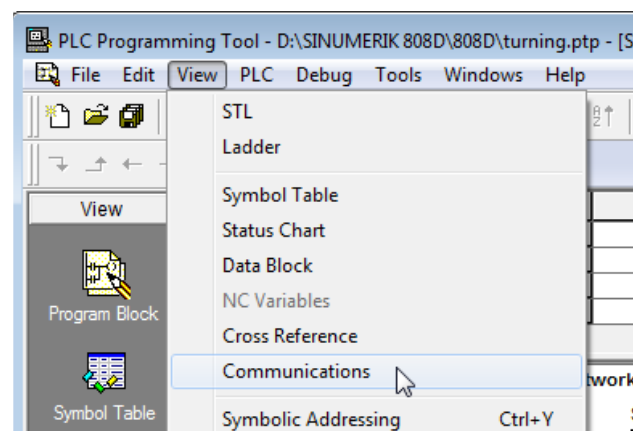
7. Double-click the access point symbol.

Then the following "Set PG/PC Interface" dialog is displayed.
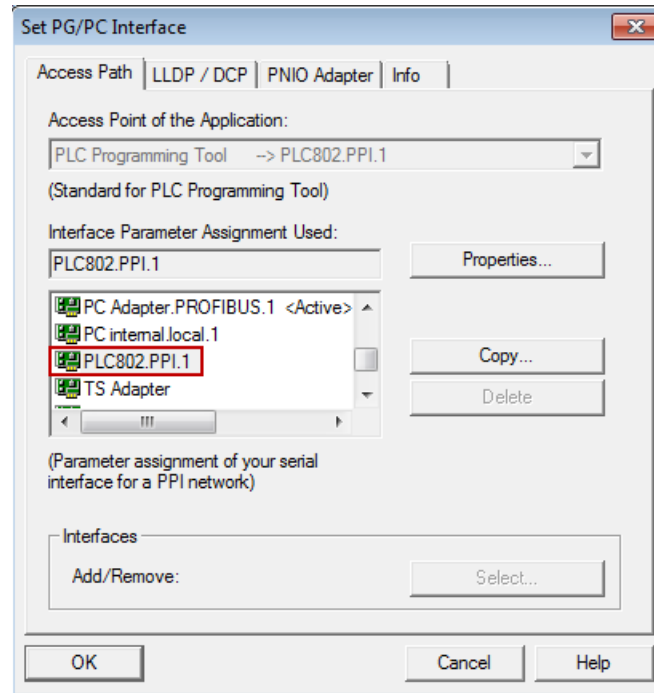
Check the interface being used. For RS232 communication, you must assign the interface "PLC802.PPI.1" to PLC programming tool.

8. Double click the interface "PLC802.PPI.1" or click the "Properties" button, and the following property dialog is displayed.
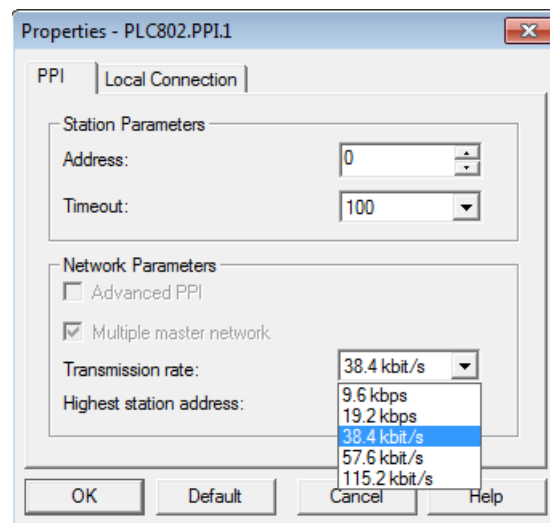
On the "PPI" tab page, set the baud rate for the transmission rate, which PLC Programming Tool will use for communication.

Note: The baud rate you select must be the same as what you have set on the control.

9.   Open the "Local connection" tab to specify the COM port to which the RS232 (V24) cable is connected.
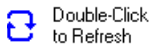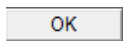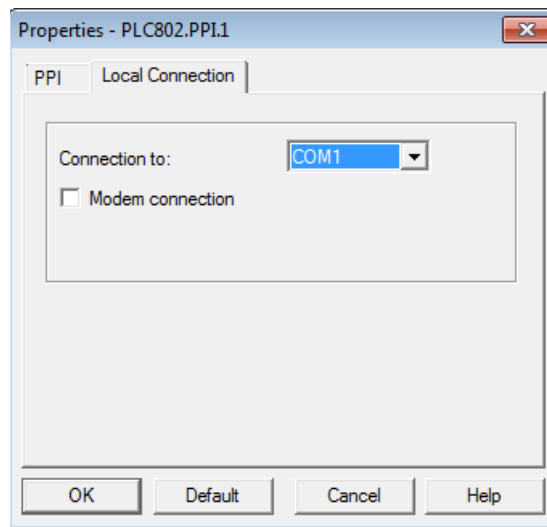
10.   Click this button twice to exit the "Set PG/PC Interface" dialog.

11.   Double-click this icon on the right side of the communication setting window. It will take several minutes to search for a valid address.

12.   Wait until the information on the connected control system is identified as follows, and then the connection is ready.
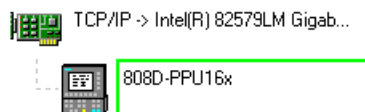
Note

Before configuring communications in PLC Programming Tool, make sure the connection is already enabled on the control system.

A.7.1.5   Downloading/uploading/comparing PLC applications

You can save, copy, or overwrite a PLC project or PLC application on the control system by using the following:

- PLC Programming Tool
- USB stick

The **PLC project** contains the PLC user program, including all of the important information (symbols, comments, ...).

You can upload/download a PLC project from/to the control system with PLC Programming Tool. Also with this tool, you can import/export the PLC project in the "**.pte**" format. Additionally, you can read/write the PLC project in the "**.pte**" format from/to a USB stick directly on the control system.
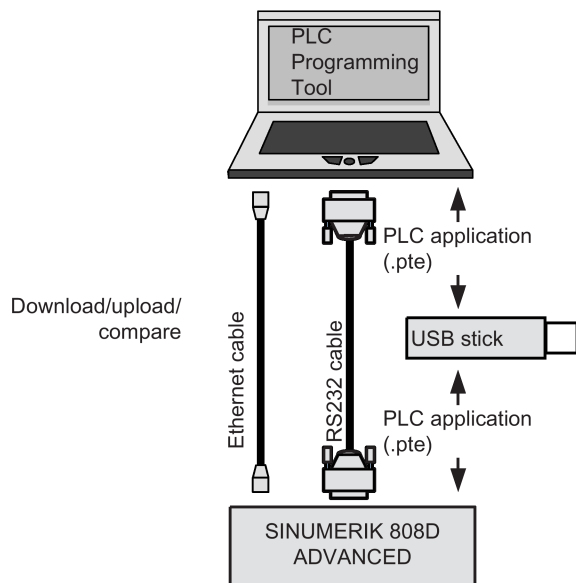
Download

You can write the transferred data into the permanent memory (load memory) of the control system with PLC Programming Tool or a USB stick.

To download a PLC application with PLC Programming Tool, proceed as follows:

1. Establish the communication between the control system and PLC Programming Tool.

   You can establish the connection by using the following methods:

   - Establishing a connection via the Ethernet interface (Page 184)
   - Establishing a connection via the RS232 interface (Page 188)

2. Select from the main screen menu as follows or click the toolbar button ⊻ to start the download:
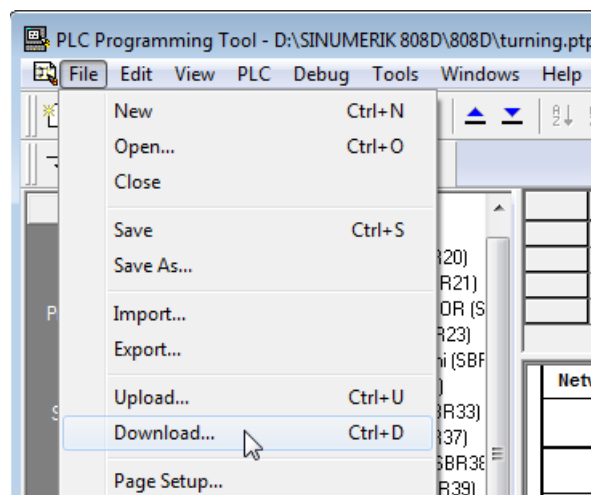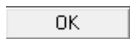
| | 3. | Click this button on the download dialog to proceed directly. You can also select the following checkbox for data blocks to include the actual values of the data blocks, and then click this button. |

| | 4. | Choose to download the PLC application when the PLC is in the **run** mode or in the **stop** mode. |
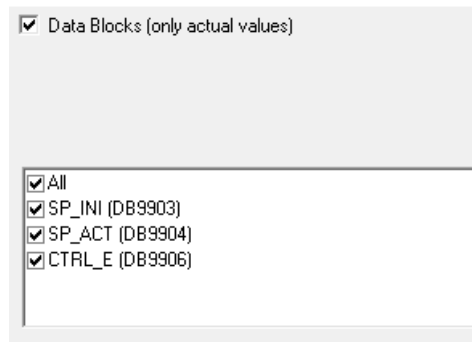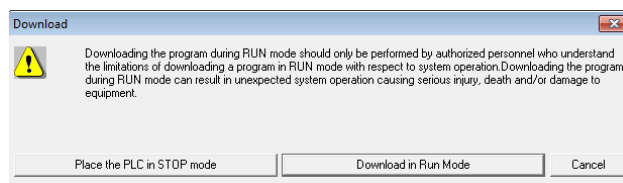
Caution: You are recommended to download the PLC application when the PLC is in the **stop** mode. Downloading the PLC application when the PLC is in the **run** mode can cause machine damages or even human injuries.

| | 5. | Start the download which will take several seconds. |
| | 6. | The download finishes when the following message appears. Then click this button to end your operations. |
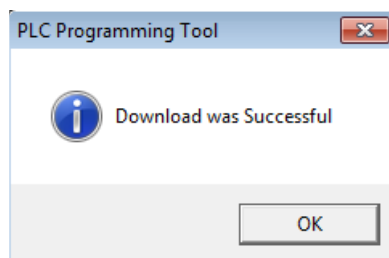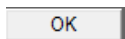
Note

If you have chosen to download when the PLC is in the **stop** mode, you can place the PLC at the **run** mode again with PLC Programming Tool (click the button ▶).

To download a machine manufacturer's PLC application with a USB stick, perform as follows:

1. Select from the main screen menu as follows to export the PLC application created with PLC Programming Tool to a USB stick:
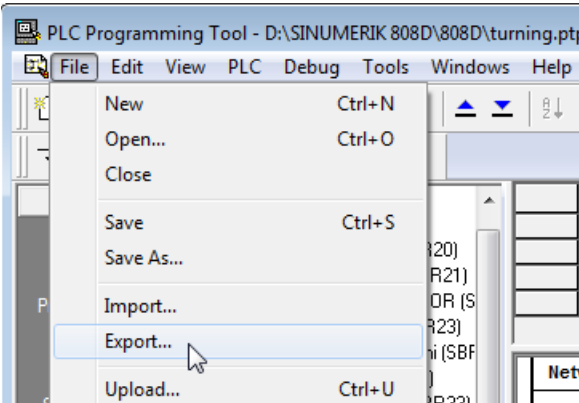
2. Save the PLC application as a .pte file with a desired file name (e.g., plc_app.pte) onto the USB stick.

3. Insert the USB stick into the USB interface at the front of the PPU.

4. Select the desired operating area on the PPU.
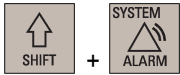
5. Open the USB stick through the following softkey operations:

Sys. data → USB
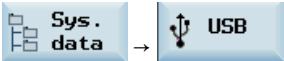
6. Select the .pte file and then press this softkey to copy the file.

Name	Type	Length
808D on PC	DIR	1
MultiLanguage	DIR	1
user cycle	DIR	1
1	txt	0 B
808Dsys_te	img	125.01 MB
Help1	txt	0 B
Help2	png	21.67 KB
SinumerikArchitectureT...	ppt	20.98 MB
alc	txt	0 B
alcu_eng	txt	5.75 KB
almc	txt	311 B
almc_chs	txt	305 B
arc_product	arc	36.00 KB
cov	com	314 B
keys	bak	41 B
oemmanual	pdf	1.74 MB
plc_app	pte	208.22 KB
sc	com	544 B

7. Press this softkey, and then access the folder for the NCK/PLC data by pressing the following key.

8. Press this softkey.

9. A warning note appears warning you that the original .pte file will be overwritten. Press this softkey to continue.

The download has been completed when the progress bar disappears.

Upload

You can back up a PLC application from the permanent memory of the control system using PLC Programming Tool or a USB stick.

To upload a PLC application using PLC Programming Tool, proceed as follows:

1. Establish the communication between the control system and PLC Programming Tool.

    You can establish the connection by using the following methods:

    - Establishing a connection via the Ethernet interface (Page 184)
    - Establishing a connection via the RS232 interface (Page 188)

2. Select from the main screen menu as follows or click the toolbar button to create a new and empty PLC application:
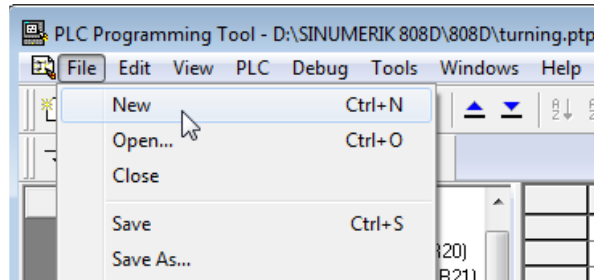
3. Select from the main screen menu as follows or click the toolbar button to start the upload:
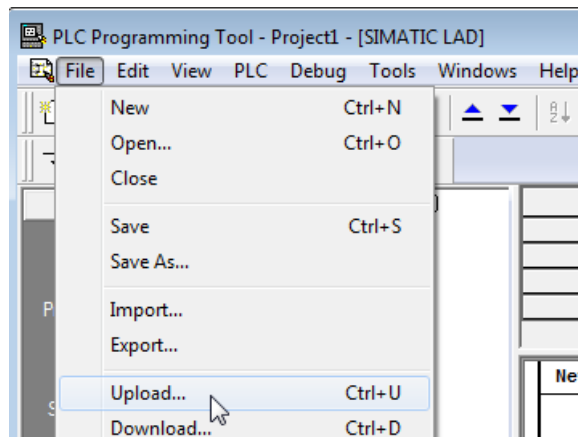
4. Click this button to proceed directly. You can also select the checkbox for data blocks to include the actual values of the data blocks, and then click this button.
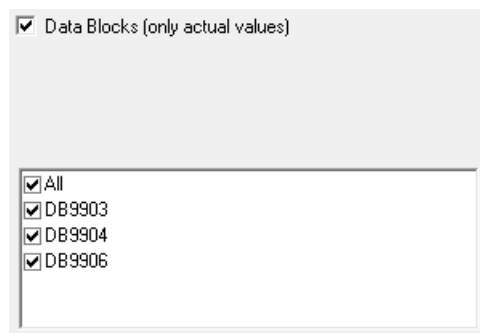
5. The upload has been completed when the following message appears.

OK
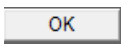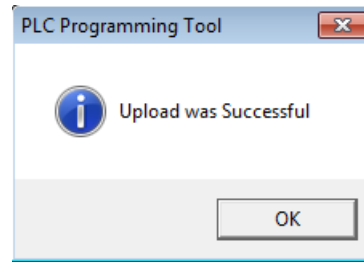
6. Click this button and you can view the upload results.

Network 1   turning or milling setting for the following program

| ONE | SM0.0 | Flag with defined ONE signal |
| T_or_M | M255.0 | 0: turning, 1: milling |

Network 2   Initialization

| SCAN_1ST | SM0.1 | First PLC cycle "1" and following cycle "0" |

Network 3   Emergency control
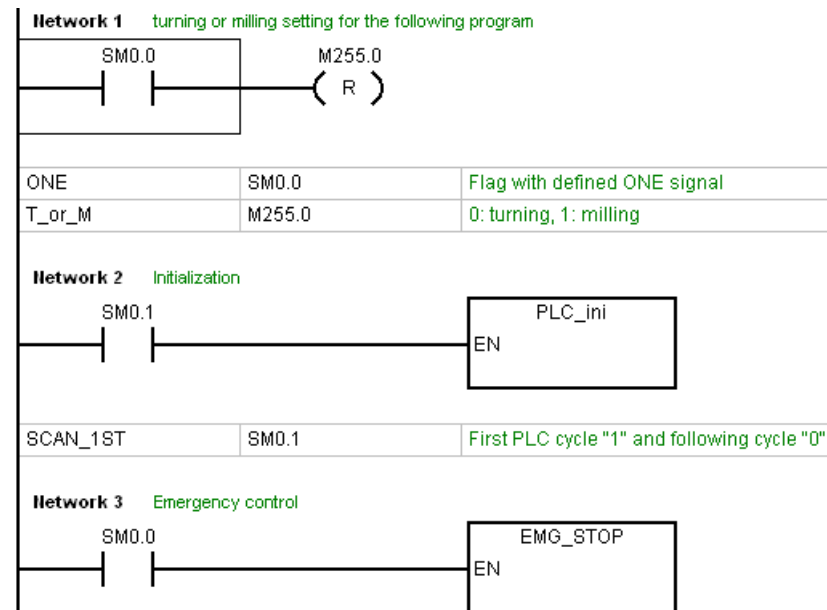
To upload a PLC application using a USB stick, proceed as follows:

1. Insert the USB stick into the USB interface at the front of the PPU.

SHIFT + SYSTEM ALARM

2. Select the desired operating area on the PPU.

3. Access the screen for the 808D data through the following softkey operations:

Sys. data → 808D data

INPUT
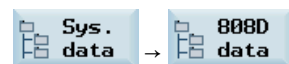
4. Access the folder for the NCK/PLC data by pressing this hardkey. Then select the machine manufacturer's PLC application file (**.pte**).

Name	Type
..	
Leadscrew error compensation	
Global user data	
Machine data	
OEM PLC application (*.pte)	
R variables	
Setting data	
Tool data	
Work offset	

Copy

5. Press this softkey to copy the selected file.

USB

6. Press this softkey and paste the **.pte** file into the USB stick with the following softkey:

Paste

7. Unplug the USB stick and plug it into the USB interface of your PC.

8. Select from the main screen menu as follows or click the toolbar button to create a new and empty PLC application:
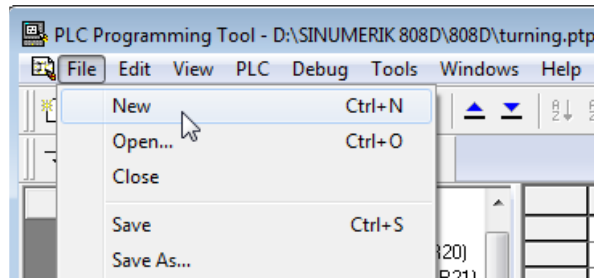
9. Import the **.pte** file from the USB stick by selecting from the main screen menu as follows:
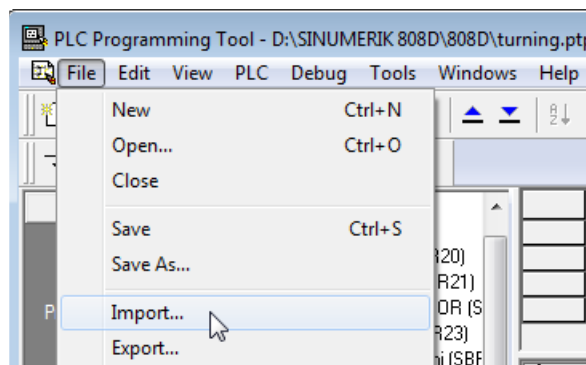
Open

10. Click this button or double-click the **.pte** file in the following dialog. It will take several seconds to import the **.pte** file.
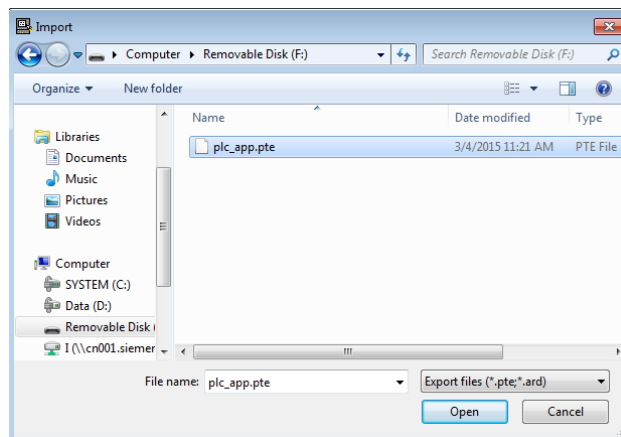
11. After successfully importing the PLC application, you can view the import results.
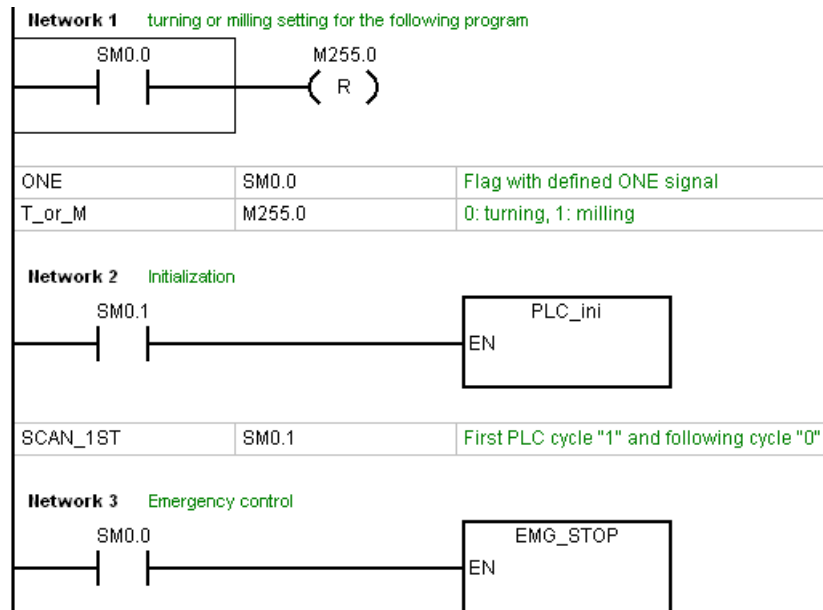
Compare

You can compare the project in PLC Programming Tool with the project on the control system by performing the following steps:

1. Select from the main screen menu as follows:
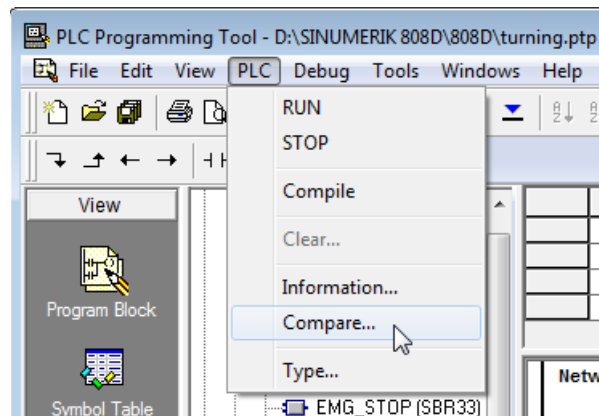
You can also select the checkbox for data blocks to include the actual values of the data blocks.
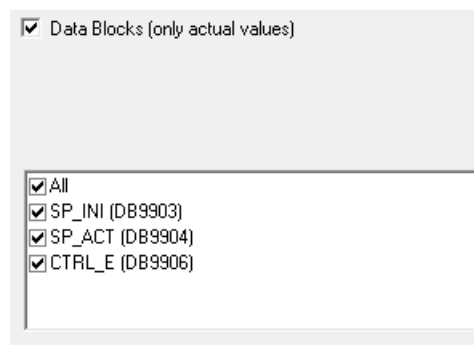
[Begin]   2.   Click this button and the comparing begins. Wait for a few seconds, and then you can view the compare results.

```
┌─ Comparison Results ──────────────────────────────────┐
  Blocks:
  ┌──────────────────────────────────────────────────┐▲
  │ MAIN (OB1): Network 6 different                  │
  │ MAIN (OB1): Network 7 different                  │▣
  │ MAIN (OB1): Network 8 different                  │
  │ MAIN (OB1): Network 9 different                  │
  │ MAIN (OB1): Network 10 different                 │
  │ MAIN (OB1): Network 11 different                 │▼
  └──────────────────────────────────────────────────┘

  Data Blocks:
  ┌──────────────────────────────────────────────────┐▲
  │ Passed                                           │
  │                                                  │
  │                                                  │
  │                                                  │
  │                                                  │▼
  └──────────────────────────────────────────────────┘
└───────────────────────────────────────────────────────┘
```
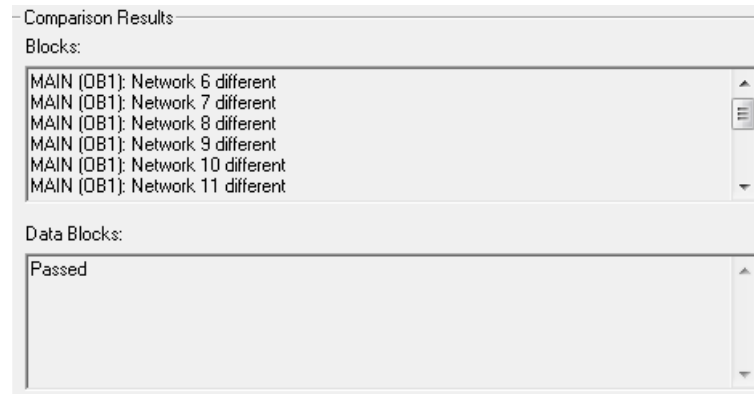
Version display

The transferred PLC application will be active in the working memory of the control after the system is started up. Then you can view the detailed information about the currently active PLC application in the version display through the following softkey operations:

[SHIFT] + [SYSTEM ALARM] → [Serv. displ.] → [Version]
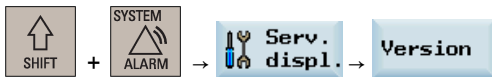
In PLC Programming Tool, right-click the OB1 block and choose "Properties". In the comment text box of the opened OB1 property dialog, you can add your own additional information for the PLC application.

```
┌─ Properties (OB1) ──────────────────────────────── ▭ ▢ ✕ ┐
│                                                          │
│  General │ Protection │                                  │
│                                                          │
│   Name                    Author                         │
│   ┌──────────────┐       ┌──────────────────────┐        │
│   │ MAIN         │       │ SNC                  │        │
│   └──────────────┘       └──────────────────────┘        │
│   Block Number                                           │
│   ┌──────┐                                               │
│   │ 0   ▲▼│                                              │
│   └──────┘                                               │
│                                                          │
│   Date Created       08/08/2008  08:09:44 am             │
│   Last Modified      03/04/2015  11:08:18 am             │
│   Comment                                                │
│   ┌──────────────────────────────────────────────┐▲     │
│   │ Subroutine Library Falcon II V00.01.16 for turning│  │
│   │                                                │     │
│   │                                                │     │
│   │                                                │     │
│   │                                                │     │
│   │                                                │▼     │
│   └──────────────────────────────────────────────┘      │
│                                                          │
│                              ┌──────┐   ┌────────┐       │
│                              │  OK  │   │ Cancel │       │
│                              └──────┘   └────────┘       │
└──────────────────────────────────────────────────────────┘
```
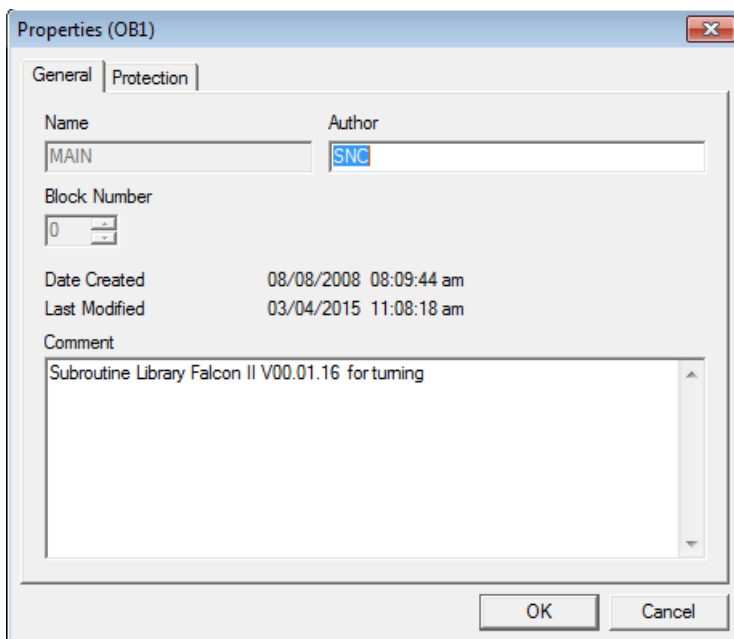
Then in the version display on the control, the added information is visible.

```
PLC_Application:

  turning.ptp 10:20 09/10/2014
Subroutine Library Falcon II V00.01.16  for turning 09/10/2014
```

A.7.1.6 Compiling and monitoring programs

Compiling PLC programs

You can check for syntax errors after editing or modifying a PLC project using the compile function of PLC Programming Tool. Proceed through the following steps to compile a PLC program:

1. Open an existing or new PLC project in PLC Programming Tool, and save it after editing or modifying as desired.

2. Start compiling by clicking the toolbar button ☑ or choosing from the main screen menu as follows:
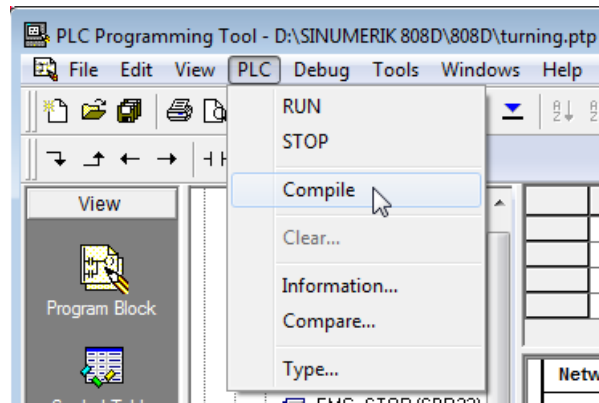
3. Wait for several seconds until the compiling finishes. Then you can check the results in the message window at the bottom of the main screen.

Monitoring a PLC program with the HMI

    There are three ways for program monitoring in this operating area.

●   →
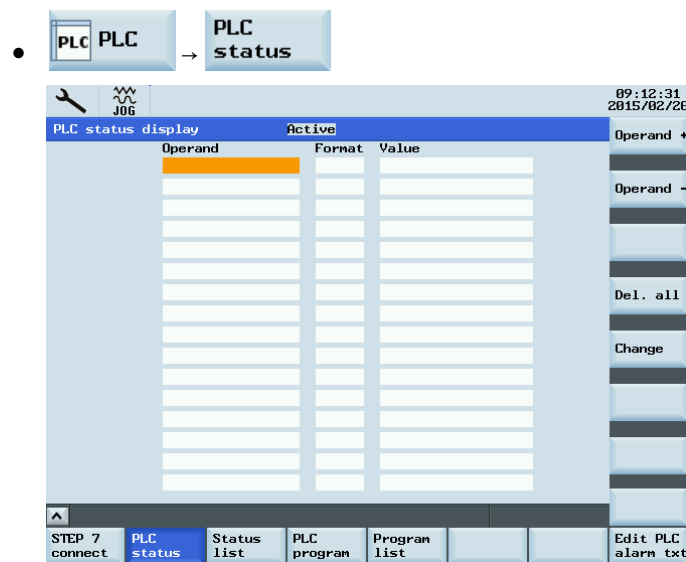
You can enter an operand to view its status.
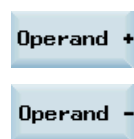
    Use these softkeys to respectively increase and decrease the bit of the operand.

Change

Pressing this softkey changes the value of the operand.

Delete all

To delete all the entered operands, press this softkey.
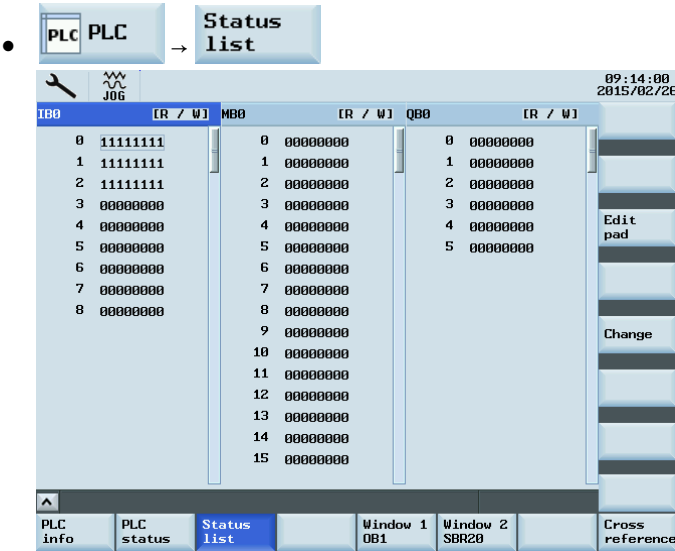
- **PLC** PLC → **Status list**

You can view the status of a PLC signal. By default, three signal status lists (inputs, flags, and outputs) are displayed in three columns.

Edit pad

You can change column sequence or assign a new signal status list (variables) with this softkey.

Change

You can also change the status of a PLC signal via this softkey.

- **PLC** PLC → **PLC program**
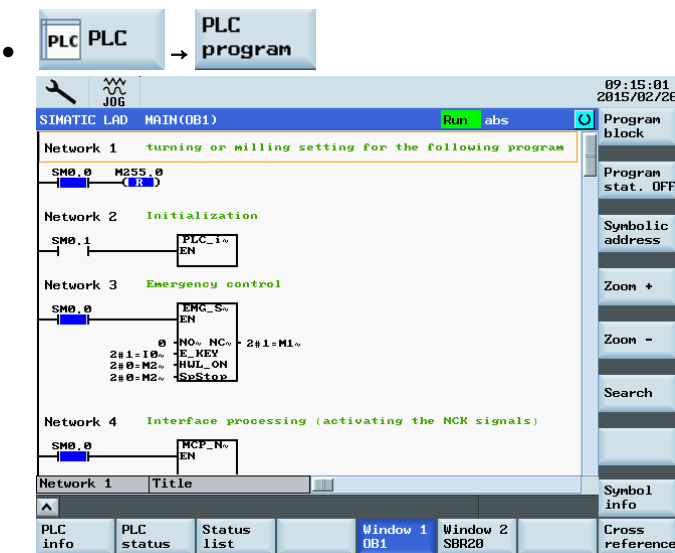
Two windows are available for you to view the program.

Program block

You can use this softkey to view the status of a subroutine.

PLC info

You can use this softkey to check the PLC operating status and data.

Cross reference

You can use this softkey to look for the target address in the cross-reference table.

Monitoring a PLC program with PLC Programming Tool

Prerequisite:

Before you can collect status to monitor or debug your program, make sure you have performed the following operations:

- Successfully compiling your program
- Establishing communications between PLC Programming Tool and the control system
- Successfully downloading your program to the control system

You can use the toolbar button 🖳 or the following menu command to monitor the online status of your PLC program when the PLC is in the run mode (toolbar button ▶).
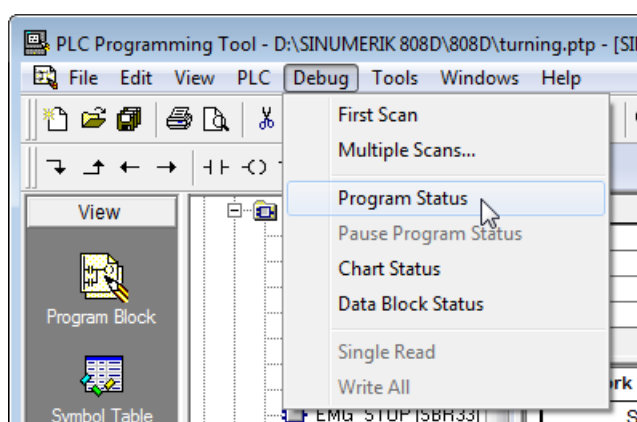
The blue color in the program editing window indicates the online connection status.
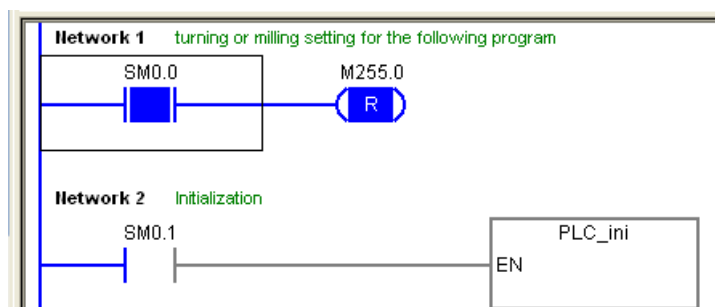
Note

Please confirm the Step 7 connection has been deactivated after the PLC commissioning is complete.

For how to deactivate this connection, see Section "Establishing a connection via the Ethernet interface (Page 184)".

A.7.2 PLC user interface

This part describes the PLC interface signals and I/O signals.

The PLC program exchanges information among the NCK, HMI, MCP, and I/O through the signals of the PLC interface and signals of the input and output cards.
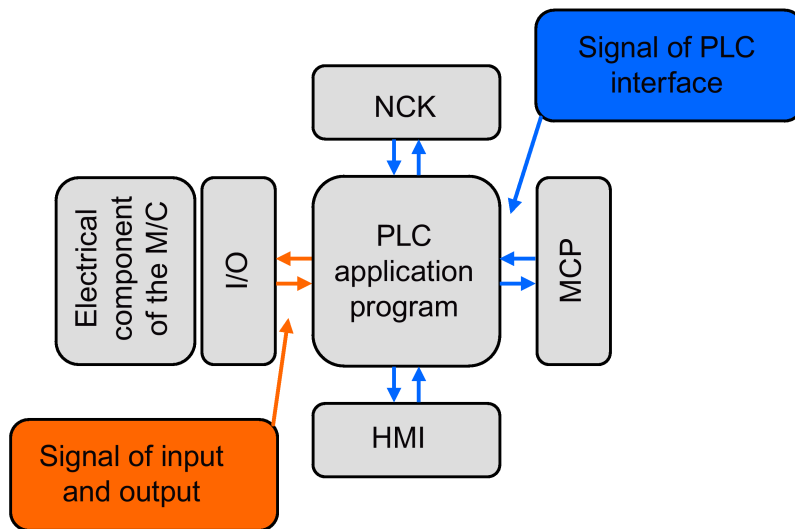
Signal overview of the PLC interface
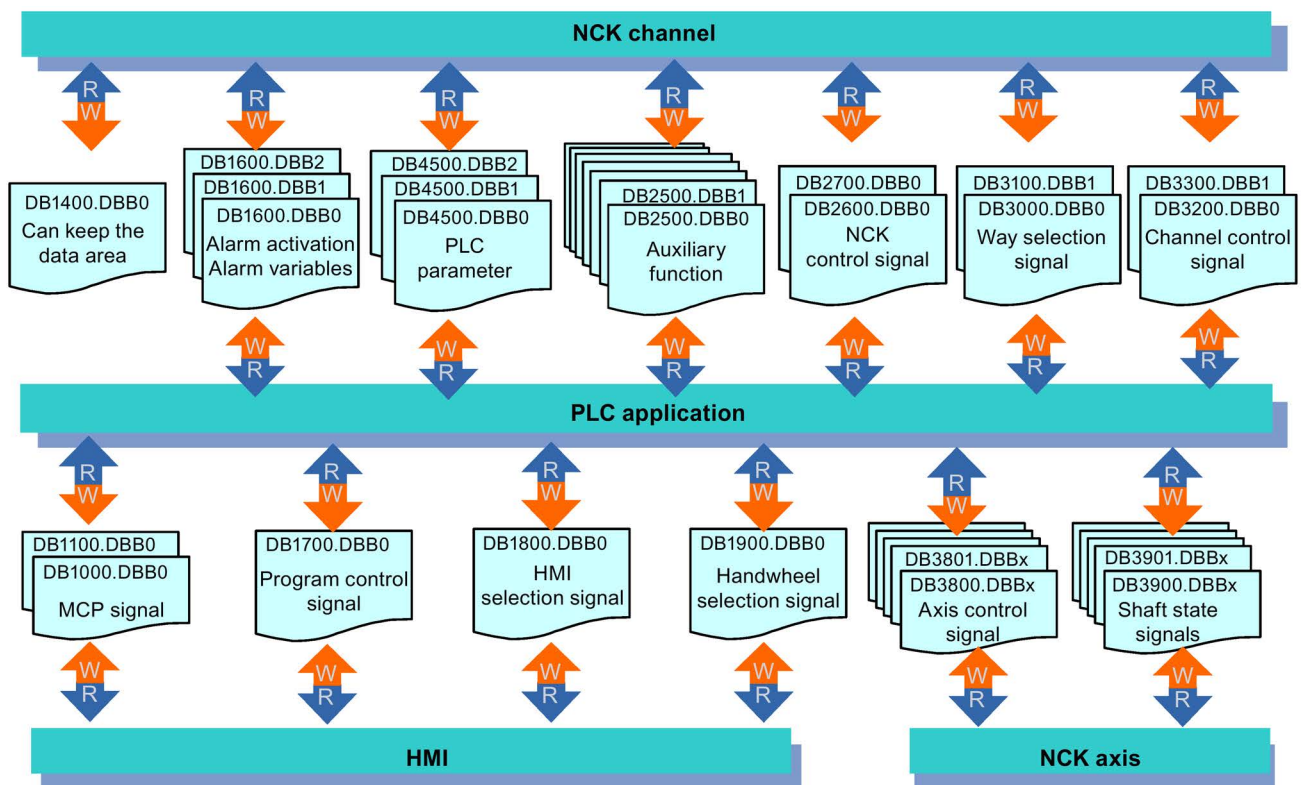
Operand identifier

Address identifier	Description	Range
DB	Data	DB1000 to DB7999
		DB9900 to DB9906
T	Timers	T0 to T15 (100 ms)
		T16 to T63 (10 ms)

Address identifier	Description	Range
C	Counters	C0 to C63
I	Image of digital inputs	I0.0 to I8.7
Q	Image of digital outputs	Q0.0 to Q5.7
M	Bit memory	M0.0 to M255.7
SM	Special bit memory	SM0.0 to SM0.6 ()
AC	ACCU	AC0 to AC3

Structure of the DB-range address

D B 3 8 0 1 . D B X 1 0 0 0 . 7

- Bit number (0 to 7)
- Offset (000 to 999)
- Subrange (0 to 9)
- Range number (00 to 99) (axis, channel)
- User range (10 to 99)
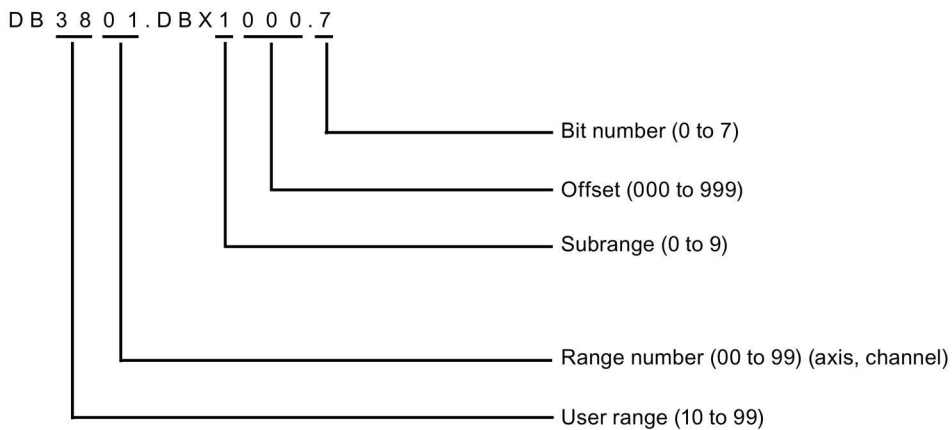
Access	Example	Description
Bit	DB3801.DBX1000.7	Bit 7 of the byte with offset 0 in subrange 1 for axis 2, user range 38
Byte	DB3801.DBB0	Byte with offset 0 in subrange 0 for axis, user range 38
Word	DB4500.DBW2	Work with offset 2 in subrange 0, range 0, user range 45
Double Word	DB2500.DBD3004	Double word with offset 4 in subrange 3, range 0, user range 25

Note

The permitted offset for an address depends on the access as follows:

- Bit or byte access: any offset

  Byte-size variables are placed one beside another seamlessly in a DB.

- Word access: the offset must be divisible by 2.

  Word-size variables (2 bytes) are always saved on straight offsets.

- Double word access: the offset must be divisible by 4.

  Double word-size variables (4 bytes) are always saved on offsets that are divisible by 4.

Notes on the PLC interface signal address representation

Currently, PLC interface signal addresses are represented by the V structure on the HMI while the manual shows them by the DB structure.

See the following table for the relationship between the two representations.

V Structure		DB Structure	
Access	Example	Example	Access
Bit	V38000002.1	DB3800.DBX2.1	Bit
Byte	VB38000002	DB3800.DBB2	Byte
Word	VW38000002	DB3800.DBW2	Word
Double Word	VD38000004	DB3800.DBD4	Double word

A.7.2.1　Signals from/to the MCP

The figure below shows the front view of the horizontal MCP for the turning variant of the control system.

Note that labels K13, K15, K19, and K21 are not included in the pre-defined MCP insertion strips. The figure includes these labels so that when you read the information in the following two tables, you know which keys on the MCP it refers to.
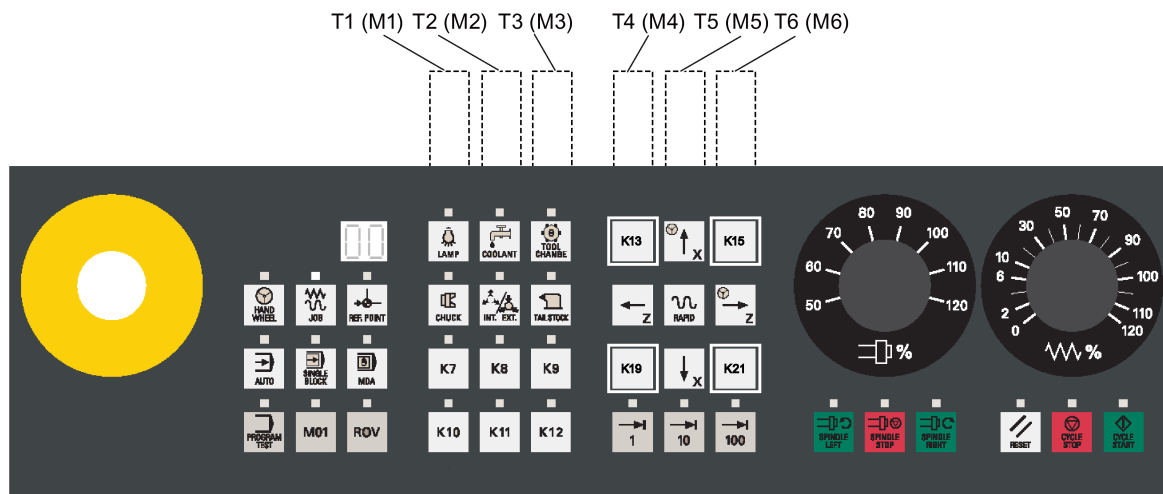
From the MCP

DB1000	From the MCP [r]							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
DBB0	M01	PROGRAM TEST	MDA	SINGLE BLOCK	AUTO	REF. POINT	JOG	HAND WHEEL
DBB1	Key 7	TAIL STOCK	INT. EXT.	CHUCK	TOOL CHANGE	COOLANT	LAMP	ROV
DBB2	100 (INC)	10 (INC)	1 (INC)	Key 12	Key 11	Key 10	Key 9	Key 8
DBB3	Axis traversing key (↑x)	Key 13	CYCLE START	CYCLE STOP	RESET	SPINDLE RIGHT	SPINDLE STOP	SPINDLE LEFT
DBB4		Key 21	Axis traversing key (↓x)	Key 19	Axis traversing key (→z)	RAPID	Axis traversing key (←z)	Key 15
DBB8				Feed override value (in Gray code)				
DBB9					Spindle override value (in Gray code)			

To the MCP

DB1100	To MCP [r/w]							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
DBB0	M01	PROGRAM TEST	MDA	SINGLE BLOCK	AUTO	REF. POINT	JOG	HAND WHEEL
DBB1	Key 7	TAIL STOCK	INT. EXT.	CHUCK	TOOL CHANGE	COOLANT	LAMP	ROV
DBB2	100 (INC)	10 (INC)	1 (INC)	Key 12	Key 11	Key 10	Key 9	Key 8
DBB3	Axis traversing key (↑x)	Key 13	CYCLE START	CYCLE STOP	RESET	SPINDLE RIGHT	SPINDLE STOP	SPINDLE LEFT
DBB4		Key 21	Axis traversing key (↓x)	Key 19	Axis traversing key (→z)	RAPID	Axis traversing key (←z)	Key 15

| DBB8 | | | 1 [1] | 1 [1] | 7 SEG LED1 [2] | | | |
| DBB9 | | | 1 [1] | 1 [1] | 7 SEG LED2 [2] | | | |

[1] To ensure the correct display of the active tool number, make sure that you set Bit 4 and Bit 5 to 1.

[2] You can set only values 0 to 9 for each 7-segment LED (LED1 and LED2).

A.7.2.2   Reading/Writing NC data

Reading/writing NC data: Job

DB1200	Reading / writing NC data [r/w]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0							Write varia-ble	Start
1	Number of variables							
2								
3								

DB1200 ... 1203	Reading / writing NC data [r/w]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Variable index							
1001	Area number							
1002	Column index for the NCK variable x (WORD)							
1003	Line index for the NCK variable x (WORD)							
1006								
1008	Writing: data to NCK variable x (data type of the variables: 1 to 4 bytes)							

Reading/writing NC data: Result

DB1200	Reading / writing NC data [r]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000							Error in job	Job com-pleted
2001								
2002								

DB1200 ... 1203	Reading / writing NC data [r]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000							Error has occurred	Valid varia-ble
3001	Access result [1]							
3002								
3004	Reading: data from NCK variable x (data type of the variables: 1 to 4 bytes)							

[1] 0: no error; 3: illegal access to object; 5: invalid address; 10: object does not exist

A.7.2.3　PI Service

PI service: Job

DB1200	PI service [r/w] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4000								Start
4001	PI index							
4002								
4003								
4004	PI parameter 1							
4006	PI parameter 2							
4008	PI parameter 3							
4010	PI parameter 4							
4012	PI parameter 5							
4014	PI parameter 6							
4016	PI parameter 7							
4018	PI parameter 8							
4020	PI parameter 9							
4022	PI parameter 10							

PI service: Result

DB1200	Reading / writing NC data [r] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5000							Error in job	Job completed
5001								
5002								

A.7.2.4　Retentive data area

DB1400	Retentive data [r/w]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	User data							
0								
	User data							
1								
	User data							
2								
	...							
...								
32								
	...							
...								
	User data							

126								
	User data							
127								

A.7.2.5 User Alarms

User alarms: Activating

DB1600	Activating alarm [r/w] PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Activation of alarm no.							
	700007	700006	700005	700004	700003	700002	700001	700000
1	Activation of alarm no.							
	700015	700014	700013	700012	700011	700010	700009	700008
2	Activation of alarm no.							
	700023	700022	700021	700020	700019	700018	700017	700016
3	Activation of alarm no.							
	700031	700030	700029	700028	700027	700026	700025	700024
4	Activation of alarm no.							
	700039	700038	700037	700036	700035	700034	700033	700032
5	Activation of alarm no.							
	700047	700046	700045	700044	700043	700042	700041	700040
...	...							
15	Activation of alarm no.							
	700127	700126	700125	700124	700123	700122	700121	700120

Variables for user alarms

DB1600	Variables for user alarms [r32/w32] PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DBD1000	Variable for alarm 700000							
DBD1004	Variable for alarm 700001							
DBD1008	Variable for alarm 700002							
…	…							
DBD1500	Variable for alarm 700125							
DBD1504	Variable for alarm 700126							
DBD1508	Variable for alarm 700127							

Active alarm response

DB1600	Active alarm response [r] PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000	Acknowledge POWER ON	Acknowledge with DB1600DBX3000.0		PLC STOP	EMERGENCY STOP	Feedrate disable all axes	Read-in disable	NC start disable

2001	
2002	
2003	

Alarm acknowledgement

DB1600	Alarm acknowledgement [r/w]							
	PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000								Ack
3001								
3002								
3003								

A.7.2.6 Signals from/to HMI

Program control signals from the HMI (retentive area)

DB1700	Signals, HMI [r/w]							
	HMI -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		Dry run feedrate selected	M01 selected		DRF selected			
1	Program test selected				Feedrate override selected for rapid traverse			
2	Skip block 7 selected	Skip block 6 selected	Skip block 5 selected	Skip block 4 selected	Skip block 3 selected	Skip block 2 selected	Skip block 1 selected	Skip block 0 selected
3	Measurement in JOG active	Calculation of measurement value not finished					Skip block 9 selected	Skip block 8 selected
4								
5								
6								
7	Reset				NC stop		NC start	

Program selection from PLC (retentive area)

DB1700	Program selection [r/w]							
	PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Program selection from the PLC: Program number							
1001	Command job from the PLC: Command							
1002								
1003								

Checkback signal: Program selection from HMI (retentive area)

DB1700	Program selection [r]							
	HMI -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000							Error program selection	Program selected
2001							Error command execution	Execute command
2002								
2003								

Signals from HMI

DB1800	Signals from HMI [r]							
	HMI -> PLC interface (signals are only present for PLC cycle)							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reset	Start measurement in JOG				JOG	Mode MDI	AUTOMATIC
1						Active the machine function		
						REF		
2								
3								

Signals from PLC

DB1800	Signals from PLC [r]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000		Commissioning archive has been read in					Boot with saved data	Boot with default values
1001								
1002								
1003								
1004	PLC cycle in µs [DINT]							
1008	Year: Tens digit, BCD				Year: Units digit, BCD			
1009	Month: Tens digit, BCD				Month: Units digit, BCD			
1010	Day: Tens digit, BCD				Day: Units digit, BCD			
1011	Hour: Tens digit, BCD				Hour: Units digit, BCD			
1012	Minute: Tens digit, BCD				Minute: Units digit, BCD			
1013	Second: Tens digit, BCD				Second: Units digit, BCD			
1014	Millisecond: Hundreds digit, BCD				Millisecond: Tens digit, BCD			
1015	Millisecond: Units digit, BCD				Weekday, BCD {1, 2, ... 7} (1 = Sunday)			

Signals to maintenance planners

DB1800	Deactivation [r/w]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000	Deactiva-tion 8	Deactiva-tion 7	Deactiva-tion 6	Deactiva-tion 5	Deactiva-tion 4	Deactiva-tion 3	Deactiva-tion 2	Deactiva-tion 1
2001	Deactiva-tion 16	Deactiva-tion 15	Deactiva-tion 14	Deactiva-tion 13	Deactiva-tion 12	Deactiva-tion 11	Deactiva-tion 10	Deactiva-tion 9
2002	Deactiva-tion 24	Deactiva-tion 23	Deactiva-tion 22	Deactiva-tion 21	Deactiva-tion 20	Deactiva-tion 19	Deactiva-tion 18	Deactiva-tion 17
2003	Deactiva-tion 32	Deactiva-tion 31	Deactiva-tion 30	Deactiva-tion 29	Deactiva-tion 28	Deactiva-tion 27	Deactiva-tion 26	Deactiva-tion 25

DB1800	Deactivation [r/w]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4000	Acknowl-edgement 8	Acknowl-edgement 7	Acknowl-edgement 6	Acknowl-edgement 5	Acknowl-edgement 4	Acknowl-edgement 3	Acknowl-edgement 2	Acknowl-edgement 1
4001	Acknowl-edgement 16	Acknowl-edgement 15	Acknowl-edgement 14	Acknowl-edgement 13	Acknowl-edgement 12	Acknowl-edgement 11	Acknowl-edgement 10	Acknowl-edgement 9
4002	Acknowl-edgement 24	Acknowl-edgement 23	Acknowl-edgement 22	Acknowl-edgement 21	Acknowl-edgement 20	Acknowl-edgement 19	Acknowl-edgement 18	Acknowl-edgement 17
4003	Acknowl-edgement 32	Acknowl-edgement 31	Acknowl-edgement 30	Acknowl-edgement 29	Acknowl-edgement 28	Acknowl-edgement 27	Acknowl-edgement 26	Acknowl-edgement 25

DB1800	Deactivation [r/w]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5000	Acknowl-edgement 8	Acknowl-edgement 7	Acknowl-edgement 6	Acknowl-edgement 5	Acknowl-edgement 4	Acknowl-edgement 3	Acknowl-edgement 2	Acknowl-edgement 1
5001	Acknowl-edgement 16	Acknowl-edgement 15	Acknowl-edgement 14	Acknowl-edgement 13	Acknowl-edgement 12	Acknowl-edgement 11	Acknowl-edgement 10	Acknowl-edgement 9
5002	Acknowl-edgement 24	Acknowl-edgement 23	Acknowl-edgement 22	Acknowl-edgement 21	Acknowl-edgement 20	Acknowl-edgement 19	Acknowl-edgement 18	Acknowl-edgement 17
5003	Acknowl-edgement 32	Acknowl-edgement 31	Acknowl-edgement 30	Acknowl-edgement 29	Acknowl-edgement 28	Acknowl-edgement 27	Acknowl-edgement 26	Acknowl-edgement 25

Signals from maintenance planners

DB1800	Warnings/Alarms [r]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000	Alarm 8	Alarm 7	Alarm 6	Alarm 5	Alarm 4	Alarm 3	Alarm 2	Alarm 1
3001	Alarm 16	Alarm 15	Alarm 14	Alarm 13	Alarm 12	Alarm 11	Alarm 10	Alarm 9
3002	Alarm 24	Alarm 23	Alarm 22	Alarm 21	Alarm 20	Alarm 19	Alarm 18	Alarm 17
3003	Alarm 32	Alarm 31	Alarm 30	Alarm 29	Alarm 28	Alarm 27	Alarm 26	Alarm 25

Signals from operator panel (retentive area)

DB1900	Signals from operator panel [r/w]							
	HMI -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Switch over Machine/Work	Simulation active						
1								
2								
3								
4								
6								
7								

General selection/status signals from HMI (retentive area)

DB1900	Signals from HMI [r]							
	HMI -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000								
1001								
1002								
1003					Axis number for handwheel 1				
	Machine axis	Handwheel selected	Contour handwheel			C	B	A
1004					Axis number for handwheel 2				
	Machine axis	Handwheel selected	Contour handwheel			C	B	A
1005								
1006								
1007								

General selection/status signals to HMI (retentive area)

DB1900	Signals to HMI [r/w]							
	PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5000						OP key block		
5001								
5002								Enable measurement in JOG
5003								
5004 ... 5007	T-number for tool measurement in JOG (DINT)							
5008 ... 5011								

5012 ... 5015	
5016 ... 5019	

A.7.2.7 Auxiliary functions transfer from NC channel

Overview

DB2500	Auxiliary functions from NCK channel [r] NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0								
1								
2								
3								
4				M fct. 5 change	M fct. 4 change	M fct. 3 change	M fct. 2 change	M fct. 1 change
5								
6								S fct. 1 change
7								
8								T fct. 1 change
9								
10								D fct. Change
11								
12						H fct. 3 change	H fct. 2 change	H fct. change
13								
14								
15								
16								
17								
18								
19								

Decoded M signals (M0 to M99)

Note

The signals are output for the duration of a PLC cycle.

DB2500	M functions from NCK channel [r] [1) 2)] NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Dynamic M functions							
	M7	M6	M5	M4	M3	M2	M1	M0
1001	Dynamic M functions							
	M15	M14	M13	M12	M11	M10	M9	M8

1002	Dynamic M functions							
	M23	M22	M21	M20	M19	M18	M17	M16
…	...							
1012	Dynamic M functions							
					M99	M98	M97	M96
1013								
1014								
1015								

[1] As the PLC user, you must generate basic functions yourself from the dynamic M functions.

[2] The basic program decodes dynamic M functions (M0 to M99).

Transferred T functions

DB2500	T functions from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000	T function 1 (DINT)							
2004								
2005								
2006								
2007								

Transferred M functions

DB2500	M functions from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000	M function 1 (DINT)							
3004	Extended address M function 1 (byte)							
3008	M function 2 (DINT)							
3012	Extended address M function 2 (byte)							
3016	M function 3 (DINT)							
3020	Extended address M function 3 (byte)							
3024	M function 4 (DINT)							
3028	Extended address M function 4 (byte)							
3032	M function 5 (DINT)							
3036	Extended address M function 5 (byte)							

Transferred S functions

DB2500	S functions from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4000	S function 1 (REAL) (DINT)							
4004	Extended address S function 1 (byte)							
4008	S function 2 (REAL)							
4012	Extended address S function 2 (byte)							
4016								
4020								

Transferred D functions

DB2500	D functions from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5000	D function 1 (DINT)							
5004								

Transferred H functions

DB2500	H functions from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
6000	H function 1 (REAL) (DINT)							
6004	Extended address H function 1 (byte)							
6008	H function 2 (REAL)							
6012	Extended address H function 2 (byte)							
6016	H function 3 (REAL)							
6020	Extended address H function 3 (byte)							

A.7.2.8   NCK signals

General signals to NCK

DB2600	General signals to NCK [r/w]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Protection level Keyswitch position 0 to 3					Acknowledge EMERGENCY STOP	Acknowledge EMERGENCY STOP	Braking along the contour in case of EMERGENCY STOP
	4	5	6	7				
1						Request axis dis-tances to go	Request axis actual values	INC inputs in mode signal range ac-tive [1]
2								
3								

[1]   Refer to mode signals

General signals from NCK

DB2700	General signals from NCK [r/w]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0							EMERGENCY OFF active	
1	Inch meas-uring sys-tem						Probe actuated	
							Probe 2	Probe 1

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2	NC ready	Drive ready	Drives in cyclic operation					
3		Air temperature alarm						NCK alarm is active
4								
5								
6								
7								
8								
9								
10								
11								
12	Change counter for motion, handwheel 1							
13	Modification counter for motion, handwheel 2							
14								
15	Change counter , inch/metric measuring system							
16								
17								
18								
19								

Signals at fast inputs and outputs

DB2800	Signals at fast inputs and outputs [r/w]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Block digital NCK inputs							
	Input 8	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1
1001	Value from PLC for NCK inputs							
	Input 8	Input 7	Input 6	Input 5	Input 4	Input 3	Input 2	Input 1
1008	Block digital NCK outputs							
	Output 8	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1
1009	Overwrite mask for digital NCK outputs							
	Output 8	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1
1010	Value from PLC for digital NCK outputs							
	Output 8	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1
1011	Setting mask for NCK outputs							
	Output 8	Output 7	Output 6	Output 5	Output 4	Output 3	Output 2	Output 1

DB2800	Signals at fast inputs and outputs [r/w]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Block external digital NCK inputs							
	Input 16	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9
1001	Value from PLC for external digit NCK inputs							
	Input 16	Input 15	Input 14	Input 13	Input 12	Input 11	Input 10	Input 9
1008	Block external digital NCK outputs							

	Output 16	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9
1009	Overwrite mask for external digital NCK outputs							
	Output 16	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9
1010	Value from PLC for external digital NCK outputs							
	Output 16	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9
1011	Setting mask for external NCK outputs							
	Output 16	Output 15	Output 14	Output 13	Output 12	Output 11	Output 10	Output 9

Signals from fast inputs and outputs

DB2900	Signals from the fast inputs and outputs [r]								
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Actual value for digital NCK inputs							
						Input 3	Input 2	Input 1
4	Setpoint for digital NCK outputs							
								Output 1

DB2900	Signals from fast inputs and outputs [r]								
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Actual value for external digital NCK inputs							
						Input 3	Input 2	Input 1
1004	NCK setpoint for external digital NCK outputs							
								Output 1

DB3000	Mode signals to NCK [r/w]								
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reset			Mode change block		Mode		
						JOG	MDI	AUTO
1	Single block					Machine function		
	Type A	Type B				REF		
2	Machine function [1]							
		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
3								

[1] To use the machine function signals in DB3000.DBB2, you must set the "INC inputs in the operating-mode signal range active" signal (DB2600.DBX1.0) to "1".

DB3100	Mode signals from NCK [r]								
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Reset				808 READY	Mode		
						JOG	MDI	AUTO

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1						Active machine function		
						REF		
2		Machine function						
		Continuous traversing active	Var. INC active	10000 INC active	1000 INC active	100 INC active	10 INC active	1 INC active
3								

A.7.2.9 Channel signals

Signals to NC channel

Control signals to NC channel

DB3200	Signals to NCK channel [r/w]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		Activate test run feedrate	Activate M01	Activate single block [1]	Activate DRF	Activate traverse forwards	Activate traverse backwards	
1	Activate program test						Enable protection zones	Activate referencing
2	Activate skip block							
	7	6	5	4	3	2	1	0
3								
4	Feedrate offset [2]							
	H	G	F	E	D	C	B	A
5	Rapid traverse override							
	H	G	F	E	D	C	B	A
6	Feedrate override active [3]	Rapid traverse override active	Path velocity limiting	Program level abort	Delete number of subroutine cycles	Delete distance - to-go	Read-in disable	Federate disable
7			Suppress start lock	NC stop axes plus spindle	NC stop	NC stop at block limit	NC start	NC start disable
8	Activate machine-related protection zone							
	Area 8	Area 7	Area 6	Area 5	Area 4	Area 3	Area 2	Area 1
9	Activate machine-related protection zone							
							Area 10	Area 9
10	Activate channel-specific protection zone							
	Area 5	Area 5	Area 5	Area 5	Area 5	Area 5	Area 5	Area 5
11	Activate channel-specific protection zone							
							Area 10	Area 9
12								
13	Do not block tool		Deactivate workpiece counter		Activate fixed feedrate			
					Feed 4	Feed 3	Feed 2	Feed 1

14	No tool change commands	JOG circle	Activate associated M01	Negative direction for contour handwheel simulation	Simulate contour handwheel	Activate contour handwheel (bit/binary coded)		
							Handwheel 2	Handwheel 1
15	Activate skip block 9	Activate skip block 8	Invert contour handwheel direction					
16								Program branches (GOTOS) control
17								
18								
19								

[1]   Select single-block type selection using the softkey.

[2]   31 positions (Gray code)

Controls signals to axes in Work

DB3200	Signals to NCK channel [r/w]							
	PLC -> NCK interface							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
1000	Axis 1 in Work							
	Traversing keys		Rapid traverse override	Traversing key distance disable	Feedrate stop	Activate handwheel (bit/binary coded) [1]		
	Plus	Minus					2	1
1001	Axis 1 in Work							
	Machine function [2]							
		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
1002								
1003								
								Handwheel direction of rotation inverted
1004	Axis 2 in Work							
	Traversing keys		Rapid travers override	Traversing key disable	Feedrate stop	Activate handwheel (bit/binary coded)		
	Plus	Minus					2	1
1005	Axis 2 in Work							
	Machine function							
		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
1006								
1007								
								Invert handwheel direction

1008								
	Axis 3 in Work							
	Traversing keys		Rapid traverse override	Traversing key disable	Feedrate stop		Activate handwheel (bit/binary coded)	
	Plus	Minus					2	1
1009	**Axis 3 in Work**							
	Machine function							
		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
1010								
1011								Invert handwheel direction

[1] The handwheel number is represented according to the $MD_HANDWH_VDI_REPRESENTATION machine data in a bit-coded (=0) or binary-coded (=1) manner.

[2] Machine function: the machine function is only entered if the "INC inputs in the operating-mode signal range active" signal (DB2600DBX1.0) is not set.

Signals from NC channel

Status signals from NC channel

DB3300	Signals from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0		Last action block active	M0/M1 active	Approach block active	Action block active	Forwards traverse active	Backwards traverse active	Execution from external active
1	program test active		M2/M30 active	Block search active	Handwheel override active	Rev. federate active		Referencing active
2								
3	Channel status				Program status			
	Reset	Interrupted	Active	Aborted	Interrupted	Stopped	Waiting	Running
4	NCK alarm with processing stop present	Channel specific NCK alarm is active	Channel operational		All axes		Stop request	Start request
					Stationary	Referenced		
5						Contour handwheel active (bit/binary coded)		
							Handwheel 2	Handwheel 1
6								
7			Invert contour handwheel direction					Protection zone not guaranteed
8	Machine-related protection zone pre-activated							
	Area 8	Area 7	Area 6	Area 5	Area 4	Area 3	Area 2	Area 1
9	Machine-related protection zone pre-activated							
							Area 10	Area 9
10	Channel-specific protection zone pre-activated							

Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Area 8	Area 7	Area 6	Area 5	Area 4	Area 3	Area 2	Area 1
11	Channel-specific protection zone pre-activated							
							Area 10	Area 9
12	Machine-related protection zone violated							
	Area 8	Area 7	Area 6	Area 5	Area 4	Area 3	Area 2	Area 1
13	Machine-related protection zone violated							
							Area 10	Area 9
14	Channel-specific protection zone violated							
	Area 8	Area 7	Area 6	Area 5	Area 4	Area 3	Area 2	Area 1
15	Channel-specific protection zone violated							
							Area 10	Area 9

Status signals, axes in Work

DB3300	Signals from NCK channel [r] NCK -> PLC interface							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
1000	Axis 1 in Work							
	Travel command		Travel request			Handwheel active (bit/binary coded) [1]		
	Plus	Minus	Plus	Minus			2	1
1001	Axis 1 in Work							
	Machine function [2]							
		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
1002								
1003								
								Contour handwheel direction of rotation inverted
1004	Axis 2 in Work							
	Traversing command		Travel request			Handwheel active (bit/binary coded)		
	Plus	Minus	Plus	Minus			2	1
1005	Axis 2 in Work							
	Machine function							
		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
1006								
1007								
								Contour handwheel direction of rotation inverted
1008	Axis 3 in Work							
	Traversing command		Travel request			Handwheel active (bit/binary coded)		
	Plus	Minus	Plus	Minus			2	1
1009	Axis 3 in Work							
	Machine function							

		Continuous traversing	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
1010								
1011								Contour handwheel direction of rotation inverted

Additional status signals from NC channel

DB3300	Signals from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4000								G00 active
4001			Travel request, drive test present				Workpiece setpoint reached	External language mode active
4002		Dry run feedrate Active	Associated M01/M00 Active	STOP_DELAYED				ASUB is stopped
4003	No tool change command active	DELAY FST SUPPRESS		DELAY FST				
4004	ProgEvent display							
				Start after block search	Boot	Operator panel Reset	Part program End	Part program Start from RESET
4005		Jog circle Active					Stop condition	StopByColl Danger
4006							Dormant ASUB Active	ASUB active
4007								
4008	Active transformation number							
4009	Reserved							
4010	Reserved							
4011	Reserved							

Asynchronous subroutines (ASUBs): Job

DB3400	ASUB: Result [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0								INT1 Start
1								INT2 Start
2								
3								

Asynchronous subroutines (ASUBs): Result

DB3400	ASUB: Result [r]							
	PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	INT1							
					ASUB execution not possible	Interrupt no. not allocated	ASUB is being executed	ASUB ended
1001	INT2							
					ASUB execution not possible	Interrupt no. not allocated	ASUB is being executed	ASUB ended
1002								
1003								

G functions from NCK channel

DB3500	G functions from NCK channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Active G function of group 1 (8 bit int)							
1	Active G function of group 2 (8 bit int)							
2	Active G function of group 3 (8 bit int)							
...	...							
62	Active G function of group 63 (8 bit int)							
63	Active G function of group 64 (8 bit int)							

A.7.2.10 Axis/spindle signals

Transferred M and S functions, axis specific

DB3700 … 3703	M, S functions [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	M function for spindle (DINT)							
4	S function for spindle (REAL)							

Signals to axis/spindle

Common signals to axis/spindle

DB3800 ... 3803	Signals to axis/spindle [r/w] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Feedrate override							
	H	G	F	E	D	C	B	A
1	Override active	Position measuring system 2	Position measuring system 1	Follow up mode	Axis spindle disable			
2	Reference point value				Clamping in progress	Distance-to-go/spindle reset	Drive enable	
	4	3	2	1				
3	Axis/spindle enable program test	Velocity/spindle speed limiting	Activate fixed feedrate				Enable approach to fixed stop	
			Feed 4	Feed 3	Feed 2	Feed 1		
4	Traversing keys		Rapid traverse override	Traverse key disable	Feedrate stop/spindle stop	Activate handwheel		
	Plus	Minus					2	1
5	Machine function [1]							
		Continuous traversing	Var. INC	1000 INC	1000 INC	100 INC	10 INC	1 INC
6								
7								Contour-handwheel direction of rotation inverted
8								
9								
10								
11								

[1] The machine function is only entered if the signal "INC inputs in the operating-mode signal range active" (DB2600.DBX1.0) is set.

Signals to axis

DB3800 ... 3803	Signals to axis [r/w] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000	Delay Ref. pt. approach			Module limit enabled	Software limit switch		Hardware limit switch	
					Plus	Minus	Plus	Minus
1001								
1002							Activate program test	Suppress program test
1003								

Signals to spindle

DB3800 ... 3803	Signals to axis [r/w] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000	Delete S value	No speed monitoring for gear change	Resynchronize spindle		Gear changed	Actual gear stage		
			2	1		C	B	A
2001		Invert M3/M4		Resynchronize during positioning				Feedrate override for spindle valid
2002	Setpoint direction of rotation		Oscillation speed	Oscillation controlled by PLC				
	Counter-clockwise	Clockwise						
2003	Spindle override							
	H	G	F	E	D	C	B	A

Signals to drive

DB3800 ... 3803	Signals to axis/spindle [r/w] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4000			Holding brake					
4001	Pulse enable	Integrator disable speed controller						
4002								
4003								

Signals to technology functions

DB3800 ... 3803	Signals to axis/spindle [r/w] PLC -> NCK interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
5000				Torque equalization controller on				
5001								
5002								
5003	Stop HIAxMove							Resume DEPMCS
5004								
5005								
5006 (spindle)				Spindle positioning	Automatic gear stage change	Setpoint direction of rotation		Spindle stop
						Counter-clockwise	Clockwise	

5007 (cou-plings)	Delete synchro-nism over-ride							
5008 (SISI-TECH)								
5009 (SISI-TECH)								
5010								
5011								

Signals from axis/spindle

General signals from axis/spindle

DB3900 ... 3903	Signals from axis/spindle [r] NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Position reached		Referenced		Encoder limit freq. exceeded			Spindle/no axis
	With exact/ stop, fine	With exact stop, coarse	Synchro-nized 2	Synchro-nized 1	2	1		
1	Current controller active	Speed controller active	Position controller active	Axis/spindle stationary (n < n_{mm})	Follow up mode active	Axis ready for operation		Traversing requests
2		Force fixed stop limited	Fixed stop reached	Activate travel to fixed stop	Measurement active		Handwheel override active	
3						AxStop active		
4	Travel command		Travel request			Handwheel active (bit/binary coded)		
	Plus	Minus	Plus	Minus			2	1
5	Active machine function							
		Continuous	Var. INC	10000 INC	1000 INC	100 INC	10 INC	1 INC
6								
7								Contour-handwheel direction of rotation inverted
8								
9								
10								
11			POS_RESTO					
			RED 2	RED 1				

Signals from axis

DB3900 ... 3903	Signals from axis [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
1000				Module limit enabled active				
1001								
1002	Rotary axis in position	Indexing axis in position	Positioning axis	Path axis				Lubrication pulse
1003								

Signals from spindle

DB3900 ... 3903	Signals from spindle [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000					Change gear stage	Setpoint gear stage		
						C	B	A
2001	Actual direction of rotation, clockwise	Speed monitoring	Spindle in setpoint range	Overlay range limit violated		Setpoint		Speed limit exceeded
						Increased	Limited	
2002	Active spindle mode				Rigid tapping		GWPS active	Const. Cutting velocity active
	Control mode	Oscillation mode	Positioning mode					
2003		Spindle in position reached						Tool with dynamic limiting

Signals from drive

DB3900 ... 3903	Signals from axis/spindle [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
4000			Holding brake opened	RLI active				
4001	Pulse enabled	Speed controller integrator disabled	Drive ready					
4002		$n_{act} = n_{set}$	$n_{act} < n_x$	$n_{act} < n_{min}$	$M_d < M_{dx}$	Ramp-up completed		
4003					Generator operation, minimum speed falled below			VDClink < alarm threshold

Signals from technology functions

DB3900 ... 3903	Signals from axis/spindle [r] NCK -> PLC interface							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
5000								
5001								
5002		Accelera-tion warn-ing threshold reached	Velocity warning threshold reached	Superim-posed mo-tion		Actual value cou-pling	Synchronous operation	
							Coarse	Fine
5003		Max. accel-eration reached	Max. veloci-ty reached	Synchroni-zation in progress	Axis is accelerat-ing	Synchro-nism over-ride travel		
5004								
5005								
5006								
5007								Synchro-nism over-ride is factored in
5008 (grinding)	Active special axis							
			Axis 6	Axis 5	Axis 4	Axis 3	Axis 2	Axis 1

A.7.2.11 PLC machine data

INT values (MD 14510 USER_DATA_INT)

DB4500	Signals from NCK [r16] NCK -> PLC interface							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
0	Int value (WORD/2 byte)							
2	Int value (WORD/2 byte)							
4	Int value (WORD/2 byte)							
6	Int value (WORD/2 byte)							
...	...							
60	Int value (WORD/2 byte)							
62	Int value (WORD/2 byte)							

HEX values (MD 14512 USER_DATA_HEX)

DB4500	Signals from NCK [r8] NCK -> PLC interface							
Byte	**Bit 7**	**Bit 6**	**Bit 5**	**Bit 4**	**Bit 3**	**Bit 2**	**Bit 1**	**Bit 0**
1000	Hex value (BYTE)							
1001	Hex value (BYTE)							
1002	Hex value (BYTE)							
1003	Hex value (BYTE)							
...	...							
1030	Hex value (BYTE)							
1031	Hex value (BYTE)							

FLOAT values (MD 14514 USER_DATA_FLOAT)

DB4500	Signals from NCK [r32]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
2000	Float value (REAL/4 byte)							
2004	Float value (REAL/4 byte)							
2008	Float value (REAL/4 byte)							
2012	Float value (REAL/4 byte)							
2016	Float value (REAL/4 byte)							
2020	Float value (REAL/4 byte)							
2024	Float value (REAL/4 byte)							
2028	Float value (REAL/4 byte)							

User alarm: Configuring (MD 14516 USER_DATA_PLC_ALARM)

DB4500	Signals from NCK [r8]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
3000	Alarm response/cancel criteria, alarm 700000							
3001	Alarm response/cancel criteria, alarm 700001							
3002	Alarm response/cancel criteria, alarm 700002							
...	...							
3247	Alarm response/cancel criteria, alarm 700247							

Note

For more information about how to configure user alarms, see Section "Editing PLC alarm texts (Page 91)".

A.7.2.12   Signals, synchronized actions

Signals, synchronized actions to channel

DB4600	Signals, synchronized actions to channel [r/w]							
	PLC -> HMI interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Deactivate synchronized action with ID...							
	ID8	ID7	ID6	ID5	ID4	ID3	ID2	ID1
1	Deactivate synchronized action with ID...							
	ID16	ID15	ID14	ID13	ID12	ID11	ID10	ID9
2	Deactivate synchronized action with ID...							
	ID24	ID23	ID22	ID21	ID20	ID19	ID18	ID17

Signals, synchronized actions from channel

DB4700	Signals, synchronized actions from channel [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Synchronized action with ID...can be blocked from the PLC							
	ID8	ID7	ID6	ID5	ID4	ID3	ID2	ID1
1	Synchronized action with ID...can be blocked from the PLC							

	ID16	ID15	ID14	ID13	ID12	ID11	ID10	ID9
2	Synchronized action with ID...can be blocked from the PLC							
	ID24	ID23	ID22	ID21	ID20	ID19	ID18	ID17

Reading and writing PLC variables

DB4900	PLC variables [r/w]							
	PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Offset [0]							
1	Offset [1]							
2	Offset [2]							
…	…							
4094	Offset [4094]							
4095	Offset [4095]							

Note

The programming engineer (NCK and PLC) is responsible for organizing (structuring) this memory area. Every storage position in the memory can be addressed provided that the limit is selected according to the appropriate data format (i.e. a 'DWORD' for a 4byte limit, a WORD for a 2byte limit, etc.). The memory area is always accessed with the information about the data type and the position offset within the memory area.

A.7.2.13   Axis actual values and distance-to-go

DB5700 ... 5704	Signals from axis/spindle [r]							
	NCK -> PLC interface							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Axis actual value (REAL)							
4	Axis distance-to-go (REAL)							

Note

The axis actual values and distances-to-go can be separately requested:

- DB2600.DBX0001.1 Request axis actual values
- DB2600.DBX0001.2 Request axis distances-to-go

If the particular request is set, then the NCK supplies these values for all axes.

A.7.2.14   Maintenance scheduler: User interface

Initial (start) data

DB9903	Initial data table [r16]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Interval 1 [h]							
2	Time of first warning 1 [h]							
4	Number of warnings to be output 1							
6	Reserved 1							
8	Interval 2 [h]							
10	Time of first warning 2 [h]							
11	Number of warnings to be output 2							
14	Reserved 2							

	...
248	Interval 32 [h]
250	Time of first warning 32 [h]
252	Number of warnings to be output 32
254	Reserved 32

Actual data

DB9904	Actual data table [r16]							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Interval 1 [h]							
2	Number of warnings to be output 1							
4	Reserved_1 1							
6	Reserved_2 1							
8	Interval 2 [h]							
10	Number of warnings to be output 2							
11	Reserved_1 2							
14	Reserved_2 2							
...	...							
248	Interval 32 [h]							
250	Number of warnings to be output 32							
252	Reserved_1 32							
254	Reserved_2 32							

A.7.2.15   User interface for ctrl energy

Energy saving profile

DB9906	Ctrl energy							
Byte	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	Control signals							
							Set time to pre-warning limit	Immediately activate energy saving profile
1	Control signals (HMI -> PLC)							
								Immediately activate energy saving profile
2	Signals to check/test the energy-saving profile							
							PLC user signal	Master computer signal
3	Reserved							

4	Status signal							
							Activation time T1 expired	Energy saving profile active
5	Reversed							
6	Actual value: actual value T1							
8	Actual value: actual value T2							
10	Effectiveness, profile							
							Disable energy saving profile	Energy saving profile configured
11	State conditions (HMI -> PLC)							
						Screen change	Data transfer	Operator panel
12	State conditions (HMI -> PLC)							
								Machine control panel
13	State conditions (HMI -> PLC)							
								NC channel 1 in reset
14								
15	State conditions (HMI -> PLC)							
							PLC user signal	Master computer signal
16	State conditions (HMI -> PLC) Activation time T1							
18	State conditions (HMI -> PLC) Activation time T2							

A.7.3 Operation symbols of PLC programming languages

Special bit memory SM bit definition (read-only)

Special markers

Special marker register can simplify the design of PLC application programs
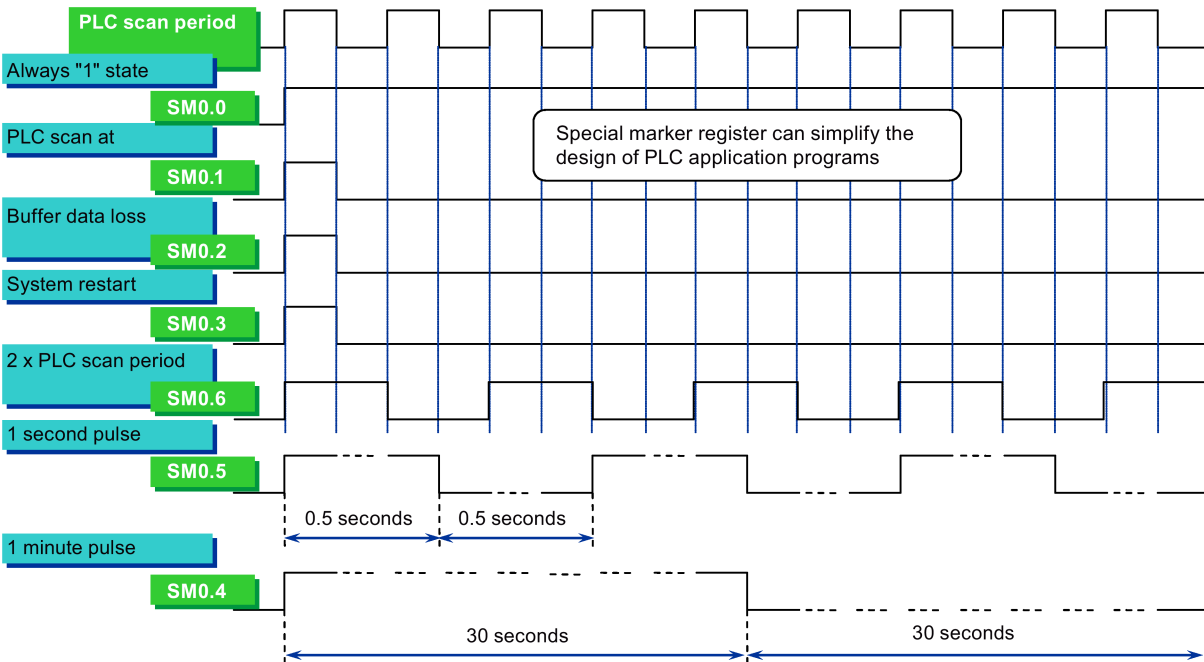
Variable access rights

[r]	You can "read only" the designated area.
[r/w]	You can "read and write" the designated area.

Data format information

1	BIT
8	BYTE
16	INT/WORD
32	DINT/DWORD/REAL

Note

All of the empty fields in the user interface are "reserved for Siemens" and may neither be written to nor be evaluated.

Fields designated with "0" always have the value "logical 0".

If there is no data format information, you can read or write to all the specified data formats.

Signal of input and output

Address

```
Input; I              Output; Q
```

Form

```
bit              I0.0, I4.6;        Q2.1, Q1.7

byte             IB4, IB12;         QB3, QB7

word             IW2, IW4;          QW0, QW6

double word      ID2, ID8;          QD0, QD4
```
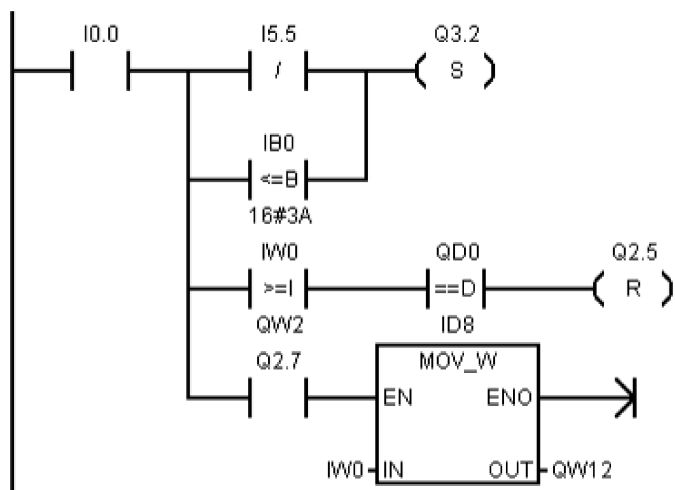

Accumulator

Accumulator: AC (max 4 accumulators)

```
Form; arithmetic accumulators AC0 and AC1;
logical accumulators AC2 and AC3.
```

Flag register: M

```
bit              M0.1;          M124.5

byte             MB21;          MB12

word             MW22;          MW106

double word      MD4;           MD28
```
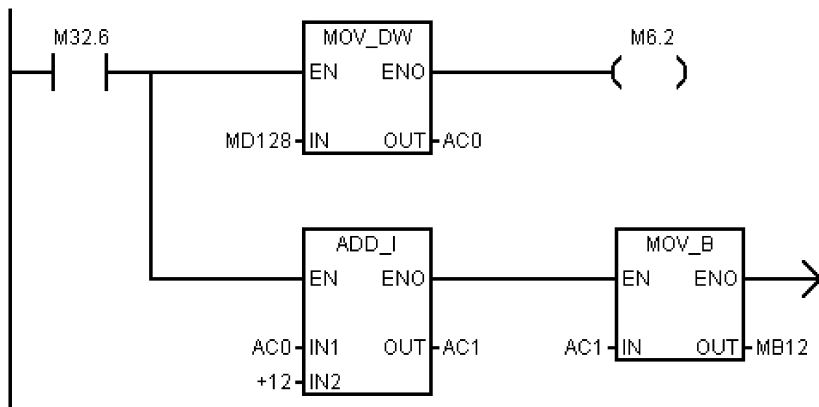
Counter

Counter: C

Form;
condition of counter bit C3, C25; - represents the
comparison result of the counter and present value.

Style:
        plus counter CTU count: counter value + 1;
R = 1 counter resets; counter value > preset value
Cn = 1

        minus counter CTD count: counter value - 1;
LD counter value = preset; value = counter value = 0
Cn = 1

        plus and minus counter CTUD plus counter:
counter value + 1;

        minus counter: counter value R = 1 counter
resets: counter value > preset value C = 1

Plus counter	Minus counter	Plus and minus counter

CTU
CU
R
PV

CTD
CD
LD
PV

CTUD
CU
R
PV

PV: is preset value

CD: is minus count pulse

LD: is loading preset value

CU: is plus count pulse
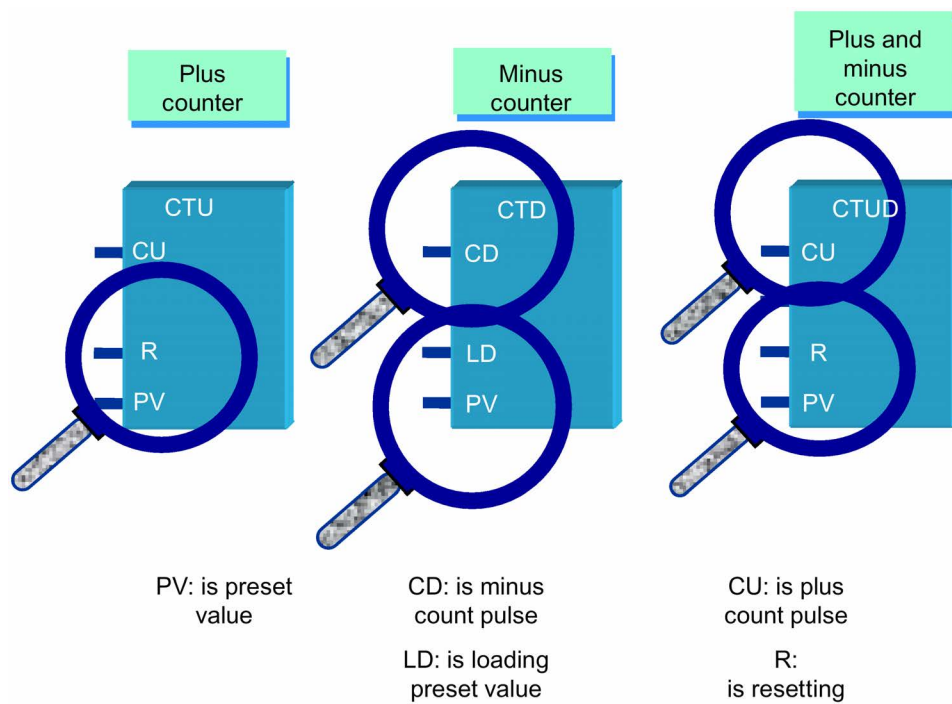
R: is resetting

Timers

Timer: T

Form;
condition of timer bit T3, T25; - represents the comparison result of timer value and preset value

timer value T3, T25; - represents timer value

Style;
open delay timer TON IN=1 begin timing ; IN=0 timer resetting ; count value>preset value Tn=1

close delay timer TOF IN=1 timer resetting ; IN=0 begin timing; count value>preset value Tn=0
keep delay timer CTUD IN=1begin timing; IN=0timer stops; count value>preset value Tn1

Assign word constant0" to T to make counter composite

Keep the sequence

Timer enable

Preset value PV

Timer value

Timer bit T
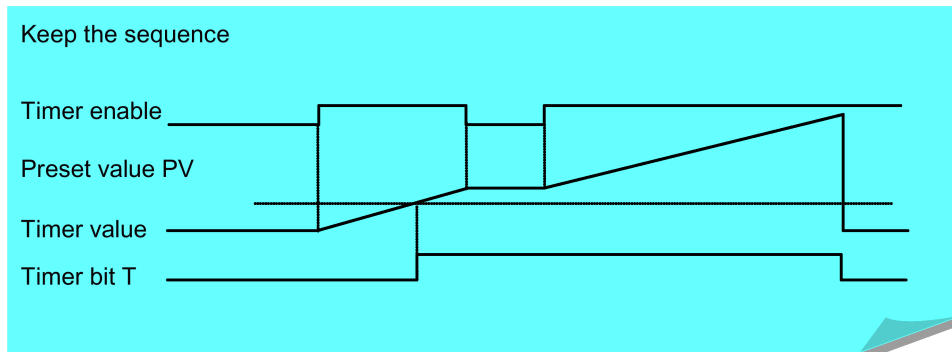
A.7.4 PLC subroutine library

In order to simplify the PLC design, we provide refined PLC functions which have generality, such as initialization, machine panel signal processing, emergency stop processing, axis enable control, hard limit, and reference point etc. By adding the desired subroutine module to the main procedure, plus other supplementary procedures, you can complete the PLC procedure design easily.

The PLC subroutine library consists of the following files:

- PLC project file: SAMPLE_TURN.PTP (application program as examples for a turning machine)
- PLC project file: SAMPLE_MILL.PTP (application program as examples for a milling machine)

Note

Through these examples, you can clearly realize how to create or invoke PLC subroutines. You can reorganize PLC subroutines or modify networks to realize most machine functions, test and debug subroutines of the library.

System resource

	Resource	
PLC system resource	Input	I0.0 to I2.7 (24 inputs on X100, X101, and X102)
		I3.0 to I8.7 (48 distributed inputs on X301 and X302)
	Output	Q0.0 to Q1.7 (16 outputs on X200 and X201)
		Q2.0 to Q5.7 (32 distributed outputs on X301 and X302)
	RAM	M0.0 to M255.7 (256 bytes)
	Non-volatile memory	DB1400.DBX0.0 to DB14000.DBX127.7 (128 bytes)
	PLC user alarm	DB1600.DBX0.0 to DB16000.DBX15.7 (128 user alarms)
	Timer	T0 to T15 (100 ms timer) T16 to T32 (10 ms timer)
	Counter	C0 to C63 (64 counters)
NC resource	Parameter MD14510(32)	Statistic INT: DB4500.DBW0 to DB4500.DBW62 (32 double words)
	Parameter MD14514(32)	Statistic HEX: DB4500.DBB1000 to DB4500.DBB1031 (32 bytes)
	Parameter MD14514(8)	Statistic REAL: DB4500.DBD2000 to DB4500.DBD2028 (8 double words)
Programming tool resource	Subroutine (64)	SBR0 to SBR63 (64 subroutines)
	Symbol table (32)	SYM1 to SYM32 (32 symbol tables)

Constant definition

Constant input	Symbol	Address
Constant "1"	ONE	SM0.0
Constant "2"	ZERO	M251.0

Zero output definition

Data type	Symbol	Address
bit	NULL_b	M255.7
byte	NULL_B	M255
word	NULL_W	M254
double-word	NULL_DW	M252

Structure of symbol tables

All the addresses in the PLC subroutine library are programmed with symbols. All the signals of interfaces are named by symbols and arranged in different symbol tables.

The name of a symbol follows some conventions. For details, see the topic Conventions for the symbols used in the subroutines (Page 241).

Symbol table	Table name	Descriptions
1	IO_1	Module I/O are defined by the manufacturer
2	IO_2	Distributed I/O are defined by the manufacturer
3, 5, 7, 13		Reserved for the manufacturer
6	MANMACH	JOG function
14	ASUP	ASUP function
15	PLC_sel_PP	PLC selects part programs
16	IS_MCP	Signals from/to the MCP
17	IS_HMI	Signals from/to the HMI
18	IS_AUX	Auxiliary functions from the NCK
19	IS_NCK	Signals from/to the NCK
20	IS_CHA	Signals from/to the channel
21	IS_AX1	Signals to/from axis 1
22	IS_AX2	Signals to/from axis 2
23	IS_AX3	Signals to/from axis 3
24	IS_AX4	Signals to/from axis 4
27	MD_PLC	PLC machine data
28	ALARM	User alarms
29	NV_MEM	Non-volatile memory
30	SPC_MEM	Special memory bit
31	SBR_MEM	Global memory used in the sample applications and subroutines
32	RESVD1	Reserved for the sample applications and subroutines

Structure of subroutines

PLC sample subroutines offer PLC functions for the machine tool.

Subroutine No.	Name	Description
0 to 19	-	Reserved for the manufacturer
20	AUX_MCP	Auxiliary function
21	AUX_LAMP	Working lamp control, called in the subroutine "AUX_MCP".
22	AUX_SAFE_DOOR	Safety door control, called in the subroutine "AUX_MCP" for a milling application
23	AUX_CHIP	Chip conveyor control, called in the subroutine "AUX_MCP" for a milling application
31	PLC_ini_USR_INI	Reserved for initialization functions of the manufacturer (this subroutine is automatically called by subroutine 32)
32	PLC_INI	PLC initialization, executed at the first PLC cycle (SM0.1)

Subroutine No.	Name	Description
33	EMG_STOP	Emergency Stop
37	MCP_NCK	Signals from the MCP and HMI are sent to NCK interfaces
38	MCP_Tool_Nr	Display tool numbers via the 7-segment LED of the MCP
39	HANDWHL	Handwheel selection via the HMI
40	AXIS_CTL	Control of feed axis enable and spindle enable
41	MINI_HHU	Handwheel on hand-held unit
42	SPINDLE	Spindle control, including the spindle braking function
43	MEAS_JOG	Tool measurement in the JOG mode
44	COOLING	Coolant control (Manual Machine key and M code: M07, M08, M09)
45	LUBRICATE	Lubrication control (interval and time)
46	PI_SERVICE	ASUP (Asynchronous Subroutine Program)
47	PLC_Select_PP	PLC selects a subroutine
48	ServPlan	Service planner
49	Gear_Chg1_Auto	Automatic gear change of the spindle
50	Gear_Chg2_Virtual	Virtual gear change of the spindle
51	Turret1_HED_T	Turret control for turning machine (turret type: Hall element transistor, 4/6 position)
52	Turret2_BIN_T	Turret control for turning machine (turret type: position detection with encodings)
53	Turret3_CODE_T	Hydraulic turret control for turning machine (turret type: position detection with encodings)
54	Turret2_3_ToolDir	Evaluate tool direction and calculate tool position (called by Turret2_BIN_T, Turret3_CODE_T)
55	Tail_stock_T	Tailstock control for turning machine
56	Lock_unlock_T	Clamp or release control for turning machine
58	MM_MAIN	Manual machine
59	MM_MCP_808D	Spindle signal processing for the manual machine
60	Disk_MGZ_M	Disk tool magazine for a milling machine
63	TOGGLE	Six key-operated switches: K1 to K6
		Two delay switches: K7, K8
34-36/57/61/62		Reserved for the OEM

Lathe and milling functions

PLC sample subroutines for lathe functions:

For turning only		
SBR 51	Turret1_HED_T	HED turret control
SBR 52	Turret2_BIN_T	Bi-direction turret (binary coded)
SBR 53	Turret3_CODE_T	Bi-direction turret (coded by turret supplier)
SBR 55	Tail_stock_T	Tailstock control
SBR 56	Lock_unlock_T	Chuck control

PLC sample subroutines for milling functions:

For milling only		
SBR 60	Disk_MGZ_M	Disk magazine control (w/o automatic tool changer)

A.7.4.1   PLC machine data

USER_DATA_INT

No.	Unit	Description
14510 [12]	-	Layout of the traverse keys
14510 [13]	0.1s	Time for spindle braking
14510 [15]	0.1s	Spindle override 50% key holding on time defined
14510 [16]	0.1s	Spindle override 100% key holding on time defined
14510 [20]	-	Maximum number of tools
14510 [21]	0.1s	Turret clamping time
14510 [22]	0.1s	Monitoring time when searching for tools
14510 [24]	1 min	Lubricating interval
14510 [25]	0.01s	Lubricating duration

USER_DATA_HEX

No.	Descriptions
14512 [16]	Bit 1: function of chip conveyor (milling)
	Bit 2: function of safety door (milling)
	Bit 3: when the function of safety door is active, it can be triggered by M01/M02 (milling)
	Bit 7: handwheel assignment with the MCP/HMI
14512 [17]	Bit 0: turret (turning); tool magazine (milling)
	Bit 1: clamping function (turning)
	Bit 2: tailstock function (turning)
	Bit 3: selection between handwheel and hand-held unit (0: handwheel; 1: hand-held unit)
14512 [18]	Special configurations for machines
	Bit 2: automatic lubrication at power-on
	Bit 4: external signal for spindle stop
	Bit 5: fixed spindle direction
	Bit 6: the hardware limit is independent from a PLC program
	Bit 7: each feed axis has a hardware limit switch (activated when Bit 6 = 0)
14512 [19]	Bit 1: function of spindle braking
	Bit 2: password clearing by power-on (0: delete the password; 1: do not delete the password)
	Bit 3: selection between normal mode and maintenance mode (0: normal mode; 1: maintenance mode)
	Bit 7: manual machine function (this function become active if you have installed licensed turning machine system and called it with a PLC subroutine)
14512 [20]	Bit 0: grey coded switch (0: spindle override controlled by the grey mode; 1: spindle override controlled by trigger user keys)
	Bit 1: spindle disable mode (0: disable by pressing the spindle stop key; 1: disable when detecting the standstill speed) [1]
	Bit 2: activate the first additional axis (0: disable the additional axis control; 1: enable the additional axis control)
	Bit 3: the first additional axis as the second spindle and does not need to be kept enabled (1: as the second spindle and does not need to be kept enabled)
	Bit 5: define the spindle override startup value (0: the startup spindle override is always 100%; 1: recode the spindle override value of the last machine turn off for the next startup)
	Bit 6/7: define the spindle override shift speed

[1]   When the position control mode is active, do not disable the spindle by detecting the standstill speed.

USER_DATA_FLOAT

No.	PLC interface	Range	Function
14514[0]	DB4500.DBD2000	-3.40e38 to 3.40e38	Tool magazine: spindle positioning angle
14514[1]	DB4500.DBD2004	-3.40e38 to 3.40e38	Tool magazine: preparation position of axis Z for tool change
14514[2]	DB4500.DBD2008	-3.40e38 to 3.40e38	Tool magazine: tool change position of axis Z
14514[3]	DB4500.DBD2012	-3.40e38 to 3.40e38	Tool magazine: velocity of axis Z, go to the tool change position
14514[4]	DB4500.DBD2016	-3.40e38 to 3.40e38	Tool magazine: velocity of axis Z, back to the tool change preparation position

A.7.4.2   Conventions for the symbols used in the subroutines

The symbols used in the subroutines follow the conventions listed below:

● Leading characters designate the destinations of interface signals.

    – P_: to PLC interface

    – H_: to HMI interface

    – N_: to NCK interface

    – M_: to MCP interface

● Subsequent characters are for areas.

    – N_: NCK

    – C_: Channel

    – 1_: Axes

    – M_: MCP

● Other short forms of the symbols are as follows.

    – HWL: **H**ardware **L**imit

    – HW: **H**and**w**heel

    – RT: **R**apid **T**raverse

    – TK: **T**raverse **k**ey

    – ACT: **Act**ive

    – SEL: **Sel**ected

● Symbols consist of a maximum of 11 upper case characters and numbers (including the leading character). Except for underlines, you cannot use any other special symbols like =, +, -, [ ], etc.

A.7.4.3   Subroutine 20 - AUX_MCP (machine auxiliary functions)

Purpose

Subroutine 20 is used to call the Auxiliary function Subroutines AUX_LAMP, AUX_CHIP, and AUX_SAFETY_DOOR.

Local variable definition

None

Relevant PLC machine data

None

Example for calling subroutine 20

```
        ONE                           AUX_MCP
 |------| |------| |---------------|EN            |
 |                                |              |
 |                                |              |
 |                                |_____|
```
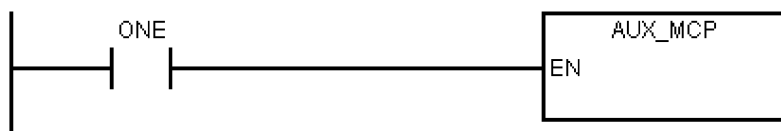
A.7.4.4   Subroutine 21 - AUX_LAMP (working lamp)

Purpose

Subroutine 21 is used to control working lamp and can be called in AUX_MCP. One-time pressing of the **"LAMP"** key activates the working lamp while double pressing de-activates the working lamp.

Local variable definition

Inputs

Variable	Type	Description
nodef	BYTE	Reserved
LampK	BOOL	Lamp on/off key

Outputs

Variable	Type	Description
LampLED	BOOL	Lamp status
LampOut	BOOL	Lamp output

Relevant PLC machine data

None

Example for calling subroutine 21

```
        ONE                           AUX_LAMP
 |------| |------| |---------------|EN            |
 |                                |              |
 |                                |              |
 |                        0 ------|nodef  LampLED|--- M_CK1
 |                   P_M_CK1 -----|LampK  LampOut|--- Q0.0
 |                                |_____|
```
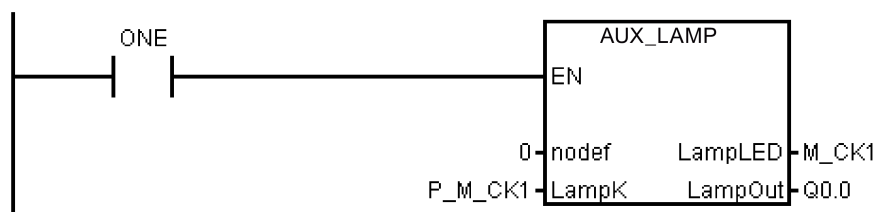
A.7.4.5   Subroutine 22 - AUX_SAFE_DOOR (safety door)

Purpose

Subroutine 22 is used to control the safety door and can be called in AUX_MCP.

Local variable definition

Inputs

Variable	Type	Description
nodef	BYTE	Reserved
DoorK	BOOL	Door control key
IsDoorCls	BOOL	Signal: door is closed
M1_2_OpDoor	BOOL	Open door when M01/M02 is active

Outputs

Variable	Type	Description
DoorOp	BOOL	Door open output
DoorLED	BOOL	Door status
MsgDoorNotCls	BOOL	Message for door open

Relevant PLC machine data

No.	Description
14512 [16].2	Selection of safety door function (0: do not use; 1: use)
14512 [16].3	Safety door function is activated by M01/M02 (0: deactivate; 1: activate)

Example for calling subroutine 22
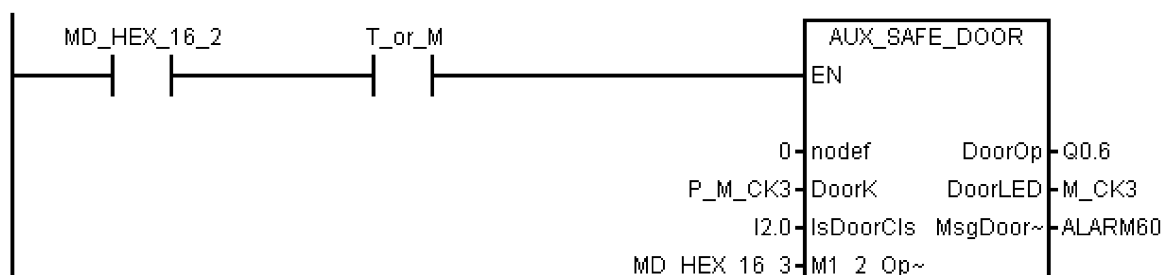
A.7.4.6   Subroutine 23 - AUX_CHIP (chip conveyor)

Purpose

Subroutine 23 is used to control the chip conveyor and can be called in AUX_MCP. At first-time pressing of the "Chip Forward" key the output "ChipFwd" is high; at second-time pressing of the "Chip Forward" key the output "ChipFwd" becomes low. When the output "ChipFwd" is low, the output "ChipRev" becomes high at pressing "Chip Reverse" key and becomes low at releasing the "Chip Reverse" key.

Local variable definition

Inputs

Variable	Type	Description
nodef	BYTE	Reserved
ChipFwdK	BOOL	Chip forward key
ChipRevK	BOOL	Chip reverse key

Outputs

Variable	Type	Description
ChipFwdLED	BOOL	Chip forward led
ChipFwd	BOOL	Chip forward output
ChipRevLED	BOOL	Chip reverse led
ChipRev	BOOL	Chip reverse output

Relevant PLC machine data

No.	Description
14512 [16].1	Selection of chip conveyor function (0: do not use; 1: use)

Example for calling subroutine 23
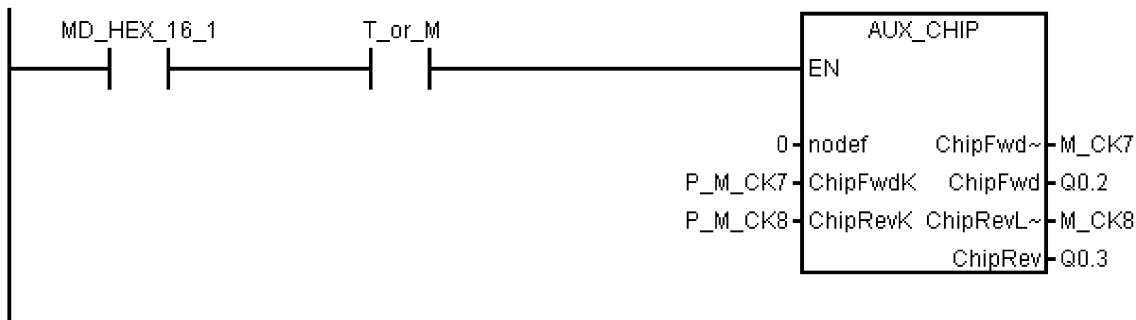
A.7.4.7   Subroutine 31 - PLC_ini_USR_ini (user initialization)

Purpose

Subroutine 31 is used for user initialization and should be called in subroutine PLC_INI. Since the subroutine PLC_INI is called only during the first PLC cycle, the subroutine PLC_ini_USER_ini is also only called during the first PLC cycle.

Local variable definition

None

Relevant PLC machine data

None

Example for calling subroutine 31
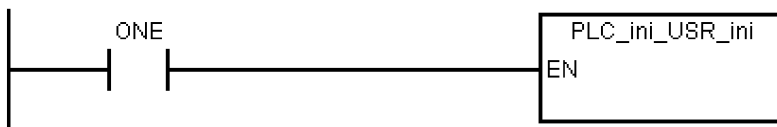
A.7.4.8   Subroutine 32 - PLC_INI (PLC initialization)

Purpose

Subroutine 32 is executed at the first PLC cycle (SM0.1). This subroutine sets NCK interface signals according to the machine settings defined by PLC machine data. In this subroutine, the following interface signals are set:

● DB3200.DBX6.7: feed override of the NCK channel becomes active

● DB380x.DBX1.5: measurement system 1 of the axes is active

- DB380x.DBX1.7: feed override of the axes is active
- DB1700.DBX1.3: active ROV

The following signals are reset:

- DB1700.DBX0.6:reset DRY

At the end of this subroutine, subroutine 31 (**PLC_ini_USR_ini**) is called. You can program the initialization of customer PLC project in the subroutine 31.

Local variable definition

None

Relevant PLC machine data

None

Example for calling subroutine 32

```
  |   Network 1          Initialization
  |
  |   SCAN_1ST                      ┌──────────────────┐
  |                                 │      PLC_INI      │
  |   ──┤ ├─┤ ├──────────────────── │ EN               │
  |                                 │                  │
  |                                 └──────────────────┘
  |
  |
```
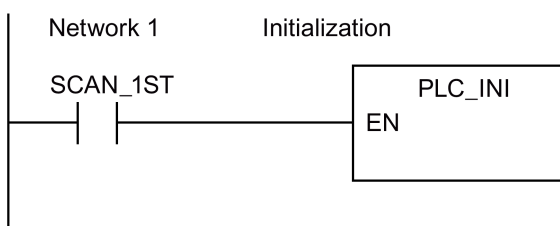
A.7.4.9   Subroutine 33 - EMG_STOP

NOTICE
Program safety
Check whether this subroutine complies with the relevant safety requirements or not.

Purpose

Subroutine 33 handles emergency stop. Pressing down the Emergency Stop button produces an emergency stop alarm and disables the drive enable signal (DB380x.DBX2.1). If you want to clear the emergency stop alarm, you must first release the Emergency Stop button and then press the **RESET** key on the MCP.

This subroutine activates the alarm below:

Alarm 700016: DRIVE NOT READY

Timing diagram
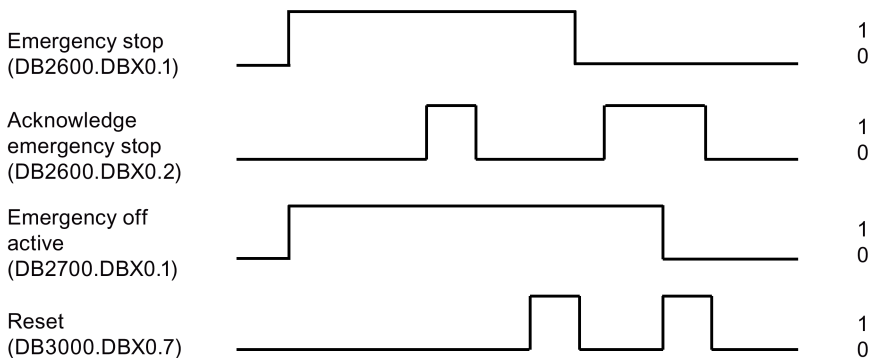
Local variable definition

Inputs

Variable	Type	Description
nodef	BYTE	Reserved
E_KEY	BOOL	Emergency stop key (NC)
HWL_ON	BOOL	Any one of the hardware limit switches is active (NO) [1]
SpStop	BOOL	Spindle stopped (NO) [2]
NO: Normal Open		
NC: Normal Close		

[1] This input can come from signal OVlmt of subroutine 40, and triggers emergency stop when the hardware limit appears.

[2] Before the drive system disables the control enable signal, the PLC detects the spindle stop signal from NCK to ensure that the spindle has stopped.

Outputs

Variable	Type	Description
NC_Ready	BOOL	NC being in the cyclic state and able to enable the drive

Relevant PLC machine data

No.	Value	Description
14512 [18].4	1	Spindle has an external stop signal
	0	Spindle has no external stop signal

Example for calling subroutine 33
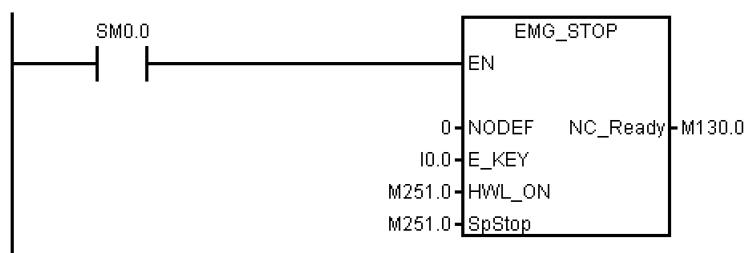
A.7.4.10   Subroutine 37 - MCP_NCK (MCP and HMI signal processing)

Purpose

Subroutine 37 is used to transfer the interface signals from the MCP and HMI to the NCK interfaces, and thus to activate the specific operating mode and control sequences. It has the following main functions:

- Selecting specific operating mode
- Selecting override
- Transferring signals from the HMI to NCK interfaces (for instance, program control, handwheel, etc.)
- Controlling the axis traversing signal according to the PLC machine data

Local variable definition

Inputs

Variable	Type	Description
nodef	BYTE	Reserved
AFL_Key	BOOL	Define the Auxiliary Function Lock at the MCP key [1]
ConHw_Key	BOOL	Define the Contour Handwheel at the MCP key

Variable	Type	Description
SimConHw_Key	BOOL	Define the simulation contour handwheel at the MCP key
NegDir-SimConHw_Key	BOOL	Define the negative direction for simulation contour handwheel at the MCP key
INCvar_Key	BOOL	Define the INCvar at the MCP key

[1] When the Auxiliary Function Lock function is active, all the outputs caused by auxiliary functions (like T, M, or S code) are disabled, only with the axis moving as usual.

Outputs

Variable	Type	Description
AFL_LED	BOOL	Define the Auxiliary Function Lock at the MCP LED
ConHw_LED	BOOL	Define the Contour Handwheel at the MCP LED
SimConHw_LED	BOOL	Define the simulation contour handwheel at the MCP LED
NegDir-SimConHw_LED	BOOL	Define the negative direction for simulation contour handwheel at the MCP LED
INCvar_LED	BOOL	Define the INCvar at the MCP LED

Relevant PLC machine data

No.	Description
14512 [20].0	Grey coded switch (0: spindle override controlled by the grey mode; 1: spindle override controlled by trigger user keys)
14512 [20].2	Activate the first additional axis (0: disable the additional axis control; 1: enable the additional axis control)
14510 [12]	Layout of the traverse keys • For a turning variant, 0: horizontal version; 1: inclined version • For a milling variant, 0: vertical milling; 1: knee-type

Example for calling subroutine 37
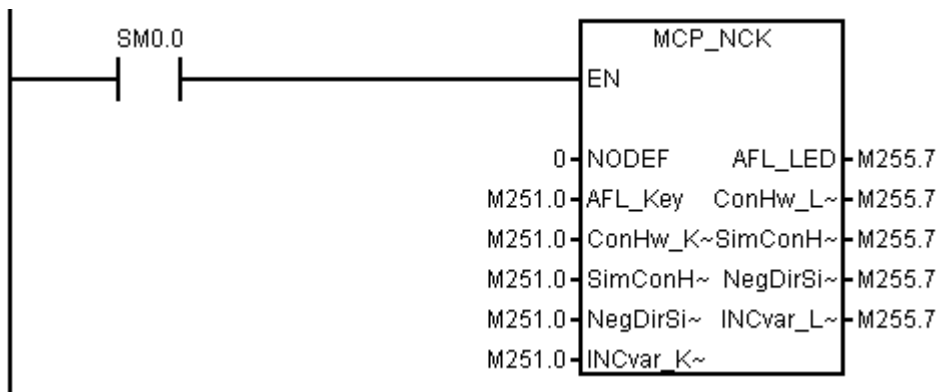
A.7.4.11   Subroutine 38 - MCP_Tool_Nr (display tool number on the MCP)

Purpose

Subroutine 38 is used to display active tool number (< 100) with the 7-segment LED on the MCP. For a tool number ≥ 100, it displays "FF".

Local variable definition

None

Assigned global variables

None

Relevant PLC machine data

None

Example for calling subroutine 38

```
        ONE                        Tool_Nr_LED
 ├───────┤ ├──────────────────┤          │
                              │EN        │
                              └──────────┘
```
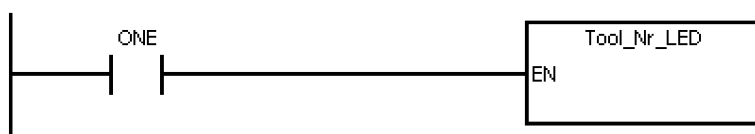
A.7.4.12   Subroutine 39 - HANDWHL (selecting a handwheel according to HMI interface signals)

Purpose

Subroutine 39 is used to select one of the two handwheels to control an axis (X, Y or Z) in the machine coordinate system or the workpiece coordinate system according to the HMI signals. With the HANDWHEEL key and axis selection key on the MCP, you can assign the handwheel 1 in the workpiece coordinate system to any axis.

Note

You cannot use subroutine 39 together with subroutine 41 - MINI_HHU.

Local variable definition

None

Assigned global variable

None

Relevant PLC machine data

No.	Value	Description
14512 [16].7	1	Handwheel assignment with the HMI
	0	Handwheel assignment with the MCP

Example for calling subroutine 39

```
       HHU_ACT                      HANDWHL
 ├───────┤ / ├──────────────────┤          │
                              │EN        │
                              └──────────┘
```
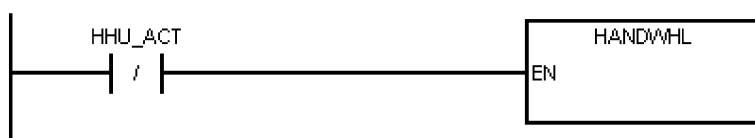
A.7.4.13 Subroutine 40 - AXIS_CTL (controlling the spindle and axes)

Purpose

Subroutine 40 is used to control the drive pulse enable (DB380xDBX4001.7) and controller enable (DB380xDBX2.1), monitoring the hardware limits and the reference cam signals, and controlling the enable signal for the spindle according to a spindle command (for example, SPINDLE CW, SPINDLE CCW, M03, M04, SPOS, etc.). The motor brake is automatically controlled by the SINAMICS V70 drives.

This subroutine provides two ways to realize the hardware limit control:

- PLC solution (MD14512 [18] bit 6 = 0)

  Each feed axis has one (MD14512 [18] bit 7 = 1) or two (MD14512 [18] bit 7 = 0) hardware limit switches. This subroutine activates the NCK hardware limit function via the NCK interface DB380xDBX1000.0 or DB380xDBX1000.1 according to the configurations of the hardware limit switches, and thus makes the NCK produce a feed stop signal to an over-distance axis.

  Furthermore, you can also connect the output **OVlmt** of this subroutine with the input **HWL_ON** of subroutine 33 to activate the Emergency Stop automatically once the hardware limit of any axis has been reached.

- Hardware solution (MD14512 [18] bit 6 = 1)

  This solution is independent of the PLC and thus is much safer:
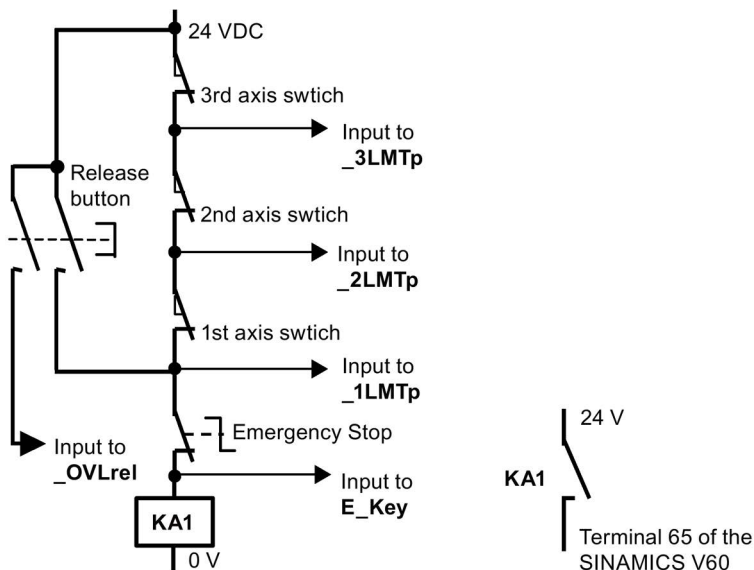
Encoding the hardware limit switches					Result
E_Key	_1LMTp	_2LMTp	_3LMTp	Direction	
0	1	1	1	-	EMERGENCY STOP active
0	0	1	1	DB3900.DBX4.7	1st + over limit
0	0	1	1	DB3900.DBX4.6	1st - over limit
0	0	0	1	DB3901.DBX4.7	2nd + over limit
0	0	0	1	DB3901.DBX4.6	2nd - over limit
0	0	0	0	DB3902.DBX4.7	3rd + over limit
0	0	0	0	DB3902.DBX4.6	3rd - over limit

In the hardware solution above, the feed stop signals for all axes can be activated via the hardware limit switches when any of the hardware limits is reached or an EMERGENCY STOP happens. You can check the information of the PLC diagnostics from the encoding of the hardware limit switches shown in the table above, and identify the cause (Emergency Stop button or a hardware limit switch of an axis) of the EMERGENCY STOP signal.

Note

When using the hardware solution, you must take below information into consideration:

- You must assign the axes one by one; for example, X axis, Z axis, spindle or X axis, Y axis, Z axis, spindle. You must not assign the axes like X axis, Y axis, spindle, Z axis.
- You must set constant "1" (i.e. SM0.0) to the input signals of the hardware limits for undefined axes; otherwise, the hardware limits of the undefined axes can be activated.

Local variable definition

Inputs

Name	Type	Description
nodef	WORD	Reserved
NC_Ready	BOOL	NC being in the cyclic state and able to enable the drive
_1LMTp	BOOL	Positive hardware limit switch of 1st axis (NC) [1]
_1LMTn	BOOL	Negative hardware limit switch of 1st axis (NC)
_1REF	BOOL	Reference cam of 1st axis (NO)
_2LMTp	BOOL	Positive hardware limit switch of 2nd axis (NC) [1]
_2LMTn	BOOL	Negative hardware limit switch of 2nd axis (NC)
_2REF	BOOL	Reference cam of 2nd axis (NO)
_3LMTp	BOOL	Positive hardware limit switch of 3rd axis (NC) [1]
_3LMTn	BOOL	Negative hardware limit switch of 3rd axis (NC)
_3REF	BOOL	Reference cam of 3rd axis (NO)
_5REF	BOOL	Reference Cam of 5th axis (NO)

[1]   The hardware limit + is used for the input if there is only one hardware limit switch or when the hardware solution is used.

Outputs

Name	Type	Description
OVlmt	BOOL	Any of the axis over hardware limits

Assigned global variables

SP_CMD	M138.1	Spindle start command (CW or CCW)

Relevant PLC machine data

No.	Value	Description
14512 [18].6	1	Overtravel employs the hardware solution
	0	Overtravel employs the PLC solution
14512 [18].7	1	Each axis has only one hardware limit switch
	0	Each axis direction has an hardware limit switch
14512 [20].1	0	Disable by pressing the spindle stop key
	1	Disable when detecting the standstill speed [1]

[1]   When setting bit 1 to **1**, make sure that the speed control mode is active.

Note

By default, the value of MD30350 is **0**, indicating that the NC will run in the real axis mode. When performing the axis control related operations on a stand-alone controller without any connection to the motor or drive, you need to set MD30350 to **1** for each axis, which indicates that the axis will run in the simulated state and thus the PLC will not detect the drive ready signal; otherwise, an alarm will be thrown out, indicating axis enable missing.

Example for calling subroutine 40
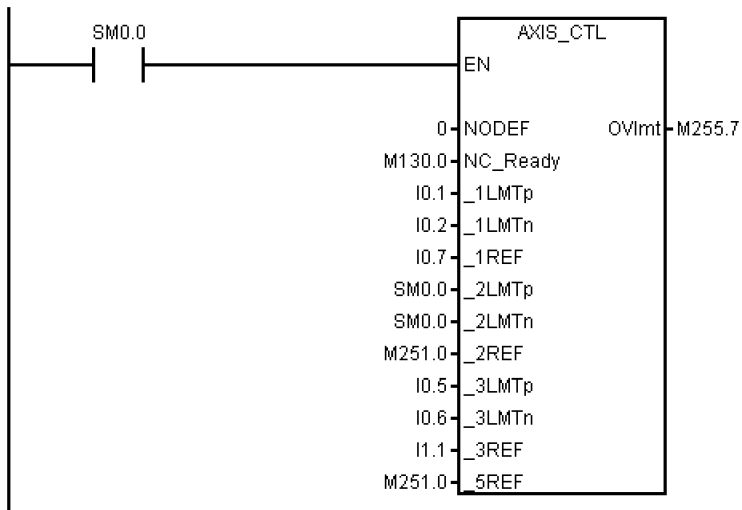
A.7.4.14   Subroutine 41 - MINI_HHU (handwheel on hand-held unit)

Purpose

Subroutine 41 is used to support the customer's handheld units. With a handheld unit, you can assign the handwheels to X axis, Y axis and Z axis, and select incremental override X1, X10, X100 at the same time. You can then use the handwheels to control the movements of your machine.

Local variable definition

Inputs

Variable	Type	Description
nodef	BYTE	Reserved
X_Sel	BOOL	Select X axis
Y_Sel	BOOL	Select Y axis
Z_Sel	BOOL	Select Z axis
_4th_Sel	BOOL	Select 4th axis
INC1	BOOL	Select INC 1
INC10	BOOL	Select INC 10
INC100	BOOL	Select INC 100
HHU_EN	BOOL	HHU enable signal
HHU_EmgStop	BOOL	Emgency stop in HHU
Key_Tp	BOOL	+direction move key
Key_Tn	BOOL	-direction move key

Outputs

Variable	Type	Description
X1_LED	BOOL	Inc 1 is active
X10_LED	BOOL	Inc 10 is active
X100_LED	BOOL	Inc 100 is active
HHU_ACT_LED	BOOL	HHU is active

Assigned global variables

None

Relevant PLC machine data

No.	Value	Description
14512 [17].3	1	Choose to use a hand-held unit
	0	Choose to use a handwheel

Example for calling subroutine 41

```
          ONE                          ┌───────────────────┐
    ──────┤ ├────────────────────────┤ MINI_HHU          │
                                      │ EN                │
          I4.0                        │                   │
    ──────┤ ├────────────────────────┤ X_Sel             │
                                      │                   │
          I4.1                        │                   │
    ──────┤ ├────────────────────────┤ Y_Sel             │
                                      │                   │
          I4.2                        │                   │
    ──────┤ ├────────────────────────┤ Z_Sel             │
                                      │                   │
          I4.3                        │                   │
    ──────┤ ├────────────────────────┤ _4th_Sel          │
                                      │                   │
          I4.4                        │                   │
    ──────┤ ├────────────────────────┤ INC1              │
                                      │                   │
          I4.5                        │                   │
    ──────┤ ├────────────────────────┤ INC10             │
                                      │                   │
          I4.6                        │                   │
    ──────┤ ├────────────────────────┤ INC100            │
                                      │                   │
          I4.7                        │                   │
    ──────┤ ├────────────────────────┤ HHU_EN            │
                                      │                   │
          ONE                         │                   │
    ──────┤ ├────────────────────────┤ HHU_EmgS~         │
                                      │                   │
          ONE                         │                   │
    ──────┤/├────────────────────────┤ Key_Tp            │
                                      │                   │
          ONE                         │                   │
    ──────┤/├────────────────────────┤ Key_Tn            │
                                      │                   │
                             X1_LED   ├─ NULL_b           │
                             X10_LED  ├─ NULL_b           │
                             X100_LED ├─ NULL_b           │
                             HHU_ACT_~├─ Q1.7             │
                                      └───────────────────┘
```
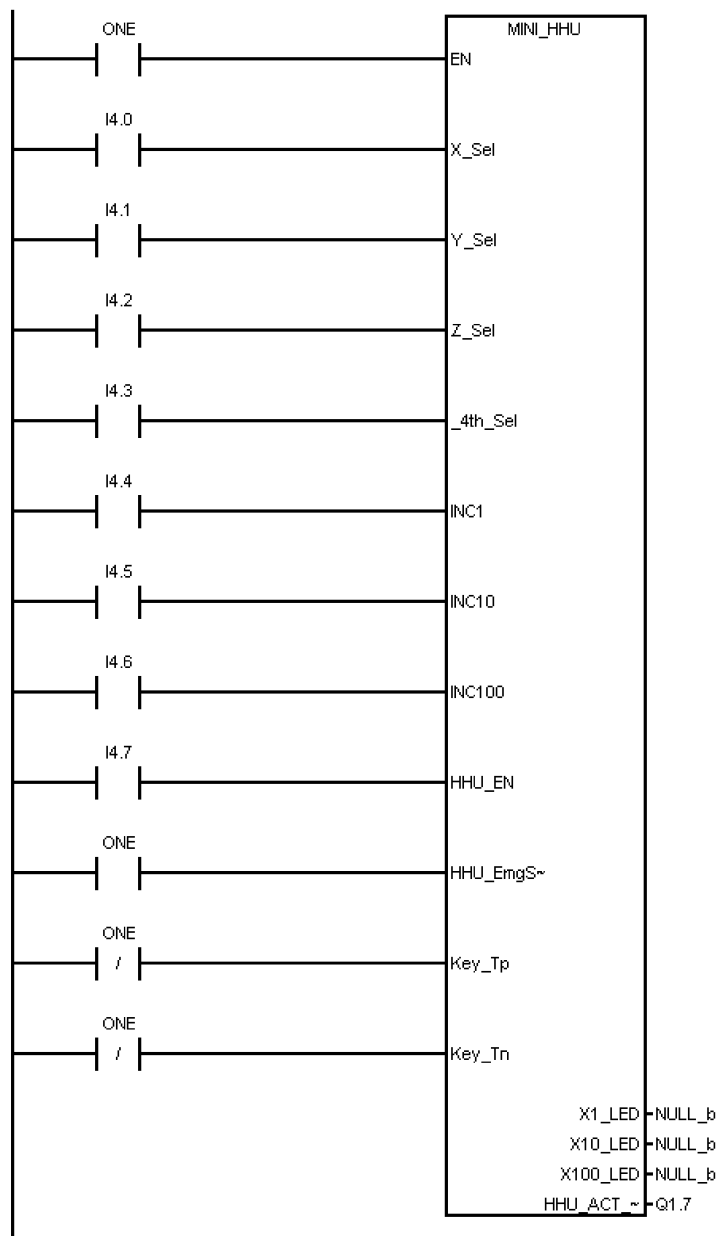
A.7.4.15   Subroutine 42 - SPINDLE (spindle control)

Purpose

Subroutine 42 is used for spindle control, including the spindle braking function. When the braking function is activated (MD14512 [19].1 = 1), the spindle brakes in the following cases:

- In the JOG mode, after you perform the following operations:

 or →

- In the AUTO or MDA mode, when the spindle changes the rotating direction or is stopped with M05/M02 during rotation

When the spindle brakes, the corresponding output becomes active; meanwhile, the spindle does not accept any rotary command until the braking completes.

Local variable definition

Inputs

Name	Type	Description
DELAY	WORD	Spindle brake delay time (unit: 0.1 s)
DrvEn	BOOL	Drive enable
SP_EN	BOOL	Condition for spindle operation (1: allowed; 0: not allowed)
IsBrake	BOOL	Brake for spindle (1: enabled; 0: forbidden)

Outputs

Name	Type	Description
SP_brake	BOOL	Spindle brake contactor
SP_LED	BOOL	Spindle operating status LED

Assigned global variables

SP_B_CMD	BOOL	Spindle braking command
T11	TIMER	Spindle braking timer

Relevant PLC machine data

No.	Type	Description
14510 [13]	BOOL	Spindle braking duration (unit: 0.1 s)
14512 [19].1	BOOL	Selection of spindle braking function (1: enabled; 0: forbidden)

Example for calling subroutine 42
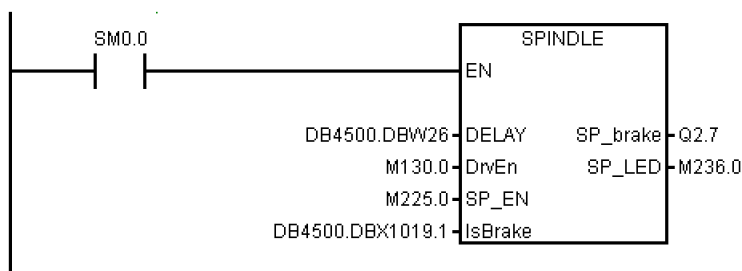
A.7.4.16 Subroutine 43 - MEAS_JOG (measurement in the JOG mode)

Purpose

Subroutine 43 is used to process the measuring probe signal and realize the "measuring in the JOG mode" function. You can use this subroutine to calibrate the probe and measure a tool.

The precondition for calling this subroutine is to call subroutine MCP_NCK (SBR38) in the main program. The "measuring in the JOG mode" function is automatically deactivated if you have changed the operating mode when the function becomes active.

Local variable definition

Inputs

Name	Type	Description
T_ACT	DWORD	Transfer the active tool into interface

Assigned global variables

MEAS_OPAUT	M240.0	Measuring in the AUTO mode
CHL_HMI	M240.2	From HMI signals: mode changes during measurement
NO_KEY	M240.3	No JOG key available for the axes
FDI_MEASJOG	M240.5	Meas_JOG forbidden for feed
ON_MEASJOG	M240.6	Meas_JOG activated
PROBE_ON	M240.7	Probe signal released
JOG_MEASJOG	M241.0	Operating mode manually output to Meas_JOG
AUT_MEASJOG	M241.1	Operating mode manually output to Meas_JOG
CHL_MEASJOG	M241.2	Operating mode change forbidden to Meas_JOG
KEY_MEASJOG	M241.3	JOG key Meas_JOG
RES_MEASJOG	M241.4	Reset Meas_JOG
ESC_MEASJOG	M241.5	Interrupt Meas_JOG
DRY_MEASJOG	M241.6	Dry run Meas_JOG
SBL_MEASJOG	M241.7	Single block Meas_JOG

Relevant PLC machine data

None

Example for calling subroutine 43
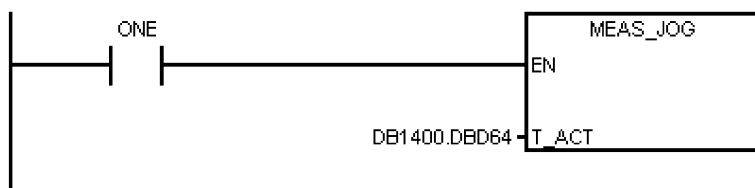
A.7.4.17 Subroutine 44 - COOLING (cooling control)

Purpose

Subroutine 44 is used to start/stop cooling using the buttons on the MCP in the JOG mode, or to start (using the auxiliary function M07/M08 in the part program) or to stop (using the M09 in the part program) cooling in the AUTO/MDA mode. Cooling is forbidden in case of EMERGENCY STOP, cooling motor overload, program test or under the simulation mode.

This subroutine can activate the following alarms:

● Alarm 700018: motor overload for the cooling pump

● Alarm 700019: low coolant level

Local variable definition

Inputs

Name	Type	Description
nodef	BYTE	Reserved
C_key	BOOL	Switch key (holding signal)
OVload	BOOL	Cooling motor overload (NC)
C_low	BOOL	Coolant level low (NC)

Outputs

Name	Type	Description
C_out	BOOL	Cooling control output
C_LED	BOOL	Cooling output status display

Assigned global variables

COOLon	MB150.0	Coolant on/off status

Relevant PLC machine data

None

Example for calling subroutine 44
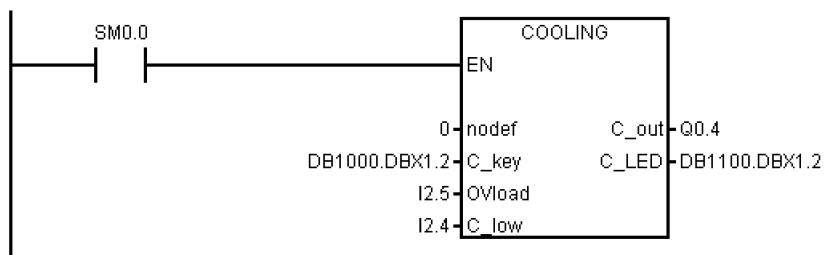
A.7.4.18   Subroutine 45 - LUBRICAT (control of lubricate)

Purpose

Subroutine 45 is used to control the lubrication according to specific time interval and duration (independent of the distance that the axis has travelled). Meanwhile, a manual button is available to start the lubrication, and you can configure that the lubrication starts automatically each time that the machine is powered up. Normally, lubricating starts automatically and cyclically according to specified time interval **Lintv**, and operates for a specific time **Ltime** at each cycle. Lubrication stops in case of an Emergency Stop, lubrication motor overload, low lubricant level.

This subroutine can activate following alarms:

- Alarm 700020: lubrication motor overload
- Alarm 700021: low lubricant level

Local variable definition

Inputs

Name	Type	Description
Lintv	WORD	Lubricating time interval
Ltime	WORD	Lubricating output time
L_key	BOOL	Manual lubricating key
L1st	BOOL	Lubricating by 1 PLC cycle (Power on)
Ovload	BOOL	Lubricating motor overload (NC)
L_low	BOOL	Lubricant level low (NC)

Outputs

Name	Type	Description
L_out	BOOL	Lubricating output
L_LED	BOOL	For lubricating status display

Assigned global variables

L_interval	C24	Timer for the lubricating time intervals (unit: min)
L_time	T27	Timer for very lubricating time duration (unit: 0.01s, max. 327.67 s)

Relevant PLC machine data

No.	Unit	Range	Description
14510 [24]	Min.	-	Lubricating time interval
14510 [25]	0.01 s	100 to 2,000	Lubricating time duration

Example for calling subroutine 45
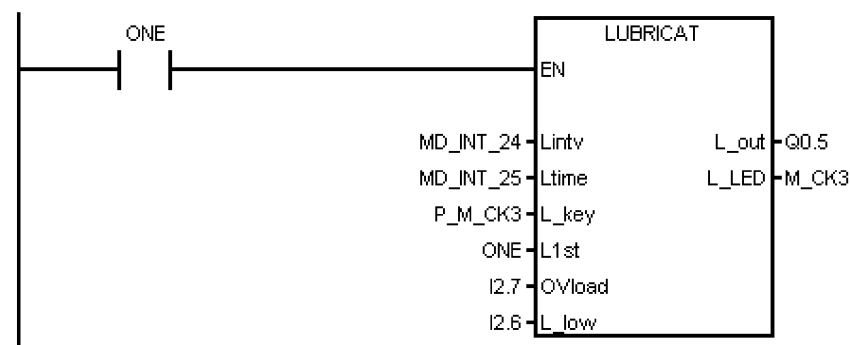
A.7.4.19 Subroutine 46 - PI_SERVICE

Purpose

Subroutine 46 is for realizing functions like ASUP (Asynchronous Subroutine Program) and deleting a password.

- **ASUP function**

The ASUP function means the execution of PLCASUP1.SPF or PLCASUP2.SPF called by the PLC. The control system provides two ASUPs for the PLC. The two ASUPs cannot be simultaneously executed, and the PLCASUP1.SPF has a higher priority over the PLCASUP2.SPF.

In a program, firstly you can initialize the ASUP1 and ASUP2 by setting "PI index" (DB1200.DBB4001) and "NCK read/write start" (DB1200.DBX4000.0), and then use a rising edge to trigger "ASUP1 start" (DB3400.DBX0.0) and "ASUP2 start" (DB3400.DBX1.0).

Note

Important!

The control system provides two user ASUPs. In the sample application, ASUP1 is used for manual tool change and ASUP2 is used for the MANUAL MACHINE of the workpiece on a turning machine with the Manual Machine Plus function.

- **Deleting a password**

To use this function, you need to only execute the PI service. Here, no initialization of the PI service is required.

By default, MD14512 [19].2 = 0, which indicates that the control system will automatically delete the password after NC restart. If you want the control system to remember the last used password every time the NC restarts, you need to set MD14512 [19].2 = 1.

Timing diagram
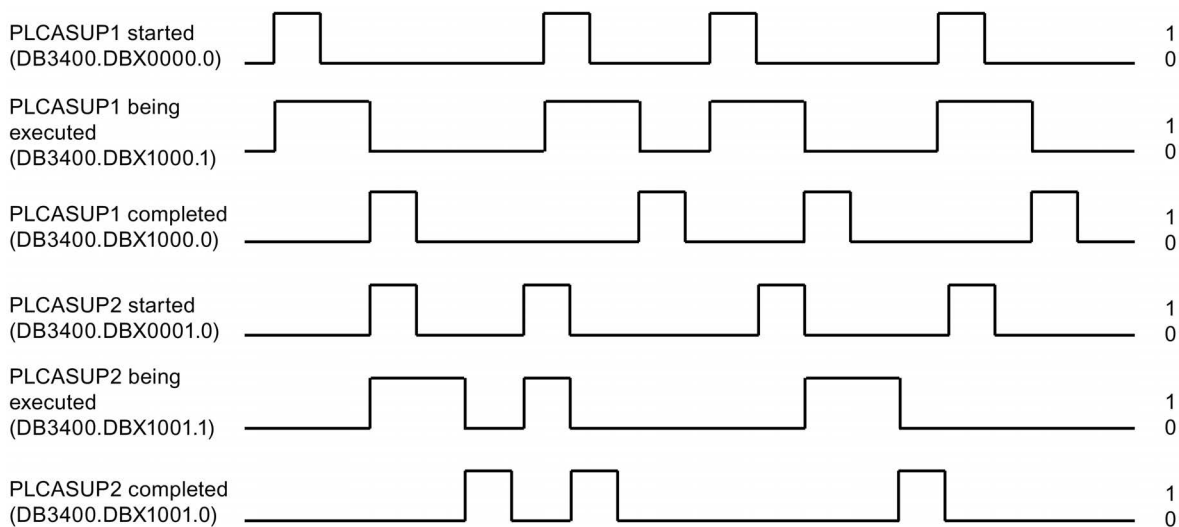
Local variable definition

Inputs

Name	Type	Description
nodef	BYTE	Reserved
ASUP1_trigger	BOOL	Start ASUP1 (rise edge)
ASUP2_trigger	BOOL	Start ASUP2 (rise edge)

Outputs

Name	Type	Description
ASUP1Run	BOOL	Indicates whether ASUP1 is running
ASUP2Run	BOOL	Indicates whether ASUP2 is running

Name	Type	Description
Err1	BOOL	ASUP1 error
Err2	BOOL	ASUP2 error

Occupied global variables

IniASUP1	M229.0	Mark of ASUP1 initialization
IniASUP2	M229.1	Mark of ASUP2 initialization
DelPswStart	M228.0	Start to delete password
DelPswSel	M228.1	Delete password select

Relevant machine data

No.	Name
10702	IGNORE_SINGLEBLOCK_MASK
11602	ASUP_START_MASK
11604	ASUP_START_PRIO_LEVEL
20116	IGNORE_INHIBIT_ASUP

No.	Value	Description
14512 [19].2	1	The control system will not delete the password after NC restart
	0	The control system will delete the password after NC restart

Example for calling subroutine 46
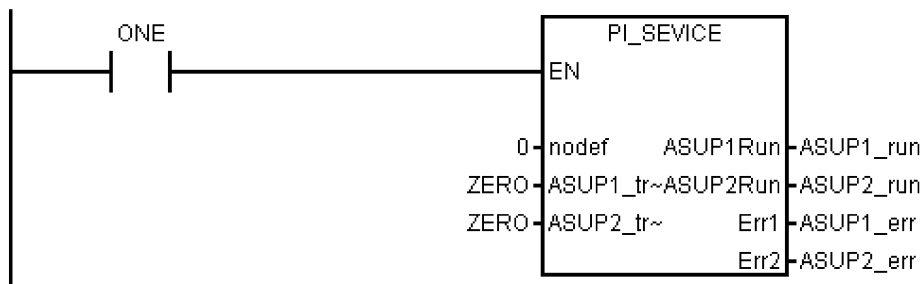
A.7.4.20 Subroutine 47 - PLC_Select_PP (PLC selects a subroutine)

Purpose

Subroutine 47 is used to select a part program.

You firstly need to create a PLC program-calling table, and assign a program index to each part program in this table. In subroutine 47 you can assign DB1700.DBB1000 to the "Program index" to select the corresponding part program.

Local variable definition

Inputs

Name	Type	Description
PP_num	BOOL	Part program number, 1-100: user; 101-200: OEM; 201-255: Siemnes

Outputs

Name	Type	Description
Finish	BOOL	PLC selects a part program successfully
Error	BOOL	PLC selects a part program incorrectly

Assigned global variables

SelPP_FinOm	BOOL	M239.6	Indicates that a part program has been selected
SelPP_ErrOm	BOOL	M239.7	Indicates that an error occurs when selecting a part program

Relevant PLC machine data

None

Example for calling subroutine 47
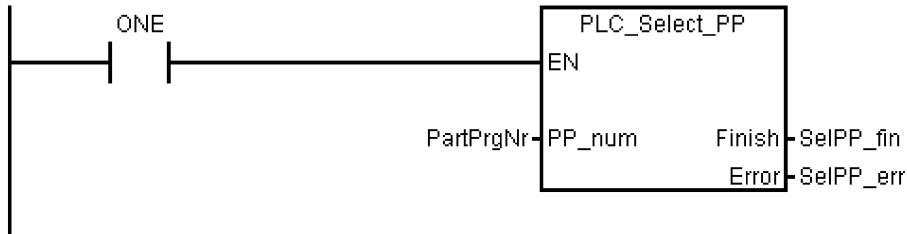
A.7.4.21   Subroutine 48 - ServPlan (service planner)

Purpose

To use subroutine 48, you must have created a service plan on the control system. When the pre-alarm time arrives, the machine outputs a notification message. When the final alarm time arrives, the machine outputs an alarm message.

Note

To perform a service plan on the PLC, you need to download DB9903(SP_INI) and DB9904(SP_ACT).

Local variable definition

Inputs

Name	Type	Description
nodef	BYTE	Reserved
Deact0	BOOL	Deactive 1st service plan
AckMsg0	BOOL	Acknowledge message of 1st service plan

Outputs

Name	Type	Description
HintMsg0	BOOL	Hint message for 1st service plan
Alarm0	BOOL	Alarm message for 1st service plan

Assigned global variables

ServPlan_msg0	BOOL	Notification message of the first service plan
ServPlan_alm0	BOOL	Alarm message for 1st service plan

Relevant PLC machine data

None

Example for calling subroutine 48
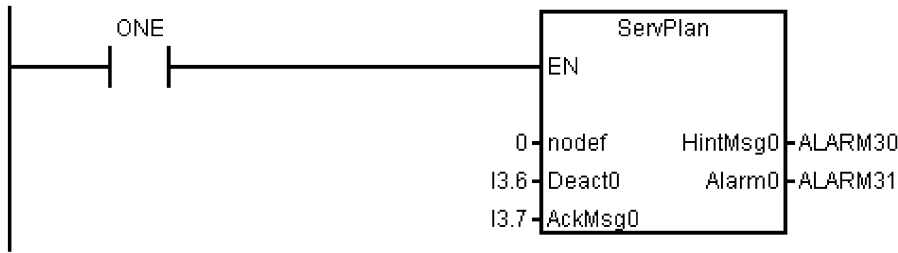
A.7.4.22   Subroutine 49 - GearChg1_Auto (automatic spindle gear change)

Purpose

Subroutine 49 is used to automatically change the gear for the analog spindle with 2-level gear detection signals.

During a gear change, the spindle oscillates and the PLC outputs the gear change signal. When the PLC detects that the desired gear level has been reached, the gear change has been completed.

You cannot use this subroutine together with subroutine 50.

Local variable definition

Inputs

Name	Type	Description
D_CHG	WORD	Delay time for gear changing
D_MON	WORD	Monitor time for gear-change in position
D_S0	WORD	Delay time for the spindle to come to standstill
T_GC	WORD	Monitor time for the whole gear change process, must > D_CHG + D_MON + D_S0
S_hold	BOOL	Spindle stopped (NO)
S_alarm	BOOL	Spindle alarm (NO)
LGi	BOOL	Low gear level in position (NO)
HGi	BOOL	High gear level in position (NO)

Outputs

Name	Type	Description
LGo	BOOL	Low gear level output
HGo	BOOL	High gear level output
LG_LED	BOOL	Low gear level inposition indicator
HG_LED	BOOL	High gear level inposition indicator

Assigned global variables

HGom	BOOL	M248.0	Signal indication of high gear stage output
LGom	BOOL	M248.1	Signal indication of low gear stage output
HGcmd	BOOL	M248.2	High gear level command
LGcmd	BOOL	M248.3	Low gear level command
SPhold	BOOL	M248.4	Spindle stops and ready for oscillation
Dstill	BOOL	M248.5	Signal for spindle stop
Dchg	BOOL	M248.6	Spindle gear change delay
Dmon	BOOL	M248.7	Monitoring for the gear change
Req_SP_G_CHG	BOOL	M244.0	Request for spindle gear change

Req_Low_G	BOOL	M244.1	Request to change to the low gear stage
Req_Hign_G	BOOL	M244.2	Request to change to the high gear stage
D_S0	TIMER	T13	Spindle stop delay
Td_GearChg	TIMER	T24	Gear change delay
Tm_GearChg	TIMER	T25	Delay for monitoring the gear change

Relevant PLC machine data

None

Example for calling subroutine 49
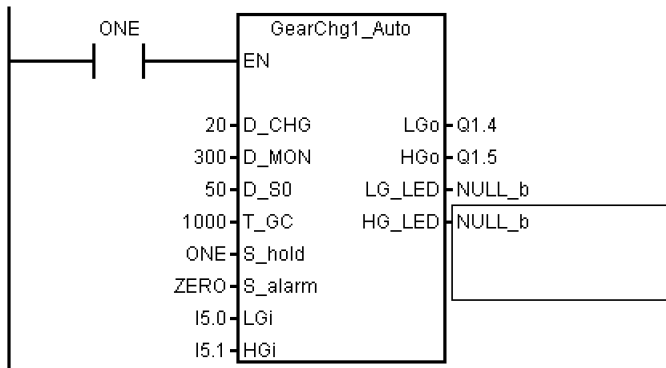
A.7.4.23 Subroutine 50 - GearChg2_Virtual (virtual spindle gear change)

Purpose

Using subroutine 50, you can requests the system to switch to the corresponding gear after changing the gear manually. The corresponding gear is set when M41-M45 are executed.

This subroutine must not be used together with GearChg1_Auto (SBR 49).

Local variable definition

Outputs

Name	Type	Description
HL_gear	BOOL	:=0, low gear level; :=1, high gear level

Assigned global variables

None

Relevant PLC machine data

None

Example for calling subroutine 50
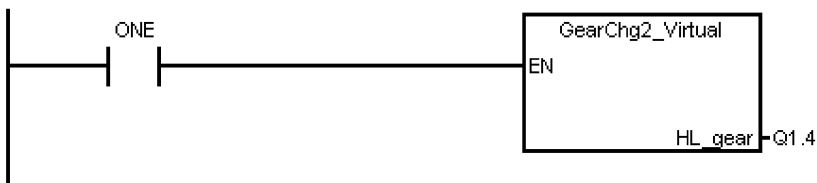
A.7.4.24 Subroutine 51 - Turret1_HED_T (turret with Hall effect device position sensor)

Purpose

Subroutine 51 is used to control the turret with a Hall effect device positioning sensor, and the turret motor is controlled by the PLC.

The turret rotates clockwise to search for a tool, and rotates counter-clockwise after positioning the desired tool to clamp it (the turret CCW rotation time can be adjusted). An alarm occurs if the turret fails to position the desired tool after the duration expires. The subroutine verifies the time that the turret rotates CCW, and sets a limit of maximum 3 seconds for this rotation time to prevent the turret motor from being broken.

In the AUTO and MDA modes, the T function starts a tool change operation. In the JOG mode, a short press on the MCP key changes a turret position.

During a tool change, the NC interface signals "Read-in disable" (**DB3200.DBX6.1**) and "Feedhold" (**DB3200.DBX6.0**) are set; this means that the part program can only continue to run after the tool change.

The turret positioning is prohibited in the case of an Emergency Stop, turret motor overload or program test/simulation.

The timing diagram for positioning a tool in the turret using the Hall effect device positioning sensor is shown as follows:
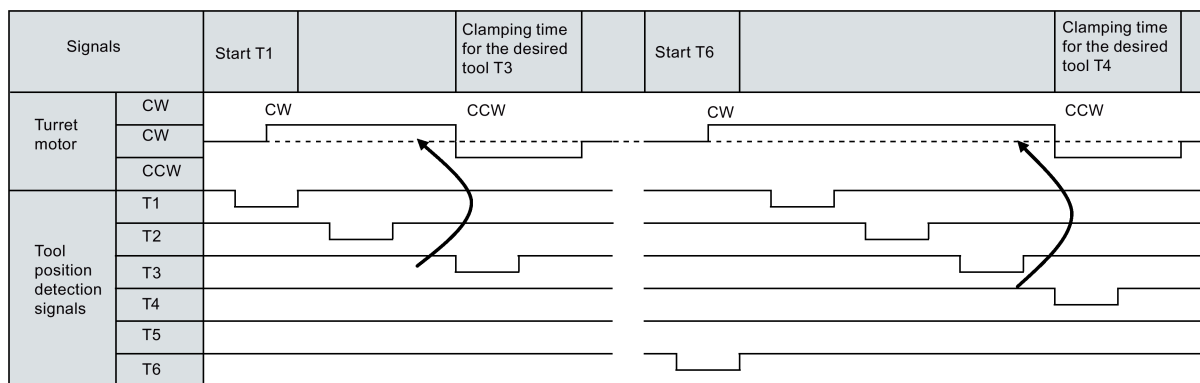
Signals		Start T1		Clamping time for the desired tool T3		Start T6			Clamping time for the desired tool T4	
Turret motor	CW	CW		CCW		CW			CCW	
	CW									
	CCW									
Tool position detection signals	T1									
	T2									
	T3									
	T4									
	T5									
	T6									

This subroutine can activate the following alarms:

- Alarm 700022: Turret motor overload

- Alarm 700023: Programmed tool number higher than the max. tool number of the turret

- Alarm 700024: Wrong setting of the max. tool number for the turret

- Alarm 700025: No turret positioning signals available

- Alarm 700026: Tool positioning time out

Timing diagram

Turret change command	1 0
Turret change completed	1 0
Turret CW for tool change	1 0
Turret CCW for turret clamping	1 0
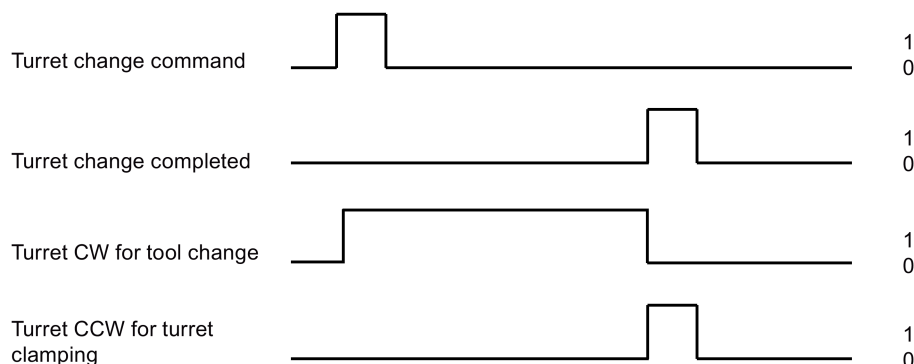
Local variable definition

Inputs

Name	Type	Description
Tmax	WORD	Number of tool on the turret, only 4, 6 are permitted
C_time	WORD	Turret clamping delay time (unit: 0.1 s)
M_time	WORD	Monitor time for searching for a tool (unit: 0.1s)
T_polar	BOOL	Tool position signal: NC/NO
T_key	BOOL	Manual tool change key
T_01 to T_06	BOOL	Tool position sensor (low active)
OVload	BOOL	Turret motor overload (NC)

Outputs

Name	Type	Description
T_cw	BOOL	Turret CW for tool change
T_ccw	BOOL	Turret CCW for turret clamping
T_LED	BOOL	Turret change status display
ERR1	BOOL	Error1: no turret position signal available
ERR2	BOOL	Error2: programmed tool exceeds turret range
ERR3	BOOL	Error3: tool searching time monitor time out
ERR4	BOOL	Error4: turret overload
ERR5	BOOL	Error5: max tool number setting error
ERR6	BOOL	Reserved

Assigned global variables

T_cw_m	M156.0	Position marking for turret CW rotation
T_ccw_m	M156.1	Position marking for turret CCW rotation
CcwDelay	M156.2	Turret CCW rotation delay
K_active	M156.3	Manual key active
Tpos_C	M156.4	Turret position changed
Tp_eq_Tc	M156.5	Programmed tool number equal to the current tool number
Tp_eq_0	M156.6	Programmed tool number equal to zero
T_P_INDX	MD160	Monitoring the tool change buffer zone in the JOG mode
T_CHL	M168.4	Operating mode locked
Tm1_FindT	T15	Monitoring timer for tool searching
T_CLAMP	T13	Clamping timer for turret 1

Relevant PLC machine data

No.	Unit	Description
14510 [20]	-	Max. tool number (4 or 6)
14510 [21]	0.1 s	Turret clamping time
14510 [22]	0.1 s	Monitoring time for tool searching
14512[17].0	-	Activating the turret function of a turning machine

Example for calling subroutine 51
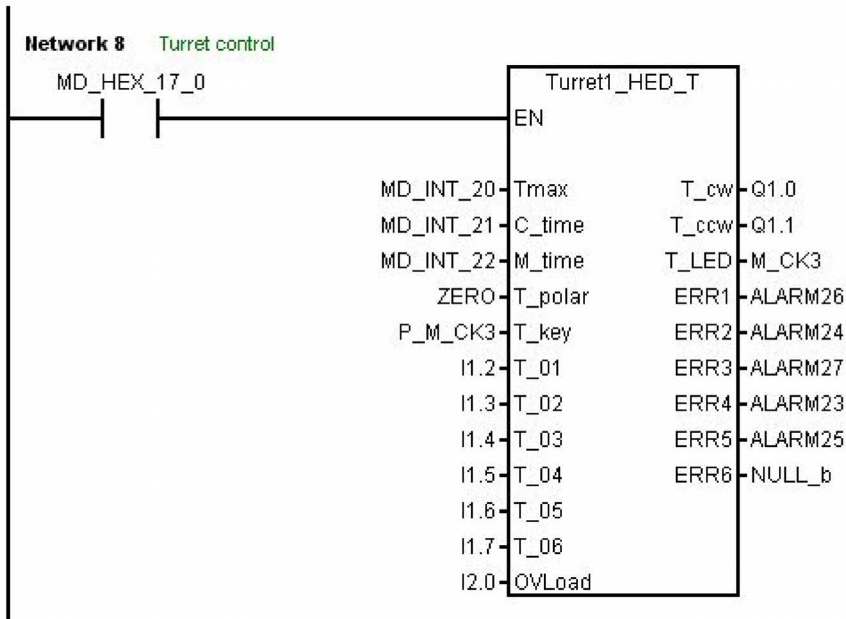
A.7.4.25   Subroutine 52 - TURRET2_BIN_T (turret with binary coding function)

Purpose

Subroutine 52 is used to control the turret with encoder positioning signals and function of dual-direction adjacent tool change. Contact the turret vendor for the working theory and the timing diagram of a tool change.

During a tool change, the NC interface signals "Read-in disable" (**DB3200.DBX6.1**) and "Feedhold" (**DB3200.DBX6.0**) are set, so the part program can continue running only after the tool change action.

The turret position action is forbidden in case of an emergency stop, turret motor overload or program test/simulation.

This subroutine can activate the following alarms:

- Alarm 700022: Turret motor overload
- Alarm 700023: Programmed tool number higher than the max. tool number of the turret
- Alarm 700024: Wrong setting of the max. tool number for the turret
- Alarm 700026: Not able to find expected tool in monitor time
- Alarm 700011: Not able to lock tool in expected time

Local variable definition

Inputs

Name	Type	Description
Tmax	WORD	Total tools on the turret
Tm_Lck	WORD	Tool lock monitor time (unit: 0.01s)
Tm_Chg	WORD	Tool change monitor time (unit: 0.1s)
T_1	BOOL	T code A
T_2	BOOL	T code B
T_3	BOOL	T code C
T_4	BOOL	T code D
Parity	BOOL	Parity bit
Strobe	BOOL	Tool on position siginal
OVload	BOOL	Turret motor overload (NC)
P_Indx	BOOL	Turret pre-indexing sensor
T_key	BOOL	Manual key for tool change

Outputs

Name	Type	Description
T_cw	BOOL	Turret CW rotation output
T_ccw	BOOL	Turret CCW rotation output
Magent	BOOL	Solenoid for clamping
T_LED	BOOL	Display for tool changing
ERR1	BOOL	Error1: turret motor overload
ERR2	BOOL	Error2: programmed tool no. > max tool no.
ERR3	BOOL	Error3: max tool no. setting error
ERR4	BOOL	Error4: not able to find pre-indexing signal in expected time
ERR5	BOOL	Error5: not able to lock in expected time

Assigned global variables

T_CURRENT	VD14000064	Current tool (retentive data)
T_cw_m	M156.0	Position marking for turret CW rotation
T_ccw_m	M156.1	Position marking for turret CCW rotation
T_P_INDX	MD160	Monitoring the tool change buffer zone in the JOG mode
T_DES	M164	Desired tool number
T_DIR	M168.0	Direction of adjacent tool change
T_POS	M168.1	Turret tool positioning finished
T_LOCK	M168.2	Turret clamping command
T_MAG	M168.3	Turret magnetic clamping

Relevant PLC machine data

No.	Unit	Description
14510 [20]	-	Max. tool number (4 or 6)
14510 [21]	0.1 s	Turret clamping time
14510 [22]	0.1 s	Monitoring time for tool searching
14512[17].0	-	Activating the turret function of a turning machine

Example for calling subroutine 52
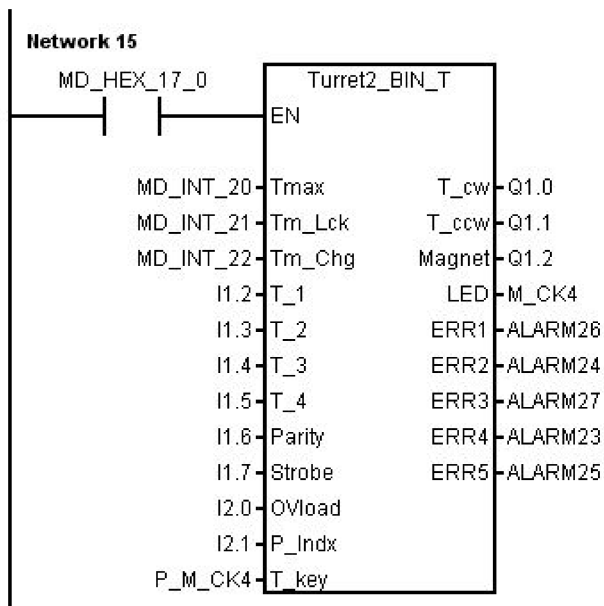
A.7.4.26   Subroutine 53 - Turret3_CODE_T (tool change control for turret with coding function)

Purpose

Subroutine 53 is used to control the turret with coded tool positions and function of adjacent tool change. The difference between the subroutine 52 and the subroutine 53 is that the subroutine 52 uses binary tool position codes while the subroutine 53 uses tool position codes made according to a specific common turret.

During a tool change, the NC interface signal "Feedhold" (**DB3200.DBX6.0**) is set; this means that the part program can only continue to run only after the tool change.

The turret positioning is prohibited in the case of an Emergency Stop, turret motor overload or program test/simulation.

Local variable definition

Inputs

Name	Type	Description
M_time	WORD	Monitor time for searching for a tool
T_key	BOOL	Tool change key
A	BOOL	Tool position code 1
B	BOOL	Tool position code 2
C	BOOL	Tool position code 3
D	BOOL	Tool position code 4
Strobe	BOOL	Tool on position siginal
Lock_i	BOOL	Lock tool siginal
OVload	BOOL	Turret overload

Tool position	Tool position code A	Tool position code B	Tool position code C	Tool position code D
1	0	1	0	0
2	0	0	0	1
3	1	0	0	0
4	0	0	1	0
5	1	1	1	0
6	1	0	1	1
7	1	1	0	1
8	0	1	1	1

Outputs

Name	Type	Description
T_UNCLAMP	BOOL	Turret release
T_CLAMP	BOOL	Turret clamping
T_CW	BOOL	Turret CW rotation
T_CCW	BOOL	Turret CCW rotation
T_LED	BOOL	Status display during the tool change

Assigned global variables

Tpos_C	BOOL	M156.4	Tool searching finished
T_cwm	BOOL	M235.6	Mark for turret CW rotation
T_ccwm	BOOL	M235.7	Mark for turret CCW rotation
TK_act	BOOL	M236.4	Mark for manual tool change
Tc_ne_0	BOOL	M237.0	Current tool number is not 0
T_dir	BOOL	M237.1	Direction for searching for an adjacent tool

Relevant PLC machine data

No.	Unit	Description
14510 [22]	0.1 s	Monitoring time for searching for a tool

Example for calling subroutine 53
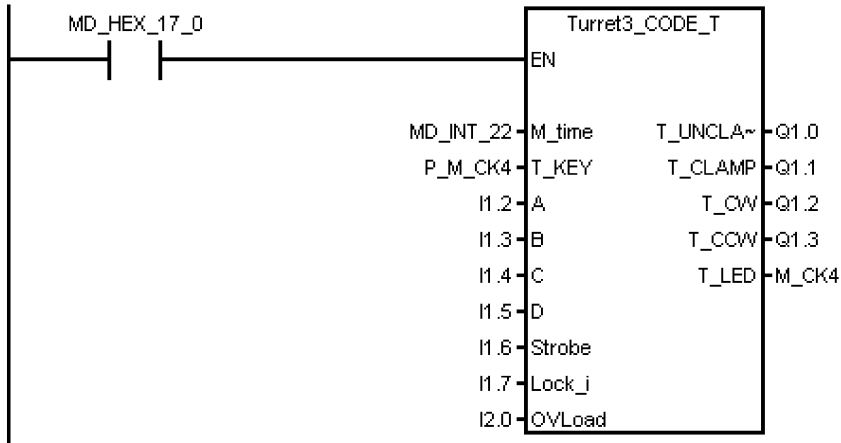
A.7.4.27   Subroutine 54 - Turret2_3_ToolDir (tool change direction)

Purpose

Subroutine 54 is used to find out the direction of searching for an adjacent tool and the pre-indexing position (this is, the previous position of the desired tool in the direction of an adjacent tool). To find out the direction, you need to know the max. tool number of the turret and the programmed tool number.

You can use this subroutine to control the turret to search for an adjacent tool on a turning machine or a machine centre. The turret tool position ranges from 2 to 64.

For example:
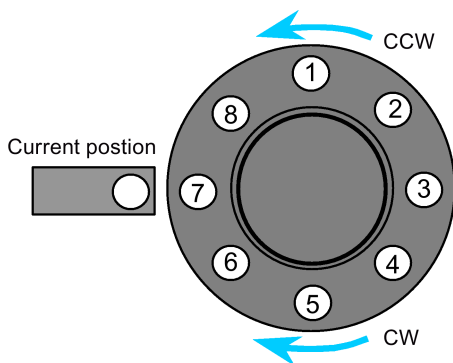
Tool position number	Current position	Programmed tool number	Pre-indexing position	Direction
1	7	2	1	CCW
2	7	5	6	CW
3	3	8	1	CW
4	1	4	3	CCW
5	6	8	7	CCW

Local variable definition

Inputs

Name	Type	Description
Tmax	DWORD	Possible positions of the turret
Pnum	DWORD	Programmed tool number
Tcurr	DWORD	Current tool number

Outputs

Name	Type	Description
P_INDXo	DWORD	Pre-indexing position: the previous tool position of the desired tool in the direction of an adjacent tool
DIR	BOOL	Direction for tool change 1: for turret CW; 0: for turret CCW

Assigned global variables

None

Relevant PLC machine data

None

Example for calling subroutine 54

This subroutine is called by subroutine 52 and subroutine 53.

Network 9   Make out the direction of turret as well as pre-indexing position

```
        ONE                   TOOL_DIR
      ──┤ ├──────────────┤EN

                    12─┤Tmax    P_INDEXo├─ P_INDEXo
              P_C_TFUNC─┤Pnum        DIR├─ M20.1
             T CURRENT ─┤Pcurr
```
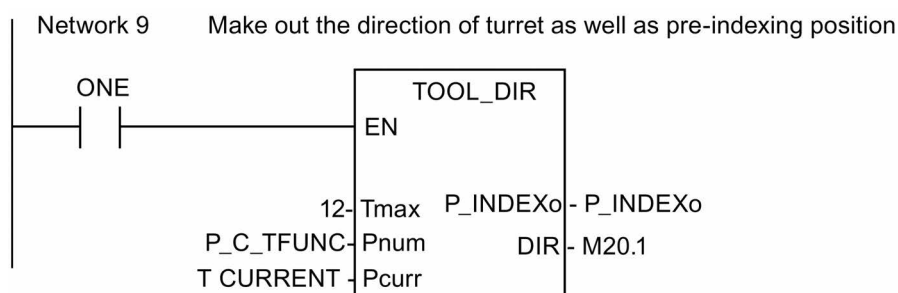
A.7.4.28   Subroutine 55 - Tail_stock_T (Tailstock control program for turning machines)

Purpose

Subroutine 55 is used to control forward or backward movement of the tailstock on a turning machine.

In the JOG mode, press the "Tailstock" key to move the tailstock forward or backward. Pressing "Tailstock" moves the tailstock forward, and one more pressing moves the tailstock backward.

In the AUTO mode, you can use M20 or M21 to control the forward or backward movement of the tailstock.

Local variable definition

Inputs

Name	Type	Description
nodef	BYTE	Reserved
TailCtrl_K	BOOL	Tailstock control key: press 1st time, advance; 2nd time, retract
SP_status	BOOL	Spindle status

Outputs

Name	Type	Description
TailAdv_O	BOOL	Tailstock advance ouput
TailRet_O	BOOL	Tailstock retract output
AdvRet_LED	BOOL	Tail advance/retract flag

Assigned global variables

SP_RUNm	BOOL	M236.0	Indicate that the spindle is running
TailAdv_m	BOOL	M229.2	Indicates that the tailstock is moving forward
TailRet_m	BOOL	M229.3	Indicates tailstock is moving backward

Relevant PLC machine data

No.	Value	Description
14512 [17].2	1	Enable tailstock in turning
	0	Disable tailstock in turning

Example for calling subroutine 55
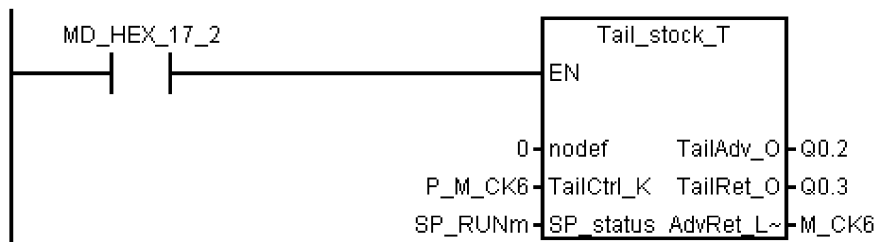
A.7.4.29   Subroutine 56 - Lock_unlock_T (clamping control for turning machine)

Purpose

Subroutine 56 is used to control the clamping or release for the chuck for a turning machine.

In the JOG mode, press the "**External/Inside clamping**" key to select either external clamping or inside clamping, and press "Clamp" or "Unclamp" key to clamp or release the chuck. Furthermore, you can also use the "Foot switch" to clamp or release the chuck. Pressing the "Foot switch" for once release the chuck, and one more pressing clamps the chuck.

In the AUTO mode, you can execute M10/M11 to control the clamping or release of the chuck.

Note

The chuck status should be kept when clamping outputs are zero.

Local variable definition

Inputs

Name	Type	Description
Delay	WORD	Delay if no in position sensor
LckRel_k	BOOL	Lock/release toggle signal
ExtIn_k	BOOL	External/internal lock key
S_velo	BOOL	Spindle velocity 0: 0 speed; 1: spindle running
Foot_switch	BOOL	Foot switch for clamp/unclamp chuck

Outputs

Name	Type	Description
Lck1_O	BOOL	Clamping output 1
Lck2_O	BOOL	Clamping output 2
Lck_LED	BOOL	Clamping output indicate
ExtIn_LED	BOOL	External/internal lock LED
Err1	BOOL	Error 1: clamp/unclamp not possible while spindle is operating

Assigned global variables

ChuckLcked	BOOL	M229.4	Chuck clamped
ChuckLckLED	BOOL	M239.2	Chuck at released state
ExtInLED_Om	BOOL	M239.5	External/inside clamping state
TR_Status	BOOL	M237.6	Chuck release command

Relevant PLC machine data

No.	Value	Description
14512 [17].1	1	Enable chuck in turning
	0	Disable chuck in turning

Example for calling subroutine 56
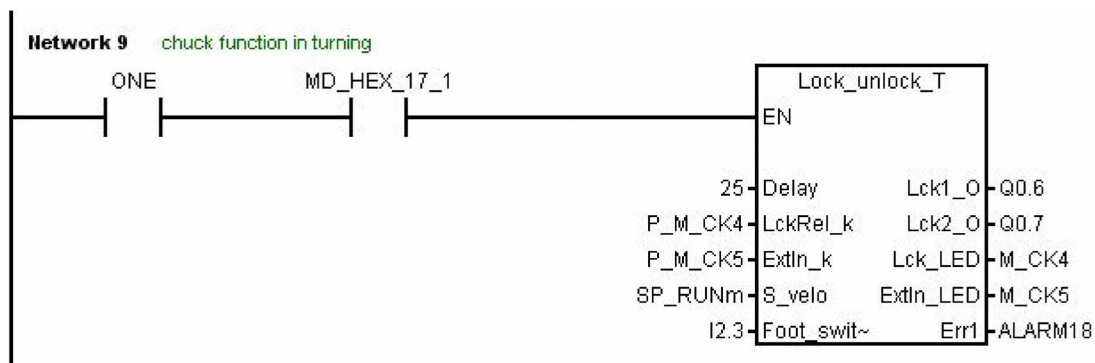
A.7.4.30   Subroutine 58 (MM_MAIN)

Purpose

To use subroutine 58, you must have licensed the optional Manual Machine Plus function for the SINUMERIK 808D ADVANCED T (Turning). The subroutines 46, 58 and 59 must be used together. This subroutine is used to control the manual machine function after the manual machine interface is activated.

Local variable definition

Inputs

Name	Type	Description
TK_X_P	BOOL	Traverse key X plus
TK_X_M	BOOL	Traverse key X minus
TK_Z_P	BOOL	Traverse key Z plus
TK_Z_M	BOOL	Traverse key Z minus
RAPID	BOOL	Rapid traverse key
SP_CW	BOOL	Start signal spindle CW
SP_CCW	BOOL	Start signal spindle CWW

Name	Type	Description
SP_STOP	BOOL	Stop signal spindle
NC_START	BOOL	NC start signal
NC_STOP	BOOL	NC stop signal
AUTO_ENABLE	BOOL	Switching to AUTO is enabled in Manual Machine Mode
MDA_ENABLE	BOOL	Switching to MDA is enabled in Manual Machine Mode
ROV	BOOL	ROV in Manual Machine Mode

Outputs

Name	Type	Description
AL_03	BOOL	Not approaching the reference point on axis X (user alarm 03)
AL_04	BOOL	Not approaching the reference point on axis Z (user alarm 04)
AL_09	BOOL	Incorrect start in the spindle direction (user alarm 09)
AL_11	BOOL	JOG program timeout (user alarm 11)
AL_12	BOOL	Spindle rate not 100% (user alarm 12)
AL_13	BOOL	Spindle not being started (user alarm 13)
AL_14	BOOL	Feed rate 0% (user alarm 14)
AL_16	BOOL	Spindle direction change in a thread not allowed (user alarm 16)

Assigned global variables

Byte	Signal	Byte 7	Byte 6	Byte 5	Byte 4	Byte 3	Byte 2	Byte 1	Byte 0
MB170	HMI<->MM						Request for MM HMI startup	MM HMI enabled	MM HMI started
MB171	HMI<->MM								
MB172	HMI<->MM								
MB173	HMI<->MM								
MB174	HMI<->MM	Cone angle 270°-360°	Cone angle 270°	Cone angle 180°-270°	Cone angle 180°	Cone angle 90°-180°	Cone angle 90°	Cone angle 0°-90°	Cone angle 0°
MB175	HMI<->MM						Direction key enabled		Spindle rotated
MB176	HMI<->MM		Working step enabled	Groove enabled	Thread chaining enabled	Drilling enabled	Arc enabled	Cutting enabled	Thread enabled
MB177	HMI<->MM								
MB178									
MB179									
MB180							Recutting canceled	Recutting performed	Recut the thread or not?

Relevant PLC machine data

No.	Unit	Range	Description
MD14512[19].7	-	-	1: to enable the manual machine function 0: to disable the manual machine function

Example for calling subroutine 58

```
    DB4500.DBX1019.7                        MM_MAIN
    ┤ ├                                   EN

       N_1_TK_P
    ┤ ├                                   TK_X_P

       N_1_TK_N
    ┤ ├                                   TK_X_M

       N_3_TK_P
    ┤ ├                                   TK_Z_P

       N_3_TK_N
    ┤ ├                                   TK_Z_M

       P_M_RAPID
    ┤ ├                                   RAPID

       P_M_SP_CW
    ┤ ├                                   SP_CW

       P_M_SP_CCW
    ┤ ├                                   SP_CCW

       P_M_SP_STOP
    ┤ ├                                   SP_STOP

       P_M_NCSTART
    ┤ ├                                   NC_STA~

       P_M_NCSTOP
    ┤ ├                                   NC_STOP

         ONE
    ┤ / ├                                 AUTO_E~

         ONE
    ┤ / ├                                 MDA_EN~

       manma_active
    ┤ ├                                   ROV

                                   AL_03 ─ ALARM50
                                   AL_04 ─ ALARM51
                                   AL_09 ─ ALARM52
                                   AL_11 ─ ALARM53
                                   AL_12 ─ ALARM54
                                   AL_13 ─ ALARM55
                                   AL_14 ─ ALARM56
                                   AL_16 ─ ALARM57
```
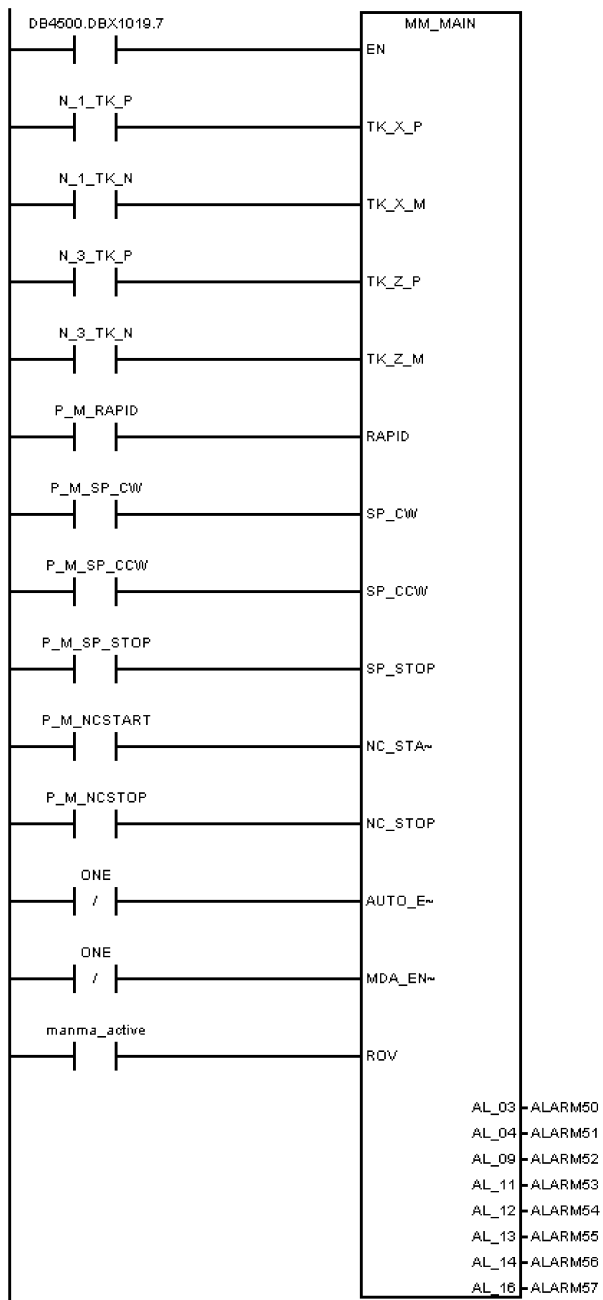
A.7.4.31 Subroutine 59 (MM_MCP_808D)

Purpose

To use subroutine 59, you must have licensed the optional Manual Machine Plus function for the SINUMERIK 808D ADVANCED T (Turning). The subroutines 46, 58 and 59 must be used together. Normally, the spindle will be stopped after you press the NC reset key. However, when a manual machine is started, you do not want to stop the spindle after pressing the NC reset key. In this case, call subroutine 59 (MM_MCP_808D) after executing subroutine 37 (MCP_NCK). Then you do not need to rewrite subroutine 37 (MCP_NCK).

Local variable definition
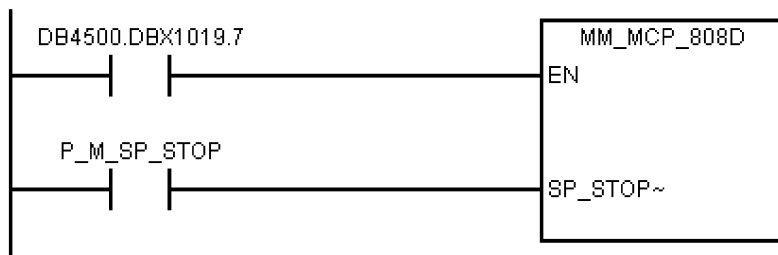
Inputs

Name	Type	Description
SP_STOP_K	BOOL	Spindle stop

Assigned global variables

None

Relevant PLC machine data

No.	Unit	Range	Description
MD14512[19].7	-	-	1: to enable the manual machine function
			0: to disable the manual machine function

Example for calling subroutine 59

A.7.4.32 Subroutine 60 - Disk_MGZ_M (disk-style tool magazine used for milling)

Purpose

You can use subroutine 60 to control the disk-style tool magazine on a milling machine.

In the reference point mode, initialize the tool magazine by pressing the "Original position of the tool magazine" key.

In the manual mode, you can rotate the tool magazine clockwise or counter-clockwise, and enable the tool magazine to reach the spindle or tool change position respectively through the "Clockwise rotation of the magazine", "Counter-clockwise rotation of the magazine", "Tool magazine reaching the spindle", and "Tool magazine reaching the tool change position" keys.

In the auto mode, you need to execute M06 to call the tool change subroutine when compiling a part program. Subroutine 60 and the tool change subroutine must be used together during the tool change process. Three operations are involved in the tool change control, that is, tool return, tool retrieval, and tool change.

1. The tool return operation is to return the tool on the spindle back to the tool magazine disk when compiling T0 and a tool is located on the spindle.

2. The tool retrieval operation is to get the desired tool from the tool magazine disk and install it on the spindle when compiling Tx (x ≠ 0) and no tool is on the spindle.

3. The tool change operation is to first return the tool on the spindle back to the tool magazine disk and then get the desired tool from the tool magazine disk when compiling Tx (x ≠ 0; x ≠ number of the tool on the spindle).

For details, please refer to the tool change subroutine.

When setting 14512[19].3 to 1, the maintenance mode is enabled, in which you can perform the following operations:

- When the tool magazine is in the spindle position, axis Z only moves upward to the tool change position.
- When axis Z is under the tool change position, the tool magazine cannot move to the spindle position.
- When the tool magazine is rotating, the tool magazine needs to go home if the emergency stop button is pressed.

The following machine data is involved in this subroutine:

MD10715: M_NO_FCT_CYCLE[0]

MD10716: M_NO_FCT_CYCLE_NAME[0]

MD22550: TOOL_CHANGE_MODE

MD22560: TOOL_CHANGE_M_CODE

Local variable definition

Inputs

Name	Type	Description
nodef	BYTE	Reserved
MgzCnt	BOOL	Magazine counter
MgzRef_k	BOOL	Set curret tool no. to 1 in magazine via this key
MgzCW_k	BOOL	Magazine CW rotate key
MgzCCW_k	BOOL	Magazine CCW rotate key
MgzSp_k	BOOL	Magazine enter spindle position key
MgzOrg_k	BOOL	Magazine original position key
MgzSp_pos	BOOL	Magazine reaches SP position
MgzOrg_pos	BOOL	Magazine reaches original position
T_rel_pos	BOOL	Spindle releases tool position
T_lck_pos	BOOL	Spindle locks tool position
T_rel_k	BOOL	Spindle release-tool key
T_rel_EnK	BOOL	Release-tool enable key

Outputs

Name	Type	Description
MgzCW_o	BOOL	Magazine CW rotate output
MgzCCW_o	BOOL	Magazine CCW rotate output
MgzSp_o	BOOL	Magazine approaching spindle position output
MgzOrg_o	BOOL	Magazine original position output
SpRelT_o	BOOL	Spindle releases a tool
RelT_En_o	BOOL	Release tool enable lamp
MgzSp_LED	BOOL	Magazine reaches spindle position
MgzOrg_LED	BOOL	Magazine reaches original position
MgzRef_LED	BOOL	Set curret tool no. to 1 in mag. output

Assigned global variables

MgzCW_cmd	BOOL	M230.0	Command for clockwise rotation of the tool magazine
MgzCCW_cmd	BOOL	M230.1	Command for counter-clockwise rotation of the tool magazine
Mgz_rot_CMD	BOOL	DB4900.DBB24	Tool change command from the tool change subroutine

No.	Unit	Range	Description
MD14512[19].3	-	-	1: to enable the maintenance mode
			0: to enable the normal mode
MD14514[2] [1]	-	-3.40e38 to 3.40e38	Tool magazine: tool change position of axis Z

[1] For the first-time commissioning, set MD14514[2] to an appropriate value so that axis Z can move freely during the commissioning. When the commissioning is finished, set MD14514 [2] to the normal value.

Example for calling subroutine 60

```
DB4500.DBX1017.0                    DISK_MGZ_M
  ──┤├────────┤├──                 EN

                           0 ─ nodef      MgzCW_o ─ Q1.0
                        I1.2 ─ Mgz_cnt    MgzCCW~ ─ Q1.1
              DB1000.DBX1.5 ─ MgzRef_k     MgzSp_o ─ Q1.2
              DB1000.DBX1.4 ─ MgzCW_k     MgzOrg_o ─ Q1.3
              DB1000.DBX1.6 ─ MgzCCW~      SpRelT_o ─ Q1.4
              DB1000.DBX2.1 ─ MgzSp_k    RelT_En_o ─ DB1100.DBX2.3
              DB1000.DBX2.2 ─ MgzOrg_k   MgzSp_L~ ─ DB1100.DBX2.1
                        I1.3 ─ MgzSp_p~  MgzOrg_L~ ─ DB1100.DBX2.2
                        I1.4 ─ MgzOrg_p~ MgzRef_L~ ─ DB1100.DBX1.5
                        I1.5 ─ T_rel_pos
                        I1.6 ─ T_lck_pos
              DB1000.DBX2.4 ─ T_rel_k
              DB1000.DBX2.3 ─ T_rel_EnK
                      M251.0 ─ Reserved1
                      M251.0 ─ Reserved2
                      M251.0 ─ Reserved3
```

A.7.4.33   Subroutines 34 to 36, 57, and 61

Explanation

Subroutines 34 to 36, 57, and 61 are reserved for users.

A.7.4.34   Subroutine 62 - Trg_key_OR

Purpose

Subroutine 62 is used for the spindle override control via three trigger user keys in the vertical MCP with the handwheel.

Local variable definition

Inputs

Name	Type	Description
noder	WORD	Reserved
IncS_Key	BOOL	Increase key of spindle override
DecS_Key	BOOL	Decrease key of spindle override
S_100_Key	BOOL	Spindle override 100% key
Noder1	BYTE	Reserved
Noder2	BYTE	Reserved

Outputs

| Name	Type	Description
LED1_S	BOOL	Lights, spindle override < 100%; flashing, 50%
LED2_S	BOOL	Lights, spindle override 100%
LED3_S	BOOL	Lights, spindle override 105-115%; flashing, 120%

Assigned global variables

SP_OV_Switch	BYTE	MB202	Spindle override switch buffer
USB_MCP_SP_OV	BYTE	MB209	USB MCP single: spindle override

Relevant PLC machine data

No.	Unit	Range	Description
14510 [15]	0.1s	0.5 s to 3 s	Spindle override 50% key holding on time defined
14510 [16]	0.1s	0.1 s to 3 s	Spindle override 100% key holding on time defined
14512 [20]	-	-	Bit 0: Grey coded switch (0: spindle override controlled by the grey mode; 1: spindle override controlled by trigger user keys)
			Bit 5: define the spindle override startup value (0: the startup spindle override is always 100%; 1: recode the spindle override value of the last machine turn off for the next startup)
			Bit 6/7: define the spindle override shift speed
			• bit 6 = 0, bit 7 = 0
			Standard speed. The steps are 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, 95%, 100%, 105%, 110%, 115%, 120%
			• bit 6 = 1, bit 7 = 0
			Two times the standard speed. The steps are 50%, 60%, 70%, 80%, 90%, 100%, 110%, 120%
			• bit 6 = 0, bit 7 = 1
			About three times the standard speed. The steps are 50%, 60%, 70%, 85%, 100%, 110%, 120%
			• bit 6 = 1, bit 7 = 1
			About four times the standard speed. The steps are 50%, 60%, 80%, 100%, 120%

Example for calling subroutine 62
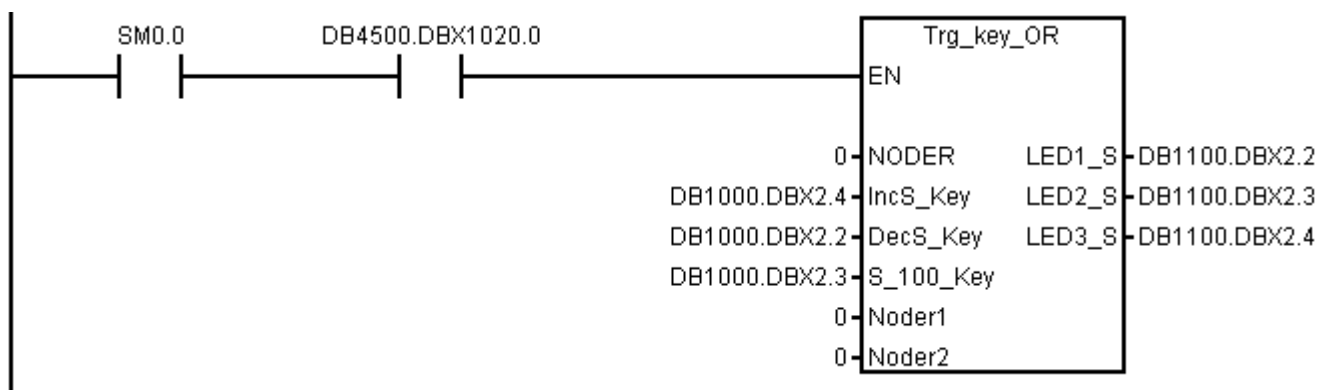
A.7.4.35   Subroutine 63 - TOGGLES

Purpose

Two types of switches are provided in subroutine 63, more specifically, a hold switch for switching a circuit on (press) and off (press again), and a delay switch for switching on a circuit and automatically switching it off after a certain time period. A total of six hold switches and two delay switches are available in this subroutine, with the delay duration being configurable. The key inputs or outputs of the subroutine can be connected with any physical inputs or outputs. The inputs and outputs of all idle switches are respectively "ZERO" and "NULL_b" (M255.7).

Local variable definition

Inputs

Name	Type	Description
Delay7	WORD	For switch 7; unit: 10 ms; max delay = 5 min
Delay8	WORD	For switch 8; unit: 10 ms; max delay = 5 min
Ki_1…Ki_6	BOOL	Input of hold switch 1...input of hold switch 6
Ki_7…Ki_8	BOOL	Inputs of delay switches 7 and 8

Outputs

Name	Type	Description
Ko_1…Ko_8	BOOL	Output of switch 1...output of switch 8

Assigned global variables

| K1st1 … K8st1	MB245	State 1 of the hold switch
K1st2 … K8st2	MB246	State 2 of the hold switch
K1on … K8on	MB247	"On" state of the hold switch

Relevant PLC machine data

None

Example for calling subroutine 63
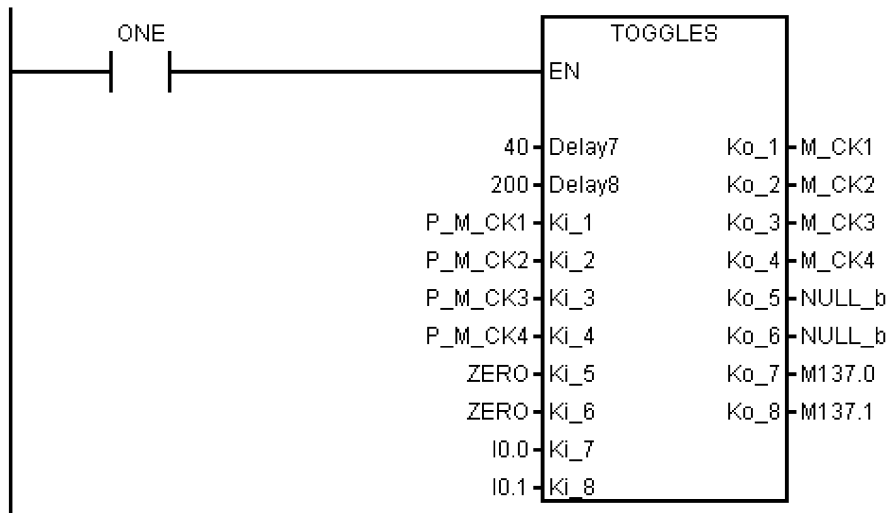
A.7.5   PLC alarms

Diagnosing of the machine is important. Complete diagnosis of the external electrics can help users understand the cause and location of breakdown immediately.
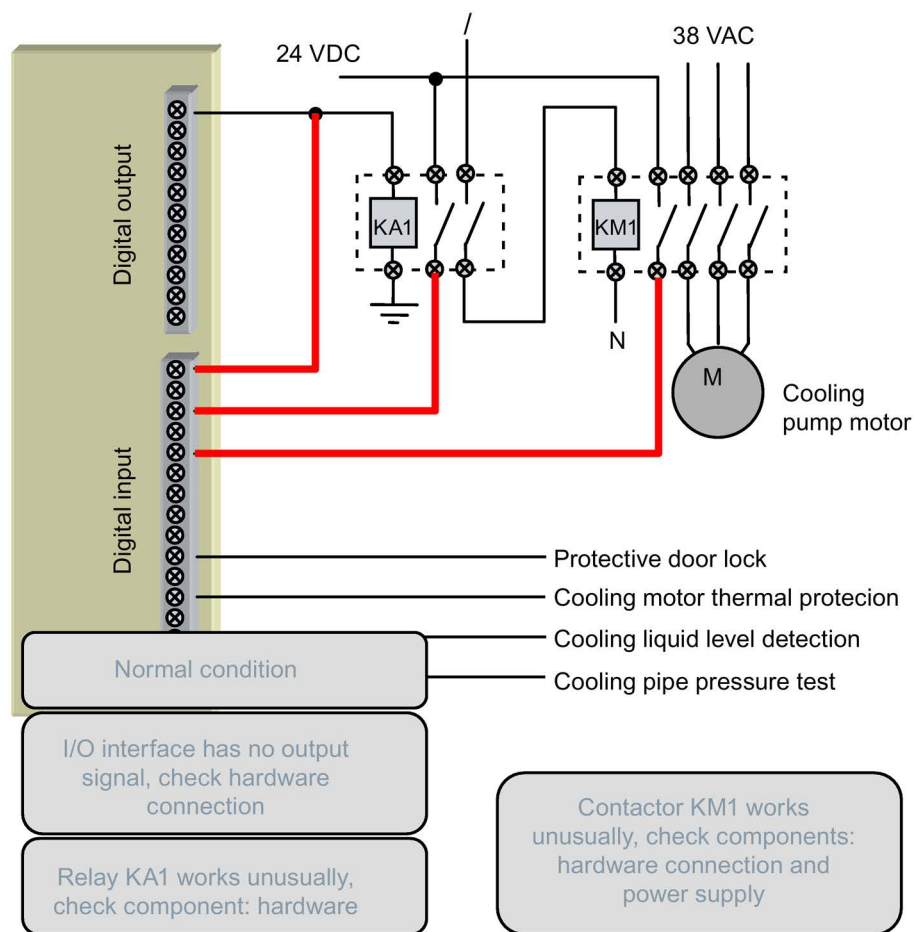
User alarms in the PLC subroutines

System provides users with 128 PLC user alarms. Every user alarm has a corresponding NCK address bit: DB1600.DBX0.0 to DB1600.DBX15.7. The address bit "1" can activate the corresponding alarm, and reset "0" can cancel the alarm.

In the PLC cross reference, you can find the reason for the PLC alarm through looking up reference addresses to make the corresponding modification.

Some user alarms are activated in a subroutine. In the case that such an alarm is generated, you can search the following list for the subroutine wherein the alarm is activated.

Alarm No.	Interface Address	Alarm Description	From SBR
700010	DB1600.DBX1.2	Handheld unit active	SBR41: MINI_HHU
700011	DB1600.DBX1.3	Tool clamping timeout	
700012	DB1600.DBX1.4	Spindle being braked	SBR42: SPINDLE
700013	DB1600.DBX1.5	Operation not allowed: chuck unclamped	SBR56: Lock_unlock_T
700014	DB1600.DBX1.6	Gear stage change timeout	SBR49: GearChg1_Auto
700015	DB1600.DBX1.7	Gear position signal error	
700016	DB1600.DBX2.0	Drives not ready	SBR33: EMG_STOP
700017	DB1600.DBX2.1	Chuck operation not allowed: spindle/prog. running	SBR56: Lock_unlock_T
700018	DB1600.DBX2.2	Cooling motor overload	SBR44: COOLING
700019	DB1600.DBX2.3	Coolant level too low	

Alarm No.	Interface Address	Alarm Description	From SBR
700020	DB1600.DBX2.4	Lubricating motor overload	SBR45: LUBRICAT
700021	DB1600.DBX2.5	Lubricant level too low	
700022	DB1600.DBX2.6	Turret motor overload	SBR51: Turret1_HED_T
700023	DB1600.DBX2.7	Prog. tool pos. number > max. tool pos. number	SBR52: Turret2_BIN_T
700024	DB1600.DBX3.0	Max. tool position number illegal	SBR53: Turret3_CODE_T
700025	DB1600.DBX3.1	No tool position signal from turret	
700026	DB1600.DBX3.2	Tool change timeout	
700028	DB1600.DBX3.4	Tool unclamped	SBR53: Turret3_CODE_T
700029	DB1600.DBX3.5	Warning: the 1st maintenance task will expire	SBR48: ServPlan
700030	DB1600.DBX3.6	Alarm: the 1st maintenance task has expired	
700031	DB1600.DBX3.7	Magazine not in spindle pos. or original pos.	SBR60: Disk_MGZ_M
700032	DB1600.DBX4.0	Magazine in spindle pos. and original pos.	SBR60: Disk_MGZ_M
700033	DB1600.DBX4.1	Magazine rot. failed: magazine/spindle not ready	SBR60: Disk_MGZ_M
700034	DB1600.DBX4.2	Blk search finds tool on spindle <> tool pro- grammed	SBR60: Disk_MGZ_M
700035	DB1600.DBX4.3	Spindle positioning to unclamping position timeout	SBR60: Disk_MGZ_M
700036	DB1600.DBX4.4	Spindle positioning to clamping position timeout	SBR60: Disk_MGZ_M
700049	DB1600.DBX6.1	Reference point of X axis not reached	SBR58: MM_MAIN
700050	DB1600.DBX6.2	Reference point of Z axis not reached	SBR58: MM_MAIN
700051	DB1600.DBX6.3	Spindle direction illegal	SBR58: MM_MAIN
700052	DB1600.DBX6.4	Monitoring time for JOG operation exceeded	SBR58: MM_MAIN
700053	DB1600.DBX6.5	Spindle override not 100%	SBR58: MM_MAIN
700054	DB1600.DBX6.6	Spindle not started	SBR58: MM_MAIN
700055	DB1600.DBX6.7	Feed override = 0%	SBR58: MM_MAIN
700056	DB1600.DBX7.0	Spindle dir. change not allowed in thread mach.	SBR58: MM_MAIN
700059	DB1600.DBX7.3	NC start not possible: safety door not closed	SBR22: AUX_SAFE_DOOR
700060	DB1600.DBX7.4	PRT/AFL change not possible: channel not reset	SBR37: MCP_NCK
700061	DB1600.DBX7.5	Mgz. in maint. Read-in & rapid traverse disabled	SBR60: Disk_MGZ_M
700062	DB1600.DBX7.6	Tool on spindle <> tool prgd. mgz. must be referenced	SBR60: Disk_MGZ_M

A.7.5.1   Alarm cancel/reset and reaction

Conditions of alarm cancel/reset

After the cancel of an alarm, you need to press one of the following two keys to clear the alarm finally.

Then the alarm displayed will disappear by itself.

 or

Alarm reaction

There are the following two ways for alarm reaction.

PLC reaction: the PLC program detects the reaction through the corresponding PLC interface, such as canceling the axis enable when giving an alarm.

NC reaction: every alarm has an eight-bit configuration MD14516[0] to [127]. You can set the cancelation condition and alarm reaction for every alarm according to the actual condition. The system then makes the corresponding reaction when the alarm begins.
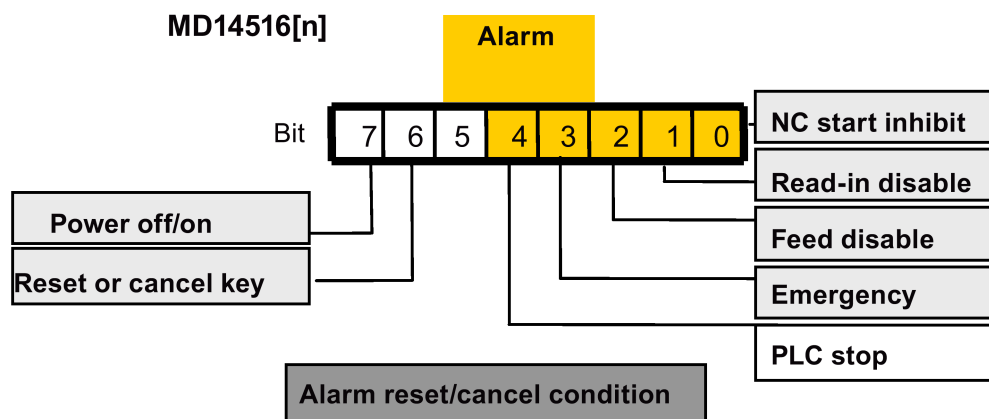
A.7.5.2   Alarm texts

Creating or editing alarm texts correctly and reasonably can make users clearly realize and understand the reason of a PLC alarm and then locate and resolve breakdown.
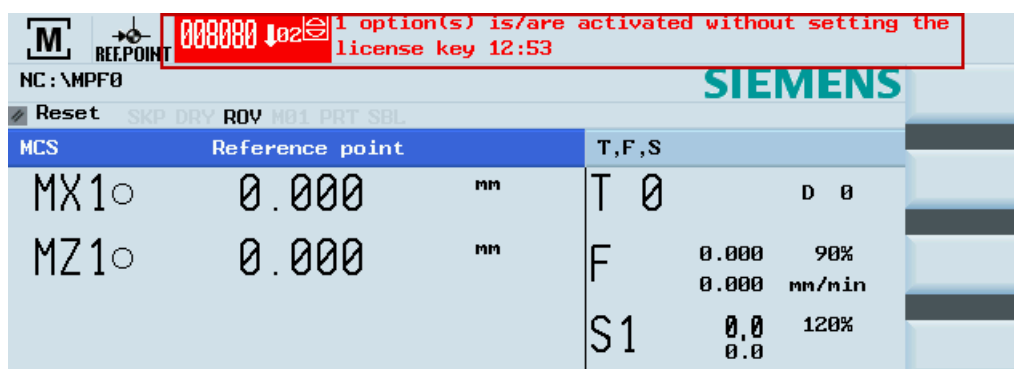
You can edit a PLC user alarm by using the following two methods:

- Editing via the USB
- Editing via the HMI

Editing a PLC user alarm via the USB
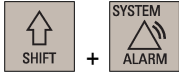
[SHIFT] + [SYSTEM ALARM]	1. Select the desired operating area.
Sys. data	2. Press this softkey.
HMI data	3. Locate the HMI data folder and then open it with the following key.

[INPUT]

4.   Locate the PLC alarm text folder and then open it through the same method as the above.

Name	Type	Length	D
⤴ ..			
📄 alcu_chs.txt			
📄 alcu_deu.txt			
📄 alcu_eng.txt			
📄 alcu_ptb.txt			
📄 alcu_rus.txt			

Copy	5. Copy the PLC alarm text in the desired language by pressing this softkey.
USB	6. Press this softkey and then paste the copied alarm text via the following softkey.

[Paste]

7.   Connect the USB stick with your PC, find the PLC alarm text that is downloaded, and then open it with the WordPad.
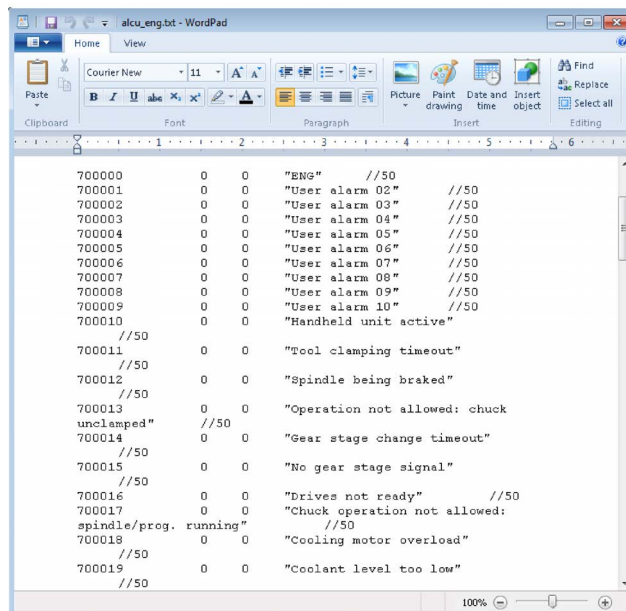
8.   Find the alarm number that needs to be edited and type your own text. Save and close the file after editing the alarm text.

9.   Remove the USB stick from the PC and connect it with the USB interface on the front panel of the PPU again.

10.   Copy the edited alarm text back to the PLC alarm text folder and overwrite the original file.

 +   11.   Select the desired operating area.

                            12.   You can check the editing result through the following PPU operations.

 →

Editing a PLC user alarm via the HMI

For how to edit a PLC user alarm via the HMI, see the topic Editing PLC alarm texts (Page 91).

A.7.6   PLC sample applications

A.7.6.1   PLC sample application (turning)

This sample application is applicable to machines with the following configurations:

- Two axes: axes X and Z, with a hardware limit switch respectively in the positive and negative directions of each axis
- An analog spindle: SP
- HALL effect device turret with six working stations
- PLC-controlled timely and quantitatively lubrication system
- PLC-controlled cooling system

Assignment of inputs and outputs

Signal	Description	Remark
I0.0	Emergency Stop button	Normally closed
I0.1	Limit switch in the "+" direction of axis X	Normally closed
I0.2	Limit switch in the "-" direction of axis X	Normally closed
I0.3		
I0.4		
I0.5	Limit switch in the "+" direction of axis Z	Normally closed
I0.6	Limit switch in the "-" direction of axis Z	Normally closed
I0.7	Reference point switch of axis X	Normally open
I1.0		
I1.1	Reference switch of axis Z	Normally open
I1.2	Tool path detecting signal T1	Valid at a low level
I1.3	Tool path detecting signal T2	Valid at a low level
I1.4	Tool path detecting signal T3	Valid at a low level
I1.5	Tool path detecting signal T4	Valid at a low level
I1.6	Tool path detecting signal T5	Valid at a low level
I1.7	Tool path detecting signal T6	Valid at a low level
I2.0	Turret motor overload	Normally closed
I2.1	Reserved for other types of turrets	Reserved
I2.2		
I2.3	Chuck foot switch	Normally open
I2.4	Coolant level too low	Normally closed
I2.5	Cooling pump motor overload	Normally closed
I2.6	Lubricant level to low	Normally closed
I2.7	Lubrication pump motor overload	Normally closed
I3.0		Reserved
I3.1		Reserved
I3.2		Reserved

Signal	Description	Remark
I3.3		Reserved
I3.4		Reserved
I3.5		Reserved
I3.6		Reserved
I3.7		Reserved
I4.0	Handheld unit: axis X selected	Valid at a high level
I4.1	Handheld unit: axis Y selected	Valid at a high level
I4.2	Handheld unit: axis Z selected	Valid at a high level
I4.3	Handheld unit: fourth axis selected	Reserved
I4.4	Handheld unit: increment X1	Valid at a high level
I4.5	Handheld unit: increment X10	Valid at a high level
I4.6	Handheld unit: increment X100	Valid at a high level
I4.7	Handheld unit: enabled	Valid at a high level
Q0.0	Working lamp	
Q0.1		
Q0.2	Tailstock forward	
Q0.3	Tailstock backward	
Q0.4	Cooling pump	
Q0.5	Lubrication pump	
Q0.6	Chuck output 1	
Q0.7	Chuck output 2	
Q1.0	Turret motor rotating clockwise	
Q1.1	Turret motor rotating counter-clockwise	
Q1.2	Reserved for other types of turrets	
Q1.3	Reserved for other types of turrets	
Q1.4	Gear shift: low gear level (SBR49: GearChg1_Auto) / Gear level status (SBR50: GearChg2_Virtual)	
Q1.5	Gear shift: high gear level (SBR49: GearChg1_Auto)	
Q1.6		
Q1.7	Handheld unit valid	

Definition of user-defined keys on the MCP

User-defined key 1	Working lamp
User-defined key 2	Manual cooling
User-defined key 3	Manual tool change
User-defined key 4	Manual chuck clamping and unclamping
User-defined key 5	Chuck clamping internally/externally
User-defined key 6	Tailstock

Structure of the sample application (OB1)

Call Conditions	Subroutine Name	Description
Each scan (SM0.0)	AUX_MCP (SBR20)	Auxiliary function
First scan (SM0.1)	PLC_INI (SBR32)	PLC initialization
Each scan (SM0.0)	EMG_STOP (SBR33)	Emergency Stop control
Each scan (SM0.0)	MCP_NCK (SBR37)	Transferring MCP and HMI signals to the NCK interface
Each scan (SM0.0)	HANDWHL (SBR39)	Selecting a hand wheel through the interface signal DB1900.DBB1xxx
Each scan (SM0.0)	AXIS_CTL (SBR40)	Coordinate enabling control, hardware limit, etc.

Call Conditions	Subroutine Name	Description
Each scan (SM0.0)	SPINDLE (SBR42)	Spindle control
Each scan (SM0.0)	COOLING (SBR44)	Cooling control
Each scan (SM0.0)	TURRET1 (SBR46)	HALL effect device turret control
Each scan (SM0.0)	ServPlan (SBR48)	Maintenance plan example: first task

Setting the relevant PLC machine data

Machine data	Corresponding function		
14510[12]	JOG key layout		
14510[13]	Time for spindle braking		
14510[20]	Maximum number of tools		
14510[21]	Time for locking a turret (in 0.1 s)		
14510[22]	Monitoring time when searching tools (in 0.1 s)		
14510[24]	Lubrication interval (in 1 min)		
14510[25]	Lubrication duration (in 0.01 s)		
14512[16]	Bit 7	Handwheel assignment with the MCP / HMI	
14512[17]	Bit 0	Turret function	
	Bit 1	Clamping function	
	Bit 2	Tailstock function	
	Bit 3	Selection between handwheel and hand-held unit (0: handwheel; 1: hand-held unit)	
14512[18]	Bit 2	One time automatic lubrication after the power-on	
	Bit 4	External signal for spindle stop	
	Bit 5	Fixing the direction of a spindle	
	Bit 6	Hardware limit is independent of the PLC application	
	Bit 7	One hardware limit triggered per axis (enabled when bit 6=0)	
14512[19]	Bit 1	Function of spindle braking	
	Bit 2	Password clearing by power-on (0: delete the password; 1: do not delete the password)	
	Bit 7	MM+ (Manual Machine Plus) function (enabled when the MM+ has been licensed and corresponding PLC subroutine has been called)	
14512[20]	Bit 1	Spindle disable mode	

A.7.6.2   PLC sample application (milling)

This sample application is applicable to machines with the following configurations:

- Three axes: axes X, Y and Z, with a hardware limit switch respectively in the positive and negative directions of each axis
- An analog spindle: SP (the fourth axis)
- PLC-controlled timely and quantitatively lubrication system
- PLC-controlled cooling system

Assignment of inputs and outputs

Signal	Description	Remark
I0.0	Emergency Stop button	Normally closed
I0.1	Limit switch in the "+" direction of axis X	Normally closed
I0.2	Limit switch in the "-" direction of axis X	Normally closed
I0.3	Limit switch in the "+" direction of axis Y	
I0.4	Limit switch in the "-" direction of axis Y	
I0.5	Limit switch in the "+" direction of axis Z	Normally closed
I0.6	Limit switch in the "-" direction of axis Z	Normally closed
I0.7	Reference point switch of axis X	Normally open
I1.0	Reference point switch of axis Y	

Signal	Description	Remark
I1.1	Reference point switch of axis Z	Normally open
I1.2	Disk-style tool magazine: tool magazine count	Valid at a low level
I1.3	Disk-style tool magazine: tool magazine at the spindle position	Valid at a low level
I1.4	Disk-style tool magazine: tool magazine at the original position	Valid at a low level
I1.5	Disk-style tool magazine: tool at the release position	Valid at a low level
I1.6	Disk-style tool magazine: tool at the clamping position	Valid at a low level
I1.7		Valid at a low level
I2.0		Normally closed
I2.1		Reserved
I2.2		
I2.3		Normally open
I2.4	Coolant level too low	Normally closed
I2.5	Cooling pump motor overload	Normally closed
I2.6	Lubricant level too low	Normally closed
I2.7	Lubrication pump motor overload	Normally closed
I3.0		Reserved
I3.1		Reserved
I3.2		Reserved
I3.3		Reserved
I3.4		Reserved
I3.5		Reserved
I3.6		Reserved
I3.7		Reserved
I4.0	Handheld unit: axis X selected	Valid at a high level
I4.1	Handheld unit: axis Y selected	Valid at a high level
I4.2	Handheld unit: axis Z selected	Valid at a high level
I4.3	Handheld unit: fourth axis selected	Reserved
I4.4	Handheld unit: increment X1	Valid at a high level
I4.5	Handheld unit: increment X10	Valid at a high level
I4.6	Handheld unit: increment X100	Valid at a high level
I4.7	Handheld unit: enabled	Valid at a high level
Q0.0	Working lamp	
Q0.1		
Q0.2	Chip forward	
Q0.3	Chip backward	
Q0.4	Cooling pump	
Q0.5	Lubrication pump	
Q0.6	Safety door open	
Q0.7		
Q1.0	Magazine rotating clockwise	
Q1.1	Magazine rotating counter-clockwise	
Q1.2	Magazine approaching spindle position	
Q1.3	Magazine approaching original position	
Q1.4	Tool release from the spindle	
Q1.5		
Q1.6		
Q1.7	Handheld unit valid	

Definition of user-defined keys on the MCP

User-defined key 1	Working lamp
User-defined key 2	Manual cooling
User-defined key 3	Safety door
User-defined key 4	Manual clockwise rotation of the tool magazine
User-defined key 5	Manual reset of the tool magazine
User-defined key 6	Manual counter-clockwise rotation of the tool magazine
User-defined key 7	Removing chip forward
User-defined key 8	Removing chip backward

Structure of the sample application (OB1)

Call Conditions	Subroutine Name	Description
Each scan (SM0.0)	AUX_MCP (SBR20)	Auxiliary function
First scan (SM0.1)	PLC_INI (SBR32)	PLC initialization
Each scan (SM0.0)	EMG_STOP (SBR33)	Emergency Stop control
Each scan (SM0.0)	MCP_NCK (SBR37)	Transferring MCP and HMI signals to the NCK interface
Each scan (SM0.0)	HANDWHL (SBR39)	Selecting a hand wheel through the interface signal DB1900.DBB1xxx
Each scan (SM0.0)	AXIS_CTL (SBR40)	Coordinate enabling control, hardware limit, etc.
Each scan (SM0.0)	SPINDLE (SBR42)	Spindle control
Each scan (SM0.0)	COOLING (SBR44)	Cooling control
Each scan (SM0.0)	LUBRICAT (SBR45)	Lubrication control

Setting the relevant PLC machine data

Machine data		Corresponding function
14510[12]		JOG key layout
14510[13]		Time for spindle braking
14510[20]		Maximum number of tools
14510[24]		Lubrication interval (in 1 min)
14510[25]		Lubrication duration (in 0.01 s)
14512[16]	Bit 1	Function of chip conveyor
	Bit 2	Function of safety door
	Bit 3	When the function of safety door is active, it can be triggered by M01/M02
	Bit 7	Handwheel assignment with the MCP / HMI
14512[17]	Bit 0	Tool magazine function
	Bit 3	Selection between handwheel and hand-held unit (0: handwheel; 1: hand-held unit)
14512[18]	Bit 2	One time automatic lubrication after the power-on
	Bit 4	External signal for spindle stop
	Bit 5	Fixing the direction of a spindle
	Bit 6	Hardware limit is independent of the PLC application
	Bit 7	One hardware limit triggered per axis (enabled when bit 6=0)
14512[19]	Bit 1	Function of spindle braking
	Bit 2	Password clearing by power-on (0: delete the password; 1: do not delete the password)
	Bit 7	MM+ (Manual Machine Plus) function (enabled when the MM+ has been licensed and corresponding PLC subroutine has been called)
14512[20]	Bit 1	Spindle disable mode

A.8 AMM communication tool

With the communication tool Access MyMachine P2P (AMM), you can establish an Ethernet connection and realize data transfer between the control system and a PC. This tool is available in the Toolbox and is supported by Windows Vista/Win 7.

Ethernet connections

The following Ethernet connections are possible between the control system and the AMM tool on the PC:
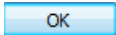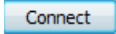
- Direct connection: direct connection between the control system and PC
- Network connection: integrating the control system into an existing Ethernet network

After an active Ethernet connection is established, the AMM tool provides the possibility of data exchange between the control system and a PC, as well as remote control of the HMI from a PC. For more information about the tool functionality, see the Online Help of the tool.

A.8.1 Establishing an Ethernet connection

Establishing a direct connection

Proceed as follows to establish a direct connection between the control system and a PC (AMM tool):

1. Connect the control system with the PC using an Ethernet cable.
2. Select the desired operating area on the PPU.

3. Press this key to view the extended softkeys.

4. Set up a direct connection on the control system through the following softkey operations:

The following dialog pops up on the screen:

5. Start the Access MyMachine P2P (PC) on your PC. A password setting dialog appears when the tool is started for the first time.
6. Enter a desired password in the input fields and then click this button to save.

   This password ensures that all the connection data for AMM is encrypted. The password can be subsequently changed at any time from the menu bar.
7. Select the direct connection option in the following dialog and then click this button.
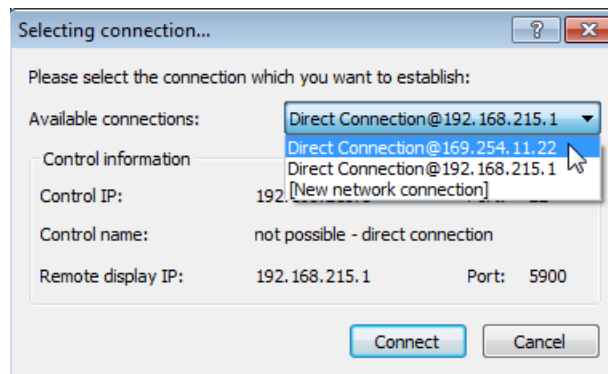
An attempt is made to establish a direct connection.

8. If you have not established any authentication data, the following dialog appears:
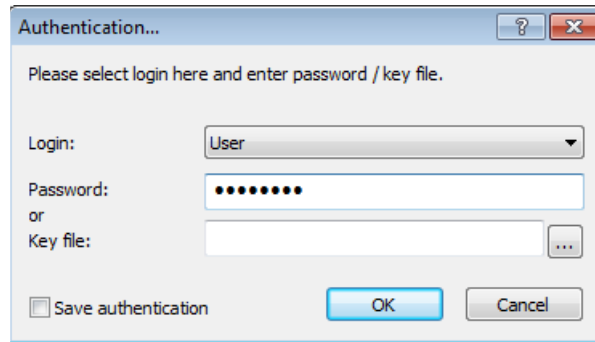
Select the log-on details and enter the corresponding password or alternatively select a key file in the dialog.

If the authentication data for the direct connection has already been saved, a connection to the control system will be set up immediately.

9. Click this button and the AMM tool connects to the control system selected.

Establishing a network connection

Proceed as follows to establish a network connection:

1. Connect the control system with the local network using an Ethernet cable.

2. Select the desired operating area on the PPU.

3. Press this key to view the extended softkeys.

4. Enter the main screen of the service control options through the following softkey operations:

Serv. displ. → Service control

5. Press this softkey to enter the window for the network configuration.
   Note: make sure the following vertical softkey is not selected:
   Direct connect.

6. Configure the network as required in the following window:

You can configure DHCP with the following key:

Note: If you select "No" for DHCP, you must enter the IP address (which must belong to the same network as that of your PC) and subnet mask manually.

Save

7. Press this softkey to save the configuration. If you select "Yes" for DHCP, you also need to restart the control system to activate the network configuration.

8. Start the AMM on your PC.

9. Select the new network connection option in the following dialog:

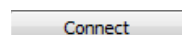This dialog can also be called with the ⊷ button from the toolbar.

10. The dialog for setting the new network connection appears. Assign the parameters for a new network connection in this dialog:
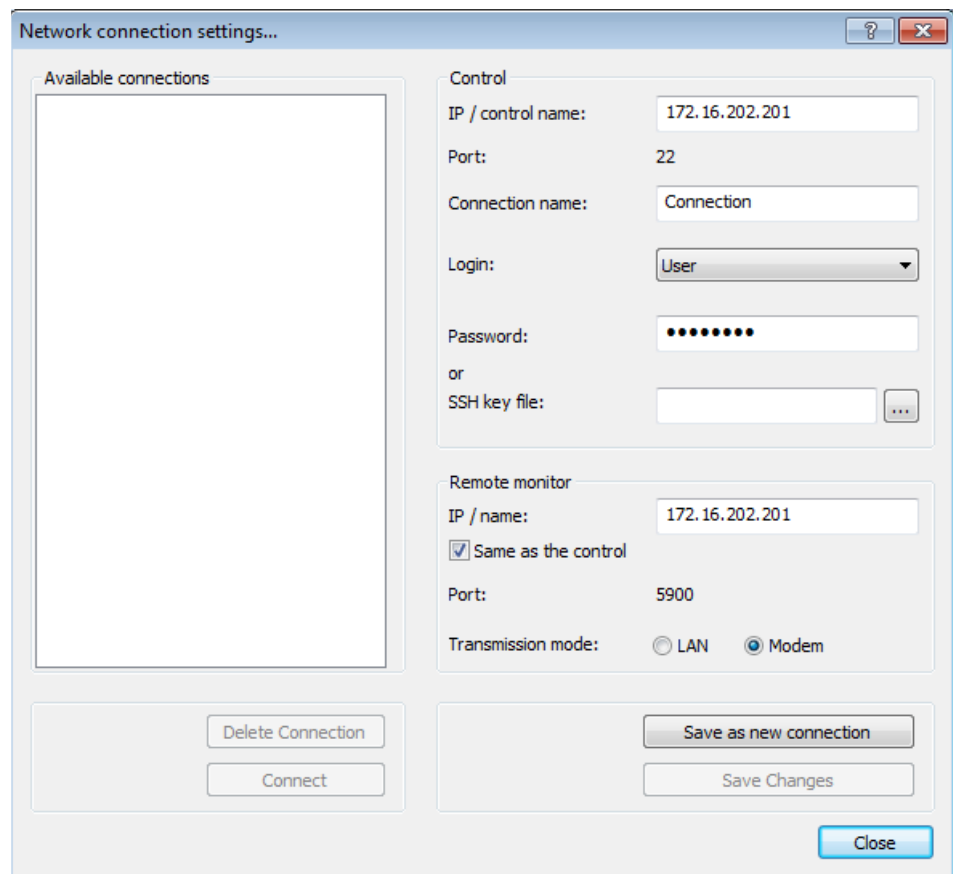
11. Select the following button to save the settings:
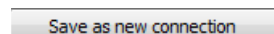
12. Select the following button and the AMM tool connects to the control system selected.

A.8.2 File management and transfer

After an active Ethernet connection is established, you can have a remote access to the control system's NC file system from your PC. In this case, you can easily manage the NC files with the AMM tool and transfer files between the control system and your PC.
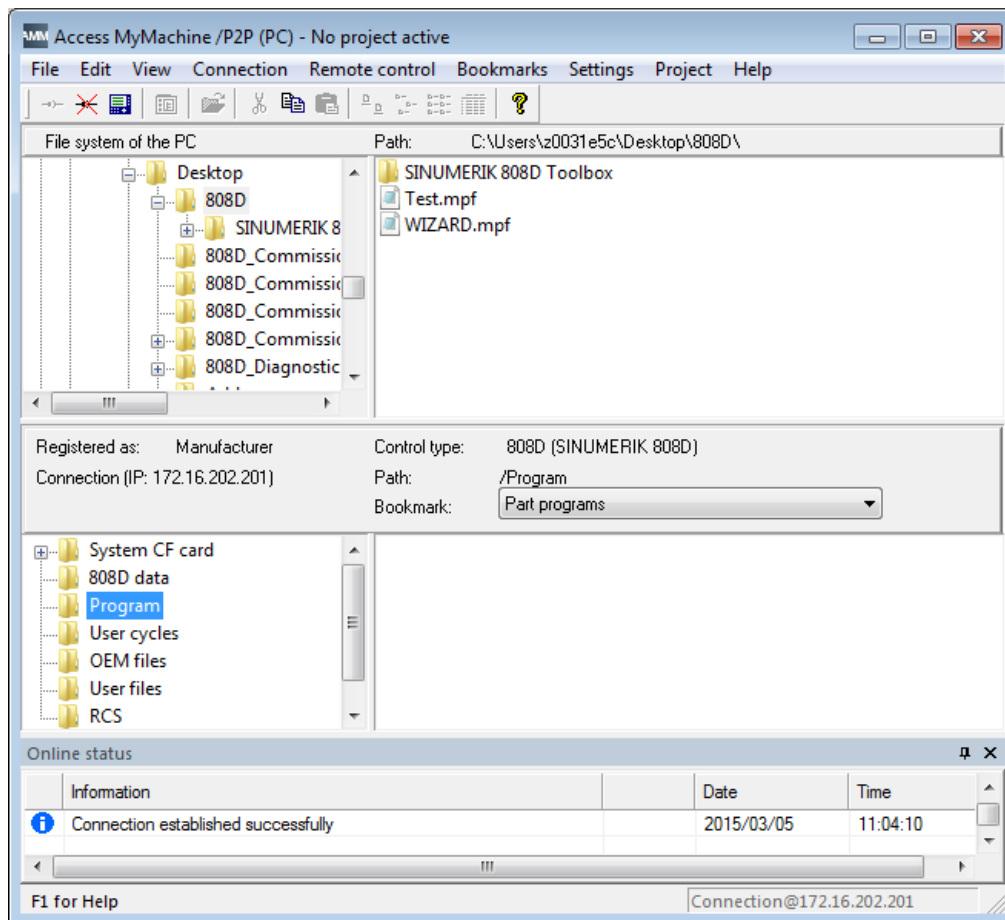
You can edit, rename, copy, or delete part programs, workpiece programs, cycles, and so on directly in the NC file system of the AMM tool.
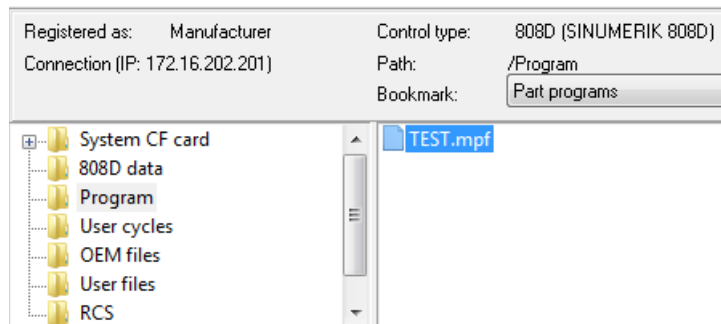
Example of transferring a file to the control system

The file transfer between the control system and a PC is possible by means of simple copy and paste/drag and drop operations.

Proceed as follows to transfer a program file from PC to the control system:

1. Open the main screen of the AMM tool on your PC.
2. Select a desired program file to be transferred (for example, Test.mpf) from the PC file system.
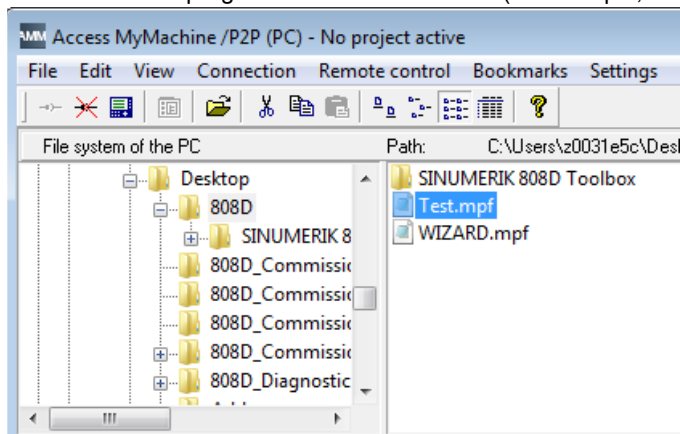
3. Copy the program file with the toolbar button , keyboard shortcuts (Ctrl + C), or from the context menu.

4. Select the program directory in the NC file system.

5. Paste the copied file into the current directory with the toolbar button , keyboard shortcuts (Ctrl + V), or from the context menu.

Registered as:	Manufacturer	Control type:	808D (SINUMERIK 808D)
Connection (IP: 172.16.202.201)		Path:	/Program
		Bookmark:	Part programs

- System CF card
- 808D data
- Program
- User cycles
- OEM files
- User files
- RCS

TEST.mpf

Alternatively, you can transfer the file by simply dragging and dropping it from the PC file system to the NC file system.

After the file is successfully pasted, you can find it in the corresponding directory on the control system.

A.8.3 Remote control

With the remote control function you can:

- Operate the HMI remotely from a PC.
- Generate screenshots of the HMI and save them onto a PC.

Configuring the remote access rights

Proceed through the following steps to configure the remote access rights on the HMI:

SYSTEM ALARM

1. Select the desired operating area on the PPU.

Remote diag.

2. Press this softkey to change the settings, if desired.

Change

3. Press this softkey to make the settings changeable. Note that this softkey is visible only with a system password.

SELECT

4. Use this key to select the desired right for remote access. You can choose to allow the remote operation/monitoring of the HMI, or forbid the remote access to the HMI.

Remote access right

Select in HMI   Permit remote operation

5. Set the behavior of the control system when it receives a remote access request.

Behavior for remote access confirmation

① Confirmation dialog display duration   10 s

② Afterwards remote access is automatically   Permitted

① Specify the duration of the following dialog displaying on the HMI:

```
Remote connection
                          Attention

   Remote control request, is the request permitted?


                                                      9s
```

The following operations on the HMI are possible when this dialog appears:
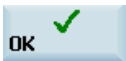
Cancel — Press this softkey to reject the request.

OK — Press this softkey to permit the request.

② Use the following key to select the automatic response for the control system after the above dialog disappears with no softkey operations.

SELECT

6. OK — Press this softkey to save the settings.
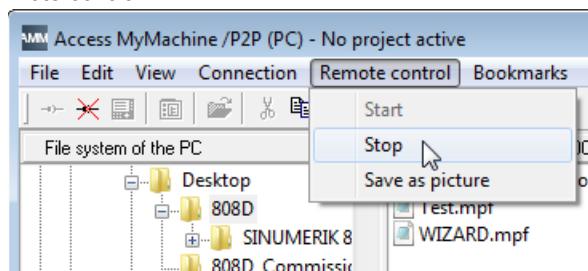
Starting/stopping remote control

Proceed through the following steps to start/stop the remote control of the HMI:

1. Start the AMM tool and establish an Ethernet connection to the control system (see section "Establishing an Ethernet connection (Page 287)").

2. Click the 🔲 button in the toolbar or select from the main window menu as follows to start the remote control.

```
AMM Access MyMachine /P2P (PC) - No project active
File  Edit  View  Connection  Remote control  Bookmarks  S
                                 Start
File system of the PC            Stop              )03
     Desktop                     Save as picture   oo
       808D                      Test.mpf
         SINUMERIK 8             WIZARD.mpf
       808D_Commissic
```
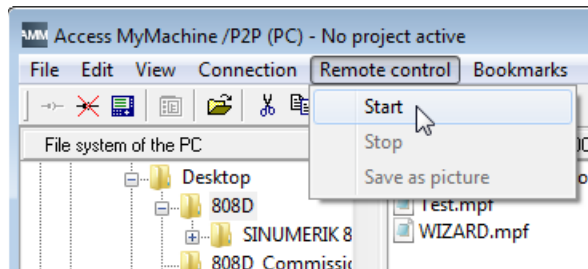
Once the remote control has been started, a monitoring window opens showing the HMI screen contents of the connected control system. You can find a 🔣 symbol in the tip area of the HMI screen.

3. Closing the monitoring window or selecting from the main window menu as follows stops the remote control.

```
AMM Access MyMachine /P2P (PC) - No project active
File  Edit  View  Connection  Remote control  Bookmarks  S
                                 Start
File system of the PC            Stop              )03
     Desktop                     Save as picture   oo
       808D                      Test.mpf
         SINUMERIK 8             WIZARD.mpf
       808D_Commissic
```

A.8.3.1 Operating the HMI via remote control

If the remote control has been started, you can use your mouse to operate the HMI by clicking on the softkeys displayed in the monitoring window.
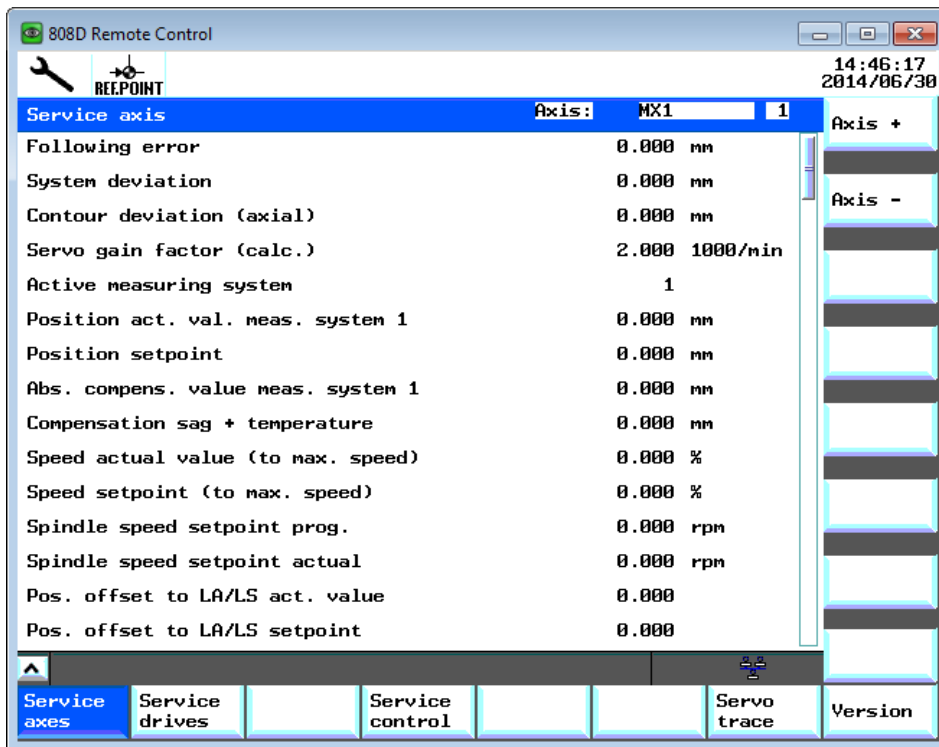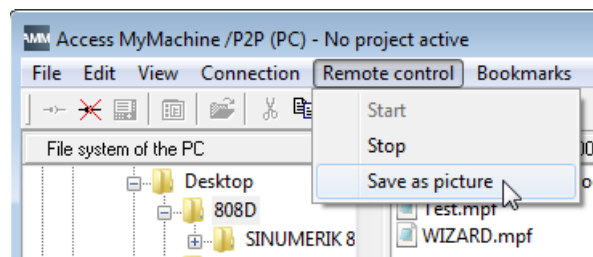

You can perform the return operation by clicking the ⋀ icon in the screen when possible.
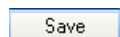
A.8.3.2 Saving the remote control screen as a picture

Operating sequence

1. After the remote control is started, select from the AMM main window menu as follows:

2. Select the target directory on your PC.
3. Specify the picture name and type.
4. Click this button to save the picture.