SIEMENS

SIMOTION

SIMOTION D4x5

Manual

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Valid for SIMOTION D425, D435, D445 and D445-1 as well as CX32, CBE30 and TB30

04/2014

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.

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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.

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

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Preface

Content of the Manual

This **document** is part of the **SIMOTION D documentation package**.

Scope

The *SIMOTION D4x5* Manual is applicable to the SIMOTION D425, SIMOTION D435, and SIMOTION D445/D445-1 devices, as well as the CX32, CBE30, and TB30 supplementary system components.

A separate *SIMOTION D4x5-2* Manual is available for the SIMOTION D4x5-2 devices including the CX32-2, CBE30-2 and TB30 system components.

Standards

The SIMOTION system was developed in accordance with ISO 9001 quality guidelines.

Content of the manual

The following is a description of the purpose and use of the equipment Manual:

- Description
  Provides information about the SIMOTION system and its integration in the automation environment.
- Operator Control (hardware)
  Provides information about the structure and architecture of the devices.
- Interfaces
  Provides information about the different interfaces of the devices, their pin assignment, and possible applications.
- Technical data
  Provides information about the properties and features of the devices.
- Dimension drawings
- Spare Parts/Accessories
  Provides information about spare parts and accessories of the SIMOTION D4x5 and SIMOTION CX32.
- Appendix
  Provides information about the various standards and specifications fulfilled by the device.
- Index for locating information.

SIMOTION Documentation

An overview of the SIMOTION documentation can be found in the SIMOTION Documentation Overview document.

This documentation is included as electronic documentation in the scope of delivery of SIMOTION SCOUT. It comprises ten documentation packages.

The following documentation packages are available for SIMOTION V4.4:

- SIMOTION Engineering System Handling
- SIMOTION System and Function Descriptions
- SIMOTION Service and Diagnostics
- SIMOTION IT
- SIMOTION Programming
- SIMOTION Programming - References
- SIMOTION C
- SIMOTION P
- SIMOTION D
- SIMOTION Supplementary Documentation

Hotline and Internet addresses

Additional information

Click the following link to find information on the the following topics:

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

http://www.siemens.com/motioncontrol/docu

Please send any questions about the technical documentation (e.g. suggestions for improvement, corrections) to the following e-mail address:
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My Documentation Manager

Click the following link for information on how to compile documentation individually on the basis of Siemens content and how to adapt it for the purpose of your own machine documentation:

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Training

Click the following link for information on SITRAIN - Siemens training courses for automation products, systems and solutions:

http://www.siemens.com/sitrain

FAQs

Frequently Asked Questions can be found in SIMOTION Utilities & Applications, which are included in the scope of delivery of SIMOTION SCOUT, and in the Service&Support pages in **Product Support**:

http://support.automation.siemens.com

Technical support

Country-specific telephone numbers for technical support are provided on the Internet under **Contact**:

http://www.siemens.com/automation/service&support

Disposal and recycling of the device

SIMOTION D is an environmentally friendly product. It includes the following features:

- In spite of its excellent resistance to fire, the flame-resistant agent in the plastic used for the housing does not contain halogens.
- Identification of plastic materials in accordance with ISO 11469.
- Less material used because the unit is smaller and with fewer components thanks to integration in ASICs.

The disposal of the products described in this manual should be performed in compliance with the valid national regulations.

The products can be largely recycled owing to their low pollutant content. To recycle and dispose of your old device in an environmentally friendly way, please contact a recycling company certified for electronic waste.

If you have any further questions about disposal and recycling, please contact your local Siemens representative. Contact details can be found in our contacts database on the Internet at:

http://www.automation.siemens.com/partner/index.asp

Further information / FAQs

You can find further information on this manual under the following FAQ:

http://support.automation.siemens.com/WW/view/de/27585482

The following information sources are also available:

- SIMOTION Utilities & Applications: SIMOTION Utilities & Applications will be included in the SIMOTION SCOUT scope of delivery and, along with FAQs, also contain free utilities (e.g. calculation tools, optimization tools, etc.) as well as application examples (ready-to-apply solutions such as winders, cross cutters or handling).
- The latest SIMOTION FAQs at http://support.automation.siemens.com/WW/view/en/10805436/133000

- SIMOTION SCOUT online help
- For additional documentation, see the *Overview of SIMOTION documentation* (separate document)

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Safety instructions

1

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 from 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 from touching live parts on damaged devices

Improper handling of devices can result in damage.

For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Observe the limit values specified in the technical specifications during transport, storage, and operation.
- Do not use damaged 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 power cables that are not used (e.g. brake cores) 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 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 inside and outside the device is prevented.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠ WARNING

Danger to life from unexpected movement of machines when using mobile wireless devices or mobile phones

Using mobile radios 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 off wireless devices or mobile phones in the immediate vicinity of the components.

⚠ WARNING

Danger to life due to fire if overheating occurs because of insufficient ventilation clearances

Inadequate ventilation clearances can cause overheating of components followed by fire and smoke development. This can cause death or serious injury. This can also result in increased downtime and reduced service life 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.

⚠ 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 functions

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

1.1.2 Safety instructions for electromagnetic fields (EMF)



⚠ 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).

1.1.3 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).

1.1.4 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 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 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 lead to death, severe injuries and/or material damage.

- Keep the software up to date.
  Information and newsletters can be found at:
  http://support.automation.siemens.com
- Incorporate the automation and drive components into a state-of-the-art, integrated industrial security concept for the installation or machine.
  For more detailed information, go to:
  http://www.siemens.com/industrialsecurity
- Make sure that you include all installed products into the integrated industrial security concept.

1.1.5 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 enabled.

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 controller 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 defects and/or software errors in the sensors, controllers, actuators, and connection technology
   - Response times of the controller and drive
   - Operating and/or ambient conditions outside of the specification
   - Condensation / conductive contamination
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - 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, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions outside of 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 the contact with fire inside and outside the inverter is not possible.
3. Hazardous touch voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions outside of 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.

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.

1.2 Specific safety information for SIMOTION D4x5



⚠ WARNING

Danger to life from hazardous voltage when connecting an unsuitable power supply

Only safety extra low voltage in accordance with EN/IEC 60950-1 may be connected at all connectors and terminals.

⚠ WARNING

Danger to life from unexpected movement of machines on automatic restart

An automatic restart can be programmed for SIMOTION controllers. When the power returns, the axes start automatically.

Make sure this presents no hazard to personnel or property.

NOTICE

Damage to option boards caused by electric fields or electrostatic discharge

Option boards are ESD-sensitive components.

De-energize the SIMOTION D4x5 device before inserting or removing the option board. SIMOTION D4x5 is in a de-energized state when all the LEDs are OFF.

Comply with the ESD rules.

NOTICE

Damage to the CompactFlash card from electrical fields or electrostatic discharge

The CompactFlash card is an ESD-sensitive component.

De-energize the SIMOTION D4x5 device before inserting or removing the CompactFlash card. SIMOTION D4x5 is in a de-energized state when all the LEDs are OFF.

Comply with the ESD rules.

NOTICE

Higher operating temperature if ventilation clearances are too small

The 80 mm clearances above and below the components must be observed.

The unit protects itself from overheating by shutting down.

The ventilation clearance is measured from the lower edge of the module, i.e. the fan/battery module is not included in the dimension.

Description 2

2.1 System overview

Overview

SIMOTION D is a drive-based version of SIMOTION based on the SINAMICS S120 drive family.

With SIMOTION D, the SIMOTION PLC and motion control functionalities as well as the SINAMICS S120 drive software run on shared control hardware.

SIMOTION D is available in two versions:

- SIMOTION D410 is a compact Control Unit for single-axis applications and is snapped on to the SINAMICS S120 PM340 power module in blocksize format.
- SIMOTION D4x5 is a Control Unit for multi-axis applications in SINAMICS S120 booksize format and is offered in several performance variants:
  - SIMOTION D425 (BASIC performance) for up to 16 axes
  - SIMOTION D435 (STANDARD performance) for up to 32 axes
  - SIMOTION D445/D445-1 (HIGH Performance) for up to 64 axes
    Compared with SIMOTION D445, SIMOTION D445-1 offers an improvement in PLC and motion control performance of approximately 30%, depending on the application. Consequently, SIMOTION D445-1 is the preferred solution for new applications as of V4.1 SP2.

This manual describes the SIMOTION D4x5 for multi-axis applications. Separate manuals are available for the SIMOTION D410 and D410-2 single-axis modules and the SIMOTION D4x5-2 multi-axis modules.

Like SINAMICS S120, SIMOTION D also follows the Totally Integrated Automation (TIA) concept. TIA is characterized by integrated data management, configuration, and communication for all products and systems. Thus, an extensive toolbox of automation modules is also available for SIMOTION D.

Note

In order to cover all versions of SIMOTION D for multi-axis applications, the product will be referred to as "D4x5". Specific product designations will be used for information that applies only to one product version, e.g. D435.

Application

SIMOTION D4x5 is ideally suited to applications with many coordinated axes with high clock-pulse rates.

Typical applications include:

- Compact multiple-axis machines
- High-performance applications with short machine cycles
- Compact machines
  - Including the complete machine control in the drive
  - With extensive connection possibilities for communication, HMI and I/O
- Distributed drive concepts
  - Applications with many axes
  - Synchronization of several SIMOTION D Control Units using distributed synchronous operation

Versions

The individual versions - SIMOTION D425 (BASIC Performance), SIMOTION D435 (STANDARD Performance) and SIMOTION D445/D445-1 (HIGH Performance) - differ in terms of their PLC performance and motion control performance. The main distinguishing features are:

	SIMOTION D425	SIMOTION D435	SIMOTION D445/D445-1
Maximum number of axes	16	32	64
Minimum servo/interpolator cycle clock	2.0 ms	1.0 ms	0.5 ms
DRIVE-CLiQ interfaces	4	4	6

SIMOTION D4x5 features PLC and motion control performance (open-loop control and motion control) for up to 16, 32 or 64 axes, as required.

Due to the following functional improvements, we recommend using a SIMOTION D445-1 instead of a SIMOTION D445 for new applications as of V4.1 SP2:

- An increase of around 30% in PLC and motion control performance, depending on the application
- Less mounting depth (mounting is possible even without spacers)
- Double-fan/battery module for higher availability
- Further information (http://support.automation.siemens.com/WW/view/en/31507782).

The computing functions integrated into the drive allow the D4x5 Control Unit to operate up to six servo, four vector or eight *V/f* axes.

The drive control supports servo control (for a highly dynamic response), vector control (for maximum torque accuracy) and *V/f* control.

Note

With the SIZER configuration tool, you can easily configure the SINAMICS S120 drive family including SIMOTION.

It provides you with support for selecting and dimensioning the components required for a motion control task.

You can also determine the possible number of axes and the resulting load with SIZER in accordance with your performance requirements.

Hardware components

As the central hardware, SIMOTION D uses the SIMOTION D4x5 as a Control Unit consisting of the SIMOTION runtime system and the SINAMICS drive control. The Control Unit uses the SINAMICS Integrated drive with various SINAMICS S120 drive modules (line and motor modules) to perform open-loop and closed-loop control of the axis grouping. A range of additional SINAMICS S120 components, such as SMx encoder systems or terminal modules can be connected via DRIVE-CLiQ. With a few exceptions (e.g. no basic positioner EPOS, no basic operator panel BOP20, etc.), the drive control integrated in SIMOTION D has the same control characteristics and performance features as the SINAMICS S120 CU320 Control Unit. The EPOS functionality is provided by the SIMOTION technology functions. The functionality of SIMOTION D can be expanded with the distributed I/O via PROFIBUS or with the CBE30 Ethernet communication board via PROFINET IO.
The following figure shows a typical SIMOTION D axis grouping.

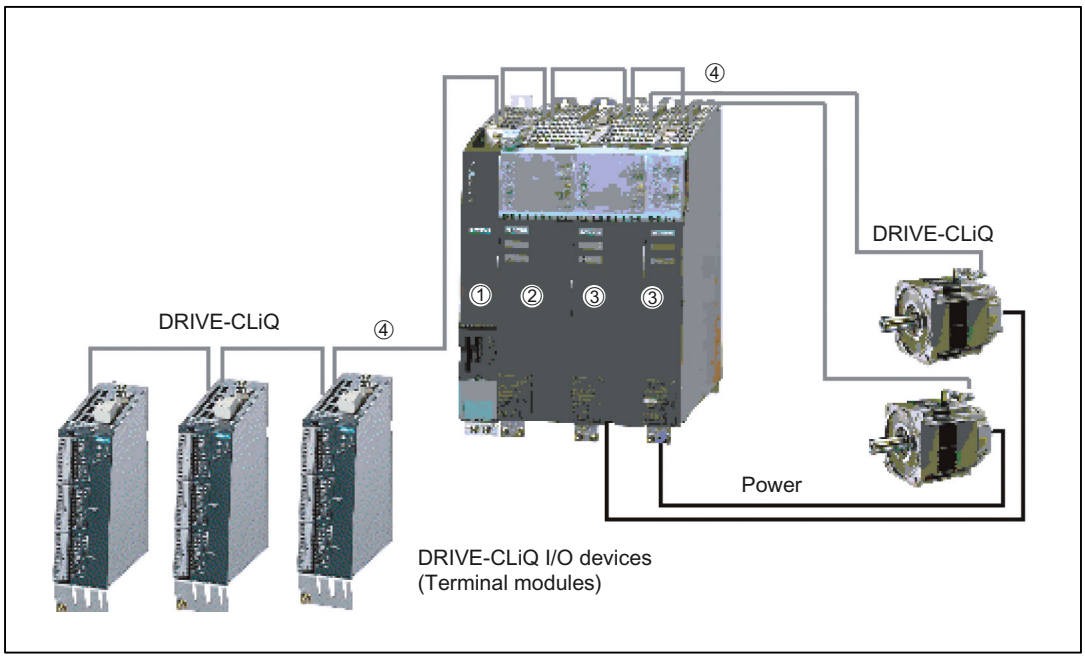


Figure 2-1 Example of a SIMOTION D4x5 axis assembly

A SIMOTION D axis grouping generally consists of the following elements:

- **SIMOTION D** (Control Unit) (1)
  This unit contains the programmable runtime system of SIMOTION and the drive software of SINAMICS S120. In principle, SIMOTION D is capable of controlling multiple axes/drives.
- One **SINAMICS infeed** (line module) (2)
  This module generates a DC link from the supply system.
- **SINAMICS power units** (motor modules) (3)
  These modules are used to control motors.
  It is also possible to operate SINAMICS PM340 power modules with the SINAMICS Control Unit adapter (CUA). A separate infeed is then unnecessary.
- **DRIVE-CLiQ components** (4)
  In SINAMICS S120 / SIMOTION D, the individual components of the drive system communicate with each other via DRIVE-CLiQ. In addition to power components, encoder systems and special DRIVE-CLiQ I/O devices can also be linked via DRIVE-CLiQ.

Extension of the drive computing performance

The motion control performance of a SIMOTION D4x5 can be utilized in full by expanding the computing performance at the drive in two different ways:

- SINAMICS S110/S120 Control Units complete with further SINAMICS S110/120 drive modules can be connected via PROFIBUS or PROFINET.
- With SIMOTION D435 and D445/D445-1, the CX32 controller extension can be connected via DRIVE-CLiQ. This module is extremely compact and can control up to six servo, four vector or eight *V/f* axes.

Software components

The basic functionality of SIMOTION D is supplied on a CompactFlash card containing the following:

The SIMOTION runtime system with the following functions:

- User-programmable runtime system (IEC 61131)
- Various runtime levels (tasks)
- PLC and arithmetic functionality
- Motion control functions
- Communication functions

The SINAMICS S120 drive control with the following functions:

- Current and torque control
- Speed control
- Closed-loop infeed

2.2 System components

Central components

SIMOTION D4x5 communicates with automation components via the following interfaces:

- PROFIBUS DP
- Ethernet
- PROFINET IO (when using a CBE30)
- DRIVE-CLiQ (DRIVE Component Link with IQ).

SIMOTION D features a SINAMICS Integrated drive element. Communication with the SINAMICS Integrated is via PROFIBUS mechanisms (DP Integrated).

The most important components of the system and their functions are shown below.

Table 2-1 Central components

Component	Function
SIMOTION D4x5 controller	... is the central motion control module. This module contains the programmable SIMOTION runtime for the SIMOTION D4x5 and the SINAMICS S120 drive software. You can use the integrated high-speed digital I/Os as: • Homing inputs • Inputs for measuring inputs • User-addressable process I/Os • Outputs for fast output cams The measuring sockets can output any analog signals.
System software	The basic functionality of SIMOTION D is supplied on a CompactFlash card containing the following: • SIMOTION runtime (kernel) • Drive software of SINAMICS S120 - implements all drive functions
Power supply	... provides the electronics power supply for SIMOTION D, e.g. via the SITOP power supply.

PROFIBUS DP

The control unit can communicate with the following components via the PROFIBUS DP interfaces:

Table 2-2 Components on PROFIBUS DP

Component	Function
Programming device (PG/PC)	... configures, parameterizes, programs, and tests with the "SIMOTION SCOUT" engineering system (ES)
SIMATIC HMI device	... is used for operating and monitoring functions. This is not an essential requirement for the operation of a control unit

Component	Function
Other controllers (e.g. SIMOTION or SIMATIC)	.. e.g. higher-level controller (plant controller); modular machine concepts with multiple controllers, distributed across individual machine modules.
Distributed I/O systems	
SIMATIC ET 200M	Modular I/O system for control cabinet installation and high channel density
SIMATIC ET 200S	Finely scalable I/O system for control cabinet configuration and particularly time-critical applications; including motor starters, safety technology and individual grouping of load groups
SIMATIC ET 200pro	Modular I/O system with IP65/67 degree of protection for machine-related applications with no control cabinet; with features such as compact designs, integrated PROFIsafe safety technology, PROFINET connection and live module replacement.
SIMATIC ET 200eco	I/O system with IP65/67 degree of protection for cabinet-free use close to the machine with flexible and fast ECOFAST or M12 connection methods
Other PROFIBUS I/O	
Gateways	• DP/AS-Interface link 20E and DP/AS-Interface link Advanced for the PROFIBUS DP gateway to AS-Interface • DP/DP coupler for connecting two PROFIBUS DP networks
Drive interfaces	• ADI4 (Analog Drive Interface for 4 axes) for connection of drives with analog ± 10 V setpoint interface or for external encoders • IM174 (Interface Module for 4 axes) for connection of drives with analog ± 10 V setpoint interface, for external sensors, or for connection of stepper drives with pulse-direction interface
Drive units with PROFIBUS DP interface (e.g. SINAMICS S120)	... convert speed setpoints into signals for controlling the motor and supply the power required to operate the motors. Can also be operated as an isochronous slave on the PROFIBUS DP.
Teleservice adapter	Remote diagnostics

Ethernet

The control unit can communicate with the following components via the Ethernet interfaces or be embedded in an automation environment:

Table 2-3 Components on the Ethernet

Component	Function
Programming device (PG/PC)	... configures, parameterizes, programs, and tests with the "SIMOTION SCOUT" engineering system (ES)
Master computer	... communicates with other devices via UDP, TCP/IP
SIMATIC HMI device	... is used for operating and monitoring functions. This is not an essential requirement for the operation of a control unit.

PROFINET IO

The use of a Communication Board Ethernet (CBE30) enables SIMOTION D4x5 to communicate with the following components via PROFINET IO:

Table 2-4 Components on the PROFINET IO

Component	Function
Programming device (PG/PC)	... configures, sets parameters, programs and tests using the SIMOTION SCOUT Engineering System (ES).
SIMATIC HMI device	... is used for operating and monitoring functions. This is not an essential requirement for the operation of a control unit.
Other controllers (e.g. SIMOTION or SIMATIC)	... e.g. higher-level controller (plant controller); modular machine concepts with multiple controllers, distributed across individual machine modules.
Master computer	... communicates with other devices via UDP, TCP/IP.
Distributed I/O systems	
SIMATIC ET 200M	Modular I/O system for control cabinet installation and high channel densities.
SIMATIC ET 200S	Finely scalable I/O system for control cabinet installation and particularly time-critical applications; including motor starters, safety technology and individual grouping of load groups.
SIMATIC ET 200pro	Modular I/O system with IP65/67 degree of protection for machine-related applications with no control cabinet; with features such as compact designs, integrated PROFIsafe safety technology, PROFINET IO connection and live module replacement.
SIMATIC ET 200eco PN	Compact block I/O with IP65/66/67 degree of protection for cabinet-free usage in machines with M12 connection method. Very rugged and resistant encapsulated metal enclosure.
Other PROFINET IO I/O devices	
Drive units with PROFINET IO interface	... convert speed setpoints into signals for controlling the motor and supply the power required to operate the motors.
Gateways	• IE/AS-Interface link PN IO for the PROFINET IO gateway to AS-Interface • PN/PN coupler for connecting two PROFINET IO networks

DRIVE-CLiQ

The DRIVE-CLiQ interfaces permit a fast connection to the SINAMICS drive components.

DRIVE-CLiQ offers the following advantages within the DRIVE-CLiQ topology rules:

- Expandability of components
- Automatic detection of components by the Control Unit
- Standardized interfaces to all components
- Uniform diagnostics down to the components
- Complete service down to the components
- Simple mechanical handling

The controller can communicate with the following components via DRIVE-CLiQ:

Table 2-5 Components connected to DRIVE-CLiQ

Component	Function
Control unit (SINAMICS S110/ S120)	Central control module in which the open- and closed-loop control functions for the drive are implemented.
Line Module (SINAMICS S120)	... generates a DC link from the supply system.
Motor Module (SINAMICS S120)	... used to control motors (DC/AC inverters, booksize).
Power Module (SINAMICS S110/ S120)	...used to control motors (AC/DC converters, blocksize).
CX32 controller extension	... enables additional axes to be connected for SIMOTION D435 and D445/D445-1.
CUA31/CUA32 control unit adapter	...enables a Power Module in blocksize format (PM340) to be connected to a booksize Control Unit D4x5, CX32 or CU320.
TM31 Terminal Module	... enables a terminal expansion via DRIVE-CLiQ (additional analog and digital I/Os).
TM41 Terminal Module	... enables a terminal expansion (analog and digital I/Os) and encoder simulation.
TM54F Terminal Module	... enables terminal expansion (secure digital I/Os) for controlling the secure motion monitoring functions of the integrated drives.
TM15, TM17 High Feature Terminal Modules	The Terminal Modules TM15 and TM17 High Feature are used to implement measuring inputs inputs and output cam outputs. In addition, these Terminal Modules provide drive-related digital I/Os with short signal delay times.
SMx Sensor Modules	... enable acquisition of encoder data from connected motors via DRIVE-CLiQ.
Motors with DRIVE-CLiQ interface	...allow simplified commissioning and diagnostics, as the motor and encoder type are identified automatically.
DMC20/DME20 DRIVE-CLiQ hub	…enables the number of DRIVE-CLiQ interfaces to be increased and the creation of a star-shaped topology.

Note

You can find detailed information about components in the SINAMICS S110/S120 family of products in the SINAMICS S110/S120 manuals.

Optional components

The functionality of the D4x5 Control Unit can be expanded by using one of the components listed below.

Table 2-6 Optional components

Component	Function
Communication Board Ethernet CBE30	Communication via PROFINET IO with IRT and PROFINET IO with RT
TB30 terminal board	Terminal expansion, i.e. additional analog and digital I/Os

The selected component is plugged into the option slot of the Control Unit.

Note

CBE30 can only be used in SIMOTION D4x5 Control Units.

CBE30-2 can only be used in SIMOTION D4x5-2 Control Units.

2.3 I/O integration

Note

Note that not all modules in the ET 200 I/O family are approved for SIMOTION. Moreover, system-related functional differences can come into play when these I/O or I/O systems are used on SIMOTION vs. on SIMATIC. For example, special process-control functions (e.g., HART modules, etc.) are not supported by SIMOTION for the ET 200M distributed I/O system.

A detailed, regularly updated list of the I/O modules approved for use with SIMOTION, as well as notes on their use, can be found on the Internet at (http://support.automation.siemens.com/WW/view/en/11886029):

In addition to the I/O modules enabled for SIMOTION, in principle all certified standard PROFIBUS slaves (DP-V0/DP-V1/DP-V2) and PROFINET IO devices with RT and IRT real-time classes may be connected to SIMOTION D4x5. These modules are integrated using the GSD file (PROFIBUS) or GSDML file (PROFINET) provided by the relevant device manufacturer.

Note

Please note that in individual cases further boundary conditions must be fulfilled in order to integrate a standard slave/standard device into SIMOTION. Thus, a few modules require "driver blocks" , e.g., in the form of function blocks, that permit (or simplify) integration.

For modules enabled for SIMOTION (e.g. SIMATIC S7-300 module FM 350-1, etc.), these driver modules are part of the SIMOTION SCOUT Engineering System command library.

2.4 Representation of SIMOTION D425 and SIMOTION D435

The following figure shows the SIMOTION D425 or SIMOTION D435 with its interfaces and front panel elements (fault and status displays).

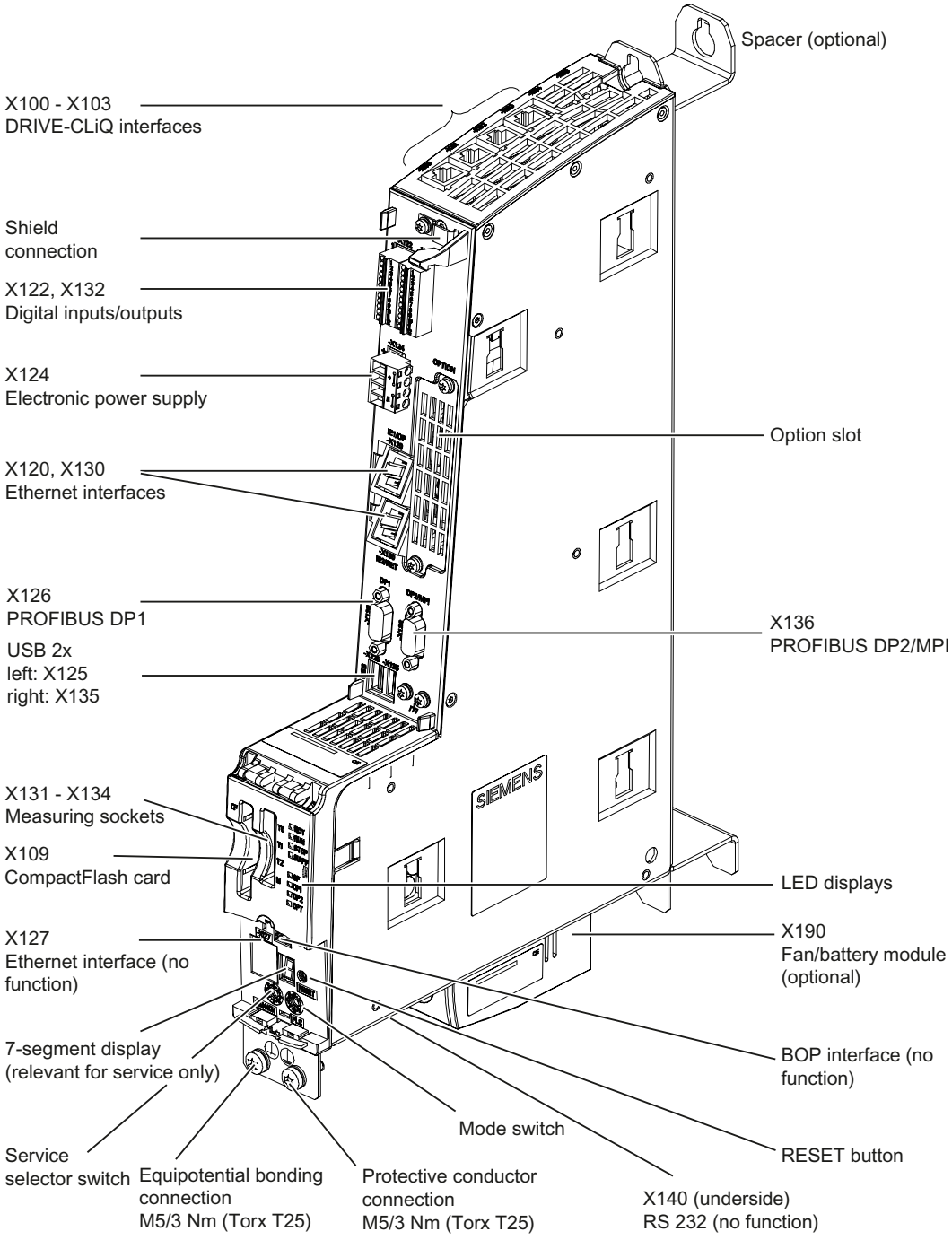


Figure 2-2 Location of interfaces and front panel elements of SIMOTION D425 and SIMOTION D435

Note

SIMOTION D425 and D435 come with pre-assembled spacers. These can be removed if necessary.

2.5 Representation of SIMOTION D445

The following figure shows the SIMOTION D445 with its interfaces and front panel elements (fault and status displays).

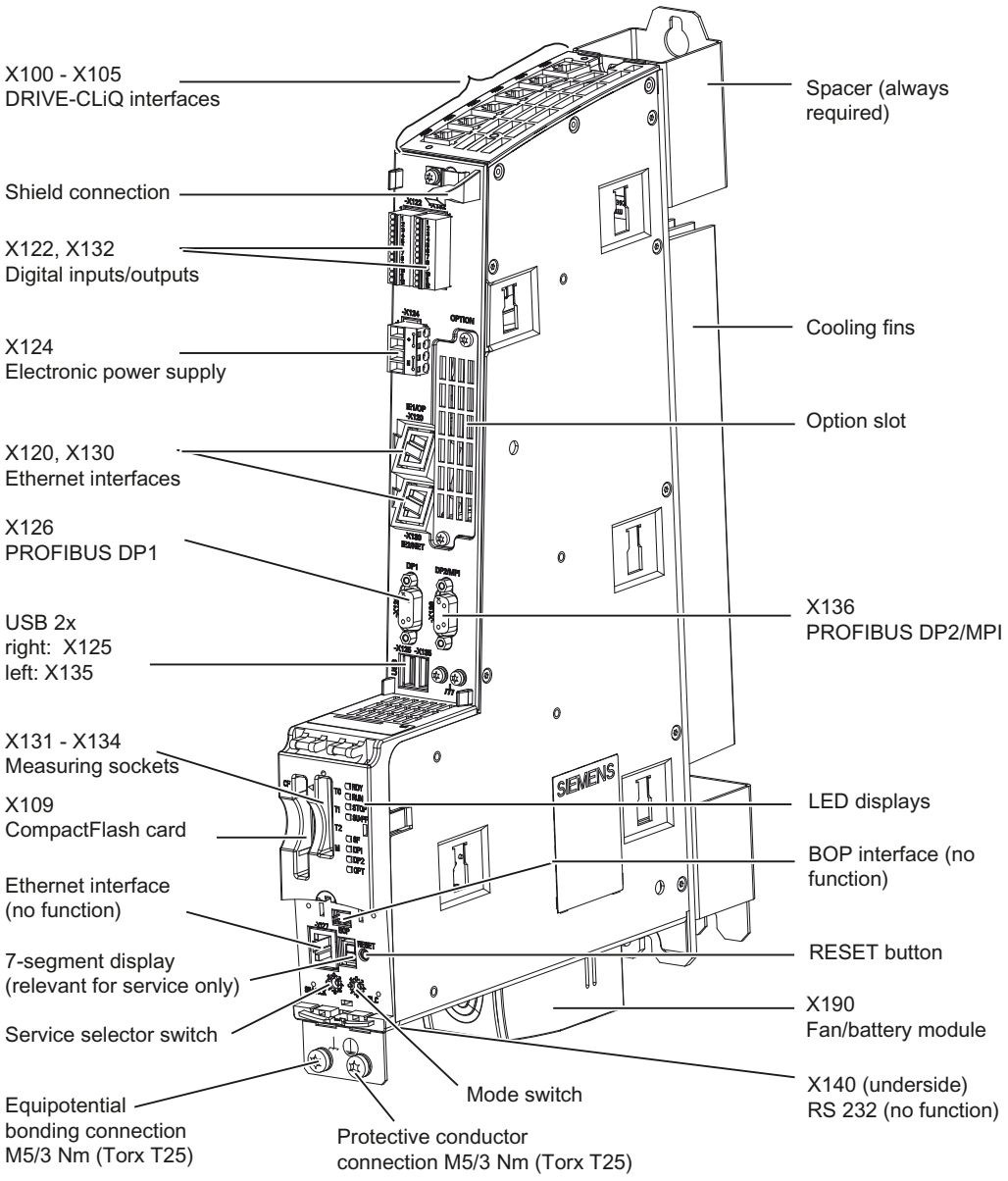


Figure 2-3 Location of interfaces and front panel elements of SIMOTION D445

Note

SIMOTION D445 must be operated with a fan / battery module for heat dissipation. Without a fan/battery module, the control unit will not start up and cannot be commissioned.

You will find a description of how to install the fan/battery module in Section "Spare Parts/ Accessories" Installing the fan/battery module (Page 85).

Note

The spacers cannot be removed in the case of the SIMOTION D445.

2.6 SIMOTION D445-1 image

The following figure shows the SIMOTION D445-1 with its interfaces and front panel elements (fault and status displays).

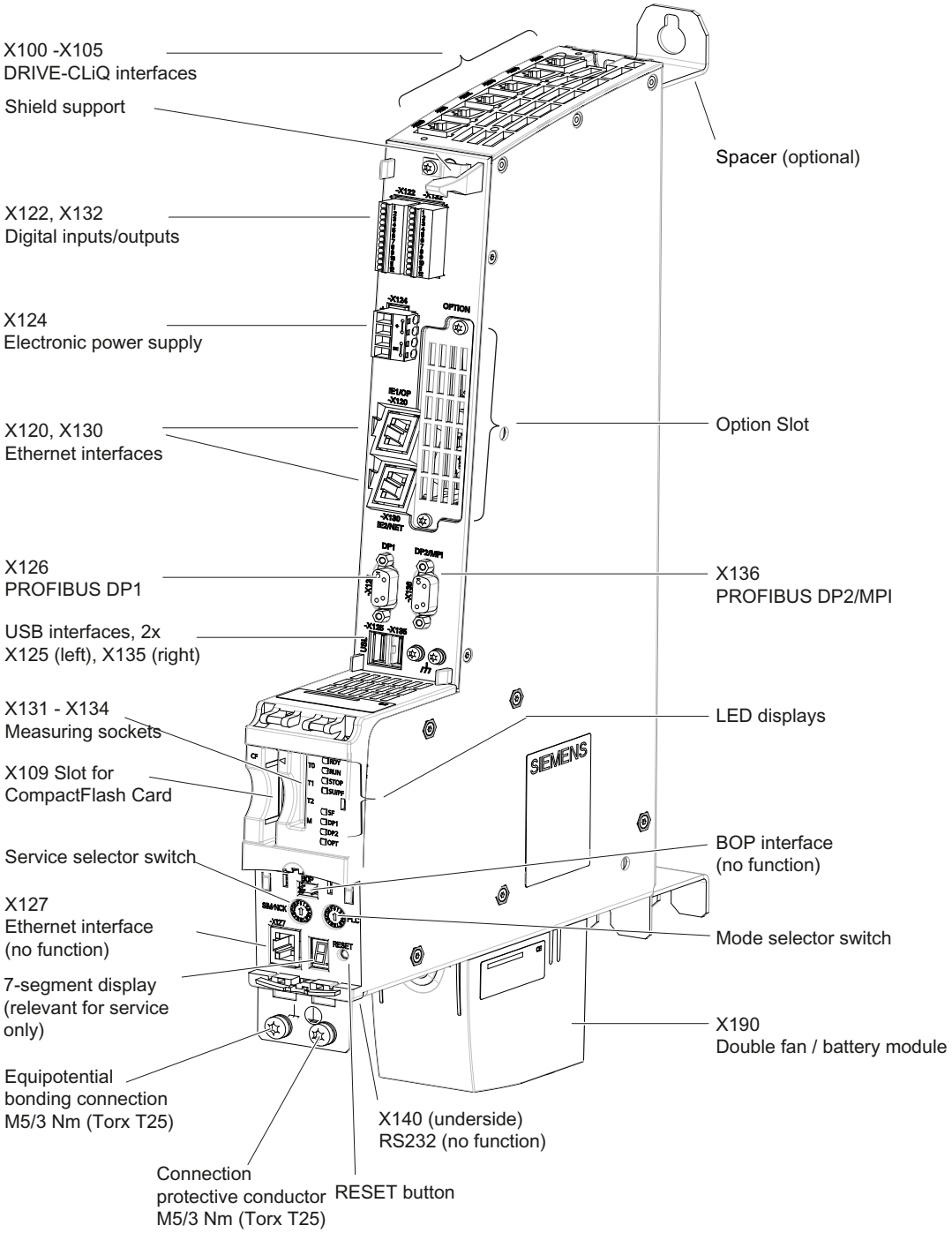


Figure 2-4 Location of interfaces and front panel elements of SIMOTION D445-1

Note

SIMOTION D445-1 must be operated with a double fan/battery module for heat dissipation. Without this module, the control unit will not start up and cannot be commissioned.

You will find information on how to install the double fan/battery module in "Spare Parts/ Accessories," Section Installing the fan/battery module (Page 85).

Note

SIMOTION D445-1 comes with pre-assembled spacers. These can be removed if necessary.

2.7 Nameplates

Side-mounted type plate

The figure below shows all the information included on the type plate located on the side of the unit.

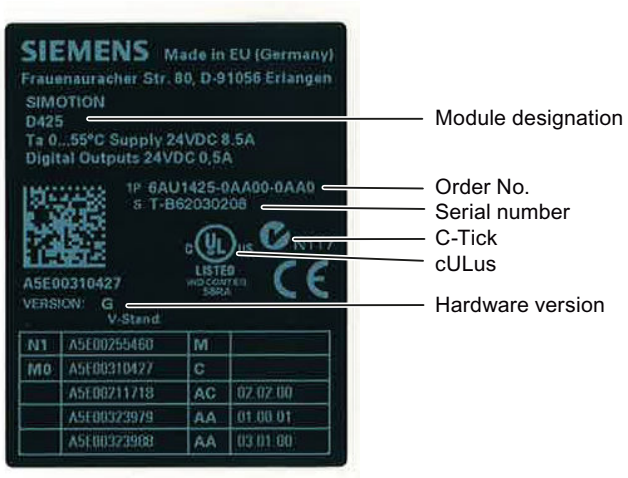


Figure 2-5 D425 type plate

Note

The information contained in each field of the type plate on your actual Control Unit may differ from that presented in this manual (for example, a later product version, approvals and marks that have not yet been earned, etc., may be shown).

MAC addresses

A second type plate for the MAC addresses of the two Ethernet interfaces is attached to the front of the device. You see this type plate when you open the front cover of the control unit.

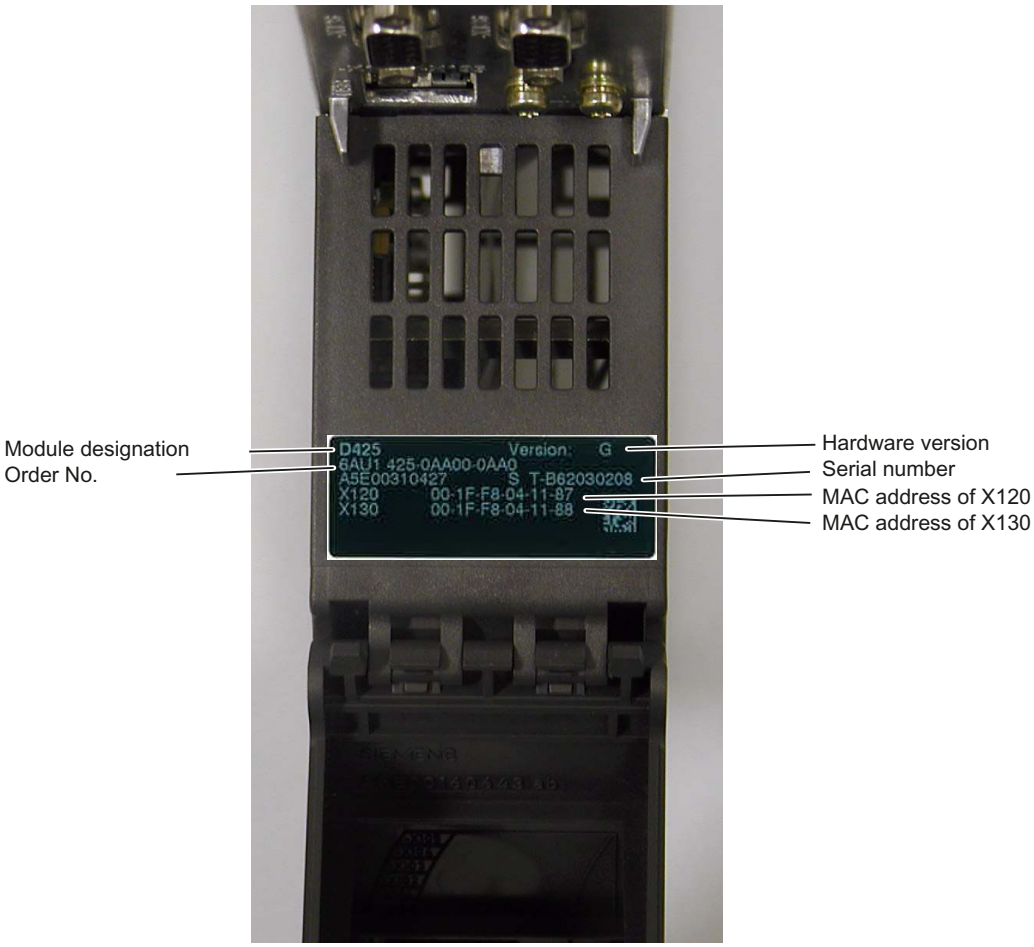


Figure 2-6 D4x5 MAC addresses

2.8 CompactFlash card

2.8.1 Usage and function of the CompactFlash Card

The CompactFlash card (CF card) is inserted in the slot with the designation CF (X109 interface).

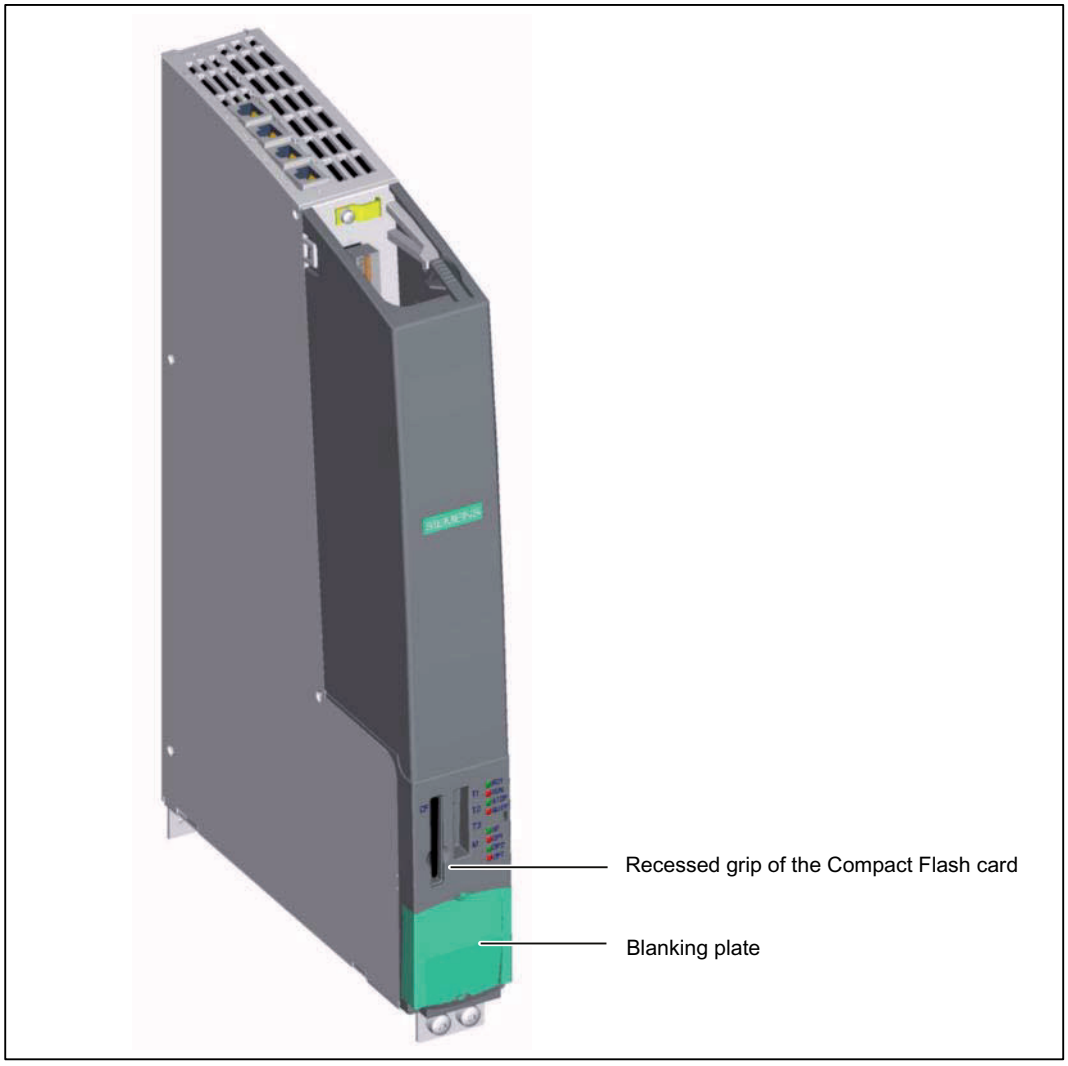


Figure 2-7 Slot for CompactFlash card

The CF card does not extend beyond the housing. An ergonomic recessed grip enables the CF card to be removed.

Characteristics of the CF card

The CF card is mandatory for operation of the SIMOTION D4x5. The CF card is not supplied with the SIMOTION D4x5 and must be ordered separately.

The SIMOTION Kernel (SIMOTION D4x5 firmware) and the software used to control the drives (SINAMICS firmware) are contained on the CF card.

The CF card is used for:

- Backing up the technology packages and user data (programs, configuration data, parameter assignments)
- Updates (e.g., SIMOTION firmware update)

The licenses for the technology functions are linked to the serial number of the CF card. This means the CF card can be inserted in a different SIMOTION D without having to change the licenses.

The CF card is supplied in a bootable format with the latest SIMOTION Kernel and drive software.

NOTICE
Damage to the CompactFlash card from electrical fields or electrostatic discharge
The CompactFlash card is an ESD-sensitive component.
De-energize the SIMOTION D4x5 device before inserting or removing the CompactFlash card. SIMOTION D4x5 is in a de-energized state when all the LEDs are OFF.
Comply with the ESD rules.

Additional information

For additional information about inserting, changing, write-accessing, and formatting the CF card, see the *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

2.8.2 CompactFlash card

CF card

CF cards with different storage capacities are available for SIMOTION D4x5.

At the time of writing, these were:

- 1-GB CF, order number 6AU1400-2PA0*-0AA0
- 512-MB CF, order number 6AU1400-2NA00-0AA0
- 64-MB CF, order number 6AU1400-2KA0*-0*A0
- 32-MB CF, order number 6AU1400-2JA0*-0*A0

You will find detailed information on the compatibility relationships for the CF card, boot loader version, SIMOTION D hardware and SIMOTION firmware version in the software compatibility

list. You can find this list both in the documentation that comes with the SIMOTION SCOUT DVD under \1_Important\Germany\Kompatibilitaet\… and on the Internet (http://support.automation.siemens.com/WW/view/en/18857317).

Type plate information

The following figure shows you all the information included on the type plate of the CF card.

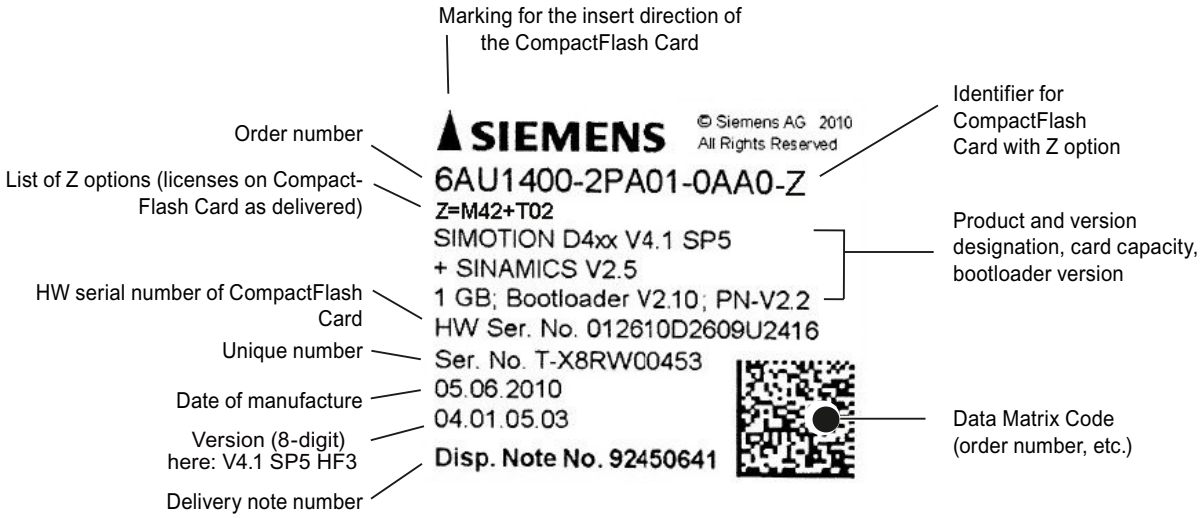


Figure 2-8 Rating plate of the CF card (example of 1-GB CF card)

Pre-installed runtime licenses

From V4.1 SP1 HF6, pre-installed licenses are printed on the type plate of the CF card as a Z option on the label underneath the order number.

Example

Example with Z option for D425 MultiAxes Package + two TControl licenses:

6AU1400-2PA01-0AA0-Z

Z=M42+T02

A maximum of 7 different Z options are printed on the label of the CF card. When there are more than 7 different Z options, the text "Z = see delivery order" is printed on the CF card in place of the Z options.

Available Z options / licenses for CF cards

- Axis licenses
  - Pxx POS license and number (e.g. P02 = 2x POS license)
  - Gxx GEAR license and number (e.g. G03 = 3 x GEAR licenses)
  - Cxx CAM license and number (e.g. C01 = 1x CAM license)
- MultiAxes package
  - M00 MultiAxes package license (platform independent)
  - M42-MultiAxes Package license for D425
  - M43-MultiAxes Package license for D435 (incl. D425)
  - M44-MultiAxes Package license for D445/D445-1 (incl. D425 and D435)
- MultiAxes and SAFETY INTEGRATED EXTENDED Package
  - S42/S43/S44 license as M42/M43/M44 license, but also including licensing of the Safety Integrated Extended Functions for all drives on SINAMICS Integrated/CX32
- TControl temperature control
  - Txx TControl license and number (e.g. T03 = 3x TControl licenses)
- SIMOTION IT
  - D00 - SIMOTION IT DIAG license (no longer under license as of SIMOTION V4.2)
  - X00 - SIMOTION IT OPC XML-DA license (no longer under license as of SIMOTION V4.2)
  - J00 - SIMOTION IT Virtual Machine license for Java applications
- Safety functions
  - Fxx-License for SINAMICS Safety Integrated Extended Functions (for integrated SINAMICS drives for SIMOTION D4x5 and CX32) (e.g. F02=2x Safety Integrated Extended Functions).

Note

CF cards provided as part of a MultiAxes bundle do not have this additional labeling option. Depending on the version, a MultiAxes bundle consists of a SIMOTION D425, D435 or D445/D445-1 plus a CF card with a "MultiAxes Package" license for the relevant SIMOTION D hardware.

2.8.3 Data matrix code on CF card

SIMOTION D CompactFlash Cards have a machine-readable identification in the form of a data matrix code (2D code).

Reader units that support the data matrix code in accordance with ECC 200 are suitable for reading the code used here.

Analysis

Example of a data string from the reader unit:

1P6AU1400-2PA01-0AA0-Z+ST-WOQB02934+30SST0B8365550000079001.

Table 2-7 Machine-readable identification via 2D code

Feature	Property
Order number ("1P" identifier to identify the products)	6AU1 400-2PA01-0AA0-Z
Serial number ("S" identifier, item number)	T-WOQB02934
HW serial number ("30S" identifier)	ST0B8365550000079001

In addition to the "serial number", CompactFlash Cards also have a "HW serial number".

If licenses are purchased for functions under license, a "license key" is generated from the HW serial number of the CompactFlash Card and the serial number of the purchased licenses, which is only valid for the respective CompactFlash Card.

The data required for the licensing can be read by reader unit via the bar codes on the license certificates (Certificate of License "CoL") and the 2D code on the CompactFlash Card in order, for example, to automate the licensing process.

Operator control (hardware) 3

3.1 Overview of operator control and display elements

The following figure shows the arrangement of the operator control and display elements of a SIMOTION D4x5.

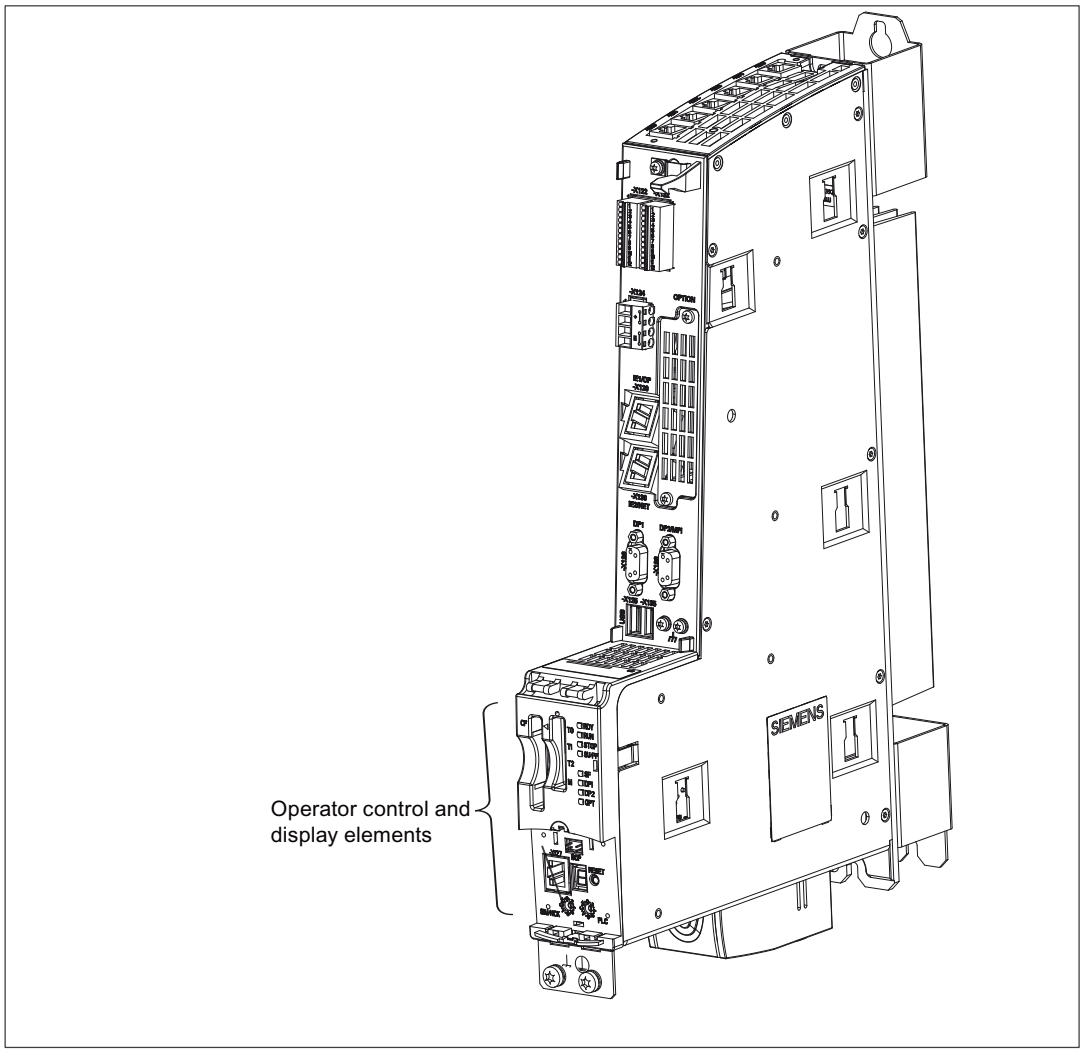


Figure 3-1 Position of operator control and display elements

The operator control and display elements are described in detail below.

The arrangement of the operator control and display elements will depend on the specific SIMOTION D4x5 device version.

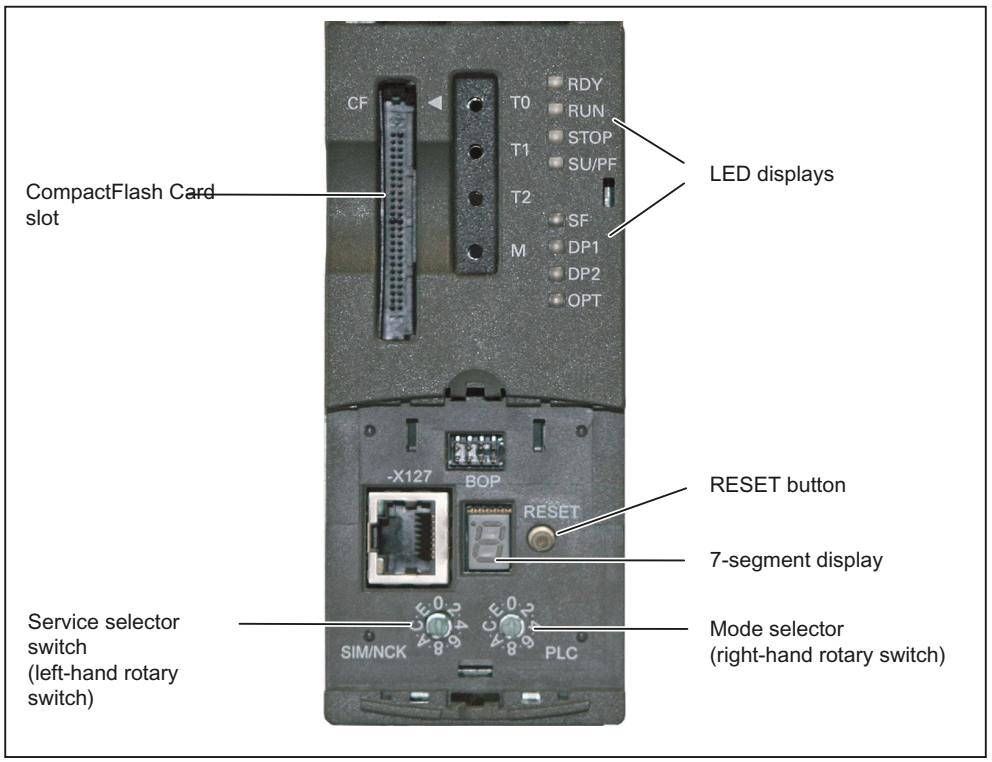


Figure 3-2 Operator control and display elements on the D425/D435/D445

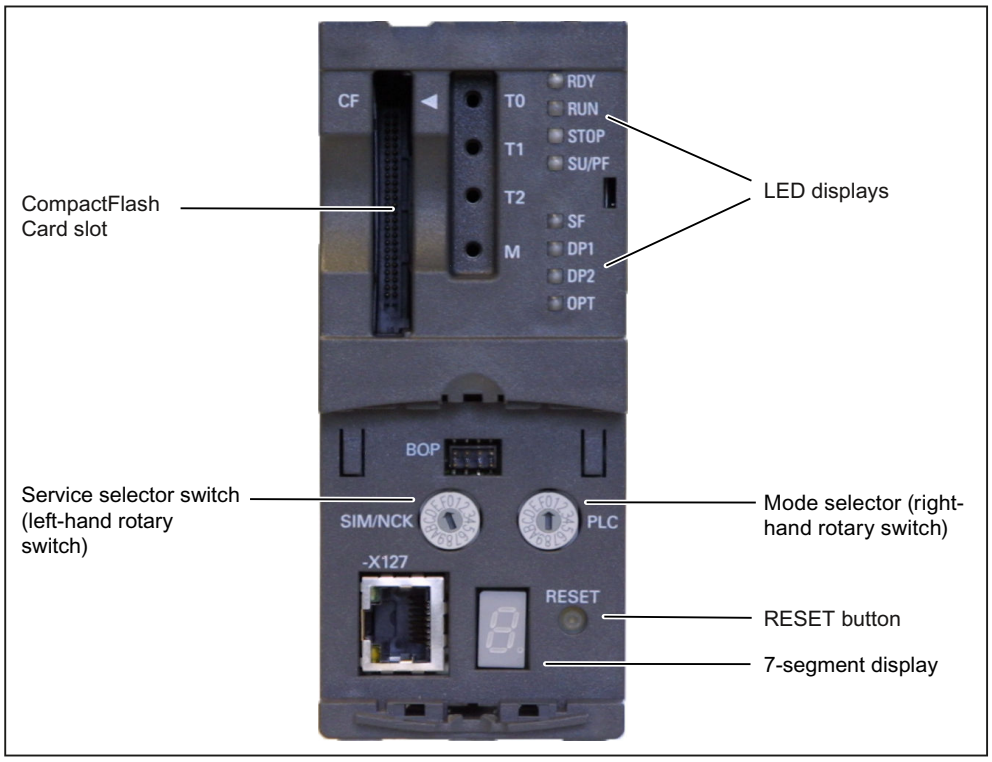


Figure 3-3 Operator control and display elements on the D445-1

3.2 Operator control elements

3.2.1 Service and operating mode switch

Properties of the service and operation mode switch

SIMOTION D4x5 has a Service selector switch and a mode switch in the lower section of the front panel.

The switch on the right labeled PLC is used for switching the operating mode of the SIMOTION D4x5.

The Service selector switch on the left (labeled SIM/NCK) is for service and diagnosis functions only. In "normal" operation this switch must remain in the 0 position (see figure below).

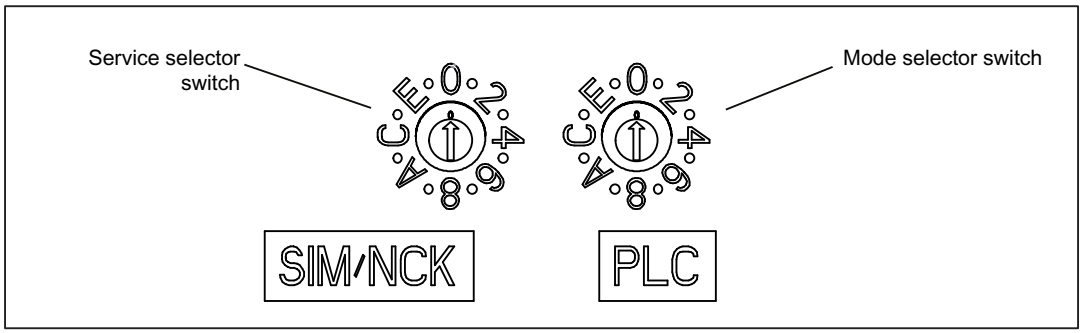


Figure 3-4 Mode switch and Service selector switch SIMOTION D4x5

NOTICE
Damage from electrostatic discharge
The rotary switch can be destroyed by static electricity.
Operate the rotary switch only with an insulated screwdriver.
Comply with the ESD rules.

Mode switch

The following table contains the possible mode switch positions and the associated LED displays. The mode switch positions are explained in the order in which they are arranged on the SIMOTION D4x5.

Table 3-1 Mode switch position

Switch position	Meaning	LED
0	RUN	RUN
1	STOPU	SU/PF
2	STOP	STOP
3	MRES	The MRES operating states are indicated via the STOP LED. (ON/OFF/flashing, see *SIMOTION D4x5* Commissioning and Hardware Installation Manual)
Other selector positions are not assigned		

The following table contains the states of the SIMOTION D4x5 that can be set via the mode switch.

Table 3-2 Mode switch settings

Meaning	Explanations
RUN	SIMOTION D4x5 runs the user program and all associated system services: • Reading process image of inputs • Execution of the user programs assigned to the execution system. • Writing process image of outputs The technology packages are active in this state. They can execute commands from the user program.
STOPU	SIMOTION D4x5 is not processing a user program. • The technology packages are active. Test and commissioning functions can be executed. The user program is not active. • The I/O modules are in a secure state. This means, for example, that digital outputs are "LOW" and analog outputs are de-energized or at zero current.
STOP	SIMOTION D4x5 is not processing a user program. • It is possible to load a complete user program. • All system services (communications, etc.) are active. • The I/O modules are in a secure state. This means, for example, that digital outputs are "LOW" and analog outputs are de-energized or at zero current. • The technology packages are inactive, i.e. all enables are deleted. No axis motions can be executed.
MRES	Performing a memory reset on the SIMOTION D4x5/restoring the factory setting Using the MRES switch position, you can perform depending on the operating sequence • SIMOTION D4x5 or • restore the SIMOTION D4x5 to its factory setting, depending on the operating sequence. For further details, see the *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

Note

It is recommended that SIMOTION SCOUT be used exclusively to switch the operating modes of the module. Therefore, leave the mode switch at position 0 (RUN). The LED display indicates the current mode selection.

For information on how to set the operating mode using SIMOTION SCOUT, see the *SIMOTION SCOUT* Configuration Manual.

Service selector switch (V4.1 SP2 and higher)

The following table shows the possible positions of the Service selector switch. The Service selector switch positions are explained in the order in which they are arranged on the SIMOTION D4x5.

Table 3-3 Switch positions of the Service selector switch

Service mode	Switch position	Meaning
-	0	No service/diagnostic functions activated (default setting)
Delete/restore non-volatile data	1	When the "Delete/restore non-volatile data" switch setting is selected, the non-volatile data of the D4x5 is first deleted and then restored along with the contents of the PMEMORY backup file.
Downgrade (device update tool)	B	SIMOTION D4x5 Control Units and projects can be updated using update data created at an earlier point in time. This upgrade data is generated with the device update tool (Menu: "Project>Start device update tool" in SIMOTION SCOUT). If the upgrade process fails to bring about the desired result, the upgrade can be rejected by means of the switch position. This will roll the system back to the previous configuration.
Backing up diagnostic data and non-volatile data	D	The diagnostic data and non-volatile data can be backed up in STOP, STOPU, and RUN modes. The advantage of backing up in RUN state is the availability of enhanced diagnostic information (via websites) and TO alarm information.

Additional references

Detailed information

- For information on setting the operating modes, see the *SIMOTION SCOUT* Configuration Manual
- For information on upgrading SIMOTION devices (device update tool), see
  - Operating Instructions *Upgrading SIMOTION Devices*
  - *SIMOTION D4x5* Commissioning and Hardware Installation Manual
- For information on creating diagnostic data and backing up/restoring non-volatile data, see the *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

3.2.2 RESET button

Arrangement

The RESET button is located behind the blanking plate on the SIMOTION D4x5.

Performing a reset operation

A reset causes the entire system to be reset and requires the system to be ramped-up again. It is similar to a "Power On Reset" except that the 24 V power supply does not have to be switched off.

3.3 7-segment display and LED display

Arrangement of LED displays

The front panel of the SIMOTION D4x5 has eight LED displays arranged in two rows of four.

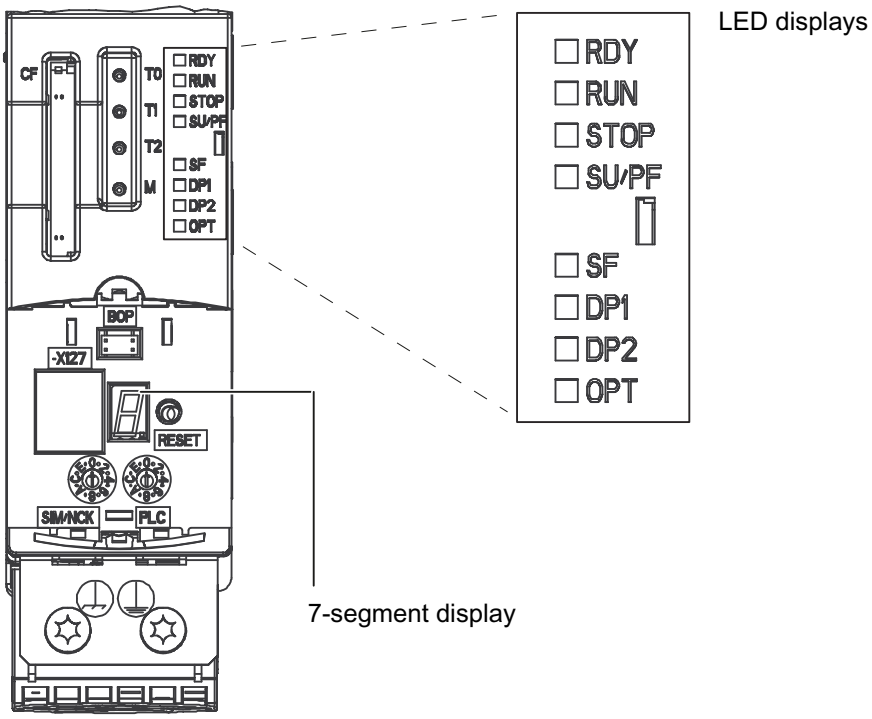


Figure 3-5 LED displays on the SIMOTION D4x5

Meaning of the LED displays

This table describes the LEDs and their meaning.

Table 3-4 Error and status displays

LED	Meaning
RDY	... indicates the operating states of SIMOTION D incl. SINAMICS Integrated.
RUN	... indicates that the user program is running.
STOP	... indicates that a user program is not running. The technology packages are not active.
SU/PF	... indicates that the technology packages are active. The user program is not active.
SF	... indicates an error state of the SIMOTION D4x5.
DP1	... indicates the state of the PROFIBUS DP1 interface.
DP2	... indicates the state of the PROFIBUS DP2/MPI interface.
OPT	... indicates the state of the option module (if available).

Note

While the SIMOTION D4x5 is ramping up, all LEDs are briefly illuminated in yellow.

7-segment display

The 7-segment display provides further status information in addition to the LED displays.

The status "6" and a flashing "." indicate that the D4x5 has ramped up and communication has been established to the SINAMICS Integrated.

Additional information

You can carry out a detailed diagnosis using a PG/PC and the Engineering System. Information on the diagnosis via LED displays can also be found in the Commissioning and Hardware Installation Manual *SIMOTION D4x5* and in the Online Help of this chapter via the link under menu instructions.

Interfaces

4

4.1 Interface overview

This section describes the interfaces of the SIMOTION D4x5.

Available interfaces

Table 4-1 Overview of available interfaces

Interface	Name	Connector type
DRIVE-CLiQ interface	X100	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X101	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X102	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X103	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X104 (D445/D445-1 only)	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X105 (D445/D445-1 only)	DRIVE-CLiQ socket
Ethernet interface IE1/OP	X120	RJ45 socket connector
Ethernet interface IE2/NET	X130	RJ45 socket connector
Digital inputs/outputs	X122, X132	Micro Combicon, 2x12-pin
Power supply connector	X124	Combicon, 4-pin
PROFIBUS DP1 interface	X126	9-pin SUB-D socket
PROFIBUS DP2/MPI interface	X136	9-pin SUB-D socket
Measuring sockets (T0, T1, T2, and G)	X131 - X134	Sockets
SIMOTION CompactFlash plug-in	X109	CompactFlash Card connector
Fan/battery module interface	X190	Fan/battery module
1. USB interface	X125	USB socket
2. USB interface	X135	USB socket
Option slot		Sockets

Non-usable interfaces

Table 4-2 Overview of interfaces that cannot be used for SIMOTION D

Interface name	Interface	Connector type
RS232 interface	X140	9-pin SUB-D connector
3. Ethernet interface (if fitted)	X127	RJ45 socket connector
Interface for BOP	-	8-pin terminal strip

4.2 DRIVE-CLiQ interfaces

DRIVE-CLiQ interfaces

All SINAMICS S120 drive system components, including the motors and encoders, are interconnected by a shared serial interface called DRIVE-CLiQ. The standardized cables and connectors reduce the variety of different parts and cut storage costs.

DRIVE-CLiQ has the following properties:

- Automatic detection of components by the Control Unit
- Standardized interfaces to all components
- Uniform diagnostics down to the components
- Complete service down to the components
- 24 V / 450 mA per DRIVE-CLiQ interface are provided for the connection of encoders and measuring systems.
  Note:
  The DRIVE-CLiQ cables with 24 V supply should be used only for components that require this (e.g. motors with a DRIVE-CLiQ interface).

Position of connectors

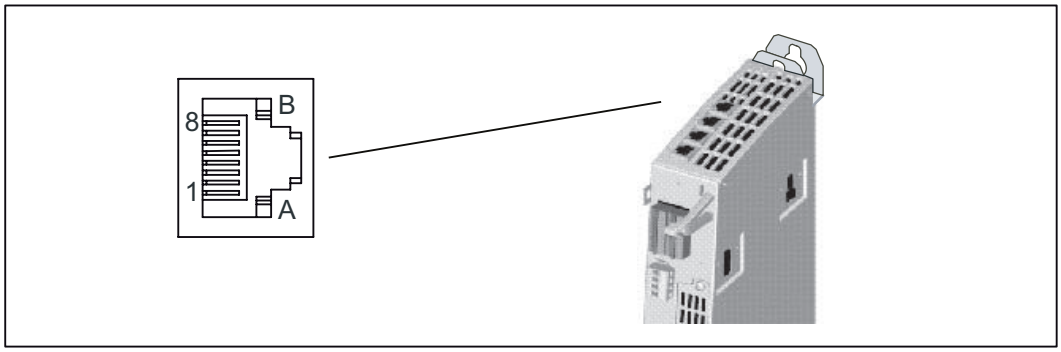


Figure 4-1 Position of the DRIVE-CLiQ interfaces on the D4x5

Characteristics

Table 4-3 X100 - X103 (SIMOTION D425, D435) or X100 – X105 (SIMOTION D445/D445-1)

Characteristic	Type
Connector type	DRIVE-CLiQ connector (RJ45 socket)
Cable type	DRIVE-CLiQ standard (inside the control cabinet)
Cable type	MOTION CONNECT (outside the control cabinet)
Maximum cable length	100 m
Dust protection filler plugs for sealing unused DRIVE-CLiQ ports	5 filler plugs contained in the D4x5 scope of delivery Filler plugs (50 pcs) order number: 6SL3066-4CA00-0AA0

DRIVE-CLiQ pin assignment

Table 4-4 DRIVE-CLiQ interface (X100 - X103 or X100 – X105)

PIN	Signal name	Signal type	Meaning
1	TXP	O	Transmit data +
2	TXN	O	Transmit data -
3	RXP	I	Receive data +
4	----	----	Reserved, do not use
5	----	----	Reserved, do not use
6	RXN	I	Receive data -
7	----	----	Reserved, do not use
8	----	----	Reserved, do not use
A	+ (24 V)	VO	Power supply for DRIVE-CLiQ, 450 mA maximum
B	M (0 V)	VO	Ground to 24 V
Signal type: I = Input; O = Output; VO = Voltage Output			

Additional references

- *SINAMICS S120 Control Units and Additional System Components* Manual
- *SINAMICS S120 Booksize Power Units* Manual
- *SINAMICS S120 for AC Drives* Manual
- *SINAMICS S120* Commissioning Manual
- *Terminal Modules TM15 and TM17 High Feature* Commissioning Manual
- *TM15/TM17 High Feature* Manual

For the order numbers, see the *Overview of SIMOTION documentation* (separate document)

4.3 Ethernet interfaces

Interfaces for connection to Industrial Ethernet.
Industrial Ethernet is a communication network with a transmission rate of 10/100 Mbit/s.

SIMOTION D4x5 offers the following functions via Ethernet interfaces:

- Communication with STEP 7 and SIMOTION SCOUT
  With STEP 7 V5.2 and lower, the "SIMATIC NET SOFTNET-PG (Protocol TPC/IP RFC 1006)" software must be installed on the PG/PC. With STEP 7 V5.3 and higher, additional software is not needed.
- Communication between SIMOTION and SIMATIC NET OPC
  The "SIMATIC NET SOFTNET-S7 (S7-OPC server)" software must be installed on the PG/PC for this function.
- Connection of HMI systems
- Communication with other devices over TCP/IP or UDP communication
- IT communication (e.g. via SIMOTION IT OPC XML-DA)

Note

SOFTNET-S7 is a superset of SOFTNET-PG, i.e., SOFTNET-S7 contains Protocol TPC/IP RFC 1006, as well.

For more information on the software packages, see *Catalog PM 21*; for the order numbers, see the *Overview of SIMOTION documentation* (separate document).

Position of connectors

The following figure shows the mounting position and designation of the Ethernet connectors on the module.

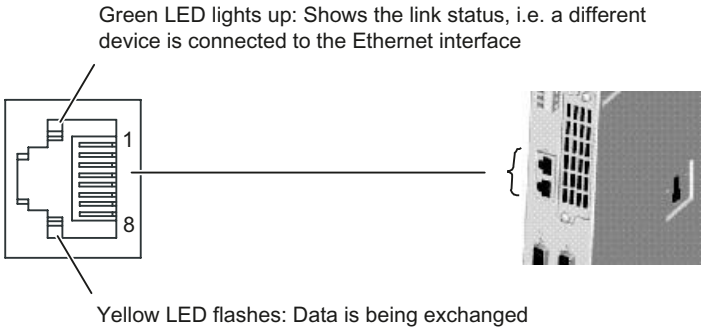


Figure 4-2 Ethernet interface

Interface characteristics

Table 4-5 X120 and X130

Characteristic	Type
Connector type	RJ45 socket connector
Cable type	Industrial Ethernet cable
Maximum cable length	100 m
Autocrossing	no
Dust protection filler plugs for sealing unused Ethernet ports	5 filler plugs contained in the D4x5 scope of delivery Filler plugs (50 pcs) order number: 6SL3066-4CA00-0AA0
Other	The X120 and X130 interfaces are full-duplex 10/100-Mbit Ethernet ports. Both ports are wired as Ethernet terminals.[1)]

[1)] Devices with Ethernet interfaces can have various pin assignments. In the case of terminal devices, for example, the send line may be on pins 1 and 2, while pins 1 and 2 on a switch or hub may connect to the receive line. If two devices are connected using Ethernet, the type of device will dictate whether a crossed or uncrossed Ethernet cable needs to be used. (For example, a crossed cable is required if two Ethernet terminal devices are directly connected.)

Pin assignment

Table 4-6 Ethernet interfaces (X120 and X130)

Pin	Signal name	Signal type	Meaning
1	TXP	Output	Ethernet transmit differential signal
2	TXN	Output	Ethernet transmit differential signal
3	RXP	Input	Ethernet receive differential signal
4	---	---	Reserved, do not use
5	---	---	Reserved, do not use
6	RXN	Input	Ethernet receive differential signal
7	---	---	Reserved, do not use
8	---	---	Reserved, do not use

Note

The MAC addresses are imprinted on an adhesive label that is located behind the protective cover and can be seen from the front.

When connecting a PG/PC via Ethernet, the following points must be observed:

- If your PG/PC has an autocrossing function, crossed and uncrossed Ethernet cables can be used.
- If your PG/PC does not have autocrossing, a crossed Ethernet cable must be used.
- If a hub or switch is located in between, an uncrossed Ethernet cable must be used (assuming the hub/switch does not have autocrossing).

4.4 Digital inputs/digital outputs

4.4.1 Features

Interface features

The digital inputs and outputs on the X122 and X132 connectors are for the connection of sensors and actuators.

Table 4-7 X122 and X132 wiring

Features		Type
Connector type	Micro Combicon	
Connectable cable types and conductor cross-sections	Rigid Flexible Flexible with end sleeve AWG/kcmil	0.14 mm^2 to 0.5 mm^2 0.14 mm^2 to 0.5 mm^2 0.25 mm^2 to 0.5 mm^2 26 to 20
Stripped length	8 to 9 mm	
Tool	Screwdriver 0.4 x 2.0 mm	
Max. current carrying capacity (ground)	4 A	

Position of connectors

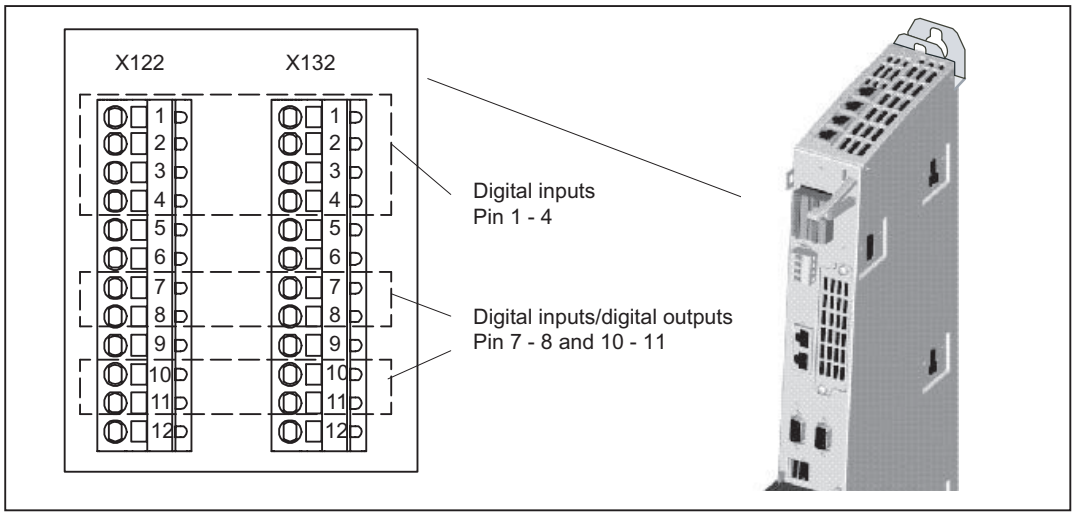


Figure 4-3 Digital inputs and digital inputs/outputs (interfaces X122 and X132)

Wiring and block diagram for SIMOTION D4x5

The following figure shows the connection and block diagram of the digital inputs and outputs.

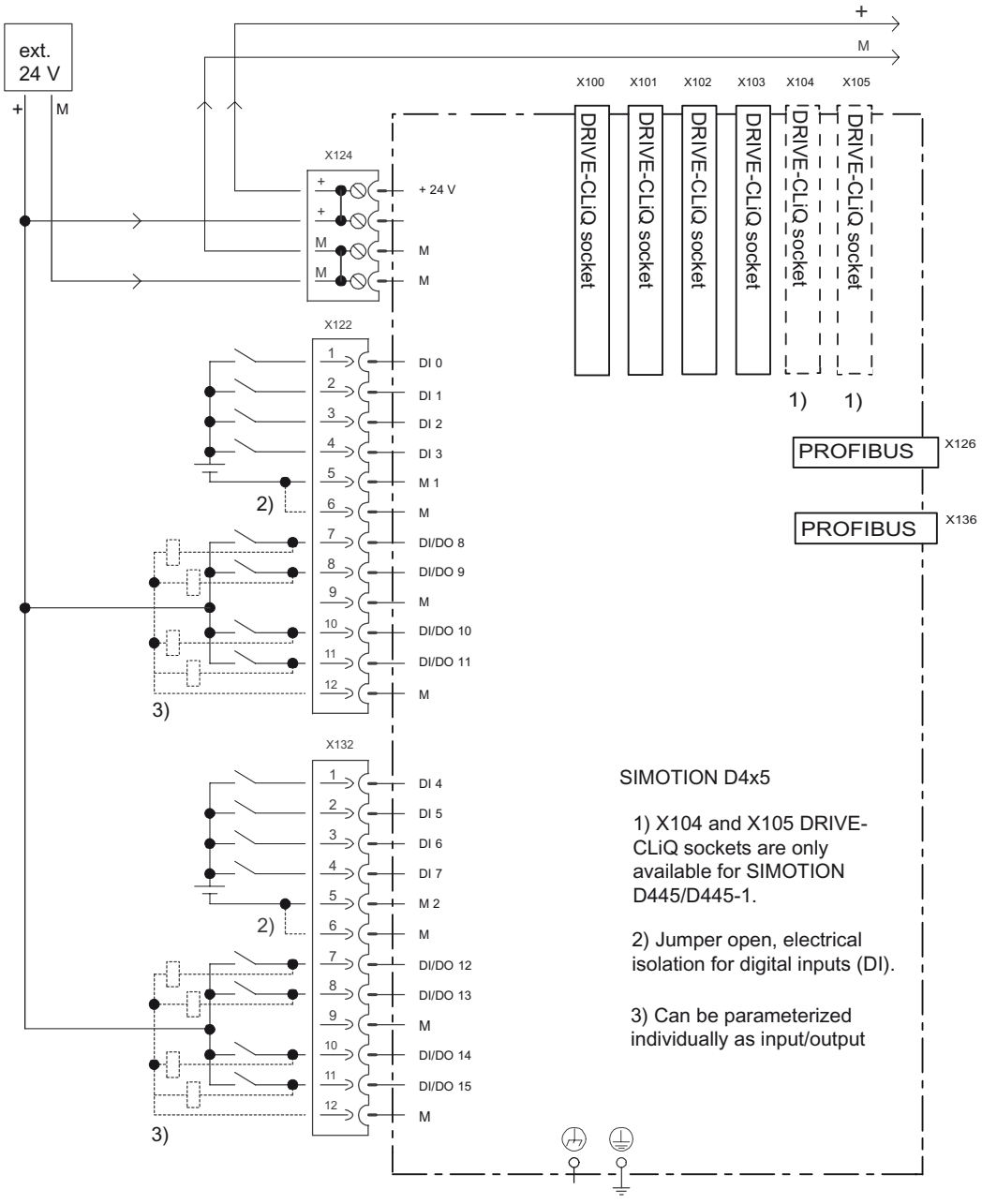


Figure 4-4 Wiring diagram and block diagram of the digital inputs/outputs

Interface assignment of X122 and X132

Table 4-8 Digital inputs/outputs X122

Pin	Designation [1]	Signal type [2]	Notes
1	DI 0	I	Digital input 0
2	DI 1	I	Digital input 1
3	DI 2	I	Digital input 2
4	DI 3	I	Digital input 3
5	G1	GND	Ground for DI 0 – DI 3 (electrically isolated relative to G)
6	G	GND	Ground
7	DI/DO 8	B	Digital input/digital output 8 (can be used as a high-speed output of an output cam/DO)
8	DI/DO 9	B	Digital input/digital output 9 (can be used as a high-speed input of a measuring input or output of an output cam/DO)
9	G	GND	Ground
10	DI/DO 10	B	Digital input/digital output 10 (can be used as a high-speed input of a measuring input or output of an output cam/DO)
11	DI/DO 11	B	Digital input/digital output 11 (can be used as a high-speed input of a measuring input or output of an output cam/DO)
12	G	GND	Ground

[1] DI: digital input; DI/DO: bidirectional digital input/output; G or GND: Electronics ground; G1: Ground reference

[2] B = Bidirectional; I = Input; GND = Reference potential (ground)

Table 4-9 Digital inputs/outputs X132

Pin	Designation [1]	Signal type [2]	Notes
1	DI 4	I	Digital input 4
2	DI 5	I	Digital input 5
3	DI 6	I	Digital input 6
4	DI 7	I	Digital input 7
5	G2	GND	Ground for DI 4 – DI 7 (electrically isolated relative to G)
6	G	GND	Ground
7	DI/DO 12	B	Digital input/digital output 12 (can be used as a high-speed output of an output cam/DO)
8	DI/DO 13	B	Digital input/digital output 13 (can be used as a high-speed input of a measuring input or output of an output cam/DO)
9	G	GND	Ground
10	DI/DO 14	B	Digital input/digital output 14 (can be used as a high-speed input of a measuring input or output of an output cam/DO)
11	DI/DO 15	B	Digital input/digital output 15 (can be used as a high-speed input of a measuring input or output of an output cam/DO)
12	G	GND	Ground

[1] DI: digital input; DI/DO: bidirectional digital input/output; G or GND: electronics ground; G2: Ground reference

[2] B = Bidirectional; I = Input; GND = Reference potential (ground)

Note

An open input is interpreted as "low".
Connecting terminal G1 or G2 ensures the function of the digital inputs. The following alternatives are available:

- Connect the carried digital input reference ground to G1 or G2.
- Insert a bridge between terminals G and G1 (or between G and G2).
  This removes the electrical isolation for these digital inputs.

4.4.2 Using the digital inputs/outputs

Connecting sensors and actuators

Digital inputs and digital outputs can be used to connect various sensors and actuators to the two 12-pin X122 and X132 front panel connectors.

The following types of digital inputs/outputs are used:

- Digital inputs
- Bidirectional digital inputs/outputs

Bidirectional digital inputs and outputs can be configured individually as digital inputs or outputs.

Assignment of the inputs/outputs to functions can be parameterized as required. Special functions (e.g. measuring input input and output cam) can be assigned to the inputs/outputs.

The enables for the drive units and/or motors (Active Line Module, Motor Module) connected to the Control Unit can, for example, be switched using the digital inputs.

Digital inputs

The Control Unit has 8 digital inputs.

The electrically isolated inputs can be used as freely addressable inputs.

Bidirectional digital inputs/outputs

The Control Unit has 8 digital inputs/outputs (DI/DO).

When the DI/DO are assigned as digital inputs, they can be used as follows:

- DI/DO9 to 11 and DI/DO13 to 15 can be used as high-speed inputs of measuring inputs or for external zero marks.
  The assignment of the inputs is not fixed, and the special use is activated in the SIMOTION SCOUT engineering system.
- All eight digital inputs/outputs can be used as freely addressable inputs or as homing inputs.

When the DI/DO are assigned as digital outputs, they can be used as follows:

- Use as freely addressable outputs
- Use as high-speed DO
- Use as high-speed outputs of output cams

Note

Shielded cables are required when connecting measuring inputs or external zero marks for optimal noise immunity.

Additional references

For information on configuring the DI/DO as freely addressable I/O, measuring inputs or outputs of output cams, see the *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

For information on the configuration and function of the measuring input, output cam, and cam track technology objects, refer to the *SIMOTION Output Cams and Measuring Inputs* Function Manual.

4.5 Power supply

This interface is provided exclusively for connection of the external power supply.

Note

When using external power supplies (e.g. SITOP), the ground potential must be connected with the protective ground terminal (PELV).

Features of the interface

Table 4-10 Interface X124

Features		Type
Connector type		4-way screw-type terminal
Connectable cable types and conductor cross-sections		
	Rigid	0.2 mm² … 2.5 mm²
	Flexible	0.2 mm² … 2.5 mm²

Features		Type
	Flexible, with wire-end ferrule without plastic sleeve	0.2 mm² … 2.5 mm²
	Flexible, with wire-end ferrule with plastic sleeve	0.2 mm² … 1.5 mm²
	AWG / kcmil	22 … 12
Stripped length		6 … 7 mm
Tool		Screwdriver 0.5 x 3 mm (M2.5)
Tightening torque		0.4 to 0.5 Nm
Max. current carrying capacity, incl. loop-through		20 A (15 A per UL/CSA)
Max. cable length		10 m

Interface assignments

Table 4-11 Power supply X124

Pin	Signal name	Signal type	Meaning
1	P24	VI	Power supply 24 V
2	P24	VI	24 V power supply
3	G	VO	Ground
4	G	VO	Ground
Signal type: VI = Voltage input (power supply) VO = Voltage output (power supply)			

Note

The 24 V is looped through via the 24 V connector. In this case, pin 1 is jumpered with pin 2, and pin 3 is jumpered with pin 4.

Position of power supply interface

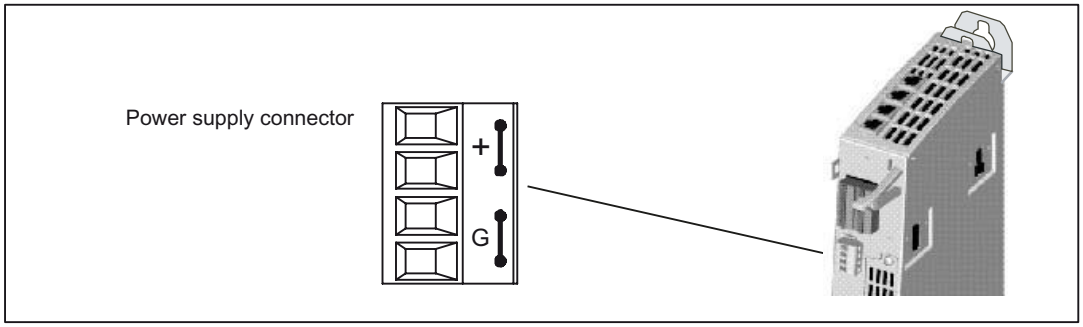


Figure 4-5 Power supply interface

4.6 PROFIBUS DP interfaces

Features of the interface

Table 4-12 Interfaces X126 and X136

Features	Type
Connector type	9-pin SUB-D socket
Cable type	PROFIBUS cable
Maximum cable length	100 m at 12 Mbps

Interface assignment for X126

Table 4-13 PROFIBUS DP interface X126

Pin	Signal name	Signal type	Meaning
1	--	--	Reserved, do not use
2	G	VO	Ground to P24_SERV
3	1RS_DP	B	RS-485 differential signal
4	1RTS_DP	O	Request to send
5	1G	VO	Ground to 1P5
6	1P5	VO	5 V power supply for bus terminal, external, short-circuit proof
7	P24_SERV	VO	24 V for teleservice, short-circuit proof, 150 mA maximum
8	1XRS_DP	B	RS-485 differential signal
9	--	--	Reserved, do not use
The 1P5 voltage is provided exclusively for the bus terminal. No OLPs are permitted.			
Signal type: VO = Voltage output (power supply) O = Output B = Bidirectional			

Interface assignment for X136

Table 4-14 PROFIBUS DP interface X136

Pin	Signal name	Signal type	Meaning
1	--	--	Reserved, do not use
2	G	VO	Ground to P24_SERV
3	2RS_DP	B	RS-485 differential signal
4	2RTS_DP	O	Request to send
5	1G	VO	Ground to 1P5
6	1P5	VO	5 V power supply for bus terminal, external, short-circuit proof
7	P24_SERV	VO	24 V for teleservice, short-circuit proof, 150 mA maximum
8	2XRS_DP	B	RS-485 differential signal
9	--	--	Reserved, do not use

Pin	Signal name	Signal type	Meaning
The 1P5 voltage is provided exclusively to supply the bus terminal. No OLPs are permitted.			
Signal type: VO = Voltage output (power supply) O = Output B = Bidirectional			

Position of connectors

The following figure shows the mounting position and designation of the connectors on the Control Unit.

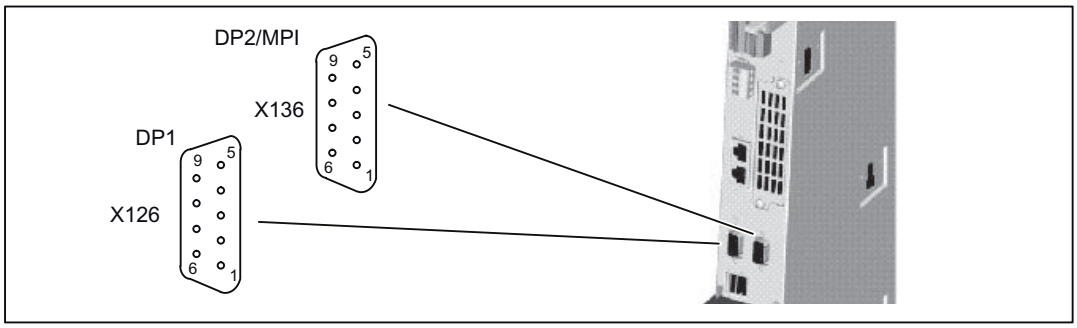


Figure 4-6 Position of connectors X126, X136

Connectable devices

The following devices can be connected to the PROFIBUS DP interfaces:

- PG / PC
- SIMATIC HMI devices
- SIMATIC S7 controllers with PROFIBUS DP interface
- Distributed I/O
- Teleservice adapter
- Drive units with PROFIBUS DP interface (standard slaves)

Note

A teleservice adapter can only be connected to one of the two interfaces.

A detailed, regularly updated list of the modules approved for use with SIMOTION, as well as notes on their use, can be found on the Internet at (http://support.automation.siemens.com/WW/view/en/11886029):

Take note of the documentation on the individual modules or devices!

4.7 Slot for CompactFlash Card

Features

Type: 50-pin connector

This interface should only be used to insert a special SIMOTION CompactFlash Card (CF card).

Consult the relevant references for detailed information about the SIMOTION CF card.

See also

SIMOTION CompactFlash Card (Page 36)

4.8 Measuring sockets

Application

The X131-X134 measuring sockets are used to output analog signals. Any interconnectable signal can be output via SINAMICS on every measuring socket on the control unit.

Note

The measuring sockets should be used exclusively for servicing purposes.

The measurements may only be performed by appropriately trained specialists.

The measuring sockets are suited for multiple-spring wire connectors with a diameter of 2 mm.

Measuring socket position

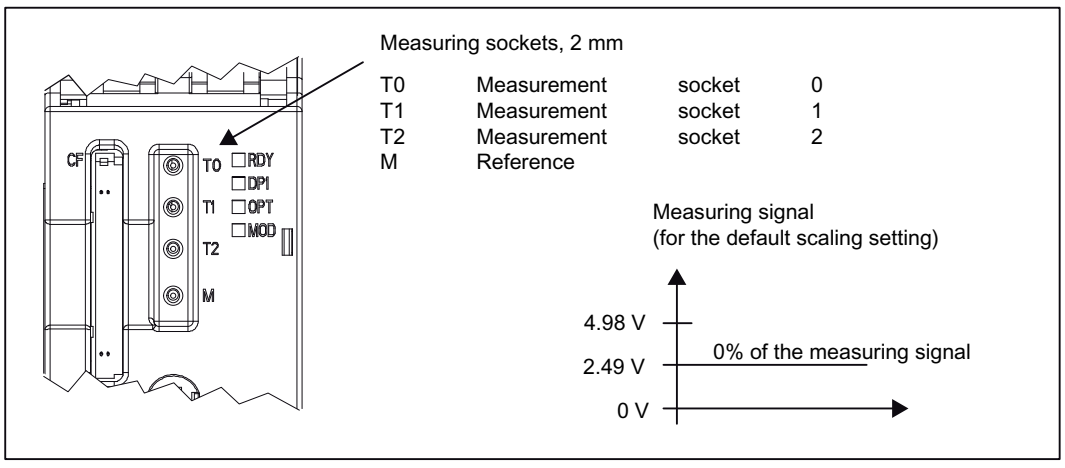


Figure 4-7 Measuring socket arrangement

4.9 USB interfaces

The USB interfaces are used for upgrading the SIMOTION D4x5 via a USB stick.

Table 4-15 Interfaces X125 and X135

Features	Versions
Connector type	Double USB socket – type A
Version	USB 2.0
Current carrying capacity	0.5 A per channel

Note

The 5 V power supply is designed to be short-circuit proof.

The USB interfaces are located on the front of the SIMOTION D4x5.

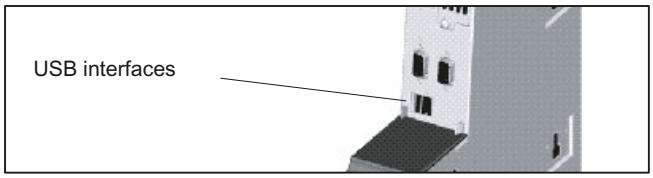


Figure 4-8 Location of USB interfaces (X125 on left, X135 on right)

4.10 Option slot

Plug-in options

Either of the following Option Boards can be plugged into the option slot:

- TB30 Terminal Board, for further details see Section Description of TB30 (Page 88)
- CBE30 Ethernet Communication Board, for further details see Section CBE30 communication board (Page 107).

Technical data

5

5.1 Technical data D4x5

Memory for system data

Table 5-1 Memory for system data and its memory size

Data	SIMOTION D425 memory size	SIMOTION D435 memory size	SIMOTION D445/ D445-1 memory size
Diagnostic buffer (non-volatile)	200 messages (SIMOTION) 200 messages (SINAMICS Integrated)	200 messages (SIMOTION) 200 messages (SINAMICS Integrated)	200 messages (SIMOTION) 200 messages (SINAMICS Integrated)
RAM (working memory) [1]	48 MB (as of V4.2) 35 MB (V4.1 SP2 - V4.1 SP5) 25 MB (V4.1 SP1)	48 MB (as of V4.2) 35 MB (V4.1 SP2 - V4.1 SP5) 25 MB (V4.1 SP1)	96 MB (as of V4.2) 70 MB (V4.1 SP2 - V4.1 SP5) 50 MB (V4.1 SP1)
RAM disk (load memory)	29 MB (as of V4.3) 23 MB (as of V4.1 SP2) 17 MB	29 MB (as of V4.3) 23 MB (as of V4.1 SP2) 17 MB	59 MB (as of V4.3) [2] 47 MB (as of V4.1 SP2) 23 MB
Retentive memory	364 KB	364 KB	364 KB
Persistent memory (user data on CF)	1-GB CF: 300 MB	1-GB CF: 300 MB	1-GB CF: 300 MB

[1] For Java applications, a dedicated 20-MB working memory will be available as of V4.1 SP1 HF6.

[2] Only D445-1; D445 is no longer supported by V4.2.

CompactFlash card

Table 5-2 CF card

Memory capacity	1 GB (order no. 6AU1400-2PA0*-0AA0) 512 MB (order no. 6AU1400-2NA00-0AA0) 64 MB (order no. 6AU1400-2KA0*-0*A0) 32 MB (order no. 6AU1400-2JA0*-0*A0)
Weight	10 g

With CompactFlash cards, SIMOTION versions up to and including V4.1 SP1 incl. hotfixes support a memory address of max. 512 MB. The limitation applies whether the card is being used by SIMOTION runtime functions or for some other purpose, such as storing documents. Once there is more than 512 MB of data on the CompactFlash card, the card is full as far as SIMOTION runtime is concerned, i.e.:

- SIMOTION runtime cannot write any further data
- SIMOTION runtime cannot read data beyond the 512 MB range.

Note

Please note that

- In their as-delivered condition, the 1-GB CF cards with order number 6AU1400-2PA0*-0AA0 contain firmware that can only run on SIMOTION D4xx modules;
- In their as-delivered condition, the 1-GB CF cards with order number 6AU1400-*PA2*-0AA0 contain firmware that can only run on SIMOTION D4xx-2 modules.

It is also possible to use the 1-GB CF cards for SIMOTION D4xx-2 (order number 6AU1400-*PA2*-0AA0) for SIMOTION D4xx modules by loading the latest boot loader and the D4xx firmware. The reverse case is also possible. The CF card must only be formatted with FAT or FAT16, and must not be formatted with FAT32 or NTFS. Note that CF cards for SIMOTION D4xx-2 may have FAT32 formatting!

Dimensions and weight

Table 5-3 Dimensions and weight of a SIMOTION D4x5

Parameter	SIMOTION D425/D435	SIMOTION D445	SIMOTION D445-1
Dimensions W x H x D [mm] (max. expansion) • Excl. fastening using spacers, no fan or battery modules • Incl. fastening using spacers, no fan or battery modules	• 50 x 380 x 230 • 50 x 380 x 270	• Not possible (spacers always required) • 50 x 380 x 270	• 50 x 380 x 230 • 50 x 380 x 270
Weight [g] • Without packaging • With packaging	• approx. 2600 • approx. 3100	• approx. 3500 • approx. 4000	• approx. 3100 • approx. 3600

Ambient conditions

Table 5-4 D4x5 environmental requirements

Parameter	Values
Permissible ambient temperature • Storage and transport • Operation	 • -40° C to +70° C • 0° C to +55° C up to 2000 m above sea level As of an altitude of 2000 m, the maximum ambient temperature decreases by 7° C every 1000 m
Permissible relative humidity (without condensation)	5 % … 95 %
Installation altitude	Max. 5,000 m above sea level [1]
Organic/biological influences • Storage • Transport • Operation	 • Class 1B1 according to EN 60 721-3-1 • Class 2B1 according to EN 60 721-3-2 • Class 3B1 according to EN 60 721-3-3
Pollution degree	2 according to EN 60 664-1
Degree of protection according to EN 60529 (IEC 60529)	IP20
Atmospheric pressure	700 … 1060 hPa

[1] The max. installation altitude for SINAMICS S120 drive components (Motor Modules, etc.) is 4000 m. Details can be found in the *SINAMICS S120 Control Units and Supplementary System Components* Manual.

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.

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

See Residual risks of power drive systems (Page 16).

Shipping backup batteries

Backup batteries may only be shipped in the original packaging. No special authorization is required to ship backup batteries. The lithium content is approximately 300 mg.

Note

The backup battery is classified as a hazardous substance, Class 9 in accordance with the relevant air-freight transportation regulations.

For information on handling backup batteries, see Section Fan/battery module (Page 83).

Storage of backup batteries

Always store backup batteries in a cool and dry place. The maximum shelf life is 10 years.

PLC and motion control performance

Table 5-5 Maximum number of axes and minimum cycle clocks for D4x5

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
Maximum number of axes	16	32	64
Minimum PROFIBUS cycle clock	2 ms	1 ms	1 ms
Minimum PROFINET send cycle clock	0.5 ms	0.5 ms	0.5 ms
Minimum position control/interpolator cycle clock	2.0 ms	1.0 ms	0.5 ms

Compared with SIMOTION D445, SIMOTION D445-1 offers an improvement in PLC and motion control performance of approximately 30%, depending on the application.

Integrated drive control

Table 5-6 Controls for integrated drives

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
Max. number of axes for integrated drive control (servo/vector/*V/f*)	6 / 4 / 8 (alternative) Drive control based on SINAMICS S120 CU320, version V2.x	6 / 4 / 8 (alternative) Drive control based on SINAMICS S120 CU320, version V2.x	6 / 4 / 8 (alternative) Drive control based on SINAMICS S120 CU320, version V2.x

Communication

Table 5-7 Interface communication

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
DRIVE-CLiQ interfaces	4	4	6
Ethernet interfaces	2	2	2

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
PROFIBUS interfaces	2	2	2
PROFINET interfaces	Optionally via CBE30: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device	Optionally via CBE30: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device	Optionally via CBE30: • 1 interface with 4 ports • Supports PROFINET IO with IRT and RT • Can be configured as PROFINET IO controller and/or device

Address space

Table 5-8 Address space

Address space	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
Logical I/O address space in KB	16 KB	16 KB	16 KB
Physical I/O address space in KB • PROFIBUS (per interface): max. each for inputs and outputs • PROFINET: max. each for inputs and outputs	• 1 KB [1)] • 4 KB [1)]	• 1 KB [1)] • 4 KB [1)]	• 1 KB [1)] • 4 KB [1)]
Permanent process image for BackgroundTask (I/O variables)	64 bytes	64 bytes	64 bytes
Additional configurable process image for each cyclic task (I/O variables)	yes	yes	yes
Address space for each PROFIBUS DP station	244 bytes	244 bytes	244 bytes
Address space per SINAMICS Integrated/ CX32 (PROFIBUS Integrated)	512 bytes	512 bytes	512 bytes
Address space for each PROFINET device	1,400 bytes	1,400 bytes	1,400 bytes

[1)] When PROFIBUS and PROFINET are used, the total address space applies

General technical data

Table 5-9 Technical data (general)

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445	SIMOTION D445-1
Fan	Optional fan/ battery module	Optional fan/ battery module	Fan/battery module included in scope of delivery	Double fan/ battery module included in scope of delivery
Power supply • Rated value • Permissible range	 24 V DC 20.4 ... 28.8 V	 24 V DC 20.4 ... 28.8 V	 24 V DC 20.4 ... 28.8 V	 24 V DC 20.4 ... 28.8 V
Current consumption, typically [1]	600 mA	600 mA	2 A	1 A
Starting current, typ.	6 A	6 A	6 A	5 A
Power loss	15 W	15 W	48 W	24 W

[1] With no load on inputs/outputs, no 24 V supply via DRIVE-CLiQ and PROFIBUS interfaces

Digital inputs

Table 5-10 Digital inputs on SIMOTION D4x5

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/D445-1
Digital inputs	8	8	8
Input voltage			
• Rated value	24 V DC	24 V DC	24 V DC
• For signal "1"	15 ... 30 V	15 ... 30 V	15 ... 30 V
• For signal "0" [2]	-3 ... +5 V	-3 ... +5 V	-3 ... +5 V
Galvanic isolation	Yes, in groups of 4 [1]	Yes, in groups of 4 [1]	Yes, in groups of 4 [1]
Current consumption typ. at signal level "1"	10 mA at 24 V	10 mA at 24 V	10 mA at 24 V
Input delay, typ. (hardware)	L -> H: 50 µs H -> L: 150 µs	L -> H: 50 µs H -> L: 150 µs	L -> H: 50 µs H -> L: 150 µs

[1] Reference potential is terminal G1 or G2

[2] The digital inputs are protected against polarity reversal up to -30 V

Digital I/Os (parameterizable)

Table 5-11 Digital I/Os of the SIMOTION D4x5

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
Digital inputs/outputs	8 Max. 6 as high-speed inputs of measuring inputs, max. 8 as high-speed outputs of output cams/DO	8 Max. 6 as high-speed inputs of measuring inputs, max. 8 as high-speed outputs of output cams/DO	8 Max. 6 as high-speed inputs of measuring inputs, max. 8 as high-speed outputs of output cams/DO
If used as an input:			
• Input voltage, rated value	24 V DC	24 V DC	24 V DC
• Input voltage, for signal "1"	15 ... 30 V	15 ... 30 V	15 ... 30 V
• Input voltage, for signal "0" [2]	-3 ... +5 V	-3 ... +5 V	-3 ... +5 V
Galvanic isolation	no	no	no
Current consumption typ. at signal level "1"	10 mA at 24 V	10 mA at 24 V	10 mA at 24 V
Input delay, typ. (hardware)	L -> H: 5 µs H -> L: 50 µs	L -> H: 5 µs H -> L: 50 µs	L -> H: 5 µs H -> L: 50 µs
Measuring input input, reproducibility	5 µs	5 µs	5 µs
If used as an output			
• Rated load voltage, permissible range	24 V DC, 20.4 to 28.8 V	24 V DC, 20.4 to 28.8 V	24 V DC, 20.4 to 28.8 V
• Galvanic isolation	no	no	No
• Current load, max.	500 mA per output	500 mA per output	500 mA per output
• Residual current, max.	2 mA	2 mA	2 mA
• Output delay, typ./ max. (hardware) [1]	L -> H: 150 µs / 400 µs H -> L: 75 µs / 100 µs	L -> H: 150 µs / 400 µs H -> L: 75 µs / 100 µs	L -> H: 150 µs / 400 µs H -> L: 75 µs / 100 µs
• Output cam output, reproducibility	125 µs	125 µs	125 µs
Switching frequency of the outputs, max.			
• With resistive load	100 Hz	100 Hz	100 Hz
• With inductive load	2 Hz	2 Hz	2 Hz
• With lamp load	11 Hz	11 Hz	11 Hz
Short-circuit protection	yes	yes	yes

[1] Data for: Vcc = 24 V, load 48 Ohm, H = 90% V_{Out}; L = 10% V_{Out}

[2] The digital inputs are protected against polarity reversal up to -30 V

Further technical data

Table 5-12 Non-volatile data backup

Data	SIMOTION D425	SIMOTION D435	SIMOTION D445/ D445-1
• Backup time, min. • Charging time, typ.	5 days (real-time clock/ SRAM backup) Just a few minutes	5 days (real-time clock/ SRAM backup) Just a few minutes	5 days (real-time clock/ SRAM backup) Just a few minutes
• Approvals	cULus (File No. E164110)	cULus (File No. E164110)	cULus (File No. E164110)
• Marking for Australia (C-Tick mark)	Hardware version D or higher	Hardware version D or higher	D445: Hardware version D or higher D445-1: Hardware version A or higher

If a fan/battery module is used with a battery installed, the backup time is at least 3 years.

For further technical data, such as the maximum number of online connections, HMI devices that can be used and a list of tasks available in the execution system, for example, see the function overview in Catalog PM 21, Motion Control SIMOTION, SINAMICS S120 and motors for production machines

5.2 Clock

Features of real-time clock

The following table lists the properties and functions of the SIMOTION D clock.

Table 5-13 Clock features

Features	Meaning
Type	Hardware clock (integrated "realtime clock")
Default setting when delivered	DT#1992-01-01-00:00:00
Accuracy With supply voltage on • 0 to 55° C With supply voltage off • 25° C • -20° C to 70° C	Max. deviation per day: • ±9 s • ±2 s • +2 s to -9 s
Backup time at least	• 5 days (at 0 to 25° C) • with fan/battery module 3 years
Charging time	A few minutes
Backup	Maintenance-free SuperCap or battery in fan/ battery module

With power OFF

In the power OFF state, the SIMOTION D clock continues to run during the the backup time (with the exception of the software clock). The buffer is recharged in the power ON state.

An error message is output if the backup function is defective. When the power is switched ON, the clock then resumes at the time set at the factory.
If the SIMOTION D4x5 is reset to its factory setting, the clock is also reset to the "default setting when delivered".

5.3 D4x5 power supply

External 24 V power supply

Power is supplied to the Control Unit by an external 24 V power supply (e.g. SITOP).

The tolerance range for the SIMOTION D4x5 is between 20.4 and 28.8 VDC.

Table 5-14 Input voltage specification

	Input voltage		Typ. current consumption [1]		Maximum current consumption	
	D425 and D435	D445	D425 and D435	D445 (D445-1)	D425 and D435	D445 (D445-1)
Minimum input voltage	20.4 V	20.4 V	0.7 A	2.35 A (1.18 A)	9.8 A	10.6 A (10.3 A)
Nominal input voltage	24 V	24 V	0.6 A	2.0 A (1 A)	8.4 A	9.0 A (8.8 A)
Maximum input voltage	28.8 V	28.8 V	0.5 A	1.67 A (0.84 A)	7.0 A	7.5 A (7.3 A)

[1] With no load on inputs/outputs, no 24 V supply via DRIVE-CLiQ and PROFIBUS interfaces

Note

If the D4x5 detects undervoltage, the module performs a RESET. If all LEDs are off, either there is no power supply or the voltage level is too low.

When the voltage level is in the permissible range again, the D4x5 restarts.

Undervoltages are detected when:

- The voltage level of the 24 V supply falls below the minimum permissible input voltage of the D4x5
- A temporary voltage dip (> 3 ms) results in the supply falling below the minimum permissible input voltage on the D4x5.

Additional references

Recommended power supply units and tables for calculating the current consumption for the assembly with SINAMICS S120 modules can be found in the "Cabinet Construction and EMC Booksize" Section in the *SINAMICS S120 Booksize Power Units* Manual.

5.4 Specifications for Protection Class and Degree of Protection

Class of protection

Safety class I in accordance with VDE 0106, Part 1 (IEC 536), i.e. a protective-conductor terminal is required on the mounting rail.

Protection against ingress of solid foreign bodies and water

IP20 degree of protection in accordance with IEC 529, i.e. protection against contact with standard probes.

Also: Protection against ingress of solid foreign bodies with diameters greater than 12.5 mm.

No special protection against ingress of water.

5.5 Input and output circuit

Protective circuit

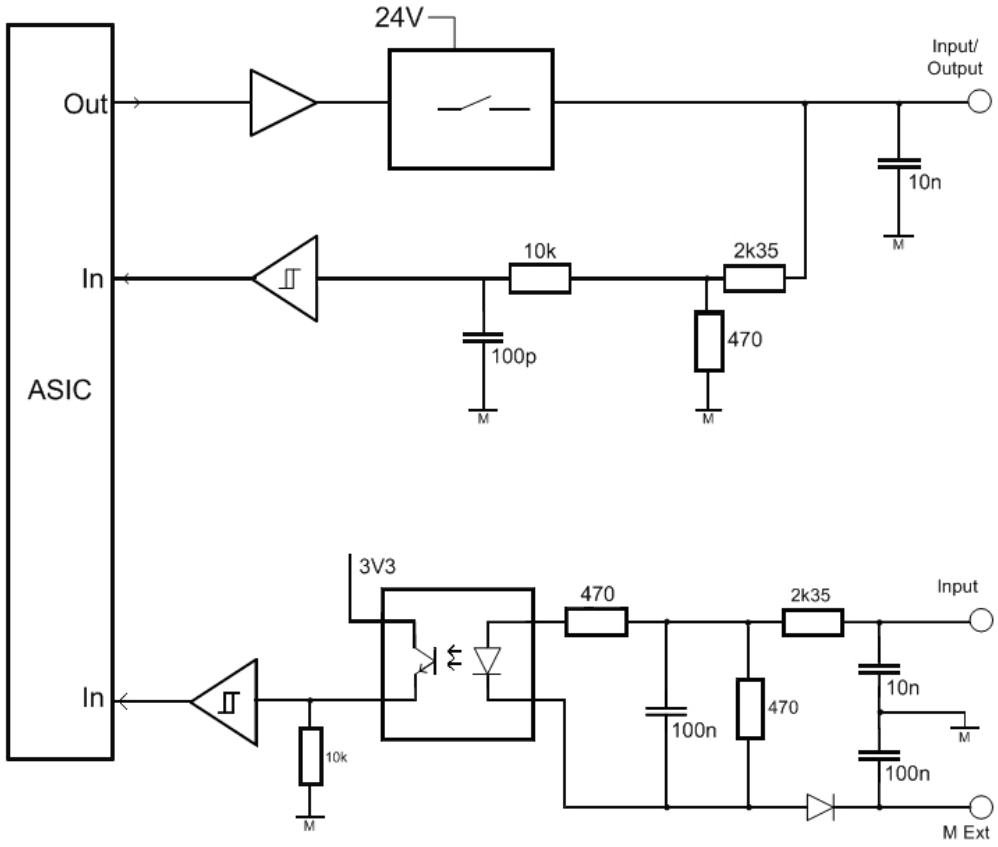


Figure 5-1 SIMOTION D4x5/CX32 input and output circuits

Dimension drawings

6

6.1 Dimension drawing of D425 and D435

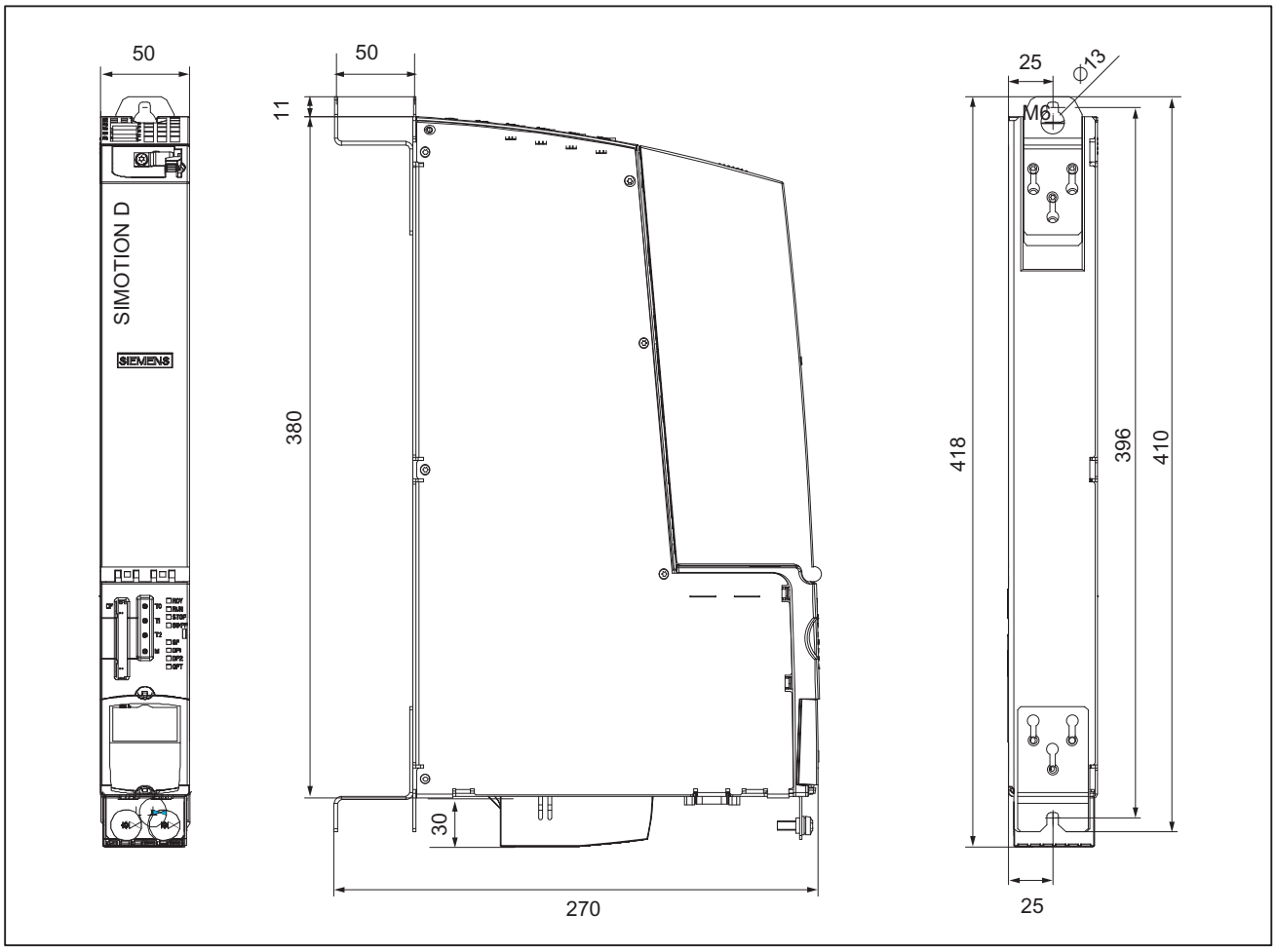


Figure 6-1 Dimension drawing of SIMOTION D425 and SIMOTION D435

The SIMOTION D425/D435 can also be operated without a fan/battery module.

NOTICE
Higher operating temperature if ventilation clearances are too small
The 80 mm clearances above and below the components must be observed.
The unit protects itself from overheating by shutting down.
The ventilation clearance is measured from the lower edge of the module, i.e. the fan/battery module is not included in the dimension.

6.2 Dimension drawing of D445

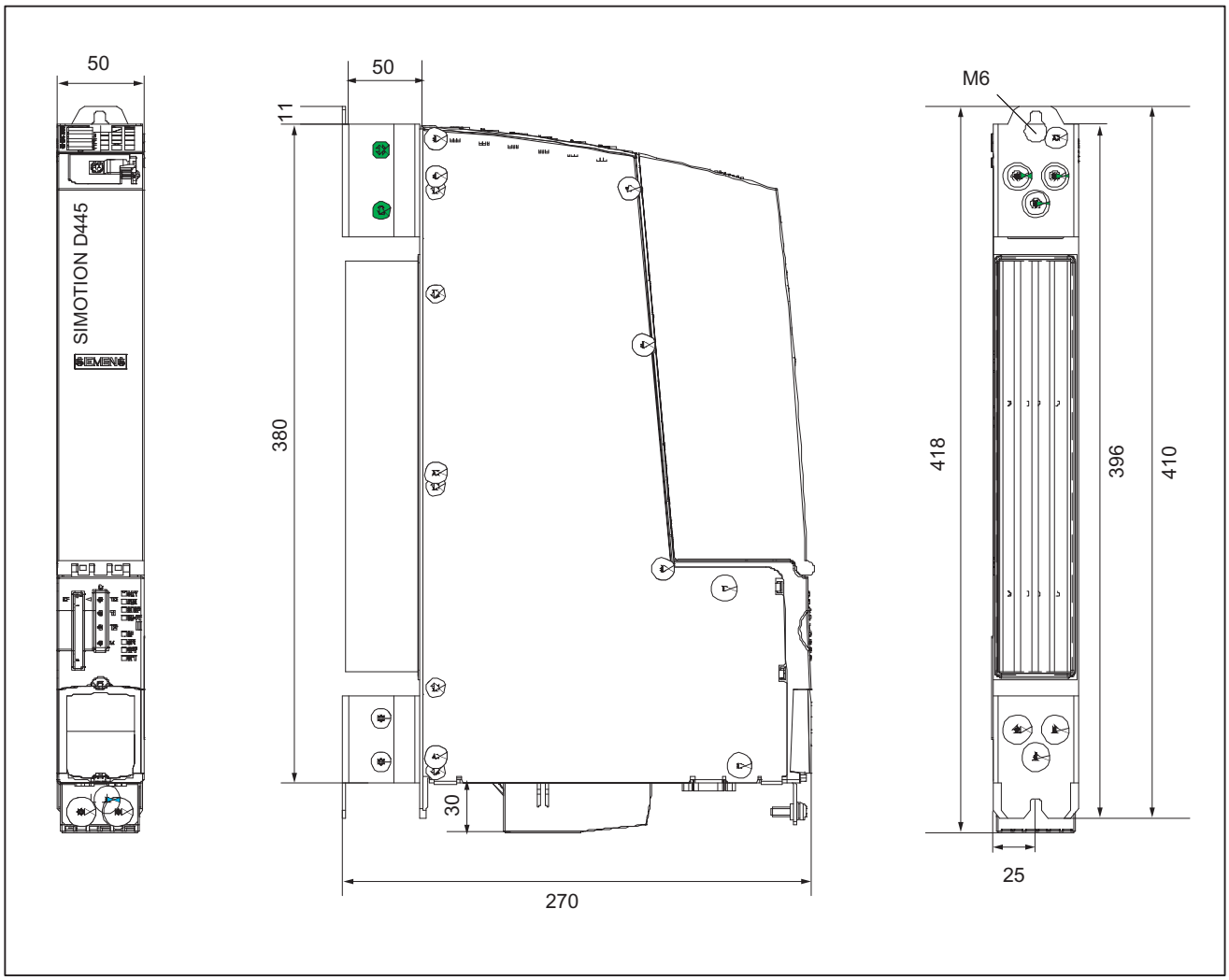


Figure 6-2 Dimension drawing of SIMOTION D445

The SIMOTION D445 must always be operated with a fan/battery module.

NOTICE
Higher operating temperature if ventilation clearances are too small
The 80 mm clearances above and below the components must be observed.
The unit protects itself from overheating by shutting down.
The ventilation clearance is measured from the lower edge of the module, i.e. the fan/battery module is not included in the dimension.

6.3 D445-1 dimension drawing

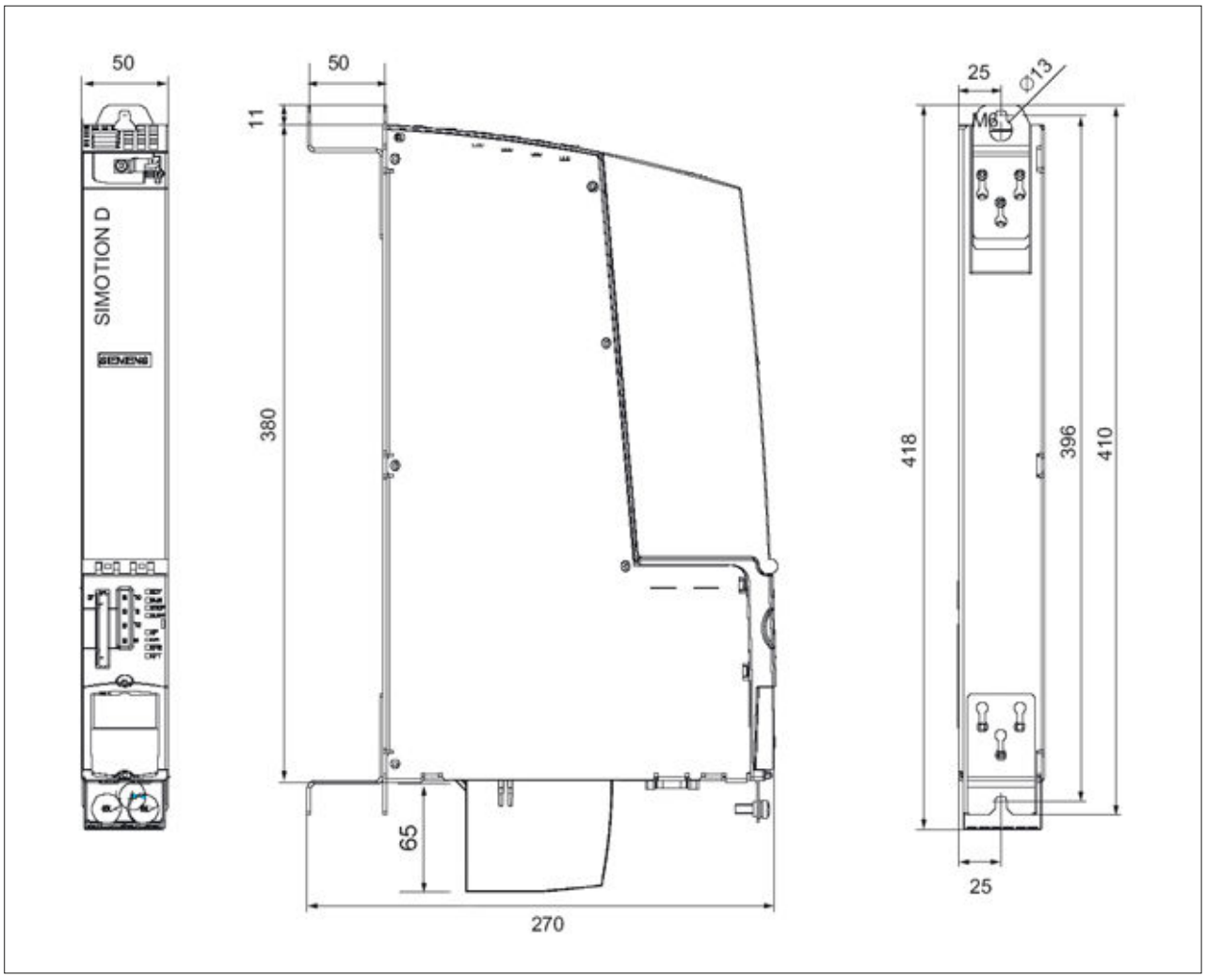


Figure 6-3 SIMOTION D445-1 dimension drawing

The SIMOTION D445-1 must always be operated with a double fan/battery module.

NOTICE
Higher operating temperature if ventilation clearances are too small
The ventilation clearances of 80 mm above and below the components must be observed.
The unit protects itself from overheating by shutting down.
The ventilation clearance is measured from the lower edge of the module, i.e. the fan/battery module is not included in the dimension.

6.4 CAD data, dimension drawings, and circuit-diagram macros

Dimension drawings and CAD data

Dimension drawings, as well as 2D and 3D CAD data, can be generated in commonly used formats using CAD CREATOR.
For further information, see the following Internet address (http://support.automation.siemens.com/WW/view/en/30559271).

Circuit-diagram macros

EPLAN circuit-diagram macros are available for SIMOTION D4x5. The macros are supported when you create circuit diagrams.
The following address will take you to the macros (http://support.automation.siemens.com/WW/view/en/31622426).

Supplementary system components 7

7.1 Supplemental system components

Additional system components

The following figure shows the connection of the supplementary system components. The connection is:

- Directly on the SIMOTION D module (fan/battery module)
- Via the option slot (TB30/CBE30)
- Via the DRIVE-CLiQ interfaces (Terminal Modules, Control Unit Adapter, etc.)

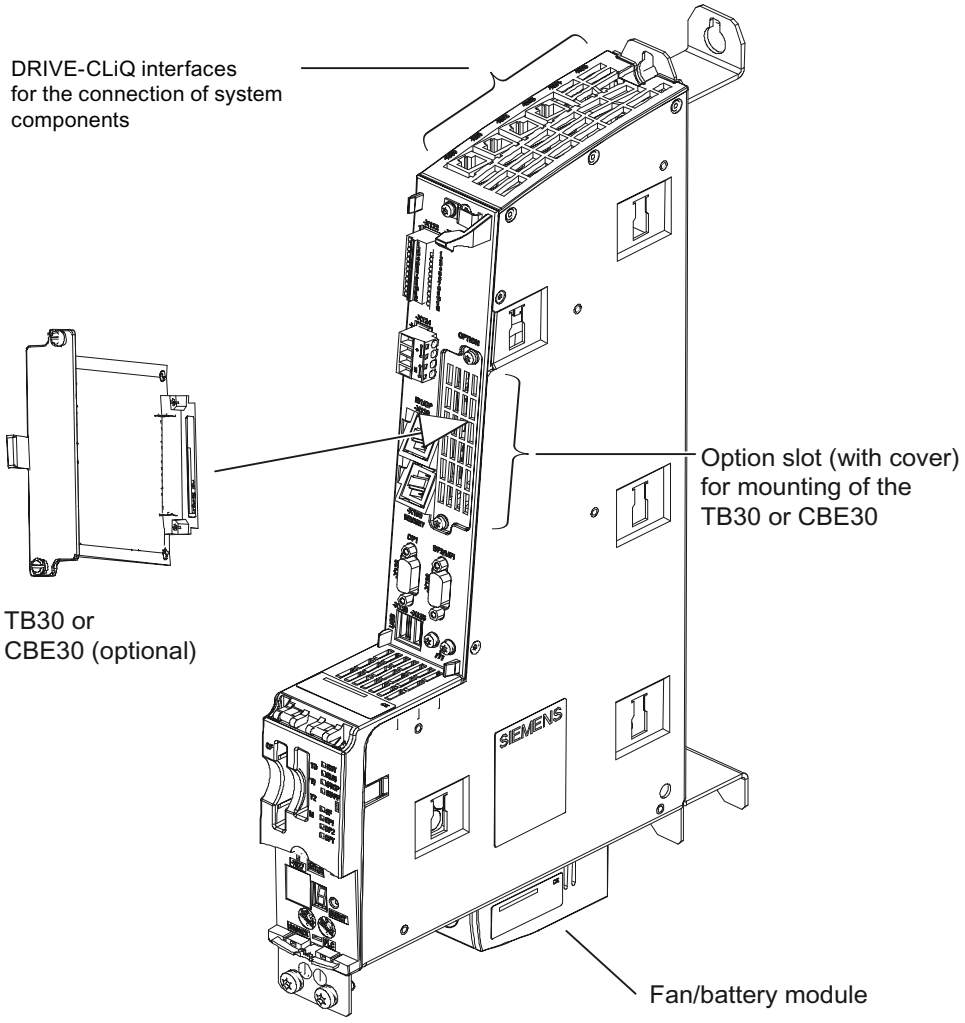


Figure 7-1 Position of supplementary D4x5 system components

7.2 Fan/battery module

7.2.1 Cooling SIMOTION D4x5 and buffering data

Functions of a fan/battery module

The fan/battery module has the following tasks:

- CPU cooling
- Buffering of the SRAM and the real-time clock if the SuperCap is insufficient.

The Control Unit monitors the temperature and the functioning of the fan.

Cooling the SIMOTION D4x5

If there is insufficient free convection for heat dissipation of the Control Unit and the supply air temperature rises above the permitted range, an external fan/battery module must be fitted to the bottom of the D4x5. This module can be installed without further measures on a Control Unit where there is insufficient ventilation in the control cabinet.

Table 7-1 Fan/battery module for SIMOTION D4x5

Characteristic	SIMOTION D425	SIMOTION D435	SIMOTION D445	SIMOTION D445-1
Fan/ battery module	Optional	D435 with order no. 6AU1 435-0AA00-0AA1 : optional ---------- D435 with order no. 6AU1 435-0AA00-0AA0 : with supply air temperature of 43° C or above	Always required (included in the D445's scope of delivery)	Always required (double fan/ battery module included in the D445-1's scope of delivery)
Compatible fan/ battery modules	Fan/ battery module (single fan)	Fan/battery module (single fan)	Fan/battery module (single fan)	Double fan/ battery module Fan/battery module (single fan)
Max. permissible supply air temperature	55 °C	55° C	55° C	55° C
Fan control	Switches on at supply air temperatures of approx. 43° C or above	Switches on when supply air temperature of approx. 43° C above	Fan is always on	Temperature-controlled fan; activated when required and runs constantly at supply air temperatures of approx. 40° C or above

The double fan/battery module also guarantees sufficient cooling with just one functional fan.

If one of the fans fails, the remaining fan continues under full load. The failure also generates an event in the PeripheralFaultTask and is signaled via a system variable (system variable as of V4.2).

Fan failures are displayed and can be read out by means of the diagnostic buffer. With overtemperature or fan failures, the SF LED flashes red/yellow (2 Hz) and the 7-segment display shows the state "8".

NOTICE
Higher operating temperature if ventilation clearances are too small The ventilation clearances of 80 mm above and below the components must be observed. The unit protects itself from overheating by shutting down. The ventilation clearance is measured from the lower edge of the module, i.e. the fan/battery module is not included in the dimension.

Buffering data

For the retentive storage of process variables, the SIMOTION D4x5 has SRAM memory that is **backed up** by SuperCap to protect against a power failure. This backup is for at least 5 days. There are two options for storing retentive data for a longer period:

- The system command **_savePersistentMemoryData** to store retentive data on the CompactFlash card (CF) of the SIMOTION D4x5
  - Backing up of data when installing a spare part
  - Backing up data when a battery is not going to be used
- Use of the fan/battery module
  - Supplied with the SIMOTION D445/D445-1
  - Optional in the case of SIMOTION D425/D435.

Note

The backup time when a battery is used is at least 3 years. For the replacement part case, you should back up the SRAM data additionally on the CF card via the application (**_savePersistentMemoryData**).

Battery

A 3 V lithium battery can be inserted in the fan/battery module. The battery is pre-assembled with an approximately 4 cm long cable with plug connector.
The matching mating connector is attached to a small printed circuit board for connection in the fan/battery module.

See also

Available spare parts and accessories (Page 119)

Replace battery in the fan/battery module (Page 86)

7.2.2 Installing the fan/battery module

Overview

The procedure for installing the fan/battery module is described below. Double fan/battery modules are installed in a similar way and so are not referred to explicitly.

Procedure

Two plastic rails for installing this module are located on the underside of the Control Unit. Proceed as follows to install the fan/battery module:

1. If required, insert a battery in the fan/battery module.
2. Hold the fan/battery module at an angle to the front with the open side facing up (battery visible).
3. Push the plastic guide into the cutouts on the underside of the Control Unit.
4. Tilt the fan/battery module up until the front latching device snaps into place.
   The electrical connection between the fan/battery module and the Control Unit is made automatically.

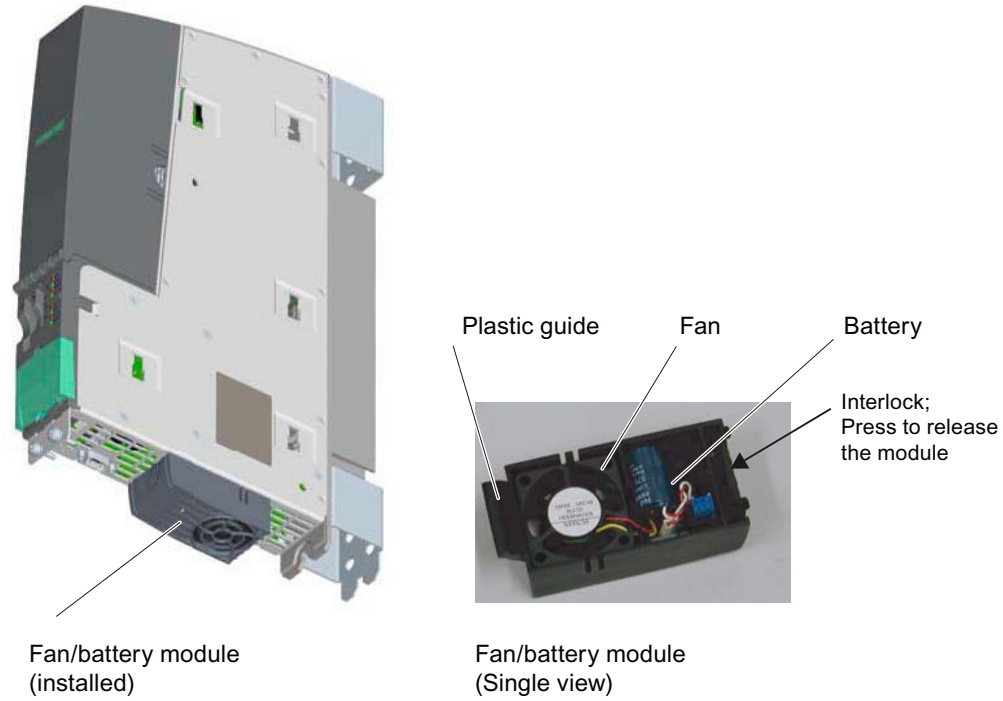


Figure 7-2 Installing the fan/battery module

7.2.3 Replace battery in the fan/battery module

Overview

The procedure for replacing the fan/battery module's battery is described below. Batteries for **double** fan/battery modules are replaced in a similar way and so are not referred to explicitly.

Procedure

Proceed as follows to replace the battery:

1. Press the latch.
   This detaches the module from its front latch (see figure above).
2. Tilt the fan/battery module forwards at an angle and pull out the plastic guide from the control unit cutout.
3. Remove the battery using a screwdriver (at the side) and disconnect the battery from the module by unplugging the connector.
4. Connect the cable connector of the new battery to the mating connector in the fan/battery module and push the battery in.

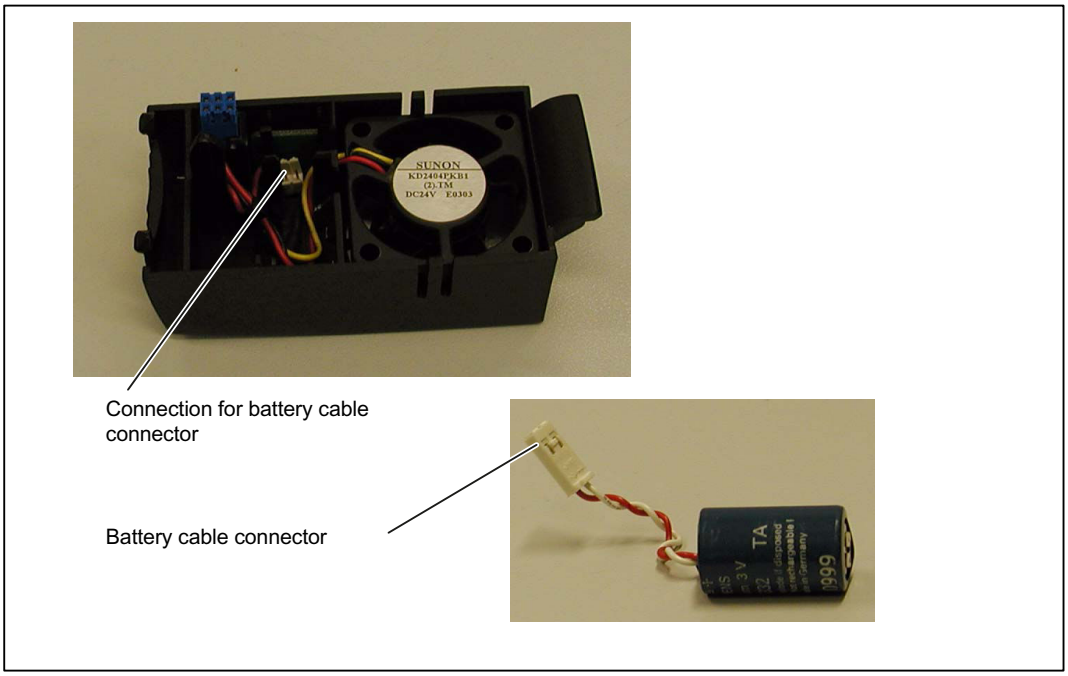


Figure 7-3 Change the battery in the fan/battery module

5. Hold the fan/battery module at an angle to the front with the open side facing up (battery visible).
6. Push the plastic guide into the cutout on the underside of the control unit.
7. Tilt the fan/battery module up until the front latch snaps into place.
   The electrical connection between the fan/battery module and the control unit is made automatically.

Rules for handling backup batteries

⚠ WARNING

Risk of ignition, explosion, and combustion

Incorrect handling of backup batteries can result in a risk of ignition, explosion, and combustion.

The regulations of DIN EN 60086-4, in particular regarding avoidance of mechanical or electrical tampering of any kind, must be complied with.

- Do not recharge
- Do not throw into a fire
- Do not solder on the body of the cell
- Do not open
- Only replace with identical types
- Only use a replacement from Siemens (for order number, see Section Available spare parts and accessories (Page 119)).

Always try to return old batteries to the manufacturer or deliver these to a registered recycling company where possible.

For information on shipping and storage of backup batteries, see Section Technical data of the D4x5 (Page 65).

Note

The fan/battery module may only be replaced when the device is in the power OFF state. The battery should be replaced at least once every 3 years, and certainly whenever the warning level is reached (see *SIMOTION D4x5* Commissioning and Hardware Installation Manual).

Delaying the replacement of the battery may result in the loss of retained data!

7.3 TB30 terminal board

7.3.1 Description

The TB30 Terminal Board is a terminal expansion module for SIMOTION D4x5. It is plugged into the option slot of the D4x5 Control Unit.

Table 7-2 Interface overview of the TB30

Type	Quantity
Digital inputs	4
Digital outputs	4
Analog inputs	2
Analog outputs	2

7.3.2 Safety information for the TB30

NOTICE
Damage to the TB30 caused by electric fields or electrostatic discharge Option boards are ESD-sensitive components. De-energize the SIMOTION D4x5 device before inserting or removing the option board. SIMOTION D4x5 is in a de-energized state when all the LEDs are OFF. Observe ESD guidelines; for details, see Section ESD guidelines (Page 123).

7.3.3 Interfaces

7.3.3.1 Overview

The following figure shows the arrangement of the interfaces on the front of the TB30.

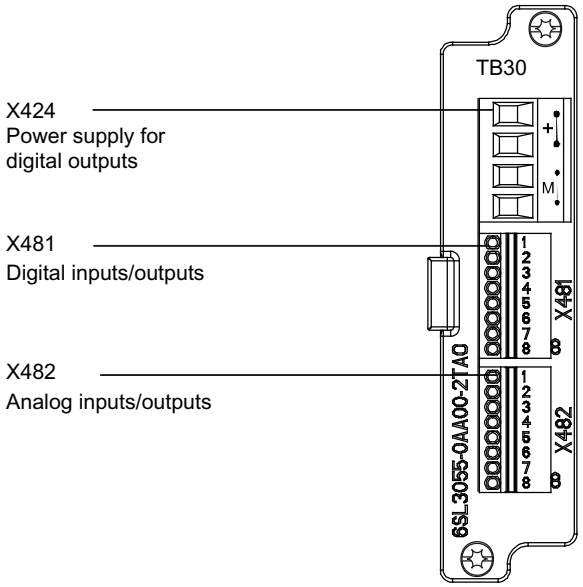


Figure 7-4 Interface arrangement on the TB30

7.3.3.2 Connection diagram

The following figure shows the schematic diagram of the TB30 as well as its connections for inputs (DI, AI), outputs (DO, AO) and power supply.

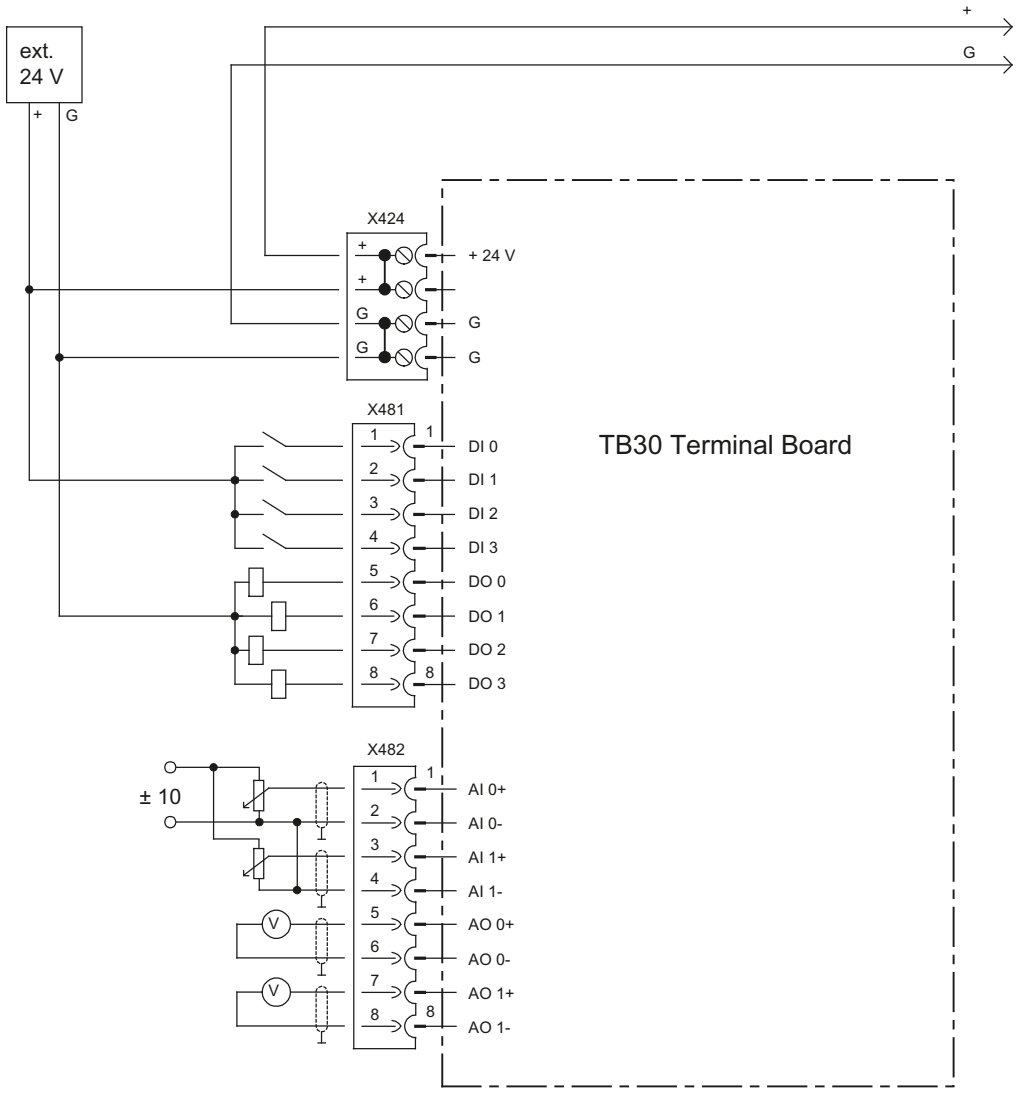


Figure 7-5 TB30 connection diagram

7.3.3.3 Power supply of digital outputs

Table 7-3 Terminal block X424

	Terminal	Function	Technical specifications
	+	Power supply	Voltage: 24 V DC (20.4 V–28.8 V)
	+	Power supply	Max. power consumption: 4 A

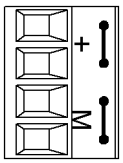
	Terminal	Function	Technical specifications
	G	Ground	Max. power consumption per digital output: 0.5 A Max. current via bridges in the connector: 20 A
	G	Ground	

Table 7-4 X424 wiring

Features		Type
Connector type		4-way screw-type terminal
Connectable cable types and conductor cross-sections		
	Rigid	0.2 mm² … 2.5 mm²
	Flexible	0.2 mm² … 2.5 mm²
	Flexible, with wire-end ferrule without plastic sleeve	0.2 mm² … 2.5 mm²
	Flexible, with wire-end ferrule with plastic sleeve	0.2 mm² … 1.5 mm²
	AWG / kcmil	22 … 12
Stripped length		6 … 7 mm
Tool		Screwdriver 0.5 x 3 mm (M2.5)
Tightening torque		0.4 to 0.5 Nm
Max. current carrying capacity, incl. loop-through		20 A (15 A per UL/CSA)
Max. cable length		10 m

Features

Two "+" terminals and two "G" terminals are available. These are jumpered in the connector. This loops through the power supply.

This power supply is only required for the digital outputs.

The option slot of the D4x5 Control Unit also provides the following power supplies:

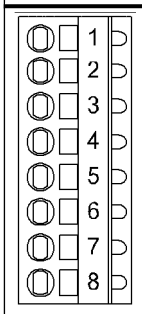
- Electronic power supply of the TB30
- Supply of the analog inputs and outputs.

The power supply of the digital outputs and the electronic power supply of the Control Unit are isolated.

7.3.3.4 Digital inputs/outputs

Table 7-5 Terminal block X481

	Terminal	Designation[1)]	Technical specifications
	1	DI 0	Voltage: -3 V to 30 V Typical current consumption: 10 mA at 24 VDC Ground reference: X424 (G terminal)
	2	DI 1	

	Terminal	Designation[1)]	Technical specifications
	3	DI 2	Input delay: • L ⇒ H: approx. 20 µs • H ⇒ L: approx. 100 µs Level (including ripple): • High signal level: 15 V to 30 V • Low signal level: -3 V to 5 V
	4	DI 3	
	5	DO 0	Voltage: 24 VDC Max. load current per output: 500 mA Ground reference: X424 (M terminal) Continuous short-circuit-proof output delay: • L ⇒ H: Typically 150 µs at 0.5 A ohmic load (500 µs max.) • H ⇒ L: Typically 50 µs at 0.5 A ohmic load Switching frequency: • With resistive load: max. 100 Hz • With inductive load: max. 0.5 Hz • With lamp load: max. 10 Hz Maximum lamp load: 5 W
	6	DO 1	
	7	DO 2	
	8	DO 3	

1) DI: digital input, DO: Digital output

Table 7-6 X481 wiring

Characteristics	Type
Connectable cable types: • Rigid • Flexible • Flexible, with wire-end ferrule without plastic sleeve • AWG / kcmil	Conductor cross-sections: • 0.14 mm^2 to 0.5 mm^2 • 0.14 mm^2 to 0.5 mm^2 • 0.25 mm^2 to 0.5 mm^2 • 26 to 20
Stripped length	8 to 9 mm
Tool	Screwdriver 0.4 x 2.0 mm

Note

An open input is interpreted as "low".

The power supply and the digital inputs/outputs are isolated from the Control Unit.

Note

With momentary interruptions in the 24 V supply, the digital outputs are deactivated during this time.

7.3.3.5 Analog inputs and outputs

Table 7-7 Terminal block X482

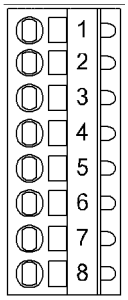
	Terminal	Designation[1)]	Technical specifications
	1	AI 0+	Analog inputs (AI): - Voltage: -10 V to +10 V - Internal resistance: 65 kΩ - Resolution: 13 bits + sign
	2	AI 0-	
	3	AI 1+	
	4	AI 1-	
	5	AO 0+	Analog outputs (AO): - Voltage range: -10 V to +10 V - Load current: Max. -3 mA to +3 mA - Resolution: 11 bits + sign - Cont. short-circuit strength
	6	AO 0-	
	7	AO 1+	
	8	AO 1-	

Table 7-8 X482 wiring

Features	Type
Connectable cable types	Conductor cross-sections
- Rigid	0.14 mm^2 to 0.5 mm^2
- Flexible	0.14 mm^2 to 0.5 mm^2
- Flexible, with end sleeve without plastic sleeve	0.25 mm^2 to 0.5 mm^2
- AWG/kcmil	26 to 20
Stripped length	8 to 9 mm
Tool	Screwdriver 0.4 x 2.0 mm

Note

An open input is interpreted as approximately "0 V."

The power supply of the analog inputs/outputs of the TB30 is via the option slot of the D4x5 Control Unit and not via X424.

The shield is connected to the Control Unit. For more information, see *SIMOTION D4x5* Commissioning and Hardware Installation Manual, Chapter "Connection."

NOTICE

Incorrect results of analog-to-digital conversion due to impermissible input voltage

The common mode range must not be violated.

Makes sure that the analog input voltage signals can have a maximum voltage of ±30 V with respect to the reference potential. If the range is infringed, incorrect results may occur during analog/digital conversion.

7.3.3.6 Working with analog inputs

The following reference contains more information about analog inputs:

- /IH1/ *SINAMICS S120* Commissioning Manual.
- /GH1/ *SINAMICS S120* Control Units and Additional System Components Manual.

7.3.3.7 Commissioning

Information about commissioning can be found in the *SIMOTION D4x5*Commissioning and Hardware Installation Manual.

7.3.4 Technical Specifications

Table 7-9 Technical data of the TB30

	Unit	Value
Electronic power supply:		
- Voltage	V_{DC}	24 (20.4 ... 28.8)
- Current via the option slot of the D4x5 (without digital outputs)	A_{DC}	0.05
- Power loss	W	<3
Response time	The response time of digital inputs/outputs and analog inputs/outputs depends on the evaluation on the Control Unit (see function diagram). **Reference:** SINAMICS S120/S150 Parameter Manual, Chapter "Function diagrams"	
Dimensions (H x W x D), approx.	mm	25 x 95 x 143
Weight	g	100

7.4 Controller Extension CX32

7.4.1 Overview of CX32

Properties

The CX32 is a module in SINAMICS S120 booksize format. The CX32 allows scaling for the drive-end computing performance of the SIMOTION D435, D445 and D445-1 Control Units.

Each CX32 can control up to 6 additional servo axes, 4 vector axes or 8 *V/f* axes.
The controller extension has 4 DI, 4 DI/DO and 4 DRIVE-CLiQ interfaces.

Drive quantity structures

If one or more CX32 modules are being used on a SIMOTION D435 or D445/D445-1, the number of drives that can be used on the SINAMICS Integrated is reduced by one. This gives the following quantified volumes:

SIMOTION V4.1/V4.2 (SINAMICS V2.5/V2.6)

Table 7-10 SIMOTION V4.1/V4.2 (SINAMICS V2.5/V2.6) quantity structure

	SINAMICS Integrated	1. CX32	2. CX32	3. CX32	4. CX32
SERVO D435	5+1 (5 drives+ 1 ALM [1])	6+1	6+1	-----	-----
SERVO D445/ D445-1	5+1	6+1	6+1	6+1	6+1
VEKTOR D435	3+1	4+1	4+1	-----	-----
VECTOR D445/ D445-1	3+1	4+1	4+1	4+1	4+1
V/f D435	7+1	8+1	8+1	----	----
V/f D445/D445-1	7+1	8+1	8+1	----	----

[1] ALM = Active Line Modules; Basic Line Modules (BLM), and Smart Line Modules (SLM) can also be used.

SIMOTION V4.0 HF2 (SINAMICS V2.4)

Table 7-11 SIMOTION V4.0 HF2 (SINAMICS V2.4) quantity structure

	SINAMICS Integrated	1. CX32	2. CX32	3. CX32	4. CX32
SERVO D435	5+1 (5 drives+ 1 ALM [1])	6+0	6+0	-----	------
SERVO D445	5+1	6+0	6+0	6+0	-----
VEKTOR D435	3+1	4+0	4+0	-----	-----
VEKTOR D445	3+1	4+0	4+0	4+0	

[1] ALM = Active Line Modules; Basic Line Modules (BLM), and Smart Line Modules (SLM) can also be used.

Note

Mixed operation of servo and vector-controlled drives

Mixed operation of servo and vector-controlled drives is not possible on a CX32. Therefore, drives on a CX32 must be operated in servo or in vector mode only. As with the SIMOTION D4x5, mixed operation of servo and *V/f*-controlled drives is possible on a CX32.

V/f-controlled drives

A maximum of 8 *V/f*-controlled drives are supported by each CX32.

7.4.2 Interfaces

Position of the interfaces

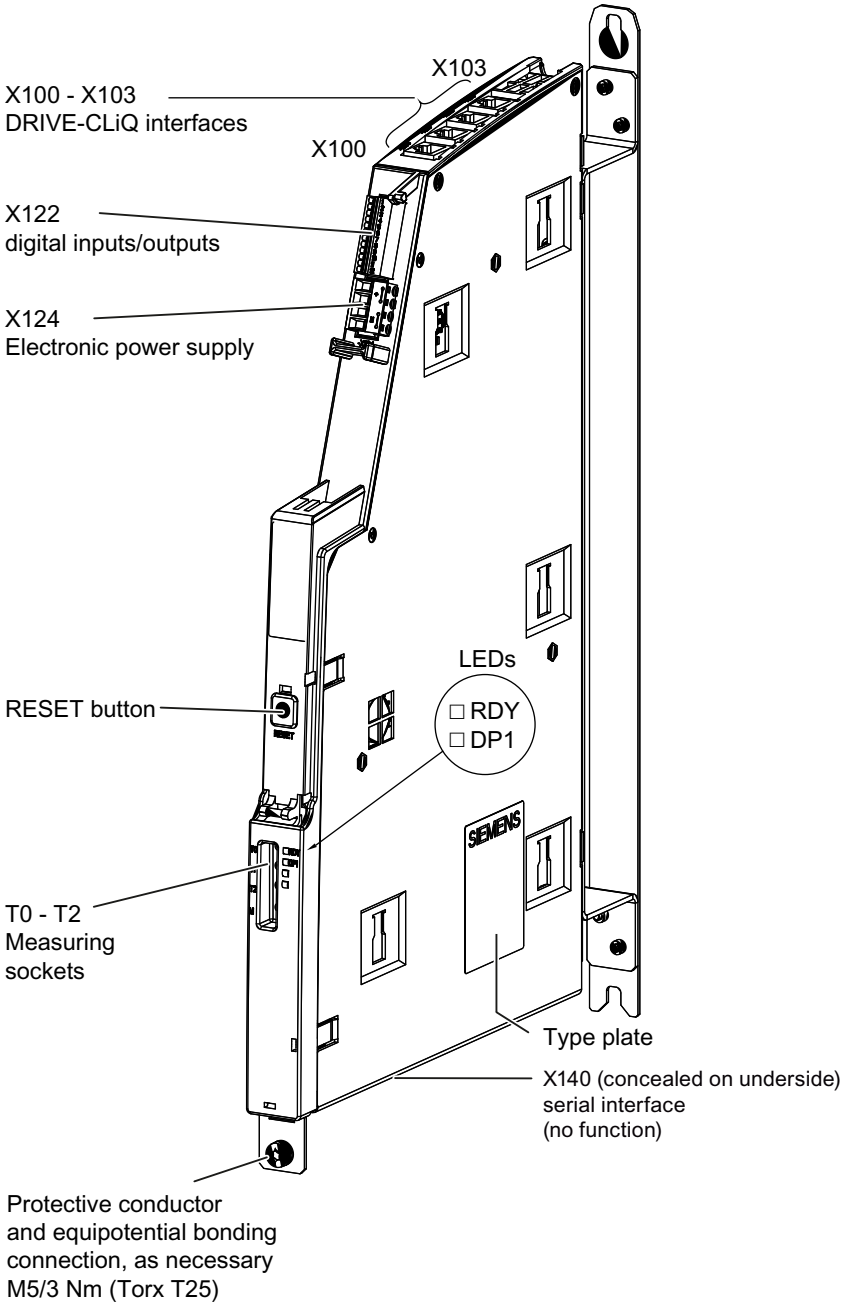


Figure 7-6 CX32 (without cover) with interfaces and operator control

NOTICE
Higher operating temperature if ventilation clearances are too small
The 80 mm clearances above and below the components must be observed.

7.4.2.1 List of interfaces

The CX32 has the following interfaces:

- 4 DRIVE-CLiQ interfaces
- 4 digital inputs/outputs
- 4 digital inputs
- Power supply connector

Available interfaces

Table 7-12 Overview of available interfaces

Interface	Name	Connector type
DRIVE-CLiQ interface	X100	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X101	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X102	DRIVE-CLiQ socket
DRIVE-CLiQ interface	X103	DRIVE-CLiQ socket
Digital inputs/outputs	X122	Micro Combicon, 1x12-pin
Power supply connector	X124	Combicon, 4-pin
Measuring sockets (T0, T1, T2, and M)	X131 - X134	Sockets

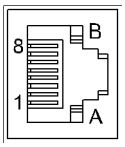
Non-usable interfaces

Table 7-13 Overview of interfaces that cannot be used for the CX32

Interface name	Interface	Connector type
RS 232 interface (as of HW version B)	X140	9-pin Sub-D connector

7.4.2.2 DRIVE-CLiQ interface

Table 7-14 DRIVE-CLiQ interface X100 – X103

	Pin	Signal name	Technical specifications
	1	TXP	Transmit data +
	2	TXN	Transmit data -
	3	RXP	Receive data +
	4	Reserved, do not use	
	5	Reserved, do not use	
	6	RXN	Receive data -
	7	Reserved, do not use	
	8	Reserved, do not use	
	A	+ (24 V)	Power supply
	B	M (0 V)	Electronic ground
Dust protection filler plugs for sealing unused DRIVE-CLiQ ports • 3 filler plugs contained in the CX32 scope of delivery • Filler plugs (50 pcs) order number: 6SL3066-4CA00-0AA0			

7.4.2.3 Digital inputs/outputs (X122)

Interface characteristics

Sensors and actuators can be connected to the X122 connector via digital inputs and outputs.

Table 7-15 X122 wiring

Characteristics	Type
Connector type	Micro Combicon
Connectable cable types: • Rigid • Flexible • Flexible, with wire-end ferrule without plastic sleeve • AWG / kcmil	Conductor cross-sections: • 0.14 mm^2 to 0.5 mm^2 • 0.14 mm^2 to 0.5 mm^2 • 0.25 mm^2 to 0.5 mm^2 • 26 to 20
Stripped length	8 to 9 mm
Tool	Screwdriver 0.4 x 2.0 mm
Max. current carrying capacity (ground)	4 A

Position of the connector

The X122 connection is on the front side of the CX32 at the top, see appropriate figure in Chapter Overview of interfaces (Page 96).

Connection and block diagram

The following figure shows the schematic diagram and the connection of the digital inputs/ outputs on the CX32 and the associated external power supply.

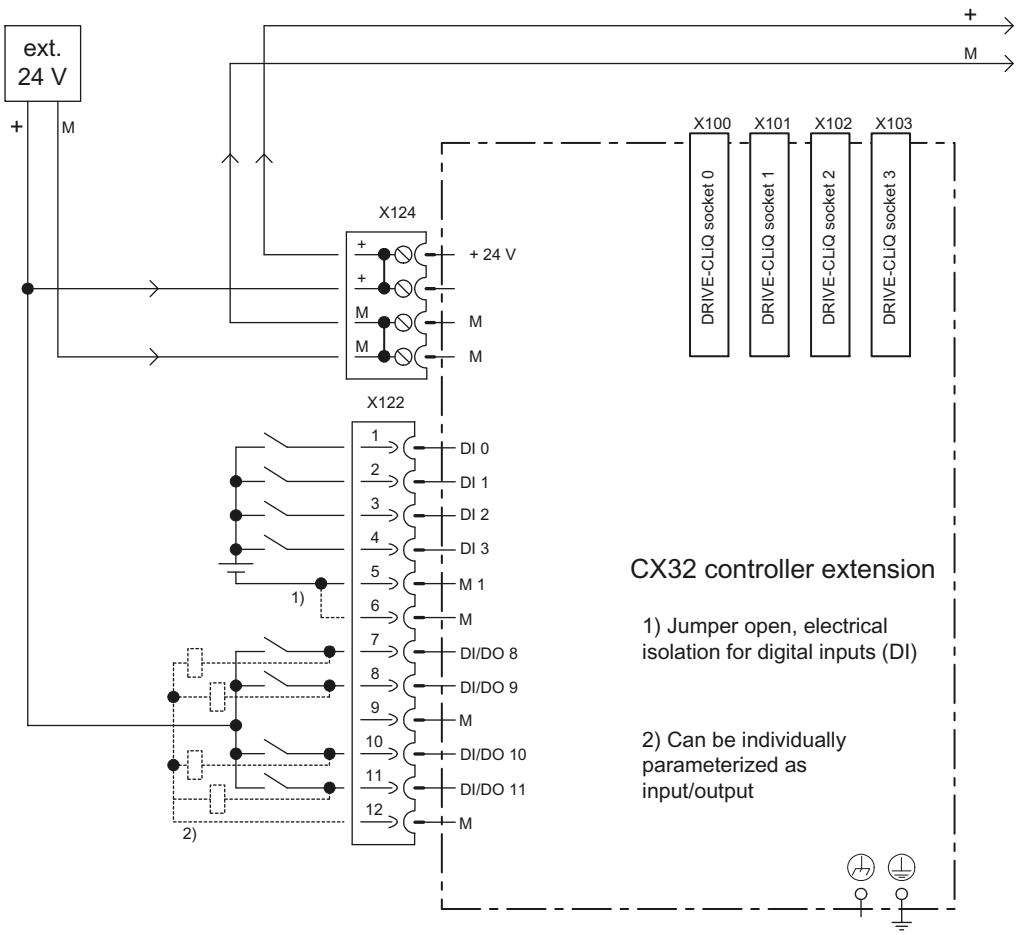


Figure 7-7 CX32 digital inputs/outputs connection diagram

Interface assignment of X122

Table 7-16 Digital inputs/outputs X122

Pin	Designation [1]	Signal type [2]	Notes
1	DI 0	I	Digital input 0
2	DI 1	I	Digital input 1
3	DI 2	I	Digital input 2
4	DI 3	I	Digital input 3
5	G1	GND	Ground for DI0 – DI3 (electrically isolated relative to G)
6	G	GND	Ground

Pin	Designation [1]	Signal type [2]	Notes
7	DI/DO 8	B	Digital input/digital output 8
8	DI/DO 9	B	Digital input/digital output 9 (can be used as a high-speed input of the measuring input)
9	G	GND	Ground
10	DI/DO 10	B	Digital input/digital output 10 (can be used as a high-speed input of the measuring input)
11	DI/DO 11	B	Digital input/digital output 11 (can be used as a high-speed input of the measuring input)
12	G	GND	Ground

[1] DI: digital input; DI/DO: bidirectional digital input/output; G or GND: Electronics ground; G1: Ground reference

[2] B = Bidirectional; I = Input; GND = Reference potential (ground)

Note

An open input is interpreted as "Low".
Terminal G1 must be connected for the digital inputs to function. The following alternatives are available:

- Connect the carried digital input reference ground to M1.
- Create the bridge between terminal G and terminal G1.
  This removes the electrical isolation for these digital inputs.

Using the digital inputs/outputs

Connecting sensors and actuators

Digital inputs and digital outputs can be used to connect various sensors and actuators to the 12-pin X122 front connector.

The following types of digital inputs/outputs are used:

- Digital inputs
- Bidirectional digital inputs/outputs

Bidirectional digital inputs and outputs can be configured individually as digital inputs or outputs.

Assignment of the inputs/outputs to functions can be parameterized as required. Special functions (e.g. input of the measuring input) can be assigned to the inputs/outputs.

The enables for the drive units and/or motors (Active Line Module, Motor Module) connected to the Control Unit can, for example, be switched using the digital inputs.

Digital inputs

There are 4 digital inputs on the CX32.

The electrically isolated inputs can be used as freely addressable inputs.

Bidirectional digital inputs/outputs

4 digital inputs/outputs (DI/DO) are available on the CX32.

When the DI/DO are assigned as digital inputs, they can be used as follows:

- The DI/DO 9 to 11 can be used as high-speed inputs for measuring inputs or for external zero marks.
  The assignment of the inputs is not fixed, and the special use is activated in the SIMOTION SCOUT engineering system.
- All four digital inputs/outputs can be used as freely addressable inputs or as homing inputs.

When parameterizing the DI/DOs as digital outputs, these can be used as freely addressable outputs.

Note

Shielded cables are required when connecting measuring inputs or external zero marks for optimal noise immunity.

Additional references

For information on configuring the DI/DOs as freely addressable I/Os or as measuring inputs, see the *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

For information on the configuration and function of the measuring input, output cam, and cam track technology objects, refer to the *SIMOTION Output Cams and Measuring Inputs* Function Manual.

7.4.2.4 Power supply

Application

This interface is provided exclusively for connection of an external power supply.

Note

When using external power supplies (e.g. SITOP), the ground potential must be connected with the protective ground terminal (PELV).

Features of the interface

Table 7-17 Interface X124

Features		Type
Connector type		4-way screw-type terminal
Connectable cable types and conductor cross-sections		
	Rigid	0.2 mm² … 2.5 mm²
	Flexible	0.2 mm² … 2.5 mm²

Features		Type
	Flexible, with wire-end ferrule without plastic sleeve	0.2 mm² … 2.5 mm²
	Flexible, with wire-end ferrule with plastic sleeve	0.2 mm² … 1.5 mm²
	AWG / kcmil	22 … 12
Stripped length		6 … 7 mm
Tool		Screwdriver 0.5 x 3 mm (M2.5)
Tightening torque		0.4 to 0.5 Nm
Max. current carrying capacity, incl. loop-through		20 A (15 A per UL/CSA)
Max. cable length		10 m

Interface assignments

Table 7-18 Power supply X124

Pin	Signal name	Signal type	Meaning
1	+	VI	Power supply 24 V
2	+	VI	Power supply 24 V
3	G	VO	Ground
4	G	VO	Ground
Signal type: VI = Voltage input (power supply) VO = Voltage output (power supply)			

Note

The 24 V supply voltage is looped through via the 24 V connector. In this case, pin 1 is jumpered with pin 2, and pin 3 is jumpered with pin 4.

7.4.2.5 Measuring sockets

Application

The T0, T1 and T2 measuring sockets are used to output analog signals. Any interconnectable signal can be output on any measuring socket of the CX32.

Note

The measuring sockets should be used exclusively for servicing purposes.

The measurements may only be performed by appropriately trained specialists.

The measuring sockets are suited for multiple-spring wire connectors with a diameter of 2 mm.

7.4.3 Displays of the LEDs

Description

Table 7-19 CX32 LEDs

LED	Description
RDY	Operating modes of the CX32
DP1	Status of the communication connection between the D4x5 and the CX32

Additional references

Detailed information on the states of the status LEDs can be found in the SIMOTION D4x5 Commissioning and Hardware Installation Manual, Diagnostics chapter.

7.4.4 RESET button

The RESET button is on the front of the device under the cover.

Function of the RESET button

The following reference contains information about the RESET button function:

- *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

7.4.5 Commissioning

Note

Information about commissioning can be found in the *SIMOTION D4x5* Commissioning and Hardware Installation Manual.

7.4.6 Technical data

Memory for system data

Table 7-20 Diagnostic buffer

Data	SIMOTION CX32
Diagnostic buffer (non-volatile)	100 messages

The data for the CX32 is stored exclusively on the SIMOTION D435/D445/D445-1, which means no action has be taken when the module is replaced.

Dimensions and weight

Table 7-21 Dimensions and weight of a SIMOTION CX32

Parameter	SIMOTION CX32
Dimensions W x H x D [mm] (max. expansion) • Without fastening using spacers • With fastening using spacers	 • 25 x 380 x 230 • 25 x 380 x 270
Weight CX32 [g] • Without packaging • With packaging	 • approx. 2200 • approx. 2700

Ambient conditions

Table 7-22 CX32 environmental requirements

Parameter	Values
Permissible ambient temperature • Storage and transport • Operation	 • -40° C ... +70° C • 0° C to +55° C up to 2000 m above sea level As of an altitude of 2000 m, the maximum ambient temperature decreases by 7° C every 1000 m
Permissible relative humidity (without condensation)	5 % ... 95 %
Installation altitude	Max. 5,000 m above sea level
Organic/biological influences • Storage • Transport • Operation	 • Class 1B1 according to EN 60 721-3-1 • Class 2B1 according to EN 60 721-3-2 • Class 3B1 according to EN 60 721-3-3
Pollution degree	2 according to EN 60 664-1

Parameter	Values
Degree of protection according to EN 60529 (IEC 60529)	IP20
Atmospheric pressure	700 ... 1060 hPa

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.

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

See Residual risks of power drive systems (Page 16).

Integrated drive control

Table 7-23 Controls for integrated drives

Data	SIMOTION CX32
Max. number of axes for integrated drive control (servo/vector/*V/f*)	6 / 4 / 8 (alternative) Drive control based on SINAMICS S120 CU320, firmware version V2.x

Communication

Table 7-24 Interface communication

Data	SIMOTION CX32
DRIVE-CLiQ interfaces	4

General technical data

Table 7-25 Technical data (general)

Data	SIMOTION CX32
Power supply • Rated value • Permissible range	 24 V DC (20.4 ... 28.8 V)
Current consumption, typically [1]	800 mA
Starting current, typ.	1.6 A
Power loss	20 W

[1] With no load on inputs/outputs, no 24 V supply via DRIVE-CLiQ interfaces

Digital inputs

Table 7-26 Digital inputs on SIMOTION CX32

Data	SIMOTION CX32
Digital inputs	4
• Rated value	24 V DC
• For signal "1"	15 ... 30
• For signal "0" 2)	-3 ... +5 V
Galvanic isolation	Yes, in groups of 4 1)
Current consumption typ. at High level	10 mA at 24 V
Input delay, typ. (hardware)	L -> H: 50 µs H -> L: 150 µs

1) The reference potential is terminal M1

2) The digital inputs are protected against polarity reversal up to -30 V

Digital I/Os (parameterizable)

Table 7-27 Digital inputs/outputs on SIMOTION CX32

Data	SIMOTION CX32
Number of digital inputs/outputs	4, max. 3 as high-speed measuring inputs
If used as an input:	
• Input voltage, rated value	24 V DC
• Input voltage, for signal "1"	15...30 V
• Input voltage, for signal "0" 2)	-3...+5 V
Galvanic isolation	No
Current consumption, typ. at High level	10 mA at 24 V
Input delay, typ. (hardware): • DI/DO 9-11: (can also be used as inputs for measuring inputs) • DI/DO 8:	 • L -> H: 5 µs H -> L: 50 µs • L -> H: 50 µs H -> L: 100 µs
Measuring input input, reproducibility	5 µs
If used as an output	
• Rated load voltage, permissible range	24 V DC, 20.4 ... 28.8 V
• Galvanic isolation	No
• Current load, max.	500 mA per output
• Residual current, max.	2 mA
• Output delay, typ./max. (hardware) 1)	L -> H: 150 µs / 400 µs H -> L: 75 µs / 100 µs
Switching frequency of the outputs, max.	
• With resistive load	100 Hz
• With inductive load	2 Hz

Data	SIMOTION CX32
• With lamp load	11 Hz
Short-circuit protection	Yes

[1] Data for: Vcc = 24 V; load 48 Ohm; H = 90% V_{out}, L = 10% V_{out}

[2] The digital inputs are protected against polarity reversal up to -30 V

7.5 CBE30 communication board Ethernet

7.5.1 CBE30 communication board

Characteristics of the CBE30

The CBE30 Ethernet communication board for SIMOTION D4x5 enables connection to a PROFINET IO network. The SIMOTION D4x5 then assumes the role of a PROFINET IO Controller and can offer the following functions:

- PROFINET IO controller, I device (also controller and device simultaneously)
- 100 Mbit/s full duplex/autocrossing
- Supports real-time classes of PROFINET IO:
  - RT (real-time)
  - IRT (isochronous real-time)

The CBE30 has an X1400 interface with an integral 4-port switch based on PROFINET ASICs ERTEC400.

NOTICE
Damage to the CBE30 caused by electric fields or electrostatic discharge Option boards are ESD-sensitive components. De-energize the SIMOTION D4x5 device before inserting or removing the option board. SIMOTION D4x5 is in a de-energized state when all the LEDs are OFF. Comply with the ESD rules.

View

The connections and LED displays are provided on the front of the CBE30.

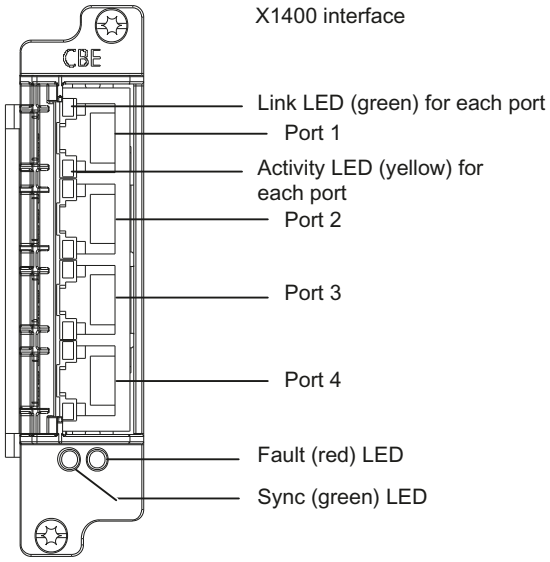


Figure 7-8 Front view of the CBE30

7.5.2 Nameplates

Type plate

The following figure shows you all the information included on the type plate.

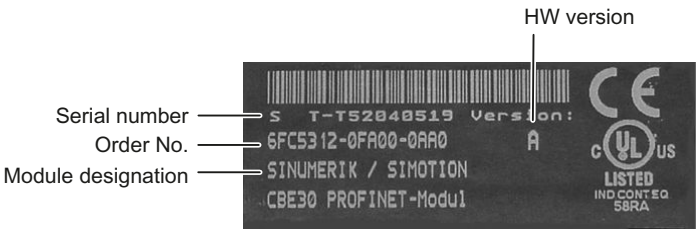


Figure 7-9 CBE30 nameplate

You might need to access the information provided on the type plate after the CBE30 has been mounted. Because the type plate is mounted on the underside of the CBE30, we recommend that you note the serial number before mounting it.

Note

The contents of the individual type plate fields of the CBE30 may differ from those described in this manual (e.g. updated product status, approvals and markings not yet issued, etc.).

MAC address

A second plate for the MAC address of the Ethernet interfaces is attached to the top side of the board:



Figure 7-10 CBE30 MAC address

This plate is only visible when the CBE30 has been removed. You need the MAC address to assign an IP address.

Note

The MAC address is affixed to the top side of the CBE30, behind the RJ45 sockets.

7.5.3 Safety Information

NOTICE
Damage to the CBE30 caused by electric fields or electrostatic discharge
Option boards are ESD-sensitive components.
De-energize the SIMOTION D4x5 device before inserting or removing the option board. SIMOTION D4x5 is in a de-energized state when all the LEDs are OFF.
Comply with the ESD rules.

See also

ESD guidelines (Page 123)

7.5.4 Interface description

7.5.4.1 Ethernet interfaces

Characteristics

The X1400 interface has full-duplex 10/100 Mbit Ethernet ports. The module has an integrated 4-port switch.

Interface characteristics

Table 7-28 X1400 features

Characteristic	Type
Connector type	RJ45 socket
Cable type	Industrial Ethernet cable
Maximum cable length	100 m
Dust protection filler plugs for sealing unused PROFINET ports	• 5 filler plugs contained in the D4x5 scope of delivery. • Filler plugs (50 pcs): Order number: 6SL3066-4CA00-0AA0

Pin assignment

Table 7-29 X1400 interface

Pin	Signal name	Signal type	Meaning
1	TXP	Output	Ethernet transmit differential signal
2	TXN	Output	Ethernet transmit differential signal
3	RXP	Input	Ethernet receive differential signal
4	--		4 together with 5 via 75 ohm at the 1 nF capacitor to the shield ground
5	--		4 together with 5 via 75 ohm at the 1 nF capacitor to the shield ground
6	RXN	Input	Ethernet receive differential signal
7	--		7 together with 8 via 75 ohm at the 1 nF capacitor to the shield ground
8	--		7 together with 8 via 75 ohm at the 1 nF capacitor to the shield ground
Screened backshell	M_EXT		Screen, permanently connected

Position of the ports

The interfaces are located on the front side of the CBE30.



Figure 7-11 CBE30 interface

7.5.4.2 LED displays

Position of the LEDs

The X1400 interface with the four ports has integrated LEDs for displaying the link and the activity for each port. The front panel of the board is also fitted with two LEDs (Fault and Sync), which indicate the bus status.

Table 7-30 Meaning of the LED displays

LED	Meaning
link	... indicates whether a different device is connected to port x and a physical connection exists
Activity	... indicates whether data is being received or sent at port x
Sync	... indicates the synchronization status of the PROFINET IO interface
Fault	... indicates a fault state of the PROFINET IO interface

Additional references

Detailed information on the states of the status LEDs can be found in

SIMOTION D4x5 Commissioning and Hardware Installation Manual, Diagnostics chapter.

7.5.5 Dimension drawing

CBE30 description

The following illustrations show the components in 4 views.

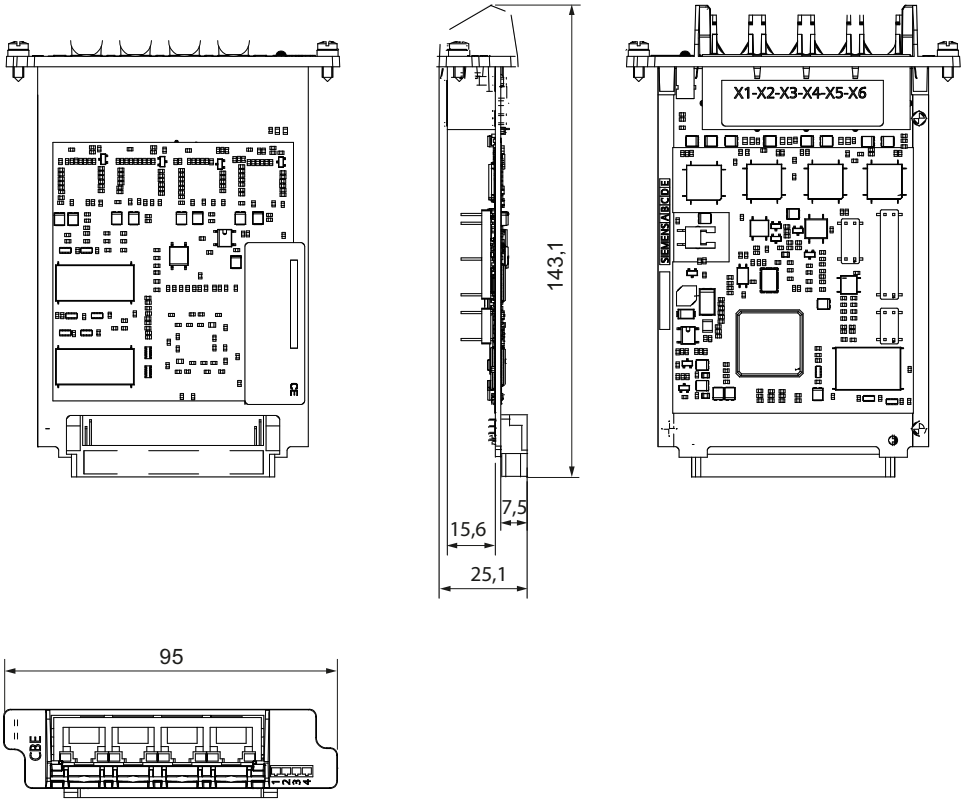


Figure 7-12 Dimension drawing CBE30

7.5.6 Commissioning

Additional references

- *SIMOTION D4x5* Commissioning and Hardware Installation Manual
- *SIMOTION Communication* System Manual

7.5.7 Technical data

CBE30 technical data

Table 7-31 Technical data

Characteristic	Value
Current requirement at 24 V DC	0.25 A
Approvals	cULus (File No. E164110)

Storage and operation

Table 7-32 Environmental conditions for CBE30

Characteristic	Value/Range	Standard
Permissible ambient temperature • Storage • Operation	 -40°C ... +70°C 0°C ... +55°C	
Permissible relative humidity (without condensation)	> 5 % to 95 %	DIN EN 60721-3-3, Class 3K5
Degree of protection	IP00	DIN EN 60529
Vibratory load		DIN EN 60721-3-3, Class 3M6
Shock load		DIN EN 60721-3-3, Class 3 M4
Free fall		DIN EN 60721-3-2, Class 2M1 and 2M2
Toppling		DIN EN 60721-3-2, Class 2M1

Dimensions and weight

Characteristic	Value
Dimensions (H x W x D)	25 x 95 x 143
Weight	100 g

7.6 Terminal module TM31

Characteristics of the TM31

With the TM31 Terminal Module, the number of available digital inputs/digital outputs and the number of analog input/analog outputs within a drive system can be expanded. The TM31 is connected via DRIVE-CLiQ. It has 2 DRIVE-CLiQ interfaces for this.

The TM31 contains the following terminals:

Table 7-33 Interface overview

Interface	Quantity
Digital inputs	8
Bidirectional inputs/outputs	4
Relay outputs with changeover contact	2
Analog inputs	2
Analog outputs	2
Temperature sensor input (KTY84-130 or PTC)	1

NOTICE
Overheating if ventilation clearances are too small Insufficient ventilation clearances result in overheating and therefore in more failures and a shortened life of the component. Maintain 50 mm ventilation clearances above and below the component.

Additional references

You will find detailed information about the TM31 in the

- *SINAMICS S120 Control Units and Additional System Components* Manual
- *SIMOTION D4x5* Commissioning and Hardware Installation Manual

7.7 Terminal module TM41

Characteristics of the TM41

With the TM41 Terminal Module, the number of available digital inputs/digital outputs and the number of analog inputs within a drive system can be expanded. In addition, the TTL output can be used for encoder emulation. The TM41 is connected via DRIVE-CLiQ.

The TM41 contains the following terminals:

Table 7-34 Interface overview

Type	Quantity
Digital inputs	4
Digital inputs/outputs	4
Analog inputs	1
TTL encoder output	1

NOTICE
Overheating if ventilation clearances are too small Insufficient ventilation clearances result in overheating and therefore in more failures and a shortened life of the component. Maintain 50 mm ventilation clearances above and below the component.

Additional references

You will find detailed information about the TM41 Terminal Module in the

- *SINAMICS S120 Control Units and Additional System Components* Manual
- *SIMOTION D4x5* Commissioning and Hardware Installation Manual

7.8 Terminal Module TM54F

Characteristics of the TM54F

The TM54F Terminal Module is a terminal expansion module for snapping on to a DIN EN 60715 mounting rail. The TM54F offers safe digital inputs and outputs for control of Safety Integrated functions of SINAMICS. The TM54F Terminal Module is supported by SIMOTION D4x5 from version V4.1 SP1 and higher.

No more than one TM54F can be assigned to each drive control (SINAMICS Integrated of a D4x5, CX32, CU320, etc.). Connection is via DRIVE-CLiQ. Each drive control must have its own dedicated TM54F.

Additional nodes (e.g. TMxx, SMxx, MMxx) can be connected to the same DRIVE-CLiQ line.

TM54 is equipped with the following terminals:

Table 7-35 Interface overview

Type	Quantity
Fail-safe digital outputs (F-DO)	4
Fail-safe digital inputs (F-DI)	10
Sensor [1] power supplies, dynamic response supported [2]	2
Sensor [1] power supplies, no dynamic response	1
Digital inputs for testing the F-DO with test stop	4

[1] Sensors: Fail-safe devices for commanding and detecting, such as emergency stop pushbuttons and safety locks as well as position switches and light arrays / light curtains.

[2] Dynamic response: The sensor power supply is switched on and off during test stop for testing the sensors, the cable routing, and the evaluation electronics of TM54F.

The TM54F has 4 fail-safe digital outputs and 10 fail-safe digital inputs. A fail-safe digital output consists of a P/M-switching output as well as a digital input for reading back the switching state. A fail-safe digital input is made up of two digital inputs.

NOTICE
Overheating if ventilation clearances are too small Insufficient ventilation clearances result in overheating and therefore in more failures and a shortened life of the component. Maintain 50 mm ventilation clearances above and below the component.

Additional references

You will find detailed information on the TM54F Terminal Module in the following sources

- *SINAMICS S120 Control Units and Additional System Components* Manual
- *SINAMICS S120 Safety Integrated* Function Manual

7.9 Terminal modules TM15 and TM17 High Feature

Features of TM15 and TM17 High Feature

The TM15 and TM17 High Feature Terminal Modules are used to implement inputs of measuring inputs and outputs of output cams for SIMOTION D. In addition, these Terminal Modules provide drive-related digital I/Os with short signal delay times. TM15 and TM17 High Feature are connected via DRIVE-CLiQ.

TM15

Each of the 24 electrically isolated digital I/Os can be parameterized channel-by-channel as a digital input (DI), digital output (DO), a measuring input input, or an output cam output.

TM15 DI/DO

Each of the 24 isolated digital I/Os can be configured on a channel-specific basis as a digital input (DI) or digital output (DO). The digital I/Os can be interconnected using BICO technology and thus used from the drive side as well. Unlike the TM15, measuring inputs and outputs of output cams are not available with the TM15 DI/DO.

Note: The module hardware for the TM15 and TM15 DI/DO is identical. A distinction is only made by the addition of the component in the SIMOTION SCOUT project navigator using "Inserting input/output component".

TM17 High Feature

Each of the 16 DI/DO can be configured on a channel-specific basis as digital input (DI), digital output (DO), measuring input or output cam output.

TM17 High Feature has fewer I/O channels than TM15, but more functionality. TM17 High Feature is distinguished by especially high resolution and accuracy as well as a

parameterizable input filter and enabling inputs (max. 6 units). Parameterized enable inputs can enable measuring inputs or outputs of output cams (gate function). Due to their high accuracy, the DI/DO channels of the TM17 High Feature are non-isolated.

Note

NOTICE
Overheating if ventilation clearances are too small Insufficient ventilation clearances result in overheating and therefore in more failures and a shortened life of the component. Maintain 50 mm ventilation clearances above and below the component.

Additional references

You will find more information on TM15 and TM17 High Feature in the

- *TM15/TM17 High Feature System Components* Manual
- Terminal Modules TM15 and TM17 High Feature *Commissioning Manual.*

7.10 CUA31/CUA32 control unit adapter

Characteristics of the CUA31/CUA32

You can connect Power Modules in blocksize format via DRIVE-CLiQ to the D4x5 Control Units using the CUA31/CUA32 adapter modules.
The CUA32 adapter module also has an additional encoder interface for an HTL, TTL, or SSI encoder.

Table 7-36 Number of interfaces on the adapter modules

Interface	CUA31	CUA32 (V4.1 SP2 and higher)
DRIVE-CLiQ interface	3	3
EP terminals/temperature sensor connection	1	1
Power module interface (PM-IF)	1	1
24 V electronic power supply	1	1
Encoder interface (HTL, TTL, SSI) Only SSI encoders without incremental tracks may be operated.	0	1
DRIVE-CLiQ cable length, max.	50 m / 100 m [1)]	100 m

[1] Max. length 50 m for CUA31 with order number 6SL3040-0PA00-0AA0
Max. length 100 m for CUA31 as of order number 6SL3040-0PA00-0AA1

NOTICE
Overheating if ventilation clearances are too small Insufficient ventilation clearances result in overheating and therefore in more failures and a shortened life of the component. Maintain 50 mm ventilation clearances above and below the component. The ventilation openings may not be covered by connecting cables.

Additional references

You will find more information on the CUA31/CUA32 control unit adapter in the *SINAMICS S120 AC Drive* Manual.

7.11 DMC20 DRIVE-CLiQ hub

Features

The DMC20 and DME20 DRIVE-CLiQ hub modules are used to implement point-to-point distribution of a DRIVE-CLiQ line. With the DMC20/DME20, an axis grouping can be expanded with four DRIVE-CLiQ sockets for additional subgroups.

- DMC20 is the hub for the control cabinet configuration
- DME20 is the hub for use without a control cabinet (IP67 degree of protection).

The modules are especially suitable for applications which require DRIVE-CLiQ nodes to be removed in groups, without interrupting the DRIVE-CLiQ line and therefore the data exchange.

Additional references

You will find detailed information about the DMC20/DME20 in the

SINAMICS S120 Control Units and Additional System Components Manual.

Available spare parts and accessories

8

Table 8-1 Spare parts and accessories

Parts for SIMOTION D4x5	Order No.	Accessories	Spare parts
1-GB CompactFlash card (CF card) With drive software and SIMOTION Kernel (latest CF card at the time of writing)	6AU1400-2PA03-0AA0	x	
PROFIBUS RS485 bus connector with angular cable outlet (35 °) With screw-type terminals, max. transmission rate 12 Mbit/s - without PG/PC interface - with PG/PC interface	 6ES7972-0BA41-0X40 6ES7972-0BB41-0X40	 x x	
PROFIBUS Fast Connect RS485 bus connector with angular cable outlet (35°) with insulation displacement terminals, max. transmission rate 12 Mbit/s - without PG/PC interface - with PG/PC interface	 6ES7972-0BA60-0XA0 6ES7972-0BB60-0XA0	 x x	
Fan/battery module incl. battery (can be used with D425/D435/D445/D445-1) In the case of the SIMOTION D445, the fan/battery module is already included in the scope of delivery. (optional for D425/D435; required for D445)	6FC5348-0AA01-0AA0	x	x
Double fan/battery module incl. battery (can be used with D445-1) In the case of the SIMOTION D445-1, the double fan/battery module is already included in the scope of delivery.	6FC5348-0AA02-0AA0		x
3 V lithium battery for fan/battery module	6FC5247-0AA18-0AA0		x
Spacers for D425 and D435 Kit, 2 units	6SL3064-1BB00-0AA0		x
Terminals for digital inputs/outputs (X122 and X132)	6SL3064-2AB00-0AA0		x
Terminal kit contains • 3 x I/O connectors for X122/X132 • 1 x 24 V connector for X124 • 5 x DRIVE-CLiQ blanking cover for X100-X105	6SL3064-8MA00-0AA0		x
Power supply connector (X124)	6SL3065-2AA00-0AA0		x
Option slot protective cover	6SL3064-3CB00-0AA0		x
Dust protection filler plugs for sealing unused DRIVE-CLiQ, Ethernet or PROFINET ports **Filler plugs (50 pcs)**	6SL3066-4CA00-0AA0	x	x
Blanking cover for the protection of the operator controls	6SL3064-3BB00-0AA0		x

To obtain ordering data information for other SINAMICS drive components, such as Line Modules, Motor Modules, DRIVE-CLiQ cables, etc., see the PM 21 Catalog.

Spares On Web

Spares On Web is an information system that displays which spare parts are available for your device.

Spares On Web (https://b2b-extern.automation.siemens.com/spares_on_web?sap-language=EN)

In order to view the spare parts, you require the order number and the serial number of the module. Both numbers can be found on the type plate on the module or the packaging label.

Repair parts

Repair parts (e.g. front flaps, shield connection terminals) have only one material number (A5E… or GWE-…).

In Spares On Web, repair parts are only visible to repair centers.

In the case of SIMOTION D, selected repair parts can also be ordered by customers.

For additional information, see FAQ (http://support.automation.siemens.com/WW/view/en/29727640).

Standards and approvals

A

A.1 General rules

CE marking

CE	Our products satisfy the requirements and protection objectives of the EC Directives and comply with the harmonized European standards (EN).

Electromagnetic compatibility

Standards for EMC are satisfied if the EMC Installation Guideline is observed.

SIMOTION products are designed for industrial use in accordance with product standard DIN EN 61800-3, Category C2.

cULus Approval

c UL us	Listed component mark for United States and the Canada Underwriters Laboratories (UL) according to Standard UL 508, File E164110, File E115352, File E85972.

You can find more information on the respective device on the Internet at http://database.ul.com/cgi-bin/XYV/template/LISEXT/1FRAME/index.htm. Enter the first 7 characters of the order number under **Keyword**. Then click **Search**.

EMC

KOREA	
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.	
For sellers or other users, please keep in mind that this device is an A-grade electromagnetic wave device. This device is intended to be used in areas other than home.	
The EMC limit values to be observed for Korea correspond to the limit values of the EMC product standard for variable-speed electric drives EN 61800-3 of Category C2 or the limit value class A, Group 1 to CISPR11. By implementing appropriate additional measures, the limit values according to category C2 or limit value class A, Group 1, are observed. For this purpose, additional measures, such as e.g., the use of an additional RFI suppression filter (EMC filter) may be necessary. In addition, measures for EMC-compliant configuration of the plant are described in this Manual and/or the Configuration Manual "EMC Installation Guideline". Please note that ultimately it is always the label on the device that provides the decisive information on the compliance with standards.	

Declaration of conformity

The current Declaration of conformity is available on the Internet at Declaration of conformity (http://support.automation.siemens.com/WW/view/en/10805446/134200).

C-Tick

AUSTRALIA	
	D425, D435, D445, D445-1 meets the requirements of the AS/NZS CISPR 22.

A.2 SIMOTION D4x5 device-specific notes

Note regarding SIMOTION D

Note

The product standard EN 61800-3 describes the EMC requirements placed on "Variable-speed drive systems". As such, it defines different limits depending on the location of the drive system.

SINAMICS S120 power units are designed for use in the second environment. The term second environment refers to all locations outside residential areas. These are basically industrial areas which are supplied from the medium-voltage line supply via their own transformers.

The same installation instructions apply for the SIMOTION D4x5/CX32 Control Units as for the SINAMICS S120 CU320 Control Units with regard to EMC.

It is essential to follow the installation instructions in the SINAMICS S120 Manuals in order to ensure compliance with emitted interference and immunity values.

For more information on this topic also refer to Catalog PM21 as well as the SINAMICS Function Manuals.

ESD guidelines

B

B.1 ESD definition

What does ESD mean?

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



NOTICE

Damage caused by electric fields or electrostatic discharge

Electric fields or electrostatic discharge can result in malfunctions as a result of damaged individual parts, 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 or aluminum foil.
- Only touch components, modules and devices if you are first grounded by applying one of the following measures:
  - 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).

B.2 Electrostatic charging of individuals

Any person who is not conductively connected to the electrical potential of the environment can accumulate an electrostatic charge.

This figure indicates the maximum electrostatic charges that can accumulate on an operator when he comes into contact with the indicated materials. These values comply with the specifications in IEC 801-2.

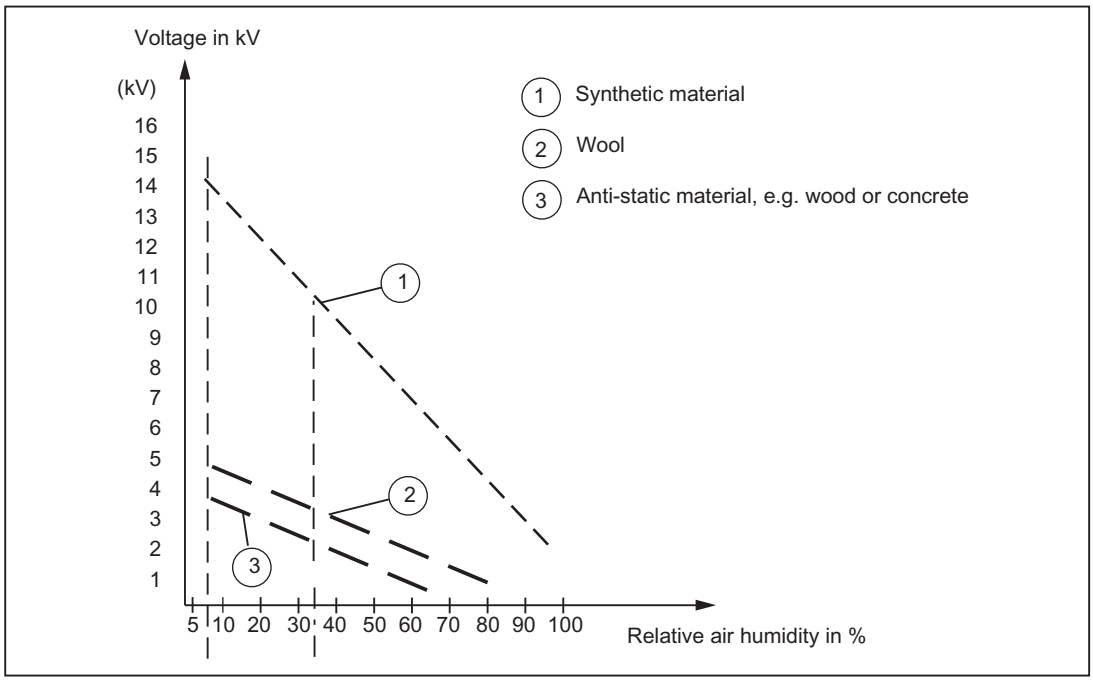


Figure B-1 Electrostatic voltage that can accumulate on operating personnel

B.3 Basic measures for protection against discharge of static electricity

Ensure sufficient grounding

When working with electrostatic sensitive devices, make sure that the you, your workstation, and the packaging are properly grounded. This prevents the accumulation of static electricity.

Avoid direct contact

You should only touch ESD components if unavoidable (for example, during maintenance work). When you touch modules, make sure that you do not touch either the pins on the modules or the printed conductors. If you follow these instructions, electrostatic discharge cannot reach or damage sensitive components.

If you have to take measurements on a module, make sure that you first discharge any static that may have accumulated in your body. To do this, touch a grounded metal object. Only use grounded measuring instruments.

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