SIEMENS

SIMOTION

SIMOTION D4x5-2

Manual

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Valid for SIMOTION D4x5-2, CX32-2, CBE30-2 and TB30

02/2012

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Preface

Content of the Manual

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

Scope

The *SIMOTION D4x5-2* manual is valid for the SIMOTION D4x5-2 Control Units, as well as the supplementary CX32-2, CBE30-2 and TB30 system components.

A separate *SIMOTION D4x5* Manual is available for the SIMOTION D425, SIMOTION D435 and SIMOTION D445/D445-1 devices including the CX32, CBE30 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 product 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 D4x5-2, CX32-2 and CBE30-2.

- 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 a separate list of references.

This documentation is included as electronic documentation in the scope of delivery of SIMOTION SCOUT. It comprises 10 documentation packages.

The following documentation packages are available for SIMOTION V4.3:

- SIMOTION Engineering System
- 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

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

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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
- Refer to the list of references (separate document) for additional documentation

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Description

1

1.1 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 D410-2 is a compact control unit predestined for single-axis applications. The control unit is snapped directly on to the SINAMICS S120 PM340 power modules in blocksize format and has an integrated drive control for either one servo, one vector or one *V/f* axis.
- SIMOTION D4x5-2 is a control unit for multi-axis applications in the SINAMICS S120 booksize format. The following performance versions are offered:
  - SIMOTION D425-2 (BASIC performance) control unit for up to 16 axes
  - SIMOTION D435-2 (STANDARD performance) control unit for up to 32 axes
  - SIMOTION D445-2 (HIGH performance) control unit for up to 64 axes
  - SIMOTION D455-2 (ULTRA-HIGH performance) control unit for up to 128 axes or applications with very short control cycles

The SIMOTION D4x5 2 is described in this manual. Separate manuals are available for the SIMOTION D410-2 and the D4x5/D410 predecessor 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 "D4x5-2". Specific product designations will be used for information that applies only to one product version, e.g. D445-2 DP/PN.

SIMOTION D4x5-2 DP describes all PROFIBUS versions and SIMOTION D4x5-2 DP/PN all PROFIBUS/PROFINET versions of the SIMOTION D4x5-2 control units.

Application

The SIMOTION D4x5-2 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 control units are available in the versions SIMOTION D425-2 (BASIC performance), SIMOTION D435-2 (STANDARD performance), SIMOTION D445-2 DP/PN (HIGH performance) and SIMOTION D455-2 DP/PN (ULTRA-HIGH performance). The versions differ in their PLC performance and in their motion control performance. The main distinguishing features are:

Table 1- 1 Device versions and characteristics

	SIMOTION D425-2	SIMOTION D435-2	SIMOTION D445-2	SIMOTION D455-2
Maximum number of axes	16	32	64	128
Minimum servo/interpolator cycle clock	0.5 ms	D435-2 DP: 0.5 ms D435-2 DP/PN: 0.5/0.25 ms [1)]	0.5/0.25 ms [1)]	0.5/0.25 ms [1)]
DRIVE-CLiQ interfaces	4	6	6	6

[1)] Explanation:

- 0.5 ms in connection with SINAMICS S120 (incl. SINAMICS Integrated / CX32-2)
- 0.25 ms in connection with Servo_fast and IPO_fast for fast I/O processing or high-performance hydraulic applications. The sensors and actuators are connected via high-speed PROFINET IO I/O modules.

The control units feature PLC and motion control performance (open-loop control and motion control) for up to 16, 32, 64 or 128 axes, as required.

The integrated drive computing performance of the control units allows up to six servo, six vector or twelve *V/f* axes on each D4x5-2 control unit (drive control based on CU320-2, firmware version ≥ V4.x).

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

The SIMOTION D4x5-2 control units and their CX32-2, CBE30-2 and TB30 supplementary system components are described in the following.

Note

With the SIZER configuration tool, you can easily configure the SINAMICS S110/120 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 D4x5-2 as 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 also 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 CU320-2 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 PROFINET IO.
The following figure shows a typical SIMOTION D axis grouping.

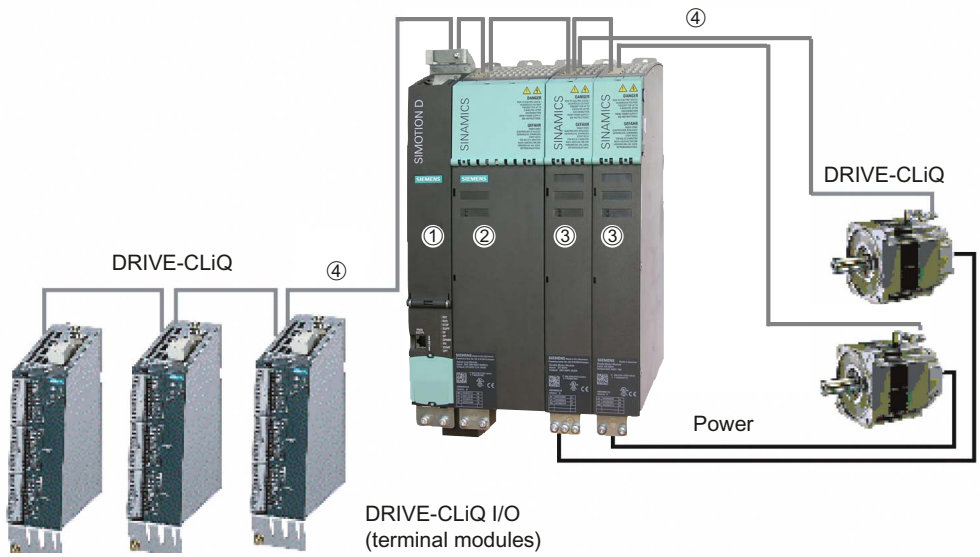


Figure 1-1 Example of an axis grouping with SIMOTION D4x5-2

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 D4x5-2 can be utilized in full by expanding the computing performance at the drive in two different ways:

- SINAMICS S110/S120 control units (e.g. CU320-2, CU305, etc.) complete with further drive components can be connected via PROFIBUS or PROFINET.
- With SIMOTION D4x5-2, the CX32-2 controller extension can be connected via DRIVE-CLiQ. This module is extremely compact, does not require a separate CompactFlash card and can control up to six servo, six vector or twelve *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:

- Freely 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:

- Closed-loop current and torque control
- Closed-loop speed control
- Closed-loop infeed

1.2 System components

Central components

SIMOTION D4x5-2 communicates with automation components via the following interfaces:

- PROFIBUS DP
- Ethernet
- PROFINET IO
- DRIVE-CLiQ (DRIVE Component Link with IQ)

SIMOTION D features a SINAMICS Integrated drive element. The communication with the SINAMICS Integrated is performed via PROFIBUS mechanisms (DP Integrated), i.e. the communication is handled, for example, via PROFIdrive message frames.

Shorter cycle times and greater numbers of addresses for each node are achieved with the "DP Integrated" compared to the "external PROFIBUS DP".

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

Table 1- 2 Central components

Component	Function
SIMOTION D4x5-2 controller	... is the central motion control module. This module contains the programmable SIMOTION runtime for the SIMOTION D4x5-2 and the SINAMICS S120 drive software. You can use the integrated high-speed digital I/Os as: • User-addressable process I/Os • Homing inputs • Inputs for measuring inputs • 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 electronic 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 1- 3 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
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 four axes) for connection of drives with analog ±10 V setpoint interface or for external encoders • IM174 (interface module for four axes) for connection of drives with analog ±10 V setpoint interface, for external encoders, 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. Also can be operated as an isochronous slave on 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 1- 4 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 D4x5-2 DP/PN can communicate with the following components via the onboard PROFINET IO interface or via the Ethernet communication board (CBE30-2).

Table 1- 5 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	
TMC	Multi-channel, fast and isochronous I/O for mechanical engineering with PROFINET IO connection in a rugged SINAMICS S120 booksize compact format; direct connection of the I/O channels on the module or separately via wiring modules.
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 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 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.

Component	Function
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 1- 6 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).
CX32-2 controller extension	... enables additional axes to be connected for SIMOTION D4x5-2.
CUA31/CUA32 control unit adapter	... enables a blocksize power module (PM340) to be connected to a booksize control unit D4x5-2, CX32-2 or CU320-2.
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 inputs of measuring inputs and outputs of output cams. In addition, these terminal modules provide drive-related digital inputs and outputs with short signal delay times.

Component	Function
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 point-to-point topology.

Note

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

It is possible that older DRIVE-CLiQ components can no longer be used with SIMOTION D4x5-2/CX32-2. You can find detailed information on this in SIMOTION D4x5-2 Commissioning and Hardware Installation Manual at "Migration of D4x5 to D4x5-2" in Section "Permissible combinations".

Optional components

The functionality of the D4x5-2 control unit can be expanded with the following components:

Table 1- 7 Optional components

Component	Function	D4x5-2 DP	D4x5-2 DP/PN
CBE30-2 Ethernet communication board	Communication via PROFINET IO with IRT and PROFINET IO with RT	No	Yes
TB30 terminal board	Terminal expansion, i.e. additional analog and digital I/Os	Yes	Yes

The components are plugged into the option slot of the control unit.

1.3 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/Os 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 D4x5-2. 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 released with SIMOTION (e.g. SIMATIC S7-300 module FM 350-1, etc.), these driver blocks are part of the SIMOTION SCOUT engineering system command library.

1.4 Representation of SIMOTION D425-2 DP and D435-2 DP

The following figure shows the SIMOTION D425-2 DP and D435-2 DP with their interfaces and front panel elements (fault and status displays).

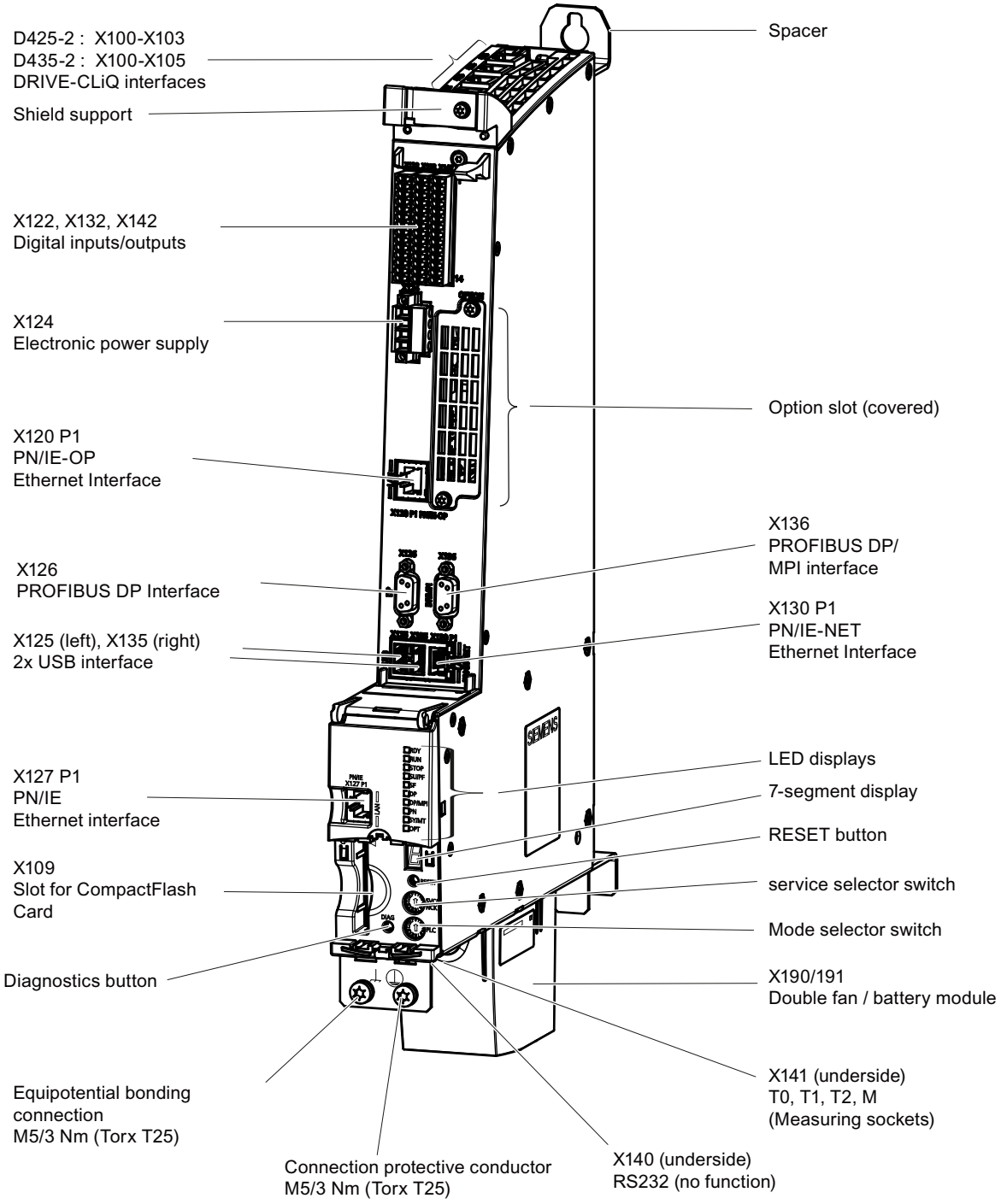


Figure 1-2 D425-2 DP and D435-2 DP representation

⚠ CAUTION

SIMOTION D425-2 DP and D435-2 DP must be operated with a double fan/battery module for heat dissipation. Without this module, the Control Units will not start up and cannot be commissioned.

Information on how to install the double fan/battery module can be found in "Supplementary system components", in Section Installing the fan/battery module (Page 95).

Note

SIMOTION D425-2 DP and D435-2 DP are supplied with pre-assembled spacers. They can be removed if necessary.

For further details, see the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

1.5 Representation of SIMOTION D425-2 DP/PN and D435-2 DP/PN

The following figure shows the SIMOTION D425-2 DP/PN and D435-2 DP/PN with their interfaces and front panel elements (fault and status displays).

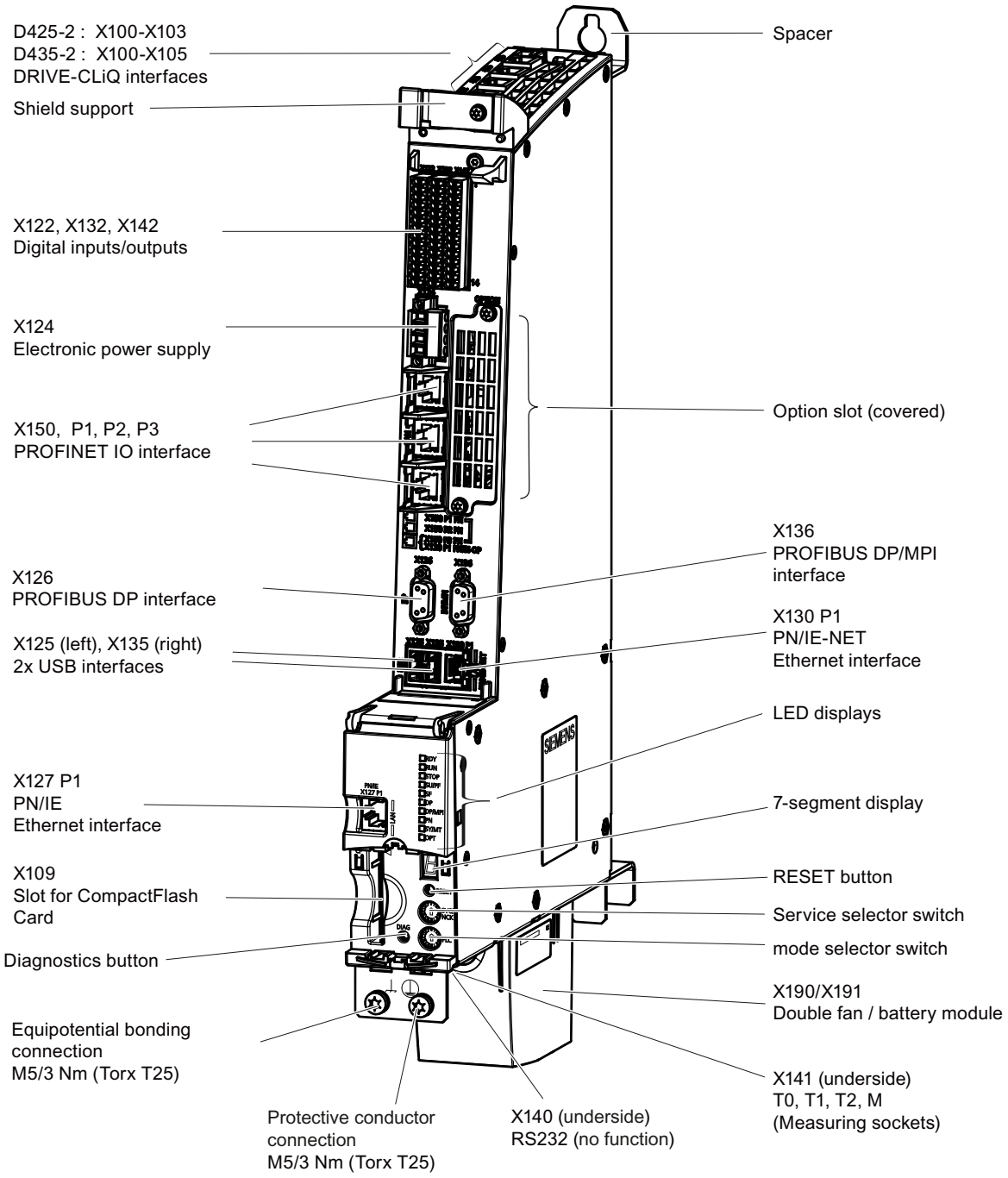


Figure 1-3 D425-2 DP/PN and D435-2 DP/PN representation

⚠ CAUTION

SIMOTION D425-2 DP/PN and D435-2 DP/PN must be operated with a double fan/battery module for heat dissipation. Without this module, the Control Units will not start up and cannot be commissioned.

Information on how to install the double fan/battery module can be found in "Supplementary system components", in Section Installing the fan/battery module (Page 95).

Note

The SIMOTION D425-2 DP/PN and D435-2 DP/PN are supplied with pre-assembled spacers. They can be removed if necessary.

For further details, see the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

1.6 Representation of SIMOTION D445-2 DP/PN and D455-2 DP/PN

The following figure shows the SIMOTION D445-2 and D455-2 with its interfaces and front panel elements (fault and status displays).

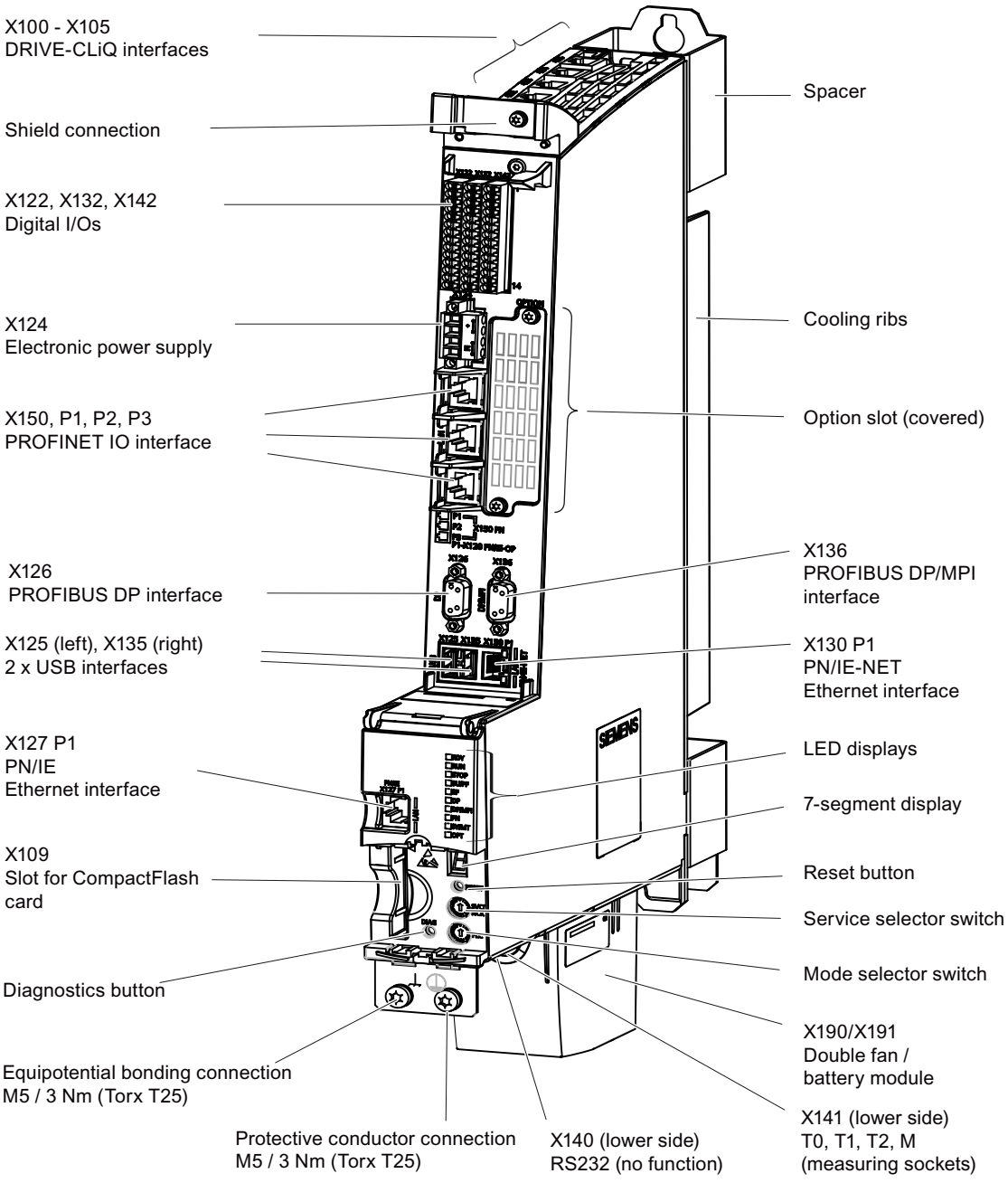


Figure 1-4 View of D445-2 DP/PN and D455-2 DP/PN

⚠ CAUTION

SIMOTION D445-2 DP/PN and D455-2 DP/PN must be operated with a double fan / battery module for heat dissipation. Without this module, the control units will not start up and cannot be commissioned.

Information on how to install the double fan / battery module can be found in "Supplementary system components", in Section Installing the fan/battery module (Page 95).

Note

With the D445-2 DP/PN and D455-2 DP/PN, the spacers can only be removed with the "external air cooling" installation method. In this installation method, the cooling fins are inserted through a cutout in the rear cabinet panel.

For further details, see the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

1.7 Type plates

Side-mounted type plate

The following figure shows the information contained on the type plate mounted on the side of the housing.

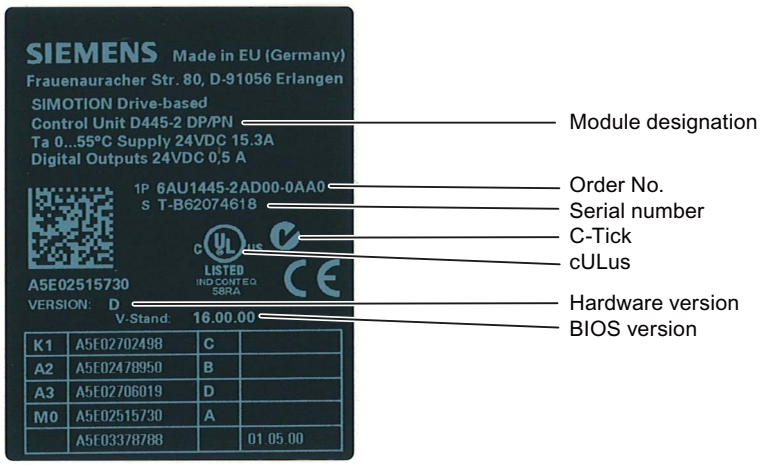


Figure 1-5 Type plate using the D445-2 DP/PN as an example

Note

You might need to access the information provided on the side-mounted type plate after the installation. The type plate is located on the right side of the module housing and is covered by a SINAMICS S120 module when mounted. For this reason, we recommend that you make a note of any required information prior to assembly.

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 granted, e.g. C-Tick, etc.).

MAC addresses

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

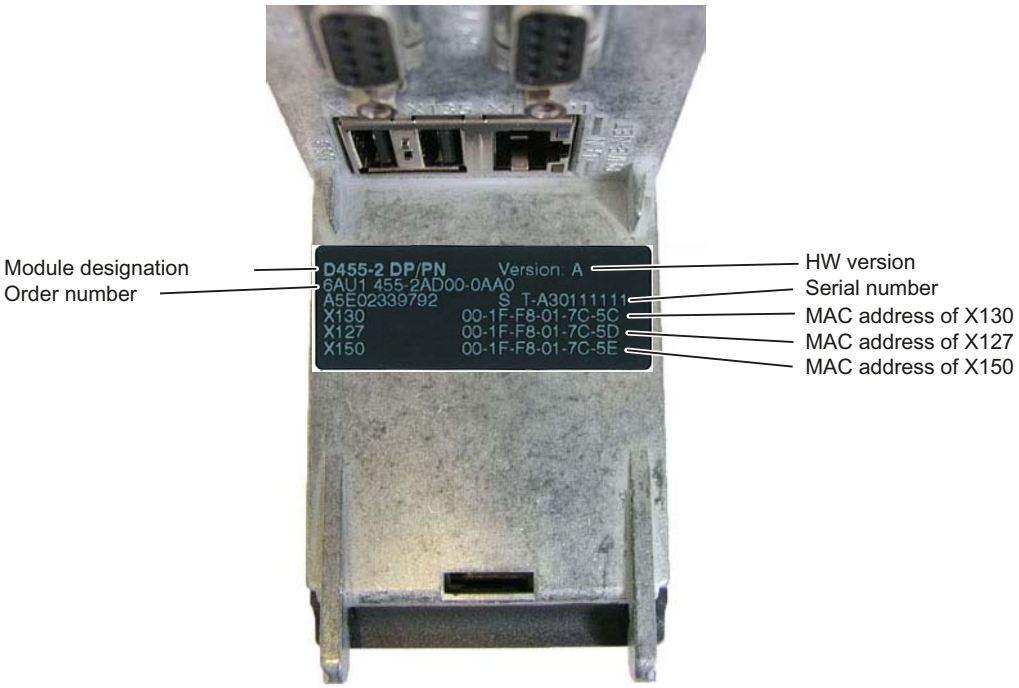


Figure 1-6 SIMOTION D4x5-2 DP/PN MAC addresses

Note

For SIMOTION D4x5-2 DP, the MAC address for the X120 interface is printed instead of the MAC address for the X150 interface.

1.8 Safety information

Note the following safety information when working with the Control Unit and its components.

NOTICE

The 80 mm clearances above and below the components must be observed. The unit protects itself from overheating by shutting down.

⚠ CAUTION

An option board may only be inserted and removed when the Control Unit and option board are disconnected from the power supply.

The CompactFlash card may only be inserted or removed when the Control Unit is disconnected from the power supply.

The SIMOTION D4x5-2 is in a de-energized state when all the LEDs are off.

⚠ WARNING

Safe, problem-free operation of SIMOTION D Control Units assumes proper transportation, storage, setup, and installation, as well as careful operation and maintenance.

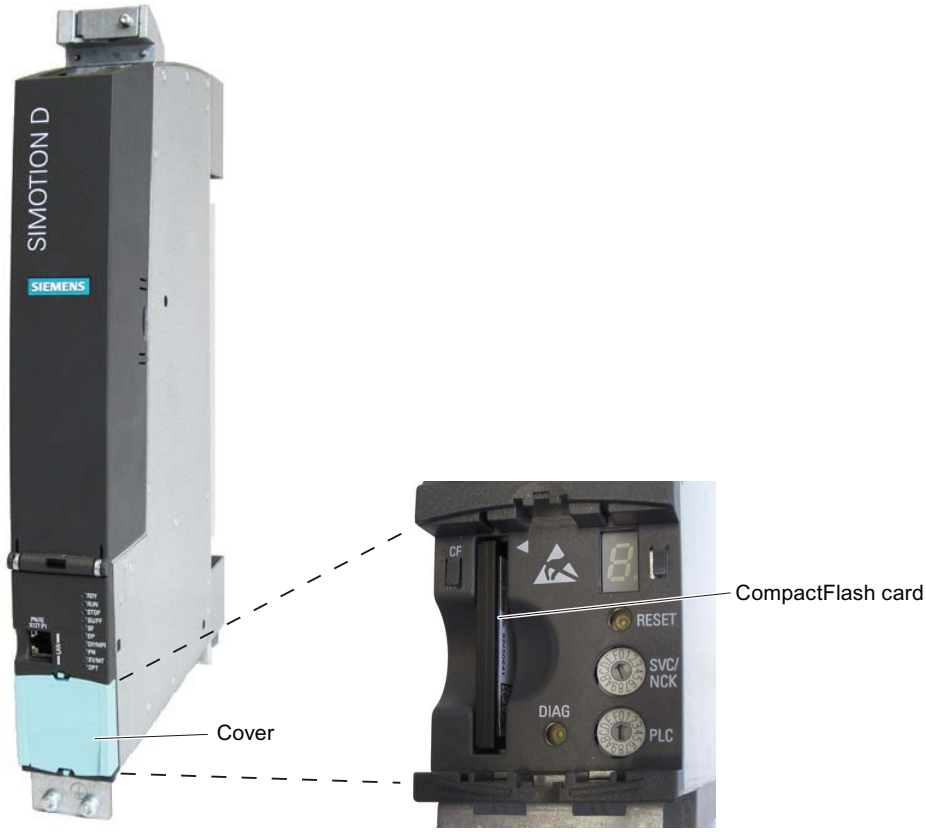
In addition to the danger and warning information provided in the technical customer documentation, the applicable national, local, and plant-specific regulations and requirements must be taken into account.

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

1.9 CompactFlash card

1.9.1 Usage and function of the CompactFlash Card

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



D4x5-2,
Operator controls with cover

Operator controls without cover

Figure 1-7 Slot for CompactFlash card

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

Properties of the CompactFlash card

The CompactFlash card is essential for operation of the SIMOTION D4x5-2. The CompactFlash card is not supplied with the SIMOTION D4x5-2 and must be ordered separately.

The SIMOTION Kernel (SIMOTION D4x5-2 firmware) and the software used to control the drives (SINAMICS firmware) are contained on the CompactFlash card.

The CompactFlash card is used for

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

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

The CompactFlash card is supplied in a bootable format with the latest SIMOTION Kernel and drive software. Please note that a CompactFlash card with a D4x5 kernel/drive software cannot run on a D4x5-2. The same applies for the reverse situation.

If an error occurs, all LEDs flash yellow with 2 Hz. An entry is also made in the diagnostic buffer and the D4x5-2 does not start.

Licenses purchased for SIMOTION D can be used for both the D4x5 and D4x5-2.

⚠ CAUTION

The CompactFlash card may only be inserted or removed when the system is de-energized. The SIMOTION D4x5-2 is in a de-energized state when all the LEDs are off.

Additional information

For additional information about inserting, changing, writing and formatting the CompactFlash card, refer to the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

1.9.2 CompactFlash card

Type plate information

The following figure shows you all the information contained on the type plate of the CompactFlash card.

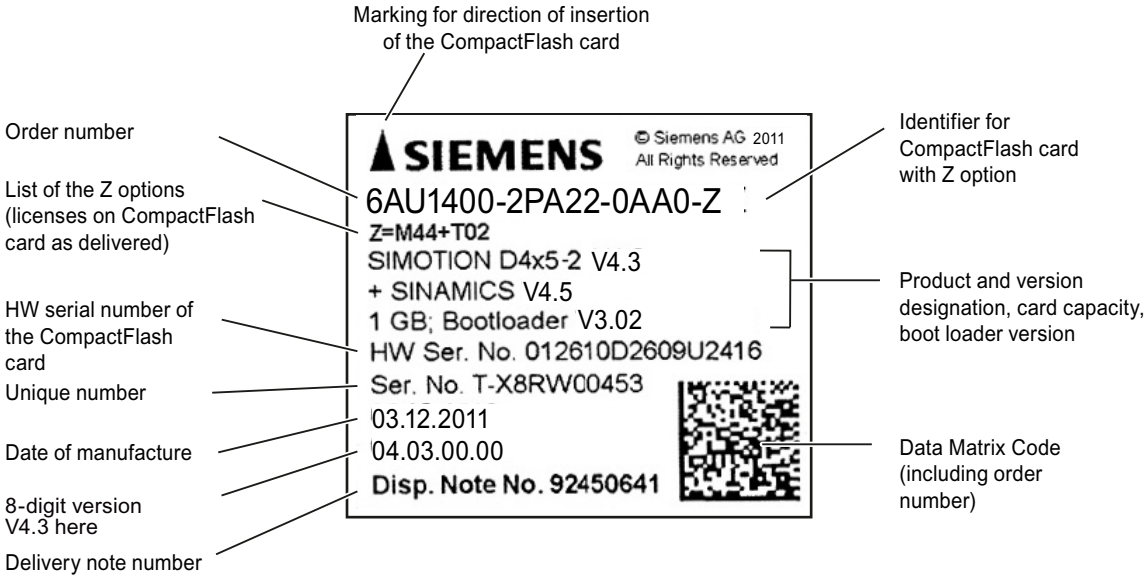


Figure 1-8 Type plate of the CompactFlash card

Pre-installed runtime licenses

The preinstalled licenses are printed on the label as Z option below the order number.

Example

Example with MultiAxes package Z option for D445/D445-1/D445-2/D455-2 + two TControl licenses:

- 6AU1400-2PA22-0AA0-Z

- Z=M44+T02

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

Available Z options / licenses for CompactFlash 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/D425-2
  - M43 MultiAxes package license for D435/D435-2 (incl. D425/D425-2)
  - M44 MultiAxes package license for D445/D445-1/D445-2/D455-2 (incl. D425/D425-2 and D435/D435-2).
- MultiAxes and Safety 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/CX32-2
- TControl temperature control
  - Txx TControl license and number (e.g. T03 = 3x TControl licenses)
- SIMOTION IT
  - J00 SIMOTION IT Virtual Machine license for Java applications
- Safety functions
  - Fxx license for SINAMICS Safety Integrated extended functions (for integrated SINAMICS drives and CX32-2 for SIMOTION D) (e.g. F02 = two Safety Integrated extended functions)
- Other functions
  - B01 Direct Product Motion (DPM) technology function license, D425/D425-2/D435/D435-2/D445/D445-1/D445-2/D455-2 only
  - B02 Multipurpose Information Interface (MIIF) communication function license

1.9.3 Data matrix code on CompactFlash 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:

1P6AU1400-2PA22-0AA0-Z+ST-WOQB02934+30SST0B8365550000079001.

Table 1- 8 Machine-readable identification via 2D code

Characteristic	Property
Order number ("1P" identifier to identify the products)	6AU1400-2PA22-0AA0-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) 2

2.1 Overview of operator control and display elements

The following figure shows the arrangement of the operator control and display elements of a SIMOTION D445-2 DP/PN.

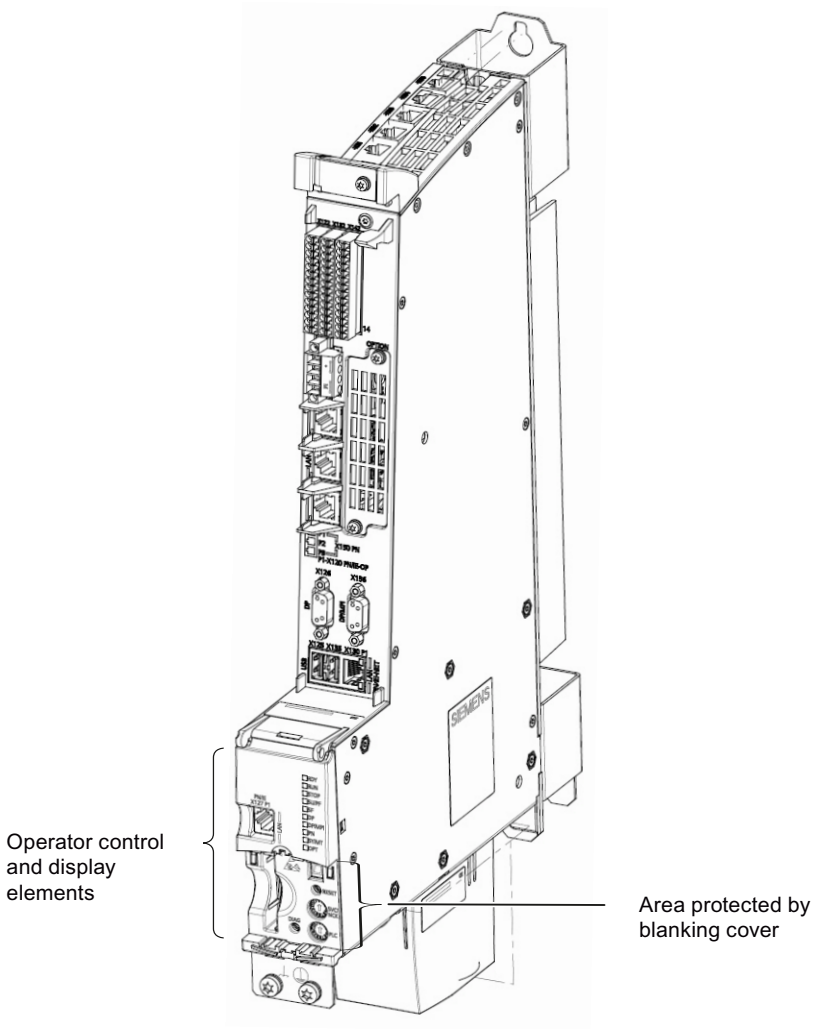


Figure 2-1 Position of operator control and display elements (example of SIMOTION D445-2 DP/PN)

The lower part of the operator control and display elements has a blanking cover during operation. This cover is removed for service work.

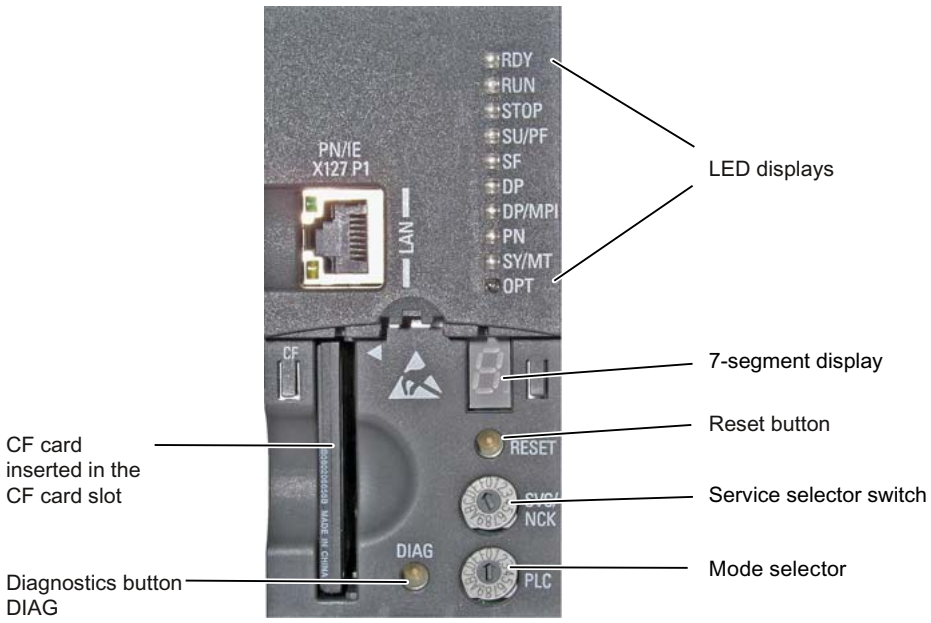


Figure 2-2 Control and display elements of the SIMOTION D4x5-2

2.2 Operator controls

2.2.1 Service and operating mode switch

Properties of the Service switch and mode selector switch

SIMOTION D4x5-2 has two selector switches on the lower front side for selection of the service functions and operating modes.

The upper selector switch (labelled SVC/NCK) is for the selection of service and diagnostic functions. In "normal" operation this switch must remain in the 0 position (see figure below).

The lower switch, labelled PLC, is used to set one or more operating modes of the SIMOTION D4x5-2.

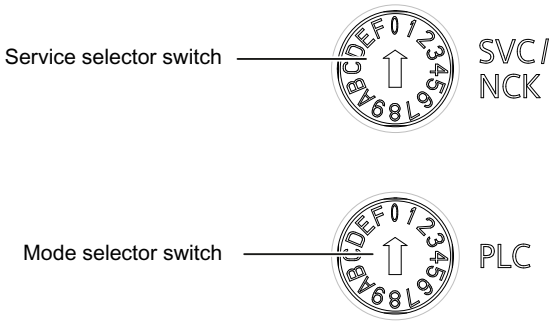


Figure 2-3 Selector switches for service and operating modes of the SIMOTION D4x5-2

CAUTION
Always use an insulated screwdriver to turn the rotary switch. Otherwise, static electricity can destroy the switch.

Mode selector switch

The following table contains the possible mode selector switch positions and the associated LED displays. The mode selector switch positions are explained in the order in which they are arranged on the SIMOTION D4x5-2.

Table 2- 1 Mode selector switch position

Selector 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 D4x5-2* Commissioning and Hardware Installation Manual)
Other selector positions are not assigned		

The following table contains the states of the SIMOTION D4x5-2 that can be set via the mode selector switch.

Table 2- 2 Mode selector switch settings

Meaning	Explanations
RUN	SIMOTION D4x5-2 processes the user program and the 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 D4x5-2 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.

Meaning	Explanations
STOP	SIMOTION D4x5-2 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 an overall reset on the SIMOTION D4x5-2 / restoring the factory setting Using the MRES switch position, you can perform depending on the operating sequence • Overall reset of the SIMOTION D4x5-2 or • Restore the SIMOTION D4x5-2 to its factory setting, depending on the operating sequence. For further details, see the *SIMOTION D4x5-2* 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 selector 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, refer to the *SIMOTION SCOUT* Configuration Manual.

Service selector switch

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 D4x5-2.

Table 2- 3 Switch positions of the Service selector switch

Service mode	Selector position	Meaning
-	0	No service/diagnostic functions activated (default setting).
Delete/restore non-volatile SIMOTION data	1	When the "Delete/restore non-volatile SIMOTION data" switch setting is selected, the non-volatile data of the D4x5-2 is first deleted and then restored along with the contents of the PMEMORY backup file.
Downgrade (device update tool)	B	SIMOTION D4x5-2 control units and projects can be upgraded using upgrade 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.
Backup of diagnostic data and non-volatile SIMOTION data	D	The diagnostic data and non-volatile SIMOTION data can be backed up in STOP, STOPU, and RUN state. The advantage of backing up in RUN state is the availability of enhanced diagnostic information (via websites) and TO alarm information.

Note

Alternatively, diagnostic data and non-volatile SIMOTION data can also be backed up via the DIAG button, see Section DIAG button (Page 43).

Additional references

Detailed information on the individual topics can be found in the following table:

Table 2- 4 References

Subject	Reference
Setting of the operating modes	• *SIMOTION SCOUT* Configuration Manual
Upgrading devices (device update tool)	• *Upgrading SIMOTION Devices* Operating Instructions and • *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual
• Creating diagnostic data and • Saving/restoring non-volatile SIMOTION data	• *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual

2.2.2 DIAG button

Layout

The DIAG button is located behind the blanking cover on the SIMOTION D4x5-2.

Function

The diagnostic data and non-volatile SIMOTION data is backed up on the CompactFlash card via the DIAG button.

The DIAG button function therefore corresponds to the function of switch position "D" of the Service selection switch.

Various options are available for backing up the data:

- Option 1: Backup during operation (in STOP/STOPU/RUN operating state)
- Option 2: Backup during the module startup

With option 1, the DIAG button only has to be pressed briefly to trigger the data backup. The DIAG button is therefore preferable to switch position "D" of the Service selection switch.

With option 2, the DIAG button has to be pressed until the boot procedure is completed. As this can take 20-30 seconds, switch position "D" is preferable here.

Additional references

For detailed information on creating diagnostic data and backing up / restoring non-volatile SIMOTION data, refer to the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

2.2.3 RESET button

Arrangement

The RESET button is located behind the blanking cover on the SIMOTION D4x5-2.

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.

2.3 7-segment and LED displays

Arrangement of the displays

The front side of the SIMOTION D4x5-2 has ten LED displays arranged arranged vertically in one row. There is also a 7-segment display below the blanking cover.

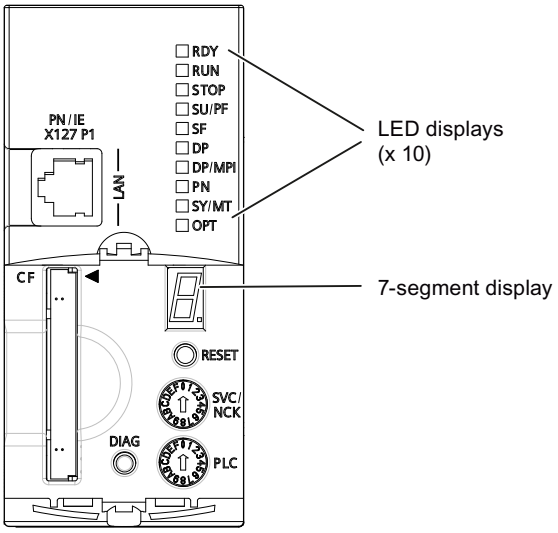


Figure 2-4 7-segment and LED display on the SIMOTION D4x5-2

Meaning of the LED displays

This table describes the LEDs and their meaning. The PN and *SY* LEDs have no function for SIMOTION D4x5-2 DP.

Table 2- 5 Error and status displays

LED	Meaning
RDY	Operating states of SIMOTION D incl. SINAMICS Integrated.
RUN	User program is running
STOP	No user program is running. The technology packages are not active
SU/PF	The technology packages are active. The user program is not active
SF	An error state of the SIMOTION D4x5-2
DP	State of the PROFIBUS DP interface
DP/MPI	State of the PROFIBUS DP/MPI interface
PN	State of the onboard PROFINET IO interface (X150)
SY/MT	- Synchronization status (SY) of the onboard PROFINET IO interface (X150) - Maintenance status (MT) of the D4x5-2 (currently without function)
OPT	State of the option module (if available).

Note

While the SIMOTION D4x5-2 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 D4x5-2 has ramped up and communication has been established to the SINAMICS Integrated.

Additional information

You can perform a detailed diagnosis with a PG/PC and the engineering system. Information on the *Diagnostics* via LED displays can also be found in the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual and in the online help of this section via the link under the *Instructions* menu.

Interfaces

3

3.1 Interface overview

This section describes the interfaces of the SIMOTION D4x5-2.

The position of the interfaces on the module can be found in the following sections:

- Representation of SIMOTION D425-2 DP and D435-2 DP (Page 22)
- Representation of SIMOTION D425-2 DP/PN and D435-2 DP/PN (Page 24)
- Representation of SIMOTION D445-2 DP/PN and D455-2 DP/PN (Page 26)

Available interfaces

Table 3- 1 Overview of available interfaces

Interface	Designation	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 (not for SIMOTION D425-2)	X104	DRIVE-CLiQ socket
DRIVE-CLiQ interface (not for SIMOTION D425-2)	X105	DRIVE-CLiQ socket
Ethernet interface PN/IE	X127 P1	RJ45 socket connector
PN/IE OP Ethernet interface (only for SIMOTION D4x5-2 DP)	X120 P1	RJ45 socket connector
Ethernet interface PN/IE-NET	X130 P1	RJ45 socket connector
PROFINET PN IO interface (only for SIMOTION D4x5-2 DP/PN)	X150 (P1, P2, P3)	RJ45 socket connector
Digital I/Os	X122, X132, X142	Mini Combicon, 3.5 mm 3x14-pin
Power supply connector	X124	Combicon, 4-pin
PROFIBUS DP interface	X126	9-pin Sub-D socket
PROFIBUS DP/MPI interface	X136	9-pin Sub-D socket
Measuring sockets (T0, T1, T2, and M)	X141	4-pin, socket
SIMOTION CF plug-in	X109	CompactFlash card connector
Fan/battery module interface	X190/X191	Fan/battery module

Interface	Designation	Connector type
1. USB interface	X125	USB socket
2. USB interface	X135	USB socket
Option slot		Sockets

Note

The third port of the PROFINET X150 P3 IO interface has an additional caption for a SIMOTION D4x5-2 DP/PN. It is called X120 PN/IE-OP.

This designation is not relevant for SIMOTION D.

Non-usable interfaces

Table 3- 2 Overview of interfaces that cannot be used for SIMOTION D

Interface name	Interface	Connector type
RS232 interface	X140	9-pin Sub-D connector

3.2 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 cable with 24 V supply is used only for components that require this (e.g. motors with a DRIVE-CLiQ interface).

Position of connectors

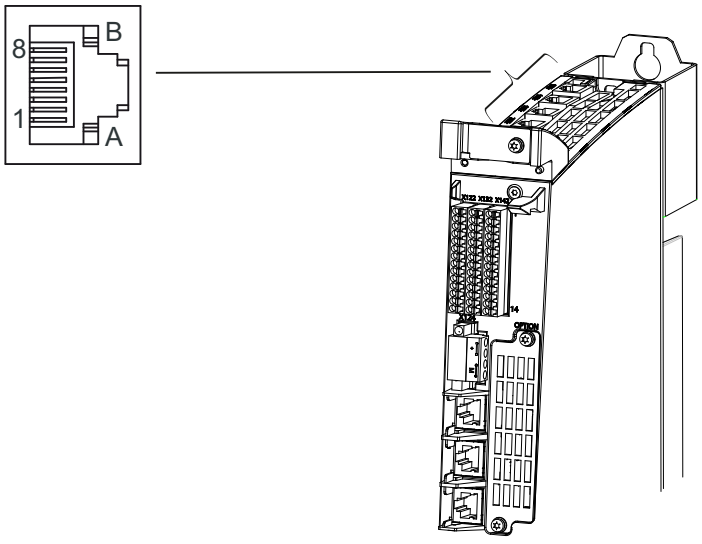


Figure 3-1 The position of the DRIVE-CLiQ interfaces on the D4x5-2 (example of D445-2 DP/PN)

Characteristics

Table 3- 3 DRIVE-CLiQ interface X100 - X105 (D425-2: Only X100 - X103)

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)
Max. cable length	100 m
Dust protection blanking plugs for sealing unused DRIVE-CLiQ ports	Five blanking plugs contained in the D4x5-2 scope of delivery Blanking plugs (50 pcs) order number: 6SL3066-4CA00-0AA0

DRIVE-CLiQ pin assignment

Table 3- 4 DRIVE-CLiQ interface X100 - X105 (D425-2: Only X100 - X103)

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 order numbers, refer to the list of references (separate document)

3.3 Ethernet interfaces

Interfaces for connection to Industrial Ethernet

Industrial Ethernet is a communication network with a transmission rate of 10/100/1000 Mbit/s.
SIMOTION D4x5-2 offers the following functions via Ethernet interfaces:

- Communication with STEP 7 and SIMOTION SCOUT
- Communication between SIMOTION and SIMATIC NET OPC

  The following software must be installed on the PG/PC for this function:
  "SIMATIC NET SOFTNET-S7 (S7-OPC server)"
- Connection of HMI systems
- Communication with other devices over TCP/IP or UDP communication
- IT communication (via SIMOTION IT DIAG, SIMOTION IT OPC XML-DA, SIMOTION IT Virtual Machine)

For more information regarding the software packages, see *Catalog PM 21*, refer to the list of references (separate document) for the order number.

Position of connectors for SIMOTION D4x5-2 DP

The following figure shows the position of the Ethernet interfaces on the D4x5-2 DP and their displays.

Display	Status		Meaning
LINK	orange		Transfer rate 1000 Mbit/s
	green		Transfer rate 10 or 100 Mbit/s
	Off		No or faulty connection
ACT	yellow		Data exchange
	Off		No data exchange

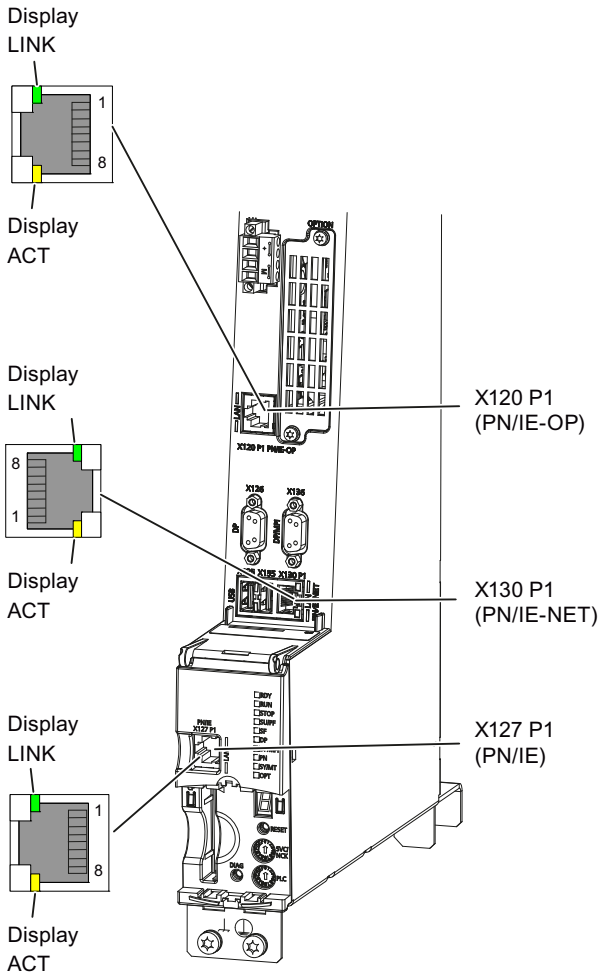


Figure 3-2 The position of the Ethernet interfaces (example of SIMOTION D435-2 DP)

Note

As of V4.3, the three Ethernet interfaces support the PROFINET basic services - they therefore have the designation PN/IE-NET, PN/IE-OP or PN/IE.

These PROFINET basic services (e.g. DCP, LLDP, SNMP) provide uniform functions for the address assignment and diagnostics, but do not provide PROFINET IO communication for the connection of drives, I/O modules, etc.

Position of connectors for SIMOTION D4x5-2 DP/PN

The following figure shows the position of the Ethernet interfaces on the D4x5-2 DP/PN and their displays.

Display	Status		Meaning
LINK	orange	☀	Transfer rate 1000 Mbit/s
	green	☀	Transfer rate 10 or 100 Mbit/s
	Off	□	No or faulty connection
ACT	yellow	☀	Data exchange
	Off	□	No data exchange

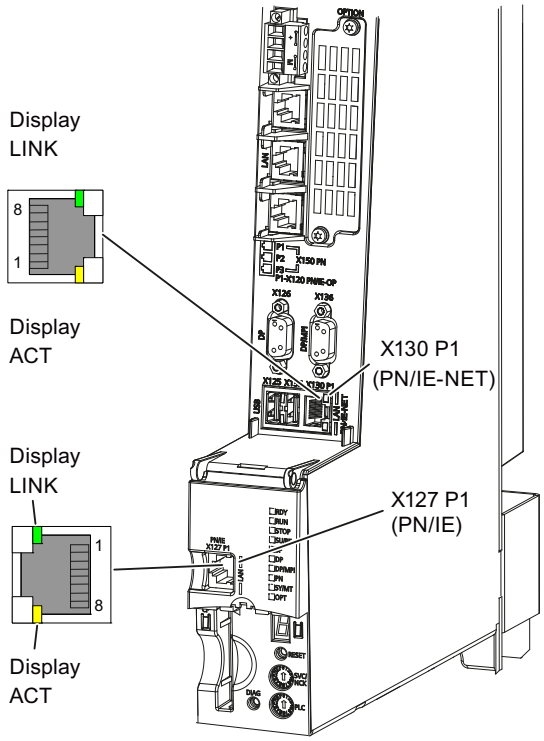


Figure 3-3 The position of the Ethernet interfaces and their displays (example of SIMOTION D445-2 DP/PN)

Note

As of V4.3, the two Ethernet interfaces support the PROFINET basic services - they therefore have the designation PN/IE-NET or PN/IE.

These PROFINET basic services (e.g. DCP, LLDP, SNMP) provide uniform functions for the address assignment and diagnostics, but do not provide PROFINET IO communication for the connection of drives, I/O modules, etc.

Additional references

Detailed information on the states of the status LEDs can be found in the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual, *Diagnostics* chapter.

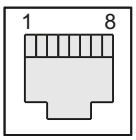
Interface characteristics

Table 3- 5 X127 P1 and X130 P1 (X120 P1 only for SIMOTION D4x5-2 DP)

Characteristic	Type
Connector type	RJ45 socket connector
Cable type	Industrial Ethernet cable • 4- and 8-wire cables can be used for 10/100 Mbit/s • 8-wire cables must be used for 1000 Mbit/s
Max. cable length	100 m
Autocrossing	Yes
Dust protection blanking plugs for sealing unused Ethernet ports	Five blanking plugs contained in the D4x5-2 scope of delivery Blanking plugs (50 pcs) order number: 6SL3 066-4CA00-0AA0
Miscellaneous	X127 P1, X120 P1 and X130 P1 are full-duplex 10/100/1000 Mbit/s Ethernet ports

Pin assignment

Table 3- 6 X127 P1 and X130 P1 Ethernet interfaces (X120 P1 only for SIMOTION D4x5-2 DP)

Representation	Pin	Assignment in 10/100 Mbit mode			Assignment in 1 Gbit mode		
		Signal name [1]	Signal type	Meaning	Signal name [1]	Signal type	Meaning
	1	TXP	O	Ethernet transmit differential signal	DA+	B	Bidirectional pair A+
	2	TXN	O	Ethernet transmit differential signal	DA-	B	Bidirectional pair A-
	3	RXP	I	Ethernet receive differential signal	DB+	B	Bidirectional pair B+
	4	- - -	- - -	Reserved, do not use	DC+	B	Bidirectional pair C+
	5	- - -	- - -	Reserved, do not use	DC	B	Bidirectional pair C-
	6	RXN	I	Ethernet receive differential signal	DB-	B	Bidirectional pair B-
	7	- - -	- - -	Reserved, do not use	DD+	B	Bidirectional pair D+
	8	- - -	- - -	Reserved, do not use	DD-	B	Bidirectional pair D-
I = Input; O = Output; B = Bidirectional							

[1] Autocrossing functionality (if required, transmit and receive lines switch over)

Note

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

3.4 PROFINET IO interface (only for SIMOTION D4x5-2 DP/PN)

PROFINET is an open component-based industrial communication system using Ethernet for distributed automation systems.

SIMOTION D4x5-2 DP/PN has a PROFINET interface with three ports (X150 P1-P3) onboard. The PROFINET interface supports operation of a SIMOTION D4x5-2 DP/PN as an IO controller and/or as an I device.

Interface position

The following figure contains information on the PROFINET interface of the control unit. Position of the interface, labeling of the ports and the associated displays are described.

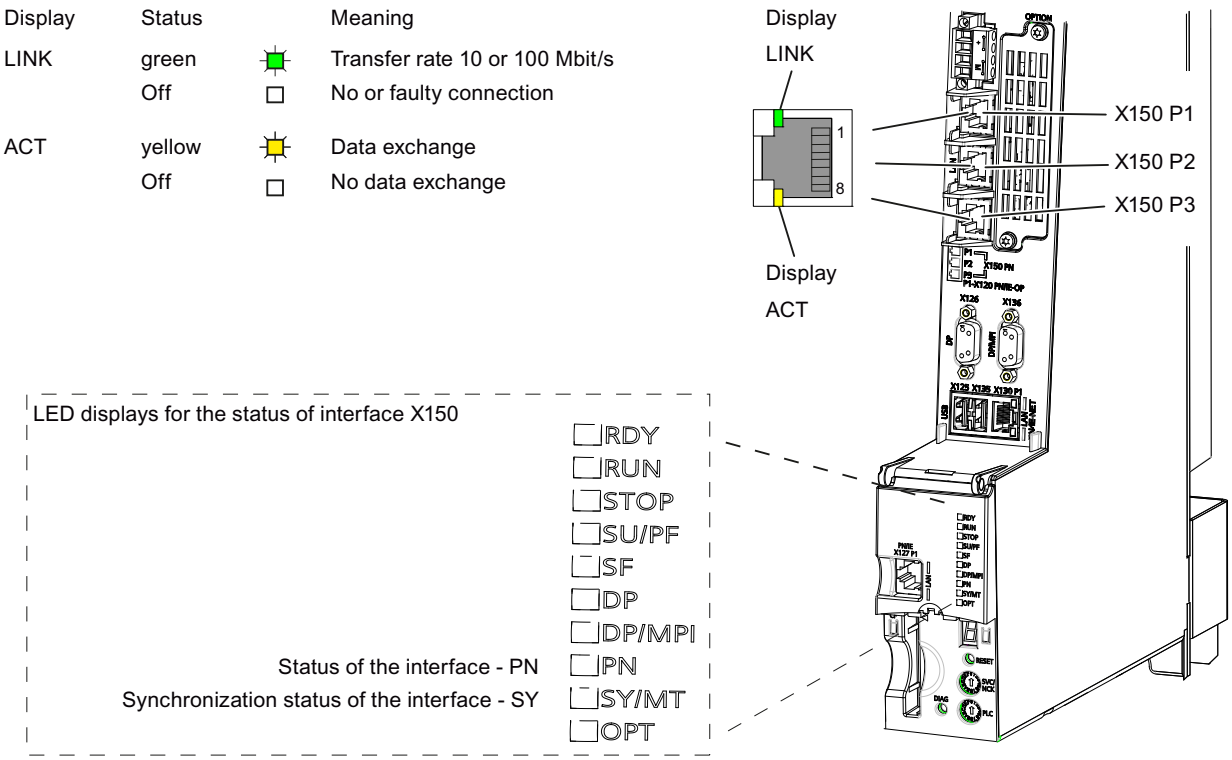


Figure 3-4 The position of the PROFINET X150 P1 to P3 interfaces and their displays (SIMOTION D445-2 DP/PN)

Note

The 3rd port of the PROFINET IO interface X150 P3 is also designated as X120 PN/IE OP. This designation is not relevant for SIMOTION D.

Additional references

Detailed information on the states of the status LEDs can be found in the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual, Section *Diagnostics*.

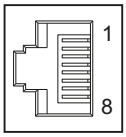
Interface characteristics

Table 3- 7 Ports X150 P1 to P3

Characteristic	Type
Connector type	RJ45plus socket
Cable type	PROFINET
Maximum cable length	100 m
Minimum transmission cycle	0.25 ms
Autocrossing	Yes i.e. both crossed and uncrossed cables can be used
Dust protection blanking plugs for sealing unused PROFINET ports	Five blanking plugs contained in the D4x5-2 scope of delivery Blanking plugs (50 pcs) order number: 6SL3066-4CA00-0AA0

Interface assignment

Table 3- 8 Assignment of the ports X150 P1 to P3

Representation	Pin	Name	Description
	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

Connectable devices

The following devices can be connected to the PROFINET IO interface:

- PG/PC programming devices (communication with SIMOTION SCOUT / STEP 7)
- SIMATIC HMI devices
- SIMATIC controllers with PROFINET interface
- Distributed I/O
- Drive units with PROFINET IO interface (standard devices)

The SIMOTION D4x5-2 DP/PN 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)
- Supports real-time classes of PROFINET IO:
  - RT (real-time)
  - IRT (isochronous real-time)

The following functions are also supported by Industrial Ethernet:

- 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.
- Communication with other devices over TCP/IP or UDP communication
- IT communication (via SIMOTION IT DIAG, SIMOTION IT OPC XML-DA, SIMOTION IT Virtual Machine)

For more information regarding the software packages, see Catalog PM 21, refer to the list of references (separate document) for the order number.

Note

A list of the modules released with SIMOTION is available at (http://support.automation.siemens.com/WW/view/en/11886029).

The list is updated regularly and contains information on the use of these modules.

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

Second PROFINET interface

The Ethernet Communication Board (CBE30-2) provides as option a second PROFINET interface for the D4x5-2 DP/PN Control Units.

The CBE30-2 cannot be used in SIMOTION D4x5 2 DP Control Units.

For details, see Section CBE30-2 Ethernet communication board (Page 107).

3.5 Digital I/Os

3.5.1 Properties

Interface characteristics

The digital I/Os on the X122, X132 and X142 connectors are for the connection of sensors and actuators.

Table 3- 9 Wiring of X122, X132 and X142

Characteristics		Type
Connector type	Mini Combicon	
Connectable cable types and conductor cross-sections	Rigid Flexible Flexible with end sleeve AWG	0.2 mm^2 to 1.5 mm^2 0.2 mm^2 to 1.5 mm^2 0.25 mm^2 to 1.5 mm^2 24 to 16
Stripped length	10 mm	
Tool	Screwdriver 0.4 x 2.0 mm	
Max. cable length	30 m	
Max. current carrying capacity (ground)	8 A	

Position of connectors

The following figure shows the position of the interface connectors on the D4x5-2 and the distribution of the various digital I/Os.

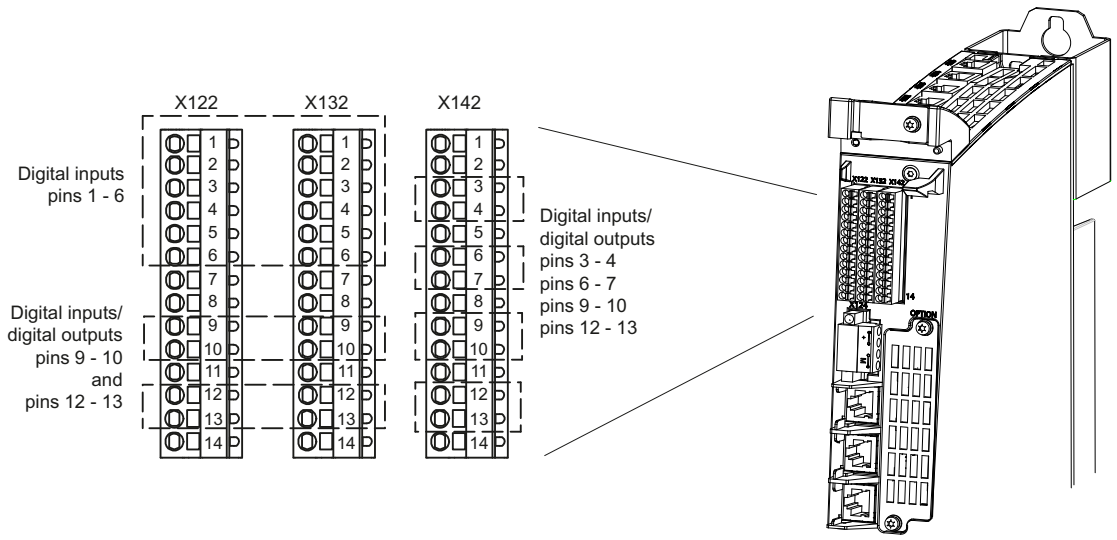


Figure 3-5 Position of the X122, X132 and X142 digital interfaces (example of SIMOTION D445-2 DP/PN)

Connection and circuit diagram for SIMOTION D4x5-2

The following figure shows the wiring and block diagram of the digital inputs as well as the digital input/outputs using the example of a SIMOTION D4x5-2 DP/PN.

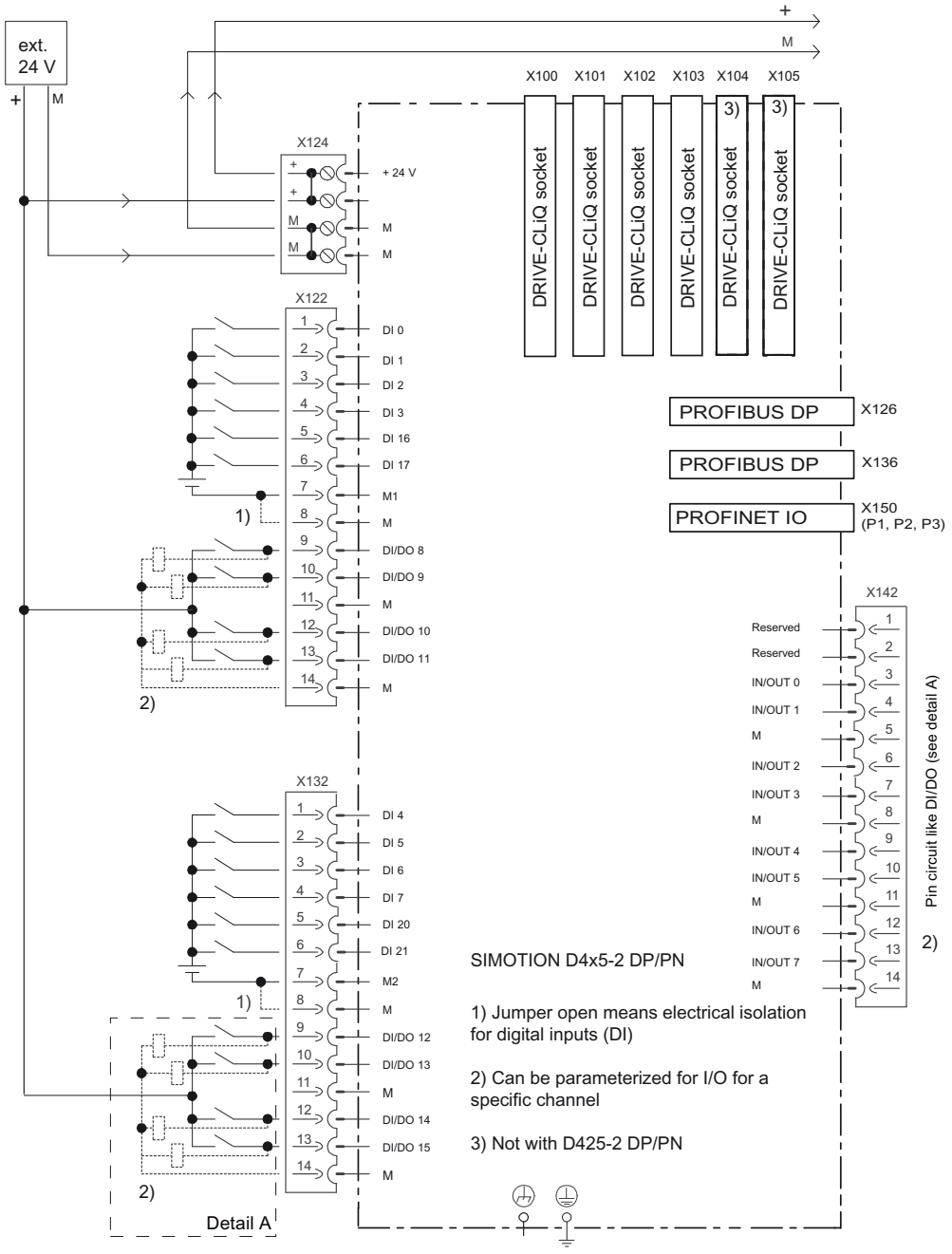


Figure 3-6 Connection and circuit diagram of the digital I/Os

Interface assignment of X122, X132 and X142

Table 3- 10 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	DI 16	I	Digital input 16
6	DI 17	I	Digital input 17
7	M1	GND	Ground for DI 0 – DI 3, DI 16, DI 17 (electrically isolated relative to M)
8	M	GND	Ground
9	DI/DO 8	B	Digital input/output 8 (can also be used as input for measuring input or as input for the external zero mark)
10	DI/DO 9	B	Digital input/output 9 (can also be used as input for measuring input or as input for the external zero mark)
11	M	GND	Ground
12	DI/DO10	B	Digital input/output 10 (can also be used as input for measuring input or as input for the external zero mark)
13	DI/DO 11	B	Digital input/output 11 (can also be used as input for measuring input or as input for the external zero mark)
14	M	GND	Ground

[1] DI: Digital input; DI/DO: Bidirectional digital input/output; M: Electronics ground; M1: Ground reference

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

Table 3- 11 Digital inputs/outputs X132

Pin	Designation [1]	Signal type [2]	Notes
1	DI 4	I	Digital input 4
2	DI5	I	Digital input 5
3	DI 6	I	Digital input 6
4	DI 7	I	Digital input 7
5	DI 20	I	Digital input 20
6	DI 21	I	Digital input 21
7	M2	GND	Ground for DI 4 – DI 7, DI 20, DI 21 (electrically isolated relative to M)
8	M	GND	Ground
9	DI/DO 12	B	Digital input/output 12 (can also be used as input for measuring input or as input for the external zero mark)
10	DI/DO 13	B	Digital input/output 13 (can also be used as input for measuring input or as input for the external zero mark)
11	M	GND	Ground

Pin	Designation [1]	Signal type [2]	Notes
12	DI/DO 14	B	Digital input/output 14 (can also be used as input for measuring input or as input for the external zero mark)
13	DI/DO 15	B	Digital input/output 15 (can also be used as input for measuring input or as input for the external zero mark)
14	M	GND	Ground

[1] DI: Digital input; DI/DO: Bidirectional digital input/output; M: Electronics ground; M2: Ground reference

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

Note

An open input is interpreted as "low".
To enable the digital inputs to work, terminal M1 or M2 must be connected. The following alternatives are available:

- Connect the carried digital input reference ground to M1 or M2.
- Insert a bridge between terminals M and M1 (or between M and M2).
  This removes the electrical isolation for these digital inputs.

Table 3- 12 Digital inputs/outputs X142

Pin	Designation [1]	Signal type [2]	Notes
1	---	---	Reserved, do not use
2	---	---	Reserved, do not use
3	IN/OUT 0	B	Digital input/output 0 (can be used as input of a measuring input or output of an output cam)
4	IN/OUT 1	B	Digital input/output 1 (can be used as input of a measuring input or output of an output cam)
5	M	GND	Ground
6	IN/OUT 2	B	Digital input/output 2 (can be used as input of a measuring input or output of an output cam)
7	IN/OUT 3	B	Digital input/output 3 (can be used as input of a measuring input or output of an output cam)
8	M	GND	Ground
9	IN/OUT 4	B	Digital input/output 4 (can be used as input of a measuring input or output of an output cam)
10	IN/OUT 5	B	Digital input/output 5 (can be used as input of a measuring input or output of an output cam)
11	M	GND	Ground
12	IN/OUT 6	B	Digital input/output 6 (can be used as input of a measuring input or output of an output cam)
13	IN/OUT 7	B	Digital input/output 7 (can be used as input of a measuring input or output of an output cam)
14	M	GND	Ground

[1] IN/OUT: Bidirectional digital input/output; M: Electronic ground

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

3.5.2 Using the digital inputs/outputs

Connecting sensors and actuators

Digital I/Os can be used to connect various sensors and actuators to the three 14-pin X122, X132 and X142 front connectors.

The following types of digital I/Os are available:

- Digital inputs (DI)
- Bidirectional digital I/Os (DI/DO, IN/OUT)

Bidirectional digital I/Os can be configured individually as digital inputs or outputs.

Assignment of the I/Os to functions can be parameterized as required. Special functions (e.g. input of measuring input and output for output cam) can also be assigned to the I/Os.

The digital I/Os on the X122 and X132 front connectors can be used by either SIMOTION or SINAMICS (e.g. as enable signal for a drive).
The digital I/Os on the X142 front connector are permanently allocated to SIMOTION.

Table 3- 13 Use of the digital I/Os

	DI 0-7, DI 17, DI 18, DI 20, DI 21 (X122, X132)	**DI/DO 8-15 (X122, X132)**	**IN/OUT 0-7 (X142)**
Galvanic isolation	Electrically isolated (ground reference M1 or M2)	Non-isolated (ground reference M)	Non-isolated (ground reference M)
Use as:			
• Freely addressable I/Os for SIMOTION	Yes	Yes	Yes
• I/Os that are assigned to the drive	Yes	Yes	No
• Measuring inputs	No	Yes (global and local measuring inputs)	Yes (global measuring inputs)
• Inputs for the external zero mark	No	Yes	No
• Cam outputs	No	No	Yes
Configuration:			
Assignment	Can be configured channel-by-channel on the drive	Can be configured channel-by-channel on the drive	Can be configured channel-by-channel in HW Config

Note

For optimal noise immunity of the digital inputs, the use of shielded cables is necessary if they are to be used as

- Inputs of measuring inputs or
- Inputs for the external zero mark

Additional references

For information on configuring the digital I/Os as freely addressable I/Os, inputs of measuring inputs or outputs of output cams, see the *SIMOTION D4x5-2* 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.

3.6 Power supply

This interface is provided 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).

Characteristics of the interface

Table 3- 14 Interface X124

Characteristics	Type
Connector type	Combicon
Connection possibility	Up to 2.5 mm^2
Max. current carrying capacity incl. loop-through	20 A
Max. cable length	10 m

Interface assignment

Table 3- 15 Power supply X124

Pin	Signal name	Meaning
1	+	24 V power supply
2	+	24 V power supply
3	M	Ground
4	M	Ground

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 in the connector. The maximum current can be limited through the current carrying capacity of the cable. The current carrying capacity of the cable depends, for example, on the type of cable installation (cable duct, laying on a cable rack, etc.).

Position of power supply interface

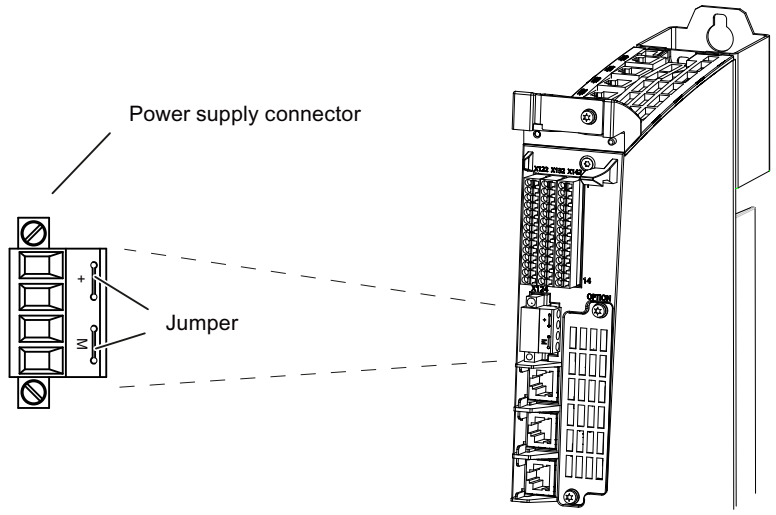


Figure 3-7 Position of the power supply interface (example of SIMOTION D445-2 DP/PN)

Note

The power supply terminal strip must be screwed on tightly using a flat-bladed screwdriver.

3.7 PROFIBUS DP interfaces

Characteristics of the interface

Table 3- 16 Interfaces X126 and X136

Characteristics	Type
Connector type	9-pin Sub-D socket
Cable type	PROFIBUS cable
Max. cable length	100 m at 12 Mbit/s

Position of connectors

The following figure shows the mounting position and designation of the connectors on the control unit.

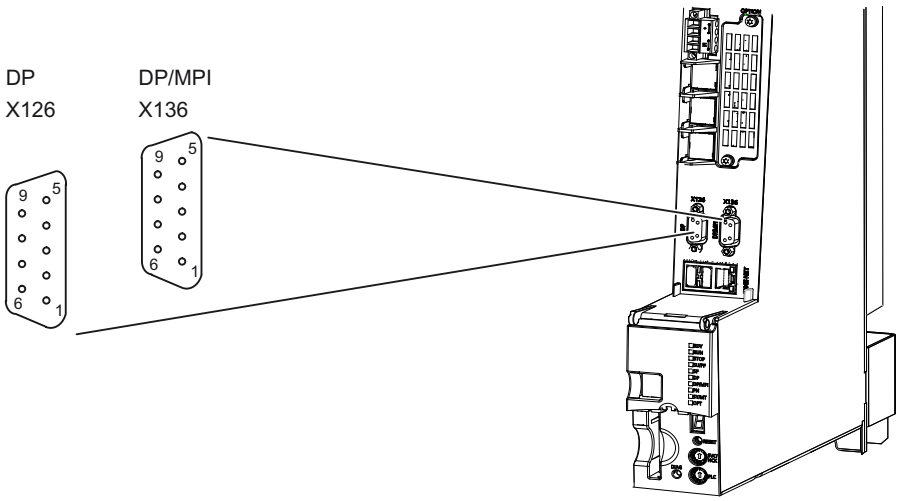


Figure 3-8 The position of the PROFIBUS X126 and X136 interfaces (example of SIMOTION D4x5-2 DP/PN)

Interface assignment for X126

Table 3- 17 PROFIBUS DP interface X126

Pin	Signal name	Signal type	Meaning
1	--	--	Reserved, do not use
2	M	VO	Ground to P24_SERV
3	1RS_DP	B	RS-485 differential signal
4	1RTS_DP	O	Request to send
5	1M	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 3- 18 PROFIBUS DP interface X136

Pin	Signal name	Signal type	Meaning
1	--	--	Reserved, do not use
2	M	VO	Ground to P24_SERV
3	2RS_DP	B	RS-485 differential signal
4	2RTS_DP	O	Request to send
5	1M	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
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			

Connectable devices

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

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

Note

For remote diagnosis, a teleservice adapter can be connected to the PROFIBUS X126 or X136 interface. A teleservice adapter can only be connected to one of the two interfaces.

The power supply for the teleservice adapter (terminals 2 and 7) can accept current loads as high as 150 mA and is sustained short-circuit proof.

3.8 Slot for CompactFlash card

Characteristics

Connector type: 50-pin connector

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

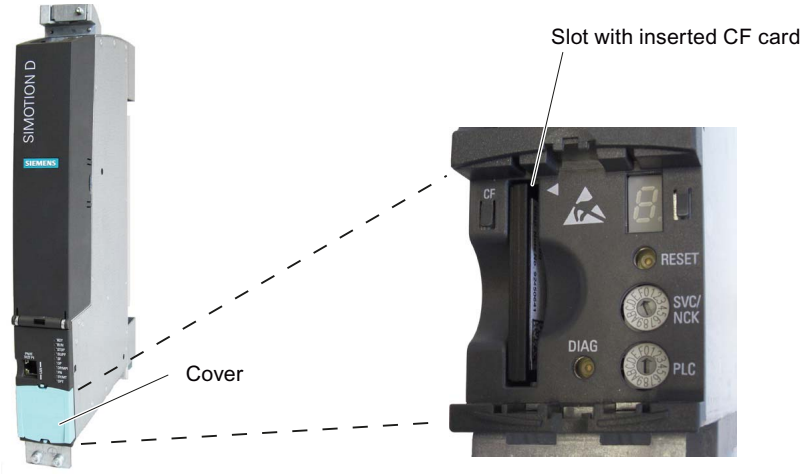


Figure 3-9 Slot for the CompactFlash card

Consult the relevant references for detailed information about the SIMOTION CompactFlash card in Section CompactFlash card (Page 33).

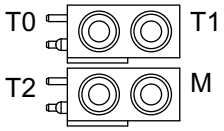
3.9 Measuring sockets

Application

The measuring sockets X141 (T0, T1 and T2) are on the lower side of the module and are used to output analog signals. Any interconnectable signal can be output via SINAMICS on every measuring socket on the control unit.

Interface assignment

Table 3- 19 Measuring sockets T0, T1, T2

	Socket	Function	Technical specifications
	T0	Measuring socket 0	Voltage: 0 V to 5 V Resolution: 8 bits Load current: Max. 3 mA Continuous short-circuit-proof Reference potential is G terminal
	T1	Measuring socket 1	
	T2	Measuring socket 2	
	M	Ground	
The measuring sockets are suited for multiple-spring wire connectors with a diameter of 2 mm.			

Note

The measuring sockets support commissioning and diagnostic functions. Connection for normal operation is not permitted.

Measuring socket position

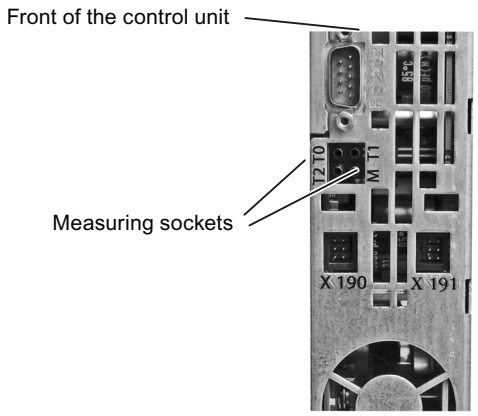


Figure 3-10 Measuring socket position

3.10 USB interfaces

The USB interfaces are used for upgrading the SIMOTION D4x5-2 via a USB stick.

Table 3- 20 Interfaces X125 and X135

Characteristics	Versions
Connector type	Double USB socket – type A
Version	USB 2.0
Power supply	5 V (short-circuit proof)
Current carrying capacity	0.5 A per channel

The USB interfaces are located on the front of the SIMOTION D4x5-2.

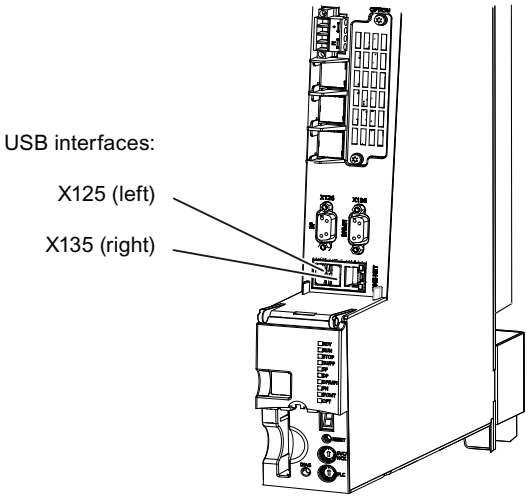


Figure 3-11 The position of the USB X125 and X135 interfaces (example of SIMOTION D4x5-2 DP/PN)

Technical data of the D4x5-2

4

4.1 Shipping and storage conditions

Shipping and storage conditions

The following conditions apply to modules that are shipped and stored in the original packaging.

Table 4- 1 Shipping conditions

Type of condition	Permissible range/class	
	Transport	Long-term storage
Climate class	2K4 acc. to EN 60721-3-2	1K4 acc. to EN 60721-3-1
Temperature	From -40° C to +70° C	From -25° C to +55° C
Relative humidity	From 5% to 95%	From 10% to 100%
Height	Max. 4000 m above sea level, For SINAMICS S120 drive components, see SINAMICS Manuals.	
Atmospheric pressure	• > 620 hPa • < 1060 hPa The specified values apply to a transportation altitude of up to 4000 m	• > 620 hPa • < 1060 hPa The specified values apply to a storage altitude of up to 4000 m
Biological environmental conditions	Class 2B1 acc. to EN 60721-3-2	Class 1B1 acc. to EN 60721-3-1
Chemically active environmental conditions	Class 2C2 acc. to EN 60721-3-2	Class 1C2 acc. to EN 60721-3-1

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 of the backup battery 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.

Notes on handling backup batteries, see Replacing the battery in the fan/battery module (Page 96).

Storage of backup batteries

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

Note

If you have a spare parts inventory, you must not store a SIMOTION D4x5-2 with the fan/battery module mounted. Only connect the fan/battery module if the fan or battery backup voltage is required.

See also

Fan/battery module (Page 93)

4.2 Mechanical and climatic ambient conditions

Conditions of use

SIMOTION D4x5-2 is designed for use in stationary, weather-protected locations.

Use prohibition

SIMOTION D4x5-2 must not be used in the following applications without additional measures:

- Locations with a high percentage of ionizing radiation
- Locations with extreme operating conditions, e.g.
  - Dust accumulation
  - Corrosive vapors or gases
- In systems that require special monitoring, e.g.
  - Elevator installations
  - Electrical installations in particularly hazardous rooms

An additional measure for using SIMOTION D4x5-2 can, for example, be installation in cabinets.

Ambient conditions for operation

SIMOTION D4x5-2 may be used under the following ambient conditions:

Table 4- 2 Environmental requirements

Ambient conditions	Application range	Comments
Climatic ambient conditions		
Climate class	3K3	According to EN 60721-3
Permissible ambient temperature: During operation when installed vertically	**From 0° C to +55° C**, up to 2000 m above sea level	As of an altitude of 2000 m, the max. ambient temperature decreases by 7°C every 1000 m increase in altitude. The maximum supply air temperature for all modules is 55° C. The fan/battery module is always required for SIMOTION D4x5-2 Control Units.
Relative humidity	From 5% to 95%	
Condensation, icing, drip, spray and splash water	Not permissible	
Installation altitude	Max. 4000 m above sea level	For SINAMICS S120 drive components, see SINAMICS Manuals.
Atmospheric pressure	620 hPa to 1060 hPa	Corresponding height 4000 m - 0 m above mean sea level
Biological, chemical and mechanical influences, pollutants		
Biological environmental conditions		• Class 3B1 according to EN 60 721-3-3; Mold, mold growth, slime, rodents, termite and other animal vermin are not permissible.
Chemically active environmental conditions		• Class 3C1 according to EN 60721-3-3
Mechanically active environmental conditions		• Class 3S1 according to EN 60721-3-3, conductive dust not permitted

Other data

Table 4- 3 Other data

Data	
Degree of protection according to EN 60529 (IEC 60529)	IP 20
Pollution degree	2 according to EN 60 664-1

4.3 Dimensions and weights

Dimensions and weights

Table 4- 4 Dimensions and weight of a SIMOTION D4x5-2

Parameter	D425-2 DP D425-2 DP/PN D435-2 DP D435-2 DP/PN	D445-2 DP/PN D455-2 DP/PN
Dimensions W x H x D [mm]		
• Without fastening using spacers, without fan/battery module	50 x 380 x 230	50 x 380 x 230
• With fastening using spacers, without fan/battery module	50 x 380 x 270	50 x 380 x 270
Weight [g] - Without packaging - With packaging	 Approx. 3.6 kg Approx. 4.2 kg	 Approx. 4.4 kg Approx. 5.0 kg

Note

The spacers can be removed for D425-2 and D435-2.

D425-2 and D435-2 do not have any cooling fins.

The presence of cooling fins for D445-2 DP/PN and D455-2 DP/PN means the spacers can be removed only for the "external cooling" installation type. In this installation method, the cooling fins are inserted through a cutout in the rear cabinet panel.

For further details, see the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

4.4 Power supply

External 24 V power supply

The control unit is supplied by an external 24 V power supply (e.g. SITOP).

The tolerance range for the input voltage of the SIMOTION D4x5-2 is between 20.4 and 28.8 VDC.

Table 4- 5 Power supply data

	D425-2 DP D435-2 DP	D425-2 DP/PN D435-2 DP/PN	D445-2 DP/PN D455-2 DP/PN
Power supply • Rated value • Permissible range	Safety extra-low voltage DVC A (PELV) 24 VDC (20.4 ... 28.8 V)		
Current consumption, typically 1)	0.7 A	1.0 A	1.9 A
Starting current, typically 1)	5 A	5 A	5 A
Power loss, typically 1)	17 W	24 W	46 W

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

Table 4- 6 Input voltage specification

Input voltage	D4x5-2
Minimum input voltage	20.4 V
Nominal input voltage	24 V
Maximum input voltage	28.8 V

Table 4- 7 Specification of the input current - typical current consumption

	Typical current consumption 1)		
Device type	D425-2 DP D435-2 DP	D425-2 DP/PN D435-2 DP/PN	D445-2 DP/PN D455-2 DP/PN
Minimum input voltage	0.8 A	1.2 A	2.24 A
Nominal input voltage	0.7 A	1.0 A	1.9 A
Maximum input voltage	0.6 A	0.8 A	1.58 A

1) With no load on inputs/outputs and no 24 V supply via DRIVE-CLiQ or PROFIBUS interface

Table 4- 8 Specification of the input current - maximum current consumption

	Maximum current consumption				
Device type	**D425-2 DP**	**D425-2 DP/PN**	**D435-2 DP**	**D435-2 DP/PN**	**D445-2 DP/PN** **D455-2 DP/PN**
Minimum input voltage	12.8 A	13.6 A	13.9 A	14.6 A	18.35 A
Nominal input voltage	10.9 A	11.5 A	11.8 A	12.4 A	15.6 A
Maximum input voltage	9.1 A	9.6 A	9.8 A	10.3 A	13 A

Note

If the D4x5-2 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 D4x5-2 restarts.

Undervoltages are detected when:

- The voltage level of the 24-V supply falls below the minimum permissible input voltage of the D4x5-2
- A temporary voltage dip (> 3 ms) results in the supply falling below the minimum permissible input voltage on the D4x5-2.

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 "Control cabinet installation and EMC booksize" chapter in the *SINAMICS S120 Booksize Power Units* Manual.

4.5 Interfaces and performance features

Memory for system data

Table 4- 9 Memory for system data and its memory size

Data	Memory size D425-2	Memory size D435-2	Memory size D445-2 DP/PN	Memory size D455-2 DP/PN
Diagnostics buffer (protected against power failure)	200 messages (SIMOTION) 200 messages (SINAMICS Integrated)	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	64 MB	128 MB	256 MB
RAM disk (load memory)	25 MB	35 MB	50 MB	70 MB
Retentive memory	364 KB	364 KB	512 KB	512 KB
Persistent memory (user data on CompactFlash) [2]	300 MB	300 MB	300 MB	300 MB

[1] A separate 20 MB of working memory is available for Java applications.

[2] These figures relate to CompactFlash cards with a capacity of 1 GB. If the "Upgrade SIMOTION devices" function is used, the downgrade option requires CompactFlash cards with double the memory requirement for "each switch position". The 300 MB persistent memories can therefore only be achieved with CompactFlash cards with at least 1 GB memory capacity.

PLC and motion control performance

Table 4- 10 Maximum number of axes and minimum cycle clocks for SIMOTION D4x5-2

Data	D425-2 DP D425-2 DP/PN	D435-2 DP D435-2 DP/PN	D445-2 DP/PN	D455-2 DP/PN
Maximum number of axes	16	32	64	128
Minimum PROFIBUS cycle clock	1 ms	1 ms	1 ms	1 ms
Minimum PROFINET send cycle clock	D425-2 DP/PN: 0.25 ms	D435-2 DP/PN: 0.25 ms	0.25 ms	0.25 ms
Minimum position control/interpolator cycle clock	0.5	D435-2 DP: 0.5 ms D435-2 DP/PN: 0.5/0.25 ms[1)]	0.5/0.25 ms [1)]	0.5/0.25 ms [1)]

1) Explanation:

- 0.5 ms in conjunction with SINAMICS S120 (incl. SINAMICS Integrated / CX32-2)
- 0.25 ms in conjunction with SERVOfast and IPOfast for high-speed I/O processing or high-performance hydraulic applications. The sensors and actuators are connected via high-speed PROFINET IO I/O modules.

Integrated drive control

Table 4- 11 Controls for integrated drives

Data	SIMOTION D4x5-2 DP/PN
Max. number of axes for integrated drive control (servo/vector/*V/f*)	6 / 6 / 12 (alternative) drive control based on SINAMICS S120 CU320-2, firmware version V4.x

Communication

Table 4- 12 Interfaces

Data	SIMOTION D4x5-2 DP	SIMOTION D4x5-2 DP/PN
DRIVE-CLiQ interfaces	6 (D425-2 DP: 4)	6 (D425-2 DP/PN: 4)
Ethernet interfaces	3	2
PROFIBUS interfaces [1]	2	2
PROFINET interfaces [2]	---	Onboard: 1 interface with 3 ports Optionally: Second interface with 4 ports via CBE30-2

[1] Supports PROFIBUS DP, isochronous, can be configured either as master or slave

[2] Supports PROFINET IO with IRT and RT, can be configured as PROFINET IO controller and/or device

Address space

Table 4- 13 Address space

	SIMOTION D4x5-2 DP	SIMOTION D4x5-2 DP/PN
Logical I/O address space	16 KB	16 KB
Physical I/O address space for each interface, one each for inputs and outputs • PROFIBUS • PROFINET	• 1 KB [1]	• 1 KB [1] • 4 KB [1] [2]
Permanent process image for BackgroundTask (I/O variables)	64 bytes	64 bytes
Additional configurable process image for each cyclic task (I/O variables)	Yes	Yes
Address space for each PROFIBUS DP station	244 bytes	244 bytes
Address space for each SINAMICS Integrated/CX32-2 (PROFIBUS Integrated)	512 bytes	512 bytes
Address space for each PROFINET device	---	1400 bytes

[1] When PROFIBUS and PROFINET are used, the total address space applies: All I/O are assigned in the logical I/O address space. The maximum number of I/Os is limited by the number that can be addressed using the logical I/O address space.

[2] A second PROFINET interface for the D4x5-2 DP/PN Control Units is optionally available for the CBE30-2.

Digital inputs

Table 4- 14 Digital inputs on SIMOTION D4x5-2

Data	SIMOTION D4x5-2
Digital inputs	12
• Rated value	24 VDC
• For signal "1"	15 ... 30 V
• For signal "0" 2)	-3 ... +5 V
Galvanic isolation	Yes, in groups of 6 1)
Current consumption typ. at signal level "1"	9 mA at 24 V
Input delay, typ. (hardware)	L -> H: 50 µs H -> L: 150 µs

1) Reference potential is terminal M1 or M2

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

Digital I/Os (parameterizable)

Table 4- 15 Digital I/Os on SIMOTION D4x5-2

Data	SIMOTION D4x5-2
Digital I/Os	16 • Max. 16 as inputs of measuring inputs • Max. 8 as cam outputs
If used as an input	
• Input voltage, rated value	24 VDC
• Input voltage, for signal "1"	15 ... 30 V
• Input voltage, for signal "0" 2)	-3 ... +5 V
Galvanic isolation	No
Current consumption typ. at signal level "1"	9 mA at 24 V
Input delay, typ. (hardware)	L -> H: 5 µs H -> L: 50 µs
Measuring input, resolution	1 µs
Measuring input, reproducibility	5 µs
If used as an output	
• Rated load voltage, permissible range	24 VDC, 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: 150/400 µs H -> L: 75/150 µs

Data	SIMOTION D4x5-2
• Output cam, resolution terminal X142	1 µs
• Output cam, reproducibility terminal X142	10 µs
Switching frequency of the outputs, max.	
• With resistive load	100 Hz
• With inductive load	2 Hz
• With lamp load	11 Hz
Short-circuit protection	Yes

1) Specification 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 4- 16 Fan, non-volatile data backup and approvals

Data	SIMOTION D425-2 DP SIMOTION D425-2 DP/PN SIMOTION D435-2 DP SIMOTION D435-2 DP/PN	SIMOTION D445-2 DP/PN SIMOTION D455-2 DP/PN
Fan	Double fan/battery module is included in the scope of delivery	Double fan/battery module is included in the scope of delivery
• Backup time, min. • Charging time, typ.	• 4 days (real-time clock buffering) • A few minutes	• 4 days (real-time clock buffering) • A few minutes
• Approvals	cULus (E164110 file)	cULus (E164110 file)
• Marking for Australia	C-Tick mark	C-Tick mark

If a double fan/battery module is used with included battery, the backup time of the real-time clock is at least three 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.

4.6 CompactFlash card

CompactFlash card

Table 4- 17 CompactFlash Card

Memory capacity	1 GB (order no. 6AU1400-2PA22-0AA0)
Weight	10 g

4.7 Clock

Properties of the real-time clock

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

Table 4- 18 Clock properties

Properties	Meaning
Type	Hardware clock (integrated "real-time clock")
Default setting when delivered	12:00 a.m. (date 01.01.2001)
Accuracy • +25° C • -40° C ... +85° C	Max. deviation per day: • ±2 s • ±5 s
Backup time at least	• 4 days (at 0 ... 25° C) • With battery in the double fan/battery module 3 years
Charging time	A few minutes
Backup	Maintenance-free SuperCap or battery in the double fan/battery module

With power OFF

In the POWER OFF state, the SIMOTION D clock continues to run during the backup time (with the exception of the software clock). The backup battery 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 D4x5-2 is reset to its factory setting, the clock is also reset to the "default setting when delivered".

4.8 Input and output circuit

Protective circuit

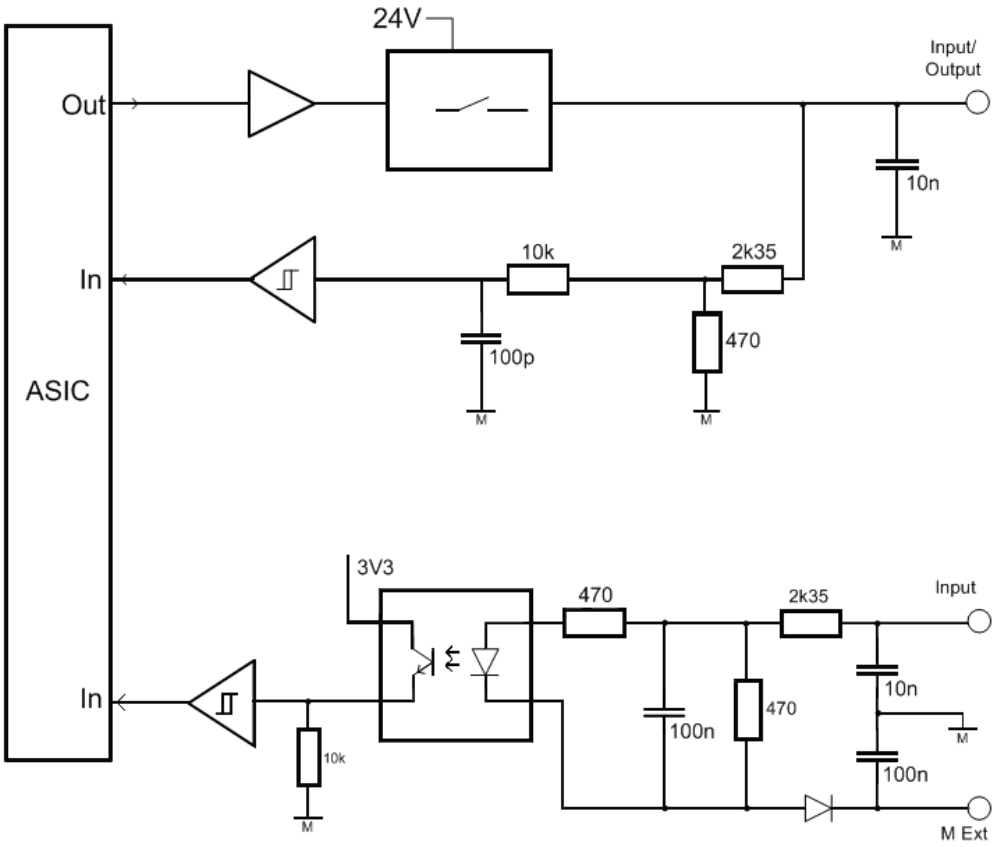


Figure 4-1 SIMOTION D4x5-2/CX32-2 input and output circuits

Dimension drawings

5

5.1 D425-2 and D435-2 dimension drawing

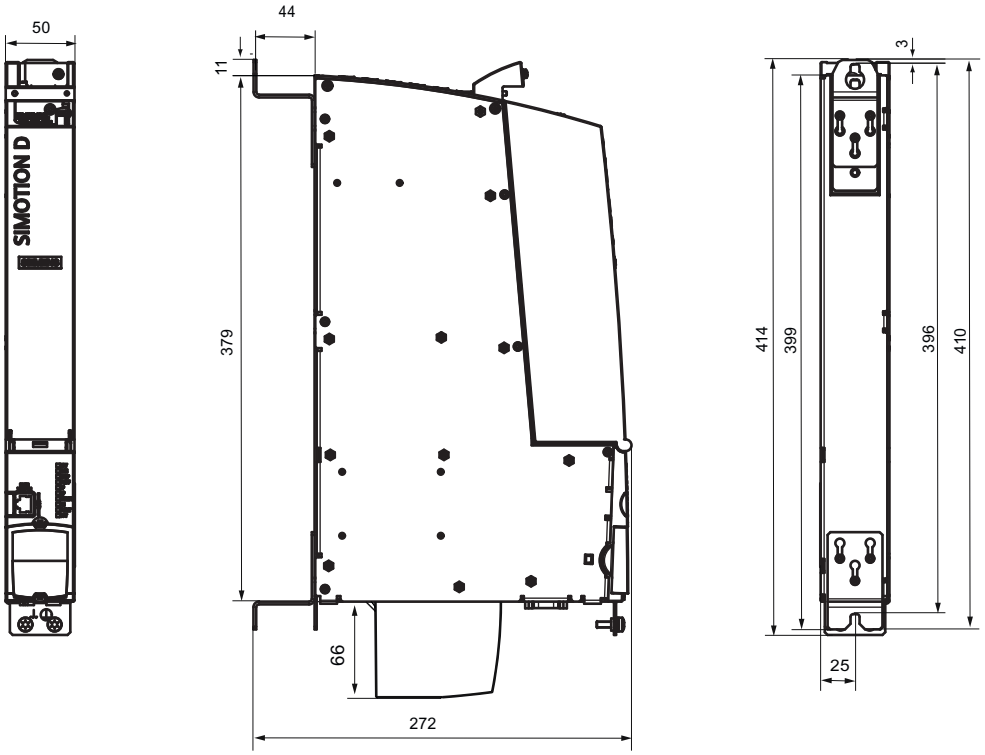


Figure 5-1 D425-2 and D435-2 dimension drawing

SIMOTION D425-2 DP, D425-2 DP/PN, D435-2 DP and D435-2 DP/PN must always be operated with a double fan/battery module.

NOTICE
The 80 mm clearances above and below the components must be observed. The unit protects itself from overheating by shutting down.

5.2 D445-2 DP/PN and D455-2 DP/PN dimension drawing

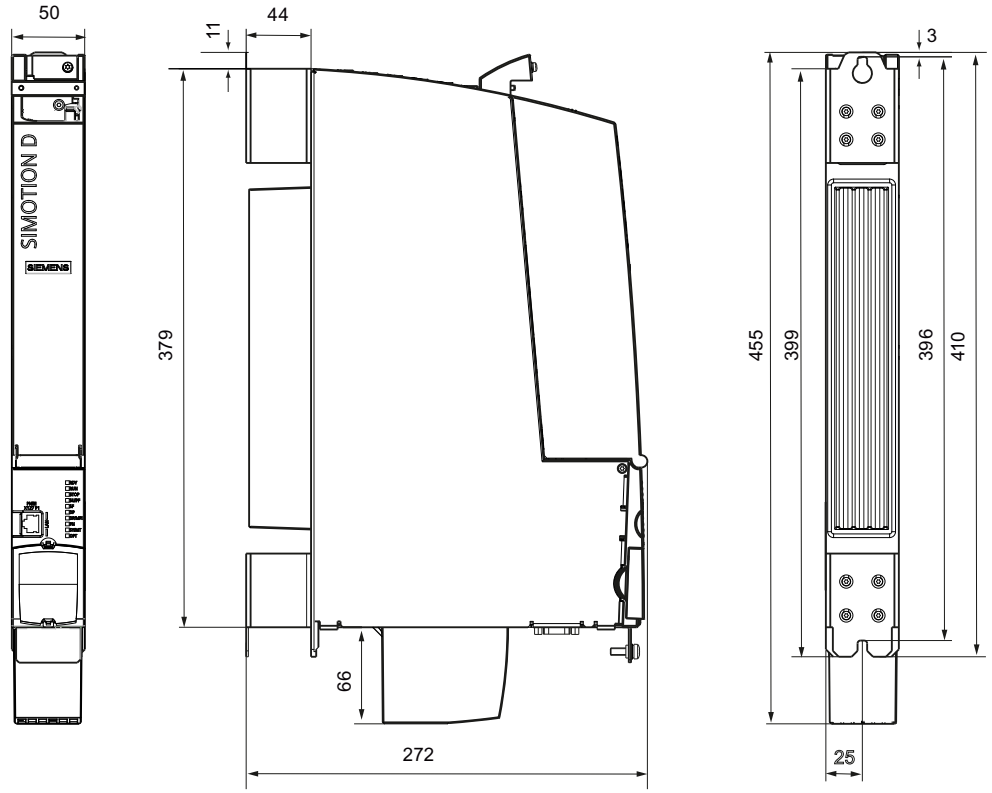


Figure 5-2 D445-2 DP/PN and D455-2 DP/PN dimension drawing

SIMOTION D445-2 DP/PN and D455-2 DP/PN must always be operated with a double fan / battery module.

NOTICE
The 80 mm clearances above and below the components must be observed. The unit protects itself from overheating by shutting down.

5.3 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 found:

- In the CAD Creator (http://support.automation.siemens.com/WW/view/en/30559271)
- In the DT Configurator (http://www.siemens.com/dt-configurator) of the Industry Mall

Circuit-diagram macros

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

Supplementary system components

6

6.1 Connection options overview

Supplementary 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, CBE30-2)
- Via the DRIVE-CLiQ interfaces (terminal modules, control unit adapter, ...).

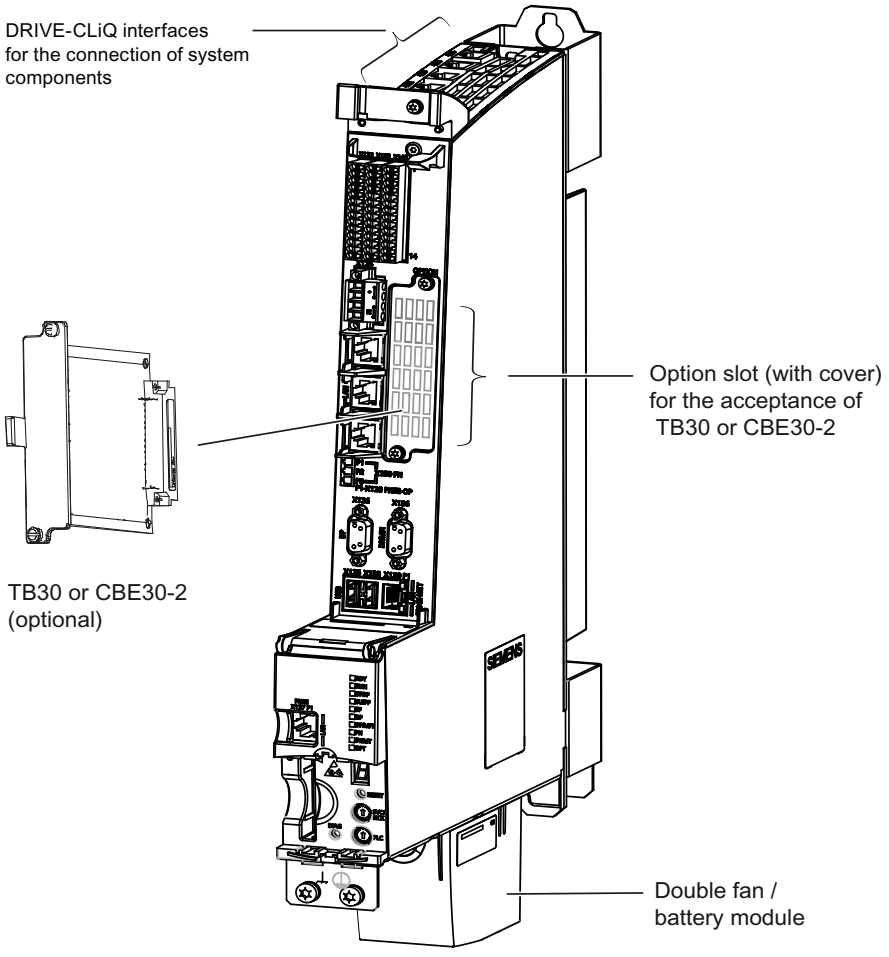


Figure 6-1 Connection of supplementary system components on the D4x5-2

Table 6- 1 Applicable option modules

Module	Order number	D4x5-2 DP	D4x5-2 DP/PN
TB30	6SL3055-0AA00-2TA0	Yes	Yes
CBE30-2	6FC5312-0FA00-2AA0	No	Yes (as of V4.3)
CBE30	6FC5312-0FA00-0AA0	No	No

6.2 Fan/battery module

6.2.1 Cooling the SIMOTION D4x5-2 and backing up the real-time clock

Functions of a fan/battery module

The fan/battery module has the following tasks:

- CPU cooling
- Backing up the real-time clock if the SuperCap is insufficient.

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

Cooling the SIMOTION D4x5-2

A fan/battery module is always required for cooling the SIMOTION D4x5-2 Control Unit.

Table 6- 2 Fan/battery module for SIMOTION D4x5-2

Property	SIMOTION D425-2 DP SIMOTION D435-2 DP/PN	SIMOTION D435-2 DP SIMOTION D435-2 DP/PN	SIMOTION D445-2 DP/PN SIMOTION D455-2 DP/PN
Fan/battery module	Always required (double fan/battery module included in the scope of supply)		
Usable fan/battery modules	Double fan/battery module, 6FC5348-0AA02-0AA0		
Max. permissible supply air temperature	55°C		
Fan control	Temperature-controlled fan unit will be switched on depending on supply air temperature and CPU load		

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

Note

Use of the fan/battery module **with single fan** (order no. 6FC5348-0AA01-0AA0) on the D4x5-2 is **not** possible.

An entry is made in the diagnostics buffer when a fan fault occurs (failure of one or both fans in the double fan/battery module). The fan failure is also signaled by the generation of an event in the PeripheralFaultTask and via a system variable.

If only one of the fans fails, the remaining fan continues under full load.

If both fans fail or with overtemperature, the controller switches to the RESET state, whereby the SF LED flashes red/yellow (2 Hz) and the 7-segment display shows the state "8".

Cooling clearance

NOTICE
The cooling clearances of 80 mm above and below the component must be observed. The unit protects itself from overheating by shutting down.

The clearance below the component is calculated from the bottom edge of the module, i.e. if there is a fan, it will not be included in the clearance.

Buffering data

For the retentive storage of process variables, the SIMOTION D4x5-2 has an NVRAM memory that permanently backs up the data against a power failure.
The real-time clock is backed up by a SuperCap and continues to run when there is a power failure. This backup is for at least four days.
If this backup time is not sufficient, the real-time clock can be backed up by a battery that is inserted in the fan/battery module. The battery is already included in the scope of delivery of fan/battery modules.

Note

The backup time when a battery is used is at least three years. For the replacement part case, you should back up the NVRAM data additionally on the CompactFlash card via the application ("_savePersistentMemoryData"). Temperature faults are recorded and signaled by the control.

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 appropriate 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 135)

Replace battery in the fan/battery module (Page 96)

6.2.2 Installing the fan/battery module

Overview

The procedure for installing the double fan/battery module is described below.

Procedure

There are cutouts on the lower side of the control unit to attach the module. Proceed as follows to install the double fan/battery module:

1. If required, insert a battery in the double fan/battery module.
2. Hold the double fan/battery module at an angle to the front with the open side facing up. The battery must be visible.
3. Push the plastic lug into the slot-like cutout on the lower side of the control unit.
4. Tilt the double fan/battery module up until the two latches snap into place at the front. Note the two contact strips that are lead through cutouts of the control unit.

   This establishes the electrical connection between the double fan/battery module and the control unit.

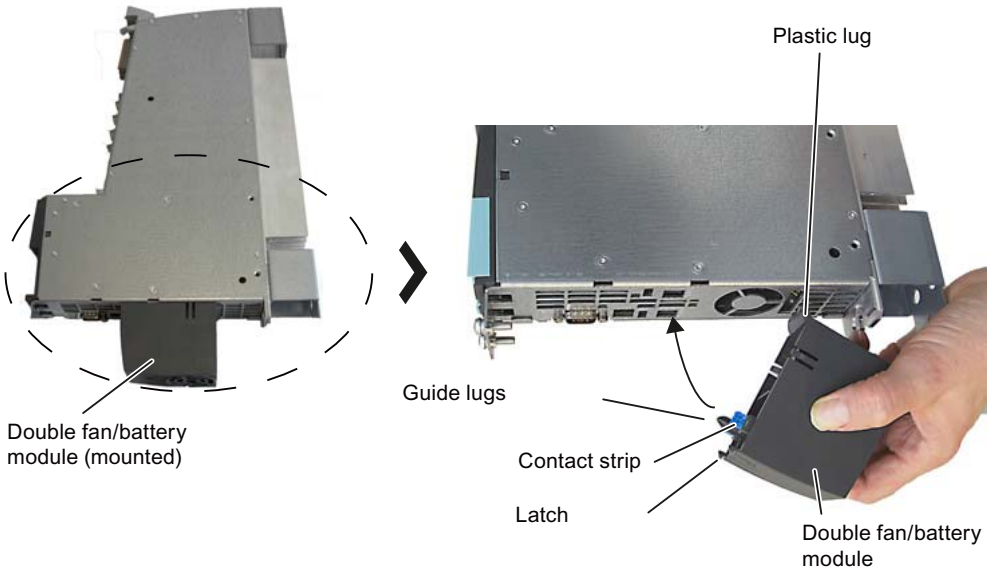


Figure 6-2 Installing the double fan/battery module

6.2.3 Replace battery in the fan/battery module

Overview

The procedure for replacing the double fan/battery module's battery is described below.

Procedure

Proceed as follows to replace the battery:

1. Press the latch. This detaches the module from its front latching device.



Figure 6-3 Unlatch the double fan/battery module

2. Tilt the double fan/battery module forwards at an angle and pull out the plastic lug 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.

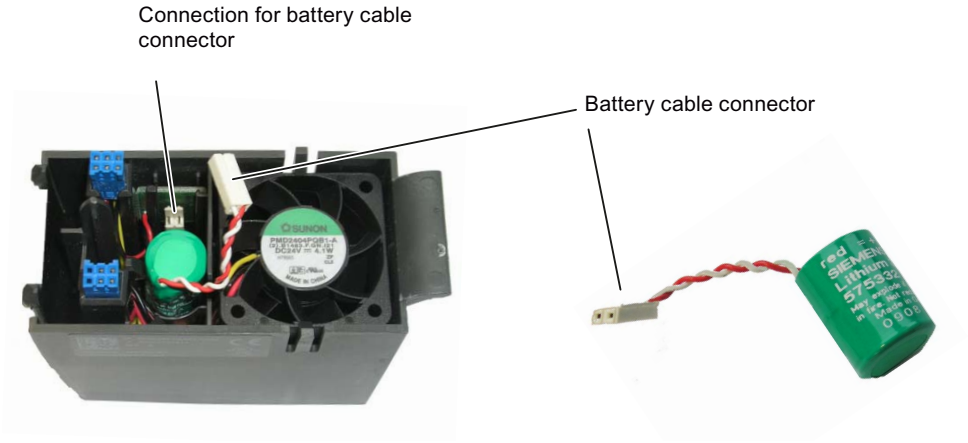


Figure 6-4 Changing the battery in the double fan/battery module

5. Hold the double fan/battery module at an angle to the front with the open side facing up (battery visible).
6. Push the plastic lug into the cutout on the lower side of the Control Unit.
7. Tilt the double fan/battery module up until the front latch snaps into place.

   The electrical connection between the double fan/battery module and the Control Unit is made automatically.

Note

The fan/battery module should preferably be replaced in the POWER OFF state.

The battery should be replaced at least once every three years, at the latest when the prewarning level is reached (see *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual).

Later replacement of the battery can result in a backup failure of the RTC (real-time clock) and therefore loss of the date and time!

Replacement during POWER ON

The fan/battery module should preferably be replaced in the POWER OFF state.
In principle, replacement during POWER ON is possible, but the following aspects must be taken into consideration:

- If the fan/battery module is disconnected and heat dissipation is required because of the temperature conditions, a fan fault is signaled (fan fault is signaled via system variable, PeripheralFaultTask and diagnostics buffer entry; if no PeripheralFaultTask is configured, the Control Unit switches to the STOP state)
- For each SIMOTION D4x5-2 with a fan fault, the Control Unit switches to RESET after approximately 1 minute to protect itself
- During the replacement, the missing fan and battery is signaled via the fanbattery.fanexisting and fanbattery.batteryexisting system variables

⚠ WARNING

The fan/battery module should only be replaced when the CPU is in the STOP state so that there is no risk of an unintentional failure of the machine/plant.

The causes of an unintentional failure can be, for example:

- No PeripheralFaultTask has been configured; if no PeripheralFaultTask is configured, the Control Unit switches to the STOP state when a fan fault occurs
- A delayed replacement can result in a RESET state
- Cables may be unintentionally disconnected during the replacement

Rules for handling backup batteries

⚠ WARNING

Improper handling of backup batteries can lead to 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 open a battery. Replace a faulty battery only with the same type.
- Only use a replacement from Siemens (see Section Available spare parts and accessories (Page 135)).
- Always try to return old batteries to the manufacturer or deliver these to a registered recycling company.

For information on shipping and storage of backup batteries, see Section Shipping and storage conditions (Page 73).

6.3 TB30 terminal board

6.3.1 Description

The TB30 terminal board is a terminal expansion module for SIMOTION D4x5-2. The module is inserted in the option slot of the D4x5-2 control unit.

Table 6- 3 Interface overview of the TB30

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

6.3.2 Safety information for the TB30

CAUTION
The terminal board may only be inserted and removed when the D4x5-2 Control Unit and the terminal board are de-energized.

CAUTION
The TB30 must only be installed by qualified personnel. Note the ESD information, further information can be found in the ESD guidelines (Page 143) section.

6.3.3 Interfaces

6.3.3.1 Overview

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

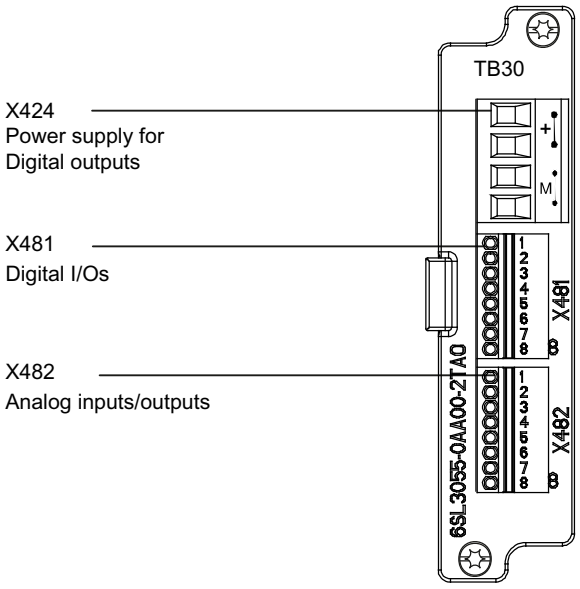


Figure 6-5 Interface arrangement on the TB30

6.3.3.2 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.

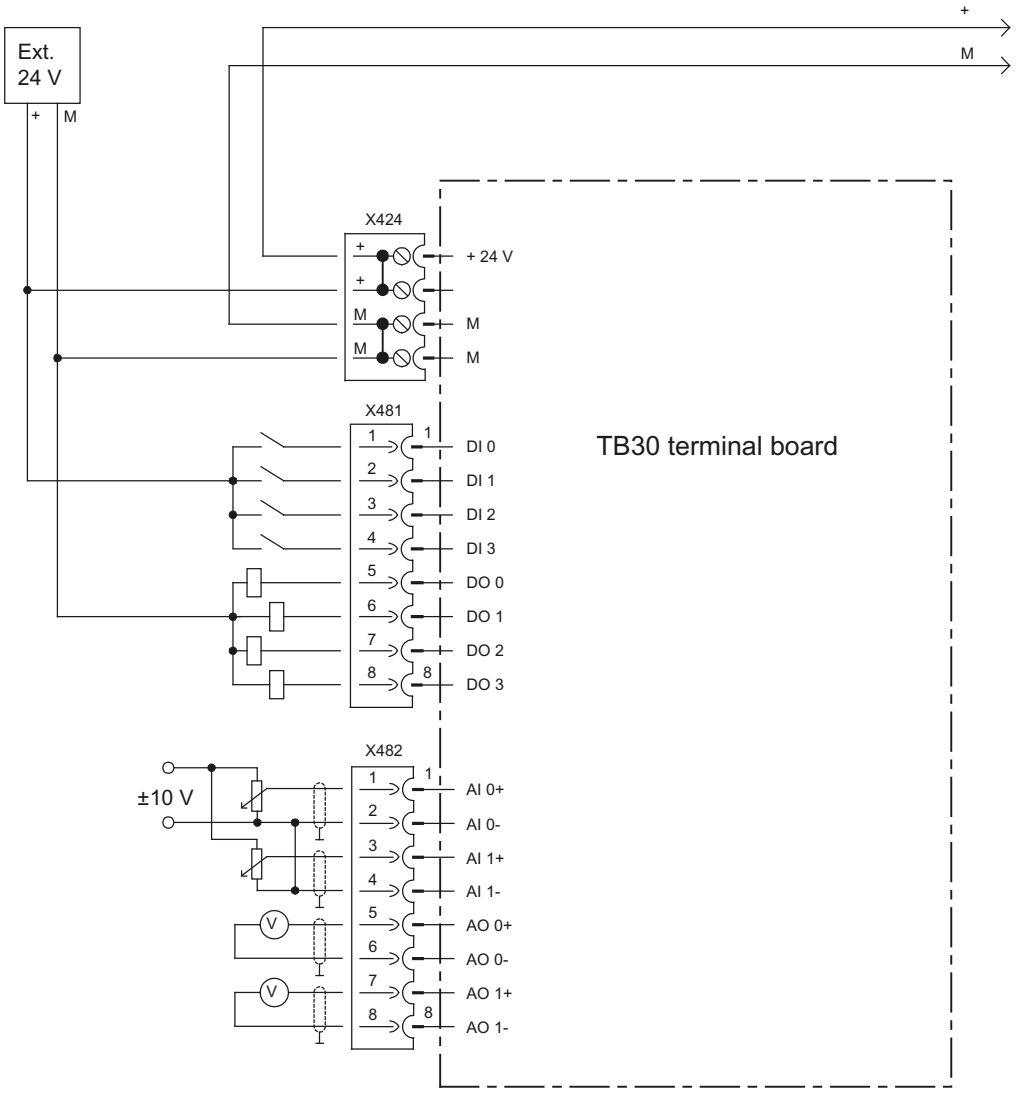


Figure 6-6 TB30 connection diagram

6.3.3.3 Power supply of digital outputs

Table 6- 4 Terminal block X424

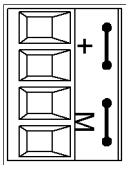
	Terminal	Function	Technical specifications
	+	Power supply	Max. current via bridges in the connector: 20 A
	+	Power supply	
	M	Ground	
	M	Ground	

Table 6- 5 X424 wiring

Characteristics	Type
Connectable cable types and conductor cross-sections Rigid, flexible With end sleeve, without plastic sleeve With end sleeve, with plastic sleeve	 0.08 mm^2 to 2.5 mm^2 0.5 mm^2 to 2.5 mm^2 0.5 mm^2 to 1.5 mm^2
Stripped length	7 mm
Tool	Screwdriver 0.6 x 3.5 m
Tightening torque	0.5 to 0.6 Nm
Max. cable length	10 m

Characteristics

Two "+" terminals and two "M" 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.

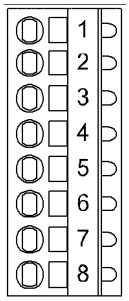
The option slot of the D4x5-2 control unit also provides the following power supplies:

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

The power supply of the digital outputs and the electronics power supply of the control unit are isolated.

6.3.3.4 Digital I/Os

Table 6- 6 Terminal block X481

	Terminal	Designation [1]
	1	DI 0
	2	DI 1
	3	DI 2
	4	DI 3
	5	DO 0
	6	DO 1
	7	DO 2
	8	DO 3

1) DI: digital input, DO: Digital output

Table 6- 7 X481 wiring

Characteristics	Type
Connectable cable types: - Rigid - Flexible - Flexible, with end sleeve 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. cable length	30 m

Note

An open input is interpreted as "low".

The power supply and the digital I/Os are isolated from the control unit.

Note

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

6.3.3.5 Analog inputs and outputs

Table 6- 8 Terminal block X482

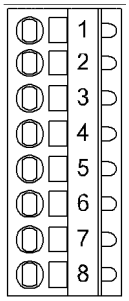
	Terminal	Designation [1)]
	1	AI 0+
	2	AI 0-
	3	AI 1+
	4	AI 1-
	5	AO 0+
	6	AO 0-
	7	AO 1+
	8	AO 1-

Table 6- 9 X482 wiring

Characteristics	Type
Connectable conductor types - Rigid - Flexible - Flexible with end sleeve, without plastic sleeve - AWG/kcmil	Conductor cross-section 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. cable length	30 m

Note

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

The power supply of the analog I/Os of the TB30 is via the option slot of the D4x5-2 control unit and not via X424.

The shield is connected to the control unit. For further information concerning "Establishing a shield connection", refer to the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual, "Connecting I/Os" section.

CAUTION

The common-mode range must not be infringed.
The analog differential voltage signals can have a maximum offset voltage of ±30 V with respect to the ground potential. If the range is infringed, incorrect results may occur during analog/digital conversion.

6.3.3.6 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

6.3.3.7 Commissioning

Information about commissioning can be found in the *SIMOTION D4x5-2*Commissioning and Hardware Installation Manual.

6.3.4 Technical Specifications

Power supply of digital outputs

Table 6- 10 Terminal block X424

Characteristic	Value/Range
Power supply	Voltage: 24 VDC (20.4 V – 28.8 V) Current via the option slot of the D4x5-2 (without digital outputs): 0.05 A Max. power consumption: 4 A Max. power consumption per digital output: 0.5 A Power loss: < 3 W
Response time	The response time of digital inputs/outputs and analog inputs/outputs depends on the evaluation on the control unit (see function diagram). **References:** SINAMICS S120/S150 List Manual, Chapter "Function diagrams"

Digital I/Os

Table 6- 11 Terminal block X481

Characteristic	Value/Range
Digital inputs	Voltage: - 3 V to 30 V Current input (typical): 10 mA at 24 V DC Ground reference: X424 (G terminal) Input delay: - L ⇒ H: Approx. 20 µs - H ⇒ L: Approx. 100 µs Level (including ripple): - High level: 15 V to 30 V - Low level: -3 V to 5 V
Digital outputs	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: - for resistive load: Max. 100 Hz - for inductive load: Max. 0.5 Hz - for lamp load: Max. 10 Hz Maximum lamp load: 5 W

Analog I/Os

Table 6- 12 Terminal block X482

Characteristic	Value/Range
Analog inputs (AI):	Voltage: -10 V to +10 V Internal resistance: 65 kΩ Resolution: 13 bits + sign
Analog outputs (AO):	Rated operating voltage: -10 V to +10 V Load current: max. -3 mA to +3 mA Resolution: 11 bits + sign Sustained short-circuit strength

Dimensions and weight

Characteristic	Value
Dimensions (H x W x D), approx.	25 x 95 x 143 mm
Weight	100 g

6.4 CBE30-2 Ethernet communication board

6.4.1 Overview

Properties of the CBE30-2

A second PROFINET interface can be implemented for the SIMOTION D4x5-2 DP/PN with the CBE30-2 Ethernet communication board.

The CBE30-2 cannot be used with the SIMOTION D4x5-2 DP.

The CBE30-2 offers the following functions:

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

The CBE30-2 has an X1400 interface with an integral 4-port switch based on PROFINET ASICs ERTEC400.

View

The connections and LED displays are located on the front of the CBE30-2.

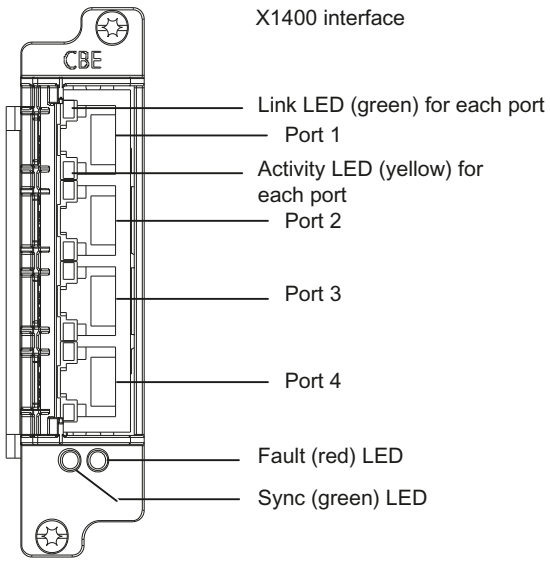


Figure 6-7 CBE30-2 front view

6.4.2 Type plate

Type plate

The figure below contains all the information included on the type plate.



Figure 6-8 CBE30-2 type plate

You might need to access the information provided on the type plate after mounting. Because the type plate is located on the under side of the CBE30-2, we recommend that you note the serial number before installing it.

Note

The contents of the individual type plate fields of the CBE30-2 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 PROFINET interfaces is attached to the top side of the board:



Figure 6-9 CBE30-2 MAC address

This plate is only visible when the CBE30-2 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 CBE30-2, behind the RJ45 sockets.

6.4.3 Safety information

CAUTION
The CBE30-2 may be inserted and removed only when the D4x5-2 Control Unit and the CBE30-2 are in a de-energized state.

CAUTION
The CBE30-2 may be installed only by qualified personnel. The ESD notes must be observed, see Section ESD guidelines (Page 143).

6.4.4 Interface description

Properties

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

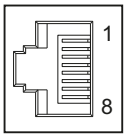
Interface characteristics

Table 6- 13 X1400 features

Characteristic	Type
Connector type	RJ45 socket
Cable type	Industrial Ethernet cable
Maximum cable length	100 m
Dust protection blanking plugs for sealing unused PROFINET ports	Five blanking plugs contained in the D4x5-2 scope of delivery Blanking plugs (50 pcs) order number: 6SL3066-4CA00-0AA0

Interface assignment

Table 6- 14 X1400 interface

Representation	Pin	Name	Signal type	Description
	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 CBE30-2.



Figure 6-10 CBE30-2 interface

6.4.5 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 6- 15 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 the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual, Section *Diagnostics*.

6.4.6 Dimension drawing

CBE30-2 representation

The following illustrations show the components in four views.

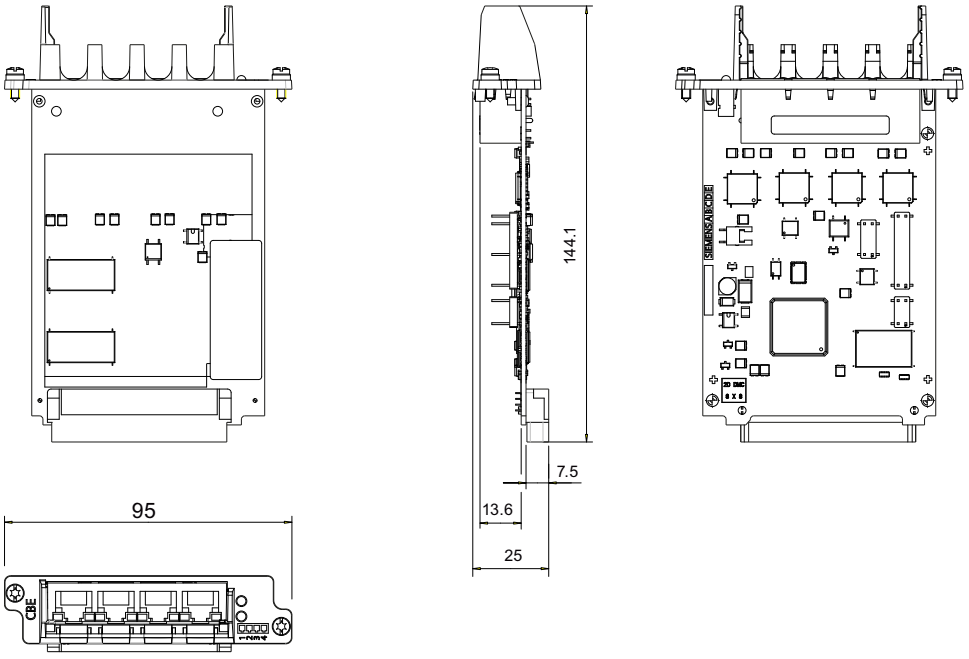


Figure 6-11 CBE30-2 dimension drawing

6.4.7 Commissioning

Additional references

- *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual
- *SIMOTION Communication* System Manual

6.4.8 Technical data

CBE30-2 technical data

Table 6- 16 CBE30-2 technical data

Characteristic	Value
Current requirement at 24 V DC	0.25 A
Approvals	cULus (File No. E164110)
Marking for Australia	C-Tick mark

Storage and operation

Table 6- 17 Ambient conditions for CBE30-2

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 3M4
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 mm
Weight	100 g

6.5 CX32-2 controller extension

6.5.1 Overview of CX32-2

Properties

The CX32-2 (order no. 6AU1432-0AA00-0AA0) is a module in the SINAMICS S120 booksize format. The CX32-2 allows scaling for the drive-end computing performance of the SIMOTION D4x5-2 control units.

Each CX32-2 can control up to six additional servo, six vector or twelve *V/f* axes.
The controller extension has six DI, four DI/DO and four DRIVE-CLiQ interfaces.

Note

The CX32 (order no. 6SL3040-0NA00-0AA0) cannot be used with the D4x5-2. If an incorrect controller extension is used, a topology error will be signaled (F01360 Topology: Actual topology not permitted).

Drive quantity structure

Table 6- 18 Drive quantity structure

Characteristic	Quantity structure
Number of CX32-2	D425-2: Max. 3 CX32-2 D435-2/D445-2/D455-2: Max. 5 CX32-2
Max. number of drives on the SINAMICS Integrated with connected CX32-2	• 6 servo or • 6 vector or • 12 *V/f* incl. an infeed (ALM, BLM, SLM)
Max. number of drives per CX32-2	• 6 servo or • 6 vector or • 12 *V/f* incl. an infeed (ALM, BLM, SLM)
Supplementary conditions	Of which max. six drives with safety extended functions (see also the following SIZER section for a detailed dimensioning)

The maximum quantity structures can be reduced depending on the configuration (for example, for connected Terminal Modules).

Note

In principle, a fourth CX32-2 can be connected to the SIMOTION D425-2 and a sixth CX32-2 connected to the SIMOTION D435-2/D445-2/D455-2.

Note however that no further drives can then be connected on the SINAMICS Integrated of the D4x5-2. Possible fields of application, for example, are modular machine concepts with a central controller.

Note

Mixed operation of servo and vector-controlled drives

Mixed operation of servo and vector-controlled drives is not possible on a CX32-2. Therefore, drives on a CX32-2 must be operated either in servo or in vector mode only. The following mixed operation is possible on a CX32-2:

- Servo and *V/f*-controlled drives
- Vector and *V/f*-controlled drives

This corresponds to the possible mixed operation on the SIMOTION D4x5-2.

V/f-controlled drives

A maximum of twelve *V/f*-controlled drives are supported by each CX32-2.

SIZER

For a detailed estimation of the drive quantity structures, we recommend that you use the SIZER configuration tool.

With SIZER, 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.

6.5.2 Interfaces

6.5.2.1 Overview of interfaces

Position of the interfaces

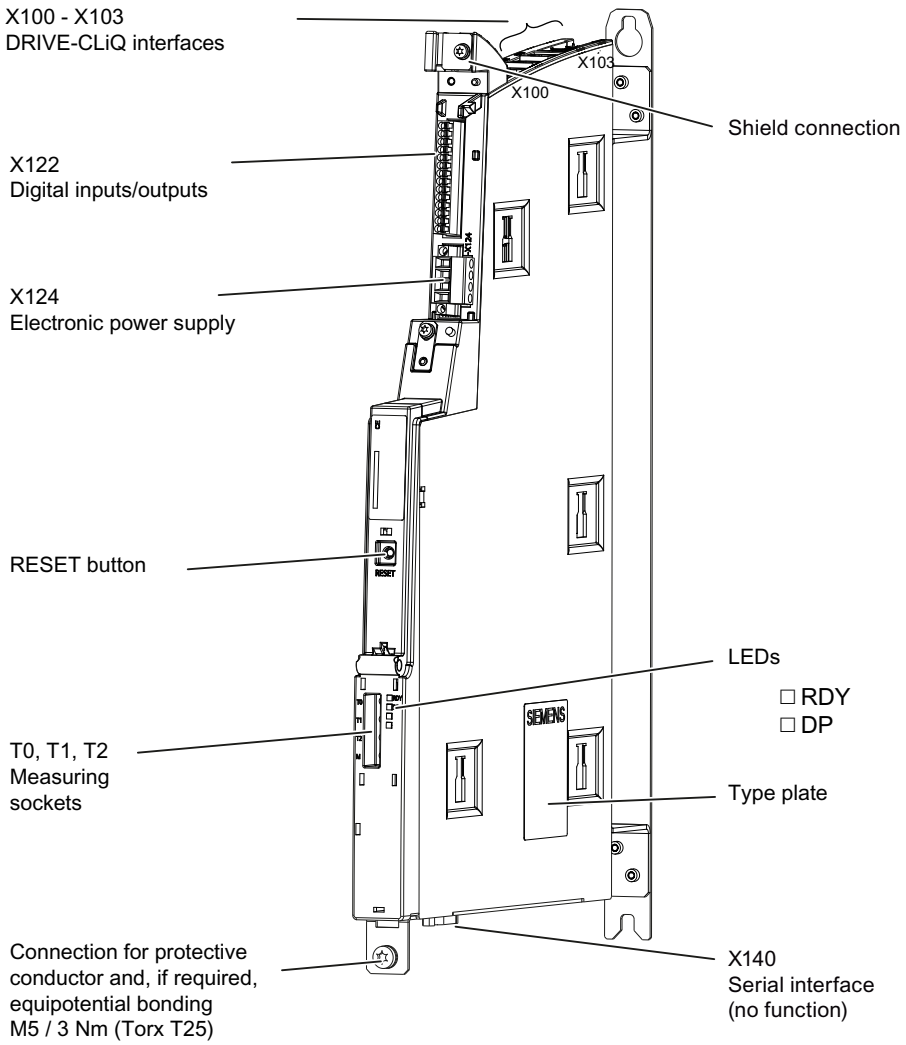


Figure 6-12 CX32-2 (without cover) with interfaces and operator control

⚠ CAUTION
The cooling clearances of 80 mm above and below the components must be observed.

6.5.2.2 List of interfaces

The CX32-2 has the following interfaces:

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

Available interfaces

Table 6- 19 Overview of available interfaces

Interface	Designation	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	Mini Combicon, 3.5 mm, 1x14-pin
Power supply connector	X124	Combicon, 4-pin
Measuring sockets (T0, T1, T2, and M)	X131 - X134	Sockets

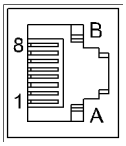
Non-usable interfaces

Table 6- 20 Overview of interfaces that cannot be used for the CX32-2

Interface name	Interface	Connector type
RS232 interface	X140	9-pin Sub-D connector

6.5.2.3 DRIVE-CLiQ interface

Table 6- 21 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 blanking plugs for sealing unused DRIVE-CLiQ ports: • Three blanking plugs contained in the CX32-2 scope of delivery • Blanking plugs (50 pcs) order number: 6SL3066-4CA00-0AA0			

6.5.2.4 Digital I/Os (X122)

Interface characteristics

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

Table 6- 22 X122 wiring

Characteristics	Type
Connector type	Mini Combicon
Connectable cable types: - Rigid - Flexible - Flexible, with end sleeve without plastic sleeve - AWG/kcmil	Conductor cross-sections: 0.2 mm^2 to 1 mm^2 0.2 mm^2 to 1.5 mm^2 0.25 mm^2 to 1.5 mm^2 24 to 16
Stripped length	8 mm
Tool	Screwdriver 0.4 x 2.0 mm
Max. cable length	30 m
Max. current carrying capacity (ground)	6 A

Position of the connector

The X122 connection is on the front side of the CX32-2 at the top, see appropriate figure in Section Overview of interfaces (Page 116).

Connection and circuit diagram

The following figure shows the schematic diagram and the connection of the digital I/Os on the CX32-2 and the associated external power supply.

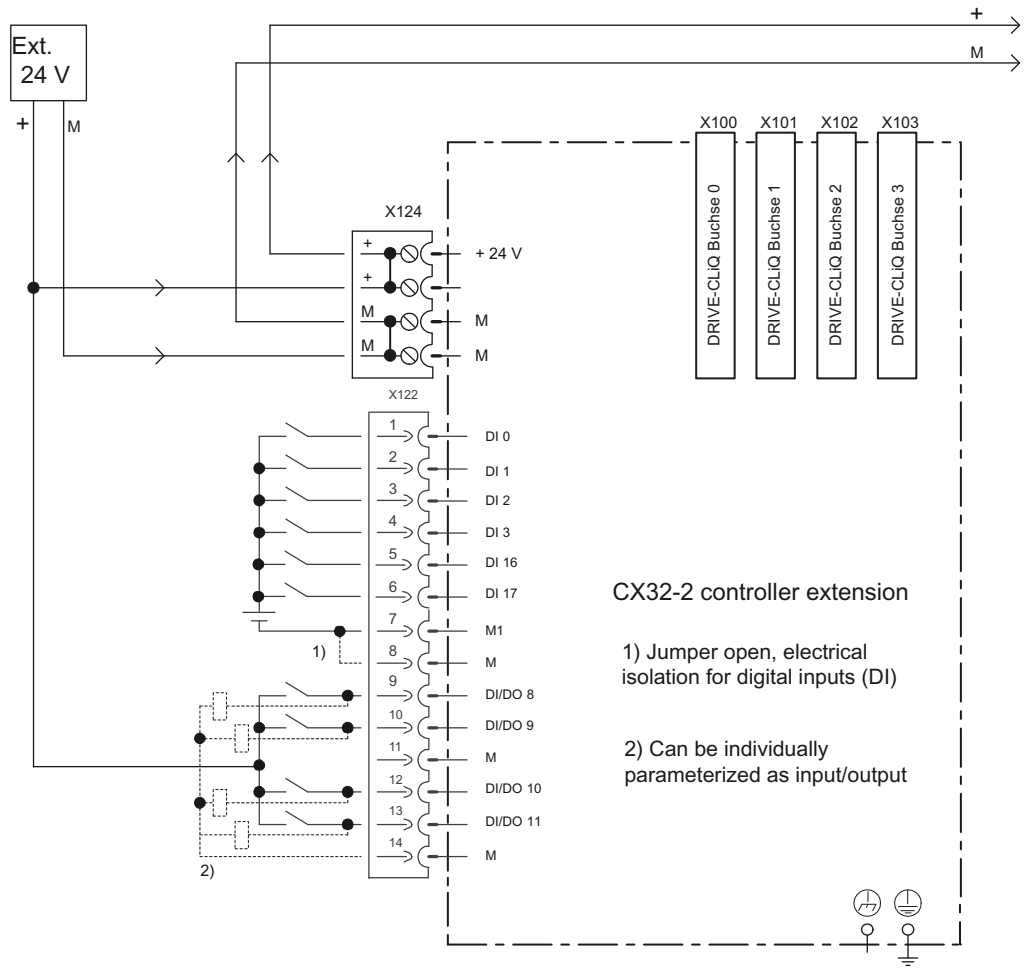


Figure 6-13 Digital I/Os connection diagram

Interface assignment of X122

Table 6- 23 Digital I/Os X122

Pin	Designation 1)	Signal type 2)	Information
1	DI 0	I	Digital input 0
2	DI 1	I	Digital input 1

Pin	Designation [1]	Signal type [2]	Information
3	DI 2	I	Digital input 2
4	DI 3	I	Digital input 3
5	DI 16	I	Digital input 16
6	DI 17	I	Digital input 17
7	M1	GND	Ground for DI 0 – DI 3, DI 16, DI 17 (electrically isolated relative to M)
8	M	GND	Ground
9	DI/DO 8	B	Digital input/output 8 (can also be used as input for measuring input or as input for the external zero mark)
10	DI/DO 9	B	Digital input/output 9 (can also be used as input for measuring input or as input for the external zero mark)
11	M	GND	Ground
12	DI/DO10	B	Digital input/output 10 (can also be used as input for measuring input or as input for the external zero mark)
13	DI/DO 11	B	Digital input/output 11 (can also be used as input for measuring input or as input for the external zero mark)
14	M	GND	Ground

[1] DI: Digital input; DI/DO: Bidirectional digital input/output; M: Electronics ground; M1: Ground reference

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

Note

An open input is interpreted as "Low".
Terminal M1 must be connected for the digital inputs to function. The following alternatives are available:

- Connect the incorporated ground reference of the digital input to M1
- Create the bridge between terminal M and terminal M1.
  This removes the electrical isolation for these digital inputs.

Using the digital I/Os

Connecting sensors and actuators

Digital inputs and digital outputs can be used to connect various sensors and actuators to the 14-pin X122 front connector.

The following types of digital I/Os are used:

- Digital inputs (DI)
- Bidirectional digital I/Os (DI/DO)

Bidirectional digital I/Os can be configured individually as digital inputs or outputs.

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

The digital I/Os on the X122 front connector can be used by either SIMOTION or SINAMICS (e.g. as enable signal for a drive).

Table 6- 24 Use of the digital I/Os

	DI 0-3, DI 16, DI 17 (X122)	DI/DO 8-11 (X122)
Galvanic isolation	Electrically isolated (ground reference M1)	Non-isolated (ground reference M)
Use as:		
• Freely addressable I/Os for SIMOTION	Yes	Yes
• I/Os that are assigned to the drive	Yes	Yes
• Measuring inputs	No	Yes (global and local measuring inputs)
• Inputs for the external zero mark	No	Yes
• Cam outputs	No	No
Configuration:		
Assignment	Can be configured channel-by-channel on the drive	Can be configured channel-by-channel on the drive

Note

For optimal noise immunity of the digital inputs, the use of shielded cables is necessary in certain cases. This is necessary when the digital inputs are to be used as

- Inputs of measuring inputs or
- Inputs for the external zero mark

Additional references

For information on configuring the I/Os as freely addressable I/Os or as measuring inputs, see the *SIMOTION D4x5-2* 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.

6.5.2.5 Power supply

Application

This interface is provided for the 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).

Characteristics of the interface

Table 6- 25 Interface X124

Characteristics	Type
Connector type	Combicon
Connection possibility	Up to 2.5 mm^2
Max. current carrying capacity incl. loop-through	20 A
Max. cable length	10 m

Interface assignment

Table 6- 26 Power supply X124

Pin	Signal name	Meaning
1	P24	24 V power supply
2	P24	24 V power supply
3	M	Ground
4	M	Ground

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 in the connector. The maximum current can be limited through the current carrying capacity of the cable. The current carrying capacity of the cable depends, for example, on the type of cable installation (cable duct, laying on a cable rack, etc.)

Note

The power supply terminal strip must be screwed on tightly using a flat-bladed screwdriver.

6.5.2.6 Measuring sockets

Application

The T0, T1 and T2 measuring sockets are used to output analog signals. Any signal interconnectable via SINAMICS can be output on any measuring socket of the CX32-2.

⚠ CAUTION
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.

6.5.3 Displays of the LEDs

Description

Table 6- 27 CX32-2 LEDs

LED	Description
RDY	Operating modes of the CX32-2
DP	Status of the communication connection between the D4x5-2 and the CX32-2

Additional references

Detailed information on the states of the status LEDs can be found in the *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual, Section *Diagnostics*.

6.5.4 Cause and rectification of faults

The following reference contains information about the cause of faults and how they can be rectified:

- *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

6.5.5 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 D4x5-2* Commissioning and Hardware Installation Manual.

6.5.6 Commissioning

Information on the commissioning in the following reference:

SIMOTION D4x5-2 Commissioning and Hardware Installation Manual.

6.5.7 Technical data of the CX32-2

Memory for system data

Table 6- 28 Diagnostic buffer

Data	SIMOTION CX32-2
Diagnostic buffer (protected against power failure)	200 messages

The data for the CX32-2 is stored on the SIMOTION D4x5-2, which means no action has to be taken on the CX32-2 when the module is replaced.

Dimensions and weights

Table 6- 29 Dimensions and weight of a SIMOTION CX32-2

Parameter	SIMOTION CX32-2
Dimensions W x H x D [mm] (max. expansion)	
• Without fastening using spacers	• 25 x 380 x 230
• With fastening using spacers	• 25 x 380 x 270
Weight CX32-2 [g]	
• Without packaging	• approx. 2600
• With packaging	• approx. 3150

Ambient conditions

The following conditions apply to modules that are shipped and stored in the original packaging.

Table 6- 30 CX32-2 environmental requirements

Parameter	Values
Permissible ambient temperature	
• Transport • Long-term storage • Operation	• -40° C ... +70° C • -25° C ... +55° C • 0° C ... +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 increase in altitude
Atmospheric pressure	620 ... 1060 hPa
Permissible relative humidity	
• During transport and storage • During operation (condensation, icing, drip, spray and splash water not permitted)	• 10 % ... 100 % • 5 % ... 90 %
Installation altitude	Max. 4000 m above sea level. For SINAMICS S120 drive components, see SINAMICS Manuals.
Biological environmental conditions • 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
Degree of protection according to EN 60529 (IEC 60529)	IP20
Pollution degree	2 according to EN 60 664-1

Integrated drive control

Table 6- 31 Controls for integrated drives

Data	SIMOTION CX32-2
Max. number of axes for integrated drive control (servo/vector/*V/f*)	6 / 6 / 12 (alternative) drive control based on SINAMICS S120 CU320-2, firmware version V4.x

Communication

Table 6- 32 Interface communication

Data	SIMOTION CX32-2
DRIVE-CLiQ interfaces	4

General technical data

Table 6- 33 Technical data (general)

Data	SIMOTION CX32-2
Power supply • Rated value • Permissible range	 24 VDC (20.4 ... 28.8 V)
Current consumption, typically [1]	300 mA
Starting current, typical	1.6 A
Power loss, typical	7 W
Power loss, max.	14 W

[1] With no load on I/Os, no 24 V supply via DRIVE-CLiQ interface

Digital inputs

Table 6- 34 Digital inputs on SIMOTION CX32-2

Data	SIMOTION CX32-2
Digital inputs	6
• Rated value	24 VDC
• For signal "1"	15 ... 30 V
• For signal "0" [2]	-3 ... +5 V
Galvanic isolation	Yes, in groups of 6 [1]
Current consumption typ. at High level	9 mA at 24 V
Input delay, typical (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 6- 35 Digital I/Os on SIMOTION CX32-2

Data	SIMOTION CX32-2
Number of digital I/Os	4 • Max. 4 as inputs of measuring inputs • Max. 0 as cam outputs
If used as an input:	
• Input voltage, rated value	24 VDC
• Input voltage, for signal "1"	15 ... 30 V
• Input voltage, for signal "0" 2)	-3 ... +5 V
Galvanic isolation	No
Current consumption typ. at signal level "1"	9 mA at 24 V
Input delay, typical (hardware)	L -> H: 5 µs H -> L: 50 µs
Measuring input, resolution	1 µs
Measuring input, reproducibility	5 µs
If used as an output	
• Rated load voltage, permissible range	24 VDC, 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
• With lamp load	11 Hz
Maximum lamp load	5 W
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

6.6 Terminal module TM31

Properties 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 two DRIVE-CLiQ interfaces for this.

The TM31 contains the following terminals:

Table 6- 36 Interface overview

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

⚠ CAUTION
The 50 mm clearances above and below the components must be observed.

Additional references

You will find detailed information about the TM31 in the

- *SINAMICS S120 Control Units and Additional System Components* Manual
- *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

6.7 Terminal module TM41

Properties 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 6- 37 Interface overview

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

⚠ CAUTION
The 50 mm clearances above and below the component must be observed.

Additional references

You will find detailed information about the TM41 terminal module in the

- *SINAMICS S120 Control Units and Additional System Components* Manual
- *SIMOTION D4x5-2* Commissioning and Hardware Installation Manual.

6.8 Terminal Module TM54F

Properties 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.

Exactly one TM54F can be assigned to each drive control (SINAMICS Integrated of a D4x5-2, CX32-2, CU320-2, etc.). Connection is via DRIVE-CLiQ. Each drive control must have its own dedicated TM54F.

TM54 is equipped with the following terminals:

Table 6- 38 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 during 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 four fail-safe digital outputs and ten 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.

⚠ CAUTION
The 50 mm clearances above and below the component must be observed.

Additional references

You will find detailed information about the TM54F terminal module in the following sources:

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

6.9 TM15 and TM17 High Feature terminal modules

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), input of a measuring input, or output of an output cam.

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/O can be interconnected using BICO technology and thus used from the drive side as well. Unlike the TM15, measuring input inputs and cam outputs 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 when inserting the component in the SIMOTION SCOUT project navigator using "Insert I/O component".

TM17 High Feature

Each of the 16 digital I/Os can be parameterized channel-by-channel as a digital input (DI), digital output (DO), input of a measuring input, or output of an output cam.

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 digital I/O channels of the TM17 High Feature are non-isolated.

Note

⚠ CAUTION
The 50 mm clearances above and below the components must be observed.

Additional references

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

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

6.10 CUA31/CUA32 control unit adapter

Properties of the CUA31/CUA32

You can connect power modules in blocksize format via DRIVE-CLiQ to the D4x5-2 control units using the CUA31/CUA32 adapter modules.
The CUA32 adapter module also has an additional encoder interface for a HTL, TTL or SSI encoder.

Table 6- 39 Number of interfaces on the adapter modules

Interface	CUA31[1)]	CUA32
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.	100 m	100 m

1) CUA31 with order number 6SL3040-0PA00-0AAx (x ≥ 1 required)

⚠ CAUTION

The 50 mm clearances above and below the components must be observed. 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.

6.11 DMC20 DRIVE-CLiQ hub

Properties

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 following source:

SINAMICS S120 Control Units and Supplementary System Components Manual

Spare parts/accessories

7

7.1 Available spare parts and accessories

Table 7- 1 Spare parts and accessories

Parts for the SIMOTION D4x5-2	Order No.	Accessories	Spare part
CompactFlash card (CF card) 1 GB With drive software and SIMOTION Kernel	6AU1400-2PA22-0AA0	x	
Seal for external air cooling (only for D445-2 DP/PN and D455-2 DP/PN)	6FC5348-0AA07-0AA0	x	
Double fan/battery module incl. battery The double fan/battery module is already included in the scope of delivery for the SIMOTION D4x5-2.	6FC5348-0AA02-0AA0		x
3 V lithium battery for fan/battery module	6FC5247-0AA18-0AA0		x
Terminal kit, contains • 3 x I/O connectors for X122/X132/X142 • 1 x 24 V connector for X124 • 5 x DRIVE-CLiQ blanking cover for X100-X105	6SL3064-2CB00-0AA0		x
Option slot protective cover	6SL3064-3CB00-0AA0		x
Spacer for SIMOTION D425-2/D435-2 Spacer for SIMOTION D445-2/D455-2	6SL3064-1BB00-0AA0 6FC5348-0AA06-0AA0		x x
Dust protection blanking plugs for sealing unused DRIVE-CLiQ, Ethernet or PROFINET ports • Blanking plugs (50 pcs)	6SL3066-4CA00-0AA0	x	x
Blanking cover for the protection of the operator controls	6SL3064-3BB00-0AA0		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	6ES7972-0BA42-0XA0 6ES7972-0BB42-0XA0	x x	
PROFIBUS FastConnect bus RS485 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	

Parts for the SIMOTION D4x5-2	Order No.	Accessories	Spare part
RJ45 FastConnect connector for Industrial Ethernet / PROFINET			
• 145° cable outlet (preferred type when the front cover is to be closed)			
- 1 pack = 1 unit	6GK1901-1BB30-0AA0	x	
- 1 pack = 10 units	6GK1901-1BB30-0AB0	x	
• 180° cable outlet			
- 1 pack = 1 unit	6GK1901-1BB10-2AA0	x	
- 1 pack = 10 units	6GK1901-1BB10-2AB0	x	
FastConnect cables for Industrial Ethernet / PROFINET			
• IE FC Standard Cable GP 2x2	6XV1840-2AH10	x	
• IE FC Flexible Cable GP 2x2	6XV1870-2B	x	
• IE FC Trailing Cable GP 2x2	6XV1870-2D	x	
• IE FC Trailing Cable 2x2	6XV1840-3AH10	x	
• IE FC Marine Cable 2x2	6XV1840-4AH10	x	
Stripping tool for Industrial Ethernet / PROFINET FastConnect cables			
• IE FC Stripping Tool	6GK1901-1GA00	x	

To obtain ordering data information for other SINAMICS drive components, such as line modules, motor modules, DRIVE-CLiQ cables, etc., refer to 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_web5446/134200)

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.

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.

EMC

USA	
Federal Communications Commission Radio Frequency Interference Statement	This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
Shielded Cables	Shielded cables must be used with this equipment to maintain compliance with FCC regulations.

USA	
Modifications	Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the equipment.
Conditions of Operations	This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CANADA	
Canadian Notice	This Class B digital apparatus complies with Canadian ICES-003.
Avis Canadien	Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

SOUTH KOREA
이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다. For sellers or other user, please keep in mind that this device in 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 EN55011. 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 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).

General warning information

CAUTION
There is a risk of injury or of damage to assets. In hazardous areas, personal injury or damage to assets can occur if plug-in connections are disconnected during operation. Make sure that your system is always de-energized before disconnecting plug-in connections in hazardous areas.

C-Tick

AUSTRALIA	
	D425-2 DP, D425-2 DP/PN, D435-2 DP, D435-2 DP/PN, D445-2 DP/PN, D455-2 DP/PN, CX32-2 and CBE30-2 meets the requirements of the AS61800-3.

A.2 SIMOTION D4x5-2 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 D4x5-2/CX32-2 Control Units as for the SINAMICS S120 CU320-2 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.

A.3 Safety of electronic controllers

Introduction

The following remarks relate to fundamental criteria and apply irrespective of the type of controller and the manufacturer.

Risk

A higher degree of safety standard applies to all applications and situations where there is a risk of material damage or injury to persons if there is a failure. Special regulations specific to the system apply to such applications. These must be taken into account for configuration of the controller (e.g. VDE 0116 for furnaces).

For electronic controllers with safety responsibility, the measures required for preventing or controlling faults depend on the hazard inherent in the plant. In this respect, the basic measures listed above are no longer adequate once the hazard exceeds a certain potential. Additional measures (e.g. double redundancy, tests, checksums, etc.) for the controller must implemented and certified (DIN VDE 0801).

The residual risk

When assessing his machine's risk in accordance with the EC Machinery Directive, the machine manufacturer must take into account the following residual risks emanating from the control and drive components:

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 not within the scope of the specification
   - Parameterization, programming, cabling, and installation errors
   - Use of radio devices / cellular phones in the immediate vicinity of the controller
   - External influences / damage
2. Exceptional temperatures as well as emissions of light, noise, particles, or gas caused by, for example:
   - Component malfunctions
   - Software errors
   - Operating and/or ambient conditions not within the scope of the specification
   - External influences / damage

3. Hazardous shock voltages caused by, for example:
   - Component malfunctions
   - Influence of electrostatic charging
   - Induction of voltages in moving motors
   - Operating and/or ambient conditions not within the scope 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

ESD guidelines

B

B.1 ESD definition

What does ESD mean?

All electronic modules are equipped with highly integrated modules or components. Because of the technology used, these electronic components are very sensitive to overvoltages and thus to discharge of static electricity.

The acronym **ESD** has become the established designation for such **E**lectrostatic **S**ensitive **D**evices. The **ESD** designation is used internationally to refer to **e**lectrostatic **s**ensitive **d**evices.

Electrostatic sensitive devices are identified by the following symbol:

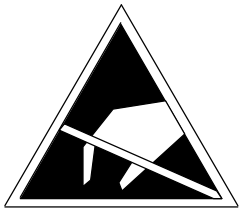


Figure B-1 Symbol for identification of electrostatic sensitive devices

⚠ CAUTION

Electrostatic sensitive devices can be irreparably damaged by voltages that are far lower than anything a person can perceive. These voltages occur if you touch a component or the electrical connection of a module without having previously discharged any static from your body. Any damage that occurs to a module as a result of overvoltage is generally not recognized immediately and only comes to light after the equipment has been operating for some time.

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.

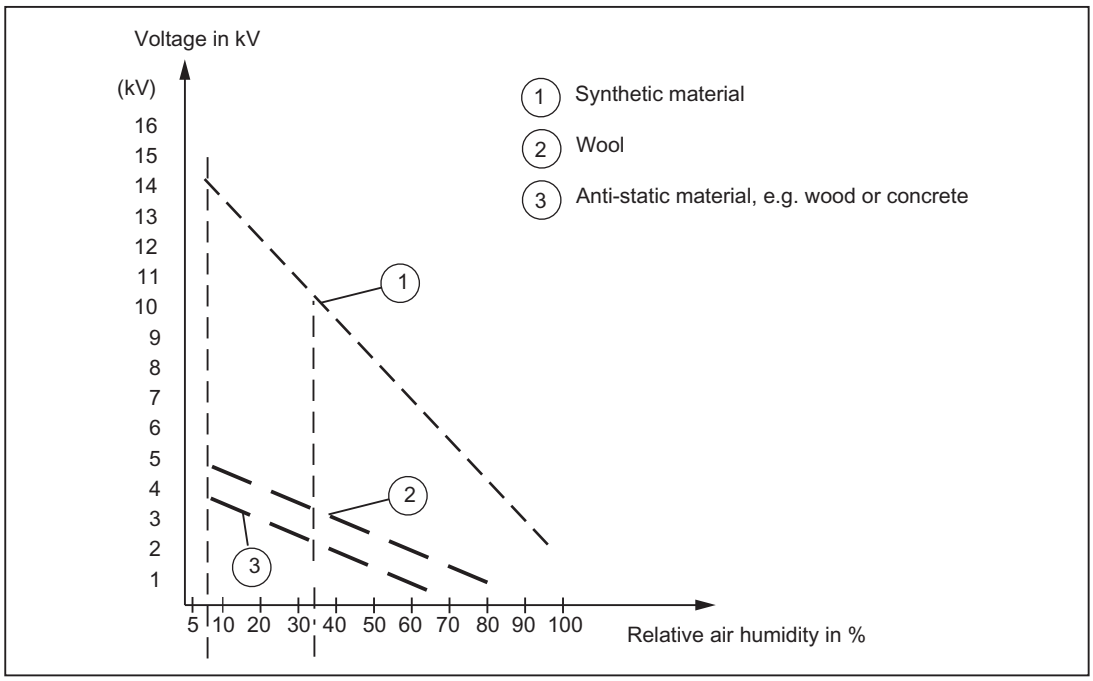


Figure B-2 Electrostatic voltage that can accumulate on operating personnel

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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