

SINAMICS S120

Control Units

Control Units

Overview

New system architecture with a central Control Unit

Electronically coordinated individual drives work together to perform your drive tasks. Higher-level controllers operate the drives to achieve the required coordinated movement. This requires cyclic data exchange between the controller and the drives. This exchange usually took place via a field bus, which required a great deal of time and effort for installation and configuration. SINAMICS S120 takes a different approach: A central Control Unit controls the drives for all connected axes and also establishes the technological links between the drives and/or axes. Since all the required data is stored in the central Control Unit, it does not need to be transferred. Inter-axis connections can be established within a Control Unit and easily configured in the STARTER commissioning tool using a mouse.

- Simple technological tasks can be carried out automatically by the SINAMICS S120 Control Unit
- The **CU310 DP** or **CU310 PN** Control Unit are available for single drives
- The **CU320** Control Unit is designed for multi-axis applications
- Sophisticated motion control tasks can be implemented with the support of the more powerful Control Units **D425**, **D435** and **D445** of **SIMOTION D** (graded according to performance)

Each of these Control Units is based on an object-oriented SINAMICS S120 standard firmware which contains all the most popular control modes and can be scaled to meet even the most advanced performance requirements.

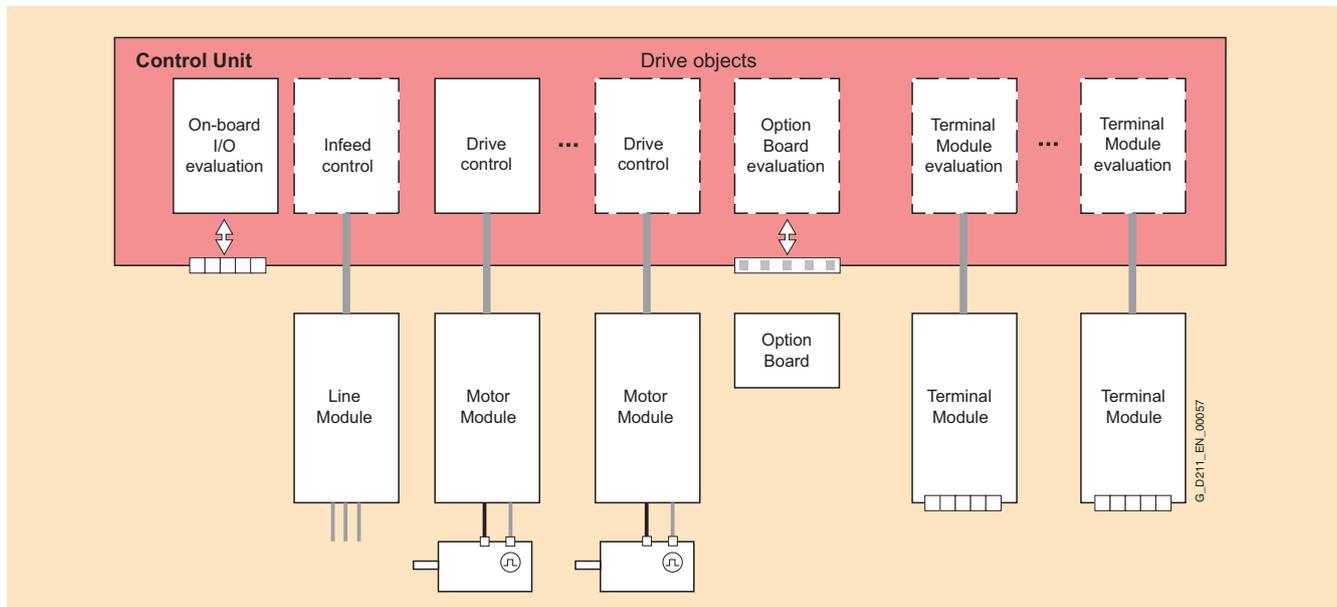
The drive controls are supplied as ready-to-configure drive objects:

- for the "Infeed Control",
- for the broad scope of rugged asynchronous (induction) motor applications "Vector Control" and V/f control
- for permanent-field synchronous motors with demanding dynamic requirements "Servo Control".

The most commonly used V/f control modes are stored in the "Vector Control" drive object and are ideal for implementing even simple applications such as, for example, group drives with SIEMOSYN motors.

Drive objects

A drive object is a self-contained software function with its own parameters and, if necessary, its own fault messages and alarms.



Overview (continued)

Comprehensive package of open-loop and closed-loop control functions

A wide variety of standard functions such as setpoint input, data set changeover, controller optimization, kinetic buffering, etc. ensure a high degree of operational reliability and excellent flexibility of application.

Overview of key open-loop and closed-loop control functions:

	Closed-loop control types S120	Open-loop control types S120	Main functions S120 for booksize/chassis	Comment, note
Infeed Control	<ul style="list-style-type: none"> • Booksize <ul style="list-style-type: none"> - Current control with/without mains sensor - V_{DC} control with/without mains sensor • Chassis <ul style="list-style-type: none"> - Current control with mains sensor - V_{DC} control with mains sensor 	<ul style="list-style-type: none"> • Booksize <ul style="list-style-type: none"> - Smart Line Modules can be selected • Chassis <ul style="list-style-type: none"> - Basic Line Modules can be selected 	<ul style="list-style-type: none"> • Mains identification • Controller optimization • Harmonics filter • Automatic restart 	The mains sensor is the VSM 10 Voltage Sensing Module; "current" is the line current; 3-phase with line frequency
Vector Control	<ul style="list-style-type: none"> • Asynchronous motor <ul style="list-style-type: none"> - Torque control with/without encoder - Speed control with/without encoder • Torque motor <ul style="list-style-type: none"> - Torque control with encoder - Speed control with/without encoder • For asynchronous and torque motors <ul style="list-style-type: none"> - Position control with encoder 	<ul style="list-style-type: none"> - Linear/parabolic characteristic - Fixed-frequency characteristic (textiles) - Independent voltage setpoint input 	<ul style="list-style-type: none"> • Data set changeover • Extended setpoint input • Motor identification • Current/speed controller optimization • Technology controller • Basic positioner • Automatic restart • Flying restart with/without encoder • Kinetic buffering • Synchronization • Droop 	<p>Mixed operation with V/f control modes is possible; it is for this reason that the V/f control modes are stored only once in the "Vector Control" drive object</p> <p>Position control can be selected as a function module from both Servo and Vector mode.</p> <p>Synchronous motors (1FK and 1FT) and linear motors can be operated only in Servo mode.</p>
Servo control	<ul style="list-style-type: none"> • Asynchronous motor <ul style="list-style-type: none"> - Torque control with encoder - Speed control with/without encoder • Synchronous motor, linear motor and torque motor <ul style="list-style-type: none"> - Torque control with encoder - Speed control with encoder • For all motor types <ul style="list-style-type: none"> - Position control with encoder 	<ul style="list-style-type: none"> - Linear/parabolic characteristic - Fixed-frequency characteristic (textiles) - Independent voltage setpoint input 	<ul style="list-style-type: none"> • Data set changeover • Setpoint input • Motor identification • Damping application • Technology controller • Basic positioner 	<p>Mixed operation with V/f control modes is possible; it is for this reason that the V/f control modes are stored only once in the "Vector Control" drive object</p> <p>Position control can be selected as a function module from both Servo and Vector mode.</p>

Technology packages

SIMOTION D Control Units support the coordinated motion control of multiple drives. In addition to drive objects, these Control Units also offer technology objects such as, for example, "cam controller", "synchronism", "cam disk" and "temperature control", and these objects are grouped to form technology packages. Users can create their own objects and set up between all configured objects.

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Control Units

Control Units

Overview (continued)

BICO technology

Every drive object contains a large number of input and output variables which can be freely and independently interconnected using Binector Connector Technology (BICO). A binector is a logic signal which can assume the value 0 or 1. A connector is a numerical value, e.g. the actual speed or current setpoint.

Function modules

The "basic positioner" is used for the absolute/relative positioning of linear and rotary axes (modulo) with motor encoders (indirect measuring system) or machine encoders (direct measuring system). The "technology controller" is designed as a PID controller. It is suitable for implementing controls for regulating variables such as fill level, temperature, tension, pressure, flow rate and dancer position.

Integrated safety functions

The Control Units support safety functions such as "Safe standstill" (STO = Safe Torque Off)

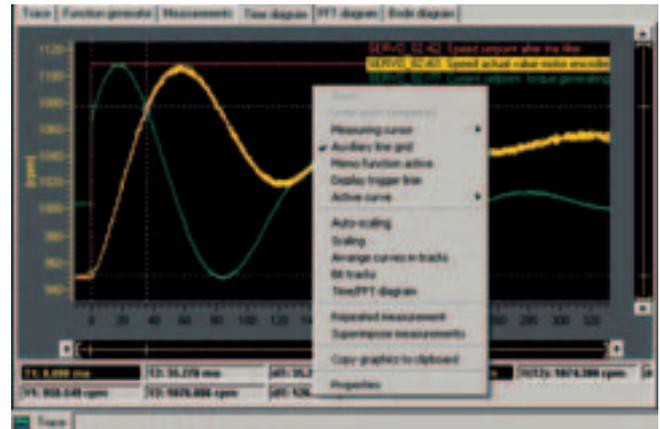
CompactFlash card

The functions of the SINAMICS S120 drives are stored on a CompactFlash card. This card contains the firmware and parameter settings for all drives in the form of a project. The CompactFlash card can also hold additional projects, which means that the correct project can be accessed immediately when series machines of different types are commissioned. When the Control Unit has booted, the data on the CompactFlash card are read and loaded to the RAM.

The firmware is organized in objects. Drive objects are used to implement open-loop and closed-loop control functions for Line Modules, Motor Modules, Power Modules and other system components connected by DRIVE-CLiQ.

Diagnostics optimally supported by trace function

The time characteristics of input and output variables associated with drive objects can be measured by the integrated trace function and displayed using the STARTER commissioning tool. The trace can record up to 4 signals simultaneously. A recording can be triggered as a function of freely selectable boundary conditions, e.g. the value of an input or output variable.



Overview



The CU310 DP Control Unit provides the communications and openloop/closed-loop control functions for a Power Module. The CU310 DP combined with a Power Module and CompactFlash card creates a powerful single axis AC drive with a PROFIBUS interface to a higher-level control.

Design

CU310 DP Control Units feature the following interfaces as standard:

- 1 DRIVE-CLiQ socket for communication with other DRIVE-CLiQ devices, e.g. Sensor or Terminal Modules
- 1 PM-IF interface for communication with Power Modules in blocksize format
- 1 interface to the BOP20 Basic Operator Panel
- 1 PROFIBUS interface with PROFIdrive V4 profile
- 1 HTL/TTL encoder evaluation circuit
- 4 parameterizable digital inputs (floating)
- 4 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 slot for the CompactFlash Card on which firmware and parameters are stored
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The status of the CU310 DP Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310 DP Control Unit for diagnostic purposes.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

Selection and ordering data

Description	Order No.
CU310 DP Control Unit (without CompactFlash card)	6SL3040-0LA00-0AA0

Accessories

Description	Order No.
PROFIBUS connector <u>without</u> PG/PC connection	6ES7972-0BA41-0XA0
PROFIBUS connector <u>with</u> PG/PC connection	6ES7972-0BB41-0XA0
STARTER commissioning tool	6SL3072-0AA00-0AG0

Integration

The CU310 DP Control Unit drives Power Modules in blocksize format via the PM-IF interface. In this case, other DRIVE-CLiQ components such as Sensor or Terminal Modules, can be connected to the DRIVE-CLiQ socket on the CU310 DP Control Unit.

Power Modules in chassis format are driven by the CU310 DP Control Unit via the DRIVE-CLiQ interface. With this option, Sensor and Terminal Modules must be connected to the free DRIVE-CLiQ sockets on the Power Module.

Parameter settings can be changed with the BOP20 Basic Operator Panel. The BOP20 panel can also be snapped onto the CU310 DP Control Unit during operation to perform troubleshooting procedures.

The CU310 DP Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

A CU310 DP Control Unit communicates with the higher-level control system using PROFIBUS and the PROFIdrive V4 profile.

The integrated safety functions such as e.g. "Safe Torque Off" (= "Safe standstill") must be selected in two channels. Two digital inputs on the CU310 DP Control Unit are required for this purpose.

An external 24 V supply can be connected to the CU310 to power the control unit when the incoming supply to the Power Module is not energized.

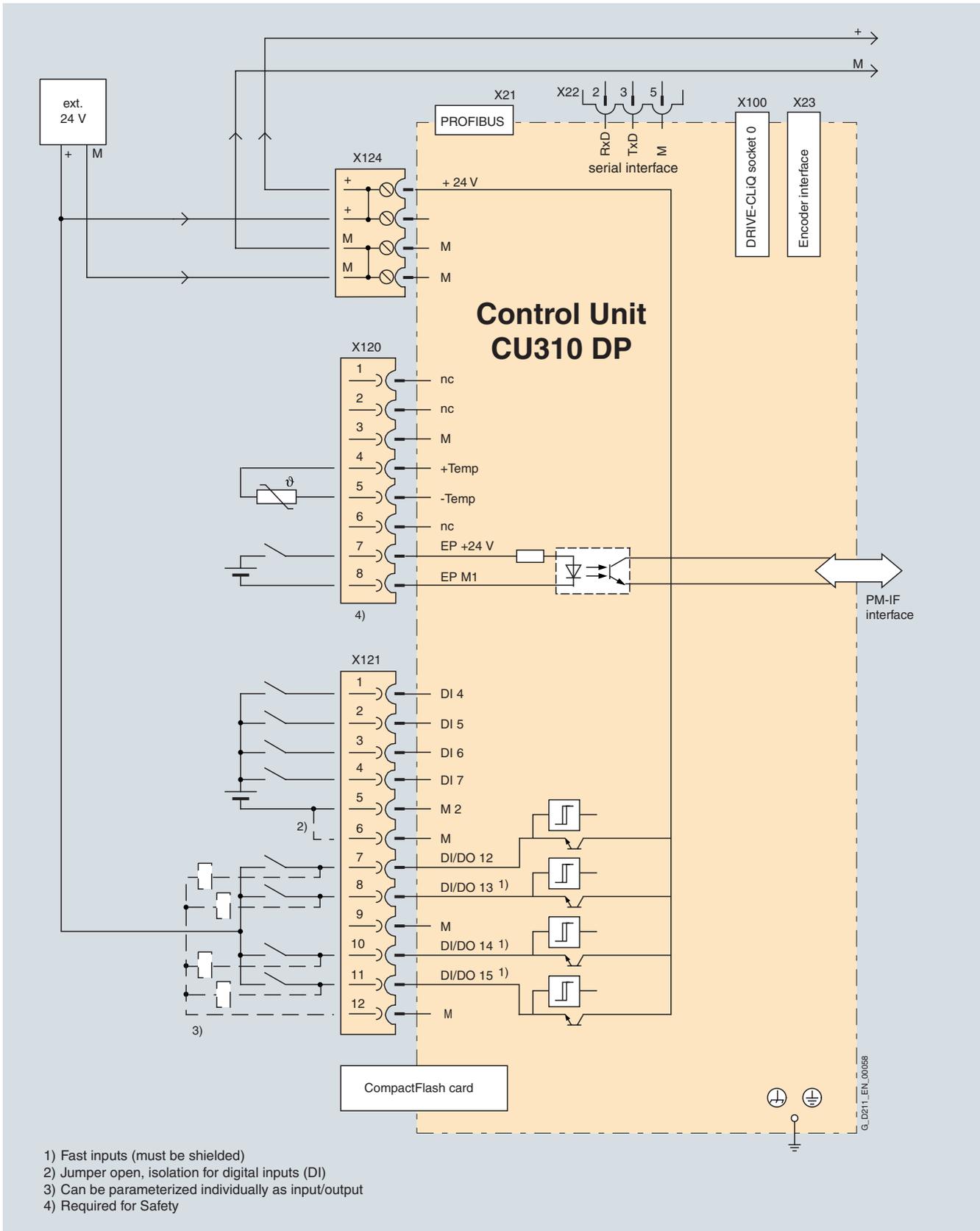
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Control Units

CU310 DP Control Unit

Integration (continued)

2



Connection example of CU310 DP Control Unit

Technical data

CU310 DP Control Unit

Max. current requirement (at 24 V DC) without taking account of digital outputs and DRIVE-CLiQ supply	0.85 A
Max. connectable cross section	2.5 mm ²
Max. fuse protection	20 A
Digital inputs	4 x floating digital inputs 4 bidirectional non-floating digital inputs/digital outputs
• Voltage	– 3 V to 30 V
• Low level (an open digital input is interpreted as "low")	– 3 V to + 5 V
• High level	15 V to + 30 V
• Current consumption (typ. at 24 V DC)	10 mA
• Signal propagation delays for digital inputs ¹⁾	L → H: approx. 50 μs H → L: approx. 100 μs
• Signal propagation delays for high-speed digital inputs ¹⁾ (high-speed digital inputs can be used for position detection)	L → H: approx. 5 μs H → L: approx. 50 μs
• Max. connectable cross section	0.5 mm ²
Digital outputs (continued-short-circuit-proof)	4 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Max. load current per digital output ²⁾	500 mA
• Delay time of the digital outputs	approx. ≈ 150 μs
• Max. connectable cross section	0.5 mm ²
Encoder evaluation	TTL or HTL incremental encoders (with adjustable parameters)
• Cut-off frequency	500 kHz
• Max. cable length for TTL incremental encoder	100 m (328 ft) (only bipolar signals permitted)
• Max. cable length for HTL incremental encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals
Power loss	< 20 W
PE connection	On housing with M5 screw
Width	73 mm (2.9 in)
Height	183.2 mm (7.2 in)
Depth	89.6 mm (3.5 in)
Weight, approx.	0.95 kg (2 lb)
Approvals	cULus (File No.: E164110)

¹⁾ The specified signal propagation delays refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

²⁾ In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

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Control Units

CU310 PN Control Unit

Overview



The CU310 PN Control Unit is designed for the communication and open-loop/closed-loop control functions of a Power Module. The CU310 PN combined with a Power Module and CompactFlash card creates a powerful single axis AC drive. The communication link to the higher-level control is provided by PROFINET IO.

Design

CU310 PN Control Unit features the following interfaces as standard:

- 1 DRIVE-CLiQ socket for communication with other DRIVE-CLiQ devices, e.g. Sensor or Terminal Modules
- 1 PM-IF interface for communication with Power Modules in blocksize format
- 1 interface to the BOP20 Basic Operator Panel
- 2 x PROFINET interfaces (RJ45 sockets) with PROFIdrive V4 profile
- 1 HTL/TTL encoder evaluation circuit
- 4 parameterizable digital inputs (floating)
- 4 parameterizable bidirectional digital inputs/digital outputs (non-floating)
- 1 serial RS232 interface
- 1 slot for the CompactFlash card on which firmware and parameters are stored
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection

The status of the CU310 PN Control Unit is indicated via multi-color LEDs.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU310 PN Control Unit for diagnostic purposes.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for tools.

Selection and ordering data

Description	Order No.
CU310 PN Control Unit (without CompactFlash card)	6SL3040-0LA01-0AA0

Accessories

Description	Order No.
STARTER commissioning tool	6SL3072-0AA00-0AG0
Industrial Ethernet FC RJ45 plug 180 (1x)	6GK1901-1BB10-2AA0
Industrial Ethernet FC RJ45 plug 180 (10x)	6GK1901-1BB10-2AB0
Industrial Ethernet FC stripping tool	6GK1901-1GA00
Industrial Ethernet FC standard cable GP 2x2	6XV1840-2AH10
Industrial Ethernet FC flexible cable GP 2x2	6XV1870-2B
Industrial Ethernet FC trailing cable GP 2x2	6XV1870-2D
Industrial Ethernet FC trailing cable 2x2	6XV1840-3AH10
Industrial Ethernet FC marine cable 2x2	6XV1840-4AH10

Further details about plugs and cables are available in the IK PI catalog.

Integration

The CU310 PN Control Unit drives Power Modules in blocksize format via the PM-IF interface. In this case, other DRIVE-CLiQ components such as Sensor or Terminal Modules can be connected to the DRIVE-CLiQ socket on the CU310 PN Control Unit.

Power Modules in chassis format are driven by the CU310 DP Control Unit via the DRIVE-CLiQ interface. With this option, Sensor and Terminal Modules must be connected to the free DRIVE-CLiQ sockets on the Power Module.

Parameter settings can be changed with the BOP20 Basic Operator Panel. The BOP20 panel can also be snapped onto the CU310 PN Control Unit during operation to perform troubleshooting procedures.

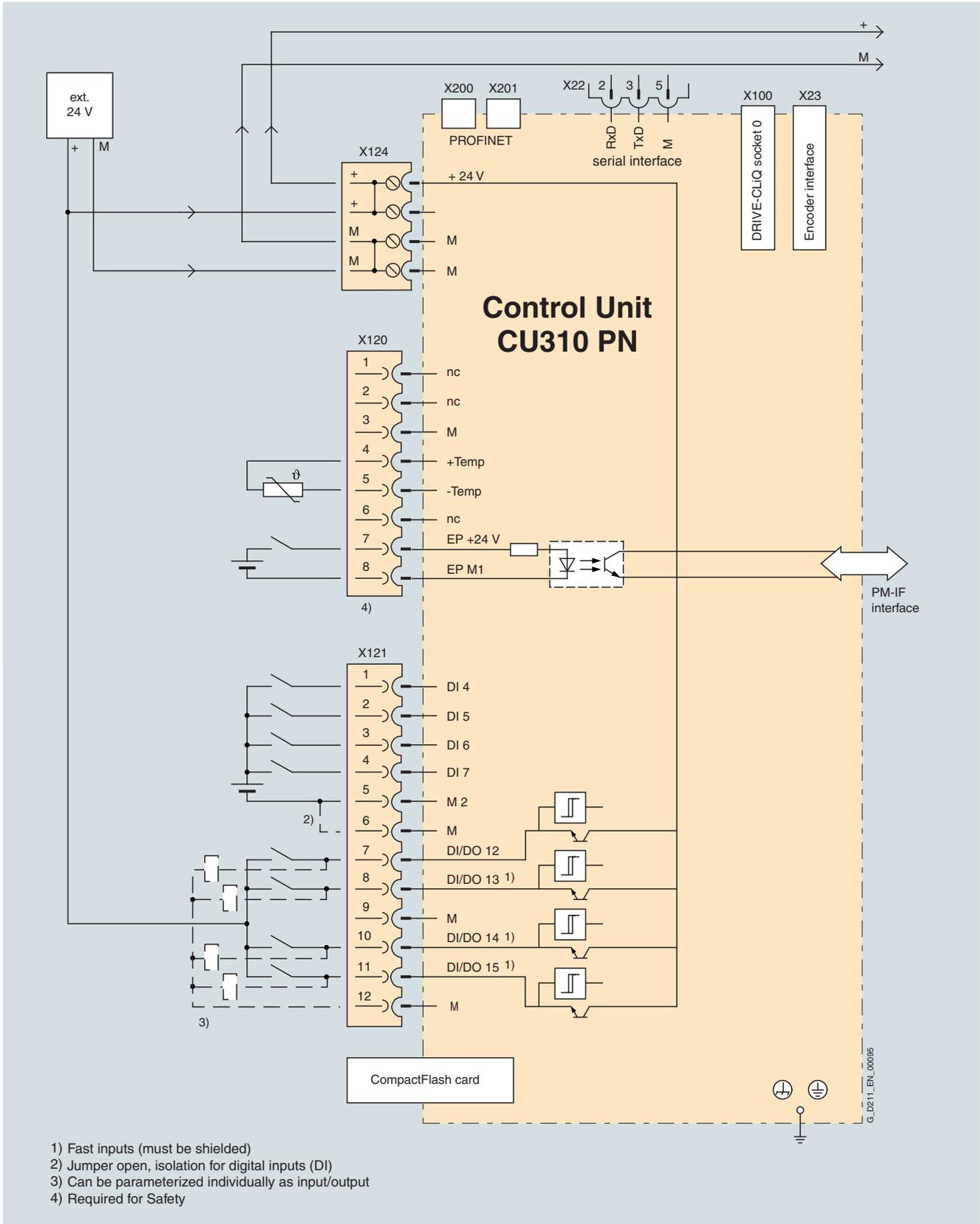
The CU310 PN Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

A CU310 PN Control Unit communicates with the higher-level control system using PROFINET IO and the PROFIdrive V4 profile.

The integrated safety functions such as e.g. "Safe Torque Off" (= "Safe standstill") must be selected in two channels. Two digital inputs on the CU310 PN Control Unit are required for this purpose.

An external 24 V supply can be connected to the CU310 to power the control unit when the incoming supply to the Power Module is not energized.

Integration (continued)



Connection example of CU310 PN Control Unit

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Control Units

CU310 PN Control Unit

Technical data

CU310 PN Control Unit

Max. current requirement (at 24 V DC) without taking account of digital outputs and DRIVE-CLiQ supply	0.9 A
Max. connectable cross section	2.5 mm ²
Max. fuse protection	20 A
Digital inputs	4 x floating digital inputs 4 bidirectional non-floating digital inputs/digital outputs
• Voltage	– 3 V to + 30 V
• Low level (an open digital input is interpreted as "low")	– 3 V to + 5 V
• High level	15 V to 30 V
• Current consumption (typ. at 24 V DC)	10 mA
• Signal propagation delays for digital inputs ¹⁾	L → H: approx. 50 μs H → L: approx. 100 μs
• Signal propagation delays for high-speed digital inputs ¹⁾ (high-speed digital inputs can be used for position detection)	L → H: approx. 5 μs H → L: approx. 50 μs
• Max. connectable cross section	0.5 mm ²
Digital outputs (continued-short-circuit-proof)	4 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Max. load current per digital output ²⁾	500 mA
• Max. connectable cross section	0.5 mm ²
Encoder evaluation	TTL or HTL incremental encoders (with adjustable parameters)
• Cut-off frequency	500 kHz
• Max. cable length for TTL incremental encoder	100 m (328 ft) (only bipolar signals permitted)
• Max. cable length for HTL incremental encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals
Power loss	< 20 W
PE connection	On housing with M5 screw
Width	73 mm (2.9 in)
Height	183.2 mm (7.2 in)
Depth	89.6 mm (3.5 in)
Weight, approx.	0.95 kg (2 lb)
Approvals	cULus (File No.: E164110)

¹⁾ The specified signal propagation delays refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

²⁾ In order to use the digital outputs, an external 24 V power supply must be connected to terminal X124.

Overview



The communication, open-loop and closed-loop control functions for one or more Motor Modules and the Line Module are executed in a CU320 Control Unit. The CU320 Control Unit is designed for multi-axis operation.

Design



CU320 Control Unit, without guard cover

CU320 Control Unit features the following interfaces as standard:

- 4 x DRIVE-CLiQ sockets for communication with other DRIVE-CLiQ devices, e.g., Motor Modules, Active Line Modules, Sensor Modules, Terminal Modules
- 1 PROFIBUS interface with PROFIdrive V4 profile
- 8 parameterizable digital inputs (floating)
- 8 parameterizable bidirectional digital inputs/digital outputs (non-floating), of which 6 are high-speed digital inputs
- 1 serial RS232 interface
- 1 interface for the BOP20 Basic Operator Panel
- 1 slot for the CompactFlash Card on which firmware and parameters are stored
- 1 slot for mounting an option module (e.g. TB30 Terminal Board)
- 3 test sockets and one reference ground for commissioning support
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 PE (protective earth) connection
- 1 ground connection

A shield connection for the signal cable shield on the option module is located on the CU320 Control Unit.

The available option slot is used to expand the interfaces, for example, to include additional terminals or for communication purposes.

The status of the CU320 Control Unit is indicated via multi-color LEDs.

As the firmware and parameter settings are stored on a plug-in CompactFlash card, the Control Unit can be changed without the need for software tools.

The CU320 Control Unit can be mounted on the side of the Line Module in booksize format via brackets integrated in a Line Module. The CU320 Control Unit can also be fixed to the wall of the control cabinet using the integrated fixing lugs. As the CU320 Control Unit is not as deep as the Line Modules, suitable spacers are available to increase the depth of the CU320 Control Unit to 270 mm (10.63 in).

Integration

DRIVE-CLiQ components, for example, Motor Modules and Active Line Modules, can be connected to a CU320 Control Unit. The number of modules depends on the performance required, including duty type and additional functions.

The BOP20 panel can also be snapped onto the CU320 Control Unit during operation to perform troubleshooting procedures.

The CU320 Control Unit and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

Communication between a CU320 Control Unit and the connected components takes place via DRIVE-CLiQ.

If an application requires more than one Control Unit, the number can be increased accordingly. The Control Units are then interconnected on a higher-level controller via PROFIBUS with the PROFIdrive V4 profile.

The integrated safety functions such as e.g. "Safe brake control" ("Safe standstill") must be selected in two channels. Two digital inputs are required for this purpose.

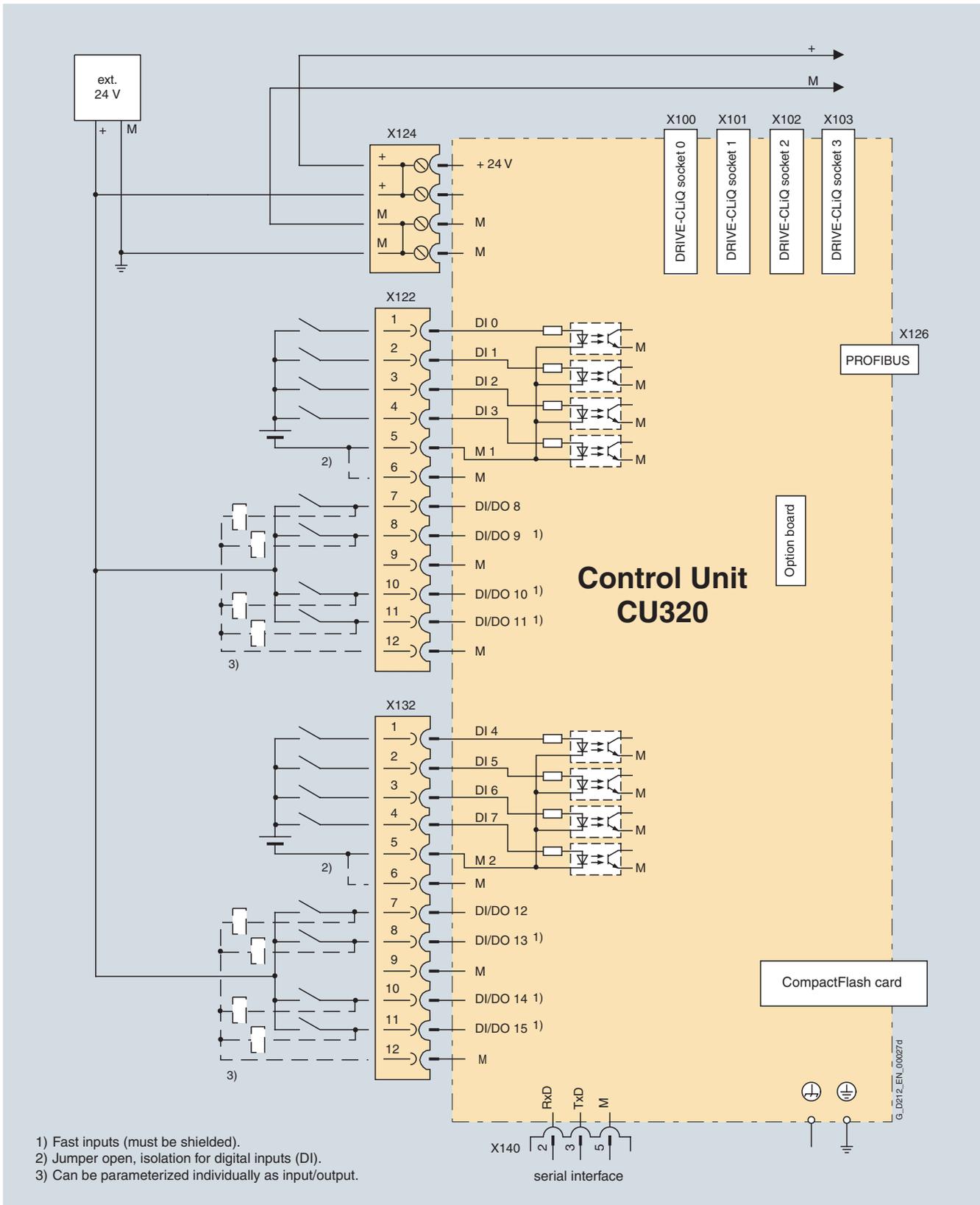
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Control Units

CU320 Control Unit

Integration (continued)

2



Connection example of CU320 control unit

Technical data

CU320 Control Unit

Max. current requirements (at 24 V DC) without taking account of digital outputs, option slot expansion and DRIVE-CLiQ supply	0.8 A
Max. connectable cross section	2.5 mm ²
Max. fuse protection	20 A
Digital inputs	8 x floating digital inputs 8 bidirectional non-floating digital inputs/digital outputs
• Voltage	– 3 V to 30 V
• Low level (an open digital input is interpreted as "low")	– 3 V to 5 V
• High level	15 V to 30 V
• Current consumption (typ. at 24 V DC)	10 mA
• Signal propagation delays for digital inputs ¹⁾	L → H: approx. 50 μs H → L: approx. 100 μs
• Signal propagation delays for high-speed digital inputs ¹⁾ (high-speed digital inputs can be used for position detection)	L → H: approx. 5 μs H → L: approx. 50 μs
• Max. connectable cross section	0.5 mm ²
Digital outputs (continued-short-circuit-proof)	8 bidirectional non-floating digital inputs/digital outputs
• Voltage	24 V DC
• Max. load current per digital output	500 mA
• Max. connectable cross section	0.5 mm ²
Power loss	20 W
PE connection	On housing with M5 screw
Ground connection	On housing with M5 screw
Width	50 mm (1.97 in)
Height	270 mm (10.93 in)
Depth	226 mm (8.9 in)
Weight, approx.	1.5 kg (3 lb)
Approvals	cULus (File No.: E164110)

Selection and ordering data

Description	Order No.
CU320 Control Unit (without CompactFlash card)	6SL3040-0MA00-0AA1

Accessories

Description	Order No.
PROFIBUS connector <u>without</u> PG/PC connection	6ES7972-0BA41-0XA0
PROFIBUS connector <u>with</u> PG/PC connection	6ES7972-0BB41-0XA0
Spacers (2 x), for increasing the depth of the CU320 Control Unit to 270 mm (10.63 in) (if the brackets on the side are not to be used, the depth still has to be 270 mm (10.63 in)).	6SL3064-1BB00-0AA0
STARTER commissioning tool	6SL3072-0AA00-0AG0

¹⁾ The specified signal propagation delays refer to the hardware. The actual reaction time depends on the time slot in which the digital input or output is processed.

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CompactFlash Card for CU310 and CU320

Overview



The CompactFlash card contains the firmware and parameter settings. It is inserted into the appropriate slot on the CU310 or CU320 Control Unit.

Design

A CU320 Control Unit can perform the communication, open-loop and closed-loop control functions for several Motor Modules. The computing capacity requirement increases in proportion to the number of connected Motor Modules and system components and in relation to the dynamic response required. The full computing capacity of the CU320 Control Unit is only available on systems with performance expansion 1.

The computing capacity requirement and utilization of the CU320 Control Unit can be calculated with the SIZER configuration tool. The firmware options are supplied in license form, which are written to the CompactFlash card in the factory as license codes.

The firmware options can also be enabled on-site, for example, if the performance expansions required are not known at the time of placing the order. You will need the serial number of the CompactFlash card and the order number of the firmware option to be enabled. With this information, you can purchase the associated license code from a license database and enable the firmware option. The license code is only valid for the CompactFlash card declared and cannot be transferred to other CompactFlash cards.

The CU310 Control Unit has been designed to control only single axes. Performance expansion 1 is not required in this case.

Selection and ordering data

Description	Order No.
CompactFlash card for CU310 DP, CU310 PN, CU320 Control Units with current firmware version including certificate of license	
• <u>without</u> performance expansion	6SL3054-0AA00-1AA0
• <u>with</u> performance expansion 1 firmware option	6SL3054-0AA01-1AA0
Firmware license Performance expansion 1 firmware option for CompactFlash card including certificate of license	6SL3074-0AA01-0AA0

Further information

Firmware version

The firmware version is encoded in the order (part) number of the CompactFlash card supplied. For the above order number the most recent firmware version is always installed on shipped CompactFlash cards, i.e. the order number on the shipped CompactFlash cards may not necessarily match the order number of the ordered CompactFlash cards.

The firmware version is encoded as follows in the order number:

Order No.	6SL3054- 0 ■ ■ 0 ■ -1AA0	
Firmware version		↑
1	B	
2	C	
3	D	
4	E	
Version		↑
.1	B	
.2	C	
.3	D	
.4	E	
.5	F	
.6	G	
without performance expansion		↑
	0	
with performance expansion 1		↑
	1	

Example: A CompactFlash card with the order number 6SL3054-0AA00-1AA0 is ordered (as specified in the catalog). The CompactFlash card with the most recent firmware version is confirmed and shipped, e.g. order number 6SL3054-0CE00-1AA0 for firmware version 2.4. In this way, it is possible to specify a specific firmware version or the most recent firmware version in a replacement part order.

Overview

SIMOTION D is the compact, drives-based version of SIMOTION based on the SINAMICS drives family. With SIMOTION D, the logic, technology functions, motion control and drive control run on a single, compact hardware platform.

SIMOTION D is available in different performance variants. This ensures the highest degree of scalability and flexibility. The IEC 61131-3-compliant PLC integrated in SIMOTION D means that the system is not just capable of controlling sequences of motions, but the entire machine as well.

HMI devices can be connected via the onboard PROFIBUS or Ethernet interface for operator control and monitoring. Functions such as remote maintenance, diagnostics and teleservice can also be used via these interfaces.

Function

The SIMOTION D controllers basic functionality is supplied with the CompactFlash card and is loaded when the system is powered on. The basic scope of functions includes the following software components:

- SINAMICS S120 drive control
- SIMOTION runtime system
 - Programmable with several languages conforming to IEC 61131
 - Various runtime levels (cyclic, sequential, event-driven)
 - PLC and arithmetic functionality
 - Communications and management functions
 - Motion control functions (Motion Control Basic)
- Test and diagnostic interfaces

Technology packages (TP)

A special feature of SIMOTION is that the basic functionality can be expanded by loading technology packages, such as:

- Motion control with technology packages:
 - Positioning – POS
 - Synchronous operation/electronic gear – GEAR
 - Cam disk – CAM
- Temperature controller – TControl

Since the technology functions have modular licenses, you only pay for what you really need.

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Control Units

SIMOTION D Control Units

Overview



SIMOTION D Control Units are available in a range of performance variants. This ensures the highest degree of scalability and flexibility. The individual variants SIMOTION D425, SIMOTION D435 and SIMOTION D445 differ in terms of performance characteristics (Motion Control + PLC) and the following features:

	SIMOTION D425	SIMOTION D435	SIMOTION D445
Maximum number of axes	16	32	64
DRIVE-CLiQ interfaces	4	4	6
Fan/battery module	Option	Option	required

Additional drives can be operated by means of PROFIBUS or PROFINET with the CU320 Control Units. Additional drives can also be directly connected to the SIMOTION D445 Control Unit by means of DRIVE-CLiQ with the SIMOTION CX32 module.

The drives can operate in Servo, Vector or *V/f* control mode.

Design

Interfaces

- Displays, diagnostics
 - LEDs to display operating states and errors
 - 7-segment status/error display during system power-up
 - 3 test sockets
- Interfaces
 - 4 x DRIVE CLiQ (6 x DRIVE CLiQ for SIMOTION D445)
 - 2 x Industrial Ethernet
 - 2 x PROFIBUS DP
- Integrated I/Os
 - 8 digital inputs
 - 8 digital inputs/outputs
- Various
 - Terminals for 24 V electronics power supply
 - Slot (Option slot) to receive a terminal expansion or additional communications ports

Data storage/data backup

SIMOTION D425, D435 and D445 Control Units have 320 KB of non-volatile SRAM (battery-backed for at least 5 days) for process variable storage. There are two options for storing data for a longer period:

- System commands for storing data on the SIMOTION CompactFlash card (CF)
- Use of a battery module

The CompactFlash card stores the runtime software and the user data and programs.

I/O

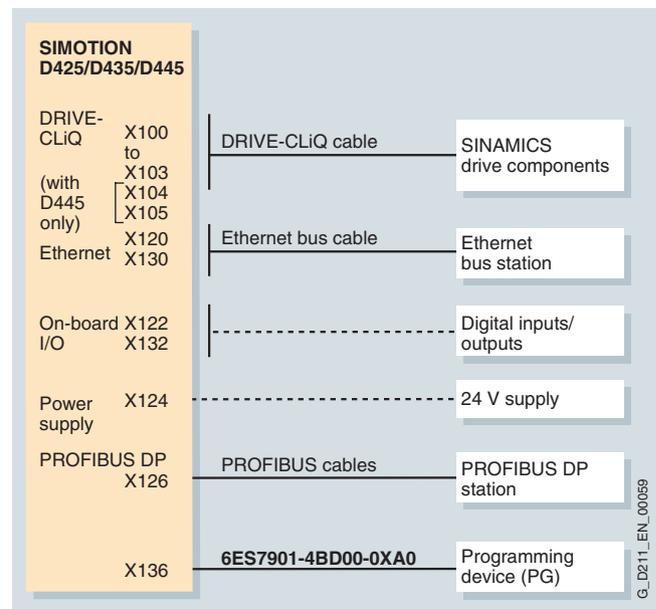
PROFIBUS DP

- Certified PROFIBUS standard slaves (DP/V0, DP/V1, DP/V2)
- SIMATIC ET 200S/M/X/eco/pro distributed I/O systems

DRIVE-CLiQ

- Modules from the SINAMICS range
- DRIVE-CLiQ cables, which are required to connect Line/Motor Modules to SIMOTION D, are supplied with the Line/Motor Modules (standard length).

Integration



Connection overview of SIMOTION D425, D435, D445

The maximum permissible cable lengths should be taken into account when planning the cable layout.

Malfunctions may occur if longer lengths are used.

The permissible length of PROFIBUS DP cables depends on the configuration.

Technical data

		SIMOTION D425 Control Unit Basic Performance 6AU1425-0AA00-0AA0	SIMOTION D435 Control Unit Standard Performance 6AU1435-0AA00-0AA1	SIMOTION D445 Control Unit High Performance 6AU1445-0AA00-0AA0
Power supply				
• Rated value	V DC	24	24	24
• Permissible range	V	20.4 to 28.8	20.4 to 28.8	20.4 to 28.8
Current consumption (at 24 V DC), not taking into account digital out- puts, typ.	A	0.6	0.6	2
Inrush current, typ.	A	6	6	6
Power loss	W	15	15	50
Permissible ambient temperature				
• Storage and transport	°C	- 40 to + 70 (- 40 °F to +158 °F)	- 40 to + 70 (- 40 °F to +158 °F)	- 40 to + 70 (- 40 °F to +158 °F)
• Operation	°C	0 to +55 (32 °F to +131 °F)	0 to +55 (32 °F to +131 °F)	0 to +55 (32 °F to +131 °F)
Permissible relative humidity (without condensation)	%	5 to 95	5 to 95	5 to 95
Air pressure	hPa	700 to 1060	700 to 1060	700 to 1060
Degree of protection to IEC 529		IP20	IP20	IP20
Width	mm	50 (1.97 in)	50 (1.97 in)	50 (1.97 in)
Height	mm	380 (14.96 in)	380 (14.96 in)	380 (14.96 in)
Depth	mm	230 (9.1 in)	230 (9.1 in)	270 (10.6 in)
Weight				
• SIMOTION D	kg	2.5 (5 lb)	2.5 (5 lb)	3.6 (8 lb)
• CompactFlash card	g	7 (0.02 lb)	7 (0.02 lb)	7 (0.02 lb)
Digital inputs		8	8	8
Rated value	V DC	24	24	24
• For signal "1"	V	15 to 30	15 to 30	15 to 30
• For signal "0"	V	- 3 to + 5	- 3 to + 5	- 3 to + 5
Isolation		Yes, in groups of 4	Yes, in groups of 4	Yes, in groups of 4
Current consumption at 24 V, typ. for signal level 1	mA	10	10	10
Signal propagation delays	µs	100	100	100
Digital inputs/outputs (parameterizable)		8	8	8
When used as an input				
• Input voltage				
- Rated value	V DC	24	24	24
- For signal "1"	V	15 to 30	15 to 30	15 to 30
- For signal "0"	V	- 3 to + 5	- 3 to + 5	- 3 to + 5
• Isolation				
No				
• Current consumption at 24 V, typ. for signal level 1	mA	10	10	10
• Signal propagation delays	µs	100 (1 µs as measuring probe)	100 (1 µs as measuring probe)	100 (1 µs as measuring probe)
When used as an output				
• Rated load voltage				
- Rated value	V DC	24	24	24
- Permissible range	V	20.4 to 28.8	20.4 to 28.8	20.4 to 28.8
• Output voltage				
- For signal "1", max.	V	15 to 30	15 to 30	15 to 30
• Isolation				
No				
• Current load, max.	mA	500 per output	500 per output	500 per output
• Residual current, max.	mA	2	2	2
• Switching frequency of the outputs				
- With ohmic load	Hz	100	100	100
- With inductive load	Hz	2	2	2
• Short-circuit protection				
yes				
Real-time clock/SRAM backup				
• Backup time, min.		5 days	5 days	5 days
• Charging time, typ.		Only a few minutes	Only a few minutes	Only a few minutes
Approvals		cULus (File No.: E164110)	cULus (File No.: E164110)	cULus (File No.: E164110)

SINAMICS S120

Control Units

SIMOTION D Control Units

Selection and ordering data

Description	Order No.
Control Unit <ul style="list-style-type: none">• SIMOTION D425• SIMOTION D435• SIMOTION D445	6AU1425-0AA00-0AA0 6AU1435-0AA00-0AA1 6AU1445-0AA00-0AA0
CompactFlash card 512 MB with SINAMICS drive software version V2.4 and SIMOTION kernel	6AU1400-2NA00-0AA0
Spacers (for D425 and D435; included as standard with D445) Kit, 2 spacers	6SL3064-1BB00-0AA0
Battery	6FC5247-0AA18-0AA0
Battery and fan module for non-volatile data storage (optional for D425 and D435; required for D445)	6FC5348-0AA01-0AA0

Further information

Further information

- on PROFIBUS DP and Industrial Ethernet can be found in Catalog IK PI or in the Interactive Catalog under "Automation Systems/SIMATIC NET Communication Systems" and under "Communication".
- on the SIMOTION Motion Control System Catalog PM10 can be found

SIMOTION CX32 Controller Extension

Overview



The CX32 Controller Extension is a SINAMICS S120-type component and permits the drive-side computing power for the SIMOTION D product range to be scaled. Each CX32 can control up to six additional servo axes.

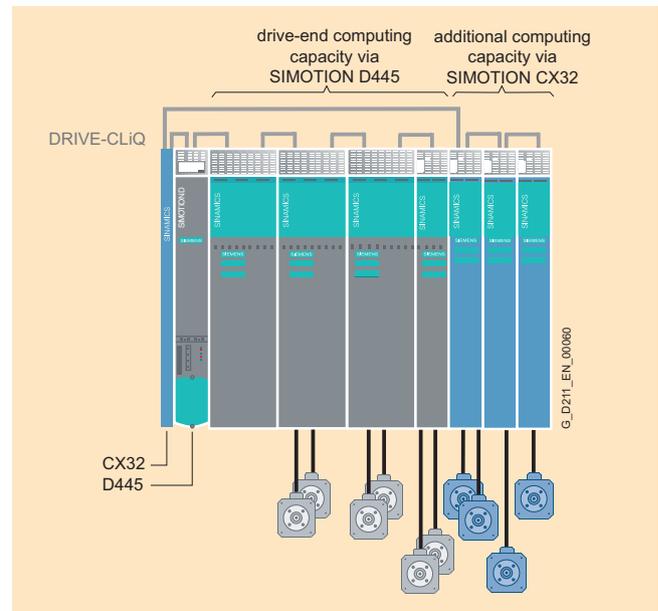
The controller is connected to SIMOTION D with DRIVE-CLiQ which ensures high-performance isochronous drive control without additional modules. The communication interfaces on the SIMOTION D modules remain available for other connections. With a width of 25 mm (0.98 in) the module requires very little space and is therefore perfectly suited for use in compact machines.

The data for the SIMOTION CX32 is stored exclusively on the SIMOTION D module which means no action has to be taken if the module is replaced. The SIMOTION CX32 can be operated on the SIMOTION D445 and D435 Control Units.

Design

Automation solutions with many axes can be implemented with SIMOTION D and the SIMOTION CX32 Controller Extension. SIMOTION D can manage and control the motion of up to 64 axes and already has the drive control for up to 6 servo axes plus the infeed integrated. Alternatively, vector axes or *V/f* axes can be operated. The drive control for up to 6 additional servo axes can be implemented with the SIMOTION CX32 Controller Extension. More than one SIMOTION CX32 Controller Extension can be used in an axis group.

Additional CU320s can be operated via PROFIBUS on a SIMOTION D425, D435 or D445.



Example of an axis group for 10 axes

Technical data

SIMOTION CX32 Controller Extension

Power supply	
• Rated value	24 V DC
• Permissible range	20.4 V to 28.8 V
Current consumption (at 24 V DC) without taking account of digital outputs and DRIVE-CLiQ supply, typ.	0.8 A
Inrush current, typ.	1.6 A
Permissible ambient temperature	
• Storage and transport	- 40 °C to +70 °C (- 40 °F to +158 °F)
• Operation	0 °C to + 55 °C (32 °F to +131 °F)
Permissible relative humidity (without condensation)	5% to 95%
Air pressure	700 to 1060 hPa
Degree of protection to IEC 529	IP20
Width	25 mm (0.98 in)
Height	380 mm (14.96 in)
Depth	230 mm (9.1 in)
Weight	1.5 kg (3 lb)
Approvals	cULus (File No.: E164110)
Digital inputs	4
Digital inputs/outputs	4, programmable

Selection and ordering data

Description	Order No.
SIMOTION CX32 Controller Extension	6SL3040-0NA00-0AA0