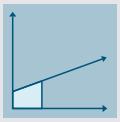
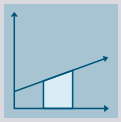
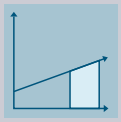
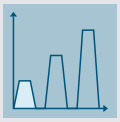
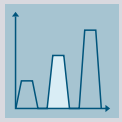
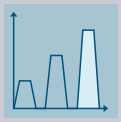
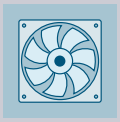
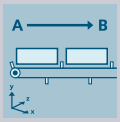
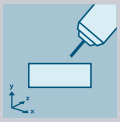
SINAMICS S110 servo drives
0.55 kW to 132 kW (0.75 hp to 150 hp)

Introduction

Application

Use	Requirements for torque accuracy/speed accuracy/position accuracy/coordination of axes/functionality					
	Continuous motion			Non-continuous motion		
	Basic	Medium	High	Basic	Medium	High
						
Pumping, ventilating, compressing	Centrifugal pumps Radial / axial fans Compressors	Centrifugal pumps Radial / axial fans Compressors	Eccentric screw pumps	Hydraulic pumps Metering pumps	Hydraulic pumps Metering pumps	Descaling pumps Hydraulic pumps
	V20 G120C G120X	G120X G130/G150 G180 [1] DCM	G220 S120	G120/G220	**S110**	S120
Moving 	Conveyor belts Roller conveyors Chain conveyors	Conveyor belts Roller conveyors Chain conveyors Lifting/lowering devices Elevators Escalators/moving walkways Indoor cranes Marine drives Cable railways	Elevators Container cranes Mining hoists Excavators for open-cast mining Test bays	Acceleration conveyors Storage and retrieval machines	Acceleration conveyors Storage and retrieval machines Cross cutters Reel changers	Storage and retrieval machines Robotics Pick & place Rotary indexing tables Cross cutters Roll feeds Engagers/ disengagers
	V20 G115D G120C ET 200pro FC-2 [2]	G120/G220 G120D G130/G150 G180 [1]	G220 S120 S150 DCM	V90 S200 G120/G220 G120D	**S110** S210 DCM	S120 S210 DCM
Processing 	Mills Mixers Kneaders Crushers Agitators Centrifuges	Mills Mixers Kneaders Crushers Agitators Centrifuges Extruders Rotary furnaces	Extruders Winders/unwinders Lead/follower drives Calenders Main press drives Printing machines	Tubular bagging machines Single-axis motion control such as • Position profiles • Path profiles	Tubular bagging machines Single-axis motion control such as • Position profiles • Path profiles	Servo presses Rolling mill drives Multi-axis motion control such as • Multi-axis positioning • Cams • Interpolations
	V20 G120C	G120/G220 G130/G150 G180 [1]	G220 S120 S150 DCM	V90 S200 G120/G220	**S110** S210	S120 S210 DCM
Machining 	Main drives for • Turning • Milling • Drilling	Main drives for • Drilling • Sawing	Main drives for • Turning • Milling • Drilling • Gear cutting • Grinding	Axis drives for • Turning • Milling • Drilling	Axis drives for • Drilling • Sawing	Axis drives for • Turning • Milling • Drilling • Lasering • Gear cutting • Grinding • Nibbling and punching
	S110	**S110** S120	S120	**S110**	**S110** S120	S120

Many applications in mechanical engineering and plant construction require machine axes to be positioned quickly and precisely by the simplest possible method. It is often simply a case of moving a machine axis from position X to position Y reliably and with the required level of performance. The SINAMICS S110 drive is ideally suited to this type of application. It is specially designed to position single axes accurately and effectively.

Practical application examples and descriptions are available on the internet at www.siemens.com/sinamics-applications

More information

You may also be interested in these frequency converters:

- Single-axis AC/AC servo converter system with high performance and dynamic response for mid-range Motion Control applications ⇒ SINAMICS S210 (Catalog D 32)
- Higher performance, more functionality ⇒ SINAMICS S120 (Catalog D 21.4)
- I/O extension using additional modules ⇒ SINAMICS S120 (Catalog D 21.4)
- Operation of linear and torque motors ⇒ SINAMICS S120 (Catalog D 21.4)
- Reduced functionality for basic applications with standard asynchronous (induction) motors ⇒ SINAMICS G120

[1] Industry-specific converters.

[2] Information on the SIMATIC ET 200pro FC-2 frequency converter is available in Catalog D 31.2 and at www.siemens.com/et200pro-fc

Overview

SINAMICS S110 – the basic positioning drive for single-axis applications

SINAMICS S110: PM240-2 Power Modules in blocksize format with CU305 Control Unit and BOP20

SINAMICS S110 can be used in numerous applications. Typical examples are:

- Handling equipment
- Feed and withdrawal devices
- Stacking units
- Automatic assembly machines
- Laboratory automation
- Metalworking
- Woodworking, glass and ceramic industries
- Printing machines
- Plastics processing machines

The SINAMICS S110 servo drive is designed for connection to both synchronous servomotors and asynchronous (induction) motors. It supports all the most popular types of encoder.

A variety of fieldbus interfaces is provided for linking the unit to a higher-level control system. Alternatively, it can be controlled via ±10 V and a pulse direction interface.

The so-called basic positioner (EPos) is an integral component of SINAMICS S110. It provides a simple method of solving positioning tasks.

Flexible in application

SINAMICS S110 is a flexible, versatile system.

Synchronous servomotors and asynchronous (induction) motors with outputs up to 132 kW can be used to implement rotary or linear axes. DRIVE-CLiQ motors can be connected simply by means of the integrated DRIVE-CLiQ interface. This means that the electronic rating plate of the motor is easy to read out, reducing the engineering time and cost involved in commissioning the drive.

Furthermore, the SINAMICS S110 features an integrated encoder interface for optional use. It is capable of evaluating HTL/TTL and SSI encoders.

In addition to pure point-to-point positioning, SINAMICS S110 naturally also offers on-the-fly changeover from continuous operation to positioning mode in order, for example, to precisely position objects transported randomly on a conveyor belt. Even simple traversing profiles with different motion cycles and wait times can be executed automatically by SINAMICS S110.

The CU305 Control Unit of the SINAMICS S110 is equipped with an integrated communication interface for linking the converter to an automation system. A PROFINET or PROFIBUS interface can be ordered. Standardized protocols for linking to a higher-level control are supported – the PROFIdrive profile for positioning mode and the PROFIsafe profile for safety-related communication.

The converter is thus perfectly coordinated with the SIMATIC S7 automation system. The devices are linked by means of PROFIBUS and the SIMATIC S7 uses standard function blocks to communicate with the drive. In addition, the STARTER commissioning tool can be seamlessly integrated into STEP 7, the SIMATIC's programming software.

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.

Basic positioner (EPos)

The EPos basic positioner provides powerful and precise positioning functions. Due to its flexibility and adaptability, the EPos basic positioner can be used for a wide range of positioning tasks. The functions are easy to use during both commissioning and operation, and the comprehensive monitoring functions are very powerful. Many applications can be implemented without external position control systems.

Additional information about the basic positioner (EPos) is provided in the section Technology functions.

Free function blocks

The drive can be adapted easily and precisely to a wide range of customized requirements using the "free function blocks" integrated in the CU305 Control Unit. The available range of blocks includes simple logic blocks such as AND/OR elements, as well as more complex devices such as smoothing elements or limit-value monitors. All blocks can be flexibly interconnected using BICO (Binector-Connector) technology, ensuring that signals are processed quickly and close to the drive which helps reduce the load on the higher-level control.

Additional information about Free Function Blocks (FBB) is provided in the section Technology functions.

Diagnostics optimally supported by trace function

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

Overview

Integral safety functions (Safety Integrated)

The Control Unit supports comprehensive safety functions. The integrated safety functions are the

Safety Integrated Basic functions

- STO = Safe Torque Off
- SBC = Safe Brake Control
- SS1 = Safe Stop 1

and the

Safety Integrated Extended functions under license

- SS2 = Safe Stop 2
- SOS = Safe Operating Stop
- SLS = Safely-Limited Speed
- SSM = Safe Speed Monitor
- SDI = Safe Direction

(abbreviations in accordance with IEC 61800-5-2)

If the integrated safety functions are used, licenses, supplementary system components such as Safe Brake Relay, or suitable safety controls will be necessary.

Additional information about the integrated safety functions is provided in the section Safety Integrated.

Memory cards

The memory card can be used as an option for SINAMICS S110. The relevant slot is located underneath the CU305 Control Unit. The complete functionality of SINAMICS S110 can be saved on the memory card: the parameter settings and the firmware. When service is required, e.g. after the converter has been replaced and the data has been downloaded from the memory card, the drive system is immediately ready for use once more.

A SINAMICS Micro Memory Card (MMC) is essential if the optional Safety Integrated Extended functions are used. The necessary license is saved on the MMC.

Varnished modules

The following units are equipped as standard with varnished or partially varnished modules:

- Blocksize format units
- Control Units
- Sensor Modules

The varnish coating protects the sensitive SMD components against corrosive gases, chemically active dust and moisture.

Extended warranty

For SINAMICS S110, Siemens offers an optional extension of warranty up to 5½ years via **Service Protect:**

- Free for the first 6 months after registering the product at: https://myregistration.siemens.com
- Subject to a charge for a further 3 or 5 years

You can find detailed information here:
https://support.industry.siemens.com/cs/ww/en/sc/4842

Concerning standard warranty please ask your partner at Siemens. Your partner can be found in our Personal Contacts Database at:
www.siemens.com/automation-contact

Function

SINAMICS S110 – Summary of the most important functions	
Control method	Servo control
• Asynchronous (induction) motor	Torque control with encoder Speed control with and without encoder Position control with encoder
• Synchronous motor	Torque control with encoder Speed control with encoder Position control with encoder
Control function	V/f characteristic
• Asynchronous (induction) motor	Basic linear
• Synchronous motor	–
Basic positioner (EPos)	Absolute and relative positioning Linear and rotary axes Motor encoder or direct measuring system 4 referencing modes 16 traversing blocks Direct setpoint specification (MDI) Jog mode Backlash compensation Following error monitoring Cam signals Position tracking for extended position range ....
Safety Integrated	Safe Torque OFF (STO) Safe Brake Control (SBC) Safe Stop 1 (SS1) Safe Stop 2 (SS2) Safe Operating Stop (SOS) Safely-Limited Speed (SLS) Safe Speed Monitor (SSM) Safe Direction (SDI)
Protection functions	Undervoltage DC link voltage Overvoltage DC link voltage Overcurrent power unit Overcurrent motor Overload power unit (I^2t) Short circuit Ground fault Overtemperature motor Overtemperature power unit
Functions for simplified commissioning	Electronic rating plate for motors with DRIVE-CLiQ Motor data identification Pole position identification Automatic controller optimization with STARTER
Free function blocks	Logic and arithmetic blocks
Data sets	2 command data sets 2 drive data sets 2 motor data sets 1 encoder data set
Further software functions	BICO interconnection Technology controller (PID) Extended setpoint channel Automatic restart Armature short-circuit brake DC brake Brake control V_{dc_min} control (kinetic buffering) V_{dc_max} control Travel to fixed stop Vertical axis Variable signaling functions Central measuring probe evaluation Pulse direction interface Efficiency optimization for asynchronous (induction) motors Runtime (operating hours counter)

Configuration

The following electronic configuring aids and engineering tools are available for the SINAMICS S110 servo drives:

SINAMICS DriveSim Basic (firmware V4.4 SP3 or higher)

SINAMICS DriveSim Basic provides easy-to-use models for PROFIdrive-enabled SINAMICS converters, so you can create a digital twin of your drive.

More information is provided on the internet at:
www.siemens.com/drive-virtualization

Siemens Product Configurator

The Siemens Product Configurator can be used on the internet without requiring any installation. The Siemens Product Configurator can be found in SiePortal at the following address:
www.siemens.com/spc

SIZER for Siemens Drives engineering tool (integrated into TIA Selection Tool)

The SIZER for Siemens Drives engineering tool makes it easy to configure the SINAMICS drive family. It provides support when selecting the hardware and firmware components necessary to implement a drive task. SIZER for Siemens Drives is designed to support configuring of the entire drive system.

You can find further information on the SIZER for Siemens Drives engineering tool in the section Engineering tools.

The SIZER for Siemens Drives engineering tool is available free on the internet at
www.siemens.com/sizer

STARTER commissioning tool

The STARTER commissioning tool allows menu-prompted commissioning, optimization and diagnostics as well as the TIA functionality. Apart from the SINAMICS drives, STARTER is also suitable for MICROMASTER 4 devices.

You can find further information about the STARTER commissioning tool in the section Engineering tools.

Additional information about the STARTER commissioning tool is available on the internet at
www.siemens.com/starter

Drive ES engineering system

Drive ES is the engineering system that can be used to integrate the communication, configuration and data management functions of Siemens drive technology into the SIMATIC automation world easily, efficiently and cost-effectively. The Drive ES PCS software package is available for SINAMICS.

You can find further information about the Drive ES engineering system in the section Engineering tools.

Additional information about the Drive ES engineering system is available on the internet at
www.siemens.com/drive-es

Technical specifications

The most important directives and standards are listed below. These are used as basis for the SINAMICS S110 servo drives and must be carefully observed to achieve an EMC-compliant configuration that is safe both functionally and in operation.

European standards	
EN 61508-1	Functional safety of electrical/electronic/ programmable electronic safety-related systems Part 1: General requirements
EN 60204-1	Electrical equipment of machines Part 1: General definitions
EN 61800-3	Adjustable speed electrical power drive systems Part 3: EMC product standard including specific test methods
IEC/EN 61800-5-1	Adjustable speed electrical power drive systems Part 5: Safety requirements Main section 1: Electrical and thermal requirements
North American standards	
UL 508C	Power Conversion Equipment
UL 61800-5-1	Adjustable Speed Electrical Power Drive Systems
CSA C22.2 No. 14	Industrial Control Equipment
Certificates of suitability	
cULus	Testing by UL (Underwriters Laboratories, www.ul.com) according to UL and CSA standards

More information

For reliable operation of the drive system, original components of the SINAMICS drive system and the original Siemens accessories as described in this Catalog and the Configuration Manuals, in the functional descriptions or user manuals must be used.

The user must observe the configuring instructions.

Combinations that differ from the configuring instructions (also in conjunction with non-Siemens products) require a special agreement.

If no original components are used, for example, for repairs, approvals such as UL, EN and Safety Integrated can become invalid. This may also result in the operating authorization for the machine in which the non-Siemens components are installed becoming invalid.

All of the certificates of suitability, approvals, certificates, declarations of conformity, test certificates, e.g. CE, UL, Safety Integrated, have been performed with the associated system components as they are described in the Catalogs and Configuration Manuals. The certificates are only valid if the products are used with the described system components, are installed according to the Installation Guidelines and are used for their intended purpose. In other cases, the vendor of these products is responsible for arranging that new certificates are issued.

CU305 Control Unit

Overview

CU305 PN Control Unit

The CU305 Control Unit for the communication and open-loop/closed-loop control functions of a SINAMICS S110 is combined with the PM240-2 Power Module in blocksize format (usable as of firmware V4.4 SP3) to create a powerful single drive.

Design

The CU305 Control Unit features the following connections and interfaces as standard:

- Fieldbus interface
  - CU305 PN: 1 PROFINET interface with 2 ports (RJ45 sockets) with PROFIdrive V4 profile
  - CU305 DP: 1 PROFIBUS interface with PROFIdrive V4 profile
- 1 DRIVE-CLiQ socket, used solely to connect a DRIVE-CLiQ motor or a Sensor Module
- 1 onboard encoder evaluation for evaluating the following encoder signals
  - Incremental encoder TTL/HTL
  - SSI encoder without incremental signals
- 1 PE/protective conductor connection
- 1 connection for the electronics power supply via the 24 V DC power supply connector
- 1 temperature sensor input (KTY84-130 or PTC)
- 3 parameterizable, fail-safe digital inputs (isolated), or alternatively 6 parameterizable digital inputs (isolated)
- 5 parameterizable digital inputs (isolated)
- 1 parameterizable, fail-safe digital output (isolated), or alternatively 1 digital output (isolated)
- 4 parameterizable bidirectional digital inputs/outputs
- 1 analog input ± 10 V, resolution 12 bit + sign
- 1 serial RS232 interface
- 1 slot for the memory card on which the firmware, parameters and licenses can be stored
- 1 PM-IF interface for communication with the PM240-2 Power Modules in blocksize format (usable as of firmware V4.4 SP3)
- 2 test sockets and one reference ground for commissioning support
- 1 interface to the BOP20 Basic Operator Panel

Integration

The CU305 Control Unit controls the PM240-2 Power Module in blocksize format (usable as of firmware V4.4 SP3) via the PM-IF interface.

A BOP20 Basic Operator Panel can also be snapped directly onto the CU305 for diagnostic purposes.

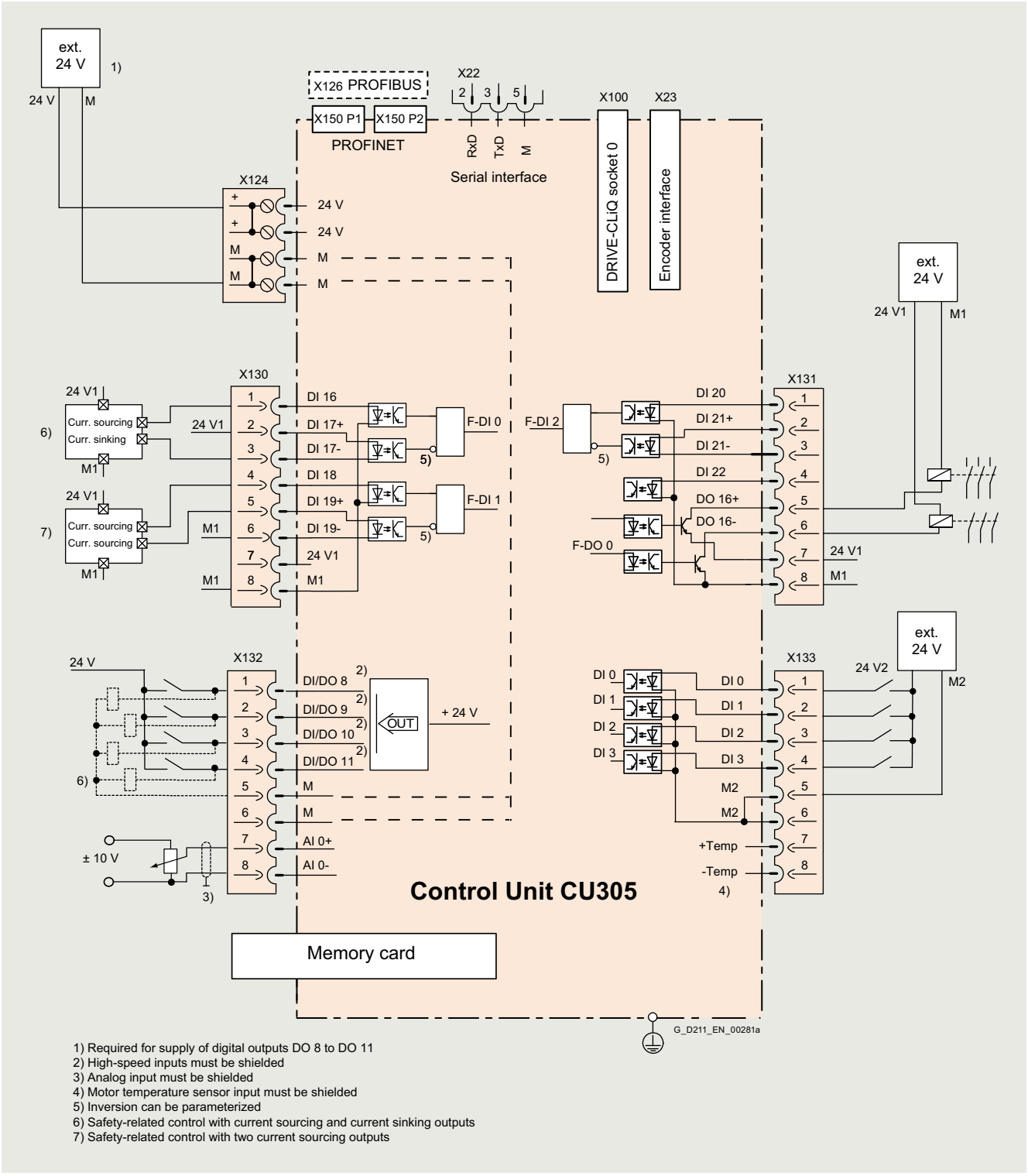
DRIVE-CLiQ motors can be connected to the integrated DRIVE-CLiQ socket as well as Sensor Modules (SMC) to permit the operation of motors without a DRIVE-CLiQ interface.

The status of the CU305 is indicated via multi-color LEDs.

The CU305 can be operated optionally with memory card. The firmware and project data are stored on the memory card pluggable from below, so that the CU305 can be replaced without the support of software tools. This memory card can also be used to perform standard commissioning on multiple drives of identical type. The memory card is available containing the latest drive firmware version. The card also contains the safety license for the Extended Safety Functions. To use these Extended Safety Functions, a memory card containing the safety license must be permanently inserted.

The CU305 and other connected components are commissioned and diagnosed with the STARTER commissioning tool.

Integration



1) Required for supply of digital outputs DO 8 to DO 11
2) High-speed inputs must be shielded
3) Analog input must be shielded
4) Motor temperature sensor input must be shielded
5) Inversion can be parameterized
6) Safety-related control with current sourcing and current sinking outputs
7) Safety-related control with two current sourcing outputs

Connection example of CU305 Control Unit

Selection and ordering data

Description	Article No.
CU305 PN Control Unit Without memory card	**6SL3040-0JA01-0AA0**
CU305 DP Control Unit Without memory card	**6SL3040-0JA00-0AA0**

Description	Article No.
Accessories	
Memory card for CU305 PN / CU305 DP Control Units 64 MB	
• With firmware version V4.4 SP3	**6SL3054-4TC00-2AA0**
• With firmware version V4.4 SP3 and safety license (Extended Functions)	**6SL3054-4TC00-2AA0-Z F01**
Safety license (Extended Functions) [1] CoL in electronic form	**6SL3074-0AA10-0AH0**
STARTER commissioning tool [2] on DVD-ROM	**6SL3072-0AA00-0AG0**

Technical specifications

CU305 PN / CU305 DP Control Units PROFINET: 6SL3040-0JA01-0AA0 PROFIBUS: 6SL3040-0JA00-0AA0	
Current requirement At 24 V DC, max. without taking account of digital outputs and DRIVE-CLiQ supply	0.8 A for CU305 incl. 350 mA for HTL encoder + 0.5 A for PM240-2 Power Module
Conductor cross-section, max.	2.5 mm^2
Fuse protection, max.	20 A
Digital inputs	in accordance with IEC 61131-2 Type 1 3 isolated fail-safe inputs 5 isolated digital inputs
• Voltage	-3 ... +30 V
• Low level (an open digital input is interpreted as "low")	-3 ... +5 V
• High level	15 ... 30 V
• Current consumption at 24 V DC, typ.	6 mA
• Delay time of digital inputs [3], approx.	
- L → H	15 µs
- H → L	55 µs
• Delay time of high-speed digital inputs [3], approx. (high-speed digital inputs can be used for position detection)	
- L → H	5 µs
- H → L	5 µs
• Conductor cross-section, max.	1.5 mm^2
Digital outputs (continuously short-circuit-proof)	1 fail-safe digital output 4 bidirectional digital inputs/ digital outputs, not isolated
• Voltage	24 V DC
• Load current per digital output [4], max.	100 mA
• Delay time [3], approx.	150 µs
• Conductor cross-section, max.	1.5 mm^2
Analog input	-10 ... +10 V Resolution 12 bits + sign
• Internal resistance	15 kΩ

CU305 PN / CU305 DP Control Units PROFINET: 6SL3040-0JA01-0AA0 PROFIBUS: 6SL3040-0JA00-0AA0	
Encoder evaluation	• Incremental encoder TTL/HTL • SSI encoder without incremental signals
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Input current range TTL/HTL	2 ... 10 mA (typ. 5 mA)
• Encoder frequency, max.	500 kHz
• SSI baud rate	100 ... 250 kBaud depending on cable length
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [5]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [5]
- SSI encoder	100 m (328 ft)
Power loss	<20 W
PE connection	M5 screw
Dimensions	
• Width	73 mm (2.87 in)
• Height	
- CU305 PN	195 mm (7.68 in)
- CU305 DP	183.2 mm (7.21 in)
• Depth	
- CU305 PN	71 mm (2.80 in)
- CU305 DP	55 mm (2.17 in)
Weight, approx.	0.95 kg (2.09 lb)
Certificate of suitability	cULus

[1] Extended function for an existing memory card. The memory card is not included with the scope of delivery. With a CoL in electronic form, the license is supplied as a PDF file. Notification of this with a download link is received by email. By specifying the Z option **F01** it is possible to order the safety license together with a memory card. In this case, the Certificate of License (CoL) is located on the SINAMICS SD card. In addition, there is a notification with an optional download by email.

[2] The STARTER commissioning tool is also available on the internet at https://support.industry.siemens.com/cs/ww/en/ps/13437/dl

[3] The specified delay times refer to the hardware. The actual reaction time depends on the time slice in which the digital input or output is processed.

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

[5] Signal cables twisted in pairs and shielded.

Overview

PM240-2 Power Modules, frame sizes FSA to FSF (with Control Unit and BOP-20 Operator Panel)

The PM240-2 Power Modules in blocksize format feature the following connections and interfaces as standard:

- Line supply connection
- PM-IF interface to connect the PM240-2 Power Module to the CU305 Control Unit. The PM240-2 Power Module also supplies power to the CU305 Control Unit using an integrated power supply
- Terminals DCP/R1 and R2 for connection of an external braking resistor
- Motor connection made with screw terminals or screw studs
- Control circuit for the Safe Brake Relay for controlling a holding brake
- 2 PE/protective conductor connections

Power Modules without integrated line filter can be connected to grounded TN/TT systems and non-grounded IT systems. Power Modules with integrated line filter are suitable only for connection to TN systems with grounded neutral point.

Note:

Shield connection kits are available for EMC-compliant installation of Power Modules.

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC.

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size for the frame sizes FSD to FSF. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSF.

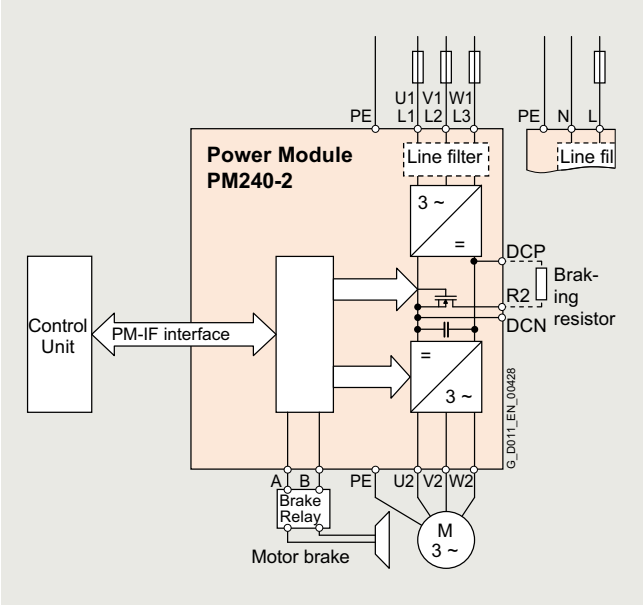
For more information, see shield connection kits for Power Modules in the section Supplementary system components.

Additional options

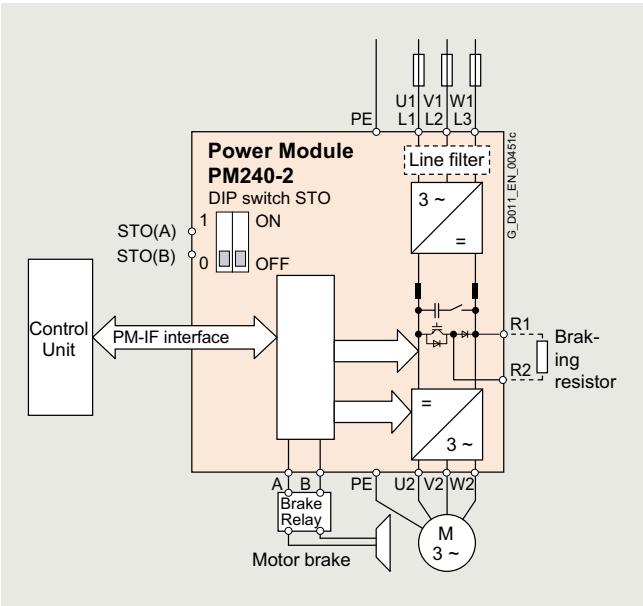
Further selected accessories are available from "Siemens Product Partner for Drives Options":
www.siemens.com/drives-options-partner

Integration

PM240-2 Power Modules in blocksize format communicate via the PM-IF interface with the CU305 Control Unit



Connection example for PM240-2 Power Modules, frame sizes FSA to FSC, with or without integrated line filter



Connection example for PM240-2 Power Modules, frame sizes FSD to FSF, with or without integrated line filter

10

Integration

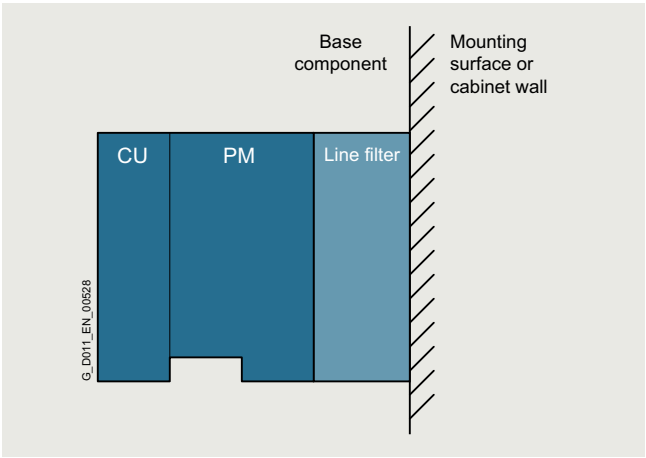
Power and DC link components that are optionally available depending on the Power Module used

The following line-side components, DC link components and load-side power components are optionally available in the appropriate frames sizes for the Power Modules:

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240-2 Power Module with integrated braking chopper						
Line-side components						
Line filter class A acc. to EN 55011	**F**	**F**	**F**	**F** [1]	**F** [1]	**F** [1]
Line filter class B acc. to EN 55011 (only for 400 V versions)	**U**	**U**	**U**	–	–	–
Line reactor (only for 3 AC versions [2])	**S** [3]	**S** [3]	**S** [3]	**I**	**I**	**I**
DC link components						
Braking resistor	**S**	**S**	**S**	**S**	**S**	**S**
Load-side power components						
Output reactor	**S**	**S**	**S**	**S**	**S**	**S**

F = Power Modules available with and without integrated filter class A
U = Base component
S = Lateral mounting
I = Integrated
– = Not possible

General design information



Frequency converter comprising a Power Module (PM), a Control Unit (CU), and a line filter as base components (side view)

- If at all possible, the line filter should be mounted directly below the converter
- With lateral mounting, the line-side components have to be mounted on the left side of the converter, and the load-side components on the right side
- Braking resistors have to be mounted directly on the control cabinet wall due to heating issues

Recommended installation combinations of the converter and optional power and DC link components

Power Module Frame size	Base	Lateral mounting	
		Left of the converter (for line-side components)	**Right of the converter (for load-side power components and DC link components)**
FSA to FSC	Line filter	Line reactor	Output reactor and/or braking resistor
FSD to FSF	–	Line filter	Output reactor and/or braking resistor

[1] PM240-2 200 V versions, frame sizes FSD to FSF are only available without integrated line filter.

[2] With the appropriate wiring, the line reactors for 200 V 3 AC can be used for the 200 V versions for 200 V 1 AC. More information can be found on the internet at: https://support.industry.siemens.com/cs/document/109482011

[3] For frame sizes FSA to FSC, for lines with uk < 1 %, it is recommended that you use a line reactor or the next more powerful Power Module. More information can be found on the internet at: https://support.industry.siemens.com/cs/document/109482011

Selection and ordering data

To ensure that a suitable Power Module is selected, the following currents should be used for applications:

- Rated output current for applications with low overload (LO)
- Base-load current for applications with high overload (HO)

With reference to the rated output current, the modules support at least 2-pole to 6-pole low-voltage motors, e.g. the SIMOTICS 1LE1 motor series. The type rating is merely a guide value. For a description of the overload performance, please refer to the general technical specifications of the Power Modules.

PM240-2 Power Modules standard variant

Type rating [1]		Rated output current I_N [2]	Power based on the base-load current [3]		Base-load current I_H [3]	Frame size	**PM240-2 Power Module standard variant without integrated line filter**	**PM240-2 Power Module standard variant with integrated line filter class A**
kW	hp	A	kW	hp	A		Article No.	Article No.
200 ... 240 V 1 AC/3 AC								
0.55	0.75	3.2	**0.37**	0.5	2.3	FSA	**6SL3210-1PB13-0UL0**	**6SL3210-1PB13-0AL0**
0.75	1	4.2	**0.55**	0.75	3.2	FSA	**6SL3210-1PB13-8UL0**	**6SL3210-1PB13-8AL0**
1.1	1.5	6	**0.75**	1	4.2	FSB	**6SL3210-1PB15-5UL0**	**6SL3210-1PB15-5AL0**
1.5	2	7.4	**1.1**	1.5	6	FSB	**6SL3210-1PB17-4UL0**	**6SL3210-1PB17-4AL0**
2.2	3	10.4	**1.5**	2	7.4	FSB	**6SL3210-1PB21-0UL0**	**6SL3210-1PB21-0AL0**
3	4	13.6	**2.2**	3	10.4	FSC	**6SL3210-1PB21-4UL0**	**6SL3210-1PB21-4AL0**
4	5	17.5	**3**	4	13.6	FSC	**6SL3210-1PB21-8UL0**	**6SL3210-1PB21-8AL0**
380 ... 480 V 3 AC [4]								
0.55	0.75	1.7	**0.37**	0.5	1.3	FSA	**6SL3210-1PE11-8UL1**	**6SL3210-1PE11-8AL1**
0.75	1	2.2	**0.55**	0.75	1.7	FSA	**6SL3210-1PE12-3UL1**	**6SL3210-1PE12-3AL1**
1.1	1.5	3.1	**0.75**	1	2.2	FSA	**6SL3210-1PE13-2UL1**	**6SL3210-1PE13-2AL1**
1.5	2	4.1	**1.1**	1.5	3.1	FSA	**6SL3210-1PE14-3UL1**	**6SL3210-1PE14-3AL1**
2.2	3	5.9	**1.5**	2	4.1	FSA	**6SL3210-1PE16-1UL1**	**6SL3210-1PE16-1AL1**
3	4	7.7	**2.2**	3	5.9	FSA	**6SL3210-1PE18-0UL1**	**6SL3210-1PE18-0AL1**
4	5	10.2	**3**	4	7.7	FSB	**6SL3210-1PE21-1UL0**	**6SL3210-1PE21-1AL0**
5.5	7.5	13.2	**4**	5	10.2	FSB	**6SL3210-1PE21-4UL0**	**6SL3210-1PE21-4AL0**
7.5	10	18	**5.5**	7.5	13.2	FSB	**6SL3210-1PE21-8UL0**	**6SL3210-1PE21-8AL0**
11	15	26	**7.5**	10	18	FSC	**6SL3210-1PE22-7UL0**	**6SL3210-1PE22-7AL0**
15	20	32	**11**	15	26	FSC	**6SL3210-1PE23-3UL0**	**6SL3210-1PE23-3AL0**
18.5	25	38	**15**	20	32	FSD	**6SL3210-1PE23-8UL0**	**6SL3210-1PE23-8AL0**
22	30	45	**18.5**	25	38	FSD	**6SL3210-1PE24-5UL0**	**6SL3210-1PE24-5AL0**
30	40	60	**22**	30	45	FSD	**6SL3210-1PE26-0UL0**	**6SL3210-1PE26-0AL0**
37	50	75	**30**	40	60	FSD	**6SL3210-1PE27-5UL0**	**6SL3210-1PE27-5AL0**
45	60	90	**37**	50	75	FSE	**6SL3210-1PE28-8UL0**	**6SL3210-1PE28-8AL0**
55	75	110	**45**	60	90	FSE	**6SL3210-1PE31-1UL0**	**6SL3210-1PE31-1AL0**
75	100	145	**55**	75	110	FSF	**6SL3210-1PE31-5UL0**	**6SL3210-1PE31-5AL0**
90	125	178	**75**	100	145	FSF	**6SL3210-1PE31-8UL0**	**6SL3210-1PE31-8AL0**
110	150	205	**90**	125	178	FSF	**6SL3210-1PE32-1UL0**	**6SL3210-1PE32-1AL0**
132	200	250	**110**	150	205	FSF	**6SL3210-1PE32-5UL0**	**6SL3210-1PE32-5AL0**

[1] Type rating based on the rated output current I_N. The rated output current I_N is based on the duty cycle for low overload (LO).

[2] The rated output current I_N is based on the duty cycle for low overload (LO). These current values are valid for 200 V or 400 V and are specified on the rating plate of the Power Module.

[3] The base-load current I_H is based on the duty cycle for high overload (HO).

[4] SIPLUS components for extreme requirements are available. Additional information is available on the internet at www.siemens.com/siplus-drives

Selection and ordering data

Shield connection kit for Power Modules

The shield connection kit makes it easier to connect the shields of supply and control cables, provides mechanical strain relief and thus ensures optimum EMC performance.

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC.

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size for the frame sizes FSD to FSF. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSF.

For more information, see shield connection kits for Power Modules in the section Supplementary system components.

Technical specifications

General technical specifications

Unless explicitly specified otherwise, the following technical specifications are valid for all PM240-2 Power Modules in blocksize format, frame sizes FSA to FSF.

Note:

When configuring the complete SINAMICS S110 drive, the system data of the associated Control Units, supplementary system components, DC link components and Sensor Modules must be taken into consideration.

Electrical specifications	
Line voltage	
• Blocksize format FSA ... FSC	200 ... 240 V 1 AC ±10 % 200 ... 240 V 3 AC ±10 % 380 ... 480 V 3 AC ±10 %
• Blocksize format FSD ... FSF	380 ... 480 V 3 AC ±10 % (in operation -20 % <1 min)
Line system configurations	Grounded TN/TT systems and non-grounded IT systems (IT networks can only be used for unfiltered devices)
Line frequency	47 ... 63 Hz
Line power factor for a 3 AC line supply voltage and type rating	
• Blocksize format FSA ... FSC	
- Fundamental power factor (cos φ_1)	>0.96
- Total (λ)	> 0.7 ... 0.85
• Blocksize format FSD ... FSF	
- Fundamental power factor (cos φ_1)	> 0.98 ... 0.99
- Total (λ)	> 0.9 ... 0.92
Efficiency class acc. to IEC 61800-9-2	IE2
Electromagnetic compatibility[1)]	
• Interference immunity	All PM240-2 Power Modules are suitable for use in both the first and second environments.
• Interference emission acc. to EN 61800-3 **second environment**	
- For devices with integrated radio suppression interference filter	Category C2
- For devices without integrated radio interference suppression filter with optional external radio interference filter for grounded line supplies	Category C2 (recommended for operation in conjunction with a residual current protective device RCD)
- For devices without integrated radio interference suppression filter for operation on IT line supplies	Category C4
• Interference emission acc. to EN 61800-3 **first environment**	Can be used in the first environment when taking into consideration the additional secondary conditions listed in the EMC notes
Overvoltage category acc. to IEC/EN 61800-5-1	III
Electronics power supply implemented as PELV circuit according to IEC/EN 61800-5-1	24 V DC, -15 % +20 % Ground = negative pole grounded via the electronics
Short-circuit current rating (SCCR) (Short Circuit Current Rating) Applies to industrial control cabinet installations according to NEC Article 409 or UL 508A.	100 kA See the Recommended line-side overcurrent protection devices section – the value depends on the fuses and circuit breakers used
Rated pulse frequency	
• For devices with a rated voltage of 200 V 1/3 AC, 400 V 3 AC and a type rating ≤ 55 kW based on I_N	4 kHz
• For devices with a type rating ≥ 75 kW based on I_N	2 kHz
Output voltage, max.	Approximately 0.95 × line voltage (at 200 V 1 AC, approximately 0.74 × line voltage)
Output frequency	0 ... 550 Hz (dependencies on the control mode and pulse frequency must be taken into account)

1) For EMC-compliant installation, observe the information in the Configuration Manual EMC installation guidelines:
https://support.industry.siemens.com/cs/document/60612658

Technical specifications

Mechanical specifications			
Degree of protection acc. to EN 60529	IP20		
Protection class			
• Line circuits with protective conductor connection according to IEC/EN 61800-5-1	I		
• Electronic circuits	Safety extra low-voltage PELV/SELV		
Type of cooling			
• Internal air cooling	Forced air cooling AF to EN 60146		
Ambient conditions			
	Long-term storage In transport packaging	**Transport** In transport packaging	**Operation**
Ambient temperature	Class 1K4 acc. to IEC 60721-3-1: 1997 -25 ... +55 °C (-13 ... +131 °F)	Class 2K4 acc. to IEC 60721-3-2: 1997 -40 ... +70 °C (-40 ... +158 °F)	Class 3K3 [1] acc. to IEC 60721-3-3: 2002 For operation without derating [2]: -10 ... +40 °C (14 ... 104 °F) (for operation with low overload) -10 ... +50 °C (14 ... 122 °F) (for operation with high overload) For operation with derating: >40 ... +60 °C (>104 ... 140 °F)
Relative humidity (oil mist, ice, condensation, dripping water, spraying water and water jets are not permitted)	Class 1K4 acc. to IEC 60721-3-1: 1997 5 ... 95 %	Class 2K3 acc. to IEC 60721-3-2: 1997 5 ... 95 % at 40 °C (104 °F)	Class 3K3 [1] acc. to IEC 60721-3-3: 2002 5 ... 95 %
Environmental class/harmful chemical substances	Class 1C2 acc. to IEC 60721-3-1: 1997	Class 2C2 acc. to IEC 60721-3-2: 1997	Class 3C2 acc. to IEC 60721-3-3: 2002
Organic/biological influences	Class 1B1 acc. to IEC 60721-3-1: 1997	Class 2B1 acc. to IEC 60721-3-2: 1997	Class 3B1 acc. to IEC 60721-3-3: 2002
Degree of pollution acc. to IEC/EN 61800-5-1 (condensation not permissible)	2		
Installation altitude			
• For operation with low overload	Up to 1000 m (3281 ft) above sea level without derating		
• For operation with high overload	Up to 2000 m (6562 ft) above sea level without derating		
• From 2000 m (6562 ft) up to 4000 m (13124 ft) above sea level observe the derating characteristics	See characteristic for current derating as a function of the installation altitude and/or reduction of the ambient temperature by 3.5 K per 500 m (1640 ft)		
Mechanical strength			
	Long-term storage In transport packaging	**Transport** In transport packaging	**Operation**
Vibratory load	Class 1M2 acc. to IEC 60721-3-1: 1997	Class 2M3 acc. to IEC 60721-3-2: 1997	Class 3M1 acc. to IEC 60721-3-3: 2002 Test values acc. to EN 60068-2-6
Shock load	Class 1M2 acc. to IEC 60721-3-1: 1997	Class 2M3 acc. to IEC 60721-3-2: 1997	Class 3M1 acc. to IEC 60721-3-3: 2002 Test values acc. to EN 60068-2-27
Certificates			
Declarations of conformity	CE (Low Voltage, EMC and Machinery Directives); Eco-design requirements of EU Directive 2019/1781		
Certificates of suitability			
• Blocksize format FSA ... FSC	UKCA; cULus according to UL 61800-5-1; CSA only with external surge voltage protection device; RCM; SEMI F47 KC (only with internal or external line filters of Category C2); RoHS; EAC		
• Blocksize format FSD ... FSF	UKCA; cULus acc. to UL 61800-5-1; CSA only with external surge voltage protection device; RCM; SEMI F47 KC (only with internal or external line filters of Category C2); RoHS; EAC WEEE (Waste Electrical & Electronic Equipment)		

[1] Better than 3K3 through increased ruggedness regarding the temperature range and humidity.

[2] Also carefully observe the permissible temperatures for the Control Unit and where relevant, the operator panel.

Technical specifications

PM240-2 Power Modules standard variant

Line voltage 200 ... 240 V 1 AC/3 AC		**PM240-2 Power Modules standard variant**				
Without integrated line filter		6SL3210-1PB13-0UL0	6SL3210-1PB13-8UL0	6SL3210-1PB15-5UL0	6SL3210-1PB17-4UL0	6SL3210-1PB21-0UL0
With integrated line filter class A		6SL3210-1PB13-0AL0	6SL3210-1PB13-8AL0	6SL3210-1PB15-5AL0	6SL3210-1PB17-4AL0	6SL3210-1PB21-0AL0
Output current at 50 Hz 230 V 1 AC						
• Rated current I_N [1]	A	3.2	4.2	6	7.4	10.4
• For S6 duty (40 %) I_{S6}	A	3.3	4.3	6.1	8.2	11.5
• Base-load current I_H [2]	A	2.3	3.2	4.2	6	7.4
• Maximum current I_{max}	A	4.6	6	8.3	11.1	15.6
Type rating						
• Based on I_N	kW (hp)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)
• Based on I_H	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η acc. to IEC 61800-9-2	%	>96.2	>96.4	>96.7	>96.4	>96.3
Power loss [3] acc. to IEC 61800-9-2 at rated current	kW	0.037	0.047	0.062	0.083	0.121
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.18)	0.005 (0.18)	0.0092 (0.325)	0.0092 (0.325)	0.0092 (0.325)
Sound pressure level L_{pA} (1 m)	dB	<50	<50	<62	<62	<62
Input current [4]						
• Rated current 1 AC/3 AC	A	7.5/4.3	9.6/5.5	13.5/7.8	18.1/10.5	24/13.9
• Based on I_H 1 AC/3 AC	A	6.6/3.8	8.4/4.8	11.8/6.8	15.8/9.1	20.9/12.1
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
Motor connection U2, V2, W2		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 2.5	1.5 ... 2.5	1.5 ... 6	1.5 ... 6	1.5 ... 6
PE connection		Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector
Motor cable length, max.						
• Shielded	m (ft)	50 (164)	50 (164)	50 (164)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)	100 (328)
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	73 (2.87)	73 (2.87)	100 (3.94)	100 (3.94)	100 (3.94)
• Height	mm (in)	196 (7.72)	196 (7.72)	292 (11.5)	292 (11.5)	292 (11.5)
• Depth without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
Frame size		FSA	FSA	FSB	FSB	FSB
Weight, approx.						
• Without integrated line filter	kg (lb)	1.4 (3.09)	1.4 (3.09)	2.9 (6.39)	2.9 (6.39)	2.9 (6.39)
• With integrated line filter	kg (lb)	1.6 (3.53)	1.6 (3.53)	3.1 (6.84)	3.1 (6.84)	3.1 (6.84)

[1] The rated output current I_N is based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. More information can be found on the internet at https://support.industry.siemens.com/cs/document/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_N) for a line impedance corresponding to u_k = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 200 ... 240 V 1 AC/3 AC		PM240-2 Power Modules standard variant	
Without integrated line filter		6SL3210-1PB21-4UL0	6SL3210-1PB21-8UL0
With integrated line filter class A		6SL3210-1PB21-4AL0	6SL3210-1PB21-8AL0
Output current at 50 Hz 230 V 1 AC			
• Rated current I_N [1]	A	13.6	17.5
• For S6 duty (40 %) I_{S6}	A	15	19.3
• Base-load current I_H [2]	A	10.4	13.6
• Maximum current I_{max}	A	20.8	27.2
Type rating			
• Based on I_N	kW (hp)	3 (4)	4 (5)
• Based on I_H	kW (hp)	2.2 (3)	3 (4)
Rated pulse frequency	kHz	4	4
Efficiency η acc. to IEC 61800-9-2	%	>96.7	>96.7
Power loss [3] acc. to IEC 61800-9-2 at rated current	kW	0.139	0.179
Cooling air requirement	m^3/s (ft^3/s)	0.0185 (0.65)	0.0185 (0.65)
Sound pressure level L_{pA} (1 m)	dB	<65	<65
Input current [4]			
• Rated current 1 AC/3 AC	A	35.9/20.7	43/24.8
• Based on I_H 1 AC/3 AC	A	31.3/18.1	37.5/21.7
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector
• Conductor cross-section	mm^2	6 ... 16	6 ... 16
Motor connection U2, V2, W2		Terminal connector	Terminal connector
• Conductor cross-section	mm^2	6 ... 16	6 ... 16
PE connection		Included in terminal connector	Included in terminal connector
Motor cable length, max.			
• Shielded	m (ft)	50 (164)	50 (164)
• Unshielded	m (ft)	100 (328)	100 (328)
Degree of protection		IP20	IP20
Dimensions			
• Width	mm (in)	140 (5.51)	140 (5.51)
• Height	mm (in)	355 (13.98)	355 (13.98)
• Depth without operator panel	mm (in)	165 (6.50)	165 (6.50)
Frame size		FSC	FSC
Weight, approx.			
• Without integrated line filter	kg (lb)	5 (11)	5 (11)
• With integrated line filter	kg (lb)	5.2 (11.5)	5.2 (11.5)

[1] The rated output current I_N is based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. More information can be found on the internet at https://support.industry.siemens.com/cs/document/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_N) for a line impedance corresponding to u_k = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules standard variant**					
Without integrated line filter		6SL3210-1PE11-8UL1	6SL3210-1PE12-3UL1	6SL3210-1PE13-2UL1	6SL3210-1PE14-3UL1	6SL3210-1PE16-1UL1	6SL3210-1PE18-0UL1
With integrated line filter class A		6SL3210-1PE11-8AL1	6SL3210-1PE12-3AL1	6SL3210-1PE13-2AL1	6SL3210-1PE14-3AL1	6SL3210-1PE16-1AL1	6SL3210-1PE18-0AL1
Output current at 50 Hz 400 V 3 AC							
• Rated current I_N [1]	A	1.7	2.2	3.1	4.1	5.9	7.7
• For S6 duty (40 %) I_{S6}	A	2	2.5	3.5	4.5	6.5	8.5
• Base-load current I_H [2]	A	1.3	1.7	2.2	3.1	4.1	5.9
• Maximum current I_{max}	A	2.6	3.4	4.7	6.2	8.9	11.8
Type rating							
• Based on I_N	kW (hp)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)	3 (4)
• Based on I_H	kW (hp)	0.37 (0.5)	0.55 (0.75)	0.75 (1)	1.1 (1.5)	1.5 (2)	2.2 (3)
Rated pulse frequency acc. to IEC 61800-9-2	kHz	4	4	4	4	4	4
Efficiency η	%	>96.0	>96.7	>97.1	>97.3	>97.3	>97.3
Power loss [3] acc. to IEC 61800-9-2 at rated current	kW	0.032	0.038	0.047	0.059	0.082	0.107
Cooling air requirement	m^3/s (ft^3/s)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)	0.005 (0.18)
Sound pressure level L_{pA} (1 m)	dB	<50	<50	<50	<50	<57	<57
Input current [4]							
• Rated current	A	2.3	2.9	4.1	5.5	7.7	10.1
• Based on I_H	A	2	2.6	3.3	4.7	6.1	8.8
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
Motor connection U2, V2, W2		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5	1 ... 2.5
PE connection		Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector
Motor cable length, max.							
• Without filter, shielded/unshielded	m (ft)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)
• With integrated filter class A, shielded/unshielded	m (ft)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)	50/100 (164/328)
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)	73 (2.87)
• Height	mm (in)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)	196 (7.72)
• Depth without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
Frame size		FSA	FSA	FSA	FSA	FSA	FSA
Weight, approx.							
• Without integrated line filter	kg (lb)	1.3 (2.87)	1.3 (2.87)	1.3 (2.87)	1.4 (3.09)	1.4 (3.09)	1.4 (3.09)
• With integrated line filter	kg (lb)	1.5 (3.31)	1.5 (2.01)	1.5 (2.01)	1.6 (3.53)	1.6 (3.53)	1.6 (3.53)

[1] The rated output current I_N is based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. More information can be found on the internet at https://support.industry.siemens.com/cs/document/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_N) for a line impedance corresponding to u_k = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules standard variant**				
Without integrated line filter		6SL3210-1PE21-1UL0	6SL3210-1PE21-4UL0	6SL3210-1PE21-8UL0	6SL3210-1PE22-7UL0	6SL3210-1PE23-3UL0
With integrated line filter class A		6SL3210-1PE21-1AL0	6SL3210-1PE21-4AL0	6SL3210-1PE21-8AL0	6SL3210-1PE22-7AL0	6SL3210-1PE23-3AL0
Output current at 50 Hz 400 V 3 AC						
• Rated current I_N [1]	A	10.2	13.2	18	26	32
• For S6 duty (40 %) I_{S6}	A	11.2	14.5	19.8	28.6	37.1
• Base-load current I_H [2]	A	7.7	10.2	13.2	18	26
• Maximum current I_{max}	A	15.4	20.4	27	39	52
Type rating						
• Based on I_N	kW (hp)	4 (5)	5.5 (7.5)	7.5 (10)	11 (15)	15 (20)
• Based on I_H	kW (hp)	3 (4)	4 (5)	5.5 (7.5)	7.5 (10)	11 (15)
Rated pulse frequency	kHz	4	4	4	4	4
Efficiency η acc. to IEC 61800-9-2	%	>97.4	>97.6	>97.7	>97.8	>97.9
Power loss [3] acc. to IEC 61800-9-2 at rated current	kW	0.138	0.180	0.236	0.320	0.375
Cooling air requirement	m^3/s (ft^3/s)	0.0092 (0.325)	0.0092 (0.325)	0.0092 (0.325)	0.0185 (0.65)	0.0185 (0.65)
Sound pressure level L_{pA} (1 m)	dB	<62	<62	<62	<65	<65
Input current [4]						
• Rated current	A	13.3	17.2	22.2	32.6	39.9
• Based on I_H	A	11.6	15.3	19.8	27	36
Line supply connection U1/L1, V1/L2, W1/L3		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 6	1.5 ... 6	1.5 ... 6	6 ... 16	6 ... 16
Motor connection U2, V2, W2		Terminal connector	Terminal connector	Terminal connector	Terminal connector	Terminal connector
• Conductor cross-section	mm^2	1.5 ... 6	1.5 ... 6	1.5 ... 6	6 ... 16	6 ... 16
PE connection		Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector	Included in terminal connector
Motor cable length, max.						
• Without filter, shielded/unshielded	m (ft)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)	150/150 (492/492)
• With integrated filter class A, shielded/unshielded	m (ft)	100/100 (328/328) [5]	100/100 (328/328) [5]	100/100 (328/328) [5]	150/150 (492/492) [5]	150/150 (492/492) [5]
Degree of protection		IP20	IP20	IP20	IP20	IP20
Dimensions						
• Width	mm (in)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)	140 (5.51)
• Height	mm (in)	292 (11.5)	292 (11.5)	292 (11.5)	355 (13.98)	355 (13.98)
• Depth without operator panel	mm (in)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)	165 (6.50)
Frame size		FSB	FSB	FSB	FSC	FSC
Weight, approx.						
• Without integrated line filter	kg (lb)	2.9 (6.39)	2.9 (6.39)	3 (6.62)	4.7 (10.4)	4.8 (10.6)
• With integrated line filter	kg (lb)	3.1 (6.84)	3.1 (6.84)	3.2 (7.06)	5.3 (11.7)	5.4 (11.91)

[1] The rated output current I_N is based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

[3] Typical values. More information can be found on the internet at https://support.industry.siemens.com/cs/document/94059311

[4] The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_N) for a line impedance corresponding to u_k = 1 %. The current values are specified on the rating plate of the Power Module.

[5] The values are applicable for low capacitance cables, e.g. MOTION-CONNECT. For standard CY cables the max. permissible motor cable length is 50 m (164 ft) (shielded) and 100 m (328 ft) (unshielded).

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules standard variant**					
Without integrated line filter		6SL3210-1PE23-8UL0	6SL3210-1PE24-5UL0	6SL3210-1PE26-0UL0	6SL3210-1PE27-5UL0	6SL3210-1PE28-8UL0	6SL3210-1PE31-1UL0
With integrated line filter class A		6SL3210-1PE23-8AL0	6SL3210-1PE24-5AL0	6SL3210-1PE26-0AL0	6SL3210-1PE27-5AL0	6SL3210-1PE28-8AL0	6SL3210-1PE31-1AL0
Output current at 50 Hz 400 V 3 AC							
• Rated current I_N [1]	A	38	45	60	75	90	110
• For S6 duty (40 %) I_{S6}	A	45	54	72	90	108	132
• Base-load current I_H [2]	A	32	38	45	60	75	90
• Maximum current I_{max}	A	64	76	90	120	150	180
Type rating							
• Based on I_N	kW (hp)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)	55 (75)
• Based on I_H	kW (hp)	15 (20)	18.5 (25)	22 (30)	30 (40)	37 (50)	45 (60)
Rated pulse frequency	kHz	4	4	4	4	4	4
Efficiency η acc. to IEC 61800-9-2	%	>97.2	>97.2	>97.5	>97.3	>97.4	>97.3
Power loss [3] acc. to IEC 61800-9-2 at rated current							
• Without integrated line filter	kW	0.584	0.713	0.848	1.12	1.31	1.69
• With integrated line filter	kW	0.587	0.716	0.854	1.13	1.32	1.70
Cooling air requirement	m^3/s (ft^3/s)	0.055 (1.94)	0.055 (1.94)	0.055 (1.94)	0.055 (1.94)	0.083 (2.93)	0.083 (2.93)
Sound pressure level L_{pA} (1 m)	dB	45 ... 65 [4]	45 ... 65 [4]	45 ... 65 [4]	45 ... 65 [4]	44 ... 62 [4]	44 ... 62 [4]
Input current [5]							
• Rated current	A	36	42	57	70	86	104
• Based on I_H	A	33	38	47	62	78	94
Line supply connection U1/L1, V1/L2, W1/L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	10 ... 35	10 ... 35	10 ... 35	10 ... 35	25 ... 70	25 ... 70
Motor connection U2, V2, W2		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	10 ... 35	10 ... 35	10 ... 35	10 ... 35	25 ... 70	25 ... 70
PE connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals	Screw terminals
Motor cable length, max.							
• Shielded	m (ft)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)	200 (656)
• Unshielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)	300 (984)
Degree of protection		IP20	IP20	IP20	IP20	IP20	IP20
Dimensions							
• Width	mm (in)	200 (7.87)	200 (7.87)	200 (7.87)	200 (7.87)	275 (10.83)	275 (10.83)
• Height	mm (in)	472 (18.58)	472 (18.58)	472 (18.58)	472 (18.58)	551 (21.69)	551 (21.69)
• Depth without operator panel	mm (in)	237 (9.33)	237 (9.33)	237 (9.33)	237 (9.33)	237 (9.33)	237 (9.33)
Frame size		FSD	FSD	FSD	FSD	FSE	FSE
Weight, approx.							
• Without integrated line filter	kg (lb)	16 (35.3)	16 (35.3)	17 (37.5)	17,5 (38.6)	26 (57.3)	26 (57.3)
• With integrated line filter	kg (lb)	17.5 (38.6)	17.5 (38.6)	18.5 (40.8)	18.5 (40.8)	28 (61.7)	28 (61.7)

1) The rated output current I_N is based on the duty cycle for low overload (LO).

2) The base-load current I_H is based on the duty cycle for high overload (HO).

3) Typical values. More information can be found on the internet at https://support.industry.siemens.com/cs/document/94059311

4) Values dependent on ambient temperature and utilization.

5) The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_N) for a line impedance corresponding to u_k = 1 %. The current values are specified on the rating plate of the Power Module.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**PM240-2 Power Modules standard variant**			
Without integrated line filter		6SL3210-1PE31-5UL0	6SL3210-1PE31-8UL0	6SL3210-1PE32-1UL0	6SL3210-1PE32-5UL0
With integrated line filter class A		6SL3210-1PE31-5AL0	6SL3210-1PE31-8AL0	6SL3210-1PE32-1AL0	6SL3210-1PE32-5AL0
Output current at 50 Hz 400 V 3 AC					
• Rated current I_N [1]	A	145	178	205	250
• For S6 duty (40 %) I_{S6}	A	174	213	246	300
• Base-load current I_H [2]	A	110	145	178	205
• Maximum current I_{max}	A	220	290	356	410
Type rating					
• Based on I_N	kW (hp)	75 (100)	90 (125)	110 (150)	132 (200)
• Based on I_H	kW (hp)	55 (75)	75 (100)	90 (125)	110 (150)
Rated pulse frequency	kHz	2	2	2	2
Efficiency η acc. to IEC 61800-9-2	%	>97.6	>97.4	>97.9	>97.8
Power loss [3] acc. to IEC 61800-9-2 at rated current					
• Without integrated line filter	kW	1.97	2.56	2.37	3.10
• With integrated line filter	kW	1.98	2.58	2.39	3.14
Cooling air requirement	m^3/s (ft^3/s)	0.153 (5.40)	0.153 (5.40)	0.153 (5.40)	0.153 (5.40)
Sound pressure level L_{pA} (1 m)	dB	56 ... 68 [4]	56 ... 68 [4]	56 ... 68 [4]	56 ... 68 [4]
Input current [5]					
• Rated current	A	140	172	198	242
• Based on I_H	A	117	154	189	218
Line supply connection U1/L1, V1/L2, W1/L3		M10 screw stud	M10 screw stud	M10 screw stud	M10 screw stud
• Conductor cross-section	mm^2	35 ... 2 × 120	35 ... 2 × 120	35 ... 2 × 120	35 ... 2 × 120
Motor connection U2, V2, W2		M10 screw stud	M10 screw stud	M10 screw stud	M10 screw stud
• Conductor cross-section	mm^2	35 ... 2 × 120	35 ... 2 × 120	35 ... 2 × 120	35 ... 2 × 120
PE connection		M10 screw stud	M10 screw stud	M10 screw stud	M10 screw stud
Motor cable length, max.					
• Shielded	m (ft)	300 (984)	300 (984)	300 (984)	300 (984)
• Unshielded	m (ft)	450 (1476)	450 (1476)	450 (1476)	450 (1476)
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	305 (12.01)	305 (12.01)	305 (12.01)	305 (12.01)
• Height	mm (in)	708 (27.87)	708 (27.87)	708 (27.87)	708 (27.87)
• Depth without operator panel	mm (in)	357 (14.06)	357 (14.06)	357 (14.06)	357 (14.06)
Frame size		FSF	FSF	FSF	FSF
Weight, approx.					
• Without integrated line filter	kg (lb)	57 (126)	57 (126)	61 (135)	61 (135)
• With integrated line filter	kg (lb)	63 (139)	63 (139)	65 (143)	65 (143)

[1] The rated output current I_N is based on the duty cycle for low overload (LO).

[2] The base-load current I_H is based on the duty cycle for high overload (HO).

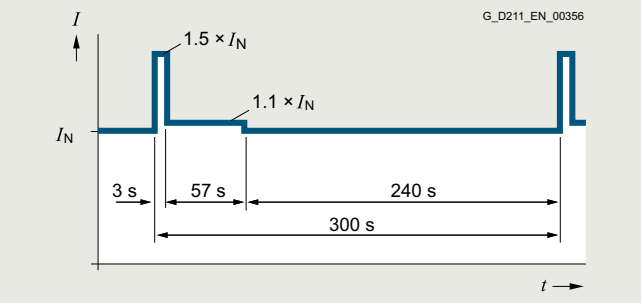
[3] Typical values. More information can be found on the internet at https://support.industry.siemens.com/cs/document/94059311

[4] Values dependent on ambient temperature and utilization.

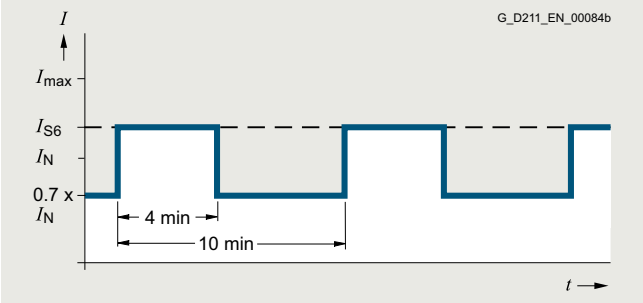
[5] The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_N) for a line impedance corresponding to u_k = 1 %. The current values are specified on the rating plate of the Power Module.

Characteristic curves

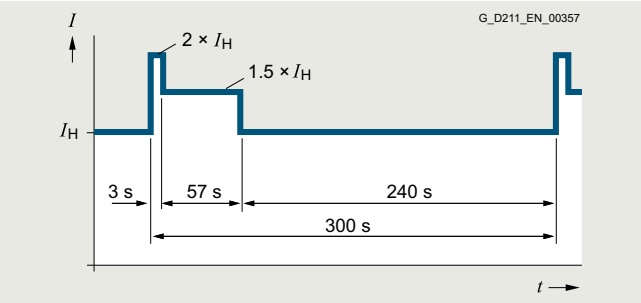
Overload capability



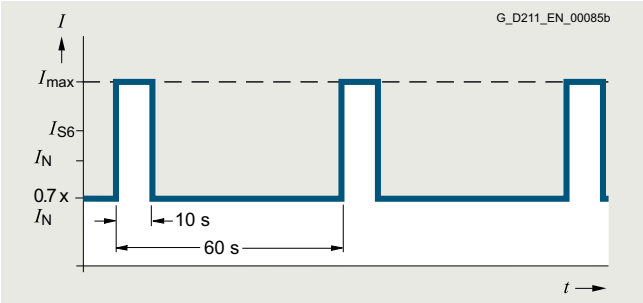
300 s duty cycle based on low overload



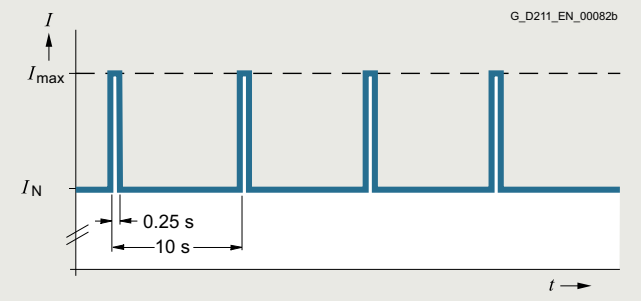
S6 duty cycle with initial load with a duty cycle duration of 600 s



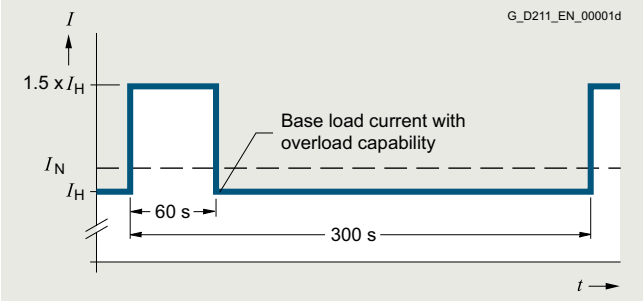
300 s duty cycle based on high overload



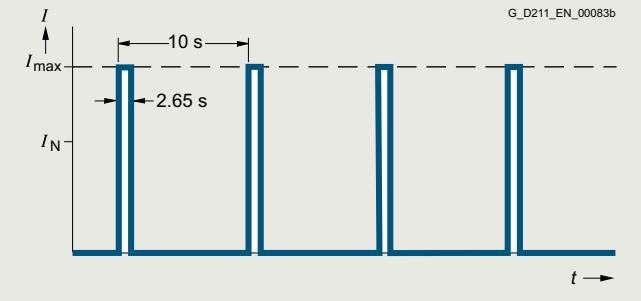
S6 duty cycle with initial load with a duty cycle duration of 60 s



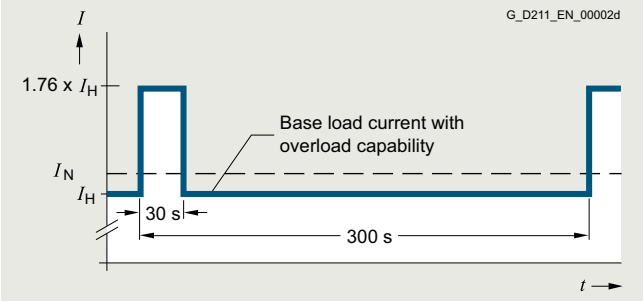
Duty cycle with initial load



Duty cycle with 60 s overload with a duty cycle duration of 300 s



Duty cycle without initial load



Duty cycle with 30 s overload with a duty cycle duration of 300 s

Characteristic curves

Derating data

Pulse frequency

Type rating [1] at 50 Hz 200 V 1 AC/3 AC		**Rated output current in A** for a pulse frequency of							
kW	hp	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.55	0.75	3.2	3.2	2.7	2.2	1.9	1.6	1.4	1.3
0.75	1	4.2	4.2	3.6	2.9	2.5	2.1	1.9	1.7
1.1	1.5	6	6	5.1	4.2	3.6	3	2.7	2.4
1.5	2	7.4	7.4	6.3	5.2	4.4	3.7	3.3	3
2.2	3	10.4	10.4	8.8	7.3	6.2	5.2	4.7	4.2
3	4	13.6	13.6	11.6	9.5	8.2	6.8	6.1	5.4
4	5	17.5	17.5	14.9	12.3	10.5	8.8	7.9	7
5.5	7.5	22	22	18.7	15.4	13.2	11	9.9	8.8
7.5	10	28	28	23.8	19.6	16.8	14	12.6	11.2
11	15	42	42	35.7	29.4	25.2	21	18.9	16.8
15	20	54	54	45.9	37.8	32.4	27	24.3	21.6
18.5	25	68	68	57.8	47.6	40.8	34	30.6	27.2
22	30	80	80	68	56	48	40	36	32
30	40	104	104	88.4	72.8	62.4	52	46.8	41.6
37	50	130	130	110.5	91	–	–	–	–
45	60	154	154	130.9	107.8	–	–	–	–
55	75	178	178	151.3	124.6	–	–	–	–

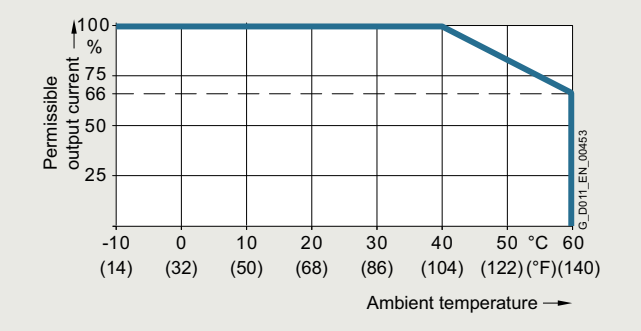
Type rating [1] at 50 Hz 400 V 3 AC		**Rated output current in A** for a pulse frequency of							
kW	hp	2 kHz	4 kHz	6 kHz	8 kHz	10 kHz	12 kHz	14 kHz	16 kHz
0.55	0.75	1.7	1.7	1.4	1.2	1	0.9	0.8	0.7
0.75	1	2.2	2.2	1.9	1.5	1.3	1.1	1	0.9
1.1	1.5	3.1	3.1	2.6	2.2	1.9	1.6	1.4	1.2
1.5	2	4.1	4.1	3.5	2.9	2.5	2.1	1.8	1.6
2.2	3	5.9	5.9	5	4.1	3.5	3	2.7	2.4
3	4	7.7	7.7	6.5	5.4	4.6	3.9	3.5	3.1
4	5	10.2	10.2	8.7	7.1	6.1	5.1	4.6	4.1
5.5	7.5	13.2	13.2	11.2	9.2	7.9	6.6	5.9	5.3
7.5	10	18	18	15.3	12.6	10.8	9	8.1	7.2
11	15	26	26	22.1	18.2	15.6	13	11.7	10.4
15	20	32	32	27.2	22.4	19.2	16	14.4	12.8
18.5	25	38	38	32.3	26.6	22.8	19	17.1	15.2
22	30	45	45	38.3	31.5	27	22.5	20.3	18
30	40	60	60	51	42	36	30	27	24
37	50	75	75	63.8	52.5	45	37.5	33.8	30
45	60	90	90	76.5	63	54	45	40.5	36
55	75	110	110	93.5	77	–	–	–	–
75	100	145	145	123.3	101.5	–	–	–	–
90	125	178	178	151.3	124.6	–	–	–	–
110	150	205	143.5	–	–	–	–	–	–
132	200	250	175	–	–	–	–	–	–

[1] Type rating based on the rated output current I_N. The rated output current I_N is based on the duty cycle for low overload (LO).

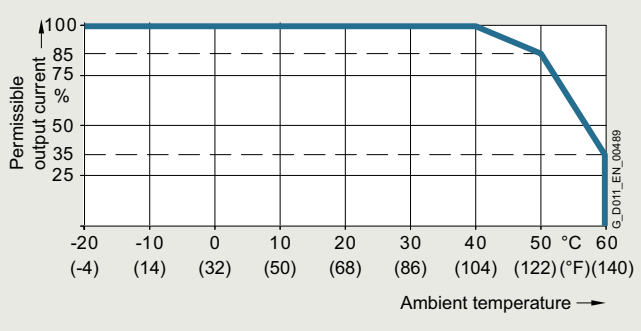
Characteristic curves

Derating data (continued)

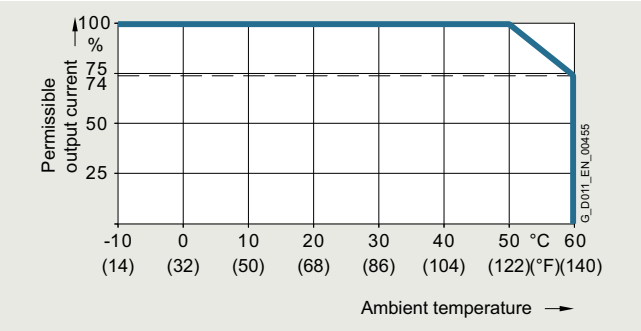
Ambient temperature



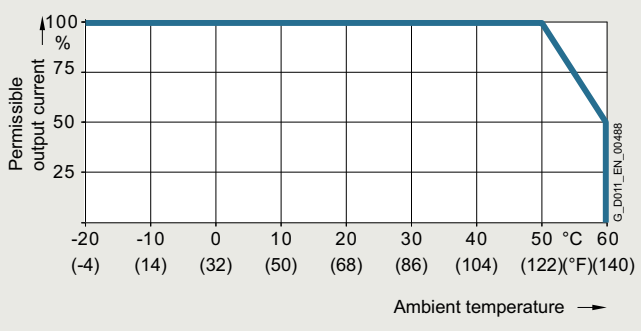
Permissible output current as a function of ambient temperature for low overload (LO) for PM240-2 Power Modules, frame sizes FSA to FSC



Permissible output current as a function of ambient temperature for low overload (LO) for PM240-2 Power Modules, frame sizes FSD to FSF



Permissible output current as a function of ambient temperature for high overload (HO) for PM240-2 Power Modules, frame sizes FSA to FSC



Permissible output current as a function of ambient temperature for high overload (HO) for PM240-2 Power Modules, frame sizes FSD to FSF

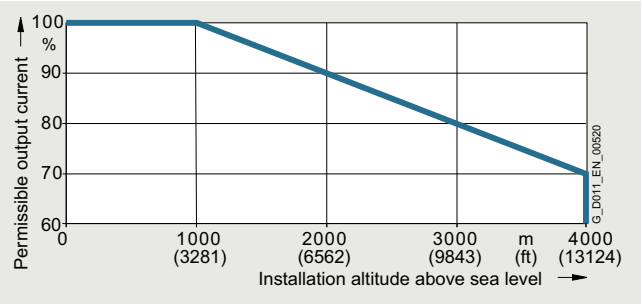
The operating temperature ranges of the Control Units should be taken into account.

Installation altitude

Permissible line supplies depending on the installation altitude

- Installation altitude up to 2000 m (6562 ft) above sea level
  - Connection to every supply system permitted for the converter
- Installation altitudes between 2000 m and 4000 m (6562 ft and 13124 ft) above sea level
  - Connection only to a TN system with grounded neutral point
  - TN systems with grounded line conductor are not permitted
  - The TN line system with grounded neutral point can also be supplied using an isolation transformer
  - The phase-to-phase voltage does not have to be reduced

The connected motors, power elements and components must be considered separately.



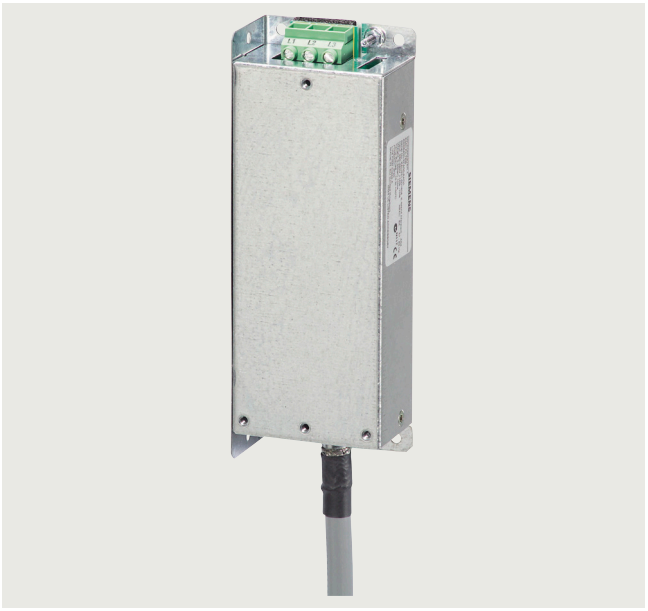
Permissible output current as a function of the installation altitude for PM240-2 Power Modules at 40 °C for low overload (LO)

System operating voltage

The rated output current remains constant over the 380 V to 480 V 3 AC voltage range.

More information on the derating data of the PM240-2 Power Modules is available in the Hardware Installation Manual on the internet at:
www.siemens.com/sinamics-g120/documentation

Overview



Line filter for PM240-2 Power Modules

With one of the additional line filters, the Power Module attains a higher radio interference class.

Integration

Line filters that are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240-2 Power Module with integrated braking chopper						
Line-side components						
Line filter class A according to EN 55011	**F**	**F**	**F**	**F** [1]	**F** [1]	**F** [1]
Line filter class B according to EN 55011 (only for 400 V versions)	**U**	**U**	**U**	–	–	–

F = Power Modules available with and without integrated filter class A
U = Base component
– = Not possible

Selection and ordering data

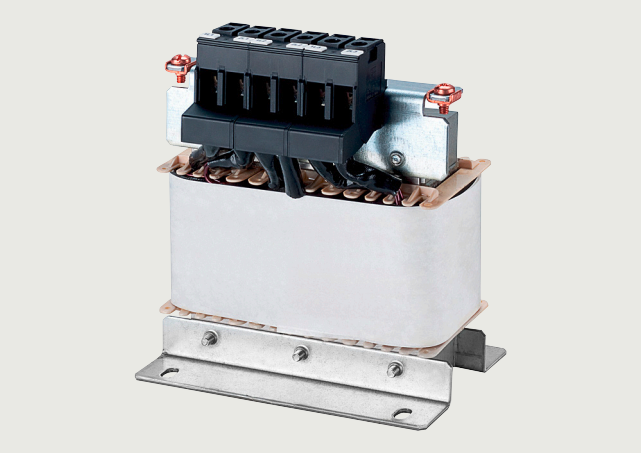
Type rating		PM240-2 Power Module standard variant		**Line filter class B according to EN 55011**
kW	hp	Type 6SL3210-...	Frame size	Article No.
380 ... 480 V 3 AC				
0.55	0.75	1PE11-8UL1	FSA	**6SL3203-0BE17-7BA0**
0.75	1	1PE12-3UL1		
1.1	1.5	1PE13-2UL1		
1.5	2	1PE14-3UL1		
2.2	3	1PE16-1UL1		
3	4	1PE18-0UL1		
4	5	1PE21-1UL0	FSB	**6SL3203-0BE21-8BA0**
5.5	7.5	1PE21-4UL0		
7.5	10	1PE21-8UL0		
11	15	1PE22-7UL0	FSC	**6SL3203-0BE23-8BA0**
15	20	1PE23-3UL0		

[1] PM240-2 200 V versions, frame sizes FSD to FSF are only available without integrated line filter.

Technical specifications

Line voltage 380 ... 480 V 3 AC		**Line filter class B**		
		6SL3203-0BE17-7BA0	6SL3203-0BE21-8BA0	6SL3203-0BE23-8BA0
Rated current	A	11.4	23.5	49.4
Pulse frequency	kHz	4 ... 16	4 ... 16	4 ... 16
Line supply connection L1, L2, L3		Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	1 ... 2.5	2.5 ... 6	6 ... 16
Load connection U, V, W		Shielded cable	Shielded cable	Shielded cable
• Cable cross-section	mm^2	1.5	4	10
• Length	m (ft)	0.45 (1.48)	0.5 (1.64)	0.54 (1.77)
PE connection		On housing via M5 screw stud	On housing via M5 screw stud	On housing via M6 screw studs
• Conductor cross-section	mm^2	1 ... 2.5	2.5 ... 6	6 ... 16
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	73 (2.87)	100 (3.94)	140 (5.51)
• Height	mm (in)	202 (7.95)	297 (11.69)	359 (14.13)
• Depth	mm (in)	65 (2.56)	85 (3.35)	95 (3.74)
Possible as base component		Yes	Yes	Yes
Weight, approx.	kg (lb)	1.75 (3.86)	4 (8.82)	7.3 (16.1)
Suitable for **PM240-2 Power Module** **standard variant** **380 ... 480 V 3 AC**	Type	6SL3210-1PE11-8UL1 6SL3210-1PE12-3UL1 6SL3210-1PE13-2UL1 6SL3210-1PE14-3UL1 6SL3210-1PE16-1UL1 6SL3210-1PE18-0UL1	6SL3210-1PE21-1UL0 6SL3210-1PE21-4UL0 6SL3210-1PE21-8UL0	6SL3210-1PE22-7UL0 6SL3210-1PE23-3UL0
• Frame size		FSA	FSB	FSC

Overview



Line reactor for PM240-2 Power Modules, frame size FSA

Line reactors smooth the current drawn by the converter and thus reduce harmonic components in the line current. Through the reduction of the current harmonics, the thermal load on the power components in the rectifier and in the DC link capacitors is reduced as well as the harmonic effects on the supply. The use of a line reactor increases the service life of the converter.

Integration

A DC link reactor is integrated in the PM240-2 Power Modules, frame sizes FSD to FSF, and therefore no line reactor is required.

Line reactors that are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240-2 Power Module with integrated braking chopper						
Line-side components						
Line reactor (only for 3 AC versions [1])	**S** [2]	**S** [2]	**S** [2]	**I**	**I**	**I**

S = Lateral mounting
I = Integrated

Selection and ordering data

Type rating		PM240-2 Power Module standard variant		**Line reactor**
kW	hp	Type 6SL3210-...	Frame size	Article No.
200 ... 240 V 3 AC [1]				
0.55	0.75	1PB13-0 . L0	FSA	**6SL3203-0CE13-2AA0**
0.75	1	1PB13-8 . L0		
1.1	1.5	1PB15-5 . L0	FSB	**6SL3203-0CE21-0AA0**
1.5	2	1PB17-4 . L0		
2.2	3	1PB21-0 . L0		
3	4	1PB21-4 . L0	FSC	**6SL3203-0CE21-8AA0**
4	5	1PB21-8 . L0		

[1] With the appropriate wiring, the line reactors for 200 V 3 AC can be used for the 200 V versions for 200 V 1 AC. More information can be found on the internet at:
https://support.industry.siemens.com/cs/document/109486005
https://support.industry.siemens.com/cs/document/109482011

[2] For frame sizes FSA to FSC, for lines with uk < 1 %, it is recommended that you use a line reactor or the next more powerful Power Module. More information can be found on the internet at:
https://support.industry.siemens.com/cs/document/109482011

Selection and ordering data

Type rating		PM240-2 Power Module standard variant		Line reactor
kW	hp	Type 6SL3210-...	Frame size	Article No.
380 ... 480 V 3 AC				
0.55	0.75	1PE11-8 . L1	FSA	**6SL3203-0CE13-2AA0**
0.75	1	1PE12-3 . L1		
1.1	1.5	1PE13-2 . L1		
1.5	2	1PE14-3 . L1	FSA	**6SL3203-0CE21-0AA0**
2.2	3	1PE16-1 . L1		
3	4	1PE18-0 . L1		
4	5	1PE21-1 . L0	FSB	**6SL3203-0CE21-8AA0**
5.5	7.5	1PE21-4 . L0		
7.5	10	1PE21-8 . L0		
11	15	1PE22-7 . L0	FSC	**6SL3203-0CE23-8AA0**
15	20	1PE23-3 . L0		

Technical specifications

Line voltage 200 ... 240 V 3 AC [1] or 380 ... 480 V 3 AC		**Line reactor**			
		6SL3203-0CE13-2AA0	6SL3203-0CE21-0AA0	6SL3203-0CE21-8AA0	6SL3203-0CE23-8AA0
Rated current	A	4	11.3	22.3	47
Power loss at 50/60 Hz	W	23/26	36/40	53/59	88/97
Line supply/load connection 1L1, 1L2, 1L3 2L1, 2L2, 2L3		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	4	4	10	16
PE connection		M4 × 8; U washer; spring lock washer	M4 × 8; U washer; spring lock washer	M5 × 10; U washer; spring lock washer	M5 × 10; U washer; spring lock washer
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	125 (4.92)	125 (4.92)	125 (4.92)	190 (7.48)
• Height	mm (in)	120 (4.72)	140 (5.51)	145 (5.71)	220 (8.66)
• Depth	mm (in)	71 (2.80)	71 (2.80)	91 (3.58)	91 (3.58)
Weight, approx.	kg (lb)	1.1 (2.43)	2.1 (4.63)	2.95 (6.50)	7.8 (17.2)
Suitable for PM240-2 Power Module standard variant 200 ... 240 V 3 AC	Type	6SL3210-1PB13-0 . L0 6SL3210-1PB13-8 . L0	6SL3210-1PB15-5 . L0 6SL3210-1PB17-4 . L0 6SL3210-1PB21-0 . L0	6SL3210-1PB21-4 . L0 6SL3210-1PB21-8 . L0	–
• Frame size		FSA	FSB	FSC	–
Suitable for PM240-2 Power Module standard variant 380 ... 480 V 3 AC	Type	6SL3210-1PE11-8 . L1 6SL3210-1PE12-3 . L1 6SL3210-1PE13-2 . L1	6SL3210-1PE14-3 . L1 6SL3210-1PE16-1 . L1 6SL3210-1PE18-0 . L1	6SL3210-1PE21-1 . L0 6SL3210-1PE21-4 . L0 6SL3210-1PE21-8 . L0	6SL3210-1PE22-7 . L0 6SL3210-1PE23-3 . L0
• Frame size		FSA	FSA	FSB	FSC

[1] With the appropriate wiring, the line reactors for 200 V 3 AC can be used for the 200 V versions for 200 V 1 AC. More information can be found on the internet at:
https://support.industry.siemens.com/cs/document/109486005
https://support.industry.siemens.com/cs/document/109482011

Selection and ordering data

Overcurrent protection devices are absolutely necessary for the operation of the converters. The following tables list recommendations for fuses.

- Siemens fuses of type 3NA3 for use in the area of validity of IEC
- UL-listed fuses Class J for use in USA and Canada

Recommendations on further overcurrent protection devices are available at:
www.siemens.com/sinamics-g120/ocpd

The Short Circuit Current Rating (SCCR) according to UL for industrial control panel installations to NEC Article 409 or UL 508A/508C or UL 61800-5-1 is as follows for Class J fuses for

- PM240-2 Power Modules for SINAMICS G120: 100 kA

SCCR and ICC values for combination with further overcurrent protection devices are available at:
www.siemens.com/sinamics-g120/ocpd

Notes for installations in Canada:

The converters are intended for line supply systems with overvoltage category III. More information is available in the technical documentation on the internet at:
www.siemens.com/sinamics-s110/documentation

More information about the listed Siemens fuses is available in Catalog LV 10 as well as in SiePortal.

Type rating [1]		PM240-2 Power Module standard variant		IEC-compliant Fuse		UL/cUL-compliant Fuse type Rated voltage 600 V AC	
		Type		Current			Current
kW	hp	6SL3210-...	Frame size	A	Article No.	Class	A
200 ... 240 V 1 AC/3 AC							
0.55	0.75	1PB13-0 . L0	FSA	16	**3NA3805**	J	15
0.75	1	1PB13-8 . L0	FSA	16	**3NA3805**	J	15
1.1	1.5	1PB15-5 . L0	FSB	32	**3NA3812**	J	35
1.5	2	1PB17-4 . L0	FSB	32	**3NA3812**	J	35
2.2	3	1PB21-0 . L0	FSB	32	**3NA3812**	J	35
3	4	1PB21-4 . L0	FSC	50	**3NA3820**	J	50
4	5	1PB21-8 . L0	FSC	50	**3NA3820**	J	50
380 ... 480 V 3 AC							
0.55	0.75	1PE11-8 . L1	FSA	10	**3NA3803**	J	10
0.75	1	1PE12-3 . L1	FSA	10	**3NA3803**	J	10
1.1	1.5	1PE13-2 . L1	FSA	16	**3NA3805**	J	15
1.5	2	1PE14-3 . L1	FSA	16	**3NA3805**	J	15
2.2	3	1PE16-1 . L1	FSA	16	**3NA3805**	J	15
3	4	1PE18-0 . L1	FSA	16	**3NA3805**	J	15
4	5	1PE21-1 . L0	FSB	32	**3NA3812**	J	35
5.5	7.5	1PE21-4 . L0	FSB	32	**3NA3812**	J	35
7.5	10	1PE21-8 . L0	FSB	32	**3NA3812**	J	35
11	15	1PE22-7 . L0	FSC	50	**3NA3820**	J	50
15	20	1PE23-3 . L0	FSC	50	**3NA3820**	J	50
18.5	25	1PE23-8 . L0	FSD	63	**3NA3822**	J	60
22	30	1PE24-5 . L0	FSD	80	**3NA3824**	J	70
30	40	1PE26-0 . L0	FSD	100	**3NA3830**	J	90
37	50	1PE27-5 . L0	FSD	100	**3NA3830**	J	100
45	60	1PE28-8 . L0	FSE	125	**3NA3832**	J	125
55	75	1PE31-1 . L0	FSE	160	**3NA3836**	J	150
75	100	1PE31-5 . L0	FSF	200	**3NA3140**	J	200
90	125	1PE31-8 . L0	FSF	224	**3NA3142**	J	250
110	150	1PE32-1 . L0	FSF	300	**3NA3250**	J	300
132	200	1PE32-5 . L0	FSF	315	**3NA3252**	J	350

[1] Type rating based on the rated output current I_N. The rated output current I_N is based on the duty cycle for low overload (LO).

Overview

Braking resistor for PM240-2 Power Modules, frame size FSD

Excess energy in the DC link is dissipated in the braking resistor. The braking resistors are intended for use with PM240-2 Power Modules which feature an integrated braking chopper, but cannot regenerate energy to the supply system. For regenerative operation, e.g. the braking of a rotating mass with high moment of inertia, a braking resistor must be connected to convert the resulting energy into heat.

The braking resistors can be installed laterally next to the PM240-2 Power Modules. The braking resistors for the Power Modules, frame sizes FSD to FSF, should be placed outside the control cabinet or outside the switchgear room so that the heat is dissipated away from the Power Modules. The level of air conditioning required is therefore reduced.

Every braking resistor has a temperature switch (UL-listed). The temperature switch should be evaluated to prevent consequential damage if the braking resistor overheats.

Note:

Shield connection kits are available for EMC-compliant installation of Power Modules.

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC.

A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size for the frame sizes FSD to FSF. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSF.

For more information, see shield connection kits for Power Modules in the section Supplementary system components.

Integration

Braking resistors that are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240-2 Power Module with integrated braking chopper						
DC link components						
Braking resistor	**S**	**S**	**S**	**S**	**S**	**S**

S = Lateral mounting

Selection and ordering data

Type rating		PM240-2 Power Module standard variant		**Braking resistor** (The prefix **"JJY:"** is part of a Siemens internal order code which does not belong to the product number of the original equipment manufacturer Heine Resistor GmbH)
kW	hp	Type 6SL3210-...	Frame size	Article No.
200 ... 240 V 1 AC/3 AC				
0.55	0.75	1PB13-0 . L0	FSA	**JJY:023146720008**
0.75	1	1PB13-8 . L0		
1.1	1.5	1PB15-5 . L0	FSB	**JJY:023151720007**
1.5	2	1PB17-4 . L0		
2.2	3	1PB21-0 . L0		
3	4	1PB21-4 . L0	FSC	**JJY:023163720018**
4	5	1PB21-8 . L0		
380 ... 480 V 3 AC				
0.55	0.75	1PE11-8 . L1	FSA	**6SL3201-0BE14-3AA0**
0.75	1	1PE12-3 . L1		
1.1	1.5	1PE13-2 . L1		
1.5	2	1PE14-3 . L1		
2.2	3	1PE16-1 . L1	FSA	**6SL3201-0BE21-0AA0**
3	4	1PE18-0 . L1		
4	5	1PE21-1 . L0	FSB	**6SL3201-0BE21-8AA0**
5.5	7.5	1PE21-4 . L0		
7.5	10	1PE21-8 . L0		
11	15	1PE22-7 . L0	FSC	**6SL3201-0BE23-8AA0**
15	20	1PE23-3 . L0		
18.5	25	1PE23-8 . L0	FSD	**JJY:023422620001**
22	30	1PE24-5 . L0		
30	40	1PE26-0 . L0	FSD	**JJY:023424020001**
37	50	1PE27-5 . L0		
45	60	1PE28-8 . L0	FSE	**JJY:023434020001**
55	75	1PE31-1 . L0		
75	100	1PE31-5 . L0	FSF	**JJY:023454020001**
90	125	1PE31-8 . L0		
110	150	1PE32-1 . L0	FSF	**JJY:023464020001**
132	200	1PE32-5 . L0		

Technical specifications

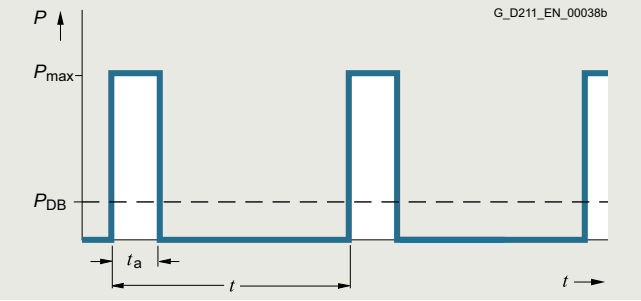
Line voltage 200 V … 240 V 1 AC/3 AC		**Braking resistor**		
		JJY:023146720008	JJY:023151720007	JJY:023163720018
Resistance	Ω	200	68	37
Rated power P_{DB} (Continuous braking power)	kW	0.0375	0.11	0.2
Peak power P_{max} (load duration t_a = 12 s with period t = 240 s)	kW	0.75	2.2	4
Power connection		Cable	Cable	Cable
Thermostatic switch		Integrated	Integrated	Integrated
Degree of protection		IP20	IP20	IP20
Dimensions				
• Width	mm (in)	60 (2.36)	60 (2.36)	60 (2.36)
• Height	mm (in)	167 (6.57)	217 (8.54)	337 (13.27)
• Depth	mm (in)	30 (1.18)	30 (1.18)	30 (1.18)
Weight, approx.	kg (lb)	0.5 (1.10)	0.7 (1.54)	1.1 (2.43)
Suitable for PM240-2 Power Module standard variant	Type	6SL3210-1PB13-0 . L0 6SL3210-1PB13-8 . L0	6SL3210-1PB15-5 . L0 6SL3210-1PB17-4 . L0 6SL3210-1PB21-0 . L0	6SL3210-1PB21-4 . L0 6SL3210-1PB21-8 . L0
• Frame size		FSA	FSB	FSC

Line voltage 380 ... 480 V 3 AC		**Braking resistor**			
		6SL3201-0BE14-3AA0	6SL3201-0BE21-0AA0	6SL3201-0BE21-8AA0	6SL3201-0BE23-8AA0
Resistance	Ω	370	140	75	30
Rated power P_{DB} (Continuous braking power)	kW	0.075	0.2	0.375	0.925
Peak power P_{max} (load duration t_a = 12 s with period t = 240 s)	kW	1.5	4	7.5	18.5
Power connection		Terminal block	Terminal block	Terminal block	Terminal block
• Conductor cross-section	mm^2	2.5	2.5	4	6
Thermostatic switch		NC contact	NC contact	NC contact	NC contact
• Contact load, max.		250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A	250 V AC/2.5 A
• Conductor cross-section	mm^2	2.5	2.5	2.5	2.5
PE connection					
• Via terminal block		Yes	Yes	Yes	Yes
• PE connection on housing		M4 screw	M4 screw	M4 screw	M4 screw
Degree of protection		IP20	IP20	IP20	IP20
Dimensions					
• Width	mm (in)	105 (4.13)	105 (4.13)	175 (6.89)	250 (9.84)
• Height	mm (in)	295 (11.61)	345 (13.58)	345 (13.58)	490 (19.29)
• Depth	mm (in)	100 (3.94)	100 (3.94)	100 (3.94)	140 (5.51)
Weight, approx.	kg (lb)	1.5 (3.31)	1.8 (3.97)	2.7 (5.95)	6.2 (13.7)
Suitable for PM240-2 Power Modules standard variant	Type	6SL3210-1PE11-8 . L1 6SL3210-1PE12-3 . L1 6SL3210-1PE13-2 . L1 6SL3210-1PE14-3 . L1	6SL3210-1PE16-1 . L1 6SL3210-1PE18-0 . L1	6SL3210-1PE21-1 . L0 6SL3210-1PE21-4 . L0 6SL3210-1PE21-8 . L0	6SL3210-1PE22-7 . L0 6SL3210-1PE23-3 . L0
• Frame size		FSA	FSA	FSB	FSC

Technical specifications

Line voltage 380 ... 480 V 3 AC		Braking resistor				
		JJY:023422620001	JJY:023424020001	JJY:023434020001	JJY:023454020001 [1]	JJY:023464020001 [2]
Resistance	Ω	25	15	10	7.1	5
Rated power P_{DB} (Continuous braking power)	kW	1.1	1.85	2.75	3.85	5.5
Peak power P_{max} (load duration t_a = 12 s with period t = 240 s)	kW	22	37	55	77	110
Power connection		Cable	Cable	Cable	Cable	Cable
Thermostatic switch		Integrated	Integrated	Integrated	Integrated	Integrated
Degree of protection		IP21	IP21	IP21	IP21	IP21
Dimensions						
• Width	mm (in)	220 (8.66)	220 (8.66)	350 (13.78)	[1]	[2]
• Height	mm (in)	470 (18.5)	610 (24.02)	630 (24.8)	[1]	[2]
• Depth	mm (in)	180 (7.09)	180 (7.09)	180 (7.09)	[1]	[2]
Weight, approx.	kg (lb)	7 (15.4)	9.5 (20.9)	13.5 (29.8)	20.5 (45.2)	27 (59.5)
Suitable for PM240-2 Power Module	Type	6SL3210-1PE23-8 . L0 6SL3210-1PE24-5 . L0	6SL3210-1PE26-0 . L0 6SL3210-1PE27-5 . L0	6SL3210-1PE28-8 . L0 6SL3210-1PE31-1 . L0	6SL3210-1PE31-5 . L0 6SL3210-1PE31-8 . L0	6SL3210-1PE32-1 . L0 6SL3210-1PE32-5 . L0
• Frame size		FSD	FSD	FSE	FSF	FSF

Characteristic curves



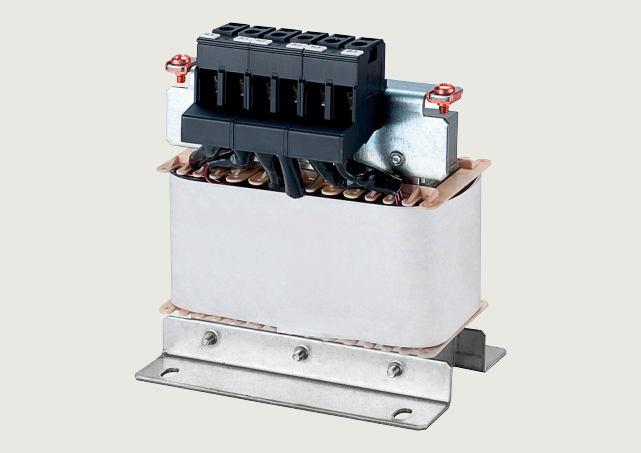
Load diagram for the braking resistors

t_a = 12 s (see section Technical specifications)
t = 240 s (see section Technical specifications)

[1] This braking resistor consists of the two braking resistors, JJY:023422620001 and JJY:023434020001, which must be connected in parallel on the plant/system side.

[2] This braking resistor consists of two JJY:023434020001 braking resistors, which must be connected in parallel on the plant/system side.

Overview



Output reactor for PM240-2 Power Modules, frame size FSA

Output reactors reduce the rate of voltage rise (*dv/dt*) and the height of the current peaks, and enable longer motor cables to be connected.

Owing to the high rates of voltage rise of the fast-switching IGBTs, the capacitance of long motor cables reverses polarity very quickly with every switching operation in the inverter. As a result, the inverter is loaded with additional current peaks of substantial magnitude.

Output reactors reduce the magnitude of these additional peaks because the cable capacitance reverses polarity more slowly across the reactor inductance, thereby attenuating the amplitudes of the current peaks.

When using output reactors, the following should be observed:

- Max. permissible output frequency 150 Hz
- Max. permissible pulse frequency 4 kHz
- The output reactor must be installed as close as possible to the Power Module

Integration

Output reactors that are optionally available depending on the Power Module used

	Frame size					
	FSA	**FSB**	**FSC**	**FSD**	**FSE**	**FSF**
PM240-2 Power Module with integrated braking chopper						
Load-side power components						
Output reactor	**S**	**S**	**S**	**S**	**S**	**S**

S = Lateral mounting

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Selection and ordering data

Type rating		PM240-2 Power Module standard variant		**Output reactor**
kW	hp	Type 6SL3210-...	Frame size	Article No.
200 ... 240 V 1 AC/3 AC				
0.55	0.75	1PB13-0 . L0	FSA	**6SL3202-0AE16-1CA0**
0.75	1	1PB13-8 . L0		
1.1	1.5	1PB15-5 . L0	FSB	**6SL3202-0AE16-1CA0**
1.5	2	1PB17-4 . L0	FSB	**6SL3202-0AE18-8CA0**
2.2	3	1PB21-0 . L0	FSB	**6SL3202-0AE21-8CA0**
3	4	1PB21-4 . L0	FSC	**6SL3202-0AE21-8CA0**
4	5	1PB21-8 . L0		
380 ... 480 V 3 AC				
0.55	0.75	1PE11-8 . L1	FSA	**6SL3202-0AE16-1CA0**
0.75	1	1PE12-3 . L1		
1.1	1.5	1PE13-2 . L1		
1.5	2	1PE14-3 . L1		
2.2	3	1PE16-1 . L1		
3	4	1PE18-0 . L1	FSA	**6SL3202-0AE18-8CA0**
4	5	1PE21-1 . L0	FSB	**6SL3202-0AE21-8CA0**
5.5	7.5	1PE21-4 . L0		
7.5	10	1PE21-8 . L0		
11	15	1PE22-7 . L0	FSC	**6SL3202-0AE23-8CA0**
15	20	1PE23-3 . L0		
18.5	25	1PE23-8 . L0	FSD	**6SE6400-3TC07-5ED0**
22	30	1PE24-5 . L0		
30	40	1PE26-0 . L0		
37	50	1PE27-5 . L0		
45	60	1PE28-8 . L0	FSE	**6SE6400-3TC14-5FD0**
55	75	1PE31-1 . L0		
75	100	1PE31-5 . L0	FSF	**6SE6400-3TC14-5FD0**
90	125	1PE31-8 . L0		
110	150	1PE32-1 . L0	FSF	**6SL3000-2BE32-1AA0**
132	200	1PE32-5 . L0	FSF	**6SL3000-2BE32-6AA0**

Technical specifications

Line voltage 200 ... 240 V 1 AC/3 AC or 380 ... 480 V 3 AC		**Output reactor (for a 4 kHz pulse frequency)**			
		6SL3202-0AE16-1CA0	6SL3202-0AE18-8CA0	6SL3202-0AE21-8CA0	6SL3202-0AE23-8CA0
Rated current	A	6.1	9	18.5	39
Power loss, max.	kW	0.09	0.08	0.08	0.11
Connection to the Power Module/ motor connection		Screw terminals	Screw terminals	Screw terminals	Screw terminals
• Conductor cross-section	mm^2	4	4	10	16
PE connection		M4 screw stud	M4 screw stud	M5 screw stud	M5 screw stud
Cable length, max. between output reactor and motor					
• 200 -10 % ... 240 V +10 % 3 AC and 380 -10 % ... 415 V +10 % 3 AC					
- Shielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
- Unshielded	m (ft)	225 (738)	225 (738)	225 (738)	225 (738)
• 440 ... 480 V 3 AC +10 %					
- Shielded	m (ft)	100 (328)	100 (328)	100 (328)	100 (328)
- Unshielded	m (ft)	150 (492)	150 (492)	150 (492)	150 (492)
Dimensions					
• Width	mm (in)	207 (8.15)	207 (8.15)	247 (9.72)	257 (10.1)
• Height	mm (in)	175 (6.89)	180 (7.09)	215 (8.46)	235 (9.25)
• Depth	mm (in)	72.5 (2.85)	72.5 (2.85)	100 (3.94)	114.7 (4.52)
Degree of protection		IP20	IP20	IP20	IP20
Weight, approx.	kg (lb)	3.4 (7.5)	3.9 (8.6)	10.1 (22.3)	11.2 (24.7)
Suitable for PM240-2 standard variant 200 ... 240 V 1 AC/3 AC	Type	6SL3210-1PB13-0 . L0 6SL3210-1PB13-8 . L0 FSA 6SL3210-1PB15-5 . L0 FSB	6SL3210-1PB17-4 . L0 FSB	6SL3210-1PB21-0 . L0 6SL3210-1PB21-4 . L0 FSB 6SL3210-1PB21-8 . L0 FSC	–
Suitable for PM240-2 standard variant 380 ... 480 V 3 AC	Type	6SL3210-1PE11-8 . L1 6SL3210-1PE12-3 . L1 6SL3210-1PE13-2 . L1 6SL3210-1PE14-3 . L1 6SL3210-1PE16-1 . L1 FSA	6SL3210-1PE18-0 . L1 FSA	6SL3210-1PE21-1 . L0 6SL3210-1PE21-4 . L0 6SL3210-1PE21-8 . L0 FSB	6SL3210-1PE22-7 . L0 6SL3210-1PE23-3 . L0 FSC

Technical specifications

Line voltage 380 ... 480 V 3 AC		Output reactor (for a 4 kHz pulse frequency)			
		6SE6400-3TC07-5ED0	6SE6400-3TC14-5FD0	6SL3000-2BE32-1AA0	6SL3000-2BE32-6AA0
Rated current	A	90	178	210	260
Power loss, max.	kW	0.27	0.47	0.49	0.5
Connection to the Power Module/ motor connection		Flat connector for M6 screw	Flat connector for M8 screw	Flat connector for M10 screw	Flat connector for M10 screw
PE connection		M6 screw	M8 screw	M8 screw	M8 screw
Cable length, max. between output reactor and motor					
• Shielded	m (ft)	200 (656)	200 (656)	300 (984)	300 (984)
• Unshielded	m (ft)	300 (984)	300 (984)	450 (1476)	450 (1476)
Dimensions					
• Width	mm (in)	270 (10.63)	350 (13.78)	300 (11.81)	300 (11.81)
• Height	mm (in)	248 (9.76)	321 (12.64)	285 (11.22)	315 (12.4)
• Depth	mm (in)	209 (8.23)	288 (11.34)	257 (10.12)	277 (10.91)
Degree of protection		IP00	IP00	IP00	IP00
Weight, approx.	kg (lb)	27 (59.5)	57 (126)	60 (132)	66 (146)
Suitable for PM240-2 standard variant	Type	6SL3210-1PE23-8 . L0 6SL3210-1PE24-5 . L0 6SL3210-1PE26-0 . L0 6SL3210-1PE27-5 . L0 FSD	6SL3210-1PE28-8 . L0 6SL3210-1PE31-1 . L0 FSE 6SL3210-1PE31-5 . L0 6SL3210-1PE31-8 . L0 FSF	6SL3210-1PE32-1 . L0 FSF	6SL3210-1PE32-5 . L0 FSF

Overview

Shield connection kits are available for EMC-compliant installation of Power Modules. The shield connection kit makes it easier to connect the shields of supply and control cables, provides mechanical strain relief and thus ensures optimum EMC performance.

A shield connection kit is supplied as standard with PM240-2 Power Modules in frame sizes FSA to FSC. A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size for the frame sizes FSD to FSF. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered for frame sizes FSD to FSF.

Selection and ordering data

Description	Article No.
Shield connection kit for PM240-2 Power Modules	
• Frame sizes FSA to FSC	Supplied with the Power Modules, available as a spare part
• Frame sizes FSD to FSF A set of shield plates is included in the scope of delivery for the motor and signal cables corresponding to the frame size. For the electromagnetically compatible connection of an optionally connectable braking resistor, the corresponding shield connection kit is to be ordered.	
- Frame size FSD	**6SL3262-1AD01-0DA0**
- Frame size FSE	**6SL3262-1AE01-0DA0**
- Frame size FSF	**6SL3262-1AF01-0DA0**

Overview

BOP20 Basic Operator Panel

Parameters can be set, diagnostics information (e.g. alarm and fault messages) read out and faults acknowledged using the BOP20 Basic Operator Panel.

Design

The BOP20 Basic Operator Panel has a backlit two-line display area with six keys.

The integrated plug connector on the rear of the BOP20 Basic Operator Panel provides its power and establishes communication with the Control Unit.

Selection and ordering data

Description	Article No.
BOP20 Basic Operator Panel	**6SL3055-0AA00-4BA0**

Integration

The BOP20 Basic Operator Panel can be inserted on the following Control Units:

- SINAMICS S110
  - CU305
- SINAMICS S120
  - CU310-2
  - CU320-2

Control Unit CU305 with attached BOP20 Basic Operator Panel

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Overview

Safe Brake Relay

With the Safe Brake Relay, the brake is controlled in accordance with IEC 61508 SIL 2 and EN ISO 13849-1 PL d and Category 3.

Design

The Safe Brake Relay can be installed below the Power Module on the shield connection plate.

The Safe Brake Relay has the following connections and interfaces:

- 1 two-channel transistor output stage to control the motor brake solenoid
- 1 connection for the cable harness (CTRL) to the Power Module in blocksize format
- 1 connection for the 24 V DC power supply

The connection between the 24 V DC supply and the Safe Brake Relay must be kept as short as possible.

The scope of supply of a Safe Brake Relay includes the following:

- 3 cable harnesses for connecting to the CTRL socket of the Power Module
  - Length 0.32 m (1.05 ft) for frame sizes FSA to FSC
  - Length 0.55 m (1.80 ft) for frame sizes FSD and FSE
  - Length 0.8 m (2.62 ft) for frame size FSF
  - Length 1.1 m (3.61 ft) for frame size FSG

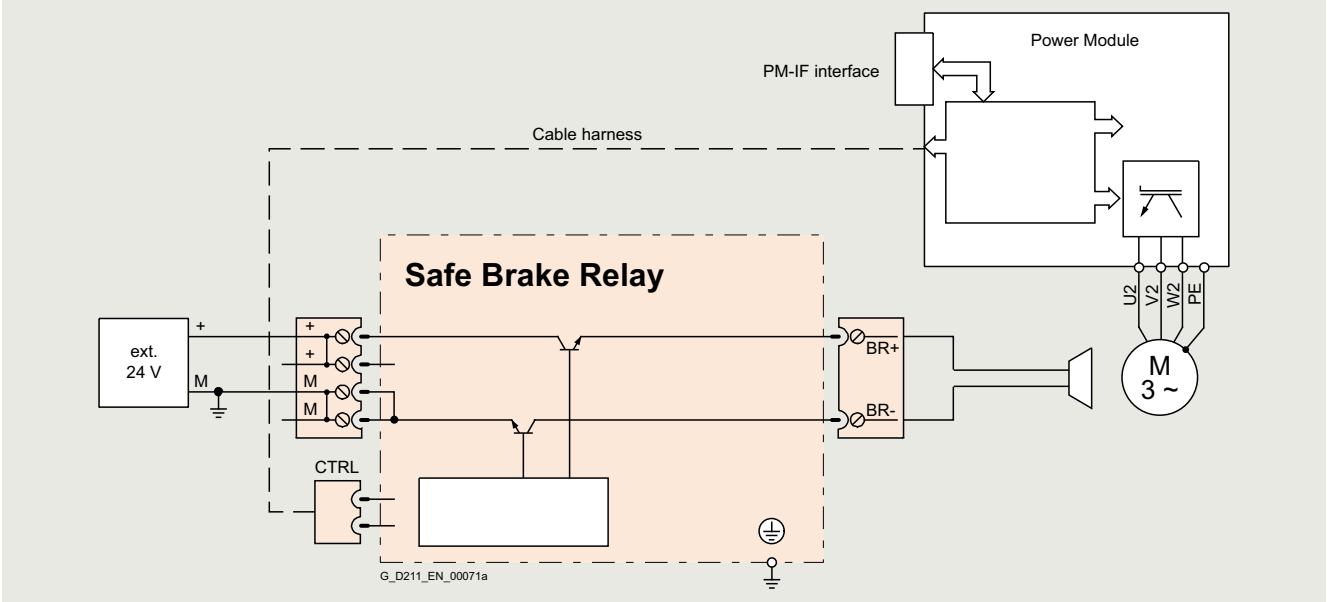
Selection and ordering data

Description	Article No.
Safe Brake Relay Including cable harness for connection to Power Module	**6SL3252-0BB01-0AA0**

Technical specifications

	Safe Brake Relay 6SL3252-0BB01-0AA0
Power supply	20.4 ... 28.8 V DC Recommended rated supply voltage 26 V DC (to compensate for voltage drop in feeder cable to 24 V DC motor brake solenoid)
Current requirement, max.	
• Motor brake	2.5 A
• At 24 V DC	0.05 A + the current requirement of motor brake
Conductor cross-section, max.	2.5 mm^2
Dimensions	
• Width	69 mm (2.72 in)
• Height	63 mm (2.48 in)
• Depth	33 mm (1.30 in)
Weight, approx.	0.17 kg (0.37 lb)

Integration

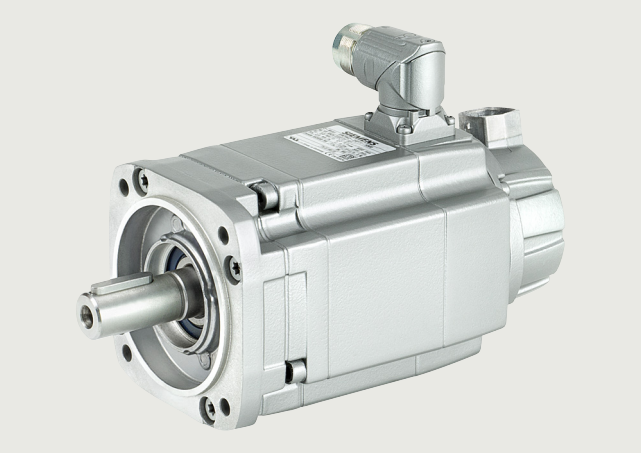


Connection example of a Safe Brake Relay

The 24 V DC solenoid of the motor brake is directly connected to the Safe Brake Relay. External overvoltage limiters are not required.

Overview

Motors with DRIVE-CLiQ interface



DRIVE-CLiQ is the preferred method for connecting the encoder systems to SINAMICS S110 or SINAMICS S120.

Motors with DRIVE-CLiQ interface are available for this purpose, e.g.

- SIMOTICS M-1PH8 and SIMOTICS S-1FT7/1FK7 synchronous motors
- SIMOTICS M-1PH8 asynchronous motors (induction motors)
- SIMOTICS T-1FW3 torque motors

Motors with a DRIVE-CLiQ interface can be directly connected to the SINAMICS S110 Control Unit CU305 or, in case of the SINAMICS S120 drive system, to the associated Motor Module using MOTION-CONNECT DRIVE-CLiQ cables. The MOTION-CONNECT DRIVE-CLiQ cable connection at the motor has degree of protection IP67.

The DRIVE-CLiQ interface supplies the motor encoder via the integrated 24 V DC supply and transfers the motor encoder and temperature signals and the electronic rating plate data, e.g. a unique identification number and rated data (voltage, current, torque) to the Control Unit. This means that for the various encoder types – e.g. resolver or absolute encoder – different encoder cables with varying permissible lengths are no longer required; just one cable type, MOTION-CONNECT DRIVE-CLiQ with varying permissible lengths, can be used for all encoders.

These motors simplify commissioning and diagnostics, as the motor and encoder type are identified automatically.

Motors without DRIVE-CLiQ interface

The encoder and temperature signals of motors without DRIVE-CLiQ interface, as well as those of external encoders, must be connected via Sensor Modules. Sensor Modules Cabinet-Mounted are available in degree of protection IP20 for control cabinet installation, as well as Sensor Modules External-Mounted in degree of protection IP67.

Only one encoder system can be connected to each Sensor Module.

More information

Motor encoder and temperature signals must be connected when possible to the corresponding Motor Module or Power Module and external encoders to the Control Unit. However, the DRIVE-CLiQ connections can also be bundled via DRIVE-CLiQ Hub Modules.

Safety Integrated

The Safety Integrated extended functions of the SINAMICS drive system require suitable encoders (see Catalog D 21.4, SIMOTICS servomotors section).

Motors driving a load via a belt

Unfavorable material combinations generate static electricity between the belt pulley and the belt. Electrostatic charging must be prevented, since this can discharge via the motor shaft and the encoder, thereby causing disturbances in the encoder signals. One countermeasure is to manufacture belts out of an antistatic material, for example.

Overview

SMC10 Sensor Module Cabinet-Mounted

The SMC10 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC10.

The following encoder signals can be evaluated:

- 2-pole resolver
- Multi-pole resolver

Design

The SMC10 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 1 encoder connection including motor temperature sensing (KTY84-130, Pt1000 [1] or PTC) via SUB-D connector
- 1 DRIVE-CLiQ interface
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE connection

The status of the SMC10 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC10 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 standard mounting rail according to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC10 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used as a strain relief mechanism.

Integration

SMC10 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Selection and ordering data

Description	Article No.
SMC10 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5AA3**
Accessories for re-ordering	
Dust protection blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Technical specifications

	SMC10 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5AA3
Current requirement, max. at 24 V DC, without taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	10 W
Encoders which can be evaluated	• 2-pole resolvers • Multi-pole resolver
• Excitation voltage, rms	4.1 V
• Excitation frequency	5 ... 16 kHz depending on the current controller clock cycle of the Motor Module or Power Module
• Transformation ratio	0.5
• Encoder frequency, max.	2 kHz (120000 rpm) depending on the number of resolver pole pairs and current controller clock cycle of the Motor Module or Power Module
• Signal subdivision (interpolation), max.	16384 times (14 bits)
• Cable length to encoder, max.	130 m (427 ft)
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.45 kg (0.99 lb)
Certificate of suitability	cULus

[1] The Pt1000 sensor is not supported when combined with a Control Unit CU305.

Overview

SMC20 Sensor Module Cabinet-Mounted

The SMC20 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC20.

The following encoder signals can be evaluated:

- Incremental encoder sin/cos 1 V_{pp}
- Absolute encoder EnDat 2.1
- SSI encoder with incremental signals sin/cos 1 V_{pp} (firmware version 2.4 and later)

The motor temperature can also be sensed using a PTC thermistor KTY84-130, Pt1000 [1] or PTC.

Design

The SMC20 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 1 encoder connection including motor temperature sensing (KTY84-130, Pt1000 [1] or PTC) via SUB-D connector
- 1 DRIVE-CLiQ interface
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE connection

The status of the SMC20 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC20 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 standard mounting rail according to EN 60715 (IEC 60715).

The signal cable shield is connected via the encoder system connector and can also be connected to the SMC20 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g. Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used as a strain relief mechanism.

Integration

SMC20 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Selection and ordering data

Description	Article No.
SMC20 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5BA3**
Accessories for re-ordering	
Dust protection blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Technical specifications

	SMC20 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5BA3
Current requirement, max. at 24 V DC, without taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	10 W
Encoders which can be evaluated	• Incremental encoder sin/cos 1 V_{pp} • Absolute encoder EnDat 2.1 • SSI encoder with incremental signals sin/cos 1 V_{pp} (firmware version 2.4 and later)
• Encoder supply	5 V DC/0.35 A
• Encoder frequency incremental signals, max.	500 kHz
• Signal subdivision (interpolation), max.	16384 times (14 bits)
• SSI baud rate	100 ... 1000 kBaud
• Cable length to encoder, max.	100 m (328 ft)
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.45 kg (0.99 lb)
Certificate of suitability	cULus

[1] The Pt1000 sensor is not supported when combined with a Control Unit CU305.

Overview

SMC30 Sensor Module Cabinet-Mounted

The SMC30 Sensor Module Cabinet-Mounted is required to evaluate the encoder signals of motors without a DRIVE-CLiQ interface. External encoders can also be connected via the SMC30.

The following encoder signals can be evaluated:

- Incremental encoders TTL/HTL with/without open-circuit detection (open-circuit detection is only available with bipolar signals)
- SSI encoder with TTL/HTL incremental signals
- SSI encoder without incremental signals

The motor temperature can also be sensed using a PTC thermistor KTY84-130, Pt1000 [1] or PTC.

Design

The SMC30 Sensor Module Cabinet-Mounted features the following connections and interfaces as standard:

- 1 encoder connection including motor temperature sensing (KTY84-130, Pt1000 [1] or PTC) either via SUB-D connector or via terminals
- 1 DRIVE-CLiQ interface
- 1 connection for the electronics power supply via the 24 V DC supply connector
- 1 PE connection

The status of the SMC30 Sensor Module Cabinet-Mounted is indicated via a multi-color LED.

The SMC30 Sensor Module Cabinet-Mounted can be snapped onto a TH 35 standard mounting rail according to EN 60715 (IEC 60715).

The maximum encoder cable length between SMC30 modules and encoders is 100 m. For HTL encoders, this length can be increased to 300 m if the A+/A- and B+/B- signals are evaluated and the power supply cable has a minimum cross-section of 0.5 mm^2.

The signal cable shield can be connected to the SMC30 Sensor Module Cabinet-Mounted via a shield connection terminal, e.g., Phoenix Contact type SK8 or Weidmüller type KLBÜ CO 1. The shield connection terminal must not be used as a strain relief mechanism.

Integration

SMC30 Sensor Modules Cabinet-Mounted communicate with a Control Unit via DRIVE-CLiQ.

Selection and ordering data

Description	Article No.
SMC30 Sensor Module Cabinet-Mounted Without DRIVE-CLiQ cable	**6SL3055-0AA00-5CA2**
Accessories for re-ordering	
Dust protection blanking plugs (50 units) For DRIVE-CLiQ port	**6SL3066-4CA00-0AA0**

Technical specifications

	SMC30 Sensor Module Cabinet-Mounted 6SL3055-0AA00-5CA2
Current requirement, max. at 24 V DC, without taking encoder into account	0.2 A
• Conductor cross-section, max.	2.5 mm^2
• Fuse protection, max.	20 A
Power loss, max.	10 W
Encoders which can be evaluated	• Incremental encoder TTL/HTL • SSI encoder with TTL/HTL incremental signals • SSI encoder without incremental signals
• Input current range TTL/HTL	4 ... 20 mA (typ. 10 mA)
• Encoder supply	24 V DC/0.35 A or 5 V DC/0.35 A
• Encoder frequency, max.	500 kHz
• SSI baud rate	100 ... 1000 kBaud
• Resolution absolute position SSI	30 bit
• Cable length, max.	
- TTL encoder	100 m (328 ft) (only bipolar signals permitted) [2]
- HTL encoder	100 m (328 ft) for unipolar signals 300 m (984 ft) for bipolar signals [2]
- SSI encoder	100 m (328 ft)
PE connection	M4 screw
Dimensions	
• Width	30 mm (1.18 in)
• Height	150 mm (5.91 in)
• Depth	111 mm (4.37 in)
Weight, approx.	0.45 kg (0.99 lb)
Certificate of suitability	cULus

[1] The Pt1000 sensor is not supported when combined with a Control Unit CU305.

[2] Signal cables twisted in pairs and shielded.

Notes