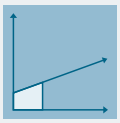
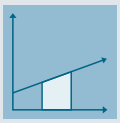
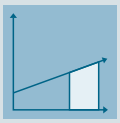
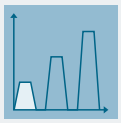
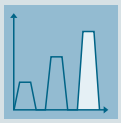
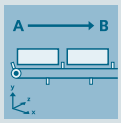
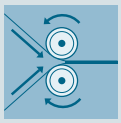
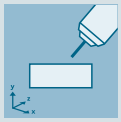
SINAMICS V20 basic converters
0.12 kW to 30 kW (0.16 hp to 40 hp)

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 G120P	G120P G130/G150 G180 [1]	S120	G120	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 con-veyors Storage and retrieval machines	Acceleration con-veyors 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 G110D G110M G120C ET 200pro FC-2 [2]	G120 G120D G130/G150 G180 [1]	S120 S150 DCM	V90 G120 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 G130/G150 G180 [1]	S120 S150 DCM	V90 G120	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

With the compact SINAMICS V20 converter, Siemens offers a simple and economical drive solution for applications with simple motion sequences and basic requirements.

SINAMICS V20 sets itself apart with its quick commissioning times, ease of operation, robustness and cost-efficiency.

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 drives:

- More performance for the control cabinet in IP20 degree of protection ⇒ SINAMICS G120C
- With positioning function in the control cabinet in IP20 degree of protection ⇒ SINAMICS G120
- With positioning function for distributed drive solutions in IP65 degree of protection ⇒ SINAMICS G120D (Catalog D 31.2)

[1] Industry-specific inverters.

[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 V20 converters, frame sizes: FSAA, FSAB, FSAC, FSA, FSB, FSC, FSD and FSE

SINAMICS V20 – The cost-effective, reliable and easy-to-use converter for basic applications

Today, in an increasing number of applications in plant and machinery construction, individual automation and drive solutions are demanded that automate simple motion sequences with low associated requirements.

The compact SINAMICS V20, the basic performance converter, offers a simple and cost-effective drive solution for these types of applications. SINAMICS V20 sets itself apart with its quick commissioning times, ease of operation, robustness and cost-efficiency.

With eight frame sizes, it covers a power range extending from 0.12 kW to 30 kW (0.16 hp to 40 hp).

Minimizing costs

SINAMICS V20 keeps engineering and commissioning costs as well as those in operation as low as possible. To increase energy efficiency, the converter is equipped with a control technique to achieve optimum energy efficiency through automatic flux reduction. Not only this, it displays the actual energy consumption and has additional, integrated energy-saving functions. This allows energy consumption to be slashed drastically.

Benefits

Easy to install

- Push-through and wall mounting
  - Side-by-side mounting possible for both
  - Compact installation allows smaller cabinets to be used
  - Push-through mounting allows the cabinet to be cooled more easily
  - Frame sizes FSAA, FSAB and FSAC (230 V 1 AC) are significantly smaller compared to the previous frame sizes FSA and FSB within the same power range
- Plug & Play
  - Can be run "out-of-the-box" without other options
  - Basic operator actions at a built-in BOP (Basic Operator Panel)
- Connection of SINAMICS V20 with USS or Modbus RTU via terminals
  - Easy integration into existing systems
  - Easier commissioning through standard libraries and connection macros
  - Full flexibility of Modbus RTU settings widens communication with controller
  - Simple connection to a control system (e.g. SIMATIC S7 PLC via Modbus RTU/USS)
- Integrated Braking Module
  - Converters ≥ 7.5 kW (frame sizes FSD and FSE) have an integrated Braking Module. In this case, the braking resistor can be directly connected. The dynamic energy is dissipated as heat in a braking resistor with an adjustable duty cycle of between 5 % and 100 %.
  - Possible to use dynamic braking to increase braking performance
- EMC category C1
  - The devices are optionally available with an integrated RFI suppression filter, enabling compliance with the radio interference limit values laid out in IEC 61800-3 category C1 when installed in the control cabinet in an EMC-compliant manner. Frame sizes FSAA, FSAB and FSAC therefore satisfy the radio interference requirements for industrial applications as well as for use in residential and business environments, including commercial applications such as refrigerated counters, fitness equipment, ventilation systems, industrial washing machines, etc.

Benefits (continued)

Easy to use

- Parameter settings can be easily transferred from one unit to another using the battery-operated parameter loader.
  - Less technical support required
  - Short commissioning time
  - The product is delivered to the customer already preset
- Integrated connection and application macros
  To simplify I/O configuration and make the appropriate settings
  - Shorter commissioning time
  - Integrated and optimized application setting
  - Simple connection and application macros can be selected instead of configuring long, complicated parameter lists
  - Errors caused by wrong parameter settings can be avoided
- Keep Running Mode allows uninterrupted operation
  This function provides higher productivity in production by automatic adaptation in the case of unstable line supplies
  - Stable operation under difficult line supply conditions
  - Higher productivity through prevention of interruptions to the production line
  - Adaptation to application-relevant reactions through flexible definition in case of faults/alarms
- Wide voltage range, advanced cooling design and coated PCBs increase robustness of the drive in difficult environments
  - Operation possible when the line supply voltage fluctuates
  - Reliable operation at line voltages:
    200 V ... 240 V 1 AC (-15 %/+10 %) [1)]
    380 V ... 480 V 3 AC (-15 %/+10 %)
  - Operating and ambient temperatures between -10 °C and +40 °C (max. +60 °C with derating)
- Wireless commissioning, operation and diagnostics via mobile device or laptop thanks to the optional web server module SINAMICS V20 Smart Access
  - Enables easy access to the converter, even when it is installed in difficult-to-access areas
  - Simple operation thanks to intuitive user interface and commissioning wizard
  - Flexible choice of terminal devices as the web server works with every HTML5-compatible web browser
- Expansion of the 400 V converters with two digital inputs and two digital outputs (relay outputs) thanks to optional SINAMICS V20 I/O Extension Module
  - Higher flexibility of the frequency converter without additional outlay for installation, hardware and software
  - Additional functionalities such as multi-pump control, with which up to four pumps can be controlled with a frequency converter

Easy to save money

Energy reduction during operation and standby

- ECO mode for V/f, V^2/f
  The integrated ECO mode for V/f, V^2/f control automatically adapts the magnetic flux in the motor to save energy. The energy consumption can be shown in kWh, CO_2 or even in the local currency.
  - Energy saving during low dynamic load cycles
  - Specifies the actual energy that has been saved
- Hibernation mode
  Converter and motor are only activated when used by the plant or machine
  - Smart hibernation saves energy
  - Motor service life is extended
  - Reduced pump wear at low speed
  - Less time needed to program PLC code for pump/fan applications (PLC)
- DC link coupling
  Applications that use SINAMICS V20 drives with the same power rating can share a common DC bus to reuse the regenerative energy
  - Generate and save energy in applications that use coupled motors
  - The converters can then optimally share the load mutually.
  - Reduce the need for dynamic braking and external components

Integrated energy flow monitoring

- Energy consumption and savings are monitored without the need for power measurement equipment
  - Intuitive values of power consumption and savings without additional investments for measurement equipment
  - Values can be shown as kWh, CO_2 or as a currency

Cost-savings for low-overload applications with SINAMICS V20 converters, frame size FSE

SINAMICS V20 frame size FSE converters feature two different load cycles:

- Low overload (LO): 110 % × I_L [2)] for 60 s (cycle time: 300 s)
- High overload (HO): 150 % × I_H [3)] for 60 s (cycle time: 300 s)

With the low-overload cycle, the converter can reach a higher output current and power.
A smaller converter can be used. Optimally designed for variable applications:

- Low overload for applications with a low dynamic response (continuous duty)
- High overload for applications with a high dynamic response (cyclic duty)

Complete motion control solutions from Siemens – SINAMICS V20 and SIMATIC

Siemens offers comprehensive solutions from a single source for general motion control applications with a selection of different SINAMICS application examples:

- Ready-to-run application examples, including wiring diagrams, parameter descriptions
- Sample configurations for connecting SINAMICS with SIMATIC, including hardware, software and wiring examples, installation instructions for the supplied S7 project, drive parameterization, and HMI sample projects
  - Correctly configured project, ready for operation
  - Optimal leveraging of TIA advantages
  - Free download via the Online Support portal:
    www.siemens.com/sinamics-applications

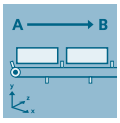
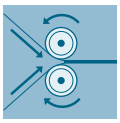
[1)] Single-phase devices can also be connected to two phases of a three-phase 120/240 V power supply system. The voltage between L1 and L2 should be within the range of 200 V to 240 V, -15 % to +10 % (phase-phase or phase-neutral conductor). Further information can be found at:
https://support.industry.siemens.com/cs/document/109476260

[2)] The output current I_L is based on the duty cycle for low overload (LO).

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

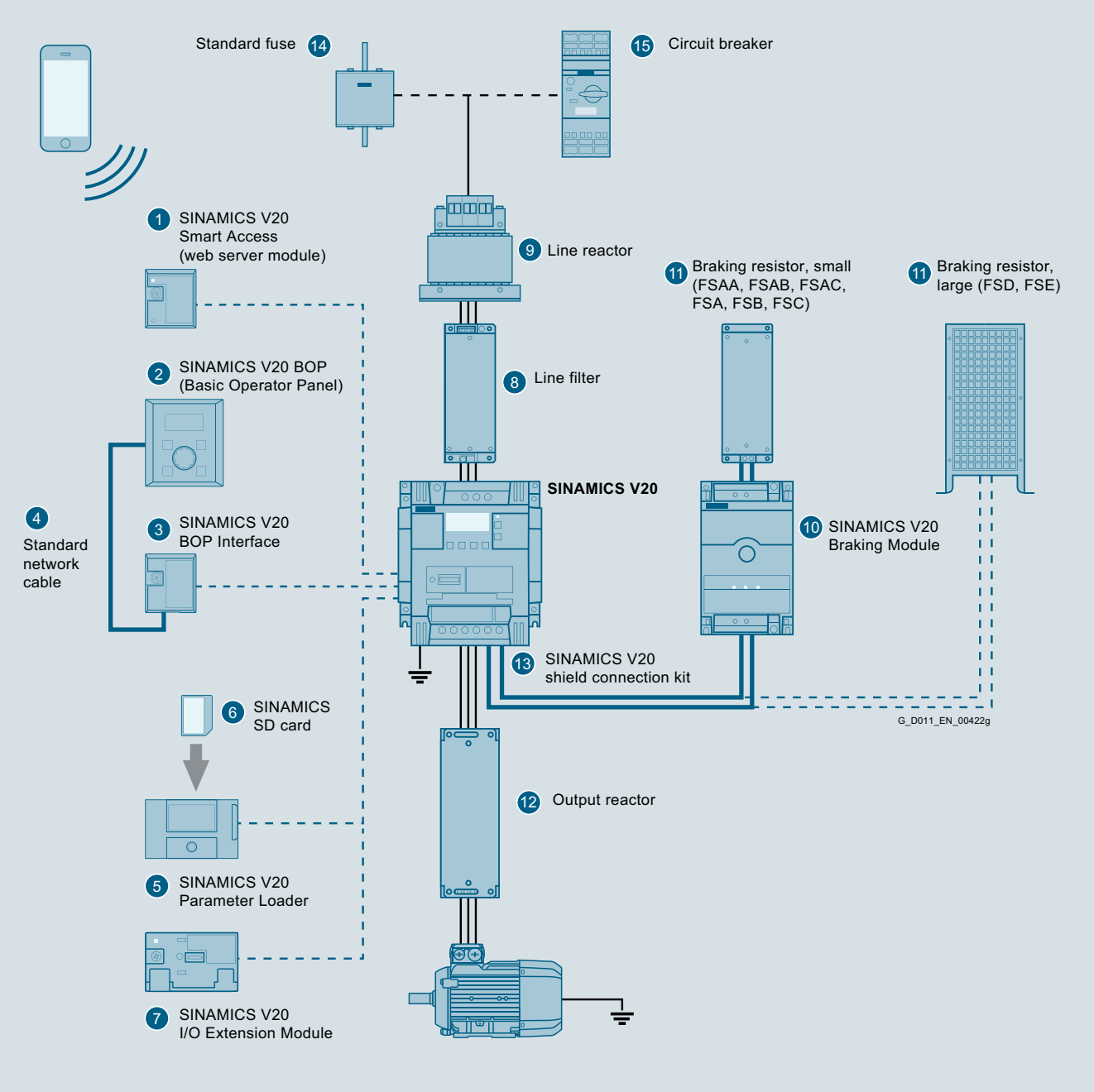
Application

Typical applications

Pumping, ventilating, compressing	Advantages
 • Centrifugal pumps • Radial/axial fans • Compressors	• High availability through automatic restart and flying restart after power failures • Broken belt detection by monitoring the load torque • Pump protection against cavitation • Hammer start and blockage clearing modes for clogged pumps • PID controller for process values (e.g. temperature, pressure, level, flow) • PID auto tuning to optimize controller parameters • Hibernation mode stops the motor when demand is low • Motor staging extends the flow range by adding two more fixed-speed drives (cascade) • Frost and condensation protection prevents moisture in motors under extreme environmental conditions • With optional SINAMICS V20 I/O Extension Module for 400 V converters: Multi-pump control [1], with which up to four pumps can be controlled with a frequency converter and applications that require additional digital inputs and digital outputs (e.g. in water supply systems for buildings)
Moving	**Advantages**
 • Conveyor belts • Roller conveyors • Chain conveyors • Moving walkways • Bucket conveyors	• Soft, jerk-free acceleration reduces the stress on the gear units, bearings, drums and rollers • Super torque start for conveyor belts with high breakaway torque • Dynamic behavior by using braking resistor or DC braking • Direct control of mechanical holding brake • Broken belt detection by monitoring the load torque • Precise stopping with Quick Stop (switch-off positioning) independently of the control cycle
Processing	**Advantages**
 • Single drives in the processing industry such as mills, mixers, kneaders, crushers, agitators, centrifuges • Single drives in commercial applications such as ovens, mixers, industrial washing machines • Main drives in machines with mechanically coupled axes such as spinning machines, braiding machines for textiles, ropes and wires	• Frost and condensation protection prevents moisture in motors under extreme environmental conditions • Higher productivity with uninterrupted production due to Keep Running Mode • Exchange of regenerative energy via the DC link • Super torque start for machines with a high breakaway torque

[1] Further information on the multi-pump control can be found in the operating instructions and on the Internet at:
www.siemens.com/sinamics-v20/documentation

Design



SINAMICS V20 converter and accessories

Design (continued)

Accessories		
①	**SINAMICS V20 Smart Access**	Wireless commissioning, operation, and diagnostics with mobile device or laptop using web server module
②	**SINAMICS V20 BOP**	• Same function as the integrated BOP (Basic Operator Panel) • Can also be used for remote mounting • Values and setpoints are changed by rotating the wheel • For distributed mounting with IP54 and UL Type 1 enclosure rating
③	**SINAMICS V20 BOP Interface**	• Connection between converter and BOP • RJ45 interface is compatible with standard network cable
④	**Standard network cable**	• Cable not included in delivery • You can use any standard network cable with standard RJ45 connector
⑤	**SINAMICS V20 Parameter Loader**	• Up to 100 parameter sets with parameter settings can be written from the memory card to the converter, or saved from the converter to the memory card • The converter does not have to be connected to the line supply
⑥	**SINAMICS SD card**	• Memory card, 512 MB • Standard SD cards up to 32 GB are supported
⑦	**SINAMICS V20 I/O Extension Module**	• Expansion of the 400 V converters with two digital inputs and two digital outputs (relay outputs)
⑧	**Line filter**	Improved EMC characteristics
⑨	**Line reactor**	• Reduces the harmonic current • Improves the power factor • Recommended if input current (rms value) is higher than the rated current of the converter
⑩	**SINAMICS V20 Braking Module**	• Shortens the deceleration ramp time • Suitable for 230 V 1 AC and 400 V 3 AC • Adjustable duty cycle from 5 % to 100 % • For frame sizes FSAA, FSAB, FSAC, FSA, FSB and FSC • FSD and FSE already have an integrated braking unit
⑪	**Braking resistor**	• Dissipates regenerative energy as heat • 5 % duty cycle as default setting
⑫	**Output reactor**	For longer motor cable • 230 V 1 AC: 200 m (shielded and unshielded) • 400 V 3 AC: - for frame sizes FSA to FSD: 150 m (shielded and unshielded) - for frame size FSE: 200/300 m (shielded/unshielded)
⑬	**Shield connection kit**	• Shield connection • Strain relief
⑭	**Standard fuse**	Recommended fuse corresponding to the IEC/UL standard
⑮	**Circuit breaker**	Recommended circuit breaker corresponding to the IEC/UL standard

Function

Feature	Comment
Connection and application macros	Sets groups of parameters to simplify commissioning • Connection macros for connections • Application macros for applications
Keep Running Mode	Single-parameter setting for a mode which keeps the motor going – enables • V_{dc_max} controller • Kinetic buffering • Restart after fault • Flying start. • Disables alarms etc.

Feature	Comment
ECO mode	Economy mode – searches for most efficient rated point
Hibernation mode	Intelligent economy mode in idle state
PID controller	Integrated PID controller with auto-tuning function
Kinetic buffering (V_{dc_min} controller)	Retention of minimal DC voltage through regenerative energy for continued operation
V_{dc_max} controller	Automatic change of ramp down time/braking time
I_{max} controller	Automatic change of ramp up time to avoid overcurrent

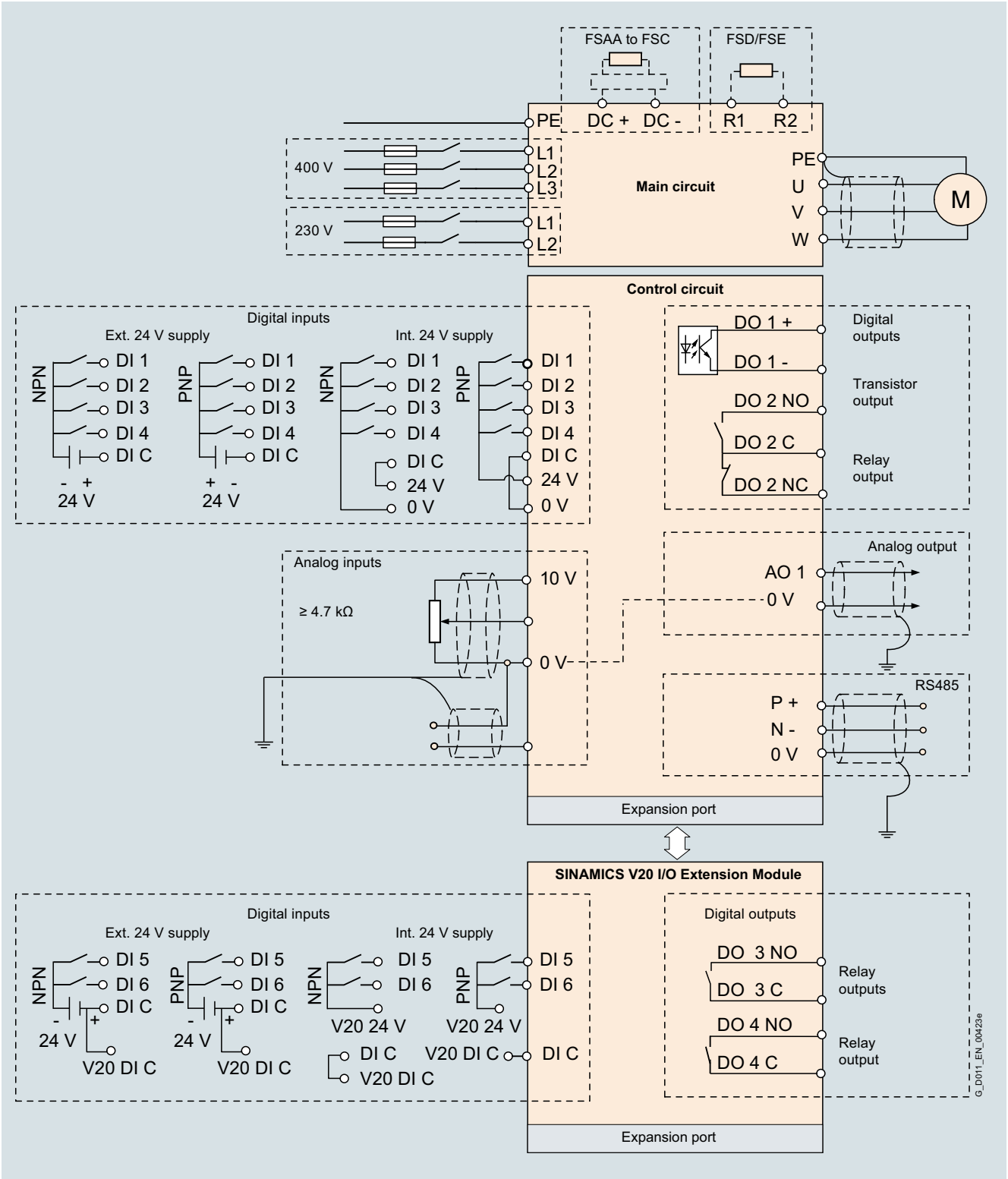
Function (continued)

Feature	Comment
Automatic restart	Automatic restart of drive once the power has been restored following a power failure. All faults are acknowledged automatically and the drive is switched on again
Flying restart	Allows the converter to be switched to a rotating motor
Energy consumption monitoring	Displays a simple estimate of energy or cost saved against use of a line-connected motor
50/60 Hz adaptation	Easy selection of operation with 50 Hz (Europe, Asia) / 60 Hz (USA)
V/f and V^2/f	V/f: perfectly suitable for almost any application in which the speed of asynchronous (induction) motors is to be changed V^2/f: suited to loads with quadratic load curves, e.g. turbo machines such as pumps and fans
FCC	Maintains motor flux current for improved efficiency
Programmable V/f coordinates	Freely adjusts the V/f characteristics, e.g. torque behavior of the synchronous motor
JOG	Moves the motor to test the direction or moves the load to specific position. When the BOP switches to JOG mode, pressing the start button of the BOP will run the motor up to the JOG frequency. Releasing the start button stops the motor
DC braking	Stops the motor which runs at constant speed and only comes to a standstill in longer time intervals, e.g. centrifuges, saws, grinding machines and conveyor belts
Mechanical holding brake control	The motor holding brake prevents the motor from undesirable turning when the converter is switched off. The converter has an internal logic to control an external motor holding brake
USS	Universal Serial Interface Protocol
Modbus RTU	Modbus RTU communication available via the RS485 link
Super torque mode	Big torque boost for starting high-inertia applications
Hammer start mode	A number of torque pulses at start-up to start difficult or "stuck" loads
Blockage clearing mode	Multiple-reverse function to clear blocked pumps
Simple parameter-based menu on internal or external BOPs	Easy selection for displaying values, editing parameters, converter setup
Simple text menu for setup	The parameter number will be shown as short text in the 7-segment LED display
Motor frequency display scaling	User settable display scaling for special applications i.e. rather than Hz, it shows application-specific values like "gallons per minute", "potatoes per hour", etc.

Feature	Comment
Customization of parameter defaults	Customers or OEMs can set their own special "permanent" defaults which can only be deleted in special mode
Converter status in case of a fault	Record the fault with running data • Fault code • Drive setpoint • Drive status • DC link voltage • Output current • Output voltage
List of modified parameters	When this filter is activated, the parameter list only displays the parameters which were modified by users
Load torque monitoring	Detects the load torque to establish failure of the mechanical connection between motor and load machine, overload, motor blocking or no-load operation, e.g. in the event of a V-belt tear in a fan or when a load machine jams
Phase loss detection	Detects and protects against phase loss
Cavitation protection	Protects against cavitation damage to pumps
Condensation protection	Automatic application of DC current to motor to protect from condensation
Frost protection	Automatically rotates motor to stop fluids freezing when temperature falls near or below freezing e.g. for the sequential connection of multiple pumps working in one system
Motor staging	Automatic control and staging of several motors
Multi-pump control [1]	Control of up to four pumps with a frequency converter by means of optional SINAMICS V20 I/O Extension Module
Dual ramp parameterizable	Switchable ramps for specific applications
Programmable fixed frequency setpoint	16 fixed frequencies can be defined and switched by digital inputs or communication
Drive data sets (DDS)	3 parameter sets for the motor and load. The user can switch the parameter set to suit the motors and applications
Command data sets (CDS)	3 parameter sets for the setpoint and command. The user can switch the parameter set to suit the control system
Flexible voltage boost	Increases the output voltage to compensate resistive losses or increase the output torque
Skippable frequency bandwidth	Defines 1 to 4 frequencies to avoid effects of mechanical resonance and suppress frequencies within an adjustable skip frequency bandwidth
2-wire/3-wire control	The wide range of setting options is especially intended to allow emulation of existing control methods on the plant or system side if the converter has to be integrated into an existing application

[1] Further information on the multi-pump control can be found in the operating instructions and on the Internet at: www.siemens.com/sinamics-v20/documentation

Integration



Connection example for SINAMICS V20

Selection and ordering data

Rated power [1] kW	hp	Rated input current A	Output current I_H [2] A	Fan	Frame size	SINAMICS V20 without integrated line filter Article No.	SINAMICS V20 with integrated line filter Category C1 [3] Article No.
200 ... 240 V 1 AC [4]							
0.12	0.16	2.3	0.9	–	FSAA	**6SL3210-5BB11-2UV1**	**6SL3210-5BB11-2BV1**
0.25	0.33	4.5	1.7	–	FSAA	**6SL3210-5BB12-5UV1**	**6SL3210-5BB12-5BV1**
0.37	0.5	6.2	2.3	–	FSAA	**6SL3210-5BB13-7UV1**	**6SL3210-5BB13-7BV1**
0.55	0.75	7.7	3.2	–	FSAB	**6SL3210-5BB15-5UV1**	**6SL3210-5BB15-5BV1**
0.75	1	10	4.2	–	FSAB	**6SL3210-5BB17-5UV1**	**6SL3210-5BB17-5BV1**
1.1	1.5	14.7	6	1	FSAC NEW	**6SL3210-5BB21-1UV1**	NEW **6SL3210-5BB21-1BV1**
1.5	2	19.7	7.8	1	FSAC NEW	**6SL3210-5BB21-5UV1**	NEW **6SL3210-5BB21-5BV1**

Rated power [1] kW	hp	Rated input current A	Output current I_H [2] A	Fan	Frame size	SINAMICS V20 without integrated line filter Article No.	SINAMICS V20 with integrated line filter Category C2 [5] Article No.
200 ... 240 V 1 AC [4]							
2.2	3	27.2	11	1	FSC	**6SL3210-5BB22-2UV0**	**6SL3210-5BB22-2AV0**
3	4	32	13.6	1	FSC	**6SL3210-5BB23-0UV0**	**6SL3210-5BB23-0AV0**

Rated power [6] kW	hp	Rated input current A	Output current I_L [7] At 400 V/ 480 V A	Power based on the output current I_H [2] kW	hp	Output current I_H [2] At 400 V/ 480 V A	Fan	Frame size	SINAMICS V20 without integrated line filter Article No.	SINAMICS V20 with integrated line filter Category C3 [8] Article No.
380 ... 480 V 3 AC										
0.37	0.5	1.7	1.3/1.3	0.37	0.5	1.3/1.3	–	FSA	**6SL3210-5BE13-7UV0**	**6SL3210-5BE13-7CV0**
0.55	0.75	2.1	1.7/1.7	0.55	0.75	1.7/1.7	–	FSA	**6SL3210-5BE15-5UV0**	**6SL3210-5BE15-5CV0**
0.75	1	2.6	2.2/2.2	0.75	1	2.2/2.2	–	FSA	**6SL3210-5BE17-5UV0**	**6SL3210-5BE17-5CV0**
1.1	1.5	4	3.1/3.1	1.1	1.5	3.1/3.1	1	FSA	**6SL3210-5BE21-1UV0**	**6SL3210-5BE21-1CV0**
1.5	2	5	4.1/4.1	1.5	2	4.1/4.1	1	FSA	**6SL3210-5BE21-5UV0**	**6SL3210-5BE21-5CV0**
2.2	3	6.4	5.6/4.8	2.2	3	5.6/4.8	1	FSA	**6SL3210-5BE22-2UV0**	**6SL3210-5BE22-2CV0**
3	4	8.6	7.3/7.3	3	4	7.3/7.3	1	FSB	**6SL3210-5BE23-0UV0**	**6SL3210-5BE23-0CV0**
4	5	11.3	8.8/8.24	4	5	8.8/8.24	1	FSB	**6SL3210-5BE24-0UV0**	**6SL3210-5BE24-0CV0**
5.5	7.5	15.2	12.5/11	5.5	7.5	12.5/11	1	FSC	**6SL3210-5BE25-5UV0**	**6SL3210-5BE25-5CV0**
7.5	10	20.7	16.5/16.5	7.5	10	16.5/16.5	2	FSD	**6SL3210-5BE27-5UV0**	**6SL3210-5BE27-5CV0**
11	15	30.4	25/21	11	15	25/21	2	FSD	**6SL3210-5BE31-1UV0**	**6SL3210-5BE31-1CV0**
15	20	38.1	31/31	15	20	31/31	2	FSD	**6SL3210-5BE31-5UV0**	**6SL3210-5BE31-5CV0**
22	30	54/45 [9]	45/40	18.5	25	38/34	2	FSE	**6SL3210-5BE31-8UV0**	**6SL3210-5BE31-8CV0**
30	40	72/54 [9]	60/52	22	30	45/40	2	FSE	**6SL3210-5BE32-2UV0**	**6SL3210-5BE32-2CV0**

[1] Rated power of the 230 V 1 AC devices based on the output current I_H. The output current I_H is based on the duty cycle for high overload (HO): 150 % I_H for 60 s within a cycle time of 300 s.

[2] The output current I_H is based on the duty cycle for high overload (HO): 150 % I_H for 60 s within a cycle time of 300 s.

[3] EN 61800-3 category C1, 1st environment (residential, commercial). Max. shielded motor cable length 5 m for frame sizes FSAA and FSAB, and 10 m for frame size FSAC – with or without external line filter.

[4] Single-phase devices can also be connected to two phases of a 3-phase 230 V power supply system. You can find detailed information here: https://support.industry.siemens.com/cs/document/109476260

[5] EN 61800-3 Category C2, 1st environment (residential, commercial). Max. shielded motor cable length 25 m for frame size FSC.

[6] Rated power of the 400 V 3 AC devices based on the output current I_L. The output current I_L is based on the duty cycle for low overload (LO): 110 % I_L for 60 s within a cycle time of 300 s.

[7] The output current I_L is based on the duty cycle for low overload (LO): 110 % I_L for 60 s within a cycle time of 300 s.

[8] EN 61800-3 Category C3, 2nd environment (industrial). Shielded motor cable length for frame size FSA max. 10 m, for frame sizes FSB to FSD max. 25 m and for frame size FSE max. 50 m. To achieve 25 m of shielded motor cable length, even for C2 category FSA converters, unfiltered converters with external line filters must be used.

[9] Regarding the first value, the rated input current for frame size FSE is based on the duty cycle for low overload (LO), regarding the second value, the current is based on the duty cycle for high overload (HO).

Selection and ordering data (continued)

Accessories

Description	Article No.
RS485 terminating resistor Content: 50 units	**6SL3255-0VC00-0HA0**
DIN rail mounting set	
• For frame sizes FSAA, FSAB, FSAC and FSA	**6SL3261-1BA00-0AA0**
- For frame sizes FSAA, FSAB and FSAC, a migration mounting set is also required for installation	
- For frame size FSA with fan, the operating instructions must be followed for assembly	
• For frame size FSB	**6SL3261-1BB00-0AA0**
Migration mounting set Required in addition to the DIN rail mounting set for installing frame sizes FSAA, FSAB and FSAC	
• For frame sizes FSAA and FSAB	**6SL3266-1ER00-0VA0**
• For frame size FSAC NEW	**6SL3266-1EB00-0VA0**

Technical specifications

	SINAMICS V20
Power range	230 V 1 AC: 0.12 ... 3 kW (0.16 ... 4 hp) 400 V 3 AC: 0.37 ... 30 kW (0.5 ... 40 hp)
Offset factor cos φ	≥ 0.95
Power factor λ	0.72
Line voltage	230 V 1 AC: 200 ... 240 V 1 AC (-15 ... +10 %) [1] 400 V 3 AC: 380 ... 480 V 3 AC (-15 ... +10 %)
Maximum output voltage	100 % of input voltage
Line frequency	50 Hz/60 Hz
Line supply type	• TN, TT, TT grounded line supply • IT for - 230 V 1 AC unfiltered devices, frame sizes FSAA, FSAB and FSAC - 400 V 3 AC unfiltered devices
Overload capability	
• Up to 15 kW	High overload (HO): 150 % I_H for 60 s within a cycle time of 300 s.
• From 18.5 kW	Low overload (LO): 110 % I_L for 60 s within a cycle time of 300 s. High overload (HO): 110 % I_H for 60 s within a cycle time of 300 s.
Output frequency	0 ... 550 Hz, resolution: 0.01 Hz
Pulse frequency	2 ... 16 kHz
Efficiency	98 %
Programmable fixed frequency setpoints	16
Analog inputs	AI1: bipolar current/voltage mode AI2: unipolar current/voltage mode can be used as digital inputs
• Resolution	12 bit
Analog output	AO1 current output 0 … 20 mA
Digital inputs	DI1 ... DI4: isolated; for 400 V converters with optional SINAMICS V20 I/O Extension Module two additional digital inputs DI5 and DI6 PNP/NPN selectable via terminal
• Input current, max.	15 mA
Digital outputs	DO1: transistor output DO2: relay output; for 400 V converters with optional SINAMICS V20 I/O Extension Module two additional digital outputs (relay outputs) DO3 and DO4 250 V AC 0.5 A with resistive load 30 V DC 0.5 A with resistive load
Integrated interface	
• Type	RS485
• Protocols	USS, Modbus RTU
Extension interface	SINAMICS V20 BOP Interface, SINAMICS V20 Smart Access, SINAMICS V20 Parameter Loader, SINAMICS V20 I/O Extension Module (cannot be operated simultaneously with SINAMICS V20 Parameter Loader)

[1] Single-phase devices can also be connected to two phases of a 3-phase 230 V power supply system. You can find detailed information at: https://support.industry.siemens.com/cs/document/109476260

Technical specifications (continued)

	SINAMICS V20
Control modes	
• V/f linear/square/multi-point	✓
• V/f with flux current control (FCC)	✓
Functions	
Easy to use	
Automatic restart	✓
Parameter cloning	✓
Drive data sets (DDS)	✓ (3)
Command data sets (CDS)	✓ (3)
JOG	✓
Pre-configured connection macros and application macros	✓
Simple parameter-based menu on internal or external SINAMICS V20 BOP	✓
Simple text menu for setup	✓
USS	✓
Modbus RTU	✓
Motor frequency display scaling	✓
Customization of parameter defaults	✓
Energy consumption monitoring	✓
List of modified parameters	✓
Converter status in case of a fault	✓
Application	
Keep Running Mode	✓
Flying restart	✓
PID controller	✓
Kinetic buffering (V_{dc_min} controller)	✓
Skippable frequency bandwidth	4
Braking functions	
• DC braking	✓
• Compound braking	✓
• Dynamic braking	✓
2-wire/3-wire control	✓
Mechanical holding brake control	✓
Super torque mode	✓
Hammer start mode	✓
Blockage clearing mode	✓
Hibernation mode	✓
Motor staging	✓
Multi-pump control [1] (for 400 V converters with optional SINAMICS V20 I/O Extension Module)	✓
Dual ramp parameterizable	✓
Wobble function	✓
BICO function	✓
Slip compensation	✓

	SINAMICS V20
Functions (continued)	
Protection	
DC link voltage control	✓
Load torque monitoring	✓
Phase loss detection	✓
Cavitation protection	✓
Condensation protection	✓
Frost protection	✓
Control	
ECO mode	✓
V_{dc_max} controller	✓
I_{max} controller	✓
Programmable V/f coordinates	✓
Flexible voltage boost	✓
50/60 Hz adaptation	✓

[1] Further information on the multi-pump control can be found in the operating instructions and on the Internet at: www.siemens.com/sinamics-v20/documentation

Technical specifications (continued)

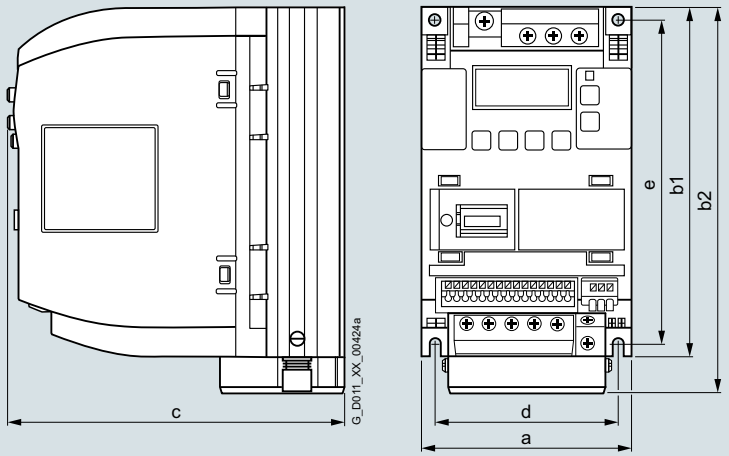
	SINAMICS V20
General technical specifications	
Degree of protection	IP20
Mounting	Wall mounting, side-by-side mounting, push-through mounting for FSB, FSC, FSD, and FSE
Ambient temperature	
• Operation	-10 ... +40 °C (14 ... 104 °F) without derating 40 ... 60 °C (104 ... 140 °F) with derating
• Storage	-40 ... +70 °C (-40 ... +158 °F)
Relative humidity	95 % (non-condensing)
Cooling	
• FSAA, FSAB, FSA up to 0.75 kW	Convection cooling
• FSAC, FSA, FSB, FSC, FSD, FSE	Power electronics cooled using heat sinks with external fan
Installation altitude	Up to 4000 m (13124 ft) above sea level 1000 ... 4000 m: (3281 ... 13124 ft): output current derating 2000 ... 4000 m (6562 ... 13124 ft): input voltage derating
Motor cable length	
• Unshielded	
- FSAA to FSD	50 m (164 ft)
- FSE	100 m (328 ft)
• Shielded	
- FSA	10 m (32.8 ft) for converter size FSA with integrated line filter category C3 To achieve 25 m (82 ft) shielded motor cable length, unfiltered converters with external line filters have to be used
- FSAA to FSD	25 m (82 ft)
- FSE	50 m (164 ft)
• Longer motor cables with an additional output reactor	
- 230 V 1 AC	200 m (656 ft) (shielded and unshielded)
- 400 V 3 AC	150 m (492 ft) (shielded and unshielded) for frame sizes FSA to FSD 200/300 m (656 ft/984 ft) (shielded/unshielded) for frame size FSE
Vibration load	
• Transport	5 ... 9 Hz: Deflection, 3.5 mm 9 … 200 Hz: Vibration 1 × *g* Vibration class: 2M3
• Operation	Area of application IIa 10 ... 58 Hz: Deflection, 0.075 mm 58 … 200 Hz: Vibration 1 × *g*
Shock load	
• Operation	Area of application II Peak acceleration: 5 × *g* Duration of shock: 30 ms

Technical specifications (continued)

	SINAMICS V20								
General technical specifications (continued)									
	FSAA without fan	**FSAB** without fan	**FSAC** with 1 fan	**FSA** without fan	**FSA** with 1 fan	**FSB** with 1 fan	**FSC** with 1 fan	**FSD** with 2 fans	**FSE** with 2 fans
Dimensions									
• Width in mm (in)	68 (2.68)	68 (2.68)	90.8 (3.57)	90 (3.54)	90 (3.54)	140 (5.51)	184 (7.24)	240 (9.45)	245 (9.65)
• Height in mm (in)	142 (5.59)	142 (5.59)	160.9 (6.33)	150 (5.91)	166 (6.54)	160 (6.3)	182 (7.17)	206.5 (8.13)	264.5 (10.41)
• Depth in mm (in)	107.8 (4.24)	127.8 (5.03)	147 (5.79)	145.5 (5.73)	145.5 (5.73)	164.5 (6.48)	169 (6.65)	172.5 (6.79)	209 (8.23)
Weight, approx.									
• 230 V 1 AC									
- Without integrated line filter	0.6 kg (1.32 lb)	0.8 kg (1.76 lb)	1.2 kg (2.65 lb)	–	–	–	2.5 kg (5.51 lb)	–	–
- With integrated line filter category C1	0.7 kg (1.54 lb)	0.9 kg (1.98 lb)	1.4 kg (3.09 lb)	–	–	–	–	–	–
- With integrated line filter category C2	–	–	–	–	–	–	2.8 kg (6.17 lb)	–	–
• 400 V 3 AC									
- Without integrated line filter	–	–	–	0.9 kg (1.98 lb)	1 kg (2.21 lb)	1.6 kg (3.53 lb)	2.4 kg (5.29 lb)	3.9 kg (8.60 lb)	6.4 kg (14.1 lb)
- With integrated line filter category C3	–	–	–	1 kg (2.21 lb)	1.1 kg (2.43 lb)	1.8 kg (3.97 lb)	2.6 kg (5.73 lb)	4.3 kg (9.48 lb)	7 kg (15.4 lb)
Mounting clearance, min.									
• Top	100 mm (3.94 in)								
• Bottom	100 mm (3.94 in) 85 mm (3.35 in) for fan-cooled FSA								
• Side	0 mm								
Certificates of suitability	cULus, CE, RCM, KC								
Environmental classes	Pollution class: 3S2 Gas class: 3C2 (SO_2, H_2S) Climate class: 3K3								
CE marking, according to	European Low Voltage Directive (EN 61800-5-1/EN 60204-1) and European EMC Directive (EN 61800-3)								
UL marking, according to	UL508C								
EMC standards, radiated emissions and disturbance voltage (conducted emissions)									
• EN 61800-3 category C1, 1st environment (residential, commercial)	• 230 V 1 AC with integrated line filter or unfiltered with external line filter, shielded cables - FSAA and FSAB: ≤5 m (16.4 ft) - FSAC: ≤10 m (32.8 ft)								
• EN 61800-3 category C2, 1st environment (residential, commercial)	• 230 V 1 AC with integrated line filter, shielded cables - FSC: ≤25 m (82 ft) • 400 V 3 AC without integrated line filter, with external line filter, shielded cables - FSA [1] to FSE ≤25 m (82 ft)								
• EN 61800-3 category C3, 2nd environment (industrial)	• 400 V 3 AC with integrated line filter, shielded cables - FSA: ≤10 m (32.8 ft) - FSB to FSD: ≤25 m (82 ft) - FSE: ≤50 m (164 ft)								
Note	The EMC product standard EN 61800-3 does not apply directly to a frequency converter but to a PDS (Power Drive System), which covers the complete circuitry, motor and cables in addition to the converter. The converters themselves are in general not subject to marking in accordance with the EMC directive.								

[1] To achieve 25 m (82 ft) shielded motor cable lengths with FSA frame size converters, unfiltered converters with external line filters have to be used.

Dimensional drawings



Frame size	Dimensions in mm (inches)				Drilling dimensions in mm (inches)	
	a (width)	b1 (height) without fan	b2 (height) with fan	c (depth)	d	e
FSAA	68 (2.68)	142 (5.59)	–	107.8 (4.24)	58 (2.28)	132 (5.2)
FSAB	68 (2.68)	142 (5.59)	–	127.8 (5.03)	58 (2.28)	132 (5.2)
FSAC	90.8 (3.57)	–	160.9 (6.33)	147 (5.79)	79 (3.11)	140 (5.51)
FSA	90 (3.54)	150 (5.91)	166 (6.54)	145.5 (5.73)	79 (3.11)	140 (5.51)
FSB	140 (5.51)	–	160 (6.3)	164.5 (6.48)	127 (5)	135 (5.31)
FSC	184 (7.24)	–	182 (7.17)	169 (6.65)	170 (6.69)	140 (5.51)
FSD	240 (9.45)	–	206.5 (8.13)	172.5 (6.79)	223 (8.78)	166 (6.54)
FSE	245 (9.65)	–	264.5 (10.41)	209 (8.23)	228 (8.98)	206 (8.11)

Frame size	Mounting clearance, min. in mm (inches)		
	Top	Bottom	Side
FSAA, FSAB, FSAC	100 (3.94)	100 (3.94)	0
FSA without fan	100 (3.94)	100 (3.94)	0
FSA with fan	100 (3.94)	85 (3.35)	0
FSB to FSE	100 (3.94)	100 (3.94)	0

More information

A Getting Started Manual is supplied in hard copy form with every SINAMICS V20. Further documentation, such as Operating Instructions and List Manuals, is available for download free of charge from the Internet at:
www.siemens.com/sinamics-v20/documentation

Detailed information on SINAMICS V20, the latest technical documentation (brochures, dimensional drawings, certificates, manuals and operating instructions) is available on the Internet at:
www.siemens.com/sinamics-v20

In addition, the Drive Technology Configurator (DT Configurator) can be used on the Internet. The DT Configurator can be found in the Siemens Industry Mall at the following address:
www.siemens.com/dt-configurator

Furthermore, the SINAMICS SELECTOR app is a practical tool that helps you find article numbers for SINAMICS V20, SINAMICS G120C, SINAMICS G120P and SINAMICS G120 converters in the output range from 0.12 kW to 630 kW quickly and easily. You will find the free downloads for Android and for iOS at the following link:
www.siemens.com/sinamics-selector