# SINAMICS S210
# 1 AC 230 V

# Edition 12/17

**WARNING**

**Danger to life if the safety instructions and installation instructions are not observed**
The Quick Installation Guide only contains the most important information for the installation of the converter. If the safety instructions and installation instructions in the associated documentation are not observed, accidents involving severe injuries or death can occur.
- Observe the safety instructions and installation instructions given in the associated operating instructions: www.siemens.com/sinamics-s210
- Also observe the safety instructions for the integrated functional Safety functions. Make sure that these functions are fully operational again after replacing a converter.

**DANGER**

**Danger to life through electric shock due to residual charge in the dc link capacitors**
Because the DC link capacitors, a hazardous voltage is present for up to 5 minutes after the power to the converter has been removed.
Contact with live parts of the converter can result in death or serious injury.
- Do not open the protective covers or the terminal covers until 5 minutes after the power has been removed.
- Before starting any work, check that the system is in a voltage-free state by measuring all terminals, including to ground.
- Ensure that the associated warning labels, in the approropriate languages, are attached.

## Technical data

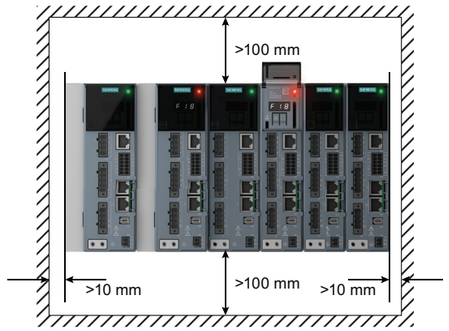
| Order number: | | 6SL3210-5HB10-1UF0 | 6SL3210-5HB10-2UF0 | 6SL3210-5HB10-4UF0 | 6SL3210-5HB10-8UF0 |
|---|---|---|---|---|---|
| Line supply | | | | | |
| • Line voltage | | 1 AC 200 ... 240 V ±10 % | | | |
| • Input frequency | Hz | 50/60 | | | |
| Rated input current | A | 1,4 | 2,7 | 5 | 9,3 |
| Inrush current | A | 8.0 | 8.0 | 8.0 | 8.0 |
| Power dissipation | W | 7 | 14 | 28 | 52,5 |
| Electronic supply | | | | | |
| • Ext. supply voltage | | 24 V -15 % ... +20 % | | | |
| • Current, max. | A | 1,6 | | | |
| Output for motor | | | | | |
| • Rated power | kW | 0,1 | 0,2 | 0,4 | 0,75 |
| • Rated output current | A | 0,8 | 1,36 | 2,4 | 4,4 |
| • Output current, max. | A | 3,1 | 4,8 | 8,7 | 16 |
| Pulse frequency | kHz | 8 | | | |
| Output frequency | Hz | 0 ... 550 | | | |
| EMC filter (integrated) | | Category C2 (≤ 10 m) / Category C3 (≤ 25 m) | | | |
| Brake resistor | | None 1) | Integrated | Integrated | Integrated |
| Digital inputs | | 2 Measuring probes or Reference marks<br>1 Failsafe input (F-DI)<br>1 Temperature monitor for ext. brake resistor | | | |
| Cooling | | Convection (without Fan) | | | |
| Frame Size | | FSA | FSA | FSB | FSC |
| Dimensions | | | | | |
| • Width | mm | 45 | 45 | 55 | 70 |
| • Hight | mm | 170 | 170 | 170 | 170 |
| • Depth | mm | 170 | 170 | 170 | 195 |
| Weight, approx. | kg | 1,1 | 1,1 | 1,2 | 1,9 |
| Climatic conditions for operation | | 0 ... 50 °C, Relative humidity: 5 ... 95 % condensation, spraying water and ice formation not permitted | | | |
| Installation altitude | | Up to max. 4000 m<br>• Up to 1000 m above sea level w/o derating<br>• Above 1000 m Derating 10 % current or 5 K per 1000 m<br>• Above 2000 m Isolation-transformer required | | | |
| Pollution degree | | 2 (according to EN 6180051) | | | |
| Protection acc. EN60529 | | IP20, Must be installed in a control cabinet | | | |
| Short-circuit current (SCCR) | | ≤ 65 kA rms | | | |
| Fuse according to IEC | | 3NA3 801 (6 A) | 3NA3 801 (6 A) | 3NA3 803 (10 A) | 3NA3 805 (16 A) |
| Fuse according to UL, classes[2] | | 6 A | 6 A | 10A | 20A |
| Directives and Standards | | CE, cULus, RCM, EAC | | | |

1) Due to the available DC-Link capacity an internal brake resistor is not required for normal operation.
2)Any class from class J, T, CC, G, etc., which are equal or better than Class RK5 fuses

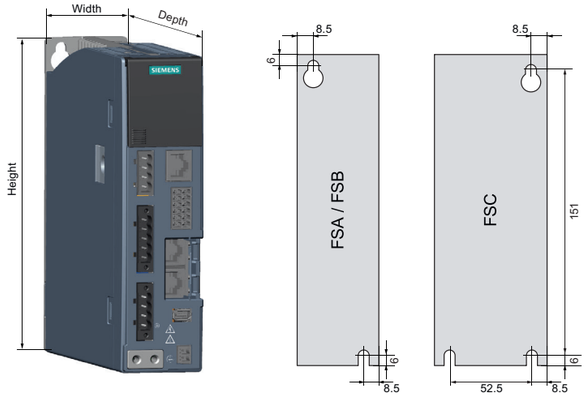
## Mounting the converter

The converter may be operated only in closed housings or in higher-level control cabinets with protective covers that are closed, and when all of the protective devices are used. The installation of the converter in a metal control cabinet or the protection with another equivalent measure must prevent the spread of fire and emissions outside the control cabinet.
Protect the converter, e.g. by installing it in a control cabinet with degree of protection IP54 according to IEC 60529 or NEMA 12. Further measures may be necessary for particularly critical operating conditions.
If condensation or conductive pollution can be excluded at the installation site, a lower degree of control cabinet protection may be permitted.
Leave a minimum 100 mm clearance to other devices at the top and bottom. A lateral clearance between multiple SINAMICS S210 converters is not mandatory. Observe a lateral clearance of at least 10 mm to other devices.

## Clearance distances



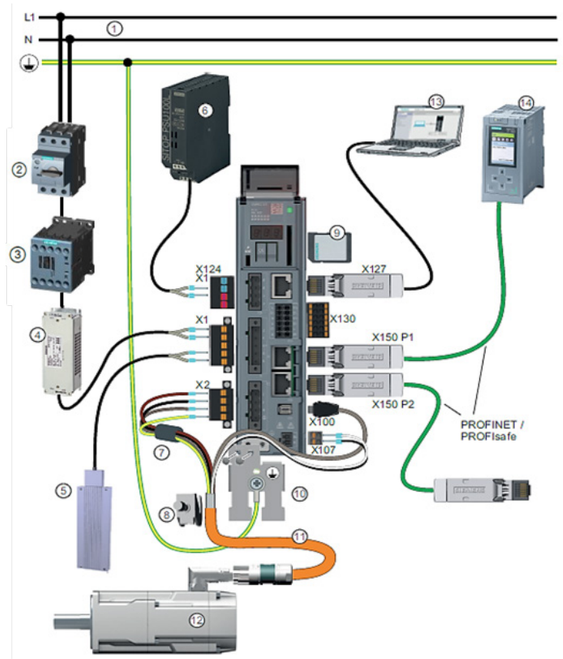

## Dimensional drawings and drill dimensions




## Dimensions

| Frame size | Width (mm) | Height (mm) | Depth (mm) | Weight (kg) |
|---|---|---|---|---|
| FSA | 45 | 170 | 170 | 1.1 |
| FSB | 55 | 170 | 170 | 1.2 |
| FSC | 70 | 170 | 195 | 1.9 |

## System overview




## System overview (cont'd)

| | | | |
|---|---|---|---|
| ① | Line supply 230 V | ⑧ | Shield clamps |
| ② | Fuse and circuit breaker | ⑨ | SD-memory card (optional) |
| ③ | Line contactor (optional) | ⑩ | Shielding plate |
| ④ | Line filter (optional) | ⑪ | OCC - connecting cable for Motor Holding Brake and encoder |
| ⑤ | External braking resistor (optional) | ⑫ | Servomotor 1FK2 |
| ⑥ | Power supply 24 V | ⑬ | Commissioning using PC |
| ⑦ | Ferrite core | ⑭ | Control example; SIMATIC S7-1500 PLC |

## Connection the converter

Install the converter so that you comply with local regulations for erecting and installing low voltage systems.

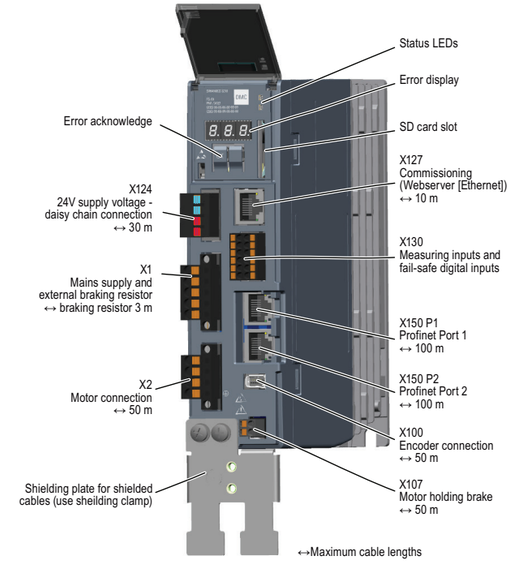
**Notes**
**Operating displays for converter operation**
If, when switching over a function from ON to OFF, an LED or other similar display is not lit or not active; this does not indicate that the device is switched-off or in a no-current condition.

**Converter is grounded (earthed) correctly**
Make sure that the shield of the motor cable is properly grounded (earth). Use the shielding clamp which comes with the cable to mount the cable to the converter's shielding plate.

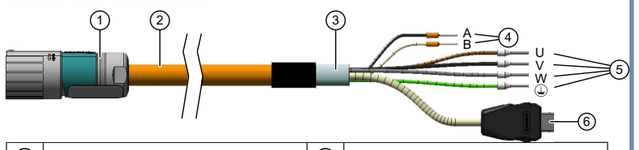
**Safety devices**
Install suitable protective equipment between the line supply and converter.

**Protection and monitoring equipment**
To provide protection against short-circuit, use the overcurrent devices listed in the Technical data (fuses, circuit breakers etc.).
If the apparent impedance of the line supply at the infeed point is not suitable, so that fuses do not rupture in the specified time in the case of insulation failure (ground fault, fault to frame), then you must use additional residual current protective devices RCD (RCCB or MRCD), type B.
To prevent an RCD from unnecessarily tripping as a result of operational leakage currents, the following preconditions must be fulfilled:
- The neutral point of the line supply is grounded.
- Use an RCCB type B with a response limit current of 300 mA. Connect the RCCB in series with the overcurrent protective devices.
- Use a separate RCD for each converter.
- The motor cables are shorter than 50 m (164 ft) shielded.

## Connections and operator controls on the converter




## Cables and connections




| | | | |
|---|---|---|---|
| ① | Circular connector M12 or M17, 10-pin | ④ | Wires for holding brake |
| ② | MOTION-CONNECT OCC cable | ⑤ | Wires for motor power |
| ③ | Shielding | ⑥ | SIEMENS IX connector for signal cable |

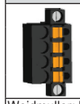
### X1: Line connection and connection for external braking resistor

| Pin | Connection for | Explanation |
|---|---|---|
| L1 | Phase L1 line system | |
| N | Neutral conductor | |
| DCP | External braking resistor<br>Internal braking resistor | If you are using the internal braking resistor, DCP and R2 must be jumpered.<br>If you are using the external braking resistor, remove the jumper between DCP and R2.<br>Connect the external braking resistor by means of terminals DCP and R1 |
| R2 | Internal braking resistor | |
| R1 | External braking resistor | |

Weidmuller: BLF 5.08HC/05/180F SN BK BX, article number 1012670000
As daisy chain: BLDF 5.08/05/180F SN BK BX, article number 1000970000

The terminals are spring-type terminals.
Permissible conductor cross-sections for single-core connection or for the connection of flexible cables with end sleeves:
- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12

### X2: Power connections for the motor



| Pin | Pin assignment | Colour coding for Siemens OCC cables |
|---|---|---|
| U | Motor phase U | Brown |
| V | Motor phase V | Black |
| W | Motor phase W | Gray |
| PE | Protective ground | Green-yellow |

Weidmuller: BLF 5.08HC/05/180F SN BK BX, article number 1012660000

The terminals are spring-type terminals.
Permissible conductor cross-sections for single-core connection or for the connection of flexible cables with end sleeves:
- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12

### X100: Siemens IX connector: Encoder connection

| Pin | Pin assignment | Explanation |
|---|---|---|
| 1 | TXP | Sending data + / encoder power supply M |
| 2 | TXN | Sending data - / encoder power supply M |
| 3 | Reserved | |
| 4 | Reserved | |
| 5 | Reserved | |
| 6 | RXP | Receiving data + / encoder power supply P24+ |
| 7 | RXN | Receiving data + / encoder power supply P24+ |
| 8 | Reserved | |
| 9 | Reserved | |
| 10 | Reserved | |

Siemens IX, article number 6FX2003-0DE01

### X107: Motor holding brake

| Pin | Pin assignment | Explanation |
|---|---|---|
| BR- | B- | Voltage for motor holding brake, 0 V (white) |
| BR+ | B+ | Voltage for motor holding brake, 24 V (black) |

Phoenix 1745894 FMC 1.5 / 2-ST-3.81, article number 1745894

The terminals are spring-type terminals.
Permissible conductor cross-sections: for single-core connection or for flexible cables with end sleeves without plastic protection:
- 0.25 mm² ... 1.5 mm², AWG: 24 ... 16

for flexible cables with end sleeves with plastic protection:
- 0.25 mm² ... 0.75 mm², AWG: 24 ... 19

Connect the wires for the holding brake to the connector X107 also if you are using a motor without holding brake.

### X124: 24 VDC control voltage

| Pin | Pin assignment | Explanation |
|---|---|---|
| M | 0 V | Power supply for the converter electronics |
| M | 0 V | |
| L+ | 24 V | |
| L+ | 24 V | |

Dinkle: article number A000101686

The terminals are spring-type terminals.
Permissible conductor cross-sections for single-core connection or for the connection of flexible cables with end sleeves:
- 0.2 mm² ... 2.5 mm²
- AWG: 26 ... 12

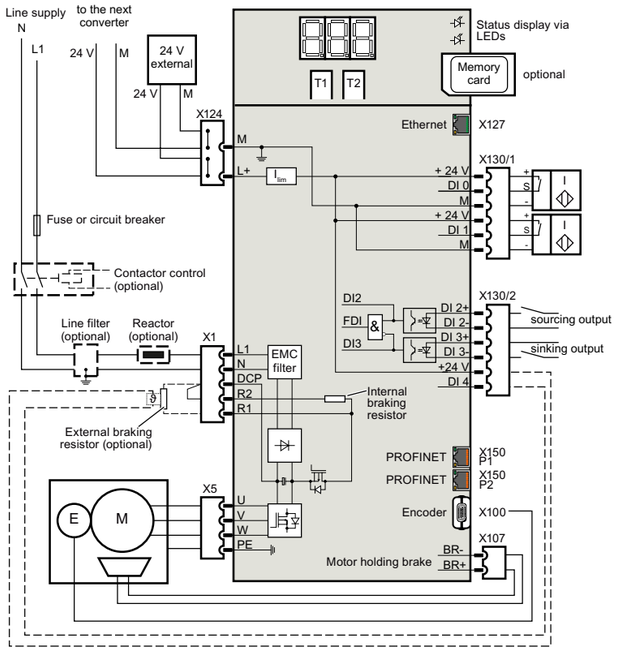
### X130: Connector for digital inputs

| Pin | Pin assignment | | Pin assignment | Pin |
|---|---|---|---|---|
| L+ | 24 V supply | | Fail-safe digital inputs | DI 1 2+ |
| DI 0 | High-speed DI, measuring input | | | DI 1 2- |
| M | Ground | | | DI 3+ |
| L+ | 24 V supply | | | DI 3- |
| DI 1 | High-speed DI, measuring input | | 24 V supply | L+ |
| M | Ground | | Digital input | DI 4 |

Dinkle: article number A000101686

The terminals are spring-type terminals.
Permissible conductor cross-sections:
- for single-wire connection: 0.2 mm² ... 1.5 mm², AWG: 24 ... 16
- for flexible cables with end sleeves: 0.25 mm² ... 1.5 mm², AWG: 24 ... 16
- for flexible cables with end sleeves with plastic protection: 0.25 mm² ... 0.75 mm², AWG: 24 ... 19

## Block diagram




## Commissioning

### Commissioning with web server

Use the web server integrated in the converter for the commissioning. The Web server integrated in the converter supports the following browsers:

- Microsoft Internet Explorer 11
- Microsoft Edge ≥ V14
- Mozilla Firefox ≥ 48
- Google Chrome ≥ V52

### Preparation for commissioning

- Mount the motor on the mechanical system. Connect the motor to the converter.
- Connect the converter to your Commissioning-PC via the Ethernet interface (X127).
- Switch the converter on.

The converter powers up and reads the motor data.

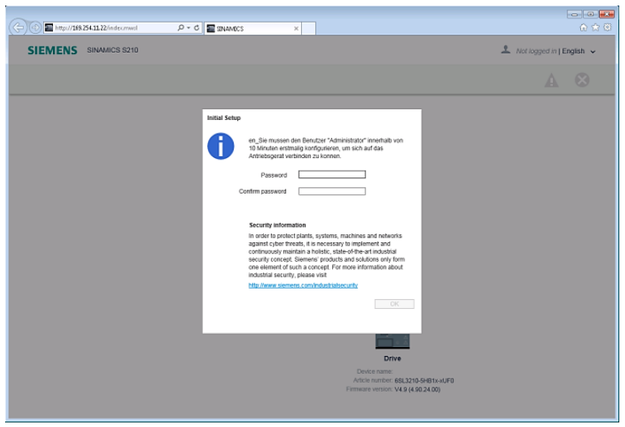
- Start the Internet-Browser for commissioning.
- Enter the IP address of the converter in the input line of your browser.
  Default-IP-Address: 169.254.11.22 (Subnet-Mask: 255.255.0.0).

**Note**
If the RDY LED is blinking fast in yellow after the first power up of the converter, then a power cycle is required after an update of a motor component. Turn the 24V supply of the converter off and back on again.

### Assigning an Administrator password

In order to get full access to the converter you have to log-in as Administrator.
For the access as Administrator a password is required.
After powering up the converter a dialog to enter the Administrator password appears for 10 min.
The following mask appears only if the Administrator password has not been assigned and only for the duration of 10 minutes after powering up the converter.
Assign an Administrator password.

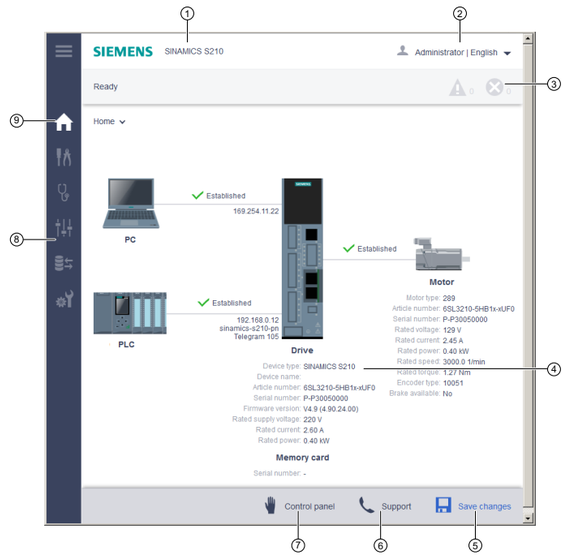
**Note**
Note down the password and store it carefully in a secure place!




### Login

After assigning the Administrator password the Log-in page is displayed.
Enter the login „Administrator“ and the password which you have assigned in the step before.
After a successful log-in the Overview page appears.

## Overview of web server




| | |
|---|---|
| ① | Button: Save retentively (Copy RAM to ROM) |
| ② | Button: Support information |
| ③ | Button: Call control panel |
| ④ | Active view of the Web server (in the example: View after user login) |
| ⑤ | Navigation toolbar (see following "Navigation of the Web server") |
| ⑥ | Icon: Start page |
| ⑦ | Message display of the converter: Displays the status of the converter and active faults and alarms |
| ⑧ | Line with general information |
| ⑨ | Drop-down list for the language selection and to log out from the Web server. |

For more detailed information, please refer to the S210 Operating Instructions.

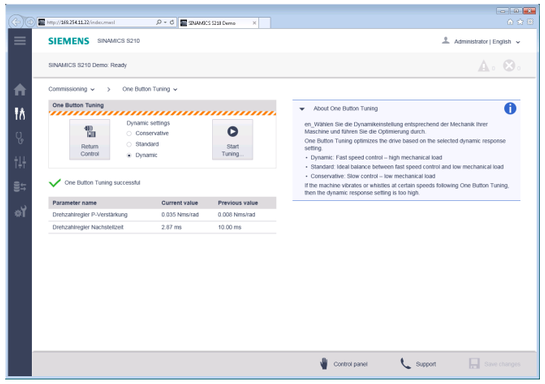
**WARNING**

**Danger due to moving parts of the machine**
During the following steps the motor will rotate. Please make sure that the motor is mounted and connected correctly and that the connected mechanics may be moved without causing a damage or injury.

### Perform a One-Button-Tuning

For the optimization of the control parameters, perform the following procedure:

1. Select 'Commissioning'
2. Select 'Tuning'
3. Click on „Take Control“ and confirm the confirmation prompt (Orange/white bar appears).
4. Choose a Dynamic setting according to the mechanical capabilities of your machine.
5. Click on „Start tuning“.
6. Enter the permissible angle of rotation for the required measurement about which the motor and the connected machine are permitted to turn without causing a damage to the mechanics (the angle should at least be 60°, a greater angle leads to better results).
7. Confirm with OK and the tuning will start.




### Control panel

If it is required to move the axis this can be done using the control panel. Click on the button 'Control panel' in the footer, take over the control and enter the desired speed.
Now the axis can be moved by holding the 'Rotate Left/Right' buttons.

### Additional functions

Further adjustments can be made by selecting the menu item 'Parameters'.

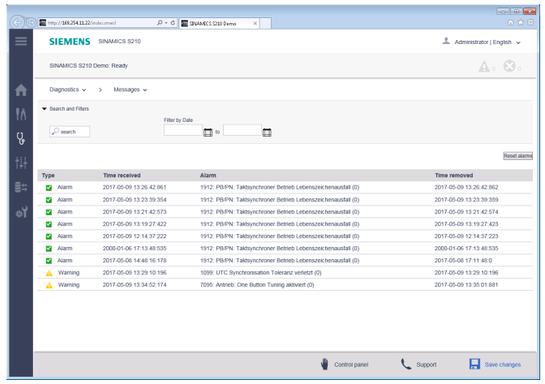
You can also save the parameter settings and restore them later if required or you can reset the converter to the factory defaults.
For this choose the menu item 'Backup &Restore'.
In the 'System' menu you can change passwords and enable the access to the web server via the Profinet interface (X150).

### Saving changes

In order to save the changes permanently click on the floppy disk symbol in the footer.

### Messages

In the menu choose 'Diagnostics' and 'Messages' to display the Warnings and Alarms including information concerning cause and remedy. A detailed description of the events is available in the manual.




## Diagnostics

### Diagnostic of the converter

Besides the diagnose with the Webserver troubleshooting can be done directly on the device. The alarms and faults are shown in the display of the converter according to the message classes defined in PROFIdrive.

### Display and operational elements

The converter displays the current operating state via two LEDs.

- RDY: Status of the converter
- COM: Status of the communication

Faults can be acknowledged with the OK button.
When using an SD-Card, push it into the slot (label to the left). When parameters were saved on the card after commissioning, an easy exchange of the converter is possible in case of a defect. Switch the converter off to plug-in or remove the SD card.


| Message number | Description |
|---|---|
| 1 | **Hardware/software error**<br>Hardware or software malfunction |
| 2 | **Network fault**<br>A line supply fault has occurred (phase failure, voltage level, etc.) |
| 3 | **Supply voltage fault**<br>Power supply fault (24 V) has been identified |
| 4 | **DC link overvoltage**<br>The DC-link voltage is too high |
| 5 | **Power electronics fault**<br>Failure in power electronics (overcurrent, overtemperature, IGBT failure,…) |
| 6 | **Overtemperature electronic component**<br>Temperature of electronics exceeded the highest permissible limit |
| 7 | **Ground fault / inter-phase short-circuit detected**<br>Failure in the power cables or motor windings |
| 8 | **Motor overload**<br>The motor has exceeded its limits |
| 9 | **Communication error to PLC**<br>Interrupted or failed network communications |
| 10 | **Safety monitoring channel detected an error**<br>A safe operation function has detected an error |
| 11 | **Position actual value/speed value error**<br>Encoder signal error detected (track signals, zero marks, absolute values…) |
| 12 | **Internal (DRIVE-CLiQ) communication error**<br>Communications between SINAMICS components is faulty or has been interrupted |
| 13 | **Fault infeed**<br>The infeed is faulty or has failed. |
| 14 | **Braking controller / Braking Module error**<br>Braking Module fault or overloaded |
| 15 | **Line filter fault**<br>The line filter exceeded temperature limits or has non-permissible state |
| 16 | **External value/signal out of the range**<br>Digital/Analog inputs error (or temperature) |
| 17 | **Application / technology fault**<br>Application or technology function has exceeded a limit (position, velocity, torque…) |
| 18 | **Error in the configuration/commissioning**<br>Error in the commissioning procedure, or the configuration of the device |
| 19 | **General drive fault**<br>Group fault |
| 20 | **Auxiliary unit fault**<br>Auxiliary unit has identified an illegal state. |

## Safety functions

A detailed description of the Safety commissioning can be found in the S210 operation instructions under
www.siemens.com/sinamics-s210

## Correcting faults of the motor

| Fault | Cause of fault (see 'Fault cases and remedial measures' below | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Motor does not start | A | B | | | | | | | | | | | | |
| Motor starts slowly | A | | C | | F | | | | | | | | | |
| Humming sound when starting | | | C | | F | | | | | | | | | |
| Humming sound in operation | A | | C | | F | | | | | | | | | |
| High temperature rise under no-load operation | | | | D | | I | | | | | | | | |
| High temperature rise under load | A | | C | | | I | | | | | | | | |
| High temperature rise of individual winding sections | | | | | F | | | | | | | | | |
| Uneven running | | | | | | | J | K | | | | | | |
| Grinding sound, running noise | | | | | | | | | L | | | | | |
| Radial vibrations | | | | | | | | | | M | N | O | P | R |
| Axial vibrations | | | | | | | | | | | | O | Q | R |

| No. | Fault cause | Remedial measures |
|---|---|---|
| A | Overload | Reduce load |
| B | Interruption of a phase in the supply cable / motor winding | Check the converter and supply cables, measure the winding resistances and insulation resistances, repair after consultation with manufacturer |
| C | Interrupted phase in the feeder cable after switching on | Check the frequency converter, supply cables and the winding resistances |
| D | Converter output voltage too high, frequency too low | Check the settings on the frequency converter, perform automatic motor identification |
| F | Winding short-circuit or phase short-circuit in stator winding | Measure the winding resistances and insulation resistances, repair after consultation with the manufacturer, if required, replace the motor |
| I | Heat dissipation impeded by deposits | Clean the surface of the drives and ensure that the cooling air can flow in and out unimpeded |
| | Cooling air inlet/outlet is blocked by foreign bodies | Remove the reason for the blocking and ensure that the cooling air can flow in and out unimpeded |
| J | Insufficient shielding for motor and/or encoder cable | Check the shielding and grounding |
| K | Excessive drive controller gain | Adjust the controller |
| L | Rotating parts are grinding | Determine cause and adjust parts |
| | Foreign bodies inside the motor | Replace the motor |
| | Bearing damage | Replace the motor |
| M | Rotor not balanced | Replace the motor |
| N | Rotor out of true, shaft bent | Consult the manufacturer |
| O | Poor alignment | Align motor set, check coupling |
| P | Coupled machine not balanced | Re-balance coupled machine |
| Q | Shocks from coupled machine | Check coupled machine |
| R | Fault originating from the gearbox | Adjust/repair gearbox |

**SIMATIC S210 Operating Instructions**
www.siemens.com/sinamics-s210

**Underwriters Laboratories**
**For United States / Canadian installations (UL/cUL):** The products are cULus listed under File E355661 Vol. 3 Sec. 8.
Solid State Motor Overload Protection: 300% of motor FLA.
Suitable for use on a circuit capable of delivering not more than 65 kA rms (symmetrical), 240 V maximum.
Branch circuit protection for individual drives shall be provided by Class J fuses stated in Technical Data.
Branch circuit protection for group installation shall be provided by 30 Amps Class J fuses.
For further protective devices and SCCRs for individual drives and group installation refer to:
https://support.industry.siemens.com/cs/document/109748999
This equipment is to be installed in an enclosure that provides a pollution degree 2 (controlled) environment.
Equipment does not provide internal motor overtemperature protection. Overtemperature protection is provided by evaluation of thermal sensor.
Use 75°C rated copper wires for all power conductors.
**Additional requirements for CSA compliance:**
Overvoltage Category OVC III must be ensured for all primary circuit connections of the equipment. This may require Surge Protective Devices (SPD) to be installed on the line side of the equipment. The SPDs shall be rated 240V (phase to phase and phase to ground) and shall provide protection for a rated impulse withstand voltage peak of 4kV.

Siemens AG
Digital Factory
Motion Control
Postfach 3180
91050 ERLANGEN
Germany



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