

Protective Devices for SINAMICS S220 Line Modules Booksize

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1 Protective devices for IEC applications

1.1 IEC General Notes

Protection for safety must be provided in accordance with

- IEC 60364 standard series
- any additional local standards and regulations for electrical installations.

The tables below provide information for each line module type and article number on the following items:

- Suitable protective devices.
The specification includes the type and the maximum rated current of the branch circuit protective devices.
- Maximum ICC (conditional short circuit current)
This is the maximum RMS value of a prospective short circuit current, available from a supply source.
- Minimum enclosure volume.
In the end application, the drive shall be installed in an outer enclosure or control cabinet which shall meet the minimum enclosure volume requirement.

Selection of protective devices

- Protective devices of the same type as specified in the tables with a lower ampere rating may be used, if suitable for the application.
- Protective devices of the same type as specified in the tables with a lower interrupting rating may be used, if suitable for the application. In such case, this lower interrupting current rating of a protective device shall be specified as the ICC of a drive and protective device combination.
- The voltage rating of the protective device must be at least the voltage rating of the supply circuit.

The SINAMICS Motor Modules provide:

- Integral Motor Overload Protection which reduces the output current flow under overload conditions. Refer to manual for adjustments.
- Integral Output Short-Circuit Protection.

Notice on I_{cc}

The I_{cc} values stated in the tables of Chapter 1 also apply to Basic Line Filters, connected between the Protective Device and the Line Module.

1.2 IEC LV HRC fuses

1.2.1 Smart Line Modules Booksize

| Line Modules | | Fuse | | | Min. enclosure volume | |
|--|------------------|-------------|------------------------|---------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Article no. | Max. rated current [A] | Icc @ 480 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 3NA3817 | 40 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| 6SL5130-6UE22-4AC 6SL5130-6UE22-4AD | 24 | 3NA3824 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |

¹⁾ Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

Siemens 3NA low-voltage fuse series is recommended.

1.3 IEC semiconductor fuses

1.3.1 Smart Line Modules Booksize

| Line Modules | | Fuse | | | Min. enclosure volume | |
|--|------------------|------------------------|------------------------|---------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Article no. | Max. rated current [A] | Icc @ 480 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 3NE1802-0 | 40 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| 6SL5130-6UE22-4AC | 24 | 3NE1820-0 3NE1020-2 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| 6SL5130-6UE22-4AD | 24 | 3NE1020-2 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |

¹⁾ Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

1.4 IEC Motor Starter Protectors

1.4.1 Smart Line Modules Booksize

| Line Modules | | Motor Starter Protector | | | Min. enclosure volume | |
|--|------------------|-------------------------|------------------------|---------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Article no. | Max. rated current [A] | Icc @ 400 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 3RV2031-4U | 40 | 65 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 3RV2041-4F | 40 | 65 | | |
| 6SL5130-6UE22-4AC 6SL5130-6UE22-4AD | 24 | 3RV2031-4K | 73 | 65 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 3RV2041-4K | 75 | 65 | | |

1.5 IEC Circuit Breakers

1.5.1 Smart Line Modules Booksize

| Line Module | | Circuit Breaker | | | Min. enclosure volume | |
|--|------------------|-----------------|------------------------|---------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Article no. | Max. rated current [A] | Icc @ 400 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 3RV2742-5GD | 40 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 3VA1040-3ED | 40 | 25 | | |
| | | 3VA1040-4ED | 40 | 36 | | |
| | | 3VA1140-3EE | 40 | 25 | | |
| | | 3VA1140-4EE | 40 | 36 | | |
| | | 3VA1140-5EE | 40 | 55 | | |
| | | 3VA1140-6EE | 40 | 70 | | |
| | | 3VA5140-4E | 40 | 36 | | |
| | | 3VA5140-5E | 40 | 55 | | |
| | | 3VA5140-6E | 40 | 70 | | |
| | | 3VA5240-5E | 40 | 55 | | |
| | | 3VA5240-6E | 40 | 70 | | |
| | | 3VA5240-7E | 40 | 100 | | |
| | | 5SY4340-6 | 40 | 15 | | |
| 6SL5130-6UE22-4AC 6SL5130-6UE22-4AD | 24 | 3RV2742-5QD | 70 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 3VA1080-3ED | 80 | 25 | | |
| | | 3VA1080-4ED | 80 | 36 | | |
| | | 3VA1180-3ED | 80 | 25 | | |
| | | 3VA1180-4ED | 80 | 36 | | |
| | | 3VA1180-5ED | 80 | 55 | | |
| | | 3VA1180-6ED | 80 | 70 | | |
| | | 3VA5170-4E | 70 | 36 | | |
| | | 3VA5170-5E | 70 | 55 | | |
| | | 3VA5170-6E | 70 | 70 | | |
| | | 3VA5270-5E | 70 | 55 | | |
| | | 3VA5270-6E | 70 | 70 | | |
| | | 3VA5270-7E | 70 | 100 | | |
| | | 5SY4363-6 | 63 | 15 | | |

¹⁾ Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

2 Protective devices for UL/CSA applications

2.1 UL/CSA General Notes

Branch circuit protection must be provided in accordance with

- the National Electrical Code (NEC) for USA
- the Canadian Electrical Code (CEC) Part I for Canada
- any additional local codes and regulations.

The tables below provide information for each line module type and article number on the following items:

- Suitable protective devices.
The specification includes the type and the maximum rated current of the branch circuit protective devices.
- Maximum SCCR (Short-Circuit Current Rating).
This is the maximum prospective symmetrical fault current at the specified voltage to which the drive system can be connected without sustaining damage exceeding defined acceptance criteria. The specified SCCR applies to the complete drive module including built-in EMI filters and pluggable terminals (where applicable).
- Minimum enclosure volume.
In the end application, the drive shall be installed in an outer enclosure or control cabinet which shall meet the minimum enclosure volume requirement.

Selection of protective devices (in accordance with NEC and CEC)

- Suitable Protective devices of the same type as specified in the tables with a lower ampere rating as permitted by NEC and/or CEC may be used, if suitable for the application.
- Protective devices of the same type as specified in the tables with a lower interrupting rating than the specified SCCR may be used, if suitable for the application. In such case, this lower interrupting current rating of a protective device shall be specified as the SCCR of a drive and protective device combination.
- The voltage rating of the protective device must be at least the voltage rating of the supply circuit.

The SINAMICS Motor Modules provide:

- Integral Motor Overload Protection which reduces the output current flow under overload conditions. Refer to manual for adjustments.
- Integral Output Short-Circuit Protection.
According to UL 508A Edition 3, components on the load side of a drive module with built-in short circuit protection are not required to have a short-circuit current rating.

The SINAMICS S220 Line Modules provide:

- Integral Converter Overload Protection according to UL 61800-5-1 Edition 2 for modular drive systems. The tripping current is 100 % of the rated input current.

UL Certificates

- UL-File E192450 Volume 26, Section 1

The Line Modules are investigated to the US standard UL 61800-5-1 Edition 2.

Notice on SCCR

- The SCCR values stated in the tables of Chapter 1 and 2 also apply to Basic Line Filters connected between the Protective Device and the Line Module.

Basic Line Filters

- UL File E70122 Category FOKY2 / FOKY8
- The Basic Line Filters are allocated to the Line Modules as follows:

| Filter Article Number | SLM | Filter Designation in UL File |
|-----------------------|-------|-------------------------------|
| 6SL5100-0HE21-6DD0 | 16 kW | B84743A0030R309 |
| 6SL5100-0HE22-4DD0 | 24 kW | B84743A0044R309 |

2.2 UL/CSA non-semiconductor fuses

2.2.1 Smart Line Modules Booksize

| Line Module | | Fuse | | Min. enclosure volume | |
|--|------------------|------------------------|---------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Max. rated current [A] | Icc @ 480 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 40 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| 6SL5130-6UE22-4AC 6SL5130-6UE22-4AD | 24 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |

¹⁾ Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

Any UL listed non-semiconductor fuse Class J, CC, T, G or CF (JDDZ/7) of any manufacturer can be used for all types.

2.3 UL/CSA semiconductor fuses

2.3.1 Smart Line Modules Booksize

| Line Module | | Fuse | | | Min. enclosure volume | |
|--|------------------|-------------|------------------------|----------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Article no. | Max. rated current [A] | SCCR @ 480 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 3NE1802-0 | 40 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| 6SL5130-6UE22-4AC | 24 | 3NE1820-0 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 3NE1020-2 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| 6SL5130-6UE22-4AD | 24 | 3NE1020-2 | 80 | 100 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |

¹⁾ Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

2.4 UL/CSA Type E Combination Motor Controllers

2.4.1 Smart Line Modules Booksize

| Line Module | | Combination Motor Controller | | | | Min. enclosure volume | |
|--|------------------|---------------------------------|-------------|------------------------|------------------------------|-----------------------------------|-----------------------------------|
| Article no. | Rated power [kW] | Rated power (@ 460 V 3-ph) [hp] | Article no. | Max. rated current [A] | SCCR @ 480 Y / 277 V AC [kA] | Metric | Imperial (USA) |
| 6SL5130-6UE21-6AC 6SL5130-6UE21-6AD | 16 | 30 | 3RV2031-4U | 40 | 65 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 30 | 3RV2041-4F | 40 | 65 | | |
| 6SL5130-6UE22-4AC 6SL5130-6UE22-4AD | 24 | 50 | 3RV2031-4K | 73 | 65 | 0,17 m ³ ¹⁾ | 5.8 ft ³ ¹⁾ |
| | | 60 | 3RV2041-4K | 75 | 65 | | |

¹⁾ Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

Type E CMCs are only suitable for non-modular drive applications (line module and one single motor module connected directly via integrated DC busbars).

3RV20 motor starter protectors are approved in accordance with UL 508/UL60947-4-1 in combination with the terminal blocks listed below:

- 3RV2031 with 3RV2938-1K
- 3RV2041 with 3RT2946-4GA07

Not necessary for CSA.

2.5 UL/CSA Circuit Breakers

Note

- For more breaker article numbers, please refer to the European circuit breaker catalog LV 18.

<https://support.industry.siemens.com/cs/ww/en/view/109761061>

2.5.1 Smart Line Modules Booksize

| Line Module | | Circuit Breaker | | | | | Min. enclosure volume | |
|--|------------------|-----------------|-----------------------|------------------------|------------|--------------------|---------------------------|------------------------|
| Article no. | Rated power [kW] | UL/CSA Type | Article no. (example) | Max. rated current [A] | SCCR @ | | Metric | Imperial (USA) |
| | | | | | 480 V [kA] | 480 Y / 277 V [kA] | | |
| 6SL5130-6UE21-6AC0 6SL5130-6UE21-6AD0 | 16 | 3RV2742 | 3RV2742-5GD | 40 | --- | 65 | 0,17 m ³ 1) | 5.8 ft ³ 1) |
| | | SEAS (3VA51) | 3VA5140-4E#.. | 40 | 25 | --- | | |
| | | MEAS (3VA51) | 3VA5140-5E#.. | 40 | 35 | --- | | |
| | | HEAS (3VA51) | 3VA5140-6E#.. | 40 | 65 | --- | | |
| | | MFAS (3VA52) | 3VA5240-5E#.. | 40 | 35 | --- | | |
| | | HFAS (3VA52) | 3VA5240-6E#.. | 40 | 65 | --- | | |
| 6SL5130-6UE22-4AC0 6SL5130-6UE22-4AD0 | 24 | 3RV2742 | 3RV2742-5QD | 70 | --- | 65 | 0,17 m ³ 1) | 5.8 ft ³ 1) |
| | | SEAS (3VA51) | 3VA5170-4E#.. | 70 | 25 | --- | | |
| | | MEAS (3VA51) | 3VA5170-5E#.. | 70 | 35 | --- | | |
| | | HEAS (3VA51) | 3VA5170-6E#.. | 70 | 65 | --- | | |
| | | MFAS (3VA52) | 3VA5270-5E#.. | 70 | 35 | --- | | |
| | | HFAS (3VA52) | 3VA5270-6E#.. | 70 | 65 | --- | | |
| | | CFAS (3VA52) | 3VA5270-7E#.. | 70 | 100 | --- | | |

#: The selected variant must be suitable for line protection.

1) Minimum enclosure volume when installed in combination with a 200 A Motor Module: 0.42 m³ / 14.8 ft³.

3 Further information

For more information, see the following links:

- Equipment Manual
<https://support.industry.siemens.com/cs/ww/en/view/109803552>
- Siemens SENTRON fuses / 3NA fuses
<https://support.industry.siemens.com/cs/ww/en/view/45314810>
- Low-Voltage Power Distribution and Electrical Installation Technology
3VA and 3VL circuit breakers, IEC information or IEC application
<https://support.industry.siemens.com/cs/ww/en/view/109482234>
- SIRIUS Industrial Controls
3RV motor starter protectors, UL and IEC information
<https://support.industry.siemens.com/cs/ww/en/view/109747945>
<https://prod3-sprcdn-assets.sprinkl.com/150018/2fc1d05e-c3cb-4460-9931-89159e949d5b-1098614487/ic21-sect-01-iec-msps.pdf>
- IEC Circuit Breakers, 3VA1, 3V5 series
<https://support.industry.siemens.com/cs/document/90318775/manual-3va-molded-case-circuit-breakers-with-iec-certificate?dti=0&lc=en-WW>
- UL Molded Case Circuit Breakers, see Siemens SPEEDFAX Product Catalog Section 7
<https://digitalcontentcenter.compas.siemens-info.com/SF-17-Sect-07-ALL-web.pdf>