Simplifying Short-Circuit Current Ratings

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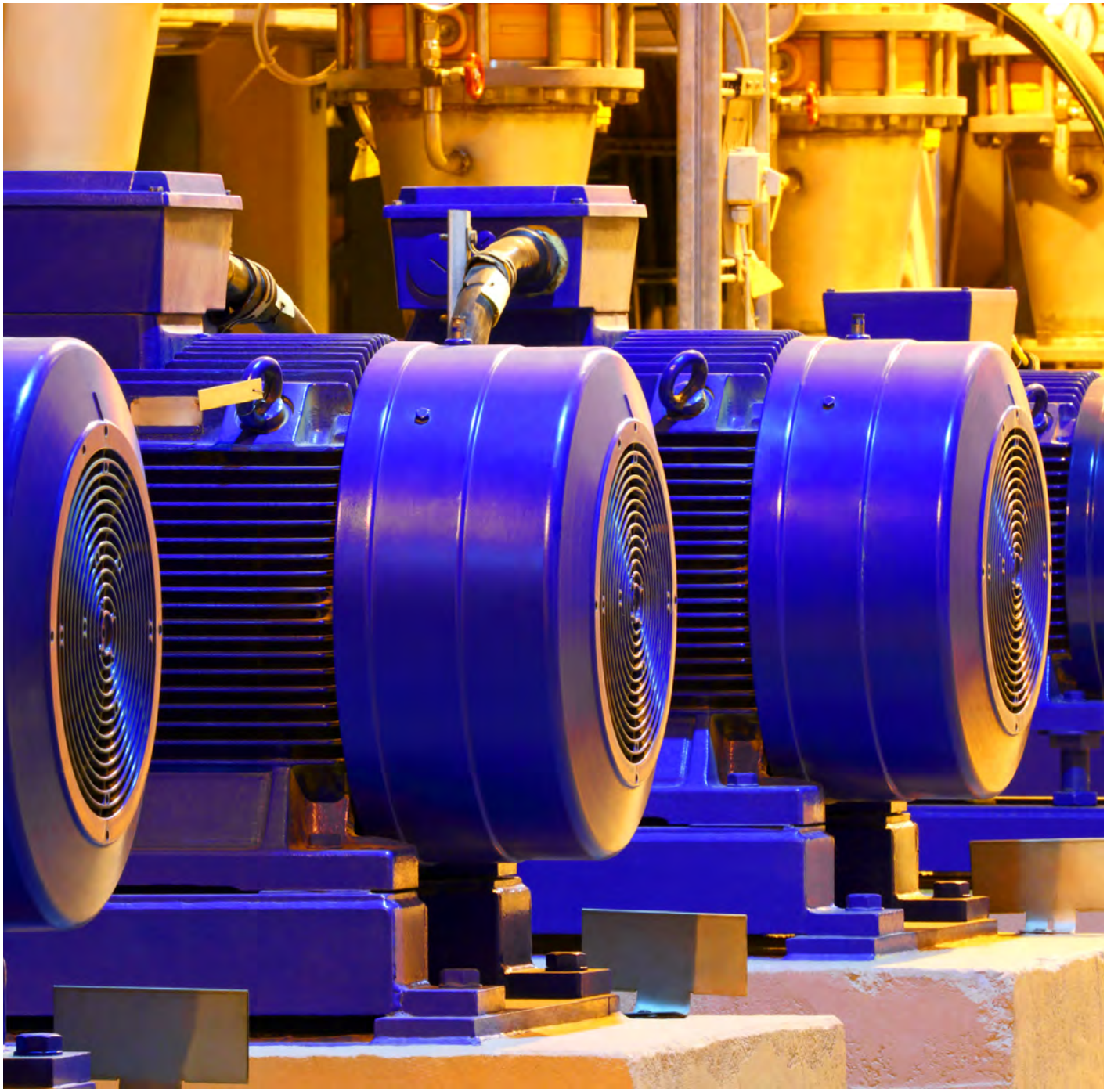
Introduction to SCCR

The short-circuit current rating (SCCR) defines the amount of current a control panel or a device can safely endure in the event of a short circuit. It is not only required by the National Electrical Code (NEC) but also designed to prevent injury to personnel and minimize equipment damage.

SCCR is most commonly determined using a “weakest link” approach, where the device with the lowest SCCR or interrupt rating in the power circuit defines the overall control panel rating. Devices often require certain conditions to be met in order to achieve a higher SCCR, such as a certain size breaker or fuse, a minimum enclosure size, use of a certain lineside spacer, or other conditions.



3 keys to successful SCCR outcomes

1. Know the available fault current

The first and most important question regarding SCCR is, “How much do I need?” There are many different types of pumping applications which may require differing levels of SCCR protection. Single home residential applications likely have lower available fault current levels, whereas higher density residential units such as apartments or high-rises may have a significantly larger fault current. Some pumping applications that are remote may have lower available fault current. Larger industrial facilities that require a high level of power to support their operation may likely have higher available fault current. The transformer that is feeding the circuit where the pumping system is powered has a signficant impact on the amount of available fault current that is present. The size, type and length of the conductors also impact the amount of available fault current, as they act as a form of impedance. This information can be readily attained in some cases, but may not be known at the time of the controls design in others. However, a worst-case scenario can be determined by attributes located on the transformer upstream of the control panel installation. Fault-current calculators can make calculation and documentation much easier.

2. Have an SCCR strategy

Designing control panels to meet SCCR compliance for each installation site can demand a significant amount of engineering effort. An even greater challenge is realizing a higher SCCR was needed after the control panel is installed. A more feasible approach is to design control panels to a standard SCCR level that meets most if not all field applications. Some types of pumping applications can vary widely on the level of SCCR needed depending on the installation site. One such example is emergency water removal equipment that may be deployed in a variety of locations and scenarios. Others may be more consistent, such as those used in high rises where the power needs are much larger. The key is to understand the typical level of available fault current and the upper end extreme for the installations of a particular type of pump panel. Once this is known the controls designer can standardize the design for either the typical or worst case SCCR condition. It is much easier to cost out by substituting devices with lower ratings when a higher one is not needed than to raise the panel’s SCCR by substituting devices with higher ratings.

3. Align with the right manufacturer

Competing design objectives such as size, performance factors, and cost-effectiveness can make achieving a high SCCR on a device challenging for manufacturers. Devices have to be tested to determine the SCCR level at which they can perform. Due to this difficulty, it is not unusual to find SCCR gaps in an offer or within a set of product offerings.

It is also important to consider the conditions required to achieve a higher SCCR for a device. Some devices may require a smaller breaker than might typically be used, to achieve a higher rating, while some devices may only permit fuses. Other device ratings may not include the use of desired accessories, such as wiring jumper busbars that expedite wiring installation of Type F combination starters.

Another consideration is that it may not be possible in all cases to use different manufacturers’ devices together to achieve a higher SCCR. Some SCCR types require a specific overcurrent protective device manufacturer or type.

Aligning with a manufacturer offering a comprehensive SCCR solution portfolio can make panel design easier and more cost-effective.

Schneider Electric's SCCR portfolio

Circuit protection – Pumps provide a vital role, and thus are often protected by circuit breakers which can easily be reset in the event of a trip. The comprehensive, market-leading PowerPacT™ series of circuit breakers provides a wide range of interrupt ratings covering up to 200 kA. TeSys™ GS fused rotary disconnects offer up to 200 kA SCCR. For branch-level protection, TeSys Motor Protective Circuit Breakers (MPCBs), which combine the function of a circuit breaker and motor overload protection, deliver up to 65 kA 480 Y interrupt rating protection. The TeSys series also includes fusible disconnect solutions with 100 kA ratings, as well as compact Class CC fuse holders with 200 kA ratings.

Disconnects – It is not unusual for non-fused disconnects to have SCCRs with fuses. TeSys VLS UL98 disconnects not only have 100 kA SCCR with fuses, but also have 100 kA 480 V SCCR with PowerPacT H and J Frame circuit breakers.

Wiring solutions – One of the most common weak links in control panels is the wiring distribution block that distributes wiring from one source to several devices. This likely does not impact controls for single pump systems but likely does impact controls for duplex, tri-plex or quad systems, or complex systems that include pumps among other types of loads. Class 9080L and finger-safe NS distribution blocks not only have SCCRs with fuses, but also have high SCCRs with breakers up to 65 kA. The PowerPacT series of breakers also simplify wiring while saving space and achieving high SCCR with power distribution connectors that allow 3, 6, or 12 wires to be applied to the load-side termination.

Motor branch circuits

- Single component branch circuits: The TeSys Ultra Type E Combination Motor Controller saves space for motor circuits up to 20 HP 480 Y and offers 65 kA (also 130 kA with the use of current limiter)
- Two-component branch circuits: Type F combinations up to 65 amps with SCCRs up to 100 kA 480 Y, MPCB and contactor 65 kA 480 Y to 520 amps
- Three-component branch circuits: Contactor and overload relay solutions to 630 amps with SCCRs ranging from 65 to 100 kA 480V with breakers and 100 kA with fuses
- Definite purpose contactors: 100 kA with breakers or fuses

Non-motor load branch circuits

- Circuit breaker and contactor from TeSys: Superior SCCRs including 85 kA (to 38 amps), 100 kA (40 to 330 amps), 65 kA (400 to 500 amps), and 100 kA (630 to 800 amps)
- Fuse and contactor: 100 kA solutions for contactors up to 800 amps
- Lighting contactor solutions with 100 kA SCCR with breakers or fuses

Speed control and communication solutions for branch circuits

- Communicating starters: TeSys island (up to 40 HP, 80 A) offers 85 kA with circuit breakers and 100 kA with fuses
- Drive solutions: The simple, compact Altivar™ ATV320 drives have up to 65 kA with breakers, 65 kA with Type E TeSys GV, and 100 kA with fuses, while the Altivar 340 Machine Drive supports up to 100 kA with breakers, 65 kA with Type E TeSys GV, and 100 kA with fuses
- Soft starter solutions: The mid-range Altistart™ 22 (10 to 480 HP 480 V) offers up to 100 kA SCCR with breakers or fuses

Transformers – When all else fails, the transformer is often used to solve an SCCR challenge. Transformers have the effect of lowering the available fault current, making the use of lower-rated SCCR devices acceptable. Schneider Electric offers transformers in different forms such as control transformer, encapsulated, and pad-mount, to fit voltage, power, environment, and size needs.

Solving common SCCR challenges

Weak spot: 480 V Delta

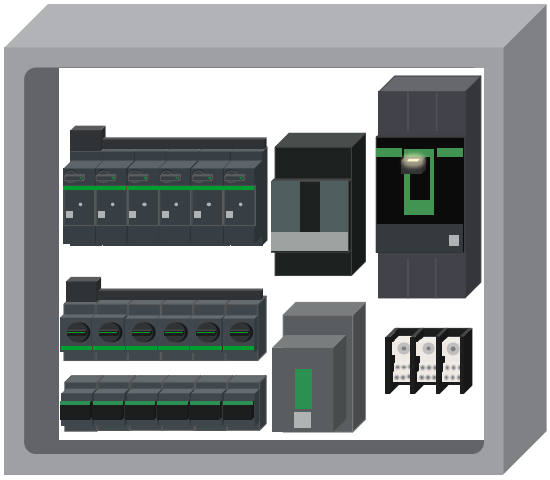
Type E or F combination devices reduce panel space but are often rated at 480 Y, meaning they cannot be used for 480 V Delta.

TeSys Ultra

TeSys Ultra Type E combination starters (up to 20 HP 480 Y) have a 65 kA SCCR and 130 kA 480 V Delta SCCR with a current limiter.

Weak spot: 10 kA busbar

Busbars distribute power to adjacent devices and install quickly. However, the default rating for busbar without an SCCR is 10 kA.



TeSys Deca

TeSys has Type F-tested combinations, including the GV2G busbar.

45mm
0.1-10A
- 100 kA SCCR with or without GV2G busbar

9-25A
- 50 kA SCCR (42 kA with GV2G busbar)

55mm
9-65A
- 65 kA SCCR

Weak spot: large contactors

Large-size contactors may have inconsistent SCCRs with breaker size limitations.

TeSys Giga

Contactors and overload relays offer SCCRs up to 100 kA 480 V with circuit breakers or 100 kA 600 V with fuses.

Weak spot: 10 kA distribution block

Power distribution blocks (PDBs) distribute wiring to multiple loads but often lack sufficient SCCR. The default rating for PDBs is 10 kA.

PowerPacT

Power distribution connectors allow for 3-, 6-, and 12-cable connections, have the interrupting rating (IR) as the breaker, and save panel space.

9080L distribution blocks

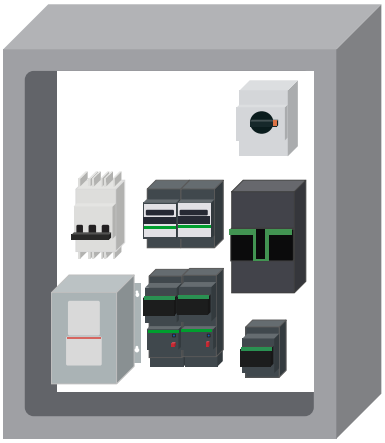
Distribution blocks offer SCCRs up to 65 kA with breakers and 100 kA with fuses.

Weak spot: mini circuit breakers

Miniature circuit breakers are often used for transformer circuits or as circuit protection for motor starters but are often limited to a 10 kA interrupt rating. When a higher SCCR is needed, it can be difficult to substitute a protection device that doesn't require additional space for increased width.

TeSys LS1

TeSys LS1 is a Class CC fuse holder rated 200 kA. Its 45 mm width provides a narrow 100 kA solution with TeSys Deca starters.

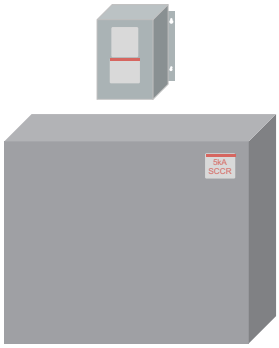


Weak spot: non-fused disconnect

Disconnects often have a higher SCCR but sometimes with fuses only, limiting an engineer's design options.

TeSys VLS

TeSys VLS disconnects have a 100 kA 480 V SCCR with PowerPact breakers and 100 kA SCCR 600 V with fuses.



Weak spot: low panel SCCR

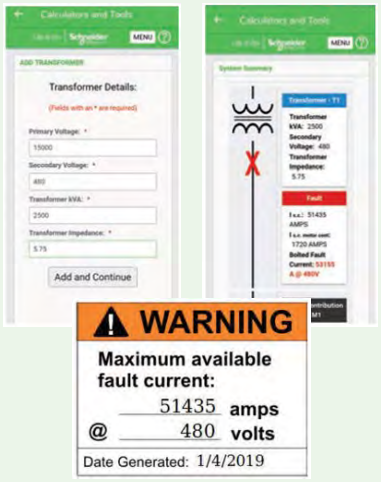
Some panel design SCCR needs are difficult to solve despite best efforts, and requirements are sometimes missed or miscommunicated.

Class 7400

Transformers help reduce the amount of available fault current, thus reducing the required panel SCCR level needed for compliance.

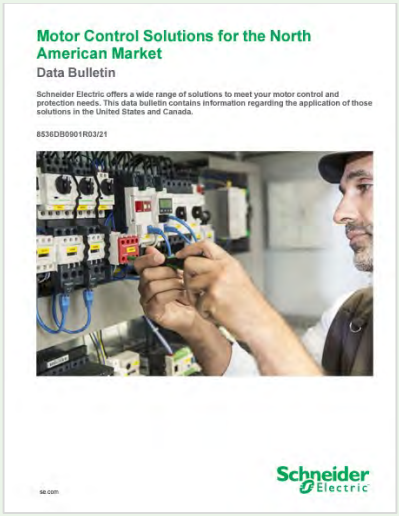
SCCR tools and resources

In addition to the range of SCCR product solutions, Schneider Electric also provides a variety of tools and resources to help customers understand, analyze, and solve short-circuit current rating needs.



Fault Current Calculator

Quickly calculate available fault current by entering installation site details. Printable documentation and labels are delivered by email.



SCCR Guide

This guide details the most common control panel items, including motor control, disconnects, circuit protection, distribution blocks, and more.

Additional Device SCCRs

SCCRs for drives and soft starters can be found on se.com in the Getting Started Annex documents.

- Altivar ATV320 drive
- Altivar ATV340 drive
- Altistart ATS22 soft starter
- and others

Combination SCCRs

Combination Type A, C, D, E, and F SCCRs can be found on the Underwriters Laboratory website.

- UL.com/SCCR

Advanced support

Schneider Electric's regional product applwication engineers are a technical resource for customers needing help solving control panel needs.

- SCCR training (virtual or on site)
- SCCR solution development.
- Advanced technical support

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