

# *R&D Engineering Note: Short circuit current rating (SCCR)*

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## *1) Introduction*

Short Circuit Current Rating (SCCR) is an equipment rating related to safety under fault current conditions. Inadequate equipment SCCR can result in serious safety hazards. It is prohibited by both the NEC and OSHA to have any equipment installed at a point in an electrical system where the available short-circuit current is greater than what the equipment can withstand.

As per UL508A Supplement SB, Seifert Systems' air conditioners have a default SCCR of 5 kA.

## *2) NEC and UL508A*

NEC requires that control panels are marked with their SCCR. It also states that UL508A Supplement SB is an acceptable approved method for calculating the SCCR.

**409.110 Marking.** An industrial control panel shall be marked with the following information that is plainly visible after installation:

(4) Short-circuit current rating of the industrial control panel based on one of the following:

- a. Short-circuit current rating of a listed and labelled assembly
- b. Short-circuit current rating established utilizing an approved method

Informational Note: ANSI/UL 508A, Standard for Industrial Control Panels, Supplement SB, is an example of an approved method.

*Exception to (4): Short-circuit current rating markings are not required for industrial control panels containing only control circuit components.*

### 3) *Calculating the SCCR for Industrial Control Panels (based on Supplement SB, UL508A)*

To assure compliance, it must be verified that the marked, or assumed, SCCR of a component is not exceeded by the available fault current. The overall SCCR of an industrial control panel shall be determined as follows:

1. Establish the SCCR of individual power circuit components (SB4.2)
2. Modifying the available short circuit current within a portion of a circuit in the panel due to the presence of current limiting components (SB4.3)
3. Determining the overall panel SCCR (SB4.4)

#### a) **SCCR of individual power circuit components (SB4.2)**

All power circuit components except for those listed in the exceptions of SB4.2.1, including disconnect switches, branch circuit protective devices, branch circuit fuse holders, load controllers, motor overload relays, terminal blocks, and bus bars, shall have a SCCR expressed in amperes or kiloamperes and voltage.

The SCCR of a feeder or branch circuit component shall be established by:

- a. The short circuit rating marked on the component or on instructions provided with the component OR
- b. The SCCR determined by the voltage rating of the component and the assumed short circuit current from Table SB4.1 OR
- c. The SCCR based on the investigation of a combination of devices as per UL508A

#### b) **Feeder components that limit the short circuit current available (SB4.3)**

The SCCR is based on the peak let-through current of current-limiting devices in used in the feeder circuit. When these devices are used in the feeder circuit, components in the branch circuit must be rated for the peak let-through current of the short-circuit-current limiting components used in the feeder circuit.

##### *j) Feeder and branch circuits supplied by a power transformer with an isolated secondary winding*

For feeder and branch circuit components and overcurrent protective devices supplied by a power transformer with an isolated secondary winding, the SCCR on the line side of the transformer shall be one of the following:

- a. If the transformer has a marked or know impedance, the secondary short circuit current ( $I_{sc}$ ) can be calculated using the formulas in SB4.3.1. For a power transformer with an unmarked impedance, or with an impedance less than 2.1%, the impedance shall be assumed as 2.1%. In this case the short circuit rating shall be determined by the formulas or tables in supplement SB.

If the SCCR of all components and interrupting rating of all overcurrent protective devices supplied by the transformer are not less than the calculated  $I_{sc}$ , the interrupting rating of the primary overcurrent protective device is able to be assigned to the SCCR on the line side of the power transformer circuit.

- b. Otherwise, the lowest SCCR of the components or the lowest interrupting rating of the overcurrent protective devices supplied by the transformer, whichever is lower, is assigned to the line side of the transformer.

*ii) Branch circuits supplied by a Listed circuit breaker marked "current limiting" in the feeder circuit*

A circuit breaker can be used as a current-limiting component in the feeder circuit only if it is marked as 'current limiting'. The let-through current of the circuit breaker is to be considered - this can be obtained from the characteristic of the circuit breaker used. The interrupting rating of the circuit breaker is considered as the SCCR on the line side if:

- 1) The SCCR of the components of the load side of the circuit breaker have a SCCR equal to or higher than the peak let-through current of the feeder circuit breaker AND
- 2) The interrupting rating of the protection devices in the branch circuit is equal to or higher than that of the circuit breaker in the feeder circuit.

*iii) Branch circuits supplied by a Class CC, G, J, L, RK1, RK5, or T fuse in the feeder circuit,*

Fuses listed in Table SB4.2 (Class CC, G, J, L, RK1, RK5 or T) are considered as current-limiting fuses. The interrupting rating of the fuse is considered as the SCCR on the line side if:

- 1) The SCCR of the components of the load side of the fuse have a SCCR equal to or higher than the peak let-through current of the fuse AND
- 2) The interrupting rating of the protection devices in the branch circuit is equal to or higher than that of the fuse in the feeder circuit.

**c) Determination of the overall SCCR of the panel (SB4.4)**

The overall SCCR of the panel is the lowest SCCR of any branch circuit as modified (where applicable) by any current limiting feeder component.

#### 4) Conclusion

As per UL508A Supplement SB, Seifert Systems' air conditioners have a default SCCR of 5 kA.

If no additional measures are taken in the installation, the resulting SCCR rating in the control panel would be 5 kA, assuming that the air conditioner is the lowest rated component in the panel.

However, a high fault SCCR is conditional on the use of current limiting components to modify the SCCR within the portion of the circuit where the air conditioner is installed. UL508A allows the use of the following current limiting components (installed in the feeder circuit):

- 1) Power transformer with an isolated secondary winding
- 2) Circuit breakers that are marked as current limiting
- 3) Fuses of Class CC, G, J, L, RK1, RK5, CF or T

Seifert Systems recommends the use of a Listed circuit breaker marked 'current limiting' or a fuse of the type listed in Table SB4.2 (UL508A) in order to maintain the SCCR value of the panel if higher than 5 kA.

The current limiting component used must have a peak let-through current less than 5 kA and the SCCR rating on the line side of this component will be equal to the interrupting rating of the device. Always check the suitability of the current limiting device used with the manufacturer and the competent certifying bodies to ensure that the compliance and safety of the installation is maintained.