

Determining the Circuit Breaker Size

Revision History

- Version 1.0 February 2019: first release

Introduction

Inverters should be protected by circuit breakers. This document describes how to determine which circuit breaker to use in three phase commercial installations.

Using Transformers in Commercial Three Phase Inverter Installations

Using transformers in a commercial installation is optional. In most cases a transformer is used to connect the installation to the medium voltage power grid. The following figure illustrates a typical transformer and commercial three phase inverter installation topology.

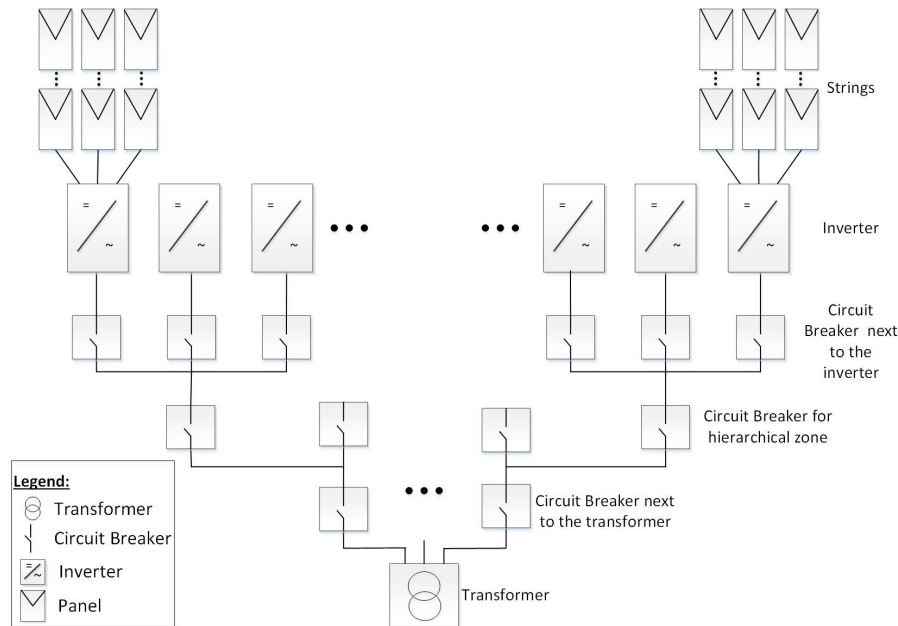


Figure 1: Typical transformer and commercial three phase inverter installation topology

There are many considerations for selecting the suitable transformer and its associated current limiting devices such as circuit breakers and fuses. The considerations must include at least the following:

- The transformer should be designed for a typical PV system production profile: high daytime loads with no loads at night.
- The current limiting devices should protect the electrical circuits and the inverters from the excess current created by an overload, or a short circuit. If a short circuit or other overcurrent occurs, the current limiting devices should block the current flow to the circuit, thus preventing damage to the electrical circuits and the inverters.

The circuit breakers and the fuses should comply with the transformer manufacturer recommendations and with the relevant sections in standards such as IEC 60909, IEC 60364, UL 508A and NEC 2017.

Some manufacturers provide detailed information about the transformer short circuit calculation procedure, and its effect on the selection of circuit breakers and fuses at the different hierarchical levels of the installation topology (see *Figure 1*).

For an example of a calculation, refer to:

- [Guidelines on the Short Circuit Current Rating for Industrial Control Panels](#)
- [Short-circuit current rating \(SCCR\) of industrial control panels](#)
- To ensure that the circuit breaker and fuses trip as expected, follow their manufacturers' recommendations, especially with respect to the various de-rating considerations.

NOTE

- Transformer procurement, installation, maintenance and support are the responsibility of the installer. Damage to the inverter due to incorrect transformer installation, or use of a transformer that is incompatible with the SolarEdge system will render the SolarEdge warranty invalid.

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Determining the Size of an Inverter Circuit Breaker

This section explains how to determine the rate of a circuit breaker next to an inverter. For an example of an inverter with a circuit breaker next to it see *Figure 1*.

Ensure you have the following parameters before determining the circuit breaker size:

- The inverter's maximum continuous output current as appears in the datasheet.
- Factor for the installation's country. This factor is dictated by regulation, applicable standards or common practice and is usually 1.25.

→ To determine the size of an inverter circuit breaker:

1. Multiply the inverter's maximum continuous output current by the factor.
For example, $40A \times 1.25 = 50A$
2. Round up the rated size, as calculated in step 1, to the closest standard circuit breaker size. See Circuit Breaker Criteria table below for standard sizes suitable for SolarEdge three phase inverters.



NOTE

If the result has a decimal fraction smaller than 0.5 round it down.

3. To ensure that the selected circuit breaker trips as expected, at minimum consider the following:

- The circuit breaker rated voltage.
- Temperature de-rating due to both close proximity of other circuit breakers and the effect of ambient temperature on the distribution board.
- De-rating due to permanent load.

If the de-rated current of the selected circuit breaker is lower than the maximum output current of the inverter, consider selecting a circuit breaker that is designed for a higher rated current, or reducing the temperature de-rating effect by increasing the distance between adjacent circuit breakers.

NOTE



- Make sure to select cables that are suitable for the environmental conditions, the operating voltage and the selected circuit breaker.
- Three or four pole circuit breakers are required. It is recommended to use a four pole circuit breaker when applicable.
- It is recommended to use a circuit breaker with tripping characteristic B or C.

Table 1: Circuit Breaker Criteria

Inverter	Max. Continuous Output Current (per Phase)	Recommended Circuit Breaker
SE12.5K	20A	25A
SE14.4KUS	40A	50A
SE15K	23A	32A
SE16K	25.5A	32A
SE17K	26A	32A
SE25K	38A	50A
SE27.6K	40A	50A
SE30K	36.5A	50A
SE33.3K	40A	50A
SE43.2KUS	120A	150A
SE50K	76A	100A
SE55K	80A	100A
SE66.6K	80A	100A
SE66.6KUS	80A	100A
SE75K	120A	150A
SE82.8K	120A	150A
SE100K	120A	150A
SE100KUS	120A	150A