Technical Note - Designing a PV System using SolarEdge Commercial Inverter and Power Optimizers

Revision history

- Version 1.0, December 2025 – Initial release

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Overview

This technical note specifies the design rules for a Commercial SolarEdge PV system, which includes:

- SolarEdge Commercial Three Phase Inverter and Three Phase Inverter with Synergy Technology.
- SolarEdge S1000, S1200, S1201, S1400, S1500, C651U Power Optimizers.
  For design rules of other Power Optimizers, refer to their respective datasheets.

Design Concept and Terminology

PV String

A PV string is a group of Power Optimizers connected in series to each other. The output of the entire string feeds the inverter as a single electrical source.

SolarEdge System

When designing a SolarEdge system, the inverter and Power Optimizer models determine the applicable system design rules and must therefore be considered during planning, as described in this document.
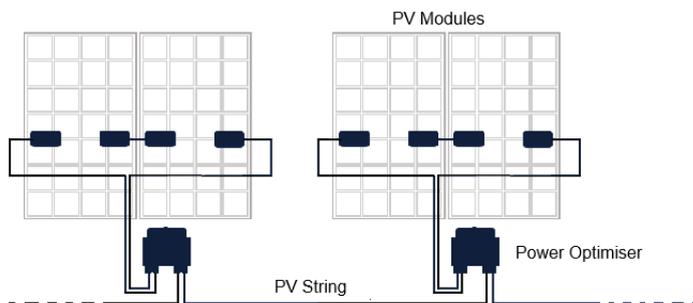
Power Optimizer and PV Module Configurations

Each Power Optimizer supports one of the following configurations:

◤ 1:1 configuration – One PV module connected to one Power Optimizer.
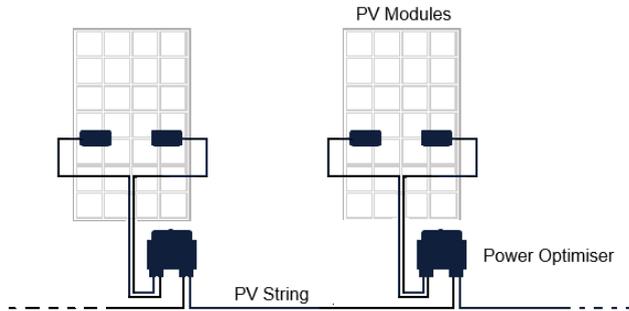
◤ 2:1 configuration – Two PV modules connected in series to one Power Optimizer.

Use only configurations approved for the specific Power Optimizer model, as outlined in the PV strings with 2:1 configuration section.

Maximum Continuous Power per String

The Maximum Continuous Power per String defines the maximum power the PV string can deliver to the inverter. This value is calculated using the following parameters:

◤ The Power Optimizer's maximum output current

◤ The inverter's fixed string voltage

Maximum Allowed Connected Power per String

The Maximum Allowed Connected Power per String specifies the maximum total Standard Test Conditions (STC) power of all PV modules connected to the Power Optimizers within a single string.

To connect more STC power per string, design your project using SolarEdge Designer.

General Design Rules

Inter-compatibility of Power Optimizers

Inter-compatibility refers to the ability to use different Power Optimizer types in the same PV string.

To ensure interoperability of Power Optimizers installed on the same PV string, all Power Optimizers must be interoperable with each other, as specified in the [inter-compatibility technical note](#).

Multiple String Design

It is permitted to connect parallel PV strings of different lengths or orientations to the same inverter.

The maximum allowable difference between the shortest and longest string connected in parallel is five (5) Power Optimizers.

Minimum STC DC Power

For 15kW inverters and above, the minimum required STC DC connected power is 11kW.
Ensure the PV array design meets or exceeds this value to support correct inverter operation.

Designing with the Three Phase Inverter with Synergy Technology

The same rules apply to Synergy units of equivalent power ratings that are part of the modular Synergy Technology inverter. For example, when designing an SE100K, which is built of three synergy units, each unit should be designed according to the rules of an SE33.3K inverter.

Designing with inverters that support Rapid Shutdown

When connecting to an inverter that supports Rapid Shutdown, each PV string must contain fewer than 28 Power Optimizers to comply with the NEC rapid-shutdown requirements (C651U is an exception, with a maximum string length of 57 Power Optimizers).

For further information, please refer to Appendix A.

PV strings with 2:1 configuration

- Before connecting SolarEdge Power Optimizers to multiple PV modules, refer to [Application Note: Connecting SolarEdge Power Optimizers to Multiple PV Modules](#).

- When two modules are required to connect in parallel to a single input Power Optimizer, refer to [Connecting two modules in parallel using a single-input Power Optimizer and a Branch Cable - Application note](#).

- When connecting Power Optimizers in a PV string using a 2:1 configuration, you may add up to five Power Optimizers in a 1:1 configuration, provided that the number of optimizers in the 2:1 configuration is **equal to or greater than the minimum required per string minus one**.

  Example: a specific configuration requires a minimum of 14 Power Optimizers and 27 PV modules per string.

String configuration	Result
29 PV modules – 13 optimizers in 2:1, 3 optimizers in 1:1	Allowed: 13 Power Optimizers ≥ 13 (14 minimum – 1) 29 PV Modules > 27
27 PV modules – 12 optimizers in 2:1, 3 optimizers in 1:1	Not Allowed: 12 Power Optimizer < 13 (14 minimum – 1)

PV strings with 1:1 configuration

It is optional to connect an **entire string** in a 1:1 configuration. In this case, the minimum and maximum number of modules per string requirements can be neglected. The requirements for the minimum and maximum number of Power Optimizers per string must be met.

System Specific Design Rules – Europe

PV system design using S1000 Power Optimizer

PV System Design Using a Three Phase Inverter with S1000 Power Optimizer		230/400V Grid SE20K, SE25K	230/400V Grid SE30K	230/400V Grid SE33.3K	Units
Equivalent Three Phase Inverter with Synergy Technology models		400V Grid SE50K	400V Grid SE90K	400V Grid SE66.6K, SE100K	
Minimum String Length	Power Optimizers	14	15	14	
	PV Modules	27	29	27	
Maximum String Length	Power Optimizers	30	30	30	
	PV Modules	60	60	60	
Maximum Continuous Power per String		13,500	15,300	13,500	W
Maximum Allowed Connected Power per String	Single String Design	15,750	17,550	15,750	
	2 Strings	18,500	20,300	15,750	
	3 Strings or more	18,500	20,300	18,500	

PV system design using S1200 Power Optimizer

PV System Design Using a Three Phase Inverter with S1200 Power Optimizer		230/400V Grid SE20K, SE25K	230/400V Grid SE30K, SE33.3K @850Vdc	230/400V Grid SE33.3K @750Vdc	Units
Equivalent Three Phase Inverter with Synergy Technology models		400V Grid SE50K	400V Grid SE66.6K, SE90K, SE100K	400V Grid SE66.6K, SE100K	
Minimum String Length	Power Optimizers	14	15	14	
	PV Modules	27	29	27	
Maximum String Length	Power Optimizers	30	30	30	
	PV Modules	60	60	60	
Maximum Continuous Power per String		15,000	17,000	15,000	W
Maximum Allowed Connected Power per String	Single String Design	17,250	19,250	17,250	
	2 Strings	20,000	23,000	17,250	
	3 Strings or more	20,000	23,000	20,000	

When connecting the S1200 Power Optimizer with the SE33.3K inverter (and equivalent SE66.6K and S100K Synergy inverters), it may be required to toggle the Fixed String Voltage from 750Vdc to 850Vdc via SolarEdge SetApp. For details, see this Application Note (EU).

PV system design using S1400 or S1500 Power Optimizer

PV System Design Using a Three Phase Inverter with S1400/1500 Power Optimizer		230/400V Grid SE20K, SE25K, SE33.3K	230/400V Grid SE30K	Units
Equivalent Three Phase Inverter with Synergy Technology models		400V Grid SE50K, SE66.6K, SE100K	400V Grid SE90K	
Minimum String Length	Power Optimizers	14	15	
	PV Modules	27	29	
Maximum String Length	Power Optimizers	30	30	
	PV Modules	60	60	
Maximum Continuous Power per String		18,000	20,400	W
Maximum Allowed Connected Power per String	Single String Design	20,250	22,650	
	2 Strings	28,000	30,400	
	3 Strings or more	28,000	30,400	

System Specific Design Rules – North America

PV system design using C651U Power Optimizer

PV System Design Using a Three Phase Inverter with C651U Power Optimizer		208V Grid SE10K	208V Grid SE17.3K	277/480V Grid SE30K, SE33.3K	277/480V Grid SE40K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	208V Grid SE50K	480V Grid SE100K	480V Grid SE80K, SE120K	
Minimum String Length	Power Optimizers	13	13	18	18	
	PV Modules	13	13	18	18	
Maximum String Length	Power Optimizers	57	57	57	57	
	PV Modules	57	57	57	57	
Maximum Continuous Power per String		10,000	9,600	20,400	20,400	W
Maximum Allowed Connected Power per String	Single String Design	15,000	11,400	22,650	22,650	
	2 Strings	15,000	15,000	30,400	30,400	
	3 Strings or more	15,000	15,000	30,400	30,400	

PV system design using S1200 or S1201 Power Optimizer

PV System Design Using a Three Phase Inverter with S1200/S1201 Power Optimizer		208V Grid SE10K	208V Grid SE17.3K	277/480V Grid SE20K, SE30K	277/480V Grid SE33.3K, SE40K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	208V Grid SE50K	-	480V Grid SE80K, SE100K, SE110K, SE120K	
Minimum String Length	Power Optimizers	8	10	15	15	
	PV Modules	15	19	29	29	
Maximum String Length	Power Optimizers	30	30	30	30	
	PV Modules	60	60	60	60	
Maximum Continuous Power per String		7,200	8,820	15,300	15,300	W
Maximum Allowed Connected Power per String	Single String Design	8,400	10,020	17,550	17,550	
	2 Strings	10,600	13,000	23,000	17,550	
	3 Strings or more	10,600	13,000	23,000	23,000	

System Specific Design Rules – Australia

PV system design using S1000 Power Optimiser

PV System Design Using a Three Phase Inverter with S1000 Power Optimiser		230/400V Grid SE15K, SE27.6K, SE30K	230/400V Grid SE17K, 25K	230/400V Grid SE33.3K	Units
Equivalent Three Phase Inverter with Synergy Technology models		400V Grid SE55K. SE90K	400V Grid SE50K	400V Grid SE66.6K, SE100K	
Minimum String Length	Power Optimisers	14	14	14	
	PV Modules	27	27	27	
Maximum String Length	Power Optimisers	30	30	30	
	PV Modules	60	60	60	
Maximum Continuous Power per String		13,950	13,500	13,500	W
Maximum Allowed Connected Power per String	Single String Design	16,200	15,750	15,750	
	2 Strings	18,950	18,500	15,750	
	3 Strings or more	18,950	18,500	18,500	

PV system design using S1200 Power Optimiser

PV System Design Using a Three Phase Inverter with S1200 Power Optimiser		230/400V Grid SE15K	230/400V Grid SE17K, 25K	230/400V Grid SE27.6K, SE30K	230/400V Grid SE33.3K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	400V Grid SE50K	400V Grid SE55K. SE90K	400V Grid SE66.6K, SE100K	
Minimum String Length	Power Optimizers	14	14	14	15	
	PV Modules	27	27	27	29	
Maximum String Length	Power Optimisers	30	30	30	30	
	PV Modules	60	60	60	60	
Maximum Continuous Power per String		15,500	15,000	15,500	17,000	W
Maximum Allowed Connected Power per String	Single String Design	20,500	17,250	17,750	19,250	
	2 Strings	20,500	20,000	20,500	23,000	
	3 Strings or more	20,500	20,000	20,500	23,000	

When connecting the S1200 power optimizer with SE33.3K inverter (and equivalent SE66.6K and S100K Synergy inverters), it may be required to toggle the Fixed String Voltage from 750Vdc to 850Vdc via SolarEdge SetApp. For details, see this Application Note (Rest of the world).

PV system design using S1400 or S1500 Power Optimiser

PV System Design Using a Three Phase Inverter with S1400/S1500 Power Optimiser		230/400V Grid SE15K	230/400V Grid SE17K	230/400V Grid SE25K, SE33.3K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	-	400V Grid SE50K, SE66.6K, SE100K	
Minimum String Length	Power Optimisers	14	14	14	
	PV Modules	27	27	27	
Maximum String Length	Power Optimisers	30	30	30	
	PV Modules	60	60	60	
Maximum Continuous Power per String		18,600	18,000	18,000	W
Maximum Allowed Connected Power per String	Single String Design	28,600	28,000	20,250	
	2 Strings	28,600	28,000	28,000	
	3 Strings or more	28,600	28,000	28,000	

System Specific Design Rules – International Markets

For complete list of supported countries and grids, see Countries Supported by SolarEdge Inverters and Grids Supported by SolarEdge Inverters.

PV system design using S1000 Power Optimizer

PV System Design Using a Three Phase Inverter with S1000 Power Optimizer		230/400V Grid SE15K	230/400V Grid SE16K, SE17K, SE25K	230/400V Grid SE27.6K	230/400V Grid SE30K, SE33.3K @850Vdc	230/400V Grid SE33.3K @750Vdc	277/480V Grid SE40K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	400V Grid SE50K	400V Grid SE55K	400V Grid SE66.6K, SE90K, SE100K	400V Grid SE66.6K, SE100K	480V Grid SE120K	
Minimum String Length	Power Optimizers	14	14	14	15	14	15	
	PV Modules	27	27	27	29	27	29	
Maximum String Length	Power Optimizers	30	30	30	30	30	30	
	PV Modules	60	60	60	60	60	60	
Maximum Continuous Power per String		13,950	13,500	13,950	15,300	13,500	15,300	W
Maximum Allowed Connected Power per String	Single String Design	16,200	15,750	16,200	17,550	15,750	17,550	
	2 Strings	18,950	18,500	18,950	20,300	15,750	17,550	
	3 Strings or more	18,950	18,500	18,950	20,300	18,500	23,000	

*SE15K is compatible with S1000 only in India.

PV system design using S1200 Power Optimizer

PV System Design Using a Three Phase Inverter with S1200 Power Optimizer		230/400V Grid SE15K	230/400V Grid SE16K, SE17K, SE25K	230/400V Grid SE27.6K	230/400V Grid SE30K, SE33.3K @850Vdc	230/400V Grid SE33.3K @750Vdc	277/480V Grid SE40K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	400V Grid SE50K	400V Grid SE55K	400V Grid SE66.6K, SE90K, SE100K	400V Grid SE66.6K, SE100K	480V Grid SE120K	
Minimum String Length	Power Optimizers	14	14	14	15	14	15	
	PV Modules	27	27	27	29	27	29	
Maximum String Length	Power Optimizers	30	30	30	30	30	30	
	PV Modules	60	60	60	60	60	60	
Maximum Continuous Power per String		15,500	15,000	15,500	17,000	15,000	17,000	W
Maximum Allowed Connected Power per String	Single String Design	20,500	17,250	17,750	19,250	17,250	19,250	
	2 Strings	20,500	20,000	20,500	23,000	17,250	19,250	
	3 Strings or more	20,500	20,000	20,500	23,000	20,000	23,000	

*SE15K is compatible with S1200 only in India.

When connecting the S1200 power optimizer with SE33.3K inverter (and equivalent SE66.6K and S100K Synergy inverters), it may be required to toggle the Fixed String Voltage from 750Vdc to 850Vdc via SolarEdge SetApp. For details, see this Application Note (Rest of the world).

PV system design using S1400 or S1500 Power Optimizer

PV System Design Using a Three Phase Inverter with S1400/1500 Power Optimizer		230/400V Grid SE15K	230/400V Grid SE16K, SE17K	230/400V Grid SE25K, SE33.3K	230/400V Grid SE27.6K	230/400V Grid SE30K	277/480V Grid SE40K	Units
Equivalent Three Phase Inverter with Synergy Technology models		-	-	400V Grid SE50K, SE66.6K, SE100K	400V Grid SE55K	400V Grid SE90K	480V Grid SE120K	
Minimum String Length	Power Optimizers	14	14	14	14	15	15	
	PV Modules	27	27	27	27	29	29	
Maximum String Length	Power Optimizers	30	30	30	30	30	30	
	PV Modules	60	60	60	60	60	60	
Maximum Continuous Power per String		18,600	18,000	18,000	18,600	20,400	20,400	W
Maximum Allowed Connected Power per String	Single String Design	28,600	28,000	20,250	20,850	22,650	22,650	
	2 Strings	28,600	28,000	28,000	28,600	30,400	30,400	
	3 Strings or more	28,600	28,000	28,000	28,600	30,400	30,400	

*SE15K is compatible with S1000 only in India.

*SE16K and SE17K are compatible with S1400/S1500 only in India, Taiwan, South Africa and Israel.

PV system design – three phase inverters for 3-wire grids

PV system design using S1000 Power Optimizer - 3-wire grids

The same rules apply to Synergy units of equivalent power ratings that are part of the modular Synergy Technology inverter.

PV System Design Using a Three Phase Inverter for 3-wire grids		SE25K, SE27.6K, SE30K. SE33.3K	SE25K	SE27.6K, SE30K. SE33.3K	SE25K, SE27.6K, SE30K. SE33.3K	SE25K, SE27.6K, SE30K. SE33.3K	Units
Equivalent Three Phase Inverter with Synergy Technology models		SE50K, SE55K, SE66.6K, SE90K, SE100K	SE50K	SE55K, SE66.6K, SE90K, SE100K	SE50K, SE55K, SE66.6K, SE90K, SE100K	SE50K, SE55K, SE66.6K, SE90K, SE100K	
Compatible Power Optimizers		S1000	S1200	S1200	S1400	S1500	
Minimum String Length	Power Optimizers	8	8	8	8	8	
	PV Modules	15	15	15	15	15	
Maximum String Length	Power Optimizers	30	30	30	30	30	
	PV Modules	60	60	60	60	60	
Maximum Continuous Power per String		7,200	8,000	8,000	9,600	9,600	W
Maximum Allowed Connected Power per String	Single String Design	8,400	9,200	9,200	10,800	10,800	
	2 Strings	8,400	9,800	9,200	11,400	15,600	
	3 Strings or more	9,000	9,800	9,800	11,400	15,600	

System Design Example

An SE30K Three Phase Inverter is connected to 70 PV modules of 600W, using S1200 Power Optimizers.

Single String

A single string design is not allowed when:

- The number of PV modules exceeds the Maximum String Length of 60 PV modules.
- The installed DC capacity of 42kW exceeds the Maximum Allowed Connected Power per String of 19,250W.

Two Strings

A two-string design is valid, with up to 38 PV modules per string.
If 39 PV modules were connected to a string, the cumulative STC power would be 23.4kW, exceeding the Maximum Allowed Connected Power per String of 23kW.

Three Strings

Three-string design is not allowed since the Minimum String Length is 29 PV modules; three strings would require at least 87 modules.

Appendix A

Rapid Shutdown in SolarEdge Systems

In North America, the National Electrical Code (NEC), section 690.12, defines Rapid Shutdown requirements for PV systems on buildings. It requires that in rooftop PV systems, controlled conductors outside the array will be reduced to 30V or less within 30 seconds of shutdown initiation. This allows installers, maintenance workers, and firefighters to handle the system very soon after shutdown, which is of particular importance in case of an emergency. SolarEdge inverters installed in Europe and APAC comply with these requirements.

The SolarEdge SafeDC™ feature ensures the DC voltage of a system is reduced to a safe level when the system is shut down, within up to 5 minutes. To comply with NEC Rapid Shutdown, each string must have no more than 28 optimizers per string. If longer strings are connected, the reduced voltage will be above 30V, as each Power Optimizer is reduced to 1 ± 0.1V.

C651U Power Optimizer is exceptional since it is reduced to a lower safety voltage of 0.5V; therefore, its maximum string length is 57 Power Optimizers.