Solar Power Inverter | SPI 100 - 1600kVA

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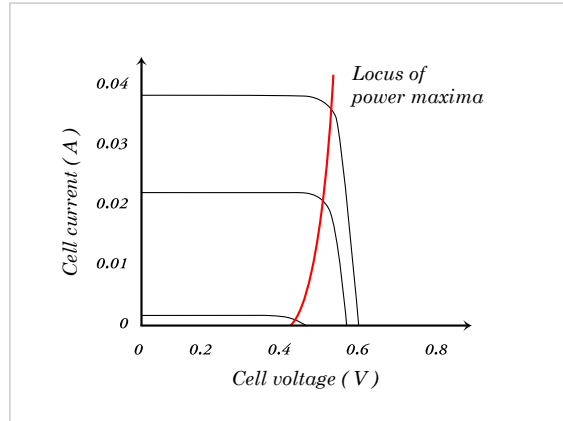
Fig. 1 – Thycon MPPT

Introduction

Thycon is Australia's leading manufacturer of electronics equipment for power management applications. Renowned for its highly reliable Uninterruptible Power Supplies (UPS), Thycon increasingly serves the equally demanding inverter needs of the renewable energy sector, most notably, that of the solar power industry, with its dedicated range of power inverters for solar farms.

Climate change and shrinking fossil resources require innovative concepts for future energy supplies. Thycon considers decentralized and modular energy technology as fundamental for an environmentally friendly and sustainable energy supply, in Australia and overseas.

Thycon aims to provide institutional owners of solar power plants with optimal yields and seamless supply to the public grid with maximized profitability thanks to its low-loss solar inverter, maximal power-point tracking and peak power support (peak power booster).

A key component for feeding the solar power generated by the solar panel system to the public grid, is the inverter. This sophisticated equipment transforms the generated dc-power into grid-compatible ac-power, according to severe standards and safety regulations.

One of the key challenges of the inverter is to assure that the solar cell's output is transferred with highest possible efficiency. Even improvements in the range of tenths of a percent lead to appreciable increases in the customers' profits since solar plants are an investment for at least 20 years. To enable this, Thycon guarantees the long-term reliability it long provided with the company's range of UPS systems. Solar farm profitability depends on efficiency, low life-cycle costs and availability, not only of sunshine but of power in its absence thanks to the Thycon energy-storage and power regulation systems.

Inverter Technology

Whereas many inverter manufacturers rely on the conventional voltage source inverter (VSI) for transforming the PV panel's DC output to AC power for the grid, the Thycon Solar Power Inverter (SPI) uses its patented current-source technology (CSI).

VSIs need to operate at a DC voltage high enough to drive power into the AC grid, which in low-sunshine is not always possible. To overcome this, VSIs use an additional converter or "boost chopper" to raise the PV output to a suitable level, thus necessitating at least two conversion stages, which is not required with the current source systems; eliminating one power conversion stage reduces losses and increases reliability.

Thycon's world-leading Static Flywheel Technology provides an efficient and robust Inverter power solution. Our system approach highlights high fault current clearing capacity, efficiency, reliability and low mean time to repair. Combining our proprietary technology with the high efficiency switching means of our converters ensures very low harmonic voltage distortion, current distortion and power loss.

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Maximum Power Point Tracking

PV cells have a single operating point where the values of the Current (I) and Voltage (V) of the cell result in a maximum power output. A PV cell has an exponential relationship between current and voltage, and the maximum power point (MPP) occurs at the knee of the curve (Fig. 1). The Thycon MPP tracker utilises a patented algorithm to search for this point and thus to allow the converter circuit to extract the maximum power available from the cells.

When used in combination with the Peak Lopping Inverter (PLI), the MPPT manages the inverter to supply to the grid, the maximal desired/allowed power, while diverting any surplus energy to an energy storage system, where allowed.

Power Limiter

The solar inverters have a programmable power limit adjustable from 0 to 100%. The operator can determine the absolute maximal power that an array can supply (to the inverter's maximal rating).

Power Factor Control

For enhanced grid stability, the Thycon Solar Inverter can supply leading or lagging power.

Peak Regulation

Used in combination with a Peak Lopping Inverter (PLI), power demands which exceed the available solar power, can be met from an energy storage

system (usually lead-acid batteries) to support the grid in riding-through a potential voltage sag, thus stiffening the network and maintaining the solar array's connected to the grid and instantly available once the peak has passed. This (optional) technology also allows the solar farm to operate seamlessly during short cloud-cover conditions, avoiding the crash starting of stand-by generators for transient "PV dips".

Reliability and maintenance requirements

Thycon has been supplying inverters in uninterruptible power supplies for over 30 years and has demonstrated their high reliability and low maintenance demands in critical applications for defence, telecommunications, computer centres and manufacturing. Transformers and power electronic converters can be forced or naturally cooled, which contributes to high reliability and low ongoing maintenance. The power components (capacitors, transformers, switchgear and instrument transformers) are all standard commercial products of proven reliability and long life expectancy.

Thycon Inverter maintenance requirements are dependent on environmental and application conditions. We accommodate customer requirements from basic to full warranty maintenance. Each maintenance plan ensures the equipment operates in top condition with

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maximum availability of engineers and parts at minimum cost to the customer. Qualified engineers perform the maintenance with the full back up and resources of Thycon.

Monitoring

The SPI has an RJ45 interface allowing optional remote SCADA monitoring of the following parameters:

- power monitoring of voltage, current, kW, kVA, power factor/harmonic distortion
- grid voltage and frequency
- battery voltage, temperature and state of charge
- operating status and alarms
- event history
- password protected user defined settings
- service control and test options

The system monitor stores the last 200 system events in a non-volatile information buffer for fast, efficient fault diagnosis and status indication.

Low-level Interface

Operating status of the equipment to a remote monitoring system can be performed in the form of 8 standard voltage-free contacts. An additional summary alarm is available for secondary monitoring or remote interlocking.

High-level interface

Real-time performance monitoring of the Inverter is performed via serial or TCP/IP connection. A basic hardcopy of operating events and data can be obtained by connecting a printer. An optional high-level interface via Modbus, SNMP or web html can be provided for immediate performance monitoring and analysis. Additional features enable you to notify your network server of alarm conditions, perform automatic autonomy shutdowns and send emails to designated recipients. Inverter data such as real-time waveforms, alarms and system events can be stored in solid state, nonvolatile memory holding up to 500 MBs of information. Connecting the Inverter to a PC using any of the available ports allows you to maintain a full history of the equipment over its lifetime.

Technical data 140kW - 560kW

	SPI-140	SPI-280	SPI-320	SPI-560
Nominal power	*140kW*	*280kW*	*320kW*	*560kW*
Operating voltage	240/415 VAC	240/415 VAC	240/415 VAC	240/415 VAC
Voltage tolerance	-10% + 10%	-10% + 10%	-10% + 10%	-10% + 10%
Operating frequency	50Hz	50Hz	50Hz	50Hz
Frequency tolerance	±5Hz	±5Hz	±5Hz	±5Hz
Power factor	>0.99	>0.99	>0.99	>0.99
THD of output current	<5%	<5%	<5%	<5%
DC voltage range	300 - 600 Vdc	300 - 600 Vdc	300 - 600 Vdc	300 - 600 Vdc
Efficiency Euro / Peak	95.5 / 98.1 %	96.4 / 98.5%	96.6 / 98.6%	96.9 / 98.7%
Cooling	Fan forced	Fan forced	Fan forced	Fan forced
Ambient temperature max	+ 50 deg C	+ 50 deg C	+ 50 deg C	+ 50 deg C
Relative humidity	95%	95%	95%	95%
Audible noise 2m	<65 dB	<65dB	<65dB	<70dB
Enclosure IP rating (indoor/ outdoor)	IP20/55	IP20/55	IP20/55	IP20/55
Enclosed material	Power coated steel	Power coated steel	Power coated steel	Power coated steel
Cubicle colour	RAL7032	RAL7032	RAL7032	RAL7032
Dimensions (w x d x h)	600x1000x1800	1200x1000x1800	1200x1000x1800	1800x1000x1800

Specifications are subject to change without notice.

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Notes