

PCS Bi-directional Grid Interfacing Reference Document: Grid-Tied Inverter

PRODUCT IDENTIFICATION

The Grid-Tied Inverter (Model: GTX-1500-HV) serves as the core bi-directional power conversion hub for modern utility-scale and commercial energy storage systems. Designed for seamless grid interfacing, this inverter enables high-efficiency DC/AC conversion for photovoltaic storage, peak shaving, and frequency regulation applications.



INTERNAL BESS TOPOLOGY

The GTX-1500-HV employs a three-level NPC (Neutral Point Clamped) topology with SiC MOSFETs. This architecture minimizes switching losses while maintaining <math><3\%</math> total harmonic distortion (THD) under full load. The inverter

integrates a dedicated DC-DC booster stage for PV string input (max 1500 V DC) and a bi-directional AC-DC stage for grid tie and islanding mode support.

THERMAL PROTECTION MECHANISMS

- Smart liquid cooling system maintains IGBT junction temperature below 85°C at 50°C ambient.
- Redundant fan assist for peak load transients >110% rated power.
- IP65-rated heat exchanger with condensation prevention.

OPERATIONAL ADVANTAGES

- Seamless switching between grid-following (PQ) and grid-forming (VF) modes (<20 ms transition)
- Nighttime SVG (Static Var Generator) function for power factor correction from 0.8 leading to 0.8 lagging
- Anti-islanding protection compliant with IEEE 1547-2018
- Black start capability with external generator synchronization

SPECIFICATION MATRIX

Parameter	Specification
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Nominal AC Power	1500 kVA @ 50°C (continuous)
Max DC Input Voltage	1500 V DC
MPPT Voltage Range	800 V – 1300 V DC
AC Output Voltage	690 V ±10% (3-phase, 50/60 Hz)
Max Efficiency	98.7% (European weighted: 98.4%)
Cooling Method	Smart Liquid Cooling + Redundant Fans
Cell Chemistry Compatibility	Tier-1 LFP (2.0 – 4.2 V/cell)
Enclosure Rating	IP65 (indoor/outdoor)
Operating Temperature	-30°C to +60°C (derated >50°C)

REGULATORY COMPLIANCE

- UL 1741 SA (certified by CSA)
- IEEE 1547-2018 and IEEE 1547.1-2020
- IEC 62109-1 & IEC 62109-2 (safety)
- VDE-AR-N 4110 (Germany)
- CE, UKCA, and CEC listed

