

Why Does the Inverter Casing Heat Up?

Applicable Model: INVT XD3-6KTL Single-Phase Hybrid Inverter

I. Reasons for Temperature Rise

The INVT XD3-6KTL adopts a natural cooling design. Its full metal casing serves as a heat sink, transferring internal heat to the casing and dissipating heat from the casing surface into the air via thermal radiation.

Heat generation during operation mainly stems from the following factors:

- High Inverter Output: Higher inverter output power produces greater Joule heat in internal power devices, which in turn increases the casing temperature.

As the entire casing acts as a heat dissipation channel, the surface panel and casing may reach relatively high temperatures during operation. This is a normal physical feature of the natural cooling design. Under high ambient temperatures or full-load operation, the internal temperature may exceed 60°C, and the casing will feel hot to the touch.

II. Working Principle

When kilowatt-class low-voltage inverters operate, large currents flow through relatively compact components, producing Joule heating (heat generated by resistance as current passes through conductors). This heat must be dissipated into the surrounding environment via the casing, so the increase in casing temperature is normal during operation.

Per NASA's research on human contact surface temperatures (Ungar & Stroud, 2010), 44°C is the maximum safe surface temperature for indefinite bare-skin contact with materials. The metal casing of the inverter may surpass this threshold during operation. Therefore, we advise: Do not touch the casing while the unit is running.

III. Safety & Certification

The INVT XD3-6KTL has passed rigorous reliability testing and safety certifications:

Item	Details
Cooling Method	Natural Cooling (Fanless Design)
Operating Temperature	-30°C ~ +60°C (Full-load Operation)
Protection Degree	IP66 (Dustproof & Waterproof, Outdoor Installation Permitted)
Safety Standards	IEC/EN 62109-1/2, IEC/EN 61000
Grid Standards	IEC 61727, IEC 62116, EN50549, VDE 4105, G98/G99
Thai Certification	Compliant with Thailand MEA/PEA grid requirements and relevant national standards

All INVT XD3-6KTL inverters are subjected to full-load aging testing at an ambient temperature of 45°C before delivery. Even when internal temperatures exceed 60°C, the inverter can operate safely and stably without fire hazards. Heating of the casing is a normal feature of the natural cooling design.

⚠ Important Reminder:

The natural cooling design eliminates fan maintenance requirements, yet high casing temperatures are normal.

Do not touch the casing during operation; wait for the unit to power off and cool down before performing any operations.

IV. Key Points

- The XD3-6KTL features a natural cooling design where the casing functions as a heat sink; casing heating is a normal physical phenomenon.
- Do not touch the casing during operation to prevent scalding risks.

References

- [1] Ungar, E & Stroud, K, 2010, A New Approach to Defining Human Touch Temperature Standards, NASA/Johnson Space Center.
- [2] IEC 62109-1/2: Safety of power converters for use in photovoltaic power systems.
- [3] INVT XD3-6KTL Product Manual & Certification Documents.