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**RECOMMENDED CONTROL METHODS
FOR
LOW AMBIENT OPERATION OF
LG SINGLE AND MULTI-FLEX INVERTERS**

Many current building designs, especially large buildings, require 'core cooling' during the colder seasons and even at times in the winter months. Buildings must use air conditioning systems year-round to reject heat collected from occupant utility loads and radiant solar energy. This is especially true as new building designs make use of better insulating materials in the construction of buildings to meet 'Green' building construction initiatives.

Utility Loads often include Computer Data Centres that must operate continuously without interruption. Environmental control equipment (cooling, humidity and filtration) servicing Data Centres must operate reliably in all ambient conditions to protect the Computer Systems from damage and/or failure.

Refrigeration systems that utilize compressors must provide some method to pre-heat the compressor oil (crank-case) when operating in Low Ambient conditions. Pre-heating the compressor crank-case ensures that refrigerant and oil are separated and oil does not become entrained in the refrigeration circuit.

LG Inverter Systems can be configured to operate in low ambient conditions (-10..-40°C) by permitting the Inverter to operate in 'Compressor Pre-heat' Mode when low ambient conditions are detected.

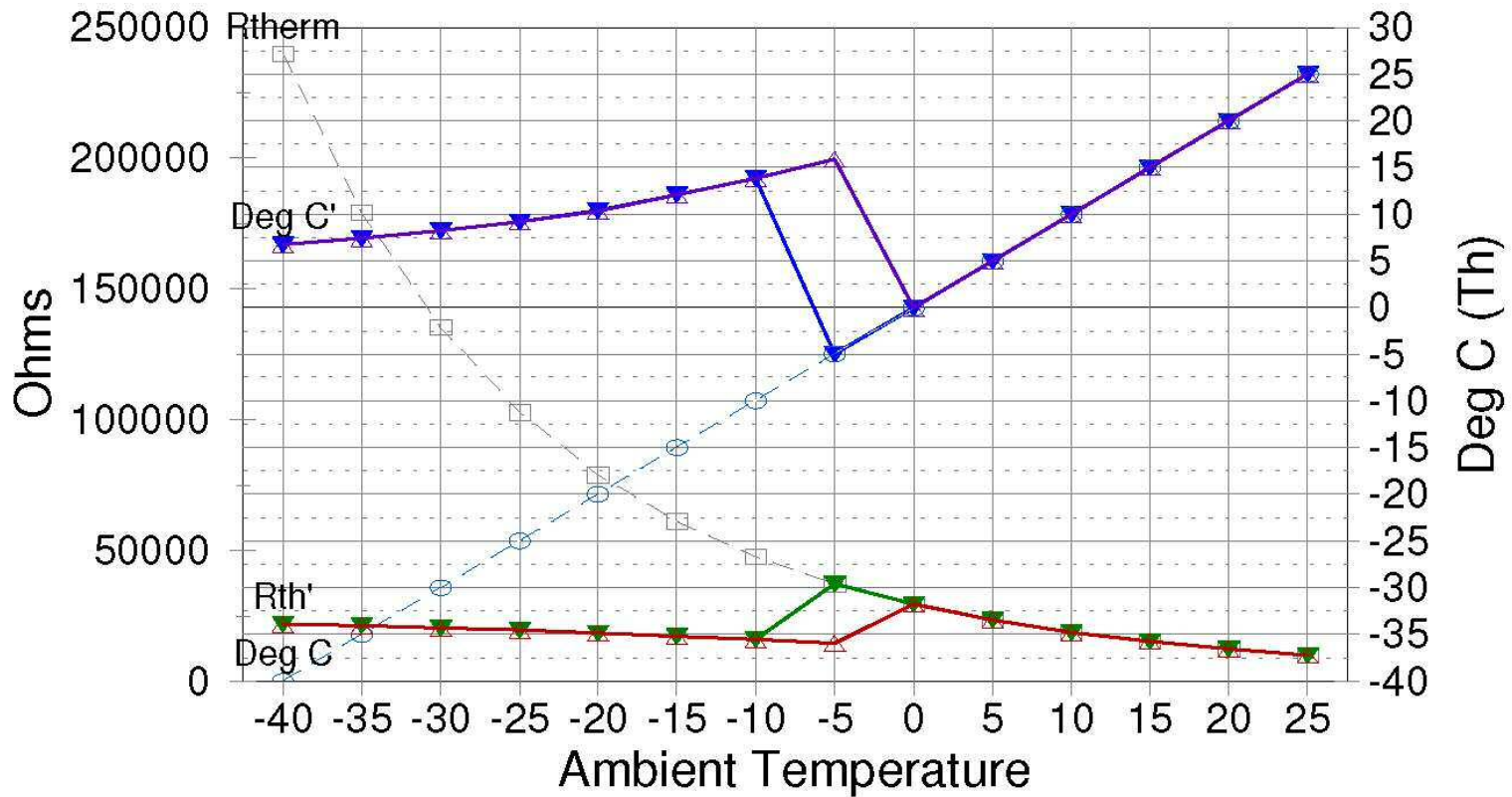
The PQCAO Low Ambient Offset Controller and Signal Conditioner provide extended 'Compressor Pre-heat' operation by introducing a 'Break-point' signal offset to the Inverter Controller Ambient Sensor Signal.

The 'Break-point' setting and temperature offset function provided by the PQCAO Controller has been selected to provide safe and reliable control of the LG Inverter Systems in Low Ambient temperatures as low as -40°C.

The following graph shows the control response of the PQCAO Controller over an ambient temperature operating range of -40..+25°C (-40..77°F). Note that this range is a sub-set of the actual operating range and has been chosen to best show the area of interest for Low Ambient Control.

Temperature Offset Control

PQCAO Controller



- Rthermister
- Ambient Deg C
- ▼- RTh (dec)
- ▲- Deg C' (inc)
- ▲- Deg C' (dec)
- ▲- Rth (inc)

Description of Operation

The operation sequence of PQCAO Low Ambient Offset Controller is generally described as follows:

Cooling Mode

When the Ambient Air Temperature is in 'Normal Operating' range for the Inverter System, the Ambient Sensor signal to the Inverter Controller represents the actual Ambient Air Temperature and the Inverter System operates normally to provide cooling service.

When the PQCAO Controller senses the Ambient Air Temperature to be lower than the Low Ambient Sensor Set-point (-10°C / 14°F typ), the Ambient Sensor signal to the Inverter Controller is Offset so that the Ambient Temperature 'appears' to be within normal-low operation range.

With the Hot Gas discharge temperature sensor signal lower than the Ambient temperature sensor signal, and the Ambient temperature sensor signal in the 'Normal' operating range; the Inverter is forced into 'Compressor Pre-Heat' Mode (compressor motor acts as a crank-case heater). When the Hot Gas discharge temperature is adequately high (crank-case warm), the compressor will be permitted to operate and provide cooling service.

When the PQCAO Controller senses the Ambient Air Temperature to be higher than the Low Ambient Sensor Set-point (-6.5°C / 20°F typ), the Offset is removed from the Ambient Sensor signal to the Inverter Controller and the Inverter System operates normally to provide cooling service.

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