



Providing insights for today's
HVAC system designer

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Electrical Power Quality for HVAC Equipment

Users, installers, and engineers prefer to connect HVAC system components to the power source and never have to worry about it again. However, issues such as lightning strikes, ground fault events, or even overvoltage trips can occur, resulting in collateral damage to the HVAC equipment.

This EN provides readers with an understanding of how to conduct a power quality analysis and provide options to make equipment more resilient when impacted by electrical transients.

Following are several electrical terms used throughout this *Engineers Newsletter*, to help better understand power quality:

Power quality is the concept of powering and grounding electrical equipment in a manner that results in reliable and consistent operation.

An **electrical transient** is a disturbance to electrical power that may inhibit reliable and consistent operation of electrical equipment.

A **power quality meter (PQM)** is a specialized measurement device used to capture and record electrical transients, as well as other power quality metrics.

A **power quality analysis** is the evaluation of electrical system operation, typically focused on identifying and resolving sources of electrical transients.

Nominal Electrical Ratings

ANSI/AHRI Standard 110, *Air-conditioning, Heating and Refrigerating Equipment Nameplate Voltages*, establishes requirements for nameplate voltage ratings of HVAC equipment. In addition, this standard also specifies voltage utilization ranges. Equipment is expected to operate normally when the input voltage is within this utilization range. The utilization range may differ between various types of equipment. In general, the utilization range is about +/- 10 percent of the nameplate voltage.

Standard 110 also considers a voltage drop from the electrical feeder panel to the equipment. The “nominal system voltage” reflects voltage at the feeder distribution panel and the “nameplate voltage” reflects voltage at the piece of equipment (Table 1).

Frequency is typically controlled in a very tight range. Except for unique installations, the electrical frequency is not a major power quality concern for HVAC equipment.

Table 1. AHRI Standard 110-2024 voltage utilization

Nominal System Voltage (at the Feeder Panel)	Nameplate Voltage (at the Equipment)	Voltage Utilization Range ("Range B")
120	115	104 to 127
208	200	180 to 228
240	230	208 to 254
480	460	416 to 508
600	575	520 to 635