Data Center Continuous (DCC) rated generator sets
Content

- Data Center Loads
- Genset Ratings – Definitions
- Feature Benefits
- DCC Rated Gensets - Rating Definition, Rating Card, Available Products, Factory Options
- CPG Alternators vs Data Center Loads
- DCC Rated Gensets vs Ratings
- Tier Levels
Data Center Loads

**UPS:**
Rectifiers - Harmonics
Capacitive Filters – Leading PF

**Transformer:**
Inductor – Lagging PF

**Variable Frequency Drive:**
Rectifiers – Harmonics

**Chillers & Fan Motors:**
Inductive – Lagging PF

**Motor Starters:**
Solid State - Harmonics

**IT Load:**
SMPS – Leading PF
Genset Ratings – Definitions

- ISO 8528 Part 1 defines these ratings

- Continuous Operating Power (COP)
- Unlimited Time Prime Power (PRP)
- Limited Time Prime Power (LTP)
- Emergency Standby Power (ESP)
Improves data center power system reliability by avoiding under utilization of generators in normal use of the power system – No need to overdesign

DCC rated gensets can be loaded to 100% of the DCC rating

- Provides the ability to **optimize a data center power system design** with a Continuous Duty genset that can be loaded to 100% of its rating for Unlimited Hours
  - **DCC Duty rating**: Unlimited hours of operation at 100% DCC rating – 100% Load Factor
DCC Rating - Definition

- Data Center Continuous (DCC) Duty Rating:

  Is defined as the maximum power which the generator is capable of delivering continuously to a constant or varying electrical load for unlimited hours in a data center application.
## Global Model Range

Our energy working for you.™

NOVEMBER 2012

<table>
<thead>
<tr>
<th>Model Name</th>
<th>Standby Ratings kW</th>
<th>Standby Ratings kVA</th>
<th>DCC Ratings kW</th>
<th>DCC Ratings kVA</th>
<th>Engine Model</th>
<th>Standard Alternator</th>
<th>Standard Controller</th>
<th>Emissions Compliance EU/TAL/EPA</th>
<th>ATS** 400 Volt, 3 Phase</th>
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DCC Rated Genset - Spec/Data Sheet

- Dedicated Spec Sheets and Data Sheets w/DCC rating definition available in:
  - https://powersuite.cummins.com

- Spec Sheet and the Data Sheet together can be supplied as official confirmation or our rating
DCC Rated Genset – Spec. Sheets

- Select DCC Model from “Ratings Card” - Example: 50Hz, DQKAG
- Select Generator Sets in “Power Suite” browse menu
- Select either 50 or 60 Hz - Diesel
- Locate Model under “Model” column & left click

Power Suite

50Hz Diesel Set Index

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DCC Rated Gensets – What it is!

- **Warranty:** 2yrs Unlimited as standard
- **Power Output:** 100% of Data Center Continuous Rating of the generator
- **Duration:** Continuous for the duration of the outage for Unlimited Hours
- **Compliance:** Uptime Tier III & IV
DCC Rated Gensets – What it is

Data Center Continuous (DCC) rating is a new rating to compliment our Stand-by, Prime & Continuous ratings as defined by ISO 8528-1

Data Center Continuous (DCC) rating is designed for data center applications
CPG Alternators vs Data Center Loads

- Robust by design to handle the effects (heating) of harmonic currents created by non-linear Data Center loads such as UPS Systems, VFDs
- “Subtransient Reactance” values of 12% or less to minimize the susceptibility to overheating and for greater compatibility to non-linear loads
- Maximum of 5% total harmonic distortion from no load to full load (linear load) and no more than 3% distortion for any one harmonic to minimize alternator contribution to harmonics
- Fast Voltage and Frequency recovery negating the impact of their dip upon loading
CPG Alternators vs Data Center Loads

- Ability to absorb reverse kVARs due to leading PF data center loads

CPG Alternators can safely absorb kVARS up to 25% of the alternator’s rated kVAR output capability. For example, a 2500 kVA, 0.8 PF rated alternator has a kVAR output capability of 1500 kVARs. This alternator has the capability to absorb $(0.25) \times 1500 = 375$ kVARs.

- kVARs resulting from leading PF loads may be referred to as “reverse kVARs” or “negative kVARs”
Site Load = 8.0 MW

N = 5

- 5 x 1.6 MW
- 5 x 1.9 MW
- 5 x 2.3 MW

DCC Rated Gensets vs ISO Standby Rating or Rating with average load level

Cummins
100% Load Factor

70% Load Factor

85% Load Factor

MW
Tier Levels

What is the Tier Level

- Common language of Data Center Infrastructure
- Different Data Centers – Different Requirements
- Different Topology – Different Availability
- Redundant Systems
- Redundant power supply path
- Concurrently Maintainable and Fault Tolerant
Tier I – Basic Capacity

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Tier II – Redundant Components

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*Emergency lighting, and other emergency functions required by local code may specify an additional ATS*
Tier III - Concurrently Maintainable

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Tier IV – Fault Tolerant

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Tier Levels & Gen Sets

Standby & Prime Power Gen Sets

Continuous Power & DCC Gen Sets

Concurrently Maintainable

Automatic Response in Failures and Operation

Tier II

Tier III & IV

Tier III

Tier IV
Compartmentalization

Gen Set Room

Gen Set N = 1

T X V
Compartmentalization

Gen Set Room

Chiller N = 4
Compartmentalization

Gen Set Room

Chiller N = 4

Tier IV
Cummins: Power of One
Power of One: Single Source for Solutions

The Power of One™ Means a Single Source for Solutions.

Services:
- After-sales Support
- Consulting and Design

Systems:
- Monitoring
- Operation and Maintenance
- Training
- Solution Delivery
- Installation and Commissioning
Advantages of the **Power of One™**

- Ensures the right people with critical skills and knowledge are available for **application support** on total power system design, deployment, performance and reliability
- Creates single source of supply for customers, simplifying ordering and **project management**
- Taking ownership of the entire system enables **better customer support**
  - One warranty
  - No finger pointing
Power of One: Benefits to You

One Supplier
One Architecture
One Design
One System
One Warranty
Faster Deployment
Greater Reliability
Less Downtime
Cummins Power Generation – Data Center Protection

- RELIABLE POWER is our business
- Global Perspective/Local Service
- World class hardware, all designed to work together

Power of One™