DOCKETED

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Document Title:	Application for Small Power Plant Exemption for McLaren Backup Generating Facility - Appendix A
Description:	N/A
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Appendix A

Generator Specifications and Generation Ratings

Cat® C175-16
Diesel Generator Sets

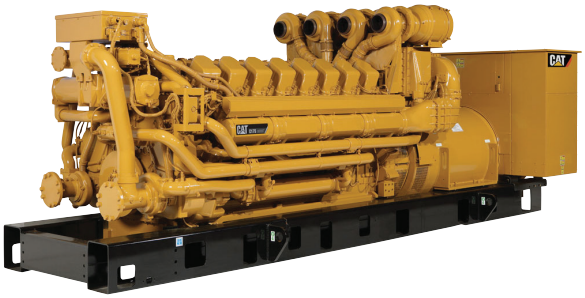


Image shown may not reflect actual configuration

Bore – mm (in)	175 (6.89)
Stroke – mm (in)	220 (8.66)
Displacement – L (in^3)	84.7 (6456.31)
Compression Ratio	16.7:1
Aspiration	TA
Fuel System	Common Rail
Governor Type	ADEM™ A4

Standby 60 Hz ekW (kVA)	Mission Critical 60 Hz ekW (kVA)	Prime 60 Hz ekW (kVA)	Continuous 60 Hz ekW (kVA)	Emissions Performance
3000 (3750)	3000 (3750)	2725 (3406)	2500 (3125)	U.S. EPA Stationary Emergency Use Only. (Tier 2)

Standard Features

Cat® Diesel Engine
- Meets U.S. EPA Stationary Emergency Use Only (Tier 2) emission standards
- Reliable performance proven in thousands of applications worldwide

Generator Set Package
- Accepts 100% block load in one step and meets other NFPA 110 loading requirements
- Conforms to ISO 8528-5 G3 load acceptance requirements
- Reliability verified through torsional vibration, fuel consumption, oil consumption, transient performance, and endurance testing

Alternators
- Superior motor starting capability minimizes need for oversizing generator
- Designed to match performance and output characteristics of Cat diesel engines

Cooling System
- Cooling systems available to operate in ambient temperatures up to 50°C (122°F)
- Tested to ensure proper generator set cooling

EMCP 4 Control Panels
- User-friendly interface and navigation
- Scalable system to meet a wide range of installation requirements
- Expansion modules and site specific programming for specific customer requirements

Warranty
- 24 months/1000-hour warranty for standby and mission critical ratings
- 12 months/unlimited hour warranty for prime and continuous ratings
- Extended service protection is available to provide extended coverage options

Worldwide Product Support
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries
- Your local Cat dealer provides extensive post-sale support, including maintenance and repair agreements

Financing
- Caterpillar offers an array of financial products to help you succeed through financial service excellence
- Options include loans, finance lease, operating lease, working capital, and revolving line of credit
- Contact your local Cat dealer for availability in your region

Optional Equipment

Engine

Air Cleaner

- ❑ Single element
- ❑ Dual element

Muffler

- ❑ Industrial grade (15 dB)
- ❑ Residential grade (25 dB)
- ❑ Critical grade (34 dB)

Starting

- ❑ Standard batteries
- ❑ Oversized batteries
- ❑ Standard electric starter(s)
- ❑ Dual electric starter(s)
- ❑ Air starter(s)
- ❑ Jacket water heater

Alternator

Output voltage

- ❑ 480V
- ❑ 600V
- ❑ 4160V
- ❑ 6300V
- ❑ 6600V
- ❑ 6900V
- ❑ 12470V
- ❑ 13200V
- ❑ 13800V

Temperature Rise (over 40°C ambient)

- ❑ 150°C
- ❑ 125°C/130°C
- ❑ 105°C
- ❑ 80°C

Winding type

- ❑ Form wound

Excitation

- ❑ Permanent magnet (PM)

Attachments

- ❑ Anti-condensation heater
- ❑ Stator and bearing temperature monitoring and protection

Power Termination

Type

- ❑ Bus bar
- ❑ Circuit breaker
- ❑ 4000A
- ❑ 5000A
- ❑ UL
- ❑ IEC
- ❑ 3-pole
- ❑ Electrically operated

Trip Unit

- ❑ LSI
- ❑ LSI-G
- ❑ LSIG-P

Control System

Controller

- ❑ EMCP 4.2
- ❑ EMCP 4.3
- ❑ EMCP 4.4

Attachments

- ❑ Local annunciator module
- ❑ Remote annunciator module
- ❑ Expansion I/O module
- ❑ Remote monitoring software

Charging

- ❑ Battery charger – 20A
- ❑ Battery charger – 35A
- ❑ Battery charger – 50A

Vibration Isolators

- ❑ Rubber
- ❑ Spring
- ❑ Seismic rated

Extended Service Options

Terms

- ❑ 2 year (prime)
- ❑ 3 year
- ❑ 5 year
- ❑ 10 year

Coverage

- ❑ Silver
- ❑ Gold
- ❑ Platinum
- ❑ Platinum Plus

Ancillary Equipment

- ❑ Automatic transfer switch (ATS)
- ❑ Uninterruptible power supply (UPS)
- ❑ Paralleling switchgear
- ❑ Paralleling controls

Certifications

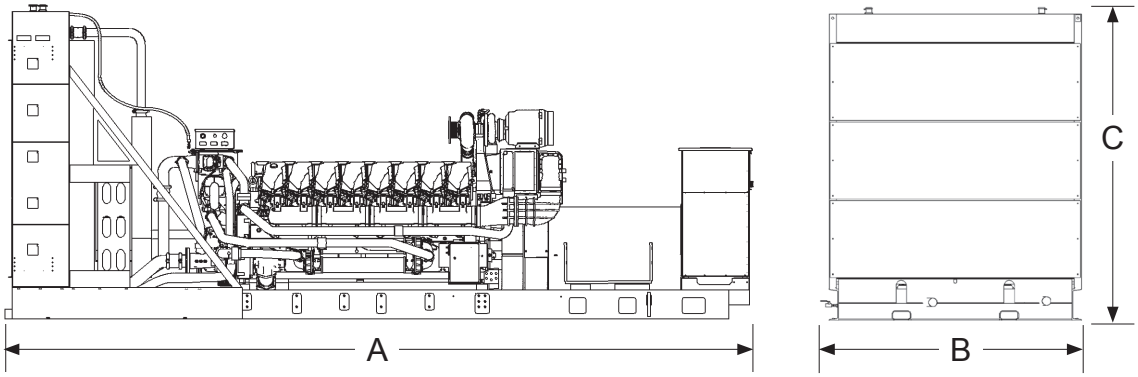
- ❑ UL2200
- ❑ CSA
- ❑ IBC seismic certification
- ❑ OSHPD pre-approval

Note: *Some options may not be available on all models. Certifications may not be available with all model configurations. Consult factory for availability.*

Package Performance

Performance	Standby		Mission Critical		Prime		Continuous	
Frequency	60 Hz		60 Hz		60 Hz		60 Hz	
Gen set power rating with fan	3000 eKW		3000 eKW		2725 ekW		2500 eKW	
Gen set power rating with fan @ 0.8 power factor	3750 kVA		3750 kVA		3406 kVA		3125 kVA	
Emissions	EPA ESE (Tier 2)		EPA ESE (Tier 2)		EPA ESE (Tier 2)		EPA ESE (Tier 2)	
Performance number	DM8448-10		DM9226-03		DM8449-06		DM8450-04	
Fuel Consumption								
100% load with fan – L/hr (gal/hr)	810.7	(214.2)	807.1	(213.2)	723.8	(191.2)	662.5	(175.0)
75% load with fan – L/hr (gal/hr)	625.8	(165.3)	616.1	(162.8)	571.0	(150.9)	526.1	(139.0)
50% load with fan – L/hr (gal/hr)	493.6	(130.4)	489.0	(129.2)	462.0	(122.0)	435.0	(114.9)
25% load with fan – L/hr (gal/hr)	305.0	(80.6)	313.6	(82.9)	295.1	(78.0)	278.2	(73.5)
Cooling System								
Radiator air flow restriction (system) – kPa (in. water)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)	0.12	(0.48)
Radiator air flow – m^3/min (cfm)	2933	(103578)	2933	(103578)	2933	(103578)	2933	(103578)
Engine coolant capacity – L (gal)	303.5	(80.2)	303.5	(80.2)	303.5	(80.2)	303.5	(80.2)
Radiator coolant capacity – L (gal)	632	(166)	632	(166)	632	(166)	632	(166)
Total coolant capacity – L (gal)	935.5	(246.2)	935.5	(246.2)	935.5	(246.2)	935.5	(246.2)
Inlet Air								
Combustion air inlet flow rate – m^3/min (cfm)	276.7	(9772.2)	264.9	(9354.6)	249.0	(8790.7)	233.4	(8241.9)
Exhaust System								
Exhaust stack gas temperature – °C (°F)	477.7	(891.9)	479.4	(894.9)	460.9	(861.5)	444.1	(831.4)
Exhaust gas flow rate – m^3/min (cfm)	725.6	(25620.0)	695.6	(24561.2)	634.0	(22388.6)	579.4	(20460.1)
Exhaust system backpressure (maximum allowable) – kPa (in. water)	6.7	(27.0)	6.7	(27.0)	6.7	(27.0)	6.7	(27.0)
Heat Rejection								
Heat rejection to jacket water – kW (Btu/min)	1379	(78436)	1373	(78059)	1248	(70951)	1161	(66018)
Heat rejection to exhaust (total) – kW (Btu/min)	3149	(179063)	3128	(177889)	2726	(155037)	2494	(141849)
Heat rejection to aftercooler – kW (Btu/min)	496	(28224)	492	(27992)	391	(22254)	349	(19848)
Heat rejection to atmosphere from engine – kW (Btu/min)	147	(8336)	182	(10340)	170	(9645)	165	(9390)
Heat rejection from alternator – kW (Btu/min)	112	(6369)	112	(6369)	99	(5619)	112	(6386)
Emissions (Nominal)								
NOx mg/Nm^3 (g/hp-h)	3113.9	(6.07)	3103.2	(6.07)	3313.2	(6.33)	3260.4	(6.12)
CO mg/Nm^3 (g/hp-h)	325.6	(0.73)	149.2	(0.34)	184.9	(0.41)	222.9	(0.48)
HC mg/Nm^3 (g/hp-h)	40.7	(0.11)	15.7	(0.04)	16.4	(0.04)	16.8	(0.04)
PM mg/Nm^3 (g/hp-h)	13.0	(0.03)	10.0	(0.03)	15.1	(0.04)	15.2	(0.04)
Emissions (Potential Site Variation)								
NOx mg/Nm^3 (g/hp-h)	3736.7	(7.28)	3723.8	(7.29)	3975.8	(7.59)	3912.5	(7.34)
CO mg/Nm^3 (g/hp-h)	586.2	(1.31)	268.6	(0.60)	332.8	(0.73)	401.1	(0.87)
HC mg/Nm^3 (g/hp-h)	54.2	(0.15)	20.9	(0.06)	21.8	(0.06)	22.3	(0.06)
PM mg/Nm^3 (g/hp-h)	18.2	(0.05)	14.0	(0.04)	21.1	(0.05)	21.3	(0.05)

Weights and Dimensions



Dim "A" mm (in)	Dim "B" mm (in)	Dim "C" mm (in)	Dry Weight kg (lb)
7947 (312.9)	2889 (113.7)	3410 (134.3)	22 906 (50,500)

Note: *For reference only. Do not use for installation design. Contact your local Cat dealer for precise weights and dimensions.*

Ratings Definitions

Standby
Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Mission Critical
Output available with varying load for the duration of the interruption of the normal source power. Average power output is 85% of the mission critical power rating. Typical peak demand up to 100% of rated power for up to 5% of the operating time. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year.

Prime
Output available with varying load for an unlimited time. Average power output is 70% of the prime power rating. Typical peak demand is 100% of prime rated ekW with 10% overload capability for emergency use for a maximum of 1 hour in 12. Overload operation cannot exceed 25 hours per year.

Continuous
Output available with non-varying load for an unlimited time. Average power output is 70-100% of the continuous power rating. Typical peak demand is 100% of continuous rated kW for 100% of the operating hours.

Applicable Codes and Standards
AS1359, CSA C22.2 No100-04, UL142, UL489, UL869, UL2200, NFPA37, NFPA70, NFPA99, NFPA110, IBC, IEC60034-1, ISO3046, ISO8528, NEMA MG1-22, NEMA MG1-33, 2014/35/EU, 2006/42/EC, 2014/30/EU.

Note: Codes may not be available in all model configurations. Please consult your local Cat dealer for availability.

Data Center Applications
Tier III/Tier IV compliant per Uptime Institute requirements. ANSI/TIA-942 compliant for Rated-1 through Rated-4 data centers.

Fuel Rates
Fuel rates are based on fuel oil of 35º API [16°C (60ºF)] gravity having an LHV of 42,780 kJ/kg (18,390 Btu/lb) when used at 29ºC (85ºF) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.)

C175-16EL
LEHE1224-00 (3-17)

June 9, 2017

Vantage Data Centers
Michael Orosco
2820 Northwestern Parkway,
Santa Clara, CA 95051

Dear Mr. Orosco,

The 3MW generators being provided for your project follow the standby generator classification per the ISO8528 standards as identified on the specification sheets provided in the previous submittals for the project.

As defined by Caterpillar and in alignment with the ISO standard, the rating reads as follows:

> STANDBY: Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year. (per ISO 8528 standards)

Please contact me with any further questions you may have.

Sincerely,

Brett Greene

Data Center Continuous (DCC) Ratings: A Comparison of DCC Ratings, ISO Definitions and Uptime Requirements

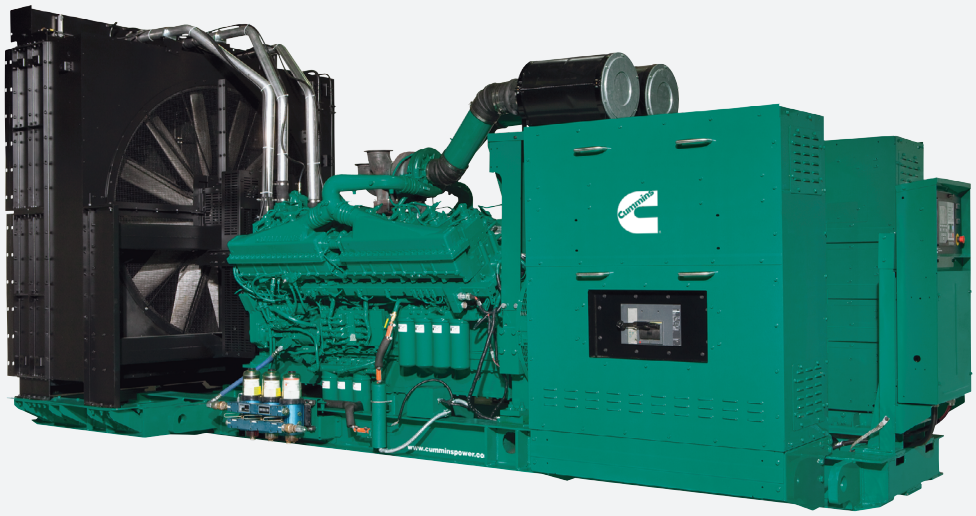
White Paper

Dave Matuseski, Technical Counsel
Critical Protection Team, Cummins

While Uptime Institute references the ISO8528-1 definitions for generator ratings in their publication Tier Standard: Topology, they do not require the use of these definitions for generators to meet the Tier III and Tier IV requirements, as described in the same publication. A more cost-effective and reliable generator rating that meets the Tier III and Tier IV requirements can be achieved when the generator manufacturer develops ratings specifically for data center applications.

Diesel Generators in a Tier III or Tier IV System

In Tier III and Tier IV systems, Uptime Institute defines the diesel generators as the primary source of power and the utility as an economic alternative. This definition puts two important requirements on the diesel generators. First, they must be large enough to carry the entire data center load. Second, there can be no limit on the number of hours the diesel generators can run.



ISO8528-1

In their *Tier Standard: Topology* publication, Uptime Institute references the Continuous (COP), Prime (PRP) and Standby (ESP) generator rating definitions of ISO8528-1. Of these ISO definitions, the only rating that meets Uptime Tier III or Tier IV at 100 percent of the generator rating is Continuous. The ISO Prime rating definition states that the generator can run continuously if the average load does not exceed 70 percent of the full generator prime rating in any 24-hour period. The ISO Standby definition limits the run-time to no more than 200 hours per year, plus it limits the generator to no more than 70 percent average power during any 24-hour period.

The Continuous definition describes a constant load with no variance. In Tier III and Tier IV data centers, the generators need to be sized for the maximum load (they are the primary source of power), but this maximum load will not be the constant load of the facility. Therefore, if the COP rating is used to specify the size of the data center generators, these generators are most likely oversized for the application.

It is important to note that Uptime Institute references the ISO definitions, but they do not require Tier III and Tier IV generator ratings to be defined by ISO.

No Limit on Run-time

The *Tier Standard: Topology* publication also states that the generator manufacturer's certification of capacity at an unlimited duration will be used to determine compliance with the applicable Tier requirements. This statement allows a generator manufacturer to design and rate a generator that more closely fits the needs of a data center and still meet the Tier III and Tier IV requirements. See a typical load profile of a data center in Figure 2. When the generator manufacturer provides a generator with no run-time limit that is sized closer to the site load and can still supply the maximum load spikes, the data center gets the most efficient use of their generator system.

ISO Generator Rating	Run-time Limitations	Load Rating
ISO Continuous (COP)	No limit on run-time at 100% of generator rating	Rated for a constant load
ISO Prime (PRP)	No limit on run-time at 70% or less of generator rating	Rated for a variable load
ISO Standby (ESP)	Allows no more than 200 hours of run-time per year	Rated for a variable load

Figure 1— ISO definitions for Continuous, Prime and Standby power

Some generator manufacturers start with the ISO Prime rating and reduce this rating by a certain percentage to achieve the no run-time limit requirement. Some manufacturers will provide a non-ISO defined rating that guarantees no run-time limit at 100 percent of that rating. These methods are discussed in section 3.3 of Uptime Institute's *Tier Standard: Topology* publication. These unlimited duration ratings from the generator manufacturer

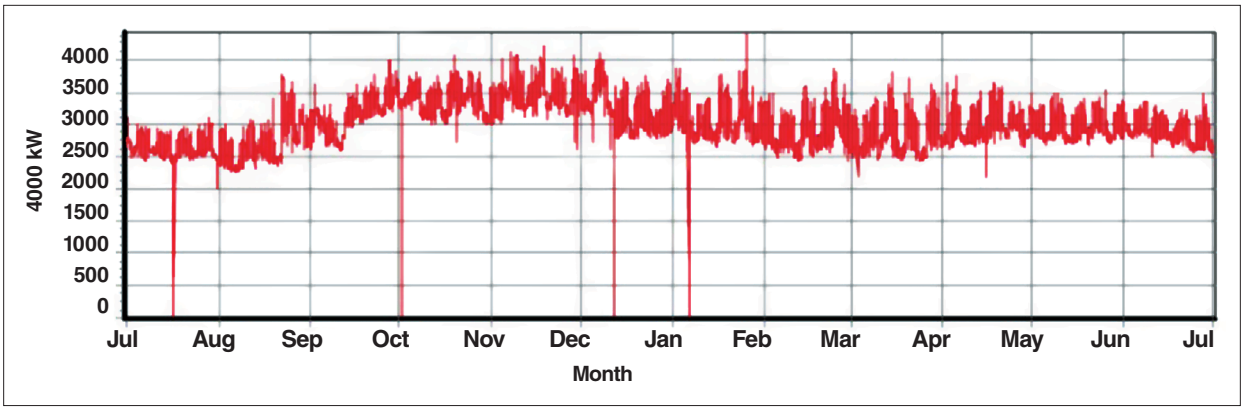


Figure 2— Typical data center load profile

will be used to determine compliance with Tier III and Tier IV requirements. **Cummins has a complete line of high-horsepower generators with a Data Center Continuous (DCC) rating meeting these requirements.** Detailed specification sheets are available for these generators in Cummins Power Generation's online resource, Power Suite[1].

The graph in Figure 3 compares a system with 2,500 kW DCC rated generators to a system with 2,500 kW ISO Prime (PRP) rated generators. This graph shows that this system requires **four** 2,500 kW DCC-rated generators to meet demand, whereas **five** 2,500 kW ISO Prime rated generators would be required to meet the same demand with no run-time limit.

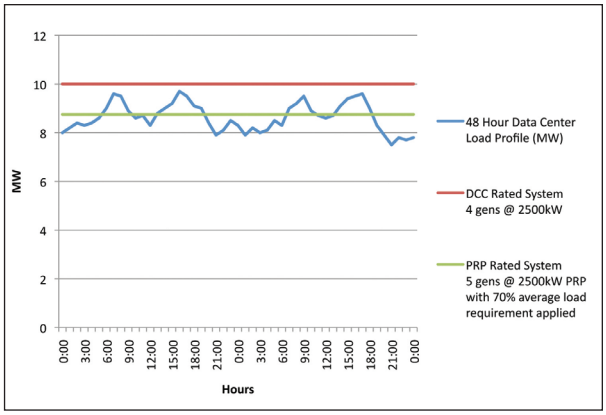


Figure 3 — Data Center Continuous (DCC) system vs. ISO Prime (PRP) system

Oversized Generators

As stated before, an ISO Continuous (COP) rated generator does meet the no run-time limit for Uptime Tier III and Tier IV. But a COP rated generator may not be the best fit for a typical data center load profile, nor does Uptime Institute require generators to be ISO COP rated.

There are optimum load levels for running diesel generators. One rule of thumb for optimum engine life is that the generator engine should be run greater than 30 percent of its maximum horsepower rating. This ensures that the exhaust temperature will be high enough to burn up the majority of particulate in the exhaust. Incomplete combustion at low loads can cause increased valve wear and degradation in the turbochargers, both of which increase maintenance needs and decrease reliability. In Figure 4, we compare a system utilizing five 1.6 megawatt COP rated generators to a system utilizing five 1.6 megawatt DCC rated generators. The load shown is about 36 to 39 percent of the generator system's 100 percent rating. This light load is very common in real-world data centers. As the graph shows, the COP rated generators are running below 30 percent of their maximum horsepower, while the DCC rated generators are running above 30 percent of their maximum horsepower. The DCC rated generator system is the more reliable choice in this example, and it will operate closer to the optimum horsepower of the engines, reducing the risk of low load failures.

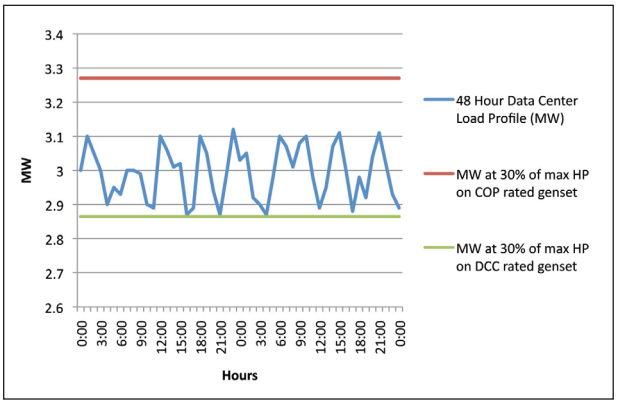


Figure 4 — Data Center Continuous (DCC) system vs. ISO Continuous (COP) system

Choose the Most Efficient Generator for Your Data Center.

To summarize, it is best to choose generators that most closely fit the load profile of your data center and still meet the Uptime Tier III and Tier IV standards. This will provide the most value. Plus, the generators will run closer to their optimum load level, which will increase the life and reliability of the generators.

[1]Power Suite, Cummins Web application for sizing and applying on-site power, can be found at powersuite.cummins.com

About the author

David Matuseski graduated from the University of Minnesota with a bachelor's degree in electrical engineering in 1987. He is a registered Professional Engineer in the state of Minnesota. Dave has been working in the power industry as a Cummins engineer and as a power engineering consultant since 1996.

Within Cummins, Dave has held the positions of design engineer, project manager, engineering manager and chief engineer. His current position is technical counsel for the Cummins Critical Protection group that specializes in the data center, healthcare and water treatment market segments.

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5410717 (GLPT-5618-ENa) 3/17.

Generator set data sheet

Power Generation

Model:	**DQLF**
Frequency:	**60**
Fuel type:	**Diesel**
KW rating:	**2750 standby**
	2500 prime
	2100 continuous
Emissions level:	**EPA NSPS Stationary Emergency Tier 2**

Exhaust emission data sheet:	EDS-1125
Exhaust emission compliance sheet:	EPA-1174
Sound performance data sheet:	MSP-1103
Cooling performance data sheet:	MCP-211
Prototype test summary data sheet:	PTS-299
Remote radiator cooling outline:	A049A843
High ambient cooling system outline (ship loose):	A049A845
Enhanced high ambient cooling system outline (ship loose):	A049A847

Fuel consumption

	Standby				Prime				Continuous
	kW (kVA)				kW (kVA)				kW (kVA)
Ratings	2750 (3438)				2500 (3125)				2100 (2625)
Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full	Full
US gph	63.3	103.4	143.4	183.4	59.7	96.1	132.5	168.9	145.5
L/hr	239	391	542	694	226	364	501	639	551

Engine

	Standby rating	Prime rating	Continuous rating
Engine manufacturer	Cummins Inc.		
Engine model	QSK78-G12		
Configuration	Cast Iron, V 18 cylinder		
Aspiration	Turbocharged and low temperature aftercooled		
Gross engine power output, kWm (bhp)	3028 (4060)	2737 (3670)	2271 (3045)
BMEP at set rated load, kPa (psi)	2599 (377)	2351 (341)	1951 (283)
Bore, mm (in)	170.0 (6.69)		
Stroke, mm (in)	190.0 (7.48)		
Rated speed, rpm	1800		
Piston speed, m/s (ft/min)	11.4 (2243)		
Compression ratio	15.5:1		
Lube oil capacity, L (qt)	413 (436)		
Overspeed limit, rpm	2100		
Regenerative power, kW	266		

Fuel flow

Maximum fuel flow, L/hr (US gph)	2234 (590)
Maximum fuel restriction at injection pump with clean filter, kPa (in Hg)	17 (5)
Maximum fuel inlet temperature, °C (°F)	71 (160)

Air

	Standby rating	Prime rating	Continuous rating
Combustion air, m^3/min (scfm)	239 (8451)	227 (8003)	207 (7302)
Maximum air cleaner restriction, kPa (in H_2O)	3.7 (15)		
Alternator cooling air, m^3/min (cfm)	270 (9535)		

Exhaust

Exhaust flow at set rated load, m^3/min (cfm)	570 (20134)	532 (18784)	480 (16965)
Exhaust temperature, °C (°F)	471 (879)	454 (850)	442 (827)
Maximum back pressure, kPa (in H_2O)	7 (28)		

High ambient cooling system (ship loose)

Ambient design °C (°F)	43 (109)	40 (104)	44 (111)
Fan load kWm (hp)	90 (121)		
Cooling capacity (with radiator), L (US gal)	738 (195)		
Cooling system air flow, m^3/min (scfm)	3060 (108000)		
Total heat rejection, MJ/min (Btu/min))	103.6 (98257)	94.6 (89618)	82.0 (77746)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		

Enhanced high ambient cooling system (ship loose)

Ambient design, °C (°F)	51 (124)	49 (120)	50 (122)
Fan load, kW_m (HP)	107 (144)		
Coolant capacity (with radiator), L (US gal)	1061 (280)		
Cooling system air flow, m^3/min (scfm)	4560 (161000)		
Total heat rejection, MJ/min (Btu/min)	103.6 (98257)	94.6 (89618)	82.0 (77746)
Maximum cooling air flow static restriction, kPa (in H_2O)	0.12 (0.5)		

Remote radiator cooling at 25C, 110M[1]

Set coolant capacity, L (US gal)	223 (59)		
Max flow rate at max friction head, jacket water circuit, L/min (US gal/min)	2222 (587)		
Max flow rate at max friction head, aftercooler circuit, L/min (US gal/min)	988 (261)		
Heat rejected, jacket water circuit, MJ/min (Btu/min)	55.1 (52234)	51.1 (48459)	45.5 (43158)
Heat rejected, aftercooler circuit, MJ/min (Btu/min)	45.9 (43523)	40.8 (38659)	33.9 (32088)
Heat rejected, fuel circuit, MJ/min (Btu/min)	2.6 (2500)		
Total heat radiated to room, MJ/min (Btu/min)	23.4 (22179)	21.4 (20341)	18.3 (17400)
Maximum friction head, jacket water circuit, kPa (psi)	69 (10)		
Maximum friction head, aftercooler circuit, kPa (psi)	48 (7)		
Maximum static head, jacket water circuit, m (ft)	18.3 (60)		
Maximum static head, aftercooler circuit, m (ft)	18.3 (60)		
Maximum jacket water outlet temp, °C (°F)	104 (220)	100 (212)	100 (212)
Maximum aftercooler inlet temp at 25 °C (77 °F) ambient, °C (°F)	49 (120)		
Maximum aftercooler inlet temp, °C (°F)	71 (160)	66 (150)	
Maximum fuel flow, L/hr (US gph)	2234 (590)		
Maximum fuel return line restriction, kPa (in Hg)	34 (10)		

[1] For non-standard remote installations contact your local Cummins Power Generation representative.

Weights[2]

Unit dry weight kgs (lbs)	23210 (51166)
Unit wet weight kgs (lbs)	24238 (53433)

[2] Weights represent a set with standard features. See outline drawing for weights of other configurations.

Derating factors

Standby	**Standard Cooling System:** Full rated power available up to 1077 m (3536 ft) elevation at ambient temperatures up to 40 °C (104 °F). At 40 °C (104 °F) derate by 4.6% per 305m (1000 ft) from 1077 m (3536 ft) to 2000 m (6560 ft). Above these conditions derate by 7.5% per 305m (1000 ft) and by an additional 17.8% per 10 °C (18 °F). **Enhanced Cooling System:** Full rated power available up to 1240 m (4067 ft) elevation at ambient temperatures up to 40°C (104°F). At 40°C (104°F) derate by 4.6% per 305m (1000 ft) from 1240 m (4067 ft) to 2399 m (7872 ft), and above 2399 m (7872 ft) derate by 7.5% per 305m (1000 ft). Full rated power available up to 387 m (1269 ft) elevation at ambient temperatures up to 50°C (122°F). At 50°C (122°F) derate by 4.6% per 305m (1000 ft) from 387 m (1269 ft) to 1600 m (5248 ft), and above 1600 m (5248 ft) derate by 7.5% per 305m (1000 ft). At higher ambient temperatures, derate by an additional 21.3% per 10 °C (18°F). **Remote Radiator Cooling Option:** Full rated power available up to 728 m (2387 ft) at ambient temperature up to 40 °C (104 °F). Above these elevations, at 40 °C (104 °F), derate by an additional 7.75% per 305 m (1000 ft). Derate by 2.25% at sea level at ambient temperatures up to 50 °C (122 °F). Above these elevations, at 50 °C (122 °F), derate by an additional 7.4% per 305 m (1000 ft). At higher ambient temperatures, derate by an additional 19% per 10 °C (18 °F),
Prime	Full rated power available up to 394 m (1294 ft) at ambient temperature up to 40 °C (104 °F). Above these elevations, at 40 °C (104 °F), derate by an additional 8.5% per 305 m (1000 ft). Derate by 11.5% at sea level at ambient temperatures up to 50 °C (122 °F). Above these elevations, at 50 °C (122 °F), derate by an additional 8.25% per 305 m (1000 ft). At higher ambient temperatures, derate by an additional 22% per 10 °C (18 °F),
Continuous	Full rated power available at sea level at ambient temperature up to 40 °C (104 °F). Above these elevations, at 40 °C (104 °F), derate by an additional 9.75% per 305 m (1000 ft). Derate by 29% at sea level at ambient temperatures up to 50 °C (122 °F). Above these elevations, at 50 °C (122 °F), derate by an additional 8.5% per 305 m (1000 ft). At higher ambient temperatures, derate by an additional 28% per 10 °C (18 °F),

Ratings definitions

Emergency standby power (ESP):	**Limited-time running power (LTP):**	**Prime power (PRP):**	**Base load (continuous) power (COP):**
Applicable for supplying power to varying electrical load for the duration of power interruption of a reliable utility source. Emergency Standby Power (ESP) is in accordance with ISO 8528. Fuel Stop power in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power to a constant electrical load for limited hours. Limited Time Running Power (LTP) is in accordance with ISO 8528.	Applicable for supplying power to varying electrical load for unlimited hours. Prime Power (PRP) is in accordance with ISO 8528. Ten percent overload capability is available in accordance with ISO 3046, AS 2789, DIN 6271 and BS 5514.	Applicable for supplying power continuously to a constant electrical load for unlimited hours. Continuous Power (COP) is in accordance with ISO 8528, ISO 3046, AS 2789, DIN 6271 and BS 5514.

Alternator data

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Winding No.	Alternator data sheet	Feature Code
220/380	Wye	125	S		N/A	13	ADS-531	B407-2
380	Wye	150	S		7944	13	ADS-516	B814-2
440	Wye	150	S/P/C		9719	12	ADS-517	B813-2
380	Wye	125	P		7944	13	ADS-516	B815-2
380	Wye	80	C		N/A	13	ADS-517	B800-2
220/380	Wye	105	C		7944	13	ADS-516	B597-2
380	Wye	105	P		10049	13	ADS-517	B840-2
440	Wye	125	S/P/C		13024	12	ADS-531	B663-2
440	Wye	105	S/P		13024	12	ADS-531	B664-2
480	Wye	150	S		8412	12	ADS-516	B816-2
277/480	Wye	125	P		8412	12	ADS-516	B718-2
480	Wye	125	S/P/C		9719	12	ADS-517	B801-2
480	Wye	105	S		13024	12	ADS-531	B280-2
480	Wye	80	S		14781	12	ADS-532	B601-2
480	Wye	80	P		13024	12	ADS-531	B694-2
480	Wye	105	C		7267	12	ADS-515	B583-2
600	Wye	150	S		8189	7	ADS-516	B817-2

Notes:

[1] Single phase power can be taken from three phase generator sets at up to the value listed in the single phase factor column for the generator set nameplate kW rating at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Alternator data (continued)

Voltage	Connection[1]	Temp rise degrees C	Duty[2]	Single phase factor[3]	Max surge kVA[4]	Winding No.	Alternator data sheet	Feature Code
347/600	Wye	125	P		8189	7	ADS-516	B720-2
347/600	Wye	80	S		N/A	7	ADS-532	B604-2
600	Wye	80	P		12426	7	ADS-531	B695-2
347/600	Wye	105	C		7233	7	ADS-515	B582-2
347/600	Wye	105	S		12426	7	ADS-531	B839-2
2400/4160	Wye	105	P/C		7295	51	ADS-519	B571-2
13200-13800	Wye	125	P		6800	91	ADS-522	B804-2
13200	Wye	105	C		6800	91	ADS-522	B805-2
13200	Wye	125	S/P		11213	91	ADS-533	B819-2
13200	Wye	105	S		11213	91	ADS-533	B501-2
13200	Wye	80	P		13438	91	ADS-534	B566-2
13200	Wye	80	S		13438	91	ADS-534	B807-2
13200	Wye	80	C		11213	91	ADS-533	B808-2
13800	Wye	125	S		7993	91	ADS-523	B820-2
13800	Wye	105	P		7993	91	ADS-523	B821-2
13800	Wye	105	C		6800	91	ADS-522	B460-2
13800	Wye	80	S		13438	91	ADS-534	B610-2
13800	Wye	80	P		11213	91	ADS-533	B809-2
13800	Wye	80	C		6800	91	ADS-522	B565-2
12470	Wye	125	S		11213	91	ADS-533	B822-2
12470	Wye	105	P		11213	91	ADS-533	B823-2
12470	Wye	105	S		13438	91	ADS-534	B568-2
12470	Wye	80	P		13438	91	ADS-534	B812-2
12470	Wye	105	C		6800	91	ADS-522	B569-2
12470	Wye	80	C		11213	91	ADS-533	B570-2
13800	Wye	105	S		11213	91	ADS-533	B895-2
2400/4160	Wye	105	S		8752	51	ADS-520	B933-2
2400/4160	Wye	80	S		11185	51	ADS-545	B935-2
2400/4160	Wye	150	S/P/C		7295	51	ADS-519	B938-2
2400/4160	Wye	125	S		7295	51	ADS-519	B940-2
600	Wye	80	C		8189	7	ADS-516	B589-2
2400/4160	Wye	80	P		8752	51	ADS-520	B939-2

Notes:

[1] Single phase power can be taken from three phase generator sets at up to the value listed in the single phase factor column for the generator set nameplate kW rating at unity power factor.

[2] Standby (S), Prime (P) and Continuous ratings (C).

[3] Factor for the *Single Phase Output from Three Phase Alternator* formula listed below.

[4] Maximum rated starting kVA that results in a minimum of 90% of rated sustained voltage during starting.

Formulas for calculating full load currents:

Three phase output

$$\frac{\text{kW} \times 1000}{\text{Voltage} \times 1.73 \times 0.8}$$

Single phase output

$$\frac{\text{kW} \times \text{SinglePhaseFactor} \times 1000}{\text{Voltage}}$$

Warning: Back feed to a utility system can cause electrocution and/or property damage. Do not connect to any building's electrical system except through an approved device or after building main switch is open.

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