Cummins Engine Technical Datasheet PDF - Complete Specifications and Application Guide

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Introduction

Cummins engines represent the gold standard in diesel power generation, delivering exceptional reliability, performance, and efficiency across the complete spectrum of generator applications. This comprehensive technical datasheet provides detailed specifications, performance characteristics, and application guidance for Cummins engines used in generator sets, serving as the authoritative reference for engineers, specifiers, and maintenance professionals.

With over 100 years of engine manufacturing expertise, Cummins has established itself as a global leader in diesel engine technology for power generation. The company offers a comprehensive range of engines from 2.2 liters to 95 liters displacement, covering generator applications from 20 kVA to over 3500 kVA. Cummins engines are recognized worldwide for their robust design, exceptional reliability, extensive service network, and comprehensive technical support infrastructure.

Modern Cummins generator engines incorporate advanced technologies including high-pressure common rail fuel injection, sophisticated electronic control systems, advanced turbocharging with charge air cooling, and comprehensive emissions after-treatment systems. These technologies enable Cummins engines to meet stringent global emissions standards while delivering outstanding fuel efficiency, transient response, and operational reliability across diverse applications and operating conditions.

Technical Specifications

Small Capacity Engines (20-100 kVA Applications)

Parameter	4BTAA-G2	4BTAA-G3	B3.3-G2
Configuration	4-cylinder in-line	4-cylinder in-line	4-cylinder in-line
Displacement	3.9 L	3.9 L	3.3 L
Bore x Stroke	102mm x 120mm	102mm x 120mm	95mm x 115mm
Aspiration	Turbocharged aftercooled	Turbocharged aftercooled	Turbocharged aftercooled
Fuel System	PT Pump	Common Rail	Common Rail
Prime Power Range	32-50 kW	45-65 kW	28-40 kW
Standby Power Range	35-55 kW	50-72 kW	31-44 kW
Governor Type	Electronic	Electronic	Electronic
Rated Speed	1500 RPM	1500 RPM	1500 RPM

Medium Capacity Engines (100-500 kVA Applications)

Parameter	6BTAA-G5	QSL9-G5	QSM11-G5

| Configuration | 6-cylinder in-line | 6-cylinder in-line | 6-cylinder in-line |

| Displacement | 5.9 L | 8.9 L | 10.8 L |

| Bore x Stroke | 102mm x 120mm | 114mm x 145mm | 125mm x 147mm |

| Aspiration | Turbocharged aftercooled | Turbocharged intercooled | Turbocharged intercooled |

| Fuel System | Common Rail | Common Rail | Common Rail |

| Prime Power Range | 80-120 kW | 150-250 kW | 200-320 kW |

| Standby Power Range | 88-132 kW | 165-275 kW | 220-352 kW |

| Governor Type | Electronic | Electronic | Electronic |

| Rated Speed | 1500 RPM | 1500 RPM | 1500 RPM |

Large Capacity Engines (500-1500 kVA Applications)

| Parameter | QSK19-G5 | QSK23-G5 | QSK38-G5 |

|---|---|---|---|

| Configuration | 6-cylinder in-line | 6-cylinder in-line | V12 |

| Displacement | 19.0 L | 22.9 L | 38.0 L |

| Bore x Stroke | 159mm x 159mm | 170mm x 170mm | 159mm x 159mm |

| Aspiration | Sequential turbocharged intercooled | Sequential turbocharged intercooled | Sequential turbocharged intercooled |

| Fuel System | Common Rail | Common Rail | Common Rail |

| Prime Power Range | 400-550 kW | 500-700 kW | 750-1100 kW |

| Standby Power Range | 440-605 kW | 550-770 kW | 825-1210 kW |

| Governor Type | Electronic | Electronic | Electronic |

| Rated Speed | 1500 RPM | 1500 RPM | 1500 RPM |

High Capacity Engines (1500+ kVA Applications)

| Parameter | QSK50-G5 | QSK60-G5 | QSK78-G5 |

|---|---|---|---|

| Configuration | V16 | V16 | V18 |

| Displacement | 50.3 L | 60.0 L | 78.0 L |

| Bore x Stroke | 159mm x 159mm | 159mm x 159mm | 159mm x 190mm |

| Aspiration | Sequential turbocharged intercooled | Sequential turbocharged intercooled | Sequential turbocharged intercooled |

| Fuel System | Common Rail | Common Rail | Common Rail |

| Prime Power Range | 1100-1500 kW | 1400-1800 kW | 1800-2500 kW |

| Standby Power Range | 1210-1650 kW | 1540-1980 kW | 1980-2750 kW |

| Governor Type | Electronic | Electronic | Electronic |

| Rated Speed | 1500 RPM | 1500 RPM | 1500 RPM |

Fuel System Specifications

Common Rail Fuel Injection System

Parameter	Specification
Injection Pressure	Up to 2400 bar
Injection Timing	Electronically controlled
Number of Injections	Multiple injection events per cycle
Injection Control	Full electronic with adaptive learning
Fuel Filter	Dual-stage with water separator
Fuel Type	ASTM D975 No. 2-D Diesel
Biodiesel Capability	B20 approved (check specific model)

Fuel Consumption Data (Typical Values)

Engine Model	Full Load (L/hr)	75% Load (L/hr)	50% Load (L/hr)
4BTAA-G2 (45 kW)	12-14	9-11	7-8
6BTAA-G5 (100 kW)	26-30	20-24	14-17
QSL9-G5 (200 kW)	52-60	40-46	28-33
QSM11-G5 (300 kW)	78-90	60-69	42-49
QSK19-G5 (500 kW)	130-150	100-115	70-82
QSK38-G5 (1000 kW)	260-300	200-230	140-165

Emissions Control Systems

Stage V / Tier 4 Final After-treatment Configuration

Component	Function	Maintenance Interval
Diesel Oxidation Catalyst (DOC)	Converts CO and HC to CO2 and H2O	3000-5000 hours
Diesel Particulate Filter (DPF)	Captures and oxidizes particulate matter	Regeneration: automatic; cleaning: 3000-5000 hours
Selective Catalytic Reduction (SCR)	Reduces NOx using DEF	DEF refill as consumed
DEF Dosing System	Injects diesel exhaust fluid	Filter change: 2000-3000 hours
NOx Sensor	Monitors NOx levels for control	Replace as needed

DEF (Diesel Exhaust Fluid) Specifications

Parameter	Specification
DEF Standard	ISO 22241 or AUS 32
Concentration	32.5% urea in deionized water
Consumption Rate	3-5% of fuel consumption
Storage Temperature	-11°C to +30°C
Shelf Life	12-18 months (depends on storage conditions)
Tank Material	HDPE, stainless steel, or compatible materials

Electronic Control System

CM850/CM2150/CM2250 Control Features

Feature	Description
Governor Control	Isochronous electronic governor
Speed Control	±0.25% steady-state regulation
Fuel Mapping	Adaptive fuel curves for optimal efficiency
Diagnostics	Real-time fault detection and logging
Communication	J1939 CAN bus, Modbus capability
Protection	Comprehensive engine protection system
Monitoring	Real-time parameter display and recording
Remote Interface	Compatible with DSE, ComAp, and other controllers

Protection Parameters

Parameter	Typical Setting	Action
Low Oil Pressure	1.0-2.5 bar (engine specific)	Shutdown
High Coolant Temperature	105-110°C	Shutdown
Overspeed	110-115% of rated	Shutdown
Low Coolant Level	Sensor activated	Shutdown
High Oil Temperature	125-130°C	Warning/Shutdown
Low Fuel Pressure	Model specific	Warning
High Exhaust Temperature	Model specific	Warning/Shutdown

Performance Curves Description

Torque and Power Curves

Cummins generator engines are designed with power curves optimized for generator applications. Unlike automotive engines with torque peaks at specific RPM ranges, generator engines deliver essentially constant torque across the operating speed range, providing excellent load acceptance and transient response. The power output increases linearly with speed up to the rated RPM.

Fuel Consumption Maps

Fuel consumption maps illustrate the relationship between engine speed, load, and specific fuel consumption. Cummins common rail engines demonstrate excellent fuel efficiency across a broad operating range. The lowest specific fuel consumption typically occurs at 70-85% load and rated speed. At reduced loads, specific fuel consumption increases due to fixed mechanical losses.

Steady-State and Transient Response

Cummins engines with electronic governing and high-pressure common rail injection deliver excellent transient response. Load step acceptance of 50-80% of rated load in a single step is typical, depending on engine size and turbocharging system. Recovery to rated speed typically occurs within 2-4 seconds. Larger engines with sequential turbocharging may have slightly longer transient response times but higher single-step load acceptance capability.

Compatible Applications

Prime Power Applications

Cummins engines are extensively used in prime power applications including remote installations, construction sites, mining operations, and locations without utility power. The robust design, excellent fuel efficiency, and comprehensive service network make Cummins ideal for continuous duty applications. Prime power ratings allow unlimited operating hours at variable loads.

Standby Power Applications

Cummins engines dominate the standby power market, providing reliable backup power for hospitals, data centers, commercial buildings, and critical infrastructure. The proven reliability, fast starting, and excellent transient response ensure rapid restoration of power during utility outages. Standby ratings provide maximum output for limited hours per year.

Marine Generator Applications

Cummins offers marine-certified versions of popular engine models for onboard power generation. Marine engines feature special cooling systems, corrosion-resistant components, and marine-grade materials suitable for the demanding marine environment. Classification society approvals include ABS, BV, DNV-GL, LR, and others.

Industrial Power Applications

Industrial applications include compressor drives, pump drives, and other mechanical drive applications. Cummins industrial engines offer various SAE flywheel and flywheel housing options for mating with driven equipment. Heavy-duty bearings, robust construction, and flexible mounting options suit diverse industrial requirements.

Download PDF Section

Official Cummins Documentation

Complete technical documentation for Cummins generator engines is available through Cummins Power Generation and authorized distributors. Documentation includes engine specification sheets, installation drawings, application guides, operation and maintenance manuals, and parts catalogs.

Available Documentation

- Engine Technical Specification Sheets
- Performance Curve Documents
- Installation Guidelines
- Operation and Maintenance Manuals
- Parts Catalogs
- Service Bulletins
- Emissions Compliance Certificates
- Application Engineering Guides

Frequently Asked Questions

1. What is the typical service life of a Cummins generator engine?

With proper maintenance, Cummins generator engines can achieve 20,000-40,000 operating hours before major overhaul depending on the engine series and application. Smaller engines (B-Series) typically achieve 20,000-25,000 hours, while larger engines (QSK Series) can exceed 40,000 hours with proper maintenance.

2. How often should I change the oil in my Cummins engine?

Oil change intervals depend on the engine series and application. Typical intervals range from 250-500 hours. Low-load operation, dusty environments, or severe applications may require more frequent changes. Follow the specific maintenance schedule for your engine model and application.

3. What is the difference between prime and standby ratings?

Prime power rating allows unlimited operating hours per year at variable loads up to the rated output, with an average load factor not exceeding 70%. A 10% overload is available for limited periods. Standby rating applies to emergency backup applications with operating hours typically limited to 200 hours per year at rated output with no overload capability.

4. What fuel do Cummins generator engines use?

Cummins generator engines are designed for ASTM D975 No. 2-D diesel fuel. Many models are approved for biodiesel blends up to B20 (20% biodiesel) with proper maintenance procedures. Cold weather operation may require winter-blend fuel or fuel additives to prevent gelling.

5. What emissions standards do Cummins engines meet?

Current Cummins generator engines meet EU Stage V and EPA Tier 4 Final emissions standards. These engines incorporate diesel oxidation catalysts, diesel particulate filters, and selective catalytic reduction with DEF injection. Earlier engine models meet previous emissions tiers.

6. Can Cummins engines run on low-load for extended periods?

Extended operation below 30% load should be avoided. Low-load operation can cause wet stacking, carbon buildup, cylinder glazing, and reduced engine efficiency. If low-load operation is unavoidable, periodic load bank testing can help maintain engine health. Consult Cummins for specific guidance.

7. What is the warranty on Cummins generator engines?

Warranty coverage varies by engine model, application, and region. Typical warranty for generator engines includes 1-2 years or 1000-2000 hours base warranty with extended coverage options available. Consult your local Cummins distributor for specific warranty terms and extended coverage programs.

8. How do I size a Cummins engine for my generator application?

Generator sizing depends on the total connected load, load characteristics (particularly motor starting requirements), operating profile, and environmental conditions. Cummins provides PowerSuite sizing software and application engineering support. Consult with a qualified engineer or Cummins distributor for accurate sizing.

9. What after-treatment maintenance is required?

After-treatment maintenance includes DPF cleaning or replacement at specified intervals, DEF filter changes, and NOx sensor monitoring. DEF tank refilling is required as consumed. Maintenance intervals depend on the specific engine model and operating conditions. Follow the maintenance schedule for your engine.

10. Can I convert a Cummins engine to run on natural gas?

Cummins offers dedicated natural gas engines (QSK19G, QSK50G, etc.) for gas generator applications. Conversion of diesel engines to natural gas is not recommended or supported by Cummins. Natural gas engines are designed specifically for gaseous fuel operation with appropriate components and controls.

11. What is DEF and why is it required?

DEF (Diesel Exhaust Fluid) is a solution of 32.5% urea in deionized water used in SCR (Selective Catalytic Reduction) systems to reduce NOx emissions. DEF is injected into the exhaust stream where it reacts with NOx in the catalyst to produce nitrogen and water. DEF is required for Stage V / Tier 4 Final compliance.

12. How do I find parts for my Cummins engine?

Cummins parts are available through the worldwide network of authorized Cummins distributors and dealers. Parts can be identified using the engine serial number and electronic parts catalog. Genuine Cummins parts are recommended to maintain warranty coverage and ensure proper fit and function.

13. What is the recommended coolant for Cummins engines?

Cummins recommends using a fully formulated heavy-duty diesel engine coolant meeting Cummins Engineering Standard (CES) 14603. This includes both conventional and extended-life coolants. Use of proper coolant with appropriate additives is essential for cooling system protection and warranty compliance.

14. How do I access Cummins diagnostic tools?

Cummins offers INSITE diagnostic software for comprehensive engine diagnostics, calibration updates, and parameter changes. INSITE connects to the engine ECM via the diagnostic data link. Alternative diagnostic tools include Cummins QuickCheck for Android devices. Contact your local distributor for access.

15. What support does Cummins provide for generator applications?

Cummins provides comprehensive support including application engineering, sizing assistance, installation guidance, commissioning support, operator training, maintenance training, and 24/7 technical support through the global distributor network. Service agreements and extended warranty programs are available.

Related Downloads

Engine Documentation

- Cummins B3.3 Series Operation Manual
- Cummins B Series (4B/6B) Technical Manual
- Cummins QSL9 Series Service Manual
- Cummins QSM11 Series Parts Catalog
- Cummins QSK19 Series Installation Guide
- Cummins QSK38/50 Series Technical Manual
- Cummins QSK60/78 Series Specifications

Emissions Documentation

- Stage V Emissions System Overview
- Tier 4 Final After-treatment Guide
- DEF Handling and Storage Guidelines
- DPF Regeneration and Maintenance
- Emissions Warranty Information

Application Guides

- Generator Set Sizing Guide
- Installation Guidelines
- Cooling System Design
- Fuel System Installation
- Ventilation Requirements
- Mounting and Vibration Isolation

Control System Documentation

- CM850 Control System Manual
- CM2150 Control System Manual

- CM2250 Control System Manual
- INSITE Diagnostic Software Guide
- J1939 Communication Protocol Guide

Service and Maintenance

- Preventive Maintenance Schedule
- Oil Analysis Program Guide
- Coolant Maintenance Guidelines
- Filter Specifications and Cross-Reference
- Service Tool Requirements

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