

# Diesel Generator Set Model DKAF Nonroad 60 Hz

25 kW, 31 kVA Standby  
23 kW, 29 kVA Prime



## Description

The Cummins Power Generation DK-series commercial generator set is a fully integrated power generation system providing optimum performance, reliability, and versatility for stationary standby or prime power applications.

A primary feature of the DK GenSet is strong motor-starting capability and fast recovery from transient load changes. The torque-matched system includes a heavy-duty Kubota 4-cycle liquid-cooled diesel engine, an AC alternator with high motor-starting kVA capacity, and an electronic voltage regulator with three phase sensing for precise regulation under steady-state or transient loads. The DK GenSet accepts 100% of the nameplate standby rating in one step, in compliance with NFPA110 requirements.

The standard PowerCommand® 1300 digital electronic control is an integrated system that combines engine and alternator controls for high reliability and optimum genset performance. The control may be upgraded to PowerCommand 2100 digital electronic control with NFPA110 compliance and electronic governing.

Optional weather-protective enclosures and coolant heaters shield the generator set from extreme operating conditions. Environmental concerns are addressed by low exhaust emission engines, sound-attenuated enclosures, exhaust silencers, and dual-wall fuel tanks.

A wide range of options, accessories, and services are available, allowing configuration to your specific power generation needs.

Every production unit is factory tested at rated load and power factor. This testing includes demonstration of rated power and single-step rated load pickup. Cummins Power Generation manufacturing facilities are registered to ISO9001 quality standards, emphasizing our commitment to high quality in the design, manufacture, and support of our products. The GenSet is CSA certified when PowerCommand 2100 control option is selected. The PowerCommand 2100 control is UL508 Listed.

All Cummins Power Generation systems are backed by a comprehensive warranty program and supported by a worldwide network of 170 distributors and service branches to assist you with warranty, service, parts, and planned maintenance support.

## Features

**Low Exhaust Emissions** - Engine certified to U.S. EPA Nonroad Source Emission Standards, 40 CFR 89, Tier 2.

**Kubota Heavy-Duty Engine** - Rugged 4-cycle, liquid-cooled, industrial diesel engine delivers reliable power, low emissions, and fast response to load changes.

**Electronic Voltage Regulator** - Torque-matched regulator provides fast recovery from transient load changes. It also includes underfrequency compensation and precise regulation.

**Alternator** - Several alternator sizes offer selectable motor starting capability with low reactance 2/3 pitch windings, low waveform distortion with non-linear loads, fault clearing short-circuit capability, and class H insulation.

**Control Systems** - The PowerCommand 1300 electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping, and precise frequency and voltage regulation. The optional PowerCommand 2100 electronic control adds alarm and status message display, AmpSentry™ protection, output metering, auto-shutdown at fault detection, NFPA110 compliance Level 1, CSA certification, and UL508 Listing.

**Cooling Systems** - Standard cooling package provides reliable running at the rated power level, at up to 50°C ambient temperature.

**Integral Vibration Isolation** - Robust skid base supports the engine, alternator, and radiator on isolators, minimizing transmitted vibration.

**E-coat Finish** - Dual electro-deposition paint system provides high resistance to scratches, corrosion, or fading.

**Enclosures** - Optional weather-protective enclosures are available.

**Fuel Tanks** - Dual wall sub-base fuel tanks and in-skid day tanks are also offered.

**Certifications** - Generator sets are designed, manufactured, tested, and certified to relevant UL, NFPA, ISO, IEC, and CSA standards.

**Warranty and Service** - Backed by a comprehensive warranty and world wide distributor network.

## Generator Set

The general specifications provide representative configuration details. Consult the outline drawing for installation design.

### Specifications – General

See outline drawing 500-3954 for installation design specifications.

<b>Unit Width, in (mm)</b>	31.0 (787)
<b>Unit Height, in (mm)</b>	38.6 (980)
<b>Unit Length, in (mm)</b>	66.9 (1699)
<b>Unit Dry Weight, lb (kg)</b>	1314 (596)
<b>Unit Wet Weight, lb (kg)</b>	1371 (622)
<b>Rated Speed, rpm</b>	1800
<b>Voltage Regulation, No Load to Full Load</b>	±2.0%
<b>Random Voltage Variation</b>	±1.0%
<b>Frequency Regulation</b>	5%
<b>Random Frequency Variation</b>	±0.5%
<b>Radio Frequency Interference</b>	Meets requirements of most industrial and commercial applications

<b>Cooling</b>	<b>Standby</b>	<b>Prime</b>
Fan Load, HP (kW)	3.4 (2.5)	3.4 (2.5)
Coolant Capacity with radiator, US Gal (L)	3.1 (11.7)	3.1 (11.7)
Coolant Flow Rate, Gal/min (L/min)	13.0 (49.2)	13.0 (49.2)
Heat Rejection To Coolant, Btu/min (MJ/min)	2055.0 (2.2)	1781.0 (1.9)
Heat Radiated To Room, Btu/min (MJ/min)	420.0 (0.4)	370.0 (0.4)
Maximum Coolant Friction Head, psi (kPa)	3.1 (21.4)	3.1 (21.4)
Maximum Coolant Static Head, ft (m)	29.5 (9.0)	29.5 (9.0)

<b>Air</b>		
Combustion Air, scfm (m <sup>3</sup> /min)	74.2 (2.1)	74.2 (2.1)
Alternator Cooling Air, scfm (m <sup>3</sup> /min)	250.0 (7.1)	250.0 (7.1)
Radiator Cooling Air, scfm (m <sup>3</sup> /min)	3500.0 (99.0)	3500.0 (99.0)
Max. Static Restriction, in H <sub>2</sub> O (Pa)	0.50 (124.50)	0.50 (124.50)

### Rating Definitions

**Standby Rating based on:** Applicable for supplying emergency power for the duration of normal power interruption. No sustained overload capability is available for this rating. (Equivalent to Fuel Stop Power in accordance with ISO3046, AS2789, DIN6271 and BS5514). Nominally rated.

**Prime (Unlimited Running Time) Rating based on:** Applicable for supplying power in lieu of commercially purchased power. Prime power is the maximum power available at a variable load for an unlimited number of hours. A 10% overload capability is available for limited time. (Equivalent to Prime Power in accordance with ISO8528 and Overload Power in accordance with ISO3046, AS2789, DIN6271, and BS5514). This rating is not applicable to all generator set models.

**Base Load (Continuous) Rating based on:** Applicable for supplying power continuously to a constant load up to the full output rating for unlimited hours. No sustained overload capability is available for this rating. Consult authorized distributor for rating. (Equivalent to Continuous Power in accordance with ISO8528, ISO3046, AS2789, DIN6271, and BS5514). This rating is not applicable to all generator set models.

### Site Derating Factors

Rated power available up to 1600 ft (488 m) at ambient temperatures up to 77°F (25°C). Above 1600 ft (488 m), derate at 4% per 1000 ft (305 m) and 1% per 10°F (2% per 11°C) above 77°F (25°C).

# Engine

Kubota heavy-duty diesel engines provide stable power, low fuel consumption, quiet operation, and fast response to sudden load changes.

Mechanical governing is standard. Electronic governing is available for applications requiring constant (isochronous) frequency regulation such as Uninterruptible Power Supply (UPS) systems, non-linear loads, or sensitive electronic loads. Optional coolant heaters are recommended for all emergency standby installations or for any application requiring fast load acceptance after start-up.

## Specifications – Engine

<b>Base Engine</b>	Kubota F2803, naturally aspirated, diesel-fueled
<b>Displacement in<sup>3</sup> (L)</b>	167.0 (2.7)
<b>Overspeed Limit, rpm</b>	2100 ±50
<b>Regenerative Power, kW</b>	9.00
<b>Cylinder Block Configuration</b>	Cast iron, In-line 5 cylinder
<b>Battery Capacity</b>	450 amps minimum at ambient temperature of 32°F(0°C)
<b>Battery Charging Alternator</b>	40 amps
<b>Starting Voltage</b>	12-volt, negative ground
<b>Lube Oil Filter Types</b>	Single spin-on, full flow
<b>Standard Cooling System</b>	122°F (50°C) ambient radiator cooling system

<b>Power Output</b>		<b>Standby</b>		<b>Prime</b>					
Gross Engine Power Output, bhp (kWm)		44.8 (33.4)		40.8 (30.4)					
BMEP at Rated Load, psi (kPa)		104.0 (717.1)		92.0 (634.3)					
Bore, in. (mm)		3.43 (87.1)		3.43 (87.1)					
Stroke, in. (mm)		3.62 (91.9)		3.62 (91.9)					
Piston Speed, ft/min (m/s)		1091.0 (5.5)		1091.0 (5.5)					
Compression Ratio		23.0:1		23.0:1					
Lube Oil Capacity, qt. (L)		13.2 (12.5)		13.2 (12.5)					
<b>Fuel Flow</b>									
Fuel Flow at Rated Load, US Gal/hr (L/hr)		3.5 (13.4)		3.5 (13.4)					
Maximum Inlet Restriction, in. Hg (mm Hg)		2.0 (50.8)		2.0 (50.8)					
Maximum Return Restriction, in. Hg (mm Hg)		5.8 (147.3)		5.8 (147.3)					
<b>Air Cleaner</b>									
Maximum Air Cleaner Restriction, in. H <sub>2</sub> O (kPa)		25.0 (6.2)		25.0 (6.2)					
<b>Exhaust</b>									
Exhaust Flow at Rated Load, cfm (m <sup>3</sup> /min)		213.0 (6.0)		200.0 (5.7)					
Exhaust Temperature, °F (°C)		970.0 (521.1)		910.0 (487.8)					
Max Back Pressure, in. H <sub>2</sub> O (kPa)		41.0 (10.2)		41.0 (10.2)					
<b>Fuel System</b>		Indirect injection, number 2 diesel fuel; fuel filter; fuel/water separator; automatic electric fuel shutoff; distributor injection pump with integral mechanical governor.							
<b>Fuel Consumption</b>		<b>Standby</b>				<b>Prime</b>			
<b>60 Hz Ratings, kW (kVA)</b>		<b>25 (31)</b>				<b>23 (29)</b>			
	Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
	US Gal/hr	0.90	1.28	1.72	2.33	0.84	1.17	1.60	2.02
	L/hr	3.4	4.8	6.5	8.8	3.2	4.4	6.1	7.6

## Alternator

Several alternators are available for application flexibility based on the required motor starting kVA and other requirements. Larger alternator sizes have lower temperature rise, for longer life of the alternator insulation system. In addition, larger alternator sizes can provide a cost-effective use of engine power in across-the-line motor starting applications and can be used to minimize voltage waveform distortion caused by non-linear loads.

These single-bearing alternators couple directly to the engine flywheel with flexible discs, for drivetrain reliability and durability. No gear reducers or speed changers are used. Two-thirds pitch windings eliminate third-order harmonic content of the AC voltage waveform and provide the standardization desired for paralleling of generator sets. The excitation system is a self (shunt) excited system with the voltage regulator powered directly from the generator set output.

## Alternator Application Notes

**Alternator Sizes** - On any given model, various alternators sizes are available to meet individual application needs.

Alternators sizes are differentiated by maximum winding temperature rise, at the generator set standby or prime rating, when operated in a 40°C ambient environment. Available temperature rises range from 80°C to 125°C. Not all temperature rise selections are available on all models. Lower temperature rise is accomplished using larger alternators at lower current density. Lower temperature rise alternators have higher motor starting kVA, lower voltage dip upon load application, and they are generally recommended to limit voltage distortion and heating due to harmonics induced by non-linear loads.

**Alternator Space Heater** - is recommended to inhibit condensation.

## Available Output Voltages

### Three Phase Reconnectable

120/208

139/240

120/240 Delta

240/416

277/480

### Single Phase Non-Reconnectable

120/240

### Three Phase Non-Reconnectable

220/380

347/600

# Specifications – Alternator

<b>Design</b>	Revolving field, single bearing, 4-pole, brushless, drip-proof construction.
<b>Stator</b>	Skewed stator and 2/3 pitch windings minimize field heating and voltage harmonics.
<b>Rotor</b>	Dynamically balanced assembly. Direct coupled to engine by a flexible drive disc. Complete amortisseur (damper) windings help minimize voltage deviations and heating effects under unbalanced loads. The rotor is supported by a pre-lubricated, maintenance-free ball-bearing.
<b>Insulation System</b>	Class H per NEMA MG1-1.65 and BS2757
<b>Standard Temperature Rise</b>	At rated load is less than 125°C at standby rating, per NEMA MG1.22.40, IEEE115 and IEC 34-1.
<b>Exciter Type</b>	The excitation system derives its power from the main output of the generator, eliminating the need for a separate excitation power source.
<b>Phase Rotation</b>	A (U), B (V), C (W)
<b>Alternator Cooling</b>	Direct drive centrifugal blower
<b>AC Waveform Total Harmonic Distortion</b>	Less than 7% total no load to full linear load, and less than 3% for any single harmonic
<b>Telephone Influence Factor (TIF)</b>	Less than 40 per NEMA MG1-22.43
<b>Telephone Harmonic Factor (THF)</b>	Less than 3

<b>Three Phase Table<sup>1</sup></b>		<b>80° C</b>	<b>80° C</b>	<b>80° C</b>	<b>80° C</b>	<b>105° C</b>	<b>105° C</b>	<b>105° C</b>	<b>105° C</b>	<b>125° C</b>	<b>125° C</b>	<b>125° C</b>	<b>125° C</b>
Feature Code		B257	B269	B386	B305	B256	B268	B385	B304	B255	B267	B384	B303
Voltage Ranges		120/208 Thru 139/240 240/416 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380	347/600	120/208 Thru 139/240 240/416 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380	347/600	120/208 Thru 139/240 240/416 Thru 277/480	120/208 Thru 139/240 240/416 Thru 277/480	220/380	347/600
Surge kW		26	26	26	26	26	26	26	26	26	26	26	26
Motor Starting kVA (at 90% sustained voltage)	Shunt	111	111	111	111	70	111	90	70	70	111	90	70
Full Load Current - Amps at Standby Rating		<u>120/208</u> 87	<u>139/240</u> 75	<u>240/416</u> 43	<u>277/480</u> 38	<u>347/600</u> 30							

**Notes:**

1. Single phase power can be taken from a three phase generator set at up to 2/3 set rated 3-phase kW at 1.0 power factor. Also see Note 2 below.

<b>Single Phase Table</b>		<b>80° C</b>	<b>80° C</b>	<b>80° C</b>	<b>105° C</b>	<b>105° C</b>	<b>105° C</b>	<b>125° C</b>	<b>125° C</b>	<b>125° C</b>			
Feature Code		B275	B257	B269	B274	B256	B268	B273	B255	B267			
Voltage Ranges		120/240 <sup>2</sup>	120/240 <sup>1</sup>	120/240 <sup>2</sup>	120/240 <sup>2</sup>	120/240 <sup>1</sup>	120/240 <sup>2</sup>	120/240 <sup>2</sup>	120/240 <sup>1</sup>	120/240 <sup>2</sup>			
Surge kW		25	26	26	25	26	26	25	26	26			
Motor Starting kVA (at 90% sustained voltage)	Shunt	62	83	83	44	44	83	44	44	83			
Full Load Current - Amps at Standby Rating		<u>120/240<sup>1</sup></u> 69	<u>120/240<sup>2</sup></u> 104										

**Notes:**

1. The broad range alternators can supply single phase output up to 2/3 set rated 3-phase kW at 1.0 power factor.
2. The extended stack (full single phase output) and 4 lead alternators can supply single phase output up to full set rated 3-phase kW at 1.0 power factor.

# Control System



**PowerCommand (1300) Control**



**PowerCommand (2100) Control**

## PowerCommand Control

- The PowerCommand Control is an integrated generator set control system providing start/stop logic, voltage regulation, engine and alternator protection, and optional engine speed governing and operator display panel.
- Controls provided include Battery monitoring and testing features, and Smart-Starting control system.
- InPower PC-based service tool available for detailed diagnostics.
- Suitable for operation in ambient temperatures from -40C to +70C, and altitudes to 13,000 feet (5000 meters).
- PCC 2100 Prototype tested; UL, CSA, and CE compliant. PCC 1300: TBD

<p><b>Alternator Protection</b></p> <ul style="list-style-type: none"> <li>• High AC current warning and shutdown (option)</li> <li>• High and low AC voltage shutdown</li> <li>• Over and under frequency shutdown</li> <li>• Excitation fault</li> </ul>	<p><b>Engine Protection</b></p> <ul style="list-style-type: none"> <li>• Overspeed shutdown</li> <li>• Low oil pressure warning and shutdown</li> <li>• High coolant temperature warning and shutdown</li> <li>• High oil temperature warning (optional)</li> <li>• Low coolant level warning or shutdown</li> <li>• Low coolant temperature warning</li> <li>• High and low battery voltage</li> <li>• Weak battery</li> <li>• Dead battery</li> <li>• Fail to start (overcrank) shutdown</li> <li>• Fail to crank shutdown</li> <li>• Redundant start disconnect</li> <li>• Cranking lockout</li> <li>• Sensor failure indication</li> </ul>	<p><b>Operator Panel (Optional)</b></p> <ul style="list-style-type: none"> <li>• MANUAL/OFF/AUTO mode function</li> <li>• Configurable off to manual and off to auto access code (keyswitch)</li> <li>• Graphics display with pushbutton access, for viewing engine and alternator data and providing setup, controls, and adjustments</li> <li>• LED lamps indicating not in auto, shutdown, warning, remote start input active, auto, and manual run</li> <li>• Symbolic or English test user screens</li> </ul>
<p><b>Alternator Data</b></p> <ul style="list-style-type: none"> <li>• 3-phase line-to-line and line-to-neutral AC volts</li> <li>• 3-phase AC current (optional)</li> <li>• Frequency</li> <li>• Total kVA</li> </ul>	<p><b>Engine Data</b></p> <ul style="list-style-type: none"> <li>• DC voltage</li> <li>• Lube oil pressure (optional)</li> <li>• Coolant temperature</li> </ul>	<p><b>Other Data</b></p> <ul style="list-style-type: none"> <li>• Genset model number</li> <li>• KVA rating</li> <li>• Starts, running hours, and control hours</li> <li>• Fault history</li> </ul>
<p><b>Governing</b></p> <ul style="list-style-type: none"> <li>• Integrated digital electronic isochronous governor</li> <li>• Temperature dynamic governing</li> </ul>	<p><b>Voltage Regulation</b></p> <ul style="list-style-type: none"> <li>• Integrated digital electronic voltage regulator</li> <li>• 1-phase line to line sensing</li> <li>• Configurable torque matching</li> </ul>	<p><b>Control Functions</b></p> <ul style="list-style-type: none"> <li>• Battle short</li> <li>• Data logging on faults</li> <li>• Time delay start and cool down</li> <li>• Cycle cranking</li> <li>• Glow plug control (some models)</li> <li>• (2) Configurable customer inputs</li> <li>• (2) Configurable customer outputs</li> </ul>
<p><b>Options</b></p>		
<ul style="list-style-type: none"> <li><input type="checkbox"/> Display panel</li> <li><input type="checkbox"/> Thermostatically controlled space heater</li> <li><input type="checkbox"/> Engine oil temperature sensor</li> <li><input type="checkbox"/> Engine shutdown alarm</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Key-type mode switch</li> <li><input type="checkbox"/> Auxiliary Relays (3)</li> <li><input type="checkbox"/> Ground fault module</li> </ul>	<ul style="list-style-type: none"> <li><input type="checkbox"/> Remote annunciator (loose)</li> <li><input type="checkbox"/> Communications network interface</li> <li><input type="checkbox"/> Power transfer control</li> </ul>

## Generator Set Options

### Engine

- 120 V, 1000 W coolant heater (thermostatically controlled)
- 240 V, 1000 W coolant heater (thermostatically controlled)
- Electronic governor

### Alternator

- 80°C rise alternator
- 105°C rise alternator
- 120/240 V, 100 W anti-condensation heater
- Extended stack (full single phase output)
- Full single phase output (Non-Reconnectible)
- Single phase - 4 lead

### Exhaust System

- Critical grade exhaust silencer
- Industrial grade exhaust silencer
- Residential grade exhaust silencer
- Set mounted critical grade exhaust silencer

### Generator Set

- 24 hour dual wall sub-base tank
- 48 hour dual wall sub-base fuel tank
- Batteries
- Battery charger, equalizer, float-type
- Export box packaging
- In-skid fuel tank
- Main line circuit breaker
- Remote annunciator panel
- Sound attenuated enclosures with mounted silencer
- Spring isolators
- Weather protective enclosure with mounted silencer
- 2 year prime power warranty
- 2 year standby warranty
- 5 year standby power warranty

## Available Products and Services

A wide range of products and services is available to match your power generation system requirements. Cummins Power Generation products and services include:

Diesel and Spark-Ignited Generator Sets

Transfer Switches

Bypass Switches

Parallel Load Transfer Equipment

Digital Paralleling Switchgear

PowerCommand Network and Software

Distributor Application Support

Planned Maintenance Agreements

## Warranty

All components and subsystems are covered by an express limited one-year warranty. Other optional and extended factory warranties and local distributor maintenance agreements are available. Contact your distributor/dealer for more information.

## Certifications



**CSA** - This generator set is CSA certified to product class 4215-01 with the PCC 2100 control option.



**PTS** - The Prototype Test Support (PTS) program verifies the performance integrity of the generator set design. Products bearing the PTS symbol have been subjected to demanding tests in accordance to NFPA 110 to verify the design integrity and performance under both normal and abnormal operating conditions including short circuit, endurance, temperature rise, torsional vibration, and transient response, including full load pickup.



**ISO9001** - This generator set was designed and manufactured in facilities certified to ISO9001.

**See your distributor for more information**



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**Important: Backfeed to a utility system can cause electrocution and/or property damage. Do not connect generator sets to any building electrical system except through an approved device or after building main switch is open.**