

# Diesel Generator Set

## Model DKAE 60 Hz

### EPA Emissions

**20 kW, 25 kVA Standby**  
**18 kW, 22.5 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 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® digital electronic control is an integrated system that combines engine and alternator controls for high reliability and optimum genset performance.

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 generator set is CSA certified and is available as UL 2200 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

**UL Listed Generator Set** - The complete generator set assembly is available Listed to UL 2200.

**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.

**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. The alternator electrical insulation system is UL 1446 Recognized.

**Control Systems** - The PowerCommand electronic control is standard equipment and provides total genset system integration including automatic remote starting/stopping and precise frequency and voltage regulation. Optional features include alarm and status message display, output metering, auto-shutdown at fault detection, and NFPA110 Level 1 compliance.

**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 500-4222 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>	1210 (549)
<b>Unit Wet Weight, lb (kg)</b>	1252 (568)
<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% (Isochronous optional ± 0.25%)
<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)	4.0 (3.0)	4.0 (3.0)
Coolant Capacity with radiator, US Gal (L)	2.7 (10.2)	2.7 (10.2)
Coolant Flow Rate, Gal/min (L/min)	14.0 (53.0)	14.0 (53.0)
Heat Rejection To Coolant, Btu/min (MJ/min)	1637.0 (1.7)	1411.0 (1.5)
Heat Radiated To Room, Btu/min (MJ/min)	360.0 (0.4)	320.0 (0.3)
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)	59.4 (1.7)	59.4 (1.7)
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)	3900.0 (110.4)	3900.0 (110.4)
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 800 ft (244 m) at ambient temperatures up to 77°F (25°C). Above 800 ft (244 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 V2203, naturally aspirated, diesel-fueled
<b>Displacement in<sup>3</sup> (L)</b>	134.0 (2.2)
<b>Overspeed Limit, rpm</b>	2100 ±50
<b>Regenerative Power, kW</b>	7.00
<b>Cylinder Block Configuration</b>	Cast iron, In-Line 4 cylinder
<b>Battery Capacity</b>	350 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)	37.1 (27.7)	33.8 (25.2)							
BMEP at Rated Load, psi (kPa)	107.0 (737.7)	97.0 (668.8)							
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)	10.4 (9.8)	10.4 (9.8)							
<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)	170.0 (4.8)	160.0 (4.5)							
Exhaust Temperature, °F (°C)	840.0 (448.9)	760.0 (404.4)							
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>20 (25)</b>	<b>18 (22.5)</b>							
	Load	1/4	1/2	3/4	Full	1/4	1/2	3/4	Full
	US Gal/hr	0.78	1.10	1.45	1.96	0.74	1.04	1.35	1.69
	L/hr	3.0	4.2	5.5	7.4	2.8	3.9	5.1	6.4

## 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		20	20	20	20	20	20	20	20	20	20	20	20
Motor Starting kVA (at 90% sustained voltage)	Shunt	70	70	90	70	58	70	72	58	58	70	72	58
Full Load Current - Amps at Standby Rating		<u>120/208</u> 69	<u>139/240</u> 60	<u>220/380</u> 38	<u>240/416</u> 35	<u>277/480</u> 30	<u>347/600</u> 24						

**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		20	20	20	20	20	20	20	20	20			
Motor Starting kVA (at 90% sustained voltage)	Shunt	44	44	44	36	36	44	36	36	44			
Full Load Current - Amps at Standby Rating		<u>120/240<sup>1</sup></u> 56	<u>120/240<sup>2</sup></u> 83										

**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 (1301) Control



Standard Operator Panel



Optional Operator/Display Panel

### PowerCommand Control

- The PowerCommand Control is an integrated generator set control system providing isochronous governing (optional), voltage regulation, engine protection, generator protection, and operator interface.
- Control provides battery monitoring and testing features, and Smart-Starting control system.
- InPower PC-based service tool available for detailed diagnostics
- Standard PCCNet RS485 network interface to devices such as remote annunciator for NFPA110 applications.
- Control boards are potted for environmental protection.
- Suitable for operation in ambient temperatures from -40C to +70C, and altitudes to 13,000 feet (5000 meters)
- Prototype tested; UL, CSA, and CE compliant

<b>AC Protection</b> <ul style="list-style-type: none"> <li>• Over current warning and shutdown*</li> <li>• Over and under voltage shutdown</li> <li>• Over and under frequency shutdown</li> <li>• Over Excitation (loss of sensing) fault</li> <li>• Field Overload</li> </ul>	<b>Engine Protection</b> <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>• Low coolant level warning or shutdown*</li> <li>• Low coolant temperature warning*</li> <li>• High, low, &amp; weak battery voltage warning*</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>	<b>Operator/Display Panel (Optional)</b> <ul style="list-style-type: none"> <li>• Manual Off switch</li> <li>• Alpha-numeric display with pushbutton access, for viewing engine and alternator data and providing setup, controls, and adjustments (English or International symbols)</li> <li>• LED lamps indicating genset running, not in auto, common warning, common shutdown, manual run mode, remote start</li> <li>• Suitable for operation in ambient temperatures from -20C to +70C</li> </ul>
<b>Alternator Data</b> <ul style="list-style-type: none"> <li>• Line to Neutral AC Volts*</li> <li>• Line to Line AC Volts*</li> <li>• 3-phase AC current*</li> <li>• Frequency*</li> <li>• Total kVA*</li> </ul>	<b>Engine Data</b> <ul style="list-style-type: none"> <li>• DC voltage*</li> <li>• Lube oil pressure*</li> <li>• Coolant temperature*</li> </ul>	<b>Other Data</b> <ul style="list-style-type: none"> <li>• Genset model data</li> <li>• Start attempts, Starts, running hours</li> <li>• Fault history</li> <li>• RS485 Modbus Interface</li> <li>• Data Logging and Fault Simulation (Requires InPower Service Tool)</li> </ul>
<b>Digital Governing (Optional)</b> <ul style="list-style-type: none"> <li>• Integrated digital electronic isochronous governor</li> <li>• Temperature dynamic governing</li> </ul>	<b>Digital Voltage Regulation</b> <ul style="list-style-type: none"> <li>• Integrated digital electronic voltage regulator</li> <li>• 2-phase line to line sensing</li> <li>• Configurable Torque Matching</li> </ul>	<b>Control Functions</b> <ul style="list-style-type: none"> <li>• Time delay start and cooldown</li> <li>• Glow plug control (some models)</li> <li>• Cycle cranking</li> <li>• (2) Configurable inputs</li> <li>• (2) Configurable outputs</li> <li>• Remote Emergency Stop</li> </ul>
<p>*Optional Operator/Display Panel required to display warnings and sensor data.</p>		
<p><b>Options</b></p>		
<input type="checkbox"/> Local Operator/Display Panel <input type="checkbox"/> Digital Electronic Governing	<input type="checkbox"/> Remote Annunciator with (3) configurable inputs & (4) configurable outputs	<input type="checkbox"/> PowerCommand for Windows remote monitoring software. (Direct connect)

## Generator Set Options

### Engine

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

### Fuel System

- 24 hour dual wall sub-base fuel tank
- 48 hour dual wall sub-base fuel tank

### 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-Reconnectable)
- Single phase - 4 lead

### Control Panel

- LCD display panel (required for any NFPA110 and CSA 282 application) includes:
  - Engine oil pressure
  - Engine coolant temperature
  - Generator AC voltage
  - Generator frequency
  - Generator amps
  - Generator kVA
  - Low/high/weak battery
- Emergency stop switch
- 120/240 V, 100 W control anti-condensation heater
- Auxiliary relay contacts
- Low fuel level warning or shutdown
- Fuel-in-rupture-basin warning or shutdown
- Low coolant level warning or shutdown

### Exhaust System

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

### Generator Set

- Batteries
- Battery charger
- Export box packaging
- UL 2200 Listed
- In-skid fuel tank
- Main line circuit breaker
- 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



**UL** - The generator set is available Listed to UL 2200 Stationary Engine Generator Assemblies.



**CSA** - This generator set is CSA certified to product class 4215-01.



**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.**