FDK ENERGY

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DATA SHEET

DIESEL GENERATOR 2200KW
MODEL#FDK-CG2750/H1
50HZ/1500RPM
CUMMINS MODEL: QSK60-G23

General Features:

- All qualified generator sets are subjected to a comprehensive performance test which includes 50% load, 70% load, 100% load, 110% load and to check, verify that all control systems, alarm and shut-down protection.
- Equipped with battery charger and 24V high performance maintenance-free lead-acid starting batteries and connecting cables.
- Stainless galvanized zinc plates with strong corrosion-proof.
- Vibration isolators between the engine/alternator and base frame.
- Equipped with industrial silencer and flexible exhaust hose.
- Designed to comply with ISO8528/GB2820.
- Powered by Cummins engine and coupled with Stamford alternator.
- Water jacket preheater, oil heater and double air cleaner, etc. are available.

FDK Diesel Generator Set Data

Genset Model	FDK-CG2750/H1	Engine Make	Cummins ONAN UK
Prime Power	2000KW/2500KVA	Engine Model	QSK60-G23
Standby Power	2200KW/2750KVA	Alternator model	Stamford PI734H
Output Frequency / Rated speed	50Hz/1500rpm	Control System	DSE7320
Rated Voltage	230V/400V	Phase	Three

(1) **Prime power**: The rating is available for an unlimited of annual operating hours in variable load applications, in accordance with ISO8528-1.A 10% overload is available for a period of 1 hour within 12-hour period of operation, in accordance with ISO 3046-1.

(2) **Standby power**: The rating is applicable for supplying emergency power in variable load applications for up to 200 hours per year in accordance with ISO8528-1. Overload is not allowed.

(3) **Rated voltage**: available with customer requirement.

Engine Specifications (DETAILED in APPENDIX)

Engine Model	QSK60-G23	Aspiration	Turbo-charged
Engine Manufacturer	Cummins ORIGINAL UK	Bore x Stroke (mm x mm)	159×190
		Displacement	60.2L
Cylinder quantity	16	Compression Ratio	14.5:1
Cylinder Arrangement	60° Vee	Prime power / Speed (KW/RPM)	2157kw/1500
Cycle	4	Standby power/ Speed (KW/RPM)	2388kw/1500

CE ISO9001:2008

Type Injection System	Cummins MCRS	Fuel Consumption at 100% load (L/H)	551.4 at 1500rpm
Piston Speed	9.5m/s	Starter motor	DC24V
Friction Energy Output	146kw	Low idle	700-900pm
Total Lubrication System Capacity	348-379L	Coolant Capacity (L)	159

Alternator Specifications

Alternator model	PI734H	Number of phase	3
Alternator manufacturer	STAMFORD	Rated voltage	400V (Available with custom requirements)
Exciter type	Single bearing, Brushless, Self-excited	Power factor	0.8
Rated output prime power	2220 KVA	Voltage regulation NL-FL	≤±1%
Rated speed	1500 rpm	Insulation grade	H
Rated frequency	50Hz	Protection grade	IP23

Alternator option: Leroy Somer, MECC, Marathon, Engga, Faraday

Control System DSE7320 (DETAILED in INSTRUCTION)

DSE7320 is an advanced control module based on micro-processor, containing all necessary functions for protection of the genset and the breaker control. It can monitor the mains supply, breaker control and automatically start the engine when the mains are abnormal. Accurately measure various operational parameters and display all values and alarms information on the LCD. In addition, the control module can automatically shut down the engine and indicate the engine failure.

FEATURES

- Microprocessor control, with high stability and credibility.
- Monitoring and measuring operational parameters of the mains supply and genset.
- Indicating operation status, fault conditions, all parameters and alarms.
- Multiple protections; multiple parameters display, like pressure, temp. etc.
- Manual, automatic and remote work mode selectable.
- Real time clock for time and date display, overall runtime display, 250 log entries.
- Overall power output display.
- Integral speed/frequency detecting, telling status of start, rated operation, overspeed etc.
- Communication with PC via RS485 OR RS232 interface, using MODBUS protocol.

Soundproof Enclosure Specification

FDK silent generator is designed by professional acoustic engineers based on years of experience. Now we can make the noise of the generator less than 80-85dB(A) at 1m, or 70-75dB(A) at 7m, 60-65dB(A) at 15m.

FEATURES

- Multi-way air intake and exhaust guarantee the power performance of the generator.
- Large-scale impedance combined type silencer effectively reduce noise of the generator.
- Internal high performance rubber damper and flexible materials reduce vibration.
- Base mounted fuel tank supports the generator running for 8 hours.

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Optional

Generator set	Alternator	Low environment Temp	ATS
☐ Open generator set	☐ Stamford	☐ Water heater	☐ CHINT
☐ Silent generator set	☐ Marathon	☐ Oil heater	☐ SCHNEIDER
☐ Trailer generator set	☐ Mecc Alte	☐ Battery heater	☐ ABB
☐ ABB MCCB circuit breaker	☐ Leroy Somer		
	☐ Farady		
	☐ Engga		
Fuel system	**Control system**	**Voltage**	**Synchronized system**
☐ 12hrs base tank	☐ AMF function	☐ 415/240V	☐ CHINT Cabinet
☐ 24hrs base tank	☐ ATS control cabinet	☐ 400/230V	☐ SCHNEIDER Cabinet
☐ Dual wall base fuel tank	☐ DSE7320	☐ 380/220V	☐ DSE8610 Module
☐ Outside fuel tank	☐ DSE7510	☐ 220/127V	☐ COMAQ Module
	☐ GU620A	☐ 200/115V	☐ DEIF Module

Dimension & Weight

Open

Overall Size: L×W×H (mm)	5900×2100×2750
Weight (kg)	16000

Soundproof Version

Overall Size: L×W×H (mm)	40FT CONTAINER
Weight (kg)	29000

Sales Promises

- FDK provides a full line of brand new and high quality products. Each and every unit is strictly factory tested before shipment.
- Quality warranty is according to our standard conditions: 12 months from BL date or 1000 running hours, whichever comes first.
- Service and parts are available from FDK or distributors in your location.
- FDK guarantee use **BRAND NEW & GENUINE MACHINE.**

Engine Performance Data	G-Drive	Date
Cummins Inc. Columbus, Indiana 47202-3005 http://www.cummins.com	**QSK60-G23** **FR60532**	29-Sep-2020

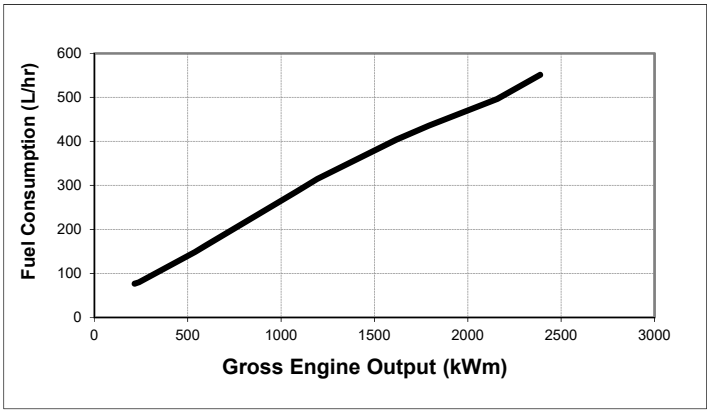
Configuration	CPL	Revision
D593008GX03	4816	2

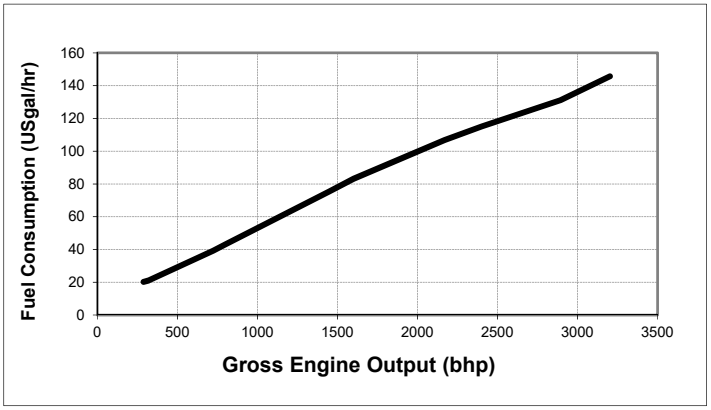
Compression Ratio	14.5:1	**Displacement**	60.2 L (3672 in³)
Fuel System	Cummins MCRS	**Aspiration**	Turbocharged and Low Temperature Aftercooled
Aftertreatment	N/A	**Emission Compliance**	EPA Tier 2

Engine Speed	Standby Power		Prime Power	
rpm	kWm	bhp	kWm	bhp
1500	2388	3202	2157	2893

Engine Fuel Consumption @ 1500 rpm

Output Power			Fuel Consumption			
%	kWm	bhp	kg/kWm-hr	lb/bhp-hr	L/hr	US gal/hr
Standby Power						
100	2388	3202	0.196	0.323	551.4	145.7
75	1791	2402	0.207	0.340	435.7	115.1
50	1194	1601	0.224	0.368	314.7	83.1
25	597	801	0.233	0.382	163.4	43.2
10	239	320	0.284	0.467	79.8	21.1
Prime Power						
100	2157	2893	0.196	0.322	496.5	131.2
75	1618	2170	0.212	0.349	404.2	106.8
50	1079	1447	0.225	0.369	284.9	75.3
25	539	723	0.234	0.385	148.6	39.3





Data Subject to Change Without Notice

These guidelines have been formulated to ensure proper application of generator drive engines in A.C. generator set installations. STANDBY POWER RATING: Applicable for supplying emergency power for the duration of the utility power outage. No overload capability is available for this rating. Under no condition is an engine allowed to operate in parallel with the public utility at the Standby Power rating. This rating should be applied where reliable utility power is available. A Standby rated engine should be sized for a Max of an 80% average load factor and 500 hours of operation per year. This includes less than 25 hours per year at the Standby Power rating. Standby ratings should never be applied except in true emergency power outages. Negotiated power outages contracted with a utility company are not considered an emergency. PRIME POWER RATING: Applicable for supplying electric power in lieu of commercially purchased power. Prime Power applications must be in the form of one of the following two categories: UNLIMITED TIME RUNNING PRIME POWER: Prime Power is available for an unlimited number of hours per year in a variable load application. Variable load should not exceed a 70% average of the Prime Power rating during any operating period of 250 hours. The total operating time at 100% Prime Power shall not exceed 500 hours per year. A 10% overload capability is available for a period of 1 hour within a 12-hour period of operation. Total operating time at the 10% overload power shall not exceed 25 hours per year. LIMITED TIME RUNNING PRIME POWER: Limited Time Prime Power is available for a limited number of hours in a non-variable load application. It is intended for use in situations where power outages are contracted, such as in utility power curtailment. Engines may be operated in parallel to the public utility up to 750 hours per year at power levels never to exceed the Prime Power rating. The customer should be aware, however, that the life of any engine will be reduced by this constant high load operation. Any operation exceeding 750 hours per year at the Prime Power rating should use the Continuous Power rating. CONTINUOUS POWER RATING: Applicable for supplying utility power at a constant 100% load for an unlimited number of hours per year. No overload capability is available for this rating.

Reference CEB00150 for determining Electrical Output.

Data shown above represent gross engine performance capabilities obtained and corrected in accordance with ISO-3046 conditions of 100 kPa (29.53 in Hg) barometric pressure [110 m (361 ft) altitude], 25 °C (77 °F) air inlet temperature, and relative humidity of 30% with No. 2 diesel or a fuel corresponding to ASTM D2.

The fuel consumption data is based on No. 2 diesel fuel weight at 0.850 kg/L. Power output curves are based on the engine operating with fuel system, water pump and lubricating oil pump; not included are battery charging alternator, fan, optional equipment and driven components.

Data Status : Production

Tolerance : +/- 5%

Chief Engineer : Tom Mcgibbon

1500 rpm Power Derate Tables

Standby

Standby Power Altitude Capability (kWm)											
Ambient Operating Temp. (°F)		77.0	86.0	95.0	104.0	108.5	113.0	117.5	122.0	126.5	131.0
Ambient Operating Temp. (°C)		25.0	30.0	35.0	40.0	42.5	45.0	47.5	50.0	52.5	55.0
Altitude (ft)	Altitude (m)										
0	0	2388	2388	2388	2388	2388	2388	2388	2388	2388	2388
328	100	2388	2388	2388	2388	2388	2388	2388	2388	2388	2366
656	200	2388	2388	2388	2388	2388	2388	2388	2388	2388	2340
984	300	2388	2388	2388	2388	2388	2388	2388	2388	2373	2313
1312	400	2388	2388	2388	2388	2388	2388	2388	2388	2347	2287
1640	500	2388	2388	2388	2388	2388	2388	2388	2380	2320	2260
1969	600	2388	2388	2388	2388	2388	2388	2388	2354	2294	2233
2625	800	2388	2388	2388	2388	2388	2388	2361	2301	2240	2180
3281	1000	2388	2388	2388	2388	2388	2368	2308	2247	2187	2127
3937	1200	2388	2388	2388	2379	2367	2315	2254	2194	2134	2074
4593	1400	2388	2388	2364	2340	2322	2261	2201	2141	2081	2021
5249	1600	2374	2349	2325	2301	2268	2208	2148	2088	2028	1968
5906	1800	2335	2310	2286	2262	2215	2155	2095	2035	1975	1914
6562	2000	2296	2271	2247	2222	2162	2102	2042	1982	1921	1861
Maximum Altitude Capability(ft)		5002	4593	4184	3775	3571	3025	2282	1540	797	54
Maximum Altitude Capability(m)		1524	1400	1275	1151	1088	922	696	469	243	17

Prime

Altitude Correct Prime Power Capability (kWm)											
Ambient Operating Temp. (°F)		77.0	86.0	95.0	104.0	108.5	113.0	117.5	122.0	126.5	131.0
Ambient Operating Temp. (°C)		25.0	30.0	35.0	40.0	42.5	45.0	47.5	50.0	52.5	55.0
Altitude (ft)	Altitude (m)										
0	0	2157	2157	2157	2157	2157	2157	2157	2157	2157	2157
328	100	2157	2157	2157	2157	2157	2157	2157	2157	2157	2137
656	200	2157	2157	2157	2157	2157	2157	2157	2157	2157	2113
984	300	2157	2157	2157	2157	2157	2157	2157	2157	2144	2089
1312	400	2157	2157	2157	2157	2157	2157	2157	2157	2120	2065
1640	500	2157	2157	2157	2157	2157	2157	2157	2150	2096	2041
1969	600	2157	2157	2157	2157	2157	2157	2157	2126	2072	2017
2625	800	2157	2157	2157	2157	2157	2157	2132	2078	2024	1969
3281	1000	2157	2157	2157	2157	2157	2139	2084	2030	1976	1921
3937	1200	2157	2157	2157	2149	2138	2091	2036	1982	1928	1873
4593	1400	2157	2157	2135	2113	2097	2043	1988	1934	1880	1825
5249	1600	2144	2122	2100	2078	2049	1995	1940	1886	1832	1777
5906	1800	2109	2087	2065	2043	2001	1947	1892	1838	1784	1729
6562	2000	2074	2052	2030	2007	1953	1899	1844	1790	1736	1681

Altitude derate data is based on a 2.2°C air temperature rise over ambient at the compressor inlet. Please contact Application Engineering if the air temperature rise over ambient exceeds this value.

Please contact Application Engineering for operation above table temperature or altitude values.

SAE AS210 Table A15 was referenced for standard day temperature and barometric pressure versus altitude.

General Engine Data

Installation Drawing Number		3170634	
Type		Four Cycle	
Aspiration		Turbocharged and Low Temperature Aftercooled	
Bore x Stroke	in x in (mm x mm)	6.25 x 7.48	(159 x 190)
Displacement	in^3 (L)	3672	(60.2)
Compression Ratio		14.5:1	
Dry Weight (Approximate)	lbm (kg)	17460	(7920)
Wet Weight (Approximate)	lbm (kg)	18893	(8570)
Aftertreatment Weight (Approximate)	lbm (kg)	0	(N/A)
Moment of Inertia of Rotating Components			
with FW6080 Flywheel, SAE 00	lbm • ft² (kg • m²)	186.9	(7.9)
Center of Gravity from Rear Face of Block	in (mm)	39.4	(1000.8)
Center of Gravity Above Crankshaft Centerline	in (mm)	8.6	(218.4)

Engine Mounting

Max Bending Moment at Rear Face of Block	lb • ft (N • m)	7634	(10350)

Exhaust System

Max Allowable Static Bending Moment @ Exhaust Outlet Flange	lb • ft (N • m)	7	(9)
Max Back Pressure at Standby Power (Exhaust Outlet)	in Hg (kPa)	2.0	(6.8)

Air Induction System

Max Air Temperature Rise Over Ambient At Compressor Inlet	°F (°C)	7	(4)
Max Intake Air Restriction			
With Normal Duty Air Cleaner and Clean Filter Element	in H_2O (kPa)	6.0	(1.5)
With Dirty Filter Element	in H_2O (kPa)	25.0	(6.2)

Cooling System

Jacket Water/ High Temperature Circuit Requirements			
Max Coolant Friction Head External to Engine (1500 rpm)	psi (kPa)	7.0	(48.3)
Coolant Capacity - Engine High Temperature Circuit	US gal (L)	42.0	(159)
Minimum Pressure Cap Rating at Sea Level	psi (kPa)	11.0	(75.8)
Max Static Head of Coolant Above Crankshaft Centerline	ft (m)	60.0	(18.3)
Max Coolant (Top Tank) Temperature for Standby/Prime Power	°F (°C)	230 / 212	(110 / 100)
Thermostat (Modulating) Range	°F (°C)	180 - 202	(82 - 94)
Low Temperature Circuit (LTC) Requirements			
Max Coolant Friction Head External to Engine (1500 rpm)	psi (kPa)	5.0	(34.5)
Max Coolant Temp into LTC @ 77°F (25°C) Ambient	°F (°C)	120	(49)
Max Coolant Temperature into LTC @			
Limiting Ambient Conditions for Standby/Prime Power	°F (°C)	160 / 158	(71 / 70)
Thermostat (Modulating) Range	°F (°C)	115 - 130	(46 - 54)
Coolant Capacity - Engine Low Temperature Circuit	US gal (L)	9.0	(34.1)

Lubrication System

Oil Pressure at Minimum Idle Speed	psi (kPa)	20	(138)
Oil Pressure at Governed Speed	psi (kPa)	60 - 70	(414 - 483)
Max Oil Temperature	°F (°C)	250	(121)
Oil Capacity : Low - High	US gal (L)	92 - 100	(348 - 379)
Total System Capacity (with Spin-On Filters)	US gal (L)	105	(397)

Fuel System

Max Allowable Fuel Supply Restriction at Stage 1 Filter Inlet	in Hg (kPa)	5.0	(16.9)
Max Allowable Head on Injector Return Line			
(Consisting of Friction Head and Static Head)	in Hg (kPa)	10.0	(33.8)
Max Fuel Inlet Temperature	°F (°C)	160	(71)
Max Supply Fuel Flow	US gph (L/hr)	263	(996
Max Return Fuel Flow	US gph (L/hr)	116	(439

Electrical System

System Voltage	volts	24	
Minimum Recommended Battery Capacity			
Cold Soak @ 0 °F (-18 °C)	CCA	1800	
Max Starting Circuit Resistance	ohm	0.002	

Cold Start Capability

Unaided Cold Start			
Minimum Cranking Speed	rpm	150	
Minimum Ambient Temp for Unaided Cold Start	°F (°C)	10	(-12)

Performance Data

Minimum Low Idle Speed	rpm	700	
Maximum Low Idle Speed	rpm	900	

		STANDBY	PRIME
		50 Hz	50 Hz
Governed Engine Speed	rpm	1500	1500
Gross Engine Power Output	bhp (kWm)	3202 (2388)	2893 (2157)
Brake Mean Effective Pressure	psi (kPa)	462 (3186)	417 (2876)
Friction Power	hp (kWm)	196 (146)	196 (146)
Intake Air Flow	ft^3/min (L/sec)	5783 (2730)	5363 (2532)
Exhaust Gas Temp	°F (°C)	896 (480)	865 (463)
Exhaust Gas Flow	ft^3/min (L/sec)	14307 (6753)	13053 (6161)
Air:Fuel Ratio		24:1	24.7:1
Radiated Heat to Ambient	BTU/min (kWm)	12605 (222)	11350 (200)
Heat to JW Radiator	BTU/min (kWm)	37937 (668)	35523 (625)
Heat to Exhaust	BTU/min (kWm)	97939 (1723)	86941 (1529)
* Heat to Fuel	BTU/min (kWm)	475 (8.4)	475 (8.4)
Heat to Aftercooler Radiator	BTU/min (kWm)	36118 (636)	31160 (548)
Charge Air Flow	lb/min (kg/min)	414 (188)	383 (174)
Turbo Comp Outlet Pressure	psi (kPa)	49.6 (342)	45 (311)
Turbo Comp Outlet Temp	°F (°C)	479 (249)	451 (233)

* This is the maximum heat rejection to fuel.

1. The test figures quoted are from a single gen-set test and do not constitute a guarantee of performance for any particular engine. The data is subject to instrumentation, measurement, and engine to engine variability.
2. Test reference procedures ISO 3744 and ANSI S12.34-1998 as applicable.
3. All data are "A" weighted and are rounded to the nearest dB.
4. Engine with "typical Radiator and fan", Sound Power (dB).
5. Engine Exhaust at 1 Meter from open stack, Sound Pressure (dB).

Emissions Data

ATTENTION: This data was taken from a single engine test according to the Test Methods and Conditions specified. This data is subject to instrumentation, measurement, and engine-to-engine variability. Field emissions test data is not guaranteed to these levels. For air permit programs, please contact Application Engineering for expected site variation.

Nominal Exhaust Emissions Data @ 1500 rpm

		STANDBY			PRIME		
Component		g/bhp-hr	mg/Nm^3	PPM	g/bhp-hr	mg/Nm^3	PPM
HC	(Total Unburned Hydrocarbons)	0.03	13	21	0.03	15	24
NOx	(Oxides of Nitrogen as NO_2)	6.12	3101	1511	5.78	2966	1445
CO	(Carbon Monoxide)	0.13	66	53	0.14	70	56
PM	(Particulate Matter)	0.02	1	N/A	N/A	1	N/A
SO_2	(Sulfur Dioxide)	0.004	1.8	0.8	0.004	1.8	0.8
CO_2	(Carbon Dioxide)	448	226600	115406	443	227219	115721

Note: mg/Nm^3 and PPM numbers are measured dry and corrected to 5% O_2 content.
$_{mg/Nm^3}$ values are normalized to standard temperature and pressure (0°C, 101.325 kPA).

Test Methods and Conditions:

Steady-State emissions recorded per ISO8178-1 during operation at rated engine speed (+/- 2%) and stated constant load (+/-2%) with engine temperatures, pressures, and emission rates stabilized.

Fuel Specification:

52-54 Cetane Number (EU), 42-48 Cetane Number (EPA), 0.0015 Max. Wt. % Sulfur as referenced by directive 97/68/EC.

Reference:

25 °C (77°F) Air inlet Temperature, 40 °C (104°F) Fuel inlet Temperature, 100 kPa (29.53 in Hg) Barometric Pressure; 10.7 g/kg (75 grains H2O/lb) of dry air Humidity (required for NOx correction): Intake Restriction set to Max allowable limit for clean filter; Exhaust Back Pressure set to Max allowable limit.