

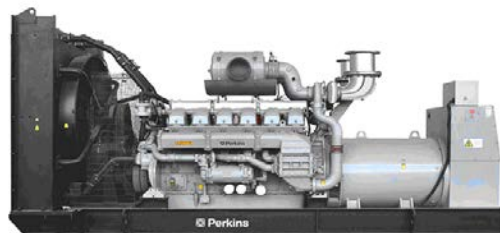
## DATA SHEET

DIESEL GENERATOR 310KW

MODEL#FDK-P310/H1

50HZ/1500RPM

PERKINS MODEL: 2206C-E13TAG2



### 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 Perkins 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-P310/H1
Prime Power	280KW/350KVA
Standby Power	310KW/388KVA
Output Frequency / Rated speed	50Hz/1500rpm
Rated Voltage	230V/400V

Engine Make	Perkins UK
Engine Model	2206C-E13TAG2
Alternator model	Stamford HCI444E
Control System	DSE7320
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	2206C-E13TAG2
Engine Manufacturer	Perkins UK
Cylinder quantity	6
Cylinder Arrangement	In-line
Cycle	4
Aspiration	Turbo charged

Bore x Stroke (mm x mm)	130x157
Displacement	12.5 L
Compression Ratio	16.3:1
Prime power / Speed (KW/RPM)	324.2kw/1500
Standby power/ Speed (KW/RPM)	368.4kw/1500
Governor type	Electric



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FDK reserves the right to change the specifications and designs without notice.

Piston Speed	N.A.
Typical genset electrical output	280 kw
Total Lubrication System Capacity (L)	40
Total Coolant Capacity (L)	51.4

Fuel Consumption at 100% load (L/HOUR)	75 at rated speed
Starter motor	24V
Alternator	24V
Minimum cranking speed.	106 rpm

### Alternator Specifications

Alternator model	HCI444E
Alternator manufacturer	STAMFORD
Exciter type	Single bearing, Brushless, Self-excited
Rated output prime power	350KVA
Rated speed	1500 rpm
Rated frequency	50Hz

Number of phase	3
Rated voltage	400V (Available with custom requirements)
Power factor	0.8
Voltage regulation NL-FL	±1%
Insulation grade	H
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
<input type="checkbox"/> Open generator set <input type="checkbox"/> Silent generator set <input type="checkbox"/> Trailer generator set <input type="checkbox"/> ABB MCCB circuit breaker	<input type="checkbox"/> Stamford <input type="checkbox"/> Marathon <input type="checkbox"/> Mecc Alte <input type="checkbox"/> Leroy Somer <input type="checkbox"/> Farady <input type="checkbox"/> Engga	<input type="checkbox"/> Water heater <input type="checkbox"/> Oil heater <input type="checkbox"/> Battery heater	<input type="checkbox"/> CHINT <input type="checkbox"/> SCHNEIDER <input type="checkbox"/> ABB
Fuel system	Control system	Voltage	Synchronized system
<input type="checkbox"/> 12hrs base tank <input type="checkbox"/> 24hrs base tank <input type="checkbox"/> Dual wall base fuel tank <input type="checkbox"/> Outside fuel tank	<input type="checkbox"/> AMF function <input type="checkbox"/> ATS control cabinet <input type="checkbox"/> DSE7320 <input type="checkbox"/> DSE7510 <input type="checkbox"/> GU620A	<input type="checkbox"/> 415/240V <input type="checkbox"/> 400/230V <input type="checkbox"/> 380/220V <input type="checkbox"/> 220/127V <input type="checkbox"/> 200/115V	<input type="checkbox"/> CHINT Cabinet <input type="checkbox"/> SCHNEIDER Cabinet <input type="checkbox"/> DSE8610 Module <input type="checkbox"/> COMAQ Module <input type="checkbox"/> DEIF Module

## Dimension & Weight

### Open

Overall Size: LxWxH (mm)	3800x1500x2400
Weight (kg)	2800

### Soundproof Version

Overall Size: LxWxH (mm)	4500x2600x3500
Weight (kg)	4300

## 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.**



# Technical Data

## 2200 Series

### Electropak

## 2206C-E13TAG2

## 2206C-E13TAG3

#### Basic technical data

Number of cylinders	6
Cylinder arrangement	vertical in-line
Cycle	4 stroke
Induction system	turbocharged, air-to-air charge cooling
Combustion system	direct injection diesel
Compression ratio	16,3:1
Bore	130 mm
Stroke	157 mm
Cubic capacity	12,5 litres
Direction of rotation	anti-clockwise when viewed from flywheel
Firing order (number 1 cylinder furthest from flywheel)	1-5-3-6-2-4
Estimated total weight of Electropak (dry)	1478 kg
Estimated total weight of Electropak (wet)	1582 kg

#### Overall dimensions - Electropak

-height	1725 mm
-length (air cleaner fitted)	2410 mm
-width	1120 mm

#### Moments of inertia (mk<sup>2</sup>)

Engine	1,36 kgm <sup>2</sup>
Flywheel	1,41 kgm <sup>2</sup>

#### Centre of gravity

Forward of rear face of cylinder block	650 mm
Above crankshaft centre line	250 mm

#### Cyclic irregularity

-1500 rev/min	1,54
-1800 rev/min	1,82

#### Performance

**Note:** All data based on operation to ISO 3046-1/1, BS5514 AND DIN 627 standard reference conditions.

All data based on 42584 MJ/kg calorific value for diesel conforming to specification BS2869 Class A2

All ratings certified to within  $\pm 3\%$   
Steady state speed capability at constant load - G2...  $\pm 0,25\%$

#### Test conditions

-air temperature	25 °C
-barometric pressure	100 kPa
-relative humidity	30 %
-air inlet restriction at maximum power (nominal)	2,5 kPa
-exhaust back pressure at maximum power (nominal)	6,8 kPa
-fuel temperature (inlet pump)	40 °C

#### Sound level

Sound pressure level (exhaust piped away, cooling pack and air cleaner fitted)

-1500 rev/min	102,5 dB(A)
-1800 rev/min	104,6 dB(A)

If the engine is to operate in ambient conditions other than those of the test conditions, suitable adjustments must be made for these changes. For full details, contact Perkins Technical Service Department. **Emissions capability:** Certified against the requirements of EU2007 Stage II (EU 97/68/EC Stage II) legislation for non road mobile machinery, powered by constant speed engines. These engines also comply with the 1/2 TA Luft (1986) NOx limits of 2000 mg/nm<sup>3</sup>

#### General installation - 2206C-E13TAG2

Designation	Units	Prime	Standby	Prime	Standby
		50Hz @ 1500 rev/min		60Hz @ 1800 rev/min	
Gross engine power	kWb	324,2	368,4	373,4	406,5
Brake mean effective pressure	kPa	2061	2356	1984	2171
Combustion air flow (at rated speed)	m <sup>3</sup> /min	25,2	26,2	28,1	29,6
Exhaust gas flow (Max.)	m <sup>3</sup> /min	67,3	71,8	68,3	74,4
Exhaust gas mass flow	kg/min	29,5	30,9	32,6	34,4
Exhaust gas temperature (turbocharger outlet)	°C	630	630	680	680
Boost pressure ratio		3,2	3,4	3,2	3,4
Overall thermal efficiency (nett)	%	38,2	39,2	40,6	40,2
Typical genset electrical output (0.8pf 25 °C)	kWe	280	320	320	350
	kVA	350	400	400	438
Assumed alternator efficiency	%	92		92	
<b>Energy balance</b>					
Energy in fuel	kWt	795,8	886,3	857,1	945,4
Energy in power output (gross)	kWb	324,2	368,4	373,4	406,5
Energy to additional losses	kWb	4,9	5,5	5,6	6,1
Energy to cooling fan	kWm	14		19	
Energy in power output (nett)	kWt	305,3	348,9	348,8	381,4
Energy to exhaust	kWt	251,8	274,5	250,6	278,6
Energy to coolant and lubricating oil	kWt	118,4	131,3	127,5	138,2
Energy to charge cooler	kWt	67,4	77,2	69,1	79,2
Energy to radiation	kWt	33,9	35,0	36,5	42,9

## General installation - 2206C-E13TAG3

Designation	Units	Prime	Standby	Prime	Standby
		50Hz @ 1500 rev/min		60Hz @ 1800 rev/min	
Gross engine power	kWb	368,4	412,5	373,4	406,5
Brake mean effective pressure	kPa	2345	2637	1984	2171
Combustion air flow (at rated speed)	m <sup>3</sup> /min	26,7	27,4	28,1	29,5
Exhaust gas flow (Max.)	m <sup>3</sup> /min	72	75,8	68,3	74,4
Exhaust gas mass flow	kg/min	31,2	32,2	32,6	34,4
Exhaust gas temperature (turbocharger outlet)	°C	630	630	680	680
Boost pressure ratio		3,4	3,3	3,2	3,4
Overall thermal efficiency (nett)	%	39,1	40,3	40,6	40,2
Typical genset electrical output (0.8pf 25 °C)	kWe	320	360	320	350
	kVA	400	450	400	438
Assumed alternator efficiency	%	92		92	
<b>Energy balance</b>					
Energy in fuel	kWt	890,3	971,9	857,1	945,4
Energy in power output (gross)	kWb	368,4	412,5	373,4	406,5
Energy to additional losses	kWb	5,5	6,2	5,6	6,1
Energy to cooling fan	kWm	14		19	
Energy in power output (nett)	kWt	348,9	392,3	348,8	381,4
Energy to exhaust	kWt	285,1	303,3	250,6	278,6
Energy to coolant and lubricating oil	kWt	127,5	139,8	127,5	138,2
Energy to charge cooler	kWt	72,5	78,8	69,1	79,2
Energy to radiation	kWt	36,8	37,6	36,5	42,9

## Rating definitions

### Prime power

Variable load. Unlimited hours usage with an average load factor of 70% of the published prime power rating over each 24 hour period. A 10% overload is available for 1 hour in every 12 hours of operation.

### Standby power

Variable load. Limited to 500 hours annual usage up to 300 hours of which may be continuous running, No overload is permitted

## Cooling system

### Radiator

Face area . . . . . 1,238 m<sup>2</sup>  
 Number of rows and materials . . . . . 1 rows, aluminium  
 Matrix density and material . . . . . 12 fins per inch, aluminium  
 Width of matrix . . . . . 1048 mm  
 Height of matrix . . . . . 1100 mm  
 Weight of radiator (dry) . . . . . 132 kg  
 Pressure cap setting (min) . . . . . 70 kPa

### Charge cooler

Face area . . . . . 1,006 m<sup>2</sup>  
 Number of rows and materials . . . . . 1 rows, aluminium  
 Matrix density and material . . . . . 12 fins per inch, aluminium  
 Width of matrix . . . . . 915 mm  
 Height of matrix . . . . . 1100 mm

### Coolant pump

Speed @ 1500 rev/min . . . . . 2056 rev/min  
 Speed @ 1800 rev/min . . . . . 2468 rev/min  
 Drive method. . . . . Gear

### Fan

Diameter . . . . . 927 mm  
 Drive ratio . . . . . 0,92:1  
 Number of blades . . . . . 9  
 Material . . . . . composite  
 Type . . . . . pusher  
 Cooling fan air flow @ 1500 rev/min . . . . . 654 m<sup>3</sup>/min  
 Cooling fan air flow @ 1800 rev/min . . . . . 788 m<sup>3</sup>/min

### Coolant

Total system capacity . . . . . 51,4 litres  
 Max. top tank temperature . . . . . 104 °C  
 Temperature rise across engine . . . . . 10 °C  
 Max. pressure in engine cooling circuit. . . . . 70 kPa  
 Max. permissible external system resistance . . . . . 30 kPa  
 Max. static pressure head on pump . . . . . 30 kPa  
 Coolant flow against 30 kPa restriction  
 -1500 rev/min . . . . . 5,3 litres/sec  
 -1800 rev/min . . . . . 6,7 litres/sec  
 Thermostat operation range . . . . . 87 to 98°C  
 For details of recommended coolant specifications, refer to the  
 Operation and Maintenance Manual for this engine model

## Duct allowance

Duct allowance 2206C-E13TAG2			
Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow			
Engine speed rev/min	Ambient clearance inhibited coolant °C	Duct allowance Pa	m <sup>3</sup> /min
1500	59	200	563
1800	59	200	716

Duct allowance 2206C-E13TAG3			
Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow			
Engine speed rev/min	Ambient clearance inhibited coolant °C	Duct allowance Pa	m <sup>3</sup> /min
1500	52	200	661
1800	57	200	716

## Electrical system

-type	24 Volt negative earth
Alternator type	.22SI
-alternator voltage	.24V
-alternator output	.70A
Starter motor type	.39MT
-starter motor voltage	.24V
-starter motor power	.7,8 kW
Number of teeth on flywheel	.113
Number of teeth on starter pinion	.11
Minimum cranking speed	.106 rev/min
Starter solenoid maximum	
-pull-in current @ -25°C	.200A
-hold-in current @ -25°C	.25A

### Cold start recommendations

#### -5°C to -10°C

Oil	SAE grade 15W40
Starter	.42MT
Battery	.24V
Max. breakaway current	.1311A
Cranking current	.588A
Starting aids (ECM controlled)	.none
Min. mean cranking speed	.106 rev/min

#### -11°C to -25°C

Oil	SAE grade 5W40
Starter	.42MT
Battery	.24 volts
Max. breakaway current	.1585 amps
Cranking current	.828 amps
Starting aids (ECM controlled)	.block heater 1,5 (110V/240V)
Min. mean cranking speed	.106 rev/min

#### Notes:

- Battery capacity is defined by the 20 hour rate
- The oil specification should be for the minimum ambient temperature as the oil will not be warmed by the immersion heater
- Breakaway current is dependent on the battery capacity available. Cables should be capable of handling transient current twice that of cranking current.

## Exhaust system

### Maximum back pressure

-1500 rev/min	.10,0 kPa
-1800 rev/min	.10,0 kPa
Exhaust outlet, internal diameter	.123 mm

## Fuel system

Injection system	.MEUI
Injector type	.MEUI
Governor type	.electronic
Governing conforms to	.ISO8528-5 Class G2
Injector pressure	.207 MPa

### Fuel lift pump

-lift pump type	.gear driven
-lift pump delivery - 1500 rev/min	.480 litres/min
-lift pump delivery - 100 rev/min	.600 litres/min
-lift pump delivery pressure	.621 kPa
-max. suction head at pump inlet	.3 m
-max. static pressure head	.4 m
-max. fuel inlet temperature	.55 °C
-fuel filter spacing primary	.10 microns
-fuel filter spacing secondary	.2 microns

### Fuel specification

BS2869 Class A2 or BSEN590  
ASTM D975 Class 1D and class 2D

**Note:** For further information on fuel specifications and restrictions, refer to the OMM, "Fluid Recommendations" for this engine model.

## Induction system

### Maximum air intake restriction

-clean filter	.2,5 kPa
-dirty filter	.6,4 kPa
-air filter type	.paper element - 15 inch diameter

## Lubrication system

Maximum total system oil capacity ... 40 litres  
 Minimum oil capacity in sump ... 32,5 litres  
 Maximum oil capacity in sump ... 38 litres  
 Maximum engine operating angles -  
 front up, front down, right side, left side ... 7°

### Lubricating oil

-oil flow @ 1500 rev/min ... 140 litres/min  
 -oil flow @ 1800 rev/min ... 172 litres/min  
 -oil pressure at bearings (1500 rev/min) ... 310 kPa  
 -oil pressure at bearings (1800 rev/min) ... 358 kPa  
 -oil pressure at bearings (min) ... 270 kPa  
 -oil temperature (continuous operation) ... 113 °C  
 -oil consumption at full load as a % of fuel consumption ... 0.15%  
 Oil filter screen spacing ... 30 microns  
 Oil consumption as % of fuel consumption ... 0,1  
 Sump drain plug tapping ... 1 1/8 UNF  
 Lubricating oil specification ... API-CH4 - SAE15W-40

### Recommended SAE viscosity

Engine Oil Viscosity		
EMA LRG-1 API CH-4 Viscosity Grade	Ambient Temperature	
	Minimum	Maximum
SAE 0W20	-40 °C	10 °C
SAE 0W30	-40 °C	30 °C
SAE 0W40	-40 °C	40 °C
SAE 5W30	-30 °C	30 °C
SAE 5W40	-30 °C	40 °C
SAE 10W30	-20 °C	40 °C
SAE 15W40	-10 °C	50 °C

### Mountings

Maximum static bending moment at rear face of block ... 1356 Nm

## Fuel consumption

**Note:** All fuel consumption figures are based on Nett power

### 2206C-E13TAG2 - 1500 rev/min

Load	g/kWhr	l/hr
Standby	205	84
110% Prime power	208	82
100% Prime power	209	75
75% of Prime power	213	58
50% of Prime power	221	40

### 2206C-E13TAG3 - 1500 rev/min

Load	g/kWhr	l/hr
Standby	202	94
205	205	93
100% Prime power	206	85
75% of Prime power	210	65
50% of Prime power	218	46

### 2206C-E13TAG2 - 1800 rev/min

Load	g/kWhr	l/hr
Standby	200	90
110% Prime power	203	92
100% Prime power	204	84
75% of Prime power	210	65
50% of Prime power	220	46

### 2206C-E13TAG3 - 1800 rev/min

Load	g/kWhr	l/hr
Standby	200	90
110% Prime power	203	92
100% Prime power	204	84
75% of Prime power	210	65
50% of Prime power	220	46

All fuel consumption figures are based on Nett power



Load acceptance

TAG2 (cold)

Initial load application: When engine reaches rated speed (15 seconds maximum after engine starts to crank)			
Descriptor	Units	50 Hz	60Hz
% of prime power	%	65	70
Load (nett)	kWm	182	224
Transient frequency deviation	%	<10	<10
Frequency recovery	Seconds	5	5

Second load application: When engine reaches rated speed (5 seconds after initial load application)			
Descriptor	Units	50 Hz	60Hz
% of prime power	%	73	83
Load (nett)	kWm	204,4	272
Transient frequency deviation	%	<10	<10
Frequency recovery	Seconds	5	5

TAG3 (cold)

Initial load application: When engine reaches rated speed (15 seconds maximum after engine starts to crank)			
Descriptor	Units	50 Hz	60Hz
% of prime power	%	57	70
Load (nett)	kWm	182,4	224
Transient frequency deviation	%	<10	<10
Frequency recovery	Seconds	5	5

Second load application: When engine reaches rated speed (5 seconds after initial load application)			
Descriptor	Units	50 Hz	60Hz
% of prime power	%	65	85
Load (nett)	kWm	208	272
Transient frequency deviation	%	<10	<10
Frequency recovery	Seconds	5	5

The information shown above complies with the requirements of classification 3 and 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5

The above figures were obtained under the following test conditions:

- minimum engine block temperature.. . . . . 45 °C
- ambient temperature. . . . . 15 °C
- governing mode . . . . . isochronous
- alternator efficiency... . . . . 92%
- alternator inertia . . . . . 6,9 kgm<sup>2</sup>
- under frequency roll off (UFRO) point set to. . . . . 1 Hz below rated
- UFRO rate set to... . . . . 2% voltage / 1% frequency
- LAM on/off.. . . . . off

All tests were conducted using an engine which was installed and serviced to Perkins Engines Company Limited recommendations.

**Note:** The general arrangement drawings shown in this data sheet are for guidance only. For installation purposes, latest versions should be requested from the Applications Department, Perkins Engines Stafford, ST16 3UB United Kingdom.



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