FDK ENERGY
SHENZHEN FUDIANKANG ENERGY CO., LTD
GUANGZHOU SANQ DIESEL GENERATOR SET CO., LTD
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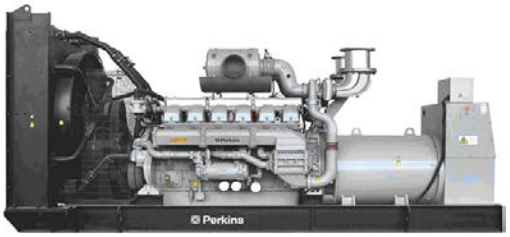
DATA SHEET

DIESEL GENERATOR 1500KW
MODEL#FDK-P1500/H1
50HZ/1500RPM
PERKINS MODEL: 4012-46TAG3A



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-P1500/H1	Engine Make	Perkins UK
Prime Power	1360KW/1700KVA	Engine Model	4012-46TAG3A
Standby Power	1500KW/1875KVA	Alternator model	Stamford PI734D
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	4012-46TAG3A	Bore x Stroke (mm x mm)	160×190
Engine Manufacturer	Perkins UK	Displacement	45.84 L
Cylinder quantity	12	Compression Ratio	13:1
Cylinder Arrangement	Vee 60°	Prime power / Speed (KW/RPM)	1500kw/1500
Cycle	4	Standby power/ Speed (KW/RPM)	1643kw/1500
Aspiration	Turbo charged	Governor type	Electronic

CE ISO9001:2008 FDK reserves the right to change the specifications and designs without noice.

Piston Speed	9.5m/s
Typical genset electrical output	1705kw
Total Lubrication System Capacity (L)	177
Total Coolant Capacity (L)	210

Fuel Consumption at 100% load (L/HOUR)	367 at rated speed
Starter motor	24V
Alternator	24V
Minimum cranking speed.	120 rpm

Alternator Specifications

Alternator model	PI734D
Alternator manufacturer	STAMFORD
Exciter type	Single bearing, Brushless, Self-excited
Rated output prime power	1650KVA
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.

CE ISO9001:2008

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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)	7000×2300×2800
Weight (kg)	7200

Soundproof Version

Overall Size: L×W×H (mm)	40FT Container
Weight (kg)	11500

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

4000 Series 4012-46TAG3A

Diesel Engine - ElectropaK

Basic technical data

Number of cylinders . ... .12
Cylinder arrangement ... ...Vee, 60°
Cycle. ... ... 4 stroke
Induction system... ... ... Turbocharged
Combustion system .. .. direct injection
Compression ratio 13:1
Bore .. .. 160 mm
Stroke .. .. 190 mm
Cubic capacity .. .. 45·842 litres
Direction of rotation .. .. clockwise, viewed on flywheel
Firing order ... ...$1^A,6^B,5^A,2^B,3^A,4^B,6^A,1^B,2^A,5^B,4^A,3^B$
Cylinder 1 . ...furthest from flywheel
Note: Cylinders designated 'A' are on the right hand side of the engine when viewed from the flywheel end

Total weight of ElectropaK

Temperate or Tropical (approximate)
-engine.. ... ... 4400 kg
-electropak dry .. .. 6000 kg
-electropak wet . ... 6400 kg

Overall dimensions of ElectropaK

	unit	Tropical	Temperate
Height	mm	2610	2260
Length	mm	3935	3971
Width	mm	2164	2192

Moment of inertia

Engine .. .. .9,73 kgm²
Flywheel ... ... .9,57 kgm²

Cyclic irregularity for engine/flywheel maximum

4012-46TAG3A. 1:638

Ratings

Steady state speed stability at constant load. ... ... ± 0·25%
Electrical rating are based on average alternator efficiency and are for guidance only (0.8 power factor being used).

Operating point

Engine speed ... ...1500 rev/min
Static injection timing . ... see engine number plate
Cooling water exit temperature .. .. < 98 °C

Fuel data ... ... to conform to BS2869 class A2 or BS EN590

Performance

All data based on operation to ISO 3046/1, BS 5514 and DIN 6271 standard reference conditions.

Noise

Estimated sound pressure level at 1 metre
-1500 rev/min . ... 111 dB(A)
For engines operating in ambient conditions other than the standard reference conditions stated below, a suitable de-rate must be applied. De-rate tables for increased ambient temperature and/or altitude are available, please contact Perkins Applications Department.

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 pressure (nominal) ... ... 3,0 kPa
Fuel temperature (inlet pump) ... ... 58 °C maximum
For test conditions relevant to data on load acceptance, refer to page 16 of this document

General installation

4012-46TAG3A - Temperate

Designation	Units	Type of operation and application		
		Spill Timing 18°		
		Baseload power	Prime power	Standby power
		50 Hz 1500 rev/min		
Gross engine power	kWm	1260	1500	1643
Fan and battery charging alternator power	kW	64		
Nett engine power	kWm	1196	1436	1579
Brake mean effective pressure (gross)	kPa	2192	2610	2859
Combustion air flow at ISO conditions	m³/min	115	125	135
Exhaust gas temperature (max) after turbo	°C	N/A	N/A	480
Exhaust gas flow (max) at atmospheric pressure	m³/min	N/A	N/A	350
Boost pressure ratio	-	3,0	3,4	3,7
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,5	41,0	39,0
Friction power and pumping losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/s	1020		
Typical Genset electrical output (0.8pf)	kVA	1420	1705	1875
	kWe	1136	1364	1500
Assumed alternator efficiency	%	95		

General installation

4012-46TAG3A - Tropical

Designation	Units	Type of operation and application		
		Spill Timing 18°		
		Baseload power	Prime power	Standby power
		50 Hz 1500 rev/min		
Gross engine power	kWm	1256	1496	1639
Fan and battery charging alternator power	kW	60		
Nett engine power	kWm	1196	1436	1579
Brake mean effective pressure (gross)	kPa	2185	2603	2852
Combustion air flow at ISO conditions	m³/min	115	125	135
Exhaust gas temperature (max) after turbo	°C	N/A	N/A	480
Exhaust gas flow (max) at atmospheric pressure	m³/min	N/A	N/A	350
Boost pressure ratio	-	3,0	3,4	3,7
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,5	41,0	39,0
Friction power and pumping losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/s	1020		
Typical Genset electrical output (0.8pf)	kVA	1420	1705	1875
	kWe	1136	1364	1500
Assumed alternator efficiency	%	95		

Note: All quoted gross engine powers include an allowance of 1.5% for installation variances. Not to be used for combined heat and power (CHP) design purposes (indicative figures only). Consult Perkins Engines Stafford Limited. Assumes complete combustion.

Rating definitions

Baseload power
Unlimited hours usage with an average load factor of 100% of the published baseload power rating.

Prime power
Variable load. Unlimited hours usage with an average load factor of 80% of the published Prime Power over each 24 hour period. A 10% overload is available for 1 hour in every 12 hours.

Standby power
Limited to 500 hours annual usage with an average load factor of 80% of the published Standby Power rating over each 24 hour period.Up to 300 hours of annual usage may be run continuously. No overload is permitted on Standby Power.

Emissions capability
All 4012-46TAG ratings are optimised to the ‘best fuel consumption’ and do not comply to Harmonised International Regulation Emission Limits. More information on these statements can be obtained by contacting the Applications Department at Perkins Engines Company Limited.

Energy balance

4012-46TAG3A - Temperate

Designation	Units	50 Hz 1500 rev/min		
		Baseload power	Prime power	Standby power
Energy in fuel	kW	3137	3650	4100
Energy in power output (gross)	kW	1260	1500	1643
Energy to cooling fan	kW		64	
Energy in power output (nett)	kW	1196	1436	1579
Energy to exhaust	kW	1010	1102	1219
Energy to coolant and oil	kW	477	510	625
Energy to radiation	kW	90	110	123
Energy to charge coolers	kW	300	429	490

4012-46TAG3A - Tropical

Designation	Units	50 Hz 1500 rev/min		
		Baseload power	Prime power	Standby power
Energy in fuel	kW	3137	3650	4100
Energy in power output (gross)	kW	1256	1496	1639
Energy to cooling fan	kW		60	
Energy in power output (nett)	kW	1196	1436	1579
Energy to exhaust	kW	1011	1106	1237
Energy to coolant and oil	kW	480	510	625
Energy to radiation	kW	90	110	110
Energy to charge coolers	kW	300	429	490

Note: Not to be used for combined heat and power (CHP) purposes (indicative figures only). If necessary, please consult Perkins Engines Company Limited.

Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For combined heat and power systems (CHP) and where there is no likelihood of ambient temperature below 10 °C, then clean 'soft' water may be used, treated with 1% by volume of Perkins inhibitor in the cooling system. The inhibitor is available in 1 litre bottles from Perkins under part number 21825 735.

Maximum pressure in crankcase water jacket ... 170 kPa
Maximum top tank temperature (standby) ... 98 °C
Maximum static pressure head on pump ... 7 m

Total coolant capacity

Electrounit (engine only) ... 73 litres
Electropak (engine and radiator):
-temperate ... 207 litres
-tropical ... 210 litres
Maximum permissible restriction to coolant pump flow ... 20 kPa
Thermostat operating range ... 71 - 85 °C
Ambient cooling clearance (standby power) based on air temperature at fan 6 °C above ambient.
Temperature rise across the engines (standby power) with inhibited coolant @ 1500 rev/min ... 8 °C
Coolant temperature shutdown switch setting ... 101 °C rising
Coolant immersion heater capacity (2 off) ... 4 kWe each

Radiator

Temperate

Radiator face area ... 3,46 m²
Material and number of rows:
-charge air and water jacket ... copper, 4 rows
Fins per inch and material:
-charge air and water jacket ... brass, 12 rows
Width of matrix ... 2,10 m
Height of matrix ... 1,65 m
Weight of radiator ... 1620 kg
Total coolant capacity including engine and pipes ... 212 litres
Pressure cap setting (min) ... 70 kPa

Tropical

Radiator face area ... 4,08 m²
Material and number of rows:
-charge air and water jacket ... copper, 4 rows
Fins per inch and material:
-charge air and water jacket ... brass, 12 rows
Width of matrix ... 1,97 m
Height of matrix ... 2,07 m
Weight of radiator ... 1630 kg
Total coolant capacity including engine and pipes ... 226 litres
Pressure cap setting (min) ... 70 kPa

Water jacket cooling data

Temperate and Tropical @ 1500 rev/min

-coolant flow ... 1020 litres/min
-coolant exit temperature (max) ... 98 °C
-coolant inlet temperature (min) ... thermostatic control
-coolant inlet temperature (max) ... 90 °C

Coolant pump

Speed ... 1.4 x e rev/min
Method of drive ... gear

Fan

Type ... axial flow
Diameter
-Temperate ... 1600 mm
-Tropical ... 1740 mm
Number of blades ... 12
Material ... Aluminium
Drive ratio
-Temperate ... 0·93:1
-Tropical ... 0·80:1

4012-46TAG3A - Temperate, Standby power

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance: 50% Glycol	**Duct allowance (Pa)**	**Min airflow (m^3/sec)**
1500 rev/min		
40 °C	250	32

4012-46TAG3A - Tropical, Standby power

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance: 50% Glycol	**Duct allowance (Pa)**	**Min airflow (m^3/sec)**
1500 rev/min		
50 °C	125	37

Lubrication system

Recommended SAE viscosity: A multigrade oil conforming to the following must be used: API CH4 15W/40.
Note: For additional notes on lubricating oil specifications, please refer to the Operation and Maintenance Manual (OMM)

Lubricating oil capacity

-total system capacity ... 177 litres
-sump maximum ... 159 litres
-sump minimum ... 136 litres
-oil temperature at normal operating conditions to bearings 105 °C

Lubrication oil pressure

-at rated speed ... 400 kPa
-minimum at 80 °C ... 340 kPa
-oil relief values open ... 400 kPa
-oil filter spacing ... 20 microns
-sump drain plug tapping size ... G1
-oil pump speed ... 2100 rev/min
-method of drive ... gear
-shutdown switch pressure setting (where fitted) ... 193 kPa falling

Oil pump flow

-1500 rev/min ... 6,0 litres/sec

Normal operating angles

Front and rear ... 5°
Side tilt ... 10°

Oil consumption

Prime power	Units	1500 rev/min
After running in (typically after 250 hours)	g/kWhr	0,52
Oil flow rate from pump	litres/sec	6

Electrical system

Type ... insulated return
Alternator voltage ... 24 volts with integral regulator
Alternator output:
... 40 amps at a stabilised output, 28 volts at 20 °C ambient
Starter type ... axial
Starter motor voltage ... 24 volts
Starter motor power ... 16,4 kW
Number of teeth on flywheel ... 156
Number of teeth on starter pinion ... 12
Minimum cranking speed ... 120 rev/min
Pull in current of starter motor
solenoid @ -25 °C max [1] ... 30 amps at 24 volts
Hold in current of starter motor
solenoid @ -25 °C max [1] ... 9 amps at 24 volts
Stop solenoid hold-in current ... 1,1 amps at 24 volts
Engine stop solenoid ... 24 volts

1. All leads to rated at 10 amps minimum

Fuel system

Recommended fuel to conform to:
BS2869 1998 Class A2 or BS EN590
Injection system . ... direct
Fuel injection pump and injector type ... . combined unit injector
Injector pressure ... ... 140 MPa
Lift pump type ... ... Tuthill TCH 1-089

Delivery

-4012-46TAG3A. ... ... 1020 litres/hour
Heat retained in fuel to tank ... ... 8 kW
Fuel inlet temperature to be less than ... ... 58 °C
Delivery pressure ... ... 300 kPa
Maximum suction head at pump inlet ... ... 2,5 m
Maximum static pressure head .. .. 3 m
Fuel filter spacing ... ...10 microns
Governor type ... ... electronic
Governing toISO 8528-12 CLASS 3 and 4; ISO 8528-5 CLASS G2
Tolerance on fuel consumption 5%

Fuel consumption

Ratings	g/kW/hr	litres/hr
	1500 rev/min	
4012-46TAG3A, Temperate		
Standby	211	405
Prime	208	370
Baseload	207	310
75% Prime	206	275
50% Prime	202	187
4012-46TAG3A, Tropical		
Standby	211	413
Prime	208	367
Baseload	207	312
75% Prime	206	275
50% Prime	202	192

Note: Fuel consumption calculated on gross rated powers.

Induction system

Maximum air intake restriction of engine:
-clean filter ... ... 2 kPa
-dirty filter. ... ... 4 kPa
-air filter type ... ... paper element

Exhaust system

Exhaust outlet size (internal) ... ...2 x 254 mm Table D flanges
Exhaust outlet flange size ... ...2 x 254 mm Table D flanges
Back pressure for total system at standby power ... ... 5 kPa
For recommended pipe sizes, please refer to the Installation Manual.

Cold start recommendations

Temperature range		
5 °C down to -10 °C (41 °F to 14 °F)	Oil:	15W40 CH4
	Starter:	2 x 24 volts
	Battery:	4 x 12V 286 Ah
	Max breakaway current:	1600 amps
	Cranking current:	810 amps
	Aids:	block heaters
	Min mean cranking speed:	120 rev/min

Notes:

- The 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 dependant on battery capacity available. Cables should be capable of handling the transient current which may be up to double the steady cranking current.

Engine mounting

Maximum static bending moment at rear face of block ... 1356 Nm
Maximum additional load applied to flywheel
due to all rotating components ... ... 850 kg

Centre of gravity

Bare engine, dry
-forward of the rear face of the cylinder block . ... 771 mm
-above the crankshaft centre line ... ... 32 mm
ElectropaK, dry
-forward of the rear face of the cylinder block . ... 1176 mm
-above the crankshaft centre line ... ... 32 mm

Typical load acceptance (cold)

At 1500 rev/min

	Initial Load Acceptance When engine reaches rated speed (15 seconds maximum after engine starts to crank)				2nd Load Application Immediately after engine has recovered to rated speed (5 seconds after initial load application)			
Engine type	**Prime Power%**	**Load kWe Nett**	**Transient Frequency Deviation %**	**Frequency recovery time seconds**	**Prime Power%**	**Load kWe Nett**	**Transient Frequency Deviation %**	**Frequency recovery time seconds**
4012-46TAG3A	63	860	≤ 10	5	37	505	≤ 10	5

The above figures were obtained under test conditions as follows:

Engine block temperature . . . . . 40 °C
Ambient temperature . . . . . 25 °C
Governing mode . . . . . Isochronous
Alternator inertia. . . . . 50 kgm²
Under frequency roll off (UFRO) point set to 49,5
UFRO rate set to . . . . . 16 v/hz
LAM on / off . . . . . on

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

Applied load is a percentage of generator electrical output efficiency as published in the general installation section of this data sheet.

The information given on this Technical Data Sheet is for standard engines, and for guidance only. For ratings other than those shown contact Perkins Engines Company Limited, Stafford.

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Distributed by

Publication No. TPD1587E, Issue 3. April 2007 © Perkins Engines Company Limited.