

# 4006-23TAG2A

527 - 746 kWm (Gross) @ 1500/1800 rpm

# 4006-23TAG3A

566 - 839 kWm (Gross) @ 1500/1800 rpm

## Electropak

# 4000

## Series

### Basic technical data

Number of cylinders	6
Cylinder arrangement	Vertical, Inline
Cycle	4 stroke, compression ignition
Induction system	Turbocharged
Compression ratio	13.6:1 nominal
Bore	160 mm
Stroke	190 mm
Cubic capacity	22.921 litres
Direction of rotation	Anticlockwise viewed on flywheel
Firing order	1, 5, 3, 6, 2, 4
Cylinder 1	Furthest from flywheel

### Weight of Electropak (engine only)

Dry	2524 kg
Wet	2663 kg

### Overall dimensions of Electropak

Height	2125 mm
Length	2927 mm
Width	1689.5 mm

### Moments of inertia

Engine	4.51 kgm <sup>2</sup>
Flywheel	6.48 kgm <sup>2</sup>
Total engine inertia (engine and flywheel)	10.99 kgm <sup>2</sup>

### Cyclic irregularity for engine standby power

4006-23TAG2A (1500 rpm)	1.68
4006-23TAG2A (1800 rpm)	1.11
4006-23TAG3A (1500 rpm)	1.64
4006-23TAG3A (1800 rpm)	1.10

### Ratings

Steady state speed stability at constant load  $\pm 0.25\%$   
Electrical ratings are based on average alternator efficiency and are for guidance only (0.8 power factor being used).

### Operating point

Engine speed	1500/1800 rpm
Static injection timing	See engine number plate
Cooling water exit temperature	98°C maximum

### Fuel data

To conform to BS2869 class A2.

### Performance

Estimated sound pressure level:	
1500 rpm	108 dB(A)
1800 rpm	113 dB(A)

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

**Note:** For engines operating in ambient conditions other than the standard reference conditions stated below, a suitable derate must be applied.

**Note:** Derate 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 (nominal)	3 kPa
Fuel temperature (inlet pump)	58°C maximum

**Note:** For test conditions relevant to data on load acceptance, refer to Perkins Applications Department.

## General installation

### 4006-23TAG2A

Designation	Units	50 Hz 1500 rpm			60 Hz 1800 rpm		
		Baseload power	Prime power	Standby power	Baseload power	Prime power	Standby power
Gross engine power	kWb	531	658	721	555	682	746
Fan power	kWm	30			44		
ElectropaK nett engine power	kWm	501	628	691	511	638	702
Gross BMEP	kPa	1854	2295	2516	1609	1977	2163
Combustion air flow	m <sup>3</sup> /min	60	64	71	62	65	72
Exhaust gas temperature after turbo (max.)	°C	430					
Exhaust gas flow (max.) at atmospheric pressure	m <sup>3</sup> /min	180			190		
Boost pressure ratio	-	3.0	3.4	3.6	3.2	3.4	3.6
Mechanical efficiency	%	90					
Overall thermal efficiency (nett)	%	38.0	38.1	38.0	35.4	35.0	35.0
Friction power and pumping losses	kWm	43			75		
Mean piston speed	m/s	9.5			11.4		
Engine coolant flow (minimum)	litres/s	10			12		
Cooling fan airflow	m <sup>3</sup> /min	870			1140		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kWe	476	597	656	480	600	660
	kVA	595	746	821	600	750	825
Assumed alternator efficiency	%	95			94		

## Rating definitions

### Baseload power

Unlimited hours usage with an average load factor of 100% of the published Baseload power. No overload is permitted on Baseload power.

### Prime power

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

### 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.

## Energy balance

Designation	Units	50 Hz 1500 rpm ½ TA Luft			50 Hz 1500 rpm best SFC			1800 rpm		
		Baseload	Prime	Standby	Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	1390	1758	1950	1317	1649	1809	1444	1823	2004
Energy in power output (gross)	kWb	531	658	721	531	658	717	555	682	746
Energy to cooling fan	kWm	30			30			44		
Energy in power output (nett)	kWm	501	628	691	501	628	687	511	638	702
Energy to exhaust	kWt	458	615	675	419	500	544	536	648	689
Energy to coolant and oil	kWt	202	231	271	173	231	264	153	218	255
Energy to radiation	kWt	45	62	79	54	66	77	58	72	80
Energy to charge coolers	kWt	154	192	204	140	194	207	142	203	234

**Note:** ½ TA Luft figures have been developed to comply with ½ TA Luft as 1986 with 2000 mg/m<sup>3</sup> NOx 5% O<sub>2</sub> limits for power generation engines.

## General installation

### 4006-23TAG3A

Designation	Units	50 Hz 1500 rpm			60 Hz 1800 rpm		
		Baseload power	Prime power	Standby power	Baseload power	Prime power	Standby power
Gross engine power	kWb	566	705	786	614	759	839
Fan power	kWm	30			44		
ElectropaK nett engine power	kWm	536	675	756	570	715	795
Gross BMEP	kPa	1969	2452	2734	1780	2200	2432
Combustion air flow	m <sup>3</sup> /min	60	69	73	68	76	78
Exhaust gas temperature after turbo (max.)	°C	500					
Exhaust gas flow (max.) at atmospheric pressure	m <sup>3</sup> /min	193			209		
Boost pressure ratio	-	3.1	3.5	3.8	3.35	3.6	3.79
Mechanical efficiency	%	90					
Overall thermal efficiency (nett)	%	38.5	38.6	38.4	35.6	35.8	35.2
Friction power and pumping losses	kWm	70			75		
Mean piston speed	m/s	9.5			11.4		
Engine coolant flow (minimum)	litres/s	10			12		
Cooling fan airflow	m <sup>3</sup> /min	870			1140		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kWe	509	641	718	542	679	755
	kVA	637	802	898	677	849	944
Assumed alternator efficiency	%	95					

**Note:** The above data is based on 42584 MJ/kg calorific value for diesel conforming to specification BS2869 Class A2.

## Rating definitions

### Baseload power

Unlimited hours usage with an average load factor of 100% of the published Baseload power. No overload is permitted on Baseload power.

### Prime power

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

### 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.

## Energy balance

Designation	Units	50 Hz 1500 rpm ½ TA Luft			50 Hz 1500 rpm best SFC			1800 rpm		
		Baseload	Prime	Standby	Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	1470	1926	2154	1390	1749	1970	1598	1995	2258
Energy in power output (gross)	kWb	566	705	786	566	705	786	614	759	839
Energy to cooling fan	kWm	30			30			44		
Energy in power output (nett)	kWm	536	675	756	536	675	756	570	715	795
Energy to exhaust	kWt	480	665	741	429	500	565	530	635	759
Energy to coolant and oil	kWt	210	280	315	190	280	310	225	309	330
Energy to radiation	kWt	59	77	86	56	70	79	64	80	90
Energy to charge coolers	kWt	155	199	226	149	194	230	165	212	240

**Note:** ½ TA Luft figures have been developed to comply with ½ TA Luft as 1986 with 2000 mg/m<sup>3</sup> NOx 5% O<sub>2</sub> limits for power generation engines.

## Cooling system

For details of recommended coolant specifications, please refer to the Operation and Maintenance Manual (OMM) for this engine model.

Nominal jacket water pressure in crankcase ..... 170 kPa  
 Maximum top temperature (standby) ..... 98°C  
 Maximum static pressure head on pump ..... 70 kPa  
 Draw down capacity ..... 22 litres  
 Maximum permissible restriction to coolant pump flow ..... 20 kPa  
 Thermostat operating range ..... 71 - 85°C

Ambient cooling clearance (open ElectropaK prime power) based on air temp at fan 3°C above ambient.

Maximum additional restriction (duct allowance) to cooling airflow (TAG2A and TAG3A Standby power) and resultant minimum airflow					
Ambient clearance: inhibited coolant		Duct allowance kPa		Min airflow m³/sec	
rpm		rpm		rpm	
1500	1800	1500	1800	1500	1800
50°C	50°C	0.3	0	14.5	19

The above information at 1500 rpm applies for ½ TA Luft and Best SFC ratings.

### Radiator

Face area ..... 1.496 m²  
 Rows and materials ..... 1 row, Aluminium

### Material and gills per inch

Jacket water ..... 12 gills/inch, Aluminium  
 Charge air section ..... 12 gills/inch, Aluminium

### Width and height of matrix

Height ..... 1651 mm  
 Width ..... 1610 mm  
 Weight (dry) radiator ..... 480 kg  
 Total coolant capacity ..... 120 litres  
 Pressure cap setting ..... 103 kPa

Coolant jacket data	Units	1500 rpm	1800 rpm
Coolant flow	litres/s	10	12
Coolant exit temperature (max)	°C	98	98
Coolant entry temperature (min)	°C	70	70

### Charge cooler, integral with radiator

Face area ..... 1.126 m²

### Coolant pump

Speed and method of drive ..... 1.4 x e rpm, gear driven

### Fan

Type ..... Engine mounted  
 Speed (1500 rpm) ..... 1170 rpm  
 Speed (1800 rpm) ..... 1404 rpm  
 Diameter ..... 1.2 m  
 Number of blades:  
 1500 rpm composite fan ..... 9  
 1800 rpm steel fan ..... 8  
 Drive ratio ..... 0.78:1

## Lubrication system

Recommended lubricating oil to conform with the specification of API CG4 15W/40.

### Lubricating oil capacity

Sump maximum ..... 113.4 litres  
 Sump minimum ..... 90.7 litres

### Lubrication oil pressure at rated speed

Minimum ..... 240 kPa  
 Oil relief valves open ..... 300 kPa  
 Oil filter spacing ..... 40 microns  
 Sump drain plug tapping size ..... G1  
 Oil pump speed and method of drive ..... 1.4 x e rpm, gear driven

### Oil pump flow

1500 rpm ..... 3.7 litres/sec  
 1800 rpm ..... 4.4 litres/sec  
 Oil consumption as a percentage of full load fuel consumption less than ..... 0.25%

### Normal operating angles

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

## Electrical system

Type ..... Insulated return  
 Alternator ..... 55 amps, 28 volts, at 20 °C ambient  
 Starter motor ..... 7.5 kW  
 Number of teeth on flywheel ..... 190  
 Number of teeth on starter motor ..... 12  
 Minimum cranking speed ..... 120 rpm  
 Pull in current of starter motor solenoid ..... 30 amps at 24 volts  
 Hold in current of starter motor solenoid ..... 9 amps at 24 volts  
 Engine stop solenoid ..... 24 volts  
 Pull in current of stop solenoid ..... 60 amps at 24 volts

## Starting requirements

Temperature range	
To 10°C (50°F)	Oil: CG4 15w/40
	Starter: 1 x 24 volts
	Battery 2 x 12v x Ah 143
	Max. breakaway Current 1000 amps
	Cranking current 600 amps
	Aids Not required

- Note:** The battery capacity is defined by the 20 hour rate at 0 °C.
- Note:** The oil specification should be for the minimum ambient temperature as the oil will not be warmed by the immersion heater.
- Note:** The breakaway current is dependant on the battery capacity available. Cables should be capable of handling the transient current which may be up to double the steady cranking current.

## Fuel system

Recommended fuel to conform to . . . . . BS2869 1998 Class A1, A2  
 Type of injection system . . . . . Direct injection  
 Fuel injector . . . . . Combined unit injector  
 Injector pressure . . . . . 220 ATS (NOP) 1400 bar max. operating pressure  
 Delivery at 1500 rpm . . . . . 630 litres/hour  
 Delivery at 1800 rpm . . . . . 810 litres/hour  
 Fuel delivery pump pressure . . . . . 250 kPa  
 Fuel lift pump maximum suction head . . . . . 2.5 m  
 Fuel return maximum pressure head . . . . . see manual  
 Fuel filter spacing . . . . . 10 microns  
 Governor type . . . . . Electronic

## Fuel consumption gross (½ TA Luft)

4006-23TAG2A	g/kWh	litres/hr
	1500	1500
Standby	213	178
Prime	213	163
Baseload	215	132
75% prime	215	125
50% prime	219	87
4006-23TAG3A	g/kWh	litres/hr
	1500	1500
Standby	222	202
Prime	214	175
Baseload	207	136
75% prime	213	132
50% prime	213	91

- Note:** All figures based on gross mechanical output with an assumed fuel density of 0.862. For fuel consumption based on electrical output of the generating set contact your OEM.

## Fuel consumption gross (best SFC)

4006-23TAG2A	g/kWh		litres/hr	
	1500	1800	1500	1800
Standby	210	228	176	197
Prime	210	224	160	177
Baseload	212	212	131	137
75% prime	213	214	124	130
50% prime	218	224	87	94
4006-23TAG3A	g/kWh		litres/hr	
	1500	1800	1500	1800
Standby	212	230	193	224
Prime	210	226	172	199
Baseload	208	213	137	152
75% prime	210	214	131	144
50% prime	213	205	91	96

- Note:** All figures based on gross mechanical output with an assumed fuel density of 0.862. For fuel consumption based on electrical output of the generating set contact your OEM.

## Induction system

### Maximum air intake restriction of engine

Clean filter . . . . . 1.25 kPa  
 Dirty filter . . . . . 3.7 kPa  
 Air filter type . . . . . Dry, paper

## Exhaust system

Exhaust outlet size (internal) . . . . . 2 x 152.4 mm

### Exhaust back pressure for total system

TAG2A . . . . . 6 kPa  
 TAG3A . . . . . 6 kPa

- Note:** For recommended pipe sizes see the Installation Manual.

## Engine mounting

Maximum additional load applies to flywheel due to all rotating components . . . . . 650 kg

Position of engine centre of gravity (wet):

Forward of the rear face of the crankcase . . . . . 625 mm  
 Above the crankshaft centre line . . . . . 140 mm

## Load acceptance (cold)

### At 1500 rpm

Engine Type	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)			
	Prime power %	Load kWm nett / kWe	Transient frequency deviation %	Frequency recovery time seconds	Prime power %	Load kWm nett / kWe	Transient frequency deviation %	Frequency recovery time seconds
4006-23TAG2A	67	421 / 400	≤ -10	5	33	211 / 200	≤ -10	5
4006-23TAG3A	66	448 / 421	≤ -10	5	34	231 / 219	≤ -10	5

### At 1800 rpm

Engine Type	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)			
	Prime power %	Load kWm nett / kWe	Transient frequency deviation %	Frequency recovery time seconds	Prime power %	Load kWm nett / kWe	Transient frequency deviation %	Frequency recovery time seconds
4006-23TAG2A	70	446 / 420	≤ -10	5	30	192 / 180	≤ -10	5
4006-23TAG3A	67	483 / 454	≤ -10	5	33	232 / 221	≤ -10	5

The above complies with requirements of Classification 3 & 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5.

The above figures were obtained under test conditions as follows:

Engine block temperature ..... 45°C  
 Alternator efficiency ..... 94%  
 Minimum ambient temperature ..... 10°C

### Isochronous governing

Under frequency roll off (UFRO) set to ..... 1 Hz below rated frequency  
 Typical alternator inertia ..... 20 kgm<sup>2</sup>

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

The information given on this Technical Data Sheet is for standard engines, and for guidance only. For ratings other than shown contact the Applications Department.

# Noise Data

## Noise levels

The figures for total noise levels are typical for an engine running at prime power rating in a semi-reverberant environment and measured at a distance of one metre from the periphery of the engine.

## Octave analysis

The following histograms show an octave band analysis at the position of the maximum noise level.

## Total noise levels

Sound pressure level ..... re:  $-20 \times 10^{-6}$  pa  
 Speed 1500 rpm ..... Ambient noise level 79 dB(A)

POSITION 7			POSITION 1			POSITION 2		
4006-23TAG2A	1500 rpm	105 dB(A)	4006-23TAG2A	1500 rpm	107 dB(A)	4006-23TAG2A	1500 rpm	105 dB(A)
	1800 rpm	110 dB(A)		1800 rpm	112 dB(A)		1800 rpm	110 dB(A)
4006-23TAG3A	1500 rpm	105 dB(A)	4006-23TAG3A	1500 rpm	107 dB(A)	4006-23TAG3A	1500 rpm	105 dB(A)
	1800 rpm	111 dB(A)		1800 rpm	112 dB(A)		1800 rpm	111 dB(A)

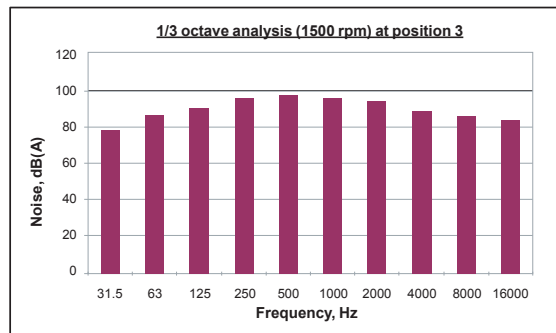
POSITION 6			POSITION 3		
4006-23TAG2A	1500 rpm	106 dB(A)	4006-23TAG2A	1500 rpm	108 dB(A)
	1800 rpm	112 dB(A)		1800 rpm	112 dB(A)
4006-23TAG3A	1500 rpm	106 dB(A)	4006-23TAG3A	1500 rpm	108 dB(A)
	1800 rpm	113 dB(A)		1800 rpm	113 dB(A)

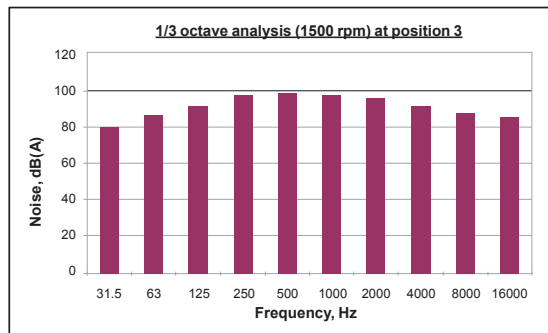
POSITION 5			POSITION 4		
4006-23TAG2A	1500 rpm	104 dB(A)	4006-23TAG2A	1500 rpm	106 dB(A)
	1800 rpm	109 dB(A)		1800 rpm	110 dB(A)
4006-23TAG3A	1500 rpm	104 dB(A)	4006-23TAG3A	1500 rpm	106 dB(A)
	1800 rpm	110 dB(A)		1800 rpm	111 dB(A)



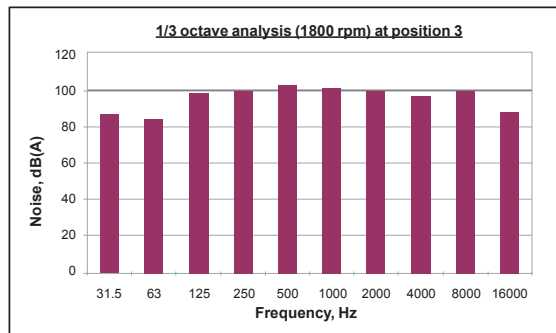
## 4006TAG2A



## 4006TAG3A



## 4006TAG2A



## 4006TAG3A

