

# 404J-22G

20.6 kWb (Gross) @ 1500 rpm

# 400

## Series

## Diesel Engine - Electropak

### Basic technical data

Number of cylinders	4
Cylinder arrangement	Inline
Cycle	Four stroke
Induction system	Naturally aspirated
Compression ratio	23.3:1
Bore	84 mm
Stroke	100 mm
Displacement	2.22 litres
Direction of rotation (Viewed from flywheel face)	Anticlockwise
Firing order (Cylinder 1 furthest from flywheel)	1, 3, 4, 2

### Weight of Electropak

Dry (estimated)	242 kg
Wet (estimated)	258 kg

### Overall dimensions of Electropak

Height	840 mm
Length	973 mm
Width	590 mm

### Centre of gravity

Forward from rear of block	147 mm
Above centre line of block	79 mm

### Moments of inertia

Engine rotational components (excluding flywheel)	0.440 kgm <sup>2</sup>
Flywheel	2.550 kgm <sup>2</sup>
Total engine (flywheel & engine)	2.990 kgm <sup>2</sup>

### Electrical output

Electrical output frequency	50 Hz
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### Ratings

Steady state speed stability at constant load	± 0.75 %
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### Cyclic irregularity for engine standby power

At 110%	Not available
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### Performance

Average sound pressure level for Electropak including raw exhaust noise at 1 metre	76.4 dB(A)
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**Note:** All data based on operation to ISO 3046/1:2002 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	100.0 kPa
Relative humidity	31.5 %
Air inlet restriction at maximum power (nominal)	5.0 kPa
Exhaust back pressure at maximum power (nominal)	10.2 kPa
Fuel temperature (inlet pump)	40 °C
All ratings certified to within	5 %

**Note:** For engine servicing information, refer to the Engine Operation and Maintenance manual.

### Conditions of use

This document is only to be used as a reference guide for installation purposes through Perkins' applications engineering team.

#### Invalid if printed.

For business tender purposes, user must obtain the latest controlled copy through Perkins applications engineering team.

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## General installation

404J-22G

Designation	Units	Type of application					
		50 Hz @ 1500 rpm			60 Hz @ 1800 rpm		
		Baseload power	Prime power	Standby power	Baseload power	Prime power	Standby power
Gross engine power output	kWb	-	18.60	20.60	N/A	N/A	N/A
Gross BMEP	kPa	-	671	743	N/A	N/A	N/A
Mean piston speed	m/s		5.0				
ElectropaK nett engine power	kW	-	18.50	20.50	N/A	N/A	N/A
Engine coolant flow against 6 kPa restriction	l/min		46.80				
Intake air flow	m³/min	-	2.00	2.00	N/A	N/A	N/A
Exhaust gas flow (maximum) at atmospheric pressure	m³/min	-	3.64	3.94	N/A	N/A	N/A
Exhaust gas temperature (maximum)	°C	-	490.0	490.0	N/A	N/A	N/A
Overall thermal efficiency	%	-	36.7	36.7	N/A	N/A	N/A
Typical generator set electrical output (0.8 pf)	kWe	-	16.10	17.84	N/A	N/A	N/A
	kVA	-	20.12	22.29	N/A	N/A	N/A
Assumed alternator efficiency	%	-	87.00	87.00	N/A	N/A	N/A

## Rating definitions

### Baseload power

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

404J-22G

Designation	Units	50 Hz @ 1500 rpm			60 Hz @ 1800 rpm		
		Baseload power	Prime power	Standby power	Baseload power	Prime power	Standby power
Power input from fuel	kWt	-	47.70	53.60	N/A	N/A	N/A
Gross engine power output	kWb	-	18.60	20.60	N/A	N/A	N/A
Cooling fan parasitic loss	kWm		0.10			N/A	
Nett power output	kWm	-	18.50	20.50	N/A	N/A	N/A
Energy flow through exhaust	kWt	-	12.60	14.10	N/A	N/A	N/A
Energy flow through coolant and oil	kWt	-	15.20	17.20	N/A	N/A	N/A
Radiative power loss	kWt	-	2.90	3.40	N/A	N/A	N/A
Energy to aftercooler	kWt	-	N/A	N/A	N/A	N/A	N/A

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

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## Cooling system

### Recommended coolant

**Note:** Perkins Extended Life Coolant, 50% antifreeze/50% water.  
For details of recommended coolant specifications, please refer to the Operation and Maintenance Manual (OMM) for this engine model.

### Total coolant capacity

ElectropaK (with radiator)	3.6 litres
ElectropaK (without radiator)	7 litres
Maximum top tank temperature	112 °C
Maximum static pressure head on pump	1 kPa
Coolant temperature rise across engine	8 °C
Maximum permissible external system resistance	15 kPa
Thermostat operation range (closed to fully open)	82-95 °C

### Radiator

Radiator face area	0.2 m <sup>2</sup>
Core material	Aluminium
Number of rows	2
Fins per inch	14.5
Width of matrix	334 mm
Height of matrix	500 mm
Pressure cap setting	90 kPa

### Fan

Fan type	Mechanical, fixed
Configuration	Pusher
Diameter (tip to tip)	320 mm
Number of blades	6
Material	Plastic
Drive ratio	1.33:1

### Duct allowance

Duct allowance	Unit	50 Hz @ 1500 rpm	60 Hz @ 1800 rpm
Ambient clearance	°C	46	N/A
Duct allowance (maximum additional cooling airflow restriction)	Pa	80	N/A
Resultant minimum airflow	m <sup>3</sup> /sec	1	N/A

## Fuel system

### System specification

Type of injection	Mechanical
Fuel injection pump	Unit injection
Fuel injector	Mechanical
Nozzle opening pressure	15 MPa
Filtration media size	25 µm
Fuel lift pump type	Mechanical
Fuel flowrate	63 l/h
Pressure	10 kPa
Maximum suction head	1 m
Maximum static pressure head	3 m
Maximum fuel temperature at lift pump inlet	40 °C
Governor type	Mechanical
Speed control conformity	ISO 8525-5 Class G2

### Fuel specification

Recommended fuel conformity ..... EN590 / ASTM D975 Grade 2D  
S15 / BS2869: 2010 Class A2 or  
EU equivalent

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

### Fuel consumption data

	50 Hz @ 1500 rpm	60 Hz @ 1800 rpm
<b>Prime power (kW):</b>	18.6	N/A
<b>Load condition</b>	<b>g/kWh</b>	<b>g/kWh</b>
Standby (110% Prime)	259	N/A
Prime	251	N/A
75% Prime	243	N/A
50% Prime	264	N/A
25% Prime	346	N/A

**Note:** For conversion to l/h use the following formula with the correct fuel density: (SFC [kg/kWh] ÷ Fuel density [kg/l]) × Power [kW] = SFC [l/h]

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## Lubrication system

### Total system capacity

Maximum sump capacity (maximum dipstick mark)	6.0 litres
Minimum sump capacity (minimum dipstick mark)	4.5 litres
Maximum oil temperature (continuous operation)	125 °C
Maximum oil temperature (intermittent operation)	135 °C

### Lubricating oil

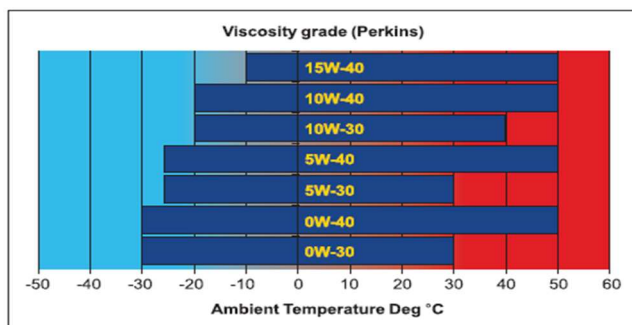
Relief valve opening pressure	352-448 kPa
Minimum oil pressure	120 kPa
Oil pressure at maximum no-load speed	TBC kPa
Oil flow at rated speed	11 l/min

### Maximum engine operating angles

Front up, front down	25 °
Right side up, right side down	25 °

**Note:** A single or multigrade oil conforming to API-CH-4 or ACEA E5 must be used.

### Recommended SAE viscosity



### Cold Start Recommendations

Minimum starting temperature	Engine oil grade	Battery specifications with glowplugs		Battery specifications without glowplugs	
		Cold start Amps (A)	Cold cranking Amps (A)	Cold start Amps (A)	Cold cranking Amps (A)
10°C	20W	540	740	N/A	N/A
0°C	20W	540	740	N/A	N/A
-5°C	15W	540	740	N/A	N/A
-10°C	15W	540	740	N/A	N/A
-15°C	10W	540	740	N/A	N/A
-20°C	5W	600	780	N/A	N/A
-25°C	5W	600	780	N/A	N/A

**Note:** Cold start Amps as per BS3911 and cold cranking Amps as per SAEJ537.

## Induction system

Max. air intake restriction (clean filter)	6 kPa
Max. air intake restriction (dirty filter)	7 kPa
Air filter type	Dry
Number of air filters	1

## Exhaust system

Number of exhaust outlets	1
Exhaust outlet diameter	42 mm
Minimum back pressure	7 kPa
Maximum back pressure	10 kPa

## Electrical system

Alternator output voltage	12 V
Alternator output current	85 A
Starter motor input voltage	12 V
Starter motor power draw	2 kW
Number of teeth on flywheel	109
Number of teeth on starter pinion	9
Engine stop method	Electronic

## Engine mounting

Maximum static bending moment at rear face of block	235.0 Nm
Maximum static bending moment for exhaust outlet (for muffler design)	20.0 Nm

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## Noise data

### Noise levels

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

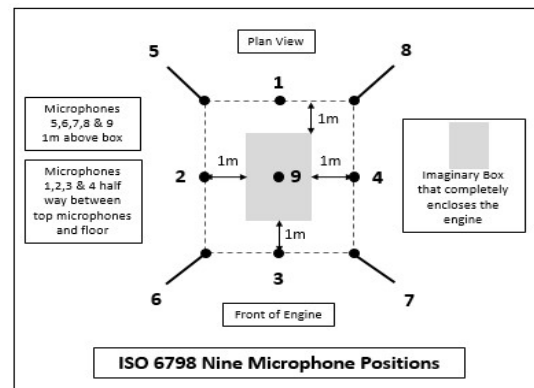
### Total noise levels

Total noise levels	50 Hz @1500 rpm dB(A)	60 Hz @1800 rpm dB(A)
Ambient noise level	47.4	N/A

### Noise data

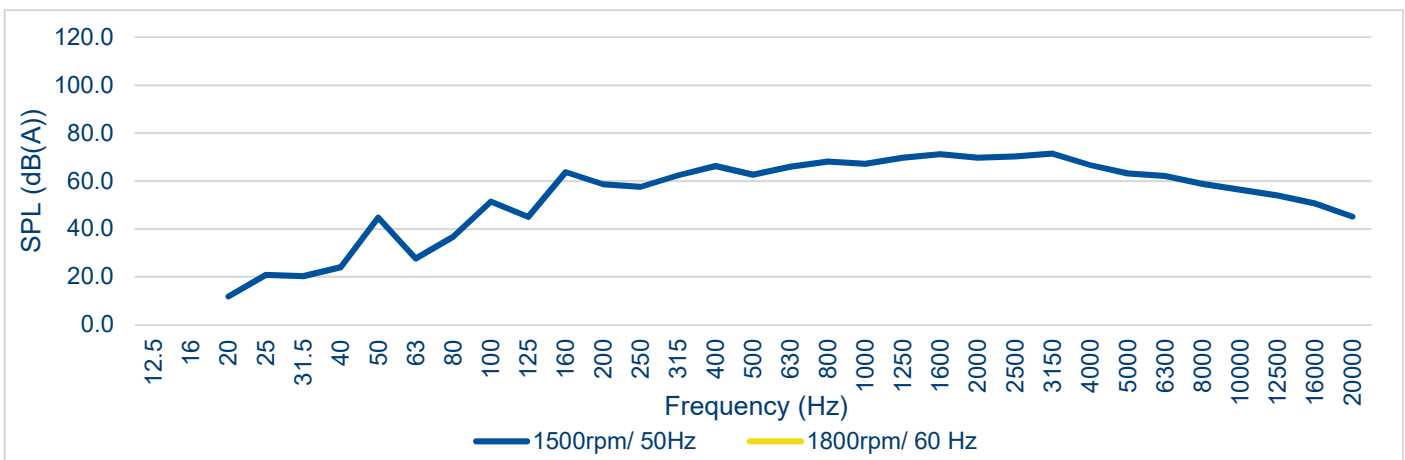
Average sound pressure level for engine	50 Hz @1500 rpm dB(A)	60 Hz @1800 rpm dB(A)
Without inlet and exhaust (Pusher fan)	Not available	N/A
With inlet and exhaust (Pusher fan)	94.8	N/A

Noise level measurement	
Position (ref. diagram)	SPL, dB(A)
1	80.1
2	77.7
3	77.9
4	80.8
5	82.8
6	82.7
7	74.8
8	75.9
9	77.5



### Octave analysis

The following figure shows a third octave band analysis at the position of the maximum noise level:



**Note:** If the engine is to operate in ambient conditions other than those of the test conditions, suitable adjustments must be made for these changes.

**Note:** Sound pressure reference level: 20  $\mu$ Pa.

**Note:** One third octave analysis performed at the position where the highest noise levels were measured.

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