

# Technical Data

## 4000 Series

# 4008TWG2

### Diesel Engine - Electrounit

#### Basic technical data

Number of cylinders ... 8  
 Cylinder arrangement ... In line  
 Cycle ... 4 stroke, compression ignition  
 Induction system ... Turbocharged  
 Compression ratio ... 13.6:1 nominal  
 Bore ... 160 mm  
 Stroke ... 190 mm  
 Cubic capacity ... 30.561 litres  
 Direction of rotation ... Anti-clockwise viewed on flywheel  
 Firing order ... 1,4,7,6,8,5,2,3  
 Cylinders 1 furthest from flywheel  
 Total weight Electrounit (engine only) ... (dry) 3350 kg  
 ... (wet) 3529 kg  
 Overall dimensions ... Height 1772 mm  
 ... Length 2890 mm  
 ... Width 1585 mm  
 Moment of inertia ... Engine 9.60 kgm<sup>2</sup>  
 ... Flywheel 6.02 kgm<sup>2</sup>  
 Cyclic irregularity for engine/flywheel (Prime power):  
 1500 rev/min ... 1.191  
 1800 rev/min ... 1.333

#### Ratings

Steady state speed stability at constant load ... ± 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 rev/min  
 Static injection timing ... See engine number plate  
 Cooling water exit temp ... <93 °C

#### Fuel data

To conform to BS2869 class A1, A2.

#### Performance

Sound pressure level 1500 rev/min ... 104/108 dBA

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

#### 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) ... 3.0 kPa  
 For load acceptance figures please refer to Applications Dept.

#### General installation

Designation	Units	50Hz 1500 rev/min			60Hz 1800 rev/min		
		Continuous Baseload	Prime Power	Standby Maximum	Continuous Baseload	Prime Power	Standby Maximum
Gross engine power	kWb	598	748	820	598	748	820
Fan power	kWm	38			64		
Net engine power	kWm	560	710	782	534	684	756
BMEP gross	bar	15.4	19.3	21.2	12.8	16.1	17.6
Combustion air flow	m <sup>3</sup> /min	48.8	60.0	66.6	54.9	65.6	70.2
Exhaust gas temperature max (after turbo)	°C	521			507		
Exhaust gas flow max (after turbo)	m <sup>3</sup> /min	179.1			185.4		
Boost pressure ratio	-	2.60	3.05	3.30	2.60	3.05	3.25
Mechanical efficiency	%	88	90	91	86	89	90
Overall thermal efficiency	%	41	41	40	40	40	40
Friction power and pumping losses	kWm	80			96		
Mean piston speed	m/s	9.5			11.4		
Engine coolant flow	l/s	7.1			8.0		
Typical Genset Electrical Output 0.8pf 25 °C (100kPa)	kVA	665	843	929	634	812	898
	kWe	532	675	743	507	650	718
Assumed alternator efficiency	%	95			95		

**Note:** Not to be used for CHP design purposes. (Indicative figures only). Consult Perkins Engines Co. Ltd. Assumes complete combustion.

**Continuous Baseload rating** Power available for continuous full load operation. **Prime Power rating** is available for unlimited hours per year with a variable load of which the average engine load factor is 80% of the published prime power rating, incorporation of a 10% overload for 1 hour in every 12 hours of operation which is permitted. **Standby Power rating** is for the supply of emergency power at variable load for the duration of the non-availability of the mains power supply. NO OVERLOAD capacity is available at this rating. Engines must not be allowed to have facilities for parallel operation with the mains supply. This rating should be applied only when reliable mains power is available. Should this not be the case then refer to Prime Power rating. A standby rated engine should be sized for an average load factor of 80% based on published standby rating for 500 operating hours per year. Standby ratings should never be applied except in true emergency power failure conditions.

## Energy balance

**Note:** Not to be used for CHP design purposes. (Indicative figures only). Consult Perkins Engines Co. Assumes complete combustion.

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	Units	1500 rev/min			1800 rev/min		
		Continuous Baseload	Prime Power	Standby Maximum	Continuous Baseload	Prime Power	Standby Maximum
Energy in fuel	kWt	1448	1838	2035	1498	1865	2054
Energy in power output (Gross)	kWb	598	748	820	598	748	820
Energy to cooling fan	kWm	38	38	38	64	64	64
Energy in power output (Net)	kWm	560	710	782	534	684	756
Energy to exhaust	kWt	493	677	752	552	684	757
Energy to coolant and oil	kWt	203	219	248	190	238	261
Energy to radiation	kWt	64	80	89	66	82	90
Energy to charge coolers	kWt	90	114	126	92	113	126

## Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For combined heat and power systems 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 bottles under Perkins Part No. OE 45350 (1 litre).  
Nominal jacket water pressure in crankcase. .... 1.7 bar

The following is a guide based on ambient air conditions of 52 °C on a Perkins supplied radiator  
Total coolant capacity:  
Electronit (engine only) ..... 48 litres  
Electropak (engine /radiator). .... 158 litres  
Pressure cap setting . .... 0.69 bar  
Fan ..... Incorporated in radiator  
Diameter ..... 1219 mm  
Heat exchanger: Optional (in lieu of radiator)  
Charge cooler: fin and tube (on engine separate to radiator)  
Ambient Cooling Clearance (Open Electropak Prime power) based on air temp at fan 3 °C above ambient.

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Maximum additional restriction (duct allowance) to cooling airflow (Prime power) and resultant minimum airflow					
Ambient Clearance 50% glycol		Duct Allowance mm H <sub>2</sub> O		Min airflow m <sup>3</sup> /min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
52 °C	52 °C	25	50	1364	982

Coolant pump speed and method of drive ... 1.4 x e rev/min Gear  
Maximum static pressure head on pump above engine crank centre line. .... 7 m  
Maximum external permissible restriction to coolant pump flow ... . 20 KPa  
Thermostat operating range.. .... 71-85 °C  
Shutdown switch setting ... ....96 °C rising  
Coolant immersion heater capacity... .... 4 kw x 1

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Jacket cooling water data	Units	1500 rev/min	1800 rev/min
Coolant flow	l/s	7.1	8.0
Coolant exit temperature (max)	°C	93	93
Coolant entry temperature (min)	°C	70	70
Coolant entry temperature (max)	°C	80	80

## Lubrication system

Recommended lubricating oil to conform with the specification of APICD or MIL - L - 2104C  
Lubricating oil capacity:  
Sump maximum . .... 154 litres  
Sump minimum . .... 127 litres  
Lubricating oil temperature maximum to bearings . .... 105 °C  
Lubricating oil pressure:  
at 80 °C temperature to bearing gallery (minimum) ... .... 0.34 MPa

Oil consumption Prime Power	Units	1500 rev/min	1800 rev/min
After RUNNING - IN*	g/kWhr	0.51	0.53
Oil flow rate from pump	l/s	3.70	4.40

\*Typical after 250 hours  
Sump drain plug tapping size . .... G1  
Oil pump speed and method of drive . .... 1.4 x e rev/min, gear  
Oil pump flow 1500rev/min. .... 3.70 litres/sec  
1800 rev/min... .... 4.40 litres/sec  
Shutdown switch setting. .... 1.93 bar falling  
Normal operating angles  
Fore and aft ..... 5°  
Side tilt ..... 10°

## Fuel system

Recommended fuel .... To conform to BS2869 1998 Class A1, A2  
Type of injection system. .... Direct injection  
Fuel injection pump ..... Combined Unit injector  
Fuel injector ..... Combined Unit Injector  
Fuel injector opening pressure ..... 234 bar  
Fuel lift pump..... Tuthill TCH 1-054  
Delivery/hour at 1500 rev/min ..... 660 litres  
Delivery/hour at 1800 rev/min ..... 810 litres  
Heat retained in fuel to tank ..... 4.0 kW  
Temperature of fuel at lift pump to be less than ..... 58 °C  
Fuel lift pump pressure..... 3.0 bar  
Fuel lift pump maximum suction head ..... 2.5 m  
Fuel lift pump maximum pressure head (see installation manual)  
Fuel filter spacing ..... 10 microns  
Governor type. .... Electronic  
Torque at the Governor output shaft ..... 0.917 kgm  
Static injection timing . .... See engine number plate  
Tolerance on Fuel consumption . .... +5%

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Fuel consumption gross				
Designation	g/kWh		Litres/hr	
	1500 rev/min	1800	1500	1800
At Standby Max power rating	210	212	203	205
At Prime Power rating	208	211	183	186
At Continuous Baseload rating	205	212	144	149
At 75% of Prime Power rating	206	213	136	141
At 50% of Prime Power rating	210	222	92	98
At 25% of Prime power rating	230	263	51	58

## Induction System

Emissions data with combustion air temperature of 25 °C at continuous base load  
Maximum air intake restriction of engine:  
Clean filter ..... 127 mm H<sub>2</sub>O  
Dirty filter ..... 380mm H<sub>2</sub>O  
Air filter type ..... 5001-00-00 MF&T

## Exhaust system

Maximum back pressure for total system

Designation	Units	1500 rev/min	1800 rev/min
4008TWG2	mm H <sub>2</sub> O	643	775

Exhaust outlet flange size ... 2 x 152 mm (Table 'D')  
 Recommended pipe sizes Refer to Installation Manual.

## Electrical system

Type ... Insulated return  
 Alternator ... 24 volts with integral regulator  
 Alternator output ... 40 amps at a stabilised output 28 volts at 20 °C ambient

Starter motor ... 24 volts  
 Starter motor power ... 8.2 kW  
 Number of teeth on flywheel ... 190  
 Number of teeth on starter motor ... 12  
 Minimum cranking speed ... 120 rev/min  
 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  
 Hold in current of stop solenoid ... 1.1 amps at 24 volts

## Engine Mounting

Position of centre of gravity (wet engine) forward from rear face of crankcase ... 855 mm  
 Engine vertical centre line above crankshaft centre line ... 140 mm  
 Maximum additional load applied to flywheel due to all rotating components ... 650 kg

## Starting Requirements

Temperature Range	
<b>Range</b> Down to 0 °C (32 °F)	Oil: SAE 30
	Starter: 1 x 24V
	Battery: 2 x 12 volts Ah 178
	Max breakaway current: 1400 amps
	Cranking current: 750 amps
	Aids: Not necessary
	Starter cable size: 70 mm
Maximum length: 6 m	

### Notes:

- Battery capacity is defined by the 20 hour rate at 0 °C.
- 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 battery capacity available. Cables should be capable of handling the transient current which may be up to double the steady cranking current.



**Noise level**

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.

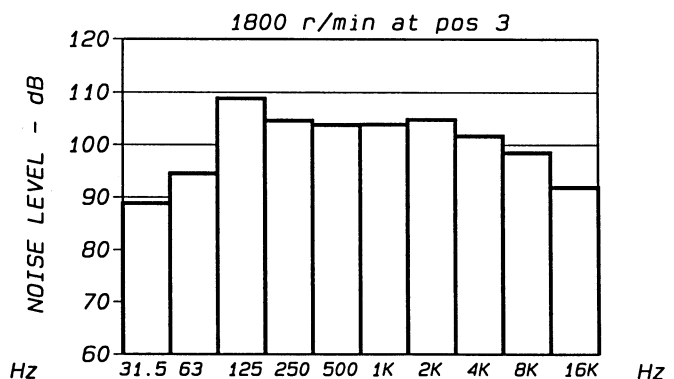
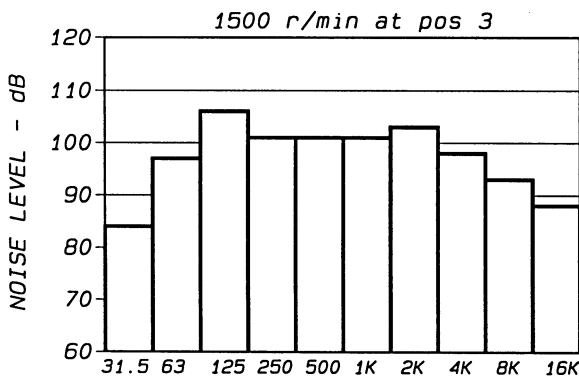
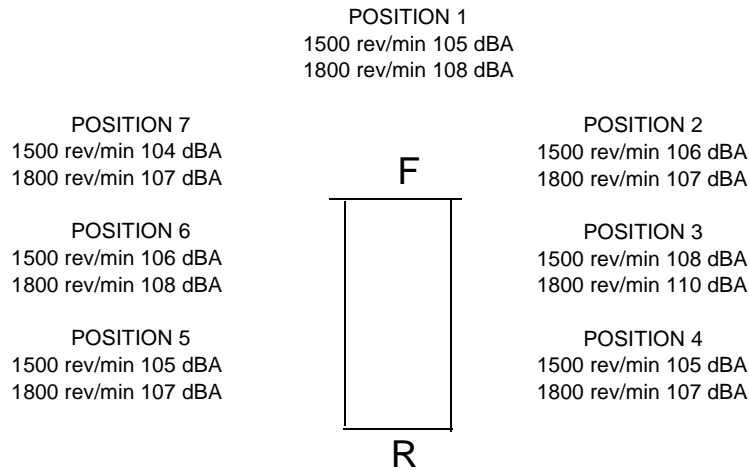
**Octave analysis**

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

**Total noise level**

Sound pressure level re:  $20 \times 10^{-6}$  pa  
 Speed 1500 rev/min..... Ambient noise level 77 dBA.  
 Speed 1800 rev/min..... Ambient noise level 77 dBA.  
 Octave analysis carried out at the position of maximum noise.

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The information given on technical data sheets are for standard ratings only. For ratings other than shown contact Perkins Engines Co Ltd Stafford.

## Notes



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