

Technical Data

4000 Series

Diesel Engine - Electrounit

4012TAG
4012TAG1
4012TAG2

Basic technical data

Number of cylinders 12
Cylinder arrangement 60° Vee
Cycle 4 stroke, compression ignition
Induction system Turbocharged
Compression ratio 13.6:1 nominal
Bore 160 mm
Stroke 190 mm
Cubic capacity 45.842 litres
Direction of rotation Anti-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
Cylinders 1 furthest from flywheel

Cylinders Designated A are on the left side of the engine when viewed from front (opposite end to flywheel)

Total weight Electrounit (engine only)
4012TAG/1/2(dry) 4400 kg
4012TAG/1/2(wet) 4604 kg
Overall dimensions Height 2118 mm
..... Length 2731 mm
..... Width 1723 mm
Moment of inertia.... Engine 9.73..Flywheel 9.57kgm²
Cyclic irregularity for engine/flywheel (Prime power):
1500 rev/min...1.744. N/A..1800 rev/min.... 4012TAG
1500 rev/min...1.714. 1.1092..1800 rev/min....4012TAG1
1500 rev/min...1.669. 1.1032..1800 rev/min.... 4012TAG2

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 103/112 d(B)A
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 4012TAG

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	882	1102	1209	-	-	-
Fan power	kWm	41			-		
Net engine power	kWm	841	1061	1168	-	-	-
BMEP gross	bar	15.4	19.2	21.0	-	-	-
Combustion air flow	m ³ /min	74	99	112	-	-	-
Exhaust gas temperature max (after turbo)	°C	460			-		
Exhaust gas flow max (after turbo)	m ³ /min	283			-		
Boost pressure ratio	-	2.60	2.80	3.05	-	-	-
Mechanical efficiency	%	88	90	91	-	-	-
Overall thermal efficiency	%	41	41	41	-	-	-
Friction power and pumping losses	kWm	120			-		
Mean piston speed	m/s	9.5			-		
Engine coolant flow (min)	l/s	15.8			-		
Typical Genset Electrical Output 0.8pf 25 °C (100kPa)	kVA	1009	1273	1402	-	-	-
	kWe	807	1019	1121	-	-	-
Assumed alternator efficiency	%	96			-		

General installation 4012TAG1

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	942	1178	1292	942	1178	1292
Fan power	kWm	42			37		
Net engine power	kWm	900	1136	1250	905	1141	1255
BMEP gross	bar	16.4	20.5	22.5	13.7	17.1	18.8
Combustion air flow	m ³ /min	79	97	105	97	107	112
Exhaust gas temperature max (after turbo)	°C	440			430		
Exhaust gas flow max (after turbo)	m ³ /min	238			247		
Boost pressure ratio	-	2.60	3.05	3.30	2.70	2.85	3.05
Mechanical efficiency	%	89	91	92	88	89	90
Overall thermal efficiency	%	43	43	42	43	42	41
Friction power and pumping losses	kWm	120			144		
Mean piston speed	m/s	9.5			11.4		
Engine coolant flow	l/s	17			20		
Typical Genset Electrical Output 0.8pf 25 °C (100kPa)	kVA	1080	1363	1500	1086	1369	1506
	kWe	864	1091	1200	869	1095	1205
Assumed alternator efficiency	%	96			96		

General installation 4012TAG2

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	1037	1296	1422	1038	1297	1423
Fan power	kWm	42			37		
Net engine power	kWm	995	1254	1380	1001	1260	1386
BMEP gross	bar	18.1	22.6	24.8	15.1	18.9	20.7
Combustion air flow	m ³ /min	81	101	107	97	103	112
Exhaust gas temperature max (after turbo)	°C	466			480		
Exhaust gas flow max (after turbo)	m ³ /min	274			283		
Boost pressure ratio	-	2.80	3.22	3.50	2.70	3.05	3.25
Mechanical efficiency	%	90	92	92	88	90	91
Overall thermal efficiency	%	43	42	41	42	41	40
Friction power and pumping losses	kWm	120			144		
Mean piston speed	m/s	9.5			11.4		
Engine coolant flow	l/s	17			20		
Typical Genset Electrical Output 0.8pf 25 °C (100kPa)	kVA	1194	1505	1656	1201	1512	1663
	kWe	955	1204	1325	961	1210	1331
Assumed alternator efficiency	%	96			96		

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.

4012TAG

	Units	1500 rev/min			1800 rev/min		
		Continuous Baseload	Prime Power	Standby Maximum	Continuous Baseload	Prime Power	Standby Maximum
Energy in fuel	kWt	2168	2682	2976	-	-	-
Energy in power output (Gross)	kWb	882	1102	1209	-	-	-
Energy to cooling fan	kWm	41	41	41	-	-	-
Energy in power output (Net)	kWm	841	1061	1168	-	-	-
Energy to exhaust	kWt	632	810	897	-	-	-
Energy to coolant and oil	kWt	324	402	451	-	-	-
Energy to radiation	kWt	77	92	102	-	-	-
Energy to charge coolers	kWt	253	276	317	-	-	-

4012TAG1

	Units	1500 rev/min			1800 rev/min		
		Continuous Baseload	Prime Power	Standby Maximum	Continuous Baseload	Prime Power	Standby Maximum
Energy in fuel	kWt	2193	2270	3117	2215	2812	3145
Energy in power output (Gross)	kWb	942	1178	1292	942	1178	1292
Energy to cooling fan	kWm	42	42	42	37	37	37
Energy in power output (Net)	kWm	900	1136	1250	905	1141	1255
Energy to exhaust	kWt	607	760	924	605	812	937
Energy to coolant and oil	kWt	343	434	465	349	420	475
Energy to radiation	kWt	77	95	100	95	99	105
Energy to charge coolers	kWt	224	303	336	224	303	336

4012TAG2

	Units	1500 rev/min			1800 rev/min		
		Continuous Baseload	Prime Power	Standby Maximum	Continuous Baseload	Prime Power	Standby Maximum
Energy in fuel	kWt	2414	3078	3477	2477	3188	3526
Energy in power output (Gross)	kWb	1037	1296	1422	1038	1297	1423
Energy to cooling fan	kWm	42	42	42	37	37	37
Energy in power output (Net)	kWm	995	1254	1380	1001	1260	1386
Energy to exhaust	kWt	665	877	1013	718	968	1058
Energy to coolant and oil	kWt	380	464	511	383	466	515
Energy to radiation	kWt	77	95	108	79	99	105
Energy to charge coolers	kWt	255	346	423	259	358	425

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:

Electrounit (engine only) 73 litres

Electropak (engine/radiator) 4012TAG 200 litres

Electropak (engine/radiator) 4012TAG1/2 235 litres

Pressure cap setting 0.69 bar

Fan Incorporated in radiator

Diameter 4012TAG 1219 mm (Pusher)

Diameter 4012TAG1/2 1524 mm (Pusher)

Ambient Cooling Clearance (Open Electropak Prime power) based on air temp at fan 3 °C above ambient.

4012TAG

Maximum additional restriction (duct allowance) to cooling airflow (Prime power) and resultant minimum airflow					
Ambient Clearance 50% glycol		Duct Allowance mm H ₂ O		Min airflow m ³ /min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
52 °C	52 °C	15	-	1350	-

4012TAG1

Maximum additional restriction (duct allowance) to cooling airflow (Prime power) and resultant minimum airflow					
Ambient Clearance 50% glycol		Duct Allowance mm H ₂ O		Min airflow m ³ /min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
52 °C	52 °C	20	21	1872	1860

4012TAG2

Maximum additional restriction (duct allowance) to cooling airflow (Prime power) and resultant minimum airflow					
Ambient Clearance 50% glycol		Duct Allowance mm H ₂ O		Min airflow m ³ /min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
52 °C	52 °C	20	21	1872	1860

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 2

Jacket cooling water data	Units	1500 rev/min	1800 rev/min
Coolant flow 4012TAG	l/s	15.8	N/A
Coolant flow 4012TAG1/2	l/s	17.0	20.0
Coolant exit temperature (max)	°C	93	93
Coolant entry temperature (min)	°C	70	70
Coolant entry temperature (max) *	°C	85	85
Coolant entry temperature (max)**	°C	88	88

*4012TAG/2 **4012TAG1

Lubrication system

Recommended lubricating oil to conform with the specification of APICD or MIL - L - 2104C

Lubricating oil capacity:

Sump maximum157,5 litres

Sump minimum115 litres

Lubricating oil temperature maximum to bearings 105 °C

Lubricating oil pressure:

at 80 °C temperature to bearing gallery (minimum).....0.34 MPa

4012TAG

Oil consumption Prime Power	Units	1500 rev/min	1800 rev/min
After RUNNING - IN*	g/kWhr	0.52	-
Oil flow rate from pump	l/s	6.0	-

4012TAG1

Oil consumption Prime Power	Units	1500 rev/min	1800 rev/min
After RUNNING - IN*	g/kWhr	0.50	0.51
Oil flow rate from pump	l/s	6.0	7.20

4012TAG2

Oil consumption Prime Power	Units	1500 rev/min	1800 rev/min
After RUNNING - IN*	g/kWhr	0.51	0.52
Oil flow rate from pump	l/s	6.0	7.20

*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 1500 rev/min..... 6.0 litres/sec

Oil pump flow 1800 rev/min..... 7.20 litres/sec

Shutdown switch setting1.93 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 1-089
 Delivery/hour at 1500 rev/min ... 1020 litres
 Delivery/hour at 1800 rev/min ... 1230 litres
 Heat retained in fuel to tank 4012TAG... 8.5 kW
 Heat retained in fuel to tank 4012TAG1/2... 9.5 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... 1.631 kgm
 Static injection timing ... See engine number plate
 Tolerance on Fuel consumption... +5%

4012TAG

Fuel consumption gross				
Designation	g/kWh		Litres/hr	
	1500 rev/min	1800	1500	1800
At Standby Max power rating	207	-	294	-
At Prime Power rating	206	-	267	-
At Continuous Baseload rating	206	-	214	-
At 75% of Prime Power rating	199	-	194	-
At 50% of Prime Power rating	204	-	132	-
At 25% of Prime power rating	220	-	71	-

4012TAG1

Fuel consumption gross				
Designation	g/kWh		Litres/hr	
	1500 rev/min	1800	1500	1800
At Standby Max power rating	203	206	309	313
At Prime Power rating	199	202	276	280
At Continuous Baseload rating	197	199	218	221
At 75% of Prime Power rating	195	198	203	206
At 50% of Prime Power rating	194	199	134	138
At 25% of Prime power rating	207	212	72	73

4012TAG2

Fuel consumption gross				
Designation	g/kWh		Litres/hr	
	1500 rev/min	1800	1500	1800
At Standby Max power rating	206	209	345	350
At Prime Power rating	201	208	306	317
At Continuous Baseload rating	197	202	241	247
At 75% of Prime Power rating	197	204	225	233
At 50% of Prime Power rating	195	203	149	155
At 25% of Prime power rating	207	221	79	84

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 H₂O
 Dirty filter ... 380 mm H₂O
 Air filter type ... 4998.00.00 MF&T

Exhaust system

Maximum back pressure for total system

Designation	Units	1500 rev/min	1800 rev/min
4012TAG	mmH ₂ O	949	-
4012TAG1	mmH ₂ O	949	1091
4012TAG2	mmH ₂ O	612	745

Exhaust outlet flange size ... 2 x 254 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... 16.4 kW
 Number of teeth on flywheel ... 156
 Number of teeth on starter motor ... 12
 Minimum cranking speed at 0 °C ... 120 rev/min
 Pull in current of each starter motor solenoid (2off) ... 30 amps at 24 volts
 Hold in current of each starter motor solenoid (2off) ... 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 771 mm

Engine vertical centre line above crankshaft centre line 38 mm

Maximum additional load applied to flywheel due to all rotating components 850 kg

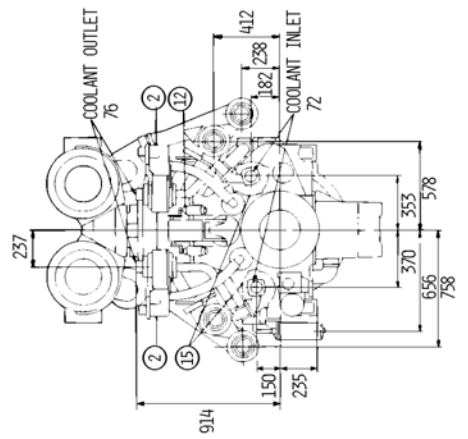
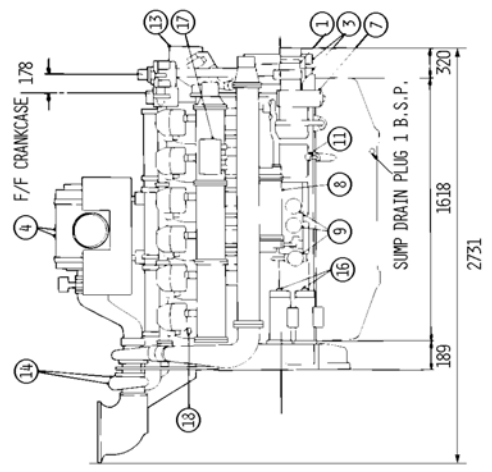
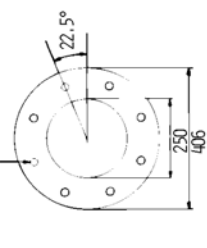
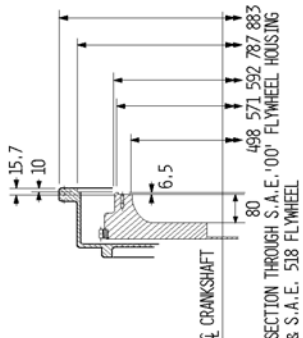
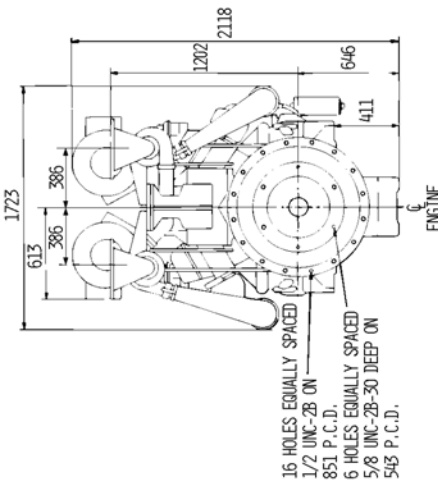
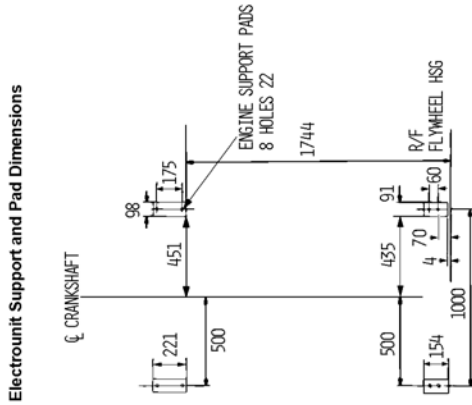
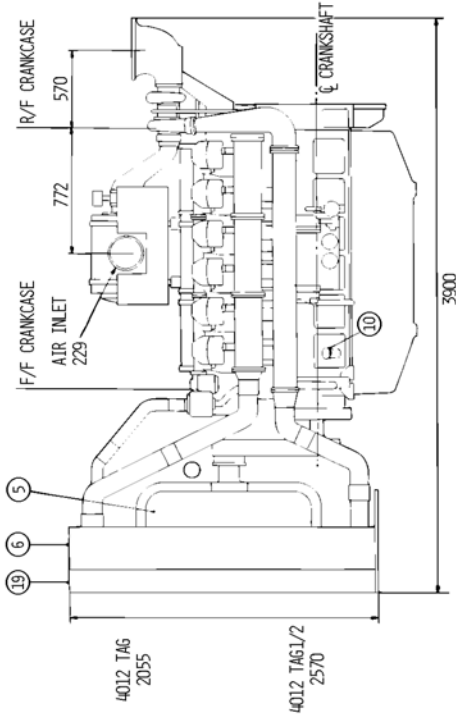
Starting Requirements

Temperature Range	
Range Down to 0 °C (32 °F)	Oil: SAE 30 Starter: 2 x 24V Battery: 4 x 12 volts x Ah 286 Max breakaway current: 1600 amps Cranking current: 810 amps Aids: Not necessary Starter cable size: 120 mm Maximum length: 6m

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.

TYPICAL ENGINE



ITEM	DESCRIPTION
1	ALTERNATOR
2	BREATHERS
3	DAMPERS
4	AIR CLEANERS
5	FAN
6	RADIATOR (COVRAD)
7	FUEL FILTER & SEPARATOR
8	OIL COOLER
9	LUBRICATING OIL FILTERS
10	OIL FILLER
11	DIPSTICK
12	STOP SOLENOID
13	GOVERNOR ACTUATOR
14	TURBOCHARGERS
15	COOLANT PUMPS
16	24V STARTER
17	GOVERNOR CONTROL BOX
18	FUEL LEAK OFF
19	CHARGE COOLER

4012TAG/4012TAG1/4012TAG2 DIESEL ENGINES

THIS DRAWING SHOWS APPROX DIMENSIONS ONLY. FOR INSTALLATION DETAILS, G.A. DRAWINGS MUST BE OBTAINED FROM PERKINS ENGINES COMPANY STAFFORD LTD A 52°C AIR AMBIENT RADIATOR CAN BE SUPPLIED AS AN OPTION.

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 level

Sound pressure level re: 20×10^{-6} pa

Speed 1500 rev/min.....Ambient noise level 75 d(B)A 4012TAG.

Speed 1800 rev/min.....Ambient noise level ---- d(B)A 4012TAG.

Speed 1500 rev/min.....Ambient noise level 84 d(B)A 4012TAG1/2.

Speed 1800 rev/min.....Ambient noise level 84 d(B)A 4012TAG1/2.

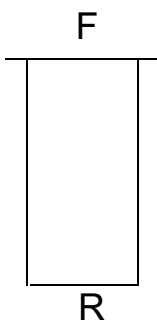
Octave analysis carried out at the position of maximum noise.

4012TAG

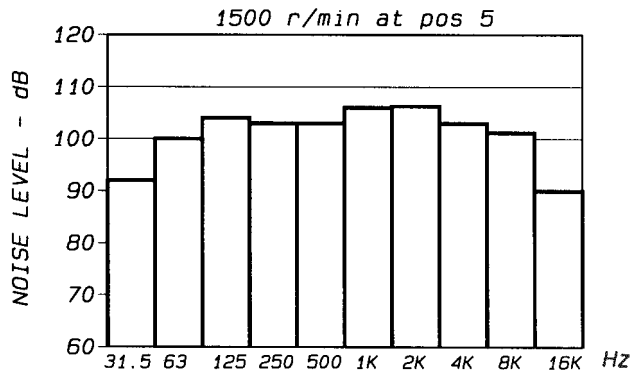
4012TAG2

4012TAG1

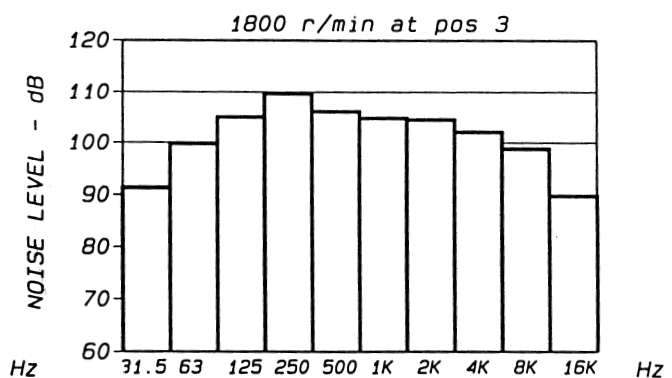
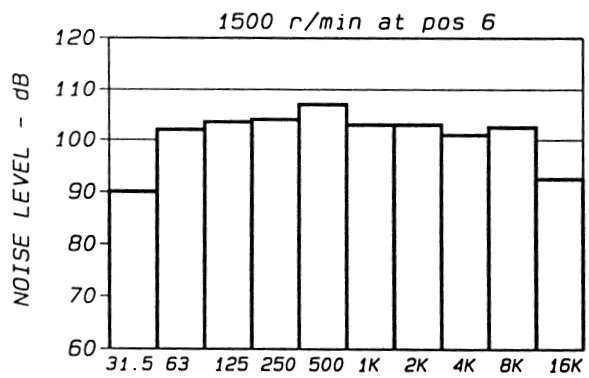
	POSITION 1	
	1500 rev/min 107 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 106 - d(B)A	4012TAG1
	1800 rev/min 107 - d(B)A	
	1500 rev/min 106 - d(B)A	4012TAG2
	1800 rev/min 107 - d(B)A	
	POSITION 2	
	1500 rev/min 110 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 108 - d(B)A	4012TAG1
	1800 rev/min 110 - d(B)A	
	1500 rev/min 108 - d(B)A	4012TAG2
	1800 rev/min 110 - d(B)A	
	POSITION 3	
	1500 rev/min 112 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 111 - d(B)A	4012TAG1
	1800 rev/min 111 - d(B)A	
	1500 rev/min 111 - d(B)A	4012TAG2
	1800 rev/min 111 - d(B)A	
	POSITION 4	
	1500 rev/min 111 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 111 - d(B)A	4012TAG1
	1800 rev/min 111 - d(B)A	
	1500 rev/min 111 - d(B)A	4012TAG2
	1800 rev/min 111 - d(B)A	
	POSITION 5	
	1500 rev/min 112 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 112 - d(B)A	4012TAG1
	1800 rev/min 111 - d(B)A	
	1500 rev/min 112 - d(B)A	4012TAG2
	1800 rev/min 111 - d(B)A	
	POSITION 6	
	1500 rev/min 112 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 112 - d(B)A	4012TAG1
	1800 rev/min 111 - d(B)A	
	1500 rev/min 112 - d(B)A	4012TAG2
	1800 rev/min 111 - d(B)A	
	POSITION 7	
	1500 rev/min 110 - d(B)A	4012TAG
	1800 rev/min ----- d(B)A	
	1500 rev/min 108 - d(B)A	4012TAG1
	1800 rev/min 110 - d(B)A	
	1500 rev/min 108 - d(B)A	4012TAG2
	1800 rev/min 110 - d(B)A	



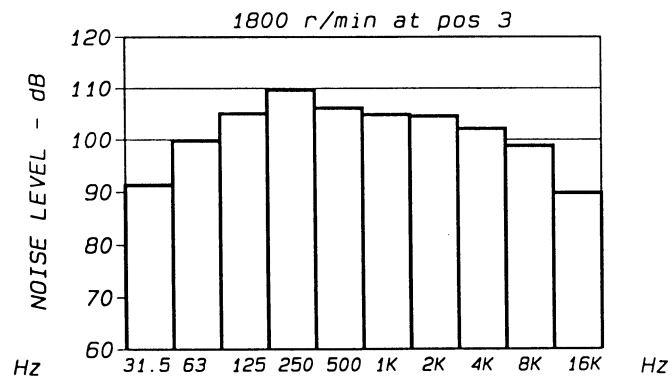
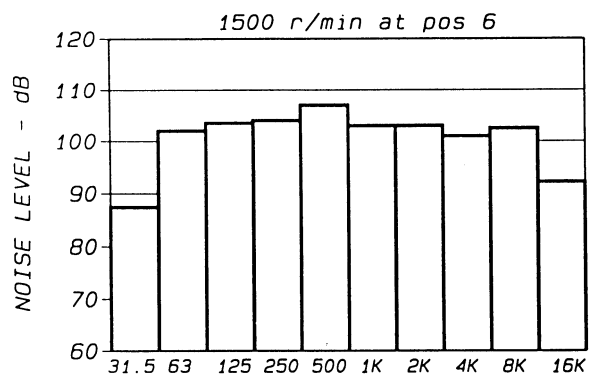
4012TAG



4012TAG1



4012TAG2



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

Notes

4000 Series

4012TAG 4012TAG1 4012TAG2



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