

# 4016TAG1A

1270 - 1741 kWm (Gross) @ 1500 rpm

# 4016TAG2A

1413 - 1937 kWm (Gross) @ 1500 rpm

# Electropak

# 4000

## Series

### Basic technical data

Number of cylinders .....16  
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 ..... 61.123 litres  
Direction of rotation..... Anti-clockwise viewed on flywheel  
Firing order 1A,1B,3A,3B,7A,7B,5A,5B,8A,8B,6A,6B,2A,2B,4A,4B  
Cylinder 1. .... furthest from flywheel  
Cylinders designated 'A' are on the left side of the engine when viewed from the front (opposite end to flywheel)

### Weight of Electrounit

#### Engine only

Dry .....5570 kg  
Wet .....5847 kg

### Overall dimensions

#### Engine only

Length..... 3302 mm  
Width ..... 1723 mm  
Height ..... 2128 mm

#### Moment of inertia

Engine..... 11.15 kgm<sup>2</sup>  
Flywheel..... 9.57 kgm<sup>2</sup>

#### Cyclic irregularity, engine/flywheel Prime power

4016TAG1A. .... 1.300  
4016TAG2A. .... 1.277

### 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 rpm  
Static injection timing ..... See engine number plate  
Cooling water exit temperature ..... < 98°C

#### Fuel data

To conform to BS2869 class A1, A2.

#### Performance

Sound pressure level 1500 rpm ..... 106 / 112 dB(A)

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

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 altitude are available.

#### 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

## General installation

### 4016TAG1A

Designation	Units	Baseload power	Prime Power	Standby power
Gross engine power	kWb	1270	1588	1741
Fan power	kWm		51	
Net engine power	kWm	1219	1537	1690
BMEP gross	bar	16.6	20.8	22.8
Combustion air flow	m <sup>3</sup> /min	107	132	140
Exhaust gas temperature, after turbo	°C	400	439	439
Exhaust gas flow maximum, after turbo	m <sup>3</sup> /min	252	343	343
Boost pressure ratio	-	3.0	3.3	3.5
Mechanical efficiency	%	88	91	92
Overall thermal efficiency	%	41	41	41
Friction power and pumping losses	kWm		160	
Mean piston speed	m/s		9.5	
Engine coolant flow (minimum)	l/s		19	
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kVA	1463	1844	2028
	kWe	1170	1476	1622
Assumed alternator efficiency	%		96	

### 4016TAG2A

Designation	Units	Baseload power	Prime Power	Standby power
Gross engine power	kWb	1413	1766	1937
Fan power	kW		51	
Net engine power	kWm	1362	1715	1886
BMEP gross	bar	18.5	23.1	25.4
Combustion air flow	m <sup>3</sup> /min	117	137	145
Exhaust gas temperature, after turbo	°C	450	493	493
Exhaust gas flow maximum, after turbo	m <sup>3</sup> /min	275	387	387
Boost pressure ratio	-	3.0	3.49	3.80
Mechanical efficiency	%	88	92	92
Overall thermal efficiency	%	41	40	40
Friction power and pumping losses	kWm		160	
Mean piston speed	m/s		9.5	
Engine coolant flow (minimum)	l/s		19	
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kVA	1634	2058	2263
	kWe	1307	1646	1811
Assumed alternator efficiency	%		96	

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

## 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.

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

## Energy balance

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

### 4016TAG1A

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kWt	3106	3846	4297
Energy in power output (gross)	kWb	1270	1588	1741
Energy to cooling fan	kWm	51		
Energy in power output (net)	kWm	1219	1537	1690
Energy to exhaust	kWt	947	1079	1276
Energy to coolant and oil	kWt	480	586	629
Energy to radiation	kWt	58	103	107
Energy to charge coolers	kWt	363	490	544

### 4016TAG2A

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kWt	3466	4361	4908
Energy in power output (gross)	kWb	1413	1766	1937
Energy to cooling fan	kWm	51		
Energy in power output (net)	kWm	1362	1716	1886
Energy to exhaust	kWt	1048	1245	1490
Energy to coolant and oil	kWt	517	660	721
Energy to radiation	kWt	68	130	150
Energy to charge coolers	kWt	420	560	610

## Cooling system

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

Nominal jacket water pressure in crankcase ... 170 kPa

The following is a guide based on ambient air conditions of 52°C on a Perkins supplied radiator.

### Total coolant capacity:

Engine only... 95 litres  
 ElectropaK (engine/radiator) ... 316 litres  
 Pressure cap setting ... 69 kPa  
 Fan ... Incorporated in radiator  
 Diameter... 1905 mm (pusher)  
 Ambient cooling clearance (open ElectropaK prime power) based on air temperature at fan 3°C above ambient.

Maximum additional restriction (duct allowance) to cooling airflow (Prime power applications) and resultant minimum airflow.

	Ambient clearance 50% glycol	Duct allowance mm H <sub>2</sub> O	Min airflow m <sup>3</sup> /sec
4016TAG1A	52°C	17	39.9
4016TAG2A	52°C	15	40.5

Coolant pump speed ... 1.4 x e rpm  
 Method of drive ... Gear driven  
 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 ... 101°C rising  
 Coolant immersion heater capacity ... 4 kW x 2

Jacket cooling water data	Units	
Coolant flow 4016TAG1/4016TAG2A	l/s	19
Coolant exit temperature (max)	°C	98
Coolant entry temperature (min)	°C	70
Coolant entry temperature (max)	°C	80

## Lubrication system

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

### Lubricating oil capacity

Sump maximum ... 214 litres  
 Sump minimum ... 147 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

Oil consumption Prime power	Units	4016TAG1A	4016TAG2A
After running-in <sup>1</sup>	g/kWhr	0.50	0.52
Oil flow rate from pump	l/s	6.70	6.70

1. Typical after 250 hours

Sump drain plug tapping size ... G1  
 Oil pump speed and method of drive ... 1.4 x e rpm, gear driven  
 Oil pump flow ... 6.70 litres/sec  
 Shutdown switch setting ... 1.93 bar falling

### Normal operating angles

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

## Fuel system

Recommended fuel to conform to:

... BS2869 1998 Class A2, 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 rpm ... 1380 litres  
 Heat retained in fuel to tank ... 12 kW  
 Temperature of fuel at lift pump to be less than ... 58°C  
 Fuel lift pump pressure ... 300 kPa  
 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 ... To ISO 8528-1 1993

## Fuel consumption Gross

### 4016TAG1A

Designation	g/kWh	Litres/hr
At Standby Max power rating	207	424
At Prime Power rating	205	383
At Continuous Baseload rating	199	297
At 75% of Prime Power rating	198	277
At 50% of Prime Power rating	198	185
At 25% of Prime Power rating	218	102

**Note:** All figures based on gross mechanical output, for fuel consumption based on electrical output of the generating set contact your OEM.

### 4016TAG2A

Designation	g/kWh	Litres/hr
At Standby Max power rating	212	483
At Prime Power rating	209	434
At Continuous Baseload rating	205	341
At 75% of Prime Power rating	203	316
At 50% of Prime Power rating	202	210
At 25% of Prime Power rating	212	110

**Note:** All figures based on gross mechanical output, for fuel consumption based on electrical output of the generating set contact your OEM.

## Induction system

### Maximum air intake restriction of engine

Clean filter ... 127 mm H<sub>2</sub>O  
 Dirty filter ... 380 mm H<sub>2</sub>O  
 Air filter type. ... MF&T 5000-00-00

## Exhaust system

### Maximum back pressure for total system

4016TAG1A. ... 949 mm H<sub>2</sub>O  
 4016TAG2A. ... 673 mm H<sub>2</sub>O  
 Exhaust outlet flange size ... 2 x 254 mm (table 'D')  
 For recommended pipe sizes, refer to the Installation Manual.

## Electrical system

Type ... Insulated return  
 Alternator ... 24 volts with integral regulator  
 Alternator output ... 55 amps, 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 (0°C) ... 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  
 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 ... 1117 mm  
 Engine vertical centre line above crankshaft centre line ... 50 mm  
 Maximum additional load applied to flywheel due to all rotating components ... 850 Kg

## Starting requirements

### Temperature range down to 0°C (32 °F)

Oil ... API CG4 15W/40  
 Starter ... 2 x 24V  
 Battery ... 4 x 12 volts x 286 Ah  
 Max breakaway current ... 2000 amps  
 Cranking current ... 957 amps  
 Aids ... Not necessary  
 Starter cable size ... 120 mm<sup>2</sup>  
 Maximum length ... 6 m

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

## Typical load acceptance (cold)

### 4016TAG1A

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 (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds
67	1031/990	≤-10	5	33	505 / 486	≤-10	5

### 4016TAG2A

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 (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds
57	977 / 938	≤-10	5	43	738 / 708	≤-10	5

The above complies with the 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 . . . . . 96%

Minimum ambient temperature ... .. 10°C

Isochronous governing

Under frequency roll off (UFRO) set to ... .. 1 Hz below rated frequency

Typical alternator inertia ... .. 50 Kgm<sup>2</sup>

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

## 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

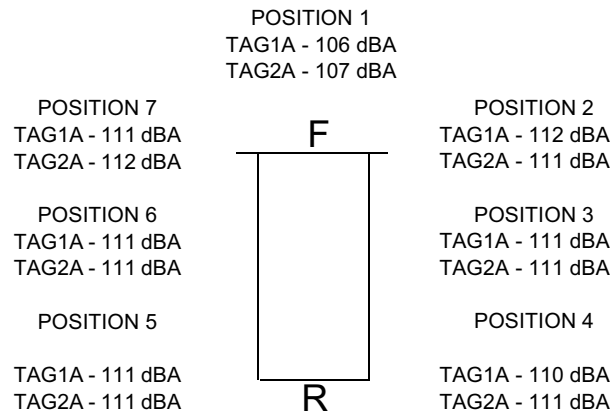
The following histograms show an octave band analysis at the position of the maximum noise level.

### Total noise level

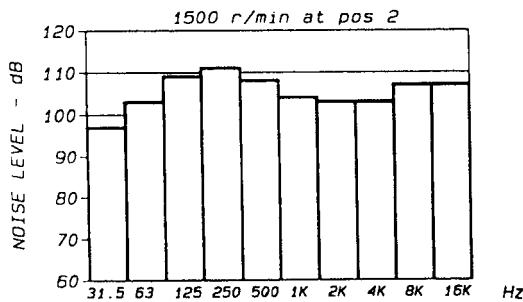
Sound pressure level... ..re:  $-20 \times 10^{-6}$  pa  
 Speed 1500 rpm... .. Ambient noise level 75 dB(A) 4016TAG1

## Octave analysis performed at the position of maximum noise

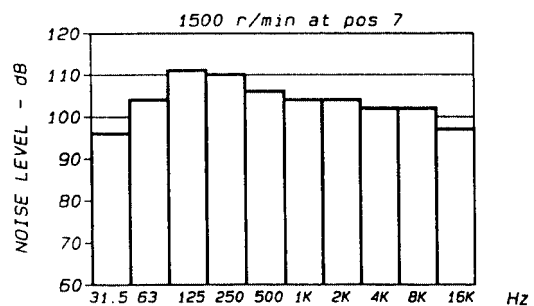
### 4016TAG1A/ 4016TAG2A



4016TAG1A



4016TAG2A



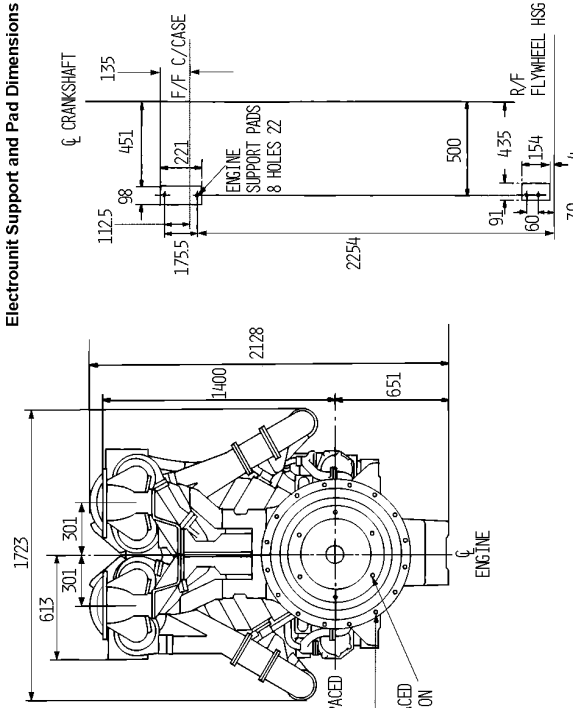
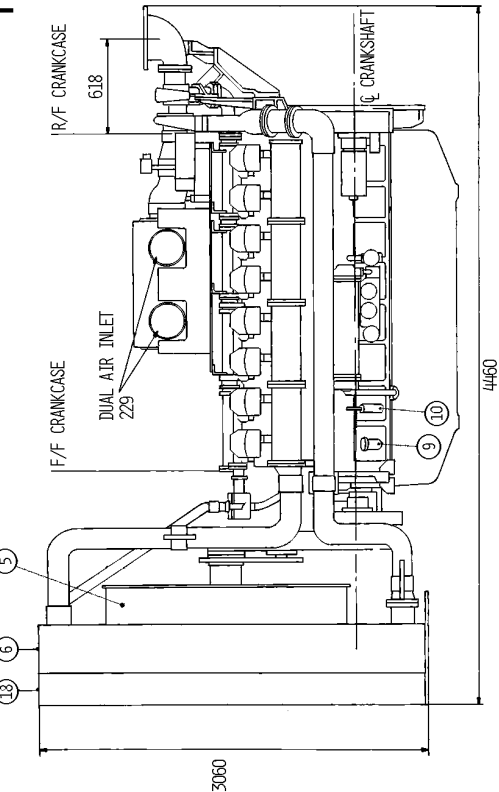
The information given on this technical data sheet are for standard ratings only. For ratings other than shown, please contact Perkins Engines Company Limited, Stafford.

### 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 Engines Company Limited recommendations.

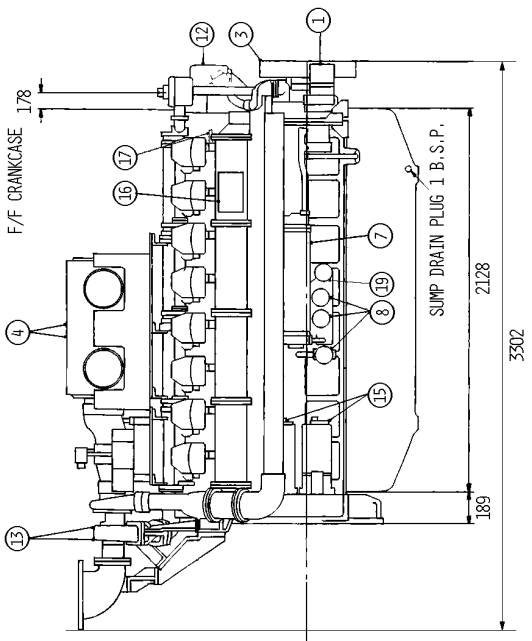
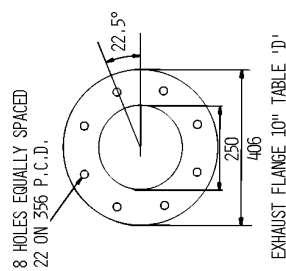
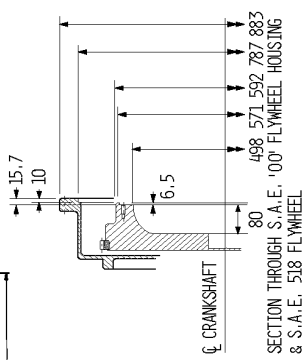
The information given on this Technical Data Sheet is for standard engines, and for guidance only. For ratings other than shown contact the Applications department.

# TYPICAL ENGINE



16 HOLES EQUALLY SPACED  
1/2 UNC-28 ON  
851 P.C.D.

6 HOLES EQUALLY SPACED  
5/8 UNC-28 30 DEEP ON  
543 P.C.D.



## Electromit Support and Pad Dimensions

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

## 4016TAG1A/4016TAG2A 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.

DIM 021





