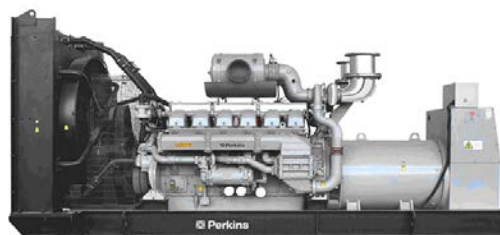


DATA SHEET

DIESEL GENERATOR 2000KW
MODEL#FDK-P2000/H1
50HZ/1500RPM
PERKINS MODEL: 4016-61TRG3



General Features:

- ♦ All qualified generator sets are subjected to a comprehensive performance test which includes 50% load, 70% load, 100% load, 110% load and to check, verify that all control systems, alarm and shut-down protection.
- ♦ Equipped with battery charger and 24V high performance maintenance-free lead-acid starting batteries and connecting cables.
- ♦ Stainless galvanized zinc plates with strong corrosion-proof.
- ♦ Vibration isolators between the engine/alternator and base frame.
- ♦ Equipped with industrial silencer and flexible exhaust hose.
- ♦ Designed to comply with ISO8528/GB2820.
- ♦ Powered by Perkins engine and coupled with Stamford alternator.
- ♦ Water jacket preheater, oil heater and double air cleaner, etc. are available.

FDK Diesel Generator Set Data

| | |
|--------------------------------|----------------|
| Genset Model | FDK-P2000/H1 |
| Prime Power | 1800KW/2250KVA |
| Standby Power | 2000KW/2500KVA |
| Output Frequency / Rated speed | 50Hz/1500rpm |
| Rated Voltage | 230V/400V |

| | |
|------------------|-----------------|
| Engine Make | Perkins UK |
| Engine Model | 4016-61TRG3 |
| Alternator model | Stamford PI734G |
| Control System | DSE7320 |
| Phase | Three |

(1) **Prime power:** The rating is available for an unlimited of annual operating hours in variable load applications, in accordance with ISO8528-1.A 10% overload is available for a period of 1 hour within 12-hour period of operation, in accordance with ISO 3046-1.

(2) **Standby power:** The rating is applicable for supplying emergency power in variable load applications for up to 200 hours per year in accordance with ISO8528-1. Overload is not allowed.

(3) **Rated voltage:** available with customer requirement.

Engine Specifications (DETAILED in APPENDIX)

| | |
|----------------------|---------------|
| Engine Model | 4016-61TRG3 |
| Engine Manufacturer | Perkins UK |
| Cylinder quantity | 16 |
| Cylinder Arrangement | Vee 60° |
| Cycle | 4 |
| Aspiration | Turbo charged |

| | |
|-------------------------------|-------------|
| Bore x Stroke (mm x mm) | 160x190 |
| Displacement | 61.123 L |
| Compression Ratio | 13:1 |
| Prime power / Speed (KW/RPM) | 1975kw/1500 |
| Standby power/ Speed (KW/RPM) | 2183kw/1500 |
| Governor type | Electronic |



ISO9001:2008

FDK reserves the right to change the specifications and designs without notice.

| | |
|---------------------------------------|--------|
| Piston Speed | 9.5m/s |
| Typical genset electrical output | 1800kw |
| Total Lubrication System Capacity (L) | 213 |
| Total Coolant Capacity (L) | 316 |

| | |
|--|--------------------|
| Fuel Consumption at 100% load (L/HOUR) | 473 at rated speed |
| Starter motor | 24V |
| Alternator | 24V |
| Minimum cranking speed. | 120 rpm |

Alternator Specifications

| | |
|--------------------------|---|
| Alternator model | PI734G |
| Alternator manufacturer | STAMFORD |
| Exciter type | Single bearing, Brushless, Self-excited |
| Rated output prime power | 2200KVA |
| Rated speed | 1500 rpm |
| Rated frequency | 50Hz |

| | |
|--------------------------|---|
| Number of phase | 3 |
| Rated voltage | 400V (Available with custom requirements) |
| Power factor | 0.8 |
| Voltage regulation NL-FL | ±1% |
| Insulation grade | H |
| Protection grade | IP23 |

Alternator option: Leroy Somer, MECC, Marathon, Engga, Faraday

Control System DSE7320 (DETAILED in INSTRUCTION)

DSE7320 is an advanced control module based on micro-processor, containing all necessary functions for protection of the genset and the breaker control. It can monitor the mains supply, breaker control and automatically start the engine when the mains are abnormal. Accurately measure various operational parameters and display all values and alarms information on the LCD. In addition, the control module can automatically shut down the engine and indicate the engine failure.

FEATURES

- ◆ Microprocessor control, with high stability and credibility.
- ◆ Monitoring and measuring operational parameters of the mains supply and genset.
- ◆ Indicating operation status, fault conditions, all parameters and alarms.
- ◆ Multiple protections; multiple parameters display, like pressure, temp. etc.
- ◆ Manual, automatic and remote work mode selectable.
- ◆ Real time clock for time and date display, overall runtime display, 250 log entries.
- ◆ Overall power output display.
- ◆ Integral speed/frequency detecting, telling status of start, rated operation, overspeed etc.
- ◆ Communication with PC via RS485 OR RS232 interface, using MODBUS protocol.

Soundproof Enclosure Specification

FDK silent generator is designed by professional acoustic engineers based on years of experience. Now we can make the noise of the generator less than 80-85dB(A) at 1m, or 70-75dB(A) at 7m, 60-65dB(A) at 15m.

FEATURES

- ◆ Multi-way air intake and exhaust guarantee the power performance of the generator.
- ◆ Large-scale impedance combined type silencer effectively reduce noise of the generator.
- ◆ Internal high performance rubber damper and flexible materials reduce vibration.
- ◆ Base mounted fuel tank supports the generator running for 8 hours.



ISO9001:2008

FDK reserves the right to change the specifications and designs without notice.

Optional

| Generator set | Alternator | Low environment Temp | ATS |
|---|---|---|--|
| <input type="checkbox"/> Open generator set <input type="checkbox"/> Silent generator set <input type="checkbox"/> Trailer generator set <input type="checkbox"/> ABB MCCB circuit breaker | <input type="checkbox"/> Stamford <input type="checkbox"/> Marathon <input type="checkbox"/> Mecc Alte <input type="checkbox"/> Leroy Somer <input type="checkbox"/> Farady <input type="checkbox"/> Engga | <input type="checkbox"/> Water heater <input type="checkbox"/> Oil heater <input type="checkbox"/> Battery heater | <input type="checkbox"/> CHINT <input type="checkbox"/> SCHNEIDER <input type="checkbox"/> ABB |
| Fuel system | Control system | Voltage | Synchronized system |
| <input type="checkbox"/> 12hrs base tank <input type="checkbox"/> 24hrs base tank <input type="checkbox"/> Dual wall base fuel tank <input type="checkbox"/> Outside fuel tank | <input type="checkbox"/> AMF function <input type="checkbox"/> ATS control cabinet <input type="checkbox"/> DSE7320 <input type="checkbox"/> DSE7510 <input type="checkbox"/> GU620A | <input type="checkbox"/> 415/240V <input type="checkbox"/> 400/230V <input type="checkbox"/> 380/220V <input type="checkbox"/> 220/127V <input type="checkbox"/> 200/115V | <input type="checkbox"/> CHINT Cabinet <input type="checkbox"/> SCHNEIDER Cabinet <input type="checkbox"/> DSE8610 Module <input type="checkbox"/> COMAQ Module <input type="checkbox"/> DEIF Module |

Dimension & Weight

Open

| | |
|-----------------------------|----------------|
| Overall Size: LxWxH (mm) | 7000x2300x2800 |
| Weight (kg) | 9800 |

Soundproof Version

| | |
|-----------------------------|----------------|
| Overall Size: LxWxH (mm) | 40FT Container |
| Weight (kg) | 13500 |

Sales Promises

- ◆ FDK provides a full line of brand new and high quality products. Each and every unit is strictly factory tested before shipment.
- ◆ Quality warranty is according to our standard conditions: 12 months from BL date or 1000 running hours, whichever comes first.
- ◆ Service and parts are available from FDK or distributors in your location.
- ◆ FDK guarantee use **BRAND NEW & GENUINE MACHINE.**



Technical Data

4000 Series

Diesel Engine

4016-61TRG1

4016-61TRG2

4016-61TRG3

1500 rev/min

Basic technical data

Number of cylinders 16
 Cylinder arrangement 60° Vee
 Cycle 4 stroke
 Induction system turbocharged, air to water charge cooled
 Combustion system direct injection
 Compression ratio 13:1
 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

Total weight of Electrounit

Engine
 - dry 5570 kg
 - wet 5847 kg
 Overall dimensions of electrounit
 Height 2128 mm
 Length 3302 mm
 Width 1723 mm

Centre of Gravity (all engines)

Forward of rear face of cylinder block 900
 Above crankshaft centre line 50

Moment of inertia (mk²)

-engine 11.15 kgm²
 -flywheel 9,57 kgm²

Cyclic irregularity for engine/flywheel

-4016-61TRG1 1:290
 -4016-61TRG2 1:277
 -4016-61TRG3 1:260

Ratings

Electrical ratings are based on average alternator efficiency and are for guidance only. (0.8 power factor being used).

Operating point

Engine speed 1500 rev/min
 Inlet manifold mixture temperature 45 °C
 Cooling water exit temperature < 98 °C

Fuel data

To conform to BS2869 class A2 or BS EN590

Performance

Steady state speed stability at constant load ± 0,25%
 All data based on operation to ISO 3046/1, BS 5514 and DIN 6271 standard reference conditions.
 Governing type Digital speed governor

Noise

Estimated sound pressure level no inlet or exhaust at 1 m
 -4016-61TRG1 110 d(B)A
 -4016-61TRG2 111 d(B)A
 -4016-61TRG3 112 d(B)A

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 at maximum power (nominal) 3 kPa
 -fuel temperature (inlet pump) 58 °C Max.

General installation 4016-61TRG1

| Designation | Units | Baseload | Prime | Standby |
|--|---------------------|----------|-------|---------|
| Gross engine power | kWm | 1269 | 1648 | 1774 |
| Fan and battery charging alternator power | kW | 90 | | |
| Net engine power | kWm | 1179 | 1558 | 1684 |
| Brake mean effective pressure | kPa | 1661 | 2157 | 2322 |
| Combustion air flow | m ³ /min | 122 | 155 | 165 |
| Exhaust gas temperature maximum after turbocharger | °C | 375 | 400 | 420 |
| Exhaust gas flow (max) | m ³ /min | 400 | | |
| Boost pressure ratio | :1 | 3.62 | | |
| Mechanical efficiency | % | 94.0 | | |
| Overall thermal efficiency (net) | % | 41.5 | 41.5 | 41.5 |
| Friction and pumping power losses | kWm | 160 | | |
| Mean piston speed | m/s | 9.5 | | |
| Engine coolant flow - minimum | l/s | 23 | | |
| Typical GenSet electrical output (0.8pf) | kVA | 1400 | 1850 | 2000 |
| | kWe | 1120 | 1480 | 1600 |
| Assumed alternator efficiency | % | 95 | | |

General installation 4016-61TRG2

| Designation | Units | Baseload | Prime | Standby |
|--|---------------------|----------|-------|---------|
| Gross engine power | kWm | 1437 | 1774 | 1985 |
| Fan and battery charging alternator power | kW | 90 | | |
| Net engine power | kWm | 1347 | 1684 | 1895 |
| Brake mean effective pressure | kPa | 1881 | 2322 | 2598 |
| Combustion air flow | m ³ /min | 131 | 158 | 175 |
| Exhaust gas temperature maximum after turbocharger | °C | 425 | 457 | 489 |
| Exhaust gas flow (max) | m ³ /min | 490 | | |
| Boost pressure ratio | :1 | 3.91 | | |
| Mechanical efficiency | % | 94.0 | | |
| Overall thermal efficiency (net) | % | 41 | 41 | 41 |
| Friction and pumping power losses | kWm | 160 | | |
| Mean piston speed | m/s | 9.5 | | |
| Engine coolant flow - minimum | l/s | 23 | | |
| Typical GenSet electrical output (0.8pf) | kVA | 1600 | 2000 | 2250 |
| | kWe | 1280 | 1600 | 1800 |
| Assumed alternator efficiency | % | 95 | | |

General installation 4016-61TRG3

| Designation | Units | Baseload | Prime | Standby |
|--|---------------------|----------|-------|---------|
| Gross engine power | kWm | 1600 | 1975 | 2183 |
| Fan and battery charging alternator power | kW | 100 | | |
| Net engine power | kWm | 1500 | 1875 | 2083 |
| Brake mean effective pressure | kPa | 2094 | 2585 | 2857 |
| Combustion air flow | m ³ /min | 135 | 160 | 175 |
| Exhaust gas temperature maximum after turbocharger | °C | 460 | 475 | 560 |
| Exhaust gas flow (max) | m ³ /min | 490 | | |
| Boost pressure ratio | :1 | 4 | | |
| Mechanical efficiency | % | 94.0 | | |
| Overall thermal efficiency (net) | % | 40 | 40 | 40 |
| Friction and pumping power losses | kWm | 160 | | |
| Mean piston speed | m/s | 9.5 | | |
| Engine coolant flow - minimum | l/s | 23 | | |
| Typical GenSet electrical output (0.8pf) | kVA | 1800 | 2250 | 2500 |
| | kWe | 1440 | 1800 | 2000 |
| Assumed alternator efficiency | % | 96 | | |

Notes:

- All quoted gross engine powers include an allowance of 1.5% for installation variances
- Not to be used for CHP design purposes (indicative figures only). Consult Perkins Engines Stafford Limited. Assumes complete combustion.

Rating definitions

Baseload power

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

Prime power

Variable load. 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.

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.

Emission capability

All 4016-61TRG ratings are optimised to "Best Fuel Consumption" and do not comply to harmonised International regulation emission limit. More information on these statements can be obtained by contacting the applications department at Perkins Engines Co Ltd.

Energy balance

4016-61TRG1

| Designation | Units | Baseload power | Prime power | Standby power |
|--------------------------------|-------|----------------|-------------|---------------|
| Energy in fuel | kWt | 3082 | 4104 | 4415 |
| Energy in power output (gross) | kWb | 1269 | 1648 | 1792 |
| Energy to cooling fan | kWm | 90 | | |
| Energy in power output (net) | kWm | 1179 | 1558 | 1702 |
| Energy to exhaust | kWt | 900 | 1149 | 1225 |
| Energy to coolant and oil | kWt | 480 | 620 | 666 |
| Energy to radiation | kWt | 90 | 117 | 131 |
| Energy to charge cooler | kWt | 343 | 570 | 601 |

4016-61TRG2

| Designation | Units | Baseload power | Prime power | Standby power |
|--------------------------------|-------|----------------|-------------|---------------|
| Energy in fuel | kWt | 3567 | 4420 | 4939 |
| Energy in power output (gross) | kWb | 1437 | 1774 | 1985 |
| Energy to cooling fan | kWm | 90 | | |
| Energy in power output (net) | kWm | 1347 | 1684 | 1895 |
| Energy to exhaust | kWt | 1030 | 1240 | 1380 |
| Energy to coolant and oil | kWt | 535 | 670 | 750 |
| Energy to radiation | kWt | 110 | 130 | 139 |
| Energy to charge cooler | kWt | 455 | 606 | 685 |

4016-61TRG3

| Designation | Units | Baseload power | Prime power | Standby power |
|--------------------------------|-------|----------------|-------------|---------------|
| Energy in fuel | kWt | 4022 | 4951 | 5458 |
| Energy in power output (gross) | kWb | 1600 | 1975 | 2183 |
| Energy to cooling fan | kWm | 100 | | |
| Energy in power output (net) | kWm | 1500 | 1875 | 2083 |
| Energy to exhaust | kWt | 1136 | 1400 | 1535 |
| Energy to coolant and oil | kWt | 614 | 757 | 830 |
| Energy to radiation | kWt | 117 | 135 | 160 |
| Energy to charge cooler | kWt | 555 | 684 | 750 |

Note: Not to be used for CHP design purposes (indicative figures only). Consult Perkins Engines Company Limited.

Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For CHP 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

Maximum pressure in crankcase water jacket ... 170 kPa
 Maximum top tank temperature (standby) ... 98°C
 Maximum static pressure on pump ... 70 kPa

Total jacket coolant capacity

Electrounit (engine only) ... 95 litres
 Maximum permissible restriction to coolant pump flow... 30 kPa
 Thermostat operating range... 71 - 85°C
 Ambient cooling clearance (standby power) based on air temperature at fan of 6°C above the ambient ... dependent on radiator selection

Temperature rise across the engine (standby power) with Inhibited coolant @ 1500 rev/min ... 5 - 9°C depending on rating
 Coolant temperature shutdown switch setting ... 101°C Rising
 Coolant immersion heater capacity (2 of) ... 4 kWe each

Water jacket cooling data

Coolant flow ... 21 l/s
 Coolant exit temperature (Max.) ... 98°C
 Coolant inlet temperature (Min.) ... 70°C
 Coolant inlet temperature (Max.) ... 80°C
 Water jacket coolant pump

Speed ... 1.4 x e rev/min
 Method of drive ... engine driven

Secondary water circuit

Coolant flow ... 12 l/s
 Maximum permissible restriction to coolant pump flow... 30 kPa
 Coolant exit temperature (Max.) ... dependent on ambient
 Coolant inlet temperature (Min.) ... 10°C
 Coolant inlet temperature (Max.) ... refer to derate charts

Lubrication system

Recommended SAE viscosity:
 Multigrade oil conforming to the following must be used API CG 15W/40 CH4.

Note: For additional notes on lubricating oil specifications, refer to the OMM manual.

Total system capacity

Maximum sump capacity ... 213 litres
 Minimum sump capacity ... 157 litres
 Oil temperature at normal operating conditions ... 95°C
 Oil temperature (in rail) maximum continuous operation ... 105°C

Lubricating oil pressure

At rated speed ... 400 kPa
 Minimum @ 80°C... 340 kPa
 Oil filter screen spacing... 40 microns
 Sump drain plug tapping size ... G1
 Oil pump speed and drive method ... 1.4 x e r/min engine driven
 Shutdown switch - pressure setting ... 193 kPa Falling

Oil consumption

Prime power after running in (typically after 250 hours) 0.52 g/kWhr
 Oil flow rate from pump ... 6.7 litres / sec

Fuel system

Recommended fuel to conform to ..BSEN590 or BS2869 Class A2

Injection system... direct
 Fuel injection pump ... Combined unit injector
 Injector pressure... 140 Mpa
 Lift pump type... Tuthill TCH 5
 Fuel delivery ... 1380 l/hr
 Heat retained in fuel to tank ... 14 kW
 Fuel inlet temperature to be less than ... 58°C
 Maximum suction head at pump inlet... 2.5 m
 Maximum static pressure head ... see manual
 Fuel filter spacing ... 10 microns
 Governor type... Electronic
 Governing to ... ISO 8528-5 2004
 Torque at the governor output shaft ... 1.631 kgm
 Tolerance on fuel consumption to ... ISO 8528-1 1993

Fuel consumption

Note: Fuel consumption calculated on gross rated powers, based on an assumed density of 0.862.

4016-61TRG1

| | g/kWh | l/hr |
|-----------------------|-------|------|
| Standby | 201 | 414 |
| Prime power | 201 | 385 |
| Base load power | 206 | 303 |
| At 75% of prime power | 209 | 300 |
| At 50% of prime power | 207 | 198 |
| At 25% of Prime power | 230 | 110 |

4016-61TRG2

| | g/kWh | l/hr |
|-----------------------|-------|------|
| Standby | 207 | 477 |
| Prime power | 205 | 421 |
| Base load power | 205 | 344 |
| At 75% of prime power | 206 | 337 |
| 337 | 210 | 216 |
| At 25% of Prime power | 225 | 116 |

4016-61TRG3

| | g/kWh | l/hr |
|-----------------------|-------|------|
| Standby | 209 | 528 |
| Prime power | 205 | 473 |
| Base load power | 200 | 373 |
| At 75% of prime power | 200 | 346 |
| At 50% of prime power | 204 | 235 |
| At 25% of Prime power | 220 | 127 |

Induction system

Maximum air intake restriction of engine:

| | |
|-----------------------|-----------|
| Clean filter | 1.24 kPa |
| Dirty filter | 3.71 kPa |
| Air filter type | Donaldson |

Exhaust system

| | |
|--------------------------------------|-----------------|
| Exhaust outlet size (internal) | 2 x 254 mm |
| Exhaust outlet flange size | 10 inch table D |
| Back pressure for total system | 4 kPa |

Electrical system

| | |
|--|----------------------|
| Voltage | 24 |
| Alternator type | Insulated return |
| Alternator output | 40 amps |
| Starter type | 2 X 24 Volt electric |
| Starter motor power | 16.4 kW |
| Number of teeth on flywheel (may change with flywheel) | 156 |
| Number of teeth on starter pinion | 12 |
| Minimum cranking speed | 120 rev/min |
| Starter solenoid pull-in current @ -25 °C Max | 30 amps |
| Starter solenoid hold-in current @ -25 °C Max | 9 amps |
| Stop solenoid hold-in current | 1.1 amps |

Cold start recommendations

Down to 0 °C

| | |
|-----------------------------------|-----------------------------|
| Oil | SAE grade API CG 15W/40 CH4 |
| Starter type | 2 x 24V |
| Battery | 4 x 12V x 286Ah |
| Max breakaway current | 2000 amps |
| Cranking current | 957 amps |
| Minimum mean cranking speed | 120 rev/min |
| AIDS | Block heaters |

Notes:

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

Mountings

Maximum static bending moment at rear face of block .. 1356 Nm

Typical load acceptance

| Initial load application - when engine reaches rated speed (15 seconds max after engine starts to crank) | | | | 2nd load step after speed recovery | | | |
|---|-----------------------|---------------------------------------|---------------------------------------|------------------------------------|--------------|---------------------------------------|---------------------------------------|
| Prime Power % | load kWm nett/ kWe | Transient frequency deviation % | Frequency recovery time seconds | Prime Power % | load kWm/kWe | Transient frequency deviation % | Frequency recovery time seconds |
| 4016-61TRG1 | | | | | | | |
| 63 | 985/936 | ≤ -10 | 5 | 37 | 573/544 | ≤ -10 | 5 |
| 4016-61TRG2 | | | | | | | |
| 58.5 | 985/936 | ≤ -10 | 5 | 41.5 | 700/644 | ≤ -10 | 5 |
| 4016-61TRG3 | | | | | | | |
| 52 | 985/936 | ≤ -10 | 5 | 48 | 900/864 | ≤ -10 | 5 |

The figure shown in the tables above were obtained under the following test conditions

Engine block temperature (cold)45°C
 Ambient temperature25°C
 Governing mode Isochronous
 Alternator inertia 55 kgm
 Under frequency roll off (UFRO) point set to49.5 Hz
 UFRO rate set to 16 V/Hz
 LAM on /off. On

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

Noise levels

The figures for total noise levels are typical for an engine running at the continuous baseload power rating in a semi-reverberant environment and measured at a distance of one metre from the periphery of the engine (sound pressure level re: -20×10^{-6} pa).

Ambient noise level 78 dBA

Octave analysis

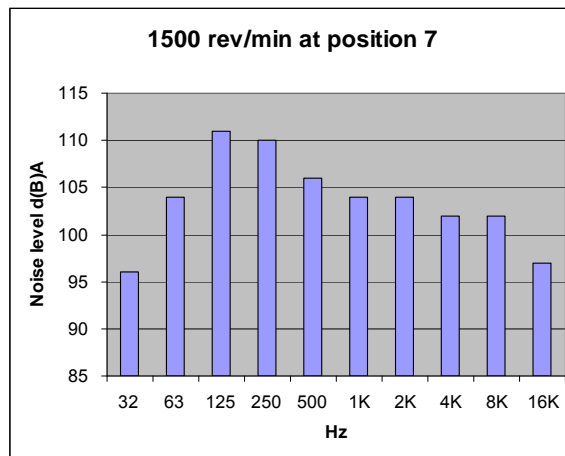
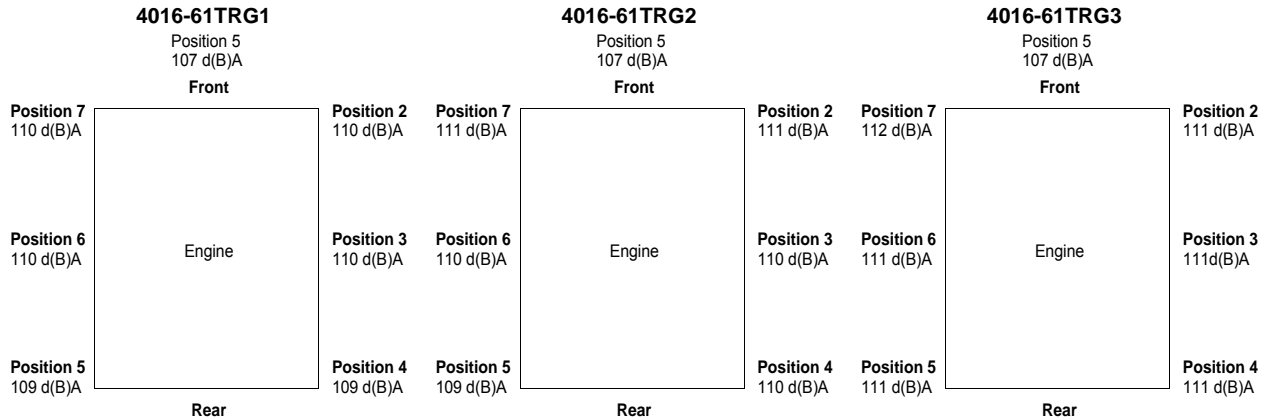
The following histograms show an octave band analysis at the position of the maximum noise.

Total noise level

Sound pressure level re: -20×10^{-6}

Speed 1500 rev/min ambient noise level 75 d(B)A

Octave analysis performed at the position of maximum noise.



The information given on this Technical Data Sheet is for guidance only.
For ratings other than those shown, please contact Perkins Engines Company Limited.