

4016-61TRG1 4016-61TRG2 4016-61TRG3

4000

Series

1269 - 2074 kWm (Gross) @ 1500 rpm

Emissions compliant

Electronit

Basic technical data

Number of cylinders	16
Cylinder arrangement	60° Vee
Cycle	4 stroke
Induction system	Turbocharged
Combustion system	Direct injection
Compression ratio	13:1
Bore	160 mm
Stroke	190 mm
Cubic capacity	61.123 litres
Direction of rotation	Anticlockwise viewed on flywheel
Firing order	1 ^A , 1 ^B , 3 ^A , 3 ^B , 7 ^A , 7 ^B , 5 ^A , 5 ^B , 8 ^A , 8 ^B , 6 ^A , 6 ^B , 2 ^A , 2 ^B , 4 ^A , 4 ^B
Cylinder 1	Furthest from flywheel

Note: Cylinders designated 'A' are on the right hand side of the engine when viewed from the flywheel end.

Weight of Electronit (engine only)

Dry	5570 kg
Wet	5847 kg

Overall dimensions of Electronit

Height	2068 mm
Length	3350 mm
Width	1652 mm

Centre of gravity

Forward of rear face of cylinder block	900 mm
Above crankshaft centre line (wet)	50 mm

Moments of inertia

Engine	11.15 kgm ²
Flywheel	9.57 kgm ²

Cyclic irregularity, engine/flywheel Prime power

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

Ratings

Steady state speed stability at constant load $\pm 0.25\%$
Electrical ratings are based on average alternator efficiency and are for guidance only (0.8 power factor being used).

Operating point

Engine speed	1500 rpm
Inlet manifold mixture temperature	45°C
Cooling water exit temperature	< 98°C

Fuel data

To conform to BS2869 class A2 or BS EN590.

Performance

Sound pressure level 1500 rpm

4016-61TRG1	110 dB(A)
4016-61TRG2	111 dB(A)
4016-61TRG3	112 dB(A)

Note: All data based on operation to ISO 3046/1, BS 5514 and DIN 6271 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 kPa
Relative humidity	50%
Air inlet restriction at maximum power (nominal)	2.5 kPa
Exhaust back pressure (nominal)	3 kPa
Fuel temperature (inlet pump)	58°C maximum



General installation

4016-61TRG1

Designation	Units	Baseload power	Prime power	Standby power
Gross engine power	kWb	1269	1648	1774
Gross BMEP	kPa	1661	2157	2322
Combustion air flow	m³/min	125	160	170
Exhaust gas temperature, after turbo	°C	425	440	460
Exhaust gas flow (max.) at atmospheric pressure	m³/min	400		
Boost pressure ratio	:1	3.7		
Mechanical efficiency	%	89	91	92
Overall thermal efficiency	%	37	36	36
Friction power and pumping losses	kWm	160		
Mean piston speed	m/s	9.5		
Engine coolant flow (minimum)	litres/s	23		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kWe	1120	1480	1600
	kVA	1400	1850	2000
Assumed alternator efficiency	%	95		

Note: All quoted gross engine powers include an allowance of 1.5% for installation variances.

Note: Not to be used for CHP design purposes (indicative figures only). Consult Perkins Engines Company Limited. 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 hour period. A 10% overload is available for 1 hour in every 12 hour 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

4016-61TRG1

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kWt	3183	4239	4608
Energy in power output (gross)	kWb	1269	1648	1774
Energy to exhaust	kWt	1115	1479	1580
Energy to coolant and oil	kWt	456	529	565
Energy to radiation	kWt	73	111	130
Energy to charge cooler	kWt	270	472	541

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



General installation

4016-61TRG2

Designation	Units	Baseload power	Prime power	Standby power
Gross engine power	kWb	1437	1774	1985
Gross BMEP	kPa	1881	2322	2598
Combustion air flow	m³/min	140	169	184
Exhaust gas temperature, after turbo	°C	420	440	460
Exhaust gas flow (max.) at atmospheric pressure	m³/min	460		
Boost pressure ratio	:1	4		
Mechanical efficiency	%	90	92	93
Overall thermal efficiency	%	40	39	37
Friction power and pumping losses	kWm	160		
Mean piston speed	m/s	9.5		
Engine coolant flow (minimum)	litres/s	23		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kWe	1280	1600	1800
	kVA	1600	2000	2250
Assumed alternator efficiency	%	95		

Note: All quoted gross engine powers include an allowance of 1.5% for installation variances.

Note: Not to be used for CHP design purposes (indicative figures only). Consult Perkins Engines Company Limited. 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 hour period. A 10% overload is available for 1 hour in every 12 hour 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

4016-61TRG2

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kWt	3609	4572	5312
Energy in power output (gross)	kWb	1437	1774	1985
Energy to exhaust	kWt	1259	1586	1854
Energy to coolant and oil	kWt	454	535	584
Energy to radiation	kWt	111	149	234
Energy to charge cooler	kWt	348	528	655

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



General installation

4016-61TRG3

Designation	Units	Baseload power	Prime power	Standby power
Gross engine power	kWb	1600	1975	2074
Gross BMEP	kPa	2094	2585	2857
Combustion air flow	m³/min	153	183	190
Exhaust gas temperature, after turbo	°C	430	460	475
Exhaust gas flow (max.) at atmospheric pressure	m³/min	460		
Boost pressure ratio	:1	4		
Mechanical efficiency	%	91	93	93
Overall thermal efficiency	%	40	38	37
Friction power and pumping losses	kWm	160		
Mean piston speed	m/s	9.5		
Engine coolant flow (minimum)	l/s	23		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kWe	1440	1800	1850
	kVA	1800	2250	2350
Assumed alternator efficiency	%	96		

Note: All quoted gross engine powers include an allowance of 1.5% for installation variances.

Note: Not to be used for CHP design purposes (indicative figures only). Consult Perkins Engines Company Limited. 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 hour period. A 5% overload is available for 1 hour in every 12 hour 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

4016-61TRG3

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kWt	4010	5241	5594
Energy in power output (gross)	kWb	1600	1975	2074
Energy to exhaust	kWt	1400	1837	1976
Energy to coolant and oil	kWt	497	597	600
Energy to radiation	kWt	86	186	241
Energy to charge cooler	kWt	427	646	703

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



Cooling system

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

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

Total 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 rpm 5 - 9°C (depending on rating)
Coolant temperature shutdown switch setting 101°C (rising)
Coolant immersion heater capacity (2 of) 4 kW (each)

Water jacket cooling data

Coolant flow	21 litres/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 rpm
Method of drive Engine driven

Secondary water circuit

Coolant flow	12 litres/s
Maximum permissible restriction to coolant pump flow	60 kPa
Coolant inlet temperature (min)	10°C
Coolant inlet temperature (max)	refer to derate charts

Lubrication system

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 operations 105 °C

Lubricating oil pressure

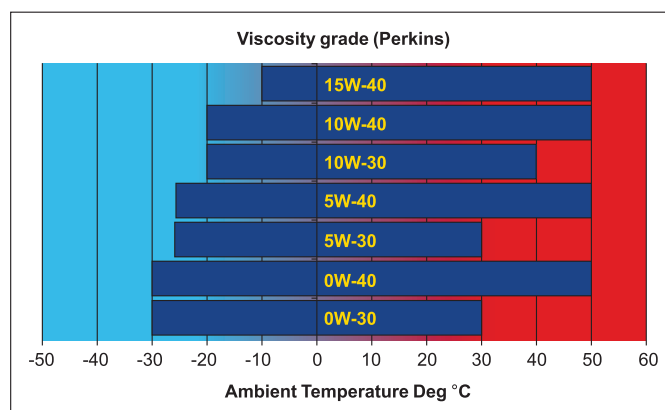
At rated speed 400 kPa
Minimum @ 80 °C 340 kPa
Oil filter screen spacing 40 microns
Sump drain plug tapping size G1
Oil pump speed and drive method 1.4 x e rpm engine driven
Shutdown switch - pressure setting..... 193 kPa (falling)

Oil consumption

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

Recommended SAE viscosity

Multigrade oil conforming to API CG 15W/40 CH4 must be used.



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

Induction system

Maximum air intake restriction of engine

Clean filter 1.24 kPa
Dirty filter..... 3.71 kPa
Air filter type..... Donaldson

Exhaust system

Maximum back pressure for total system

Exhaust outlet size (internal)..... 2 x 254 mm
Exhaust outlet flange size 10 inch Table D
Back pressure for total system at standby power 3.91 kPa

Note: For recommended pipe sizes see the Installation Manual.



Fuel system

Recommended fuel to conform to BS2869 Class A2 or BS EN590
Type of injection system Direct injection
Fuel injection pump Combined unit injector
Fuel injector pressure 140 Mpa
Lift pump type DFM
Fuel delivery 1380 litres/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

4016-61TRG1

Rating	g/kWh	litres/hr
Standby	234	480
Prime power	233	447
Base load power	229	337
At 75% Prime power	229	337
At 50% Prime power	223	212
At 25% Prime power	230	109

4016-61TRG2

Rating	g/kWh	litres/hr
Standby	221	513
Prime power	214	442
Base load power	209	347
At 75% Prime power	206	317
At 50% Prime power	204	209
At 25% Prime power	210	107

4016-61TRG3

Rating	g/kWh	litres/hr
Standby	224	537
Prime power	220	503
Base load power	208	385
At 75% prime power	207	355
At 50% prime power	204	233
At 25% prime power	210	118

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

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

Electrical system

Voltage 24 volts
Alternator type Insulated return
Alternator output 55 amps
Starter motor type 2 x 24 volt electric
Starter motor power 16.4 kW
Number of teeth on flywheel 156
Number of teeth on starter pinion 12
Minimum cranking speed (0 °C) 120 rpm
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

Engine mounting

Maximum static bending moment at rear face of block 1356 Nm

Cold start recommendations

Temperature range down to -10 °C (14 °F)

Oil API CG 15W/40
Starter 2 x 24 volts
Battery 4 x 12 volts x 286 Ah
Max breakaway current 2000 amps
Cranking current 957 amps
Aids Block heaters
Minimum mean cranking speed 120 rpm

Note: Battery capacity is defined by the 20 hour rate.

Note: The oil specification should be for the minimum ambient temperature as the oil will not be warmed by the immersion heater.

Note: 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

Initial load acceptance when engine reaches rated speed (15 seconds maximum 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 nett/ kWe	Transient frequency deviation %	Frequency recovery time seconds
4016-61TRG1							
60	944 / 920	≤ -10	5	40	614 / 600	≤ -10	5
4016-61TRG2							
56	944 / 920	≤ -10	5	44	740 / 720	≤ -10	5
4016-61TRG3							
50	944 / 920	≤ -10	5	50	944 / 920	≤ -10	5

The figures shown in the table above were obtained under the following test conditions:

Engine block temperature (cold) 45°C
 Ambient temperature 25°C
 Governing mode Isochronous
 Alternator inertia 55 kgm²
 Under frequency roll off (UFRO) point set to 49.5 Hz
 UFRO rate set to 16 volts/Hz
 LAM on/off..... On

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

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

Emissions

Rating	German TA Luft @ <3 MW	German TA Luft @ >3 MW	French Limits 2000 @ <500 hours/year	French Limits 1500 @ >500 hours/year
4016-61TRG1 - Spill timing 10°				
Baseload	N/A	N/A	N/A	No
Prime power	N/A	Yes	Yes	No
4016-61TRG2 - Spill timing 11°				
Baseload	N/A	Yes	Yes	No
Prime power	N/A	Yes	Yes	No
4016-61TRG3 - Spill timing 11°				
Baseload	N/A	Yes	Yes	No
Prime power	N/A	Yes	Yes	No

German TA Luft legislation (1986) limits:

- NO_x ≤ 2000 mg/Nm³
- CO ≤ 650 mg/Nm³
- HC ≤ 150 mg/Nm³
- PM ≤ 50 mg/Nm³

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

Applied load is a percentage of generator electrical output efficiency as published in the general installation section of this data sheet.



Noise Data

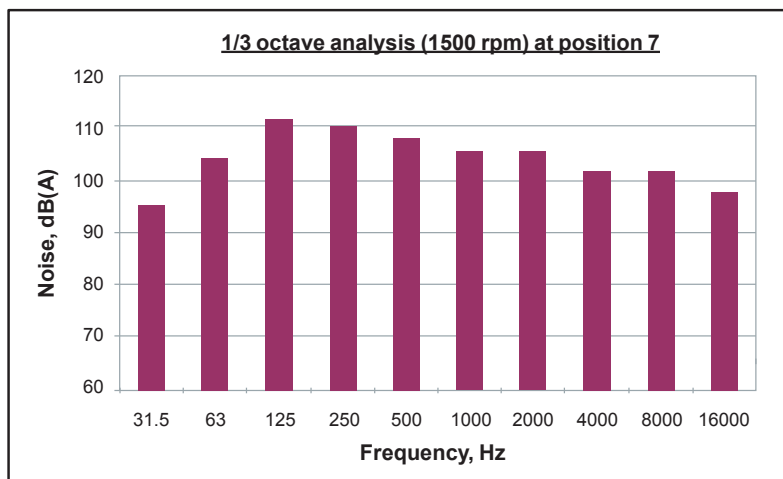
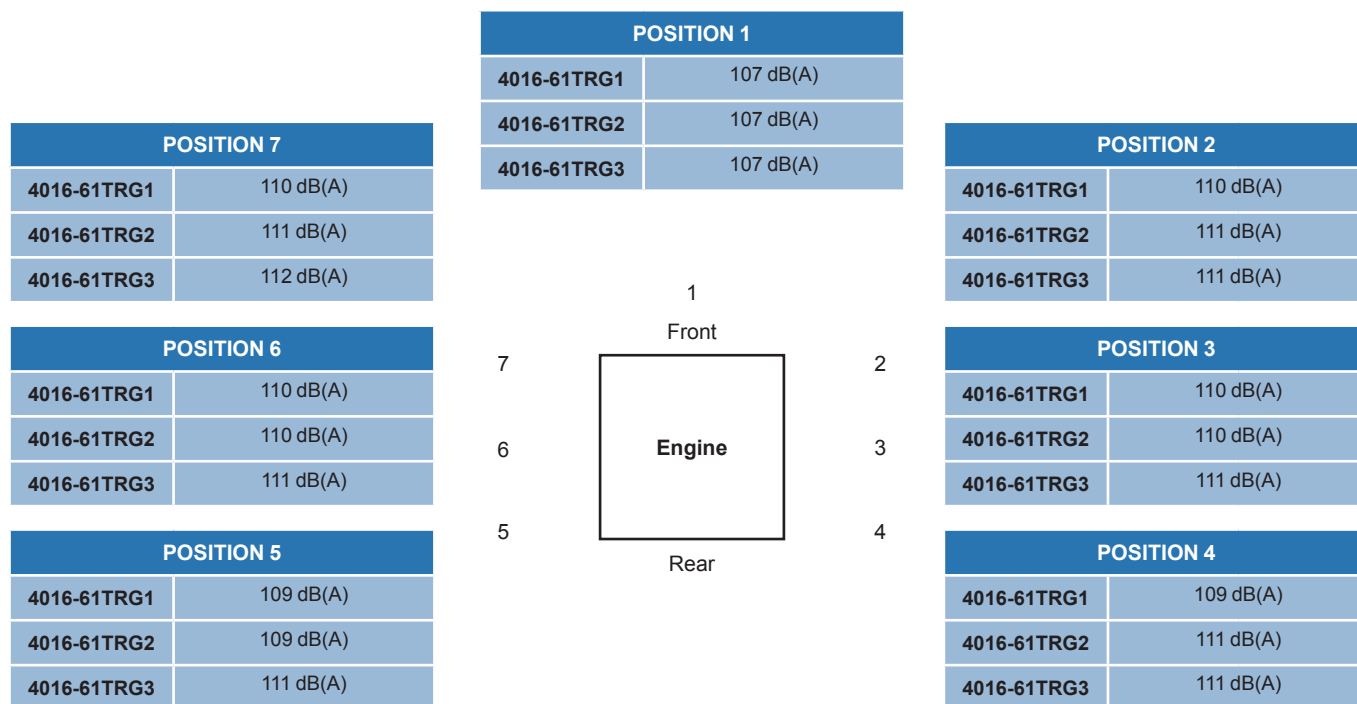
Noise levels

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).

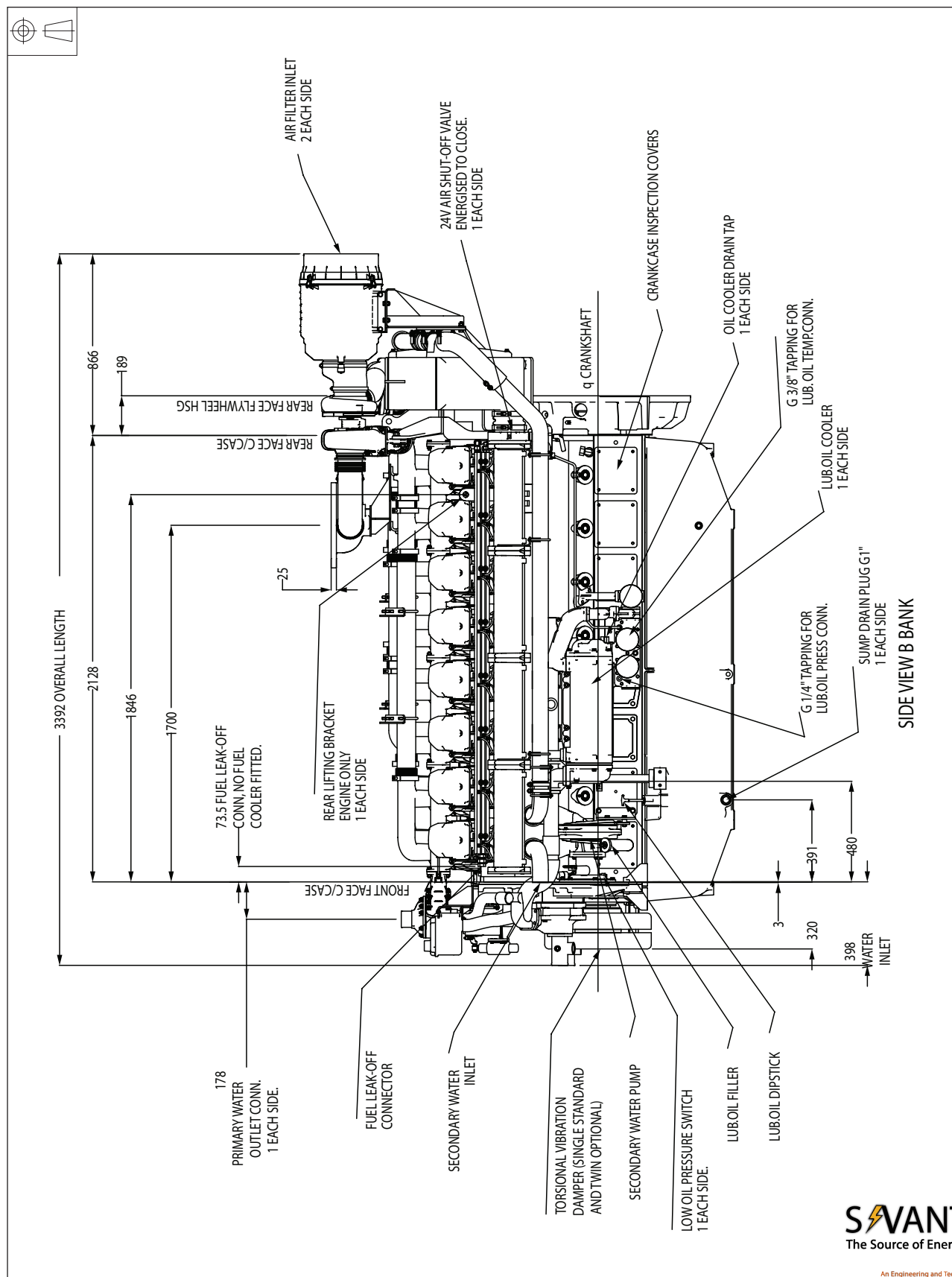
Ambient noise level 78 dB(A)

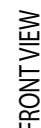
Octave analysis

The following histogram shows an octave band analysis at the position of the maximum noise level.

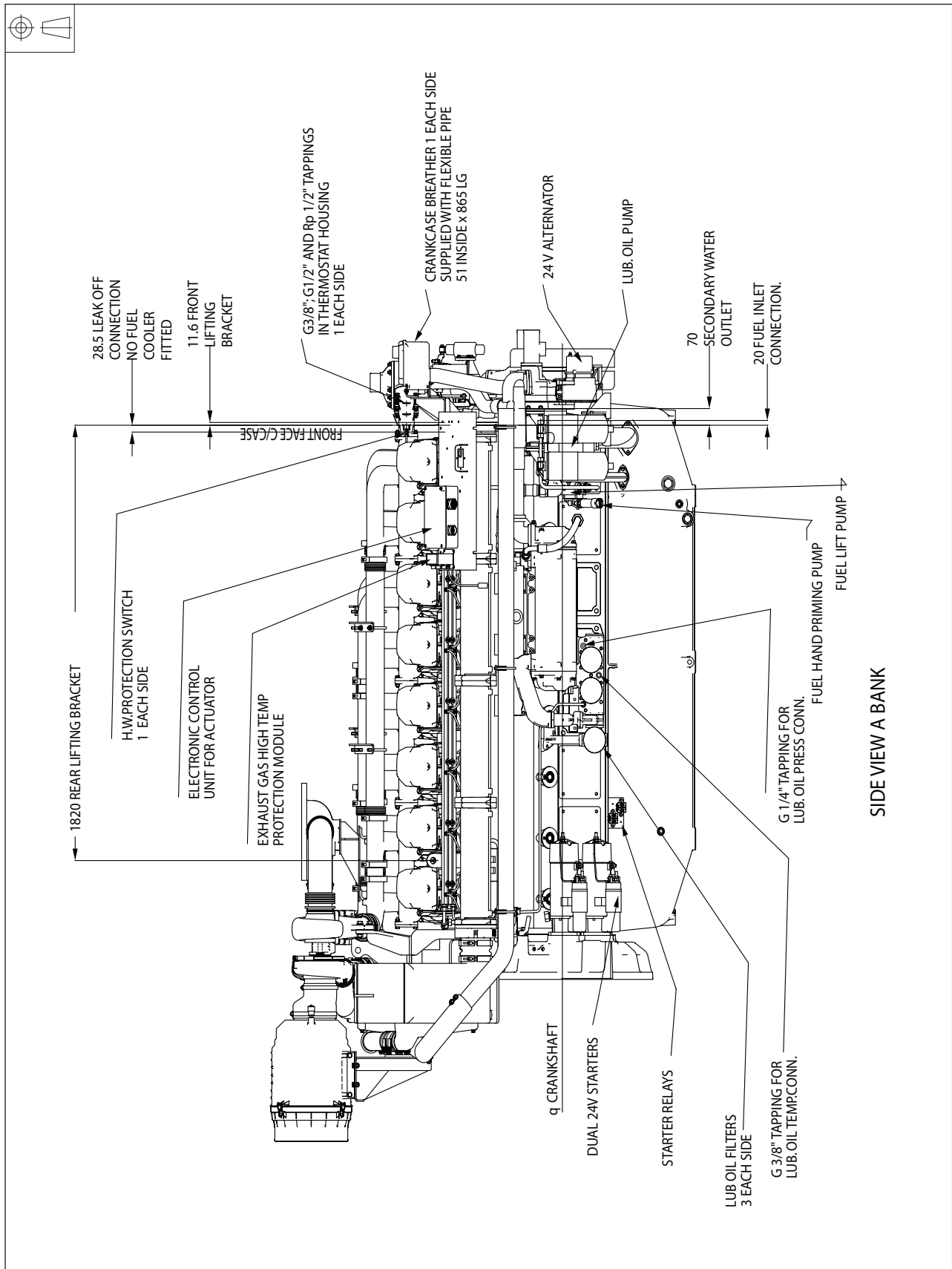


4016-61TRG1 - Left side view

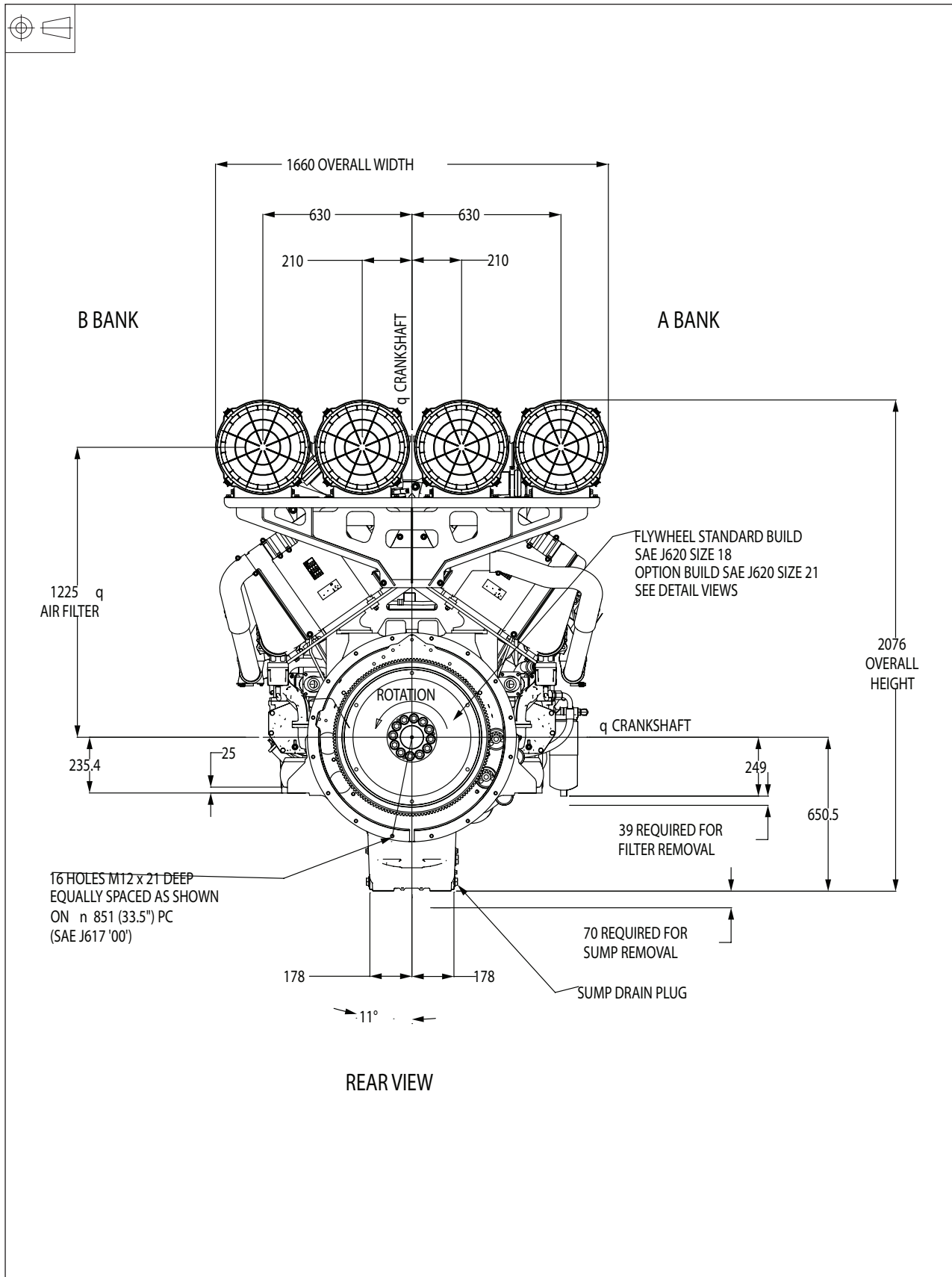




4016-61TRG1 - Right side view



4016-61TRG1 - Rear view



4016-61TRG1 - Accessories view

