

Technical Data

4000 Series

4012-46TAG3A

Diesel Engine - Electropak

Basic technical data

Number of cylinders 12
 Cylinder arrangement Vee, 60°
 Cycle 4 stroke
 Induction system Turbocharged
 Combustion system direct injection
 Compression ratio 13:1
 Bore 160 mm
 Stroke 190 mm
 Cubic capacity 45-842 litres
 Direction of rotation anti-clockwise when viewed from 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
 Cylinder 1 furthest from flywheel
Note: Cylinders designated 'A' are on the right hand side of the engine when viewed from the flywheel end

Approximate weights

Description	unit	Tropical	Temperate
Engine (dry)	Kg	4400	4400
Electropak (wet) + fuel cooler	Kg	6450	6086
Electropak (wet) - fuel cooler	Kg	6425	6070

Overall dimensions of Electropak

	unit	Tropical	Temperate
Height	mm	2610	2259
Length	mm	3883	3915
Width	mm	2164	2198

Moment of inertia

Engine 9,73 kgm²
 Flywheel 9,57 kgm²

Cyclic irregularity for engine/flywheel maximum

4012-46TAG3A 1:638

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 rev/min
 Static injection timing see engine number plate
 Cooling water exit temperature < 98 °C
 Fuel data to conform to BS2869 class A2 or BS EN590

Performance

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

Noise

For noise data, refer to page 16.
 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/or altitude are available, please contact Perkins Applications Department.

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 pressure (nominal) 3,0 kPa
 Fuel temperature (inlet pump) 58 °C maximum
 For test conditions relevant to data on load acceptance, refer to page 16 of this document.

General installation

4012-46TAG3A - Temperate

Designation	Units	Type of operation and application		
		Baseload power	Prime power	Standby power
Gross engine power	kWm	1260	1500	1643
Fan and battery charging alternator power	kW	64		
Nett engine power	kWm	1196	1436	1579
Brake mean effective pressure (gross)	kPa	2192	2610	2859
Combustion air flow at ISO conditions	m ³ /min	115	125	135
Exhaust gas temperature (max) after turbo	°C	480		
Exhaust gas flow (max) at atmospheric pressure	m ³ /min	350		
Boost pressure ratio	-	3,0	3,4	3,7
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,5	41,0	39,0
Friction power and pumping losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/min	1020		
Typical Genset electrical output (0.8pf)	kVA	1420	1705	1875
	kWe	1136	1364	1500
Assumed alternator efficiency	%	95		

4012-46TAG3A - Tropical

Designation	Units	Type of operation and application		
		Baseload power	Prime power	Standby power
Gross engine power	kWm	1260	1500	1643
Fan and battery charging alternator power	kW	60		
Nett engine power	kWm	1200	1440	1583
Brake mean effective pressure (gross)	kPa	2192	2610	2859
Combustion air flow at ISO conditions	m ³ /min	115	125	135
Exhaust gas temperature (max) after turbo	°C	480		
Exhaust gas flow (max) at atmospheric pressure	m ³ /min	350		
Boost pressure ratio	-	3,0	3,4	3,7
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,5	41,0	39,0
Friction power and pumping losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/min	1020		
Typical Genset electrical output (0.8pf)	kVA	1425	1710	1880
	kWe	1140	1368	1504
Assumed alternator efficiency	%	95		

Note: Not to be used for combined heat and power (CHP) purposes (indicative figures only). If necessary, please consult the Applications Department, Perkins Engines Company Limited, Stafford.

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 hour 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.

Emissions capability

All 4012-46TAG ratings are optimised to the 'best fuel consumption' and do not comply to Harmonised International Regulation Emission Limits. More information on these statements can be obtained by contacting the Applications Department at Perkins Engines Company Limited.

Energy balance

4012-46TAG3A - Temperate

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	3137	3650	4100
Energy in power output (gross)	kW	1260	1500	1643
Energy to cooling fan	kW	64		
Energy in power output (nett)	kW	1196	1436	1579
Energy to exhaust	kW	1010	1102	1219
Energy to coolant and oil	kW	477	510	625
Energy to radiation	kW	90	110	123
Energy to charge coolers	kW	300	429	490

4012-46TAG3A - Tropical

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	3137	3650	4100
Energy in power output (gross)	kW	1260	1500	1643
Energy to cooling fan	kW	60		
Energy in power output (nett)	kW	1200	1440	1583
Energy to exhaust	kW	1010	1102	1219
Energy to coolant and oil	kW	477	510	625
Energy to radiation	kW	90	110	123
Energy to charge coolers	kW	300	428	490

Note: Not to be used for combined heat and power (CHP) purposes (indicative figures only). If necessary, please consult the Applications Department, Perkins Engines Company Limited, Stafford.

Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For combined heat and power systems (CHP) 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 1 litre bottles from Perkins under part number 21825 735.

Maximum pressure in crankcase water jacket ... 170 kPa
 Maximum top tank temperature (standby) ... 98 °C
 Maximum static pressure head on pump ... 7 m

Total coolant capacity

Electronit (engine only) ... 73 litres
 Electropak (engine and radiator):
 -temperate... 207 litres
 -tropical ... 210 litres
 Maximum permissible restriction to coolant pump flow... 20 kPa
 Thermostat operating range... 71 - 85 °C
 Ambient cooling clearance (standby power) based on air temperature at fan 6 °C above ambient.
 Temperature rise across the engines (standby power) with inhibited coolant ... 8 °C
 Coolant temperature shutdown switch setting ... 101 °C rising
 Coolant immersion heater capacity (2 off) ... 4 kWe each

Radiator

Temperate

Radiator face area ... 3,46 m²
 Material and number of rows:
 -charge air and water jacket... copper, 4 rows
 Fins per inch and material:
 -charge air and water jacket... brass, 12 rows
 Width of matrix ... 2,10 m
 Height of matrix... 1,65 m
 Weight of radiator... 1620 kg
 Total coolant capacity including engine and pipes. ... 212 litres
 Pressure cap setting (min). ... 70 kPa

Tropical

Radiator face area ... 4,08 m²
 Material and number of rows:
 -charge air and water jacket... copper, 4 rows
 Fins per inch and material:
 -charge air and water jacket... brass, 12 rows
 Width of matrix ... 1,97 m
 Height of matrix... 2,07 m
 Weight of radiator... 1630 kg
 Total coolant capacity including engine and pipes. ... 226 litres
 Pressure cap setting (min). ... 70 kPa

Water jacket cooling data

Temperate and Tropical

-coolant flow ... 1020 litres/min
 -coolant exit temperature (max). ... 98 °C
 -coolant inlet temperature (min). ... thermostatic control
 -coolant inlet temperature (max) ... 90 °C

Coolant pump

Speed. ... 1.4 x e rev/min
 Method of drive ... gear

Fan

Type ... axial flow
 Diameter
 -Temperate ... 1600 mm
 -Tropical ... 1740 mm
 Number of blades... 12
 Material ... Aluminium
 Drive ratio
 -Temperate ... 0-93:1
 -Tropical ... 0-80:1

4012-46TAG3A - Temperate, Standby power

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance: 50% Glycol	Duct allowance (Pa)	Min airflow (m ³ /sec)
40 °C	250	32

4012-46TAG3A - Tropical, Standby power

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance: 50% Glycol	Duct allowance (Pa)	Min airflow (m ³ /sec)
50 °C	125	37

Lubrication system

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

Note: For additional notes on lubricating oil specifications, please refer to the Operation and Maintenance Manual (OMM).

Lubricating oil capacity

-total system capacity... 177 litres
 -sump maximum... 157,5 litres
 -sump minimum... 115 litres
 -oil temperature at normal operating conditions to bearings 105 °C

Lubrication oil pressure

-at rated speed ... 400 kPa
 -minimum at 80 °C... 340 kPa
 -oil relief valves open ... 400 kPa
 -oil filter spacing ... 20 microns
 -sump drain plug tapping size ... G1
 -oil pump speed... 2100 rev/min
 -method of drive ... gear
 -shutdown switch pressure setting (where fitted) .. 193 kPa falling
 Oil pump flow ... 6,0 litres/sec

Normal operating angles

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

Oil consumption

Prime power	Units	
After "running in" (typically after 250 hours)	g/kWhr	0,52
Oil flow rate from pump	litres/sec	6

Electrical system

Type	insulated return
Alternator voltage	24 volts with integral regulator
Alternator output	40 amps output, 28 volts at 20 °C ambient
Starter type	axial
Starter motor voltage	24 volts
Starter motor power	16,4 kW
Number of teeth on flywheel	156
Number of teeth on starter pinion	12
Minimum cranking speed	120 rev/min
Pull in current of starter motor solenoid @ -25 °C max ⁽¹⁾	30 amps at 24 volts
Hold in current of starter motor solenoid @ -25 °C max ⁽¹⁾	9 amps at 24 volts
Stop solenoid hold-in current	1,1 amps at 24 volts
Engine stop solenoid	24 volts

1. All leads to rated at 10 amps minimum

Fuel system

Recommended fuel to conform to:
BS2869 1998 Class A2 or BS EN590

Injection system	direct
Fuel injection pump and injector type	combined unit injector
Injector pressure	140 MPa
Lift pump type	Tuthill TCH 1-089

Delivery

-4012-46TAG3A	1020 litres/hour
Heat retained in fuel to tank	8 kW
Fuel inlet temperature to be less than	58 °C
Delivery pressure	300 kPa
Maximum suction head at pump inlet	2,5 m
Maximum static pressure head	see installation manual for details
Fuel filter spacing	10 microns
Governor type	electronic
Governing to ISO 8528-12 CLASS 3 and 4; ISO 8528-5 CLASS G2	
Tolerance on fuel consumption	5%

Fuel consumption

Ratings	g/kW/hr	litres/hr
4012-46TAG3A, Temperate & Tropical		
Standby	211	405
Prime	208	370
Baseload	207	310
75% Prime	206	275
50% Prime	202	187

Note: Fuel consumption calculated on gross rated powers.

Induction system

Maximum air intake restriction of engine:

-clean filter	2 kPa
-dirty filter	4 kPa
-air filter type	Medium duty axial flow

Exhaust system

Exhaust outlet size (internal)	2 x 254 mm Table D flanges
Exhaust outlet flange size	2 x 254 mm Table D flanges
Back pressure for total system at standby power	5 kPa

For recommended pipe sizes, please refer to the Installation Manual.

Cold start recommendations

Temperature range	
5 °C down to -10 °C (41 °F to 14 °F)	Oil: 15W40 CH4 Starter: 2 x 24 volts Battery: 4 x 12V 286 Ah Max breakaway current: 1600 amps Cranking current: 810 amps Aids: block heaters Min mean cranking speed: 120 rev/min

Notes:

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

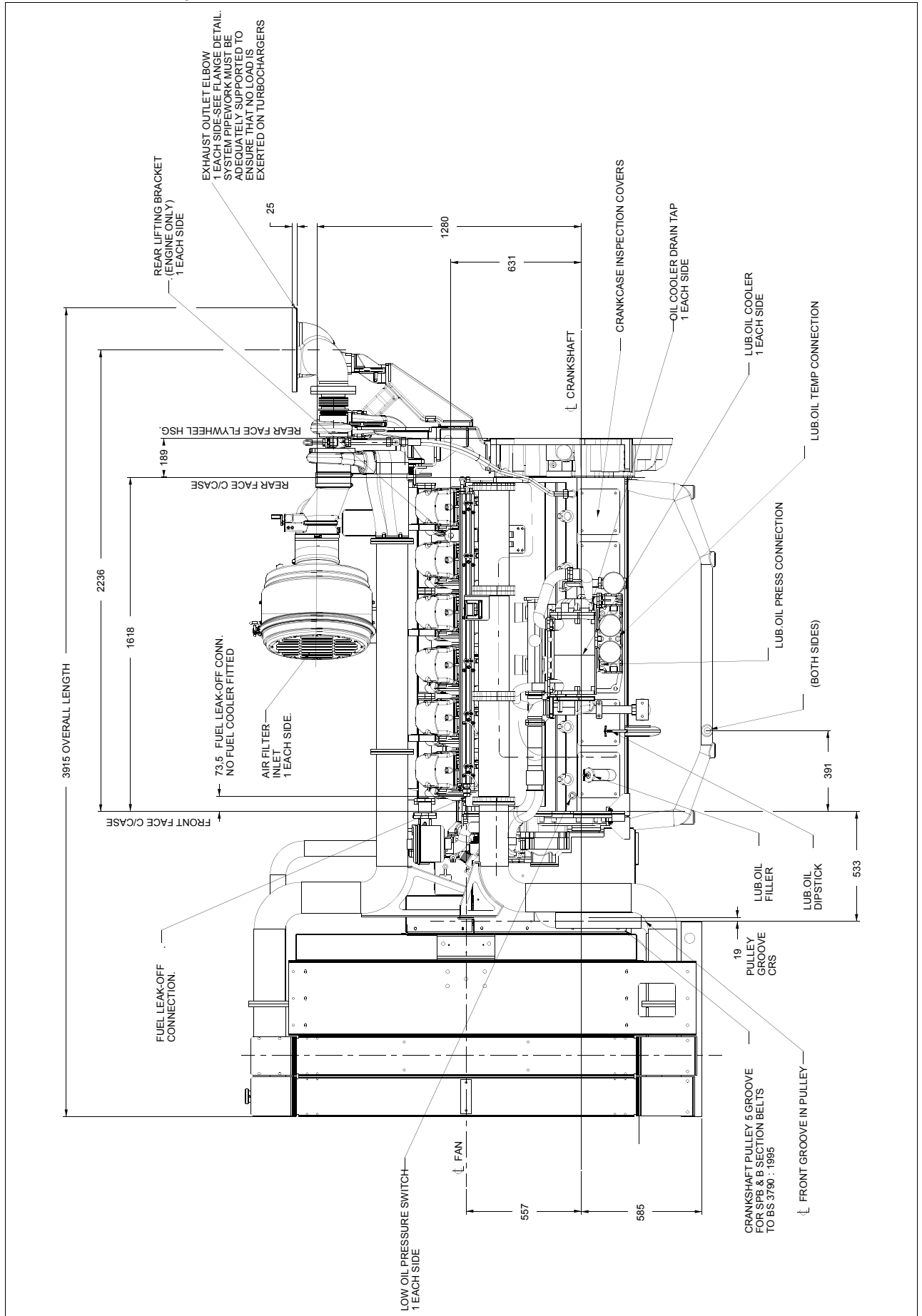
Engine mounting

Maximum static bending moment at rear face of block	1356 Nm
Maximum additional load applied to flywheel due to all rotating components	850 kg

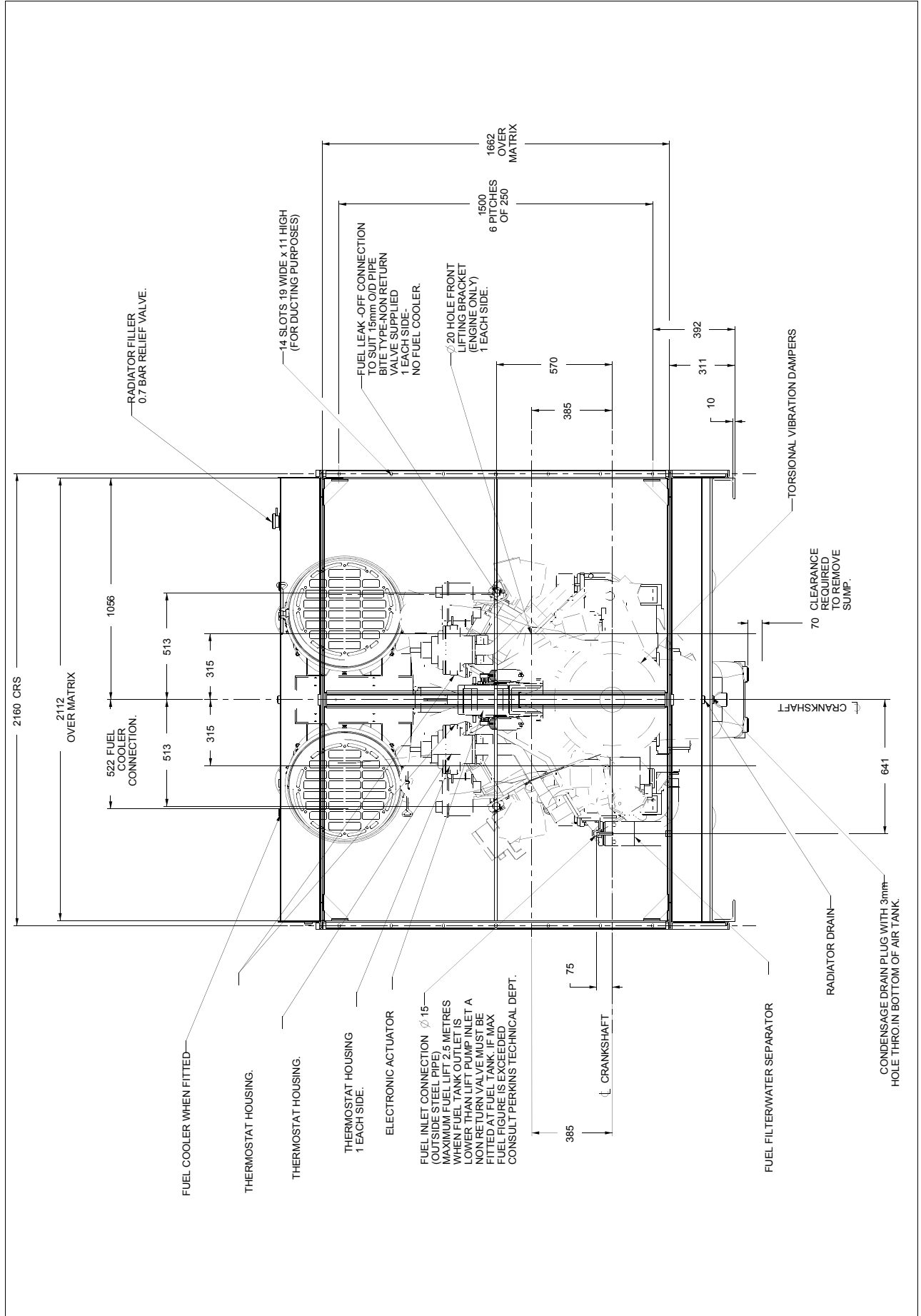
Centre of gravity

Bare engine, dry	
-forward of the rear face of the cylinder block	771 mm
-above the crankshaft centre line	32 mm
ElectropaK, dry	
-forward of the rear face of the cylinder block	1176 mm
-above the crankshaft centre line	32 mm

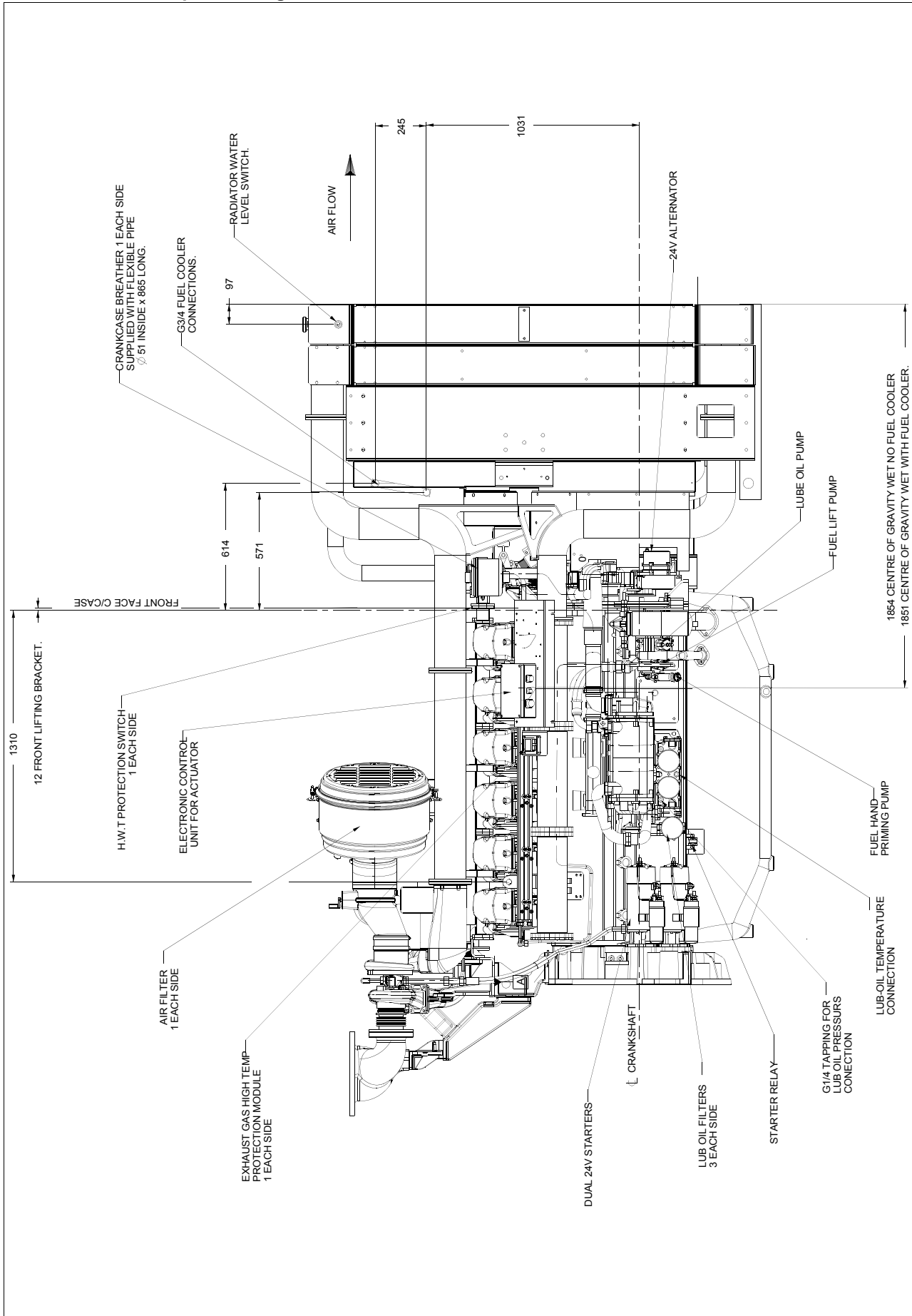
4012-46TAG3A Temperate - Left hand side view



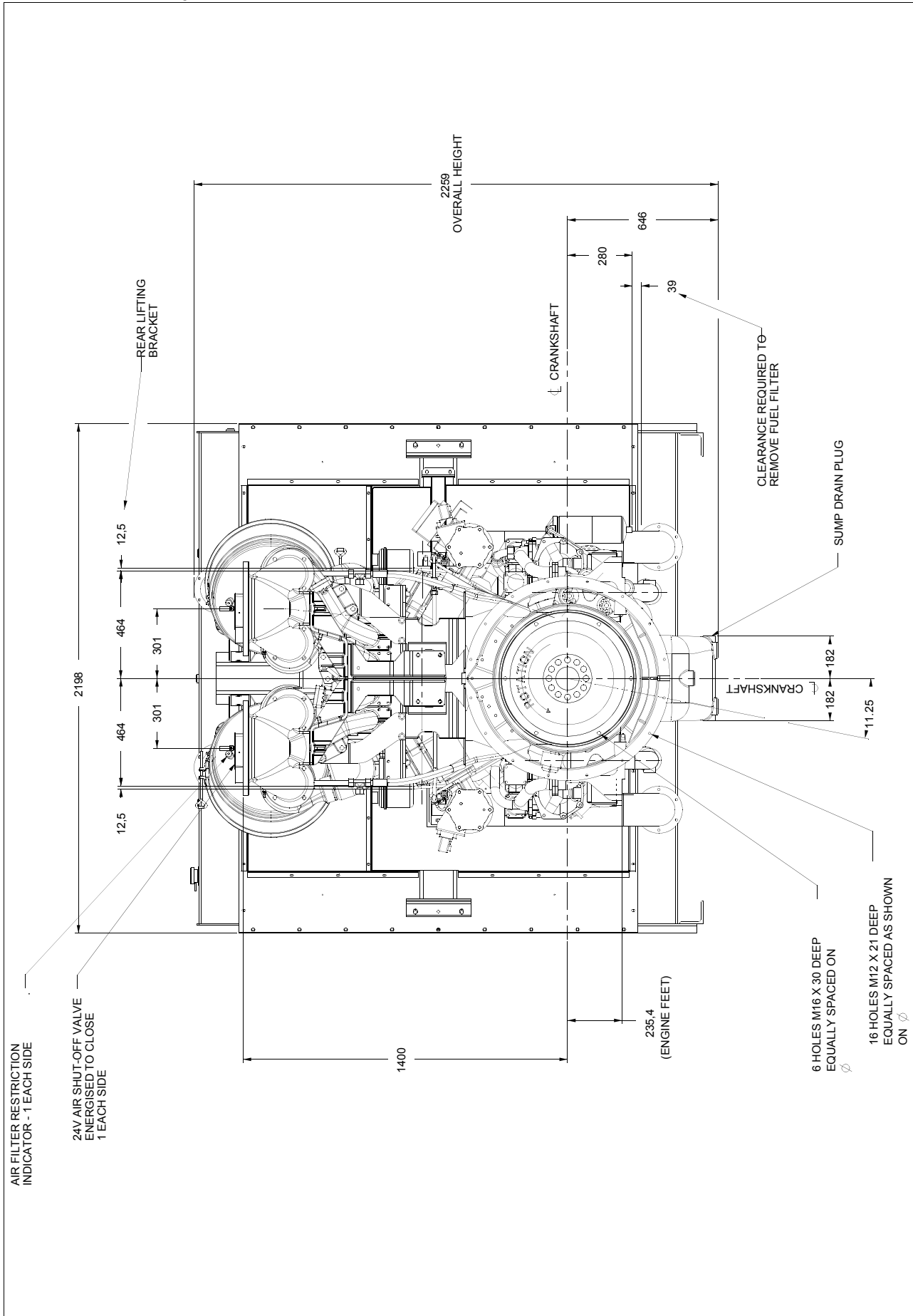
4012-46TAG3A Temperate - Front view



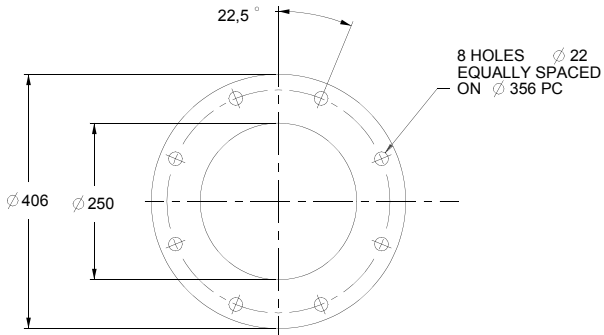
4012-46TAG3A Temperate - Right hand side view



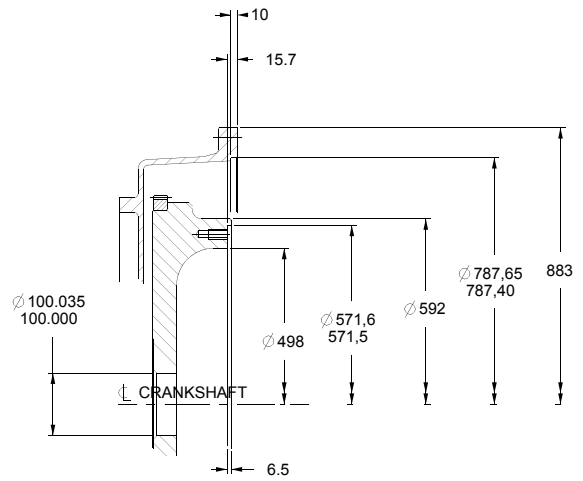
4012-46TAG3A Temperate - Rear view



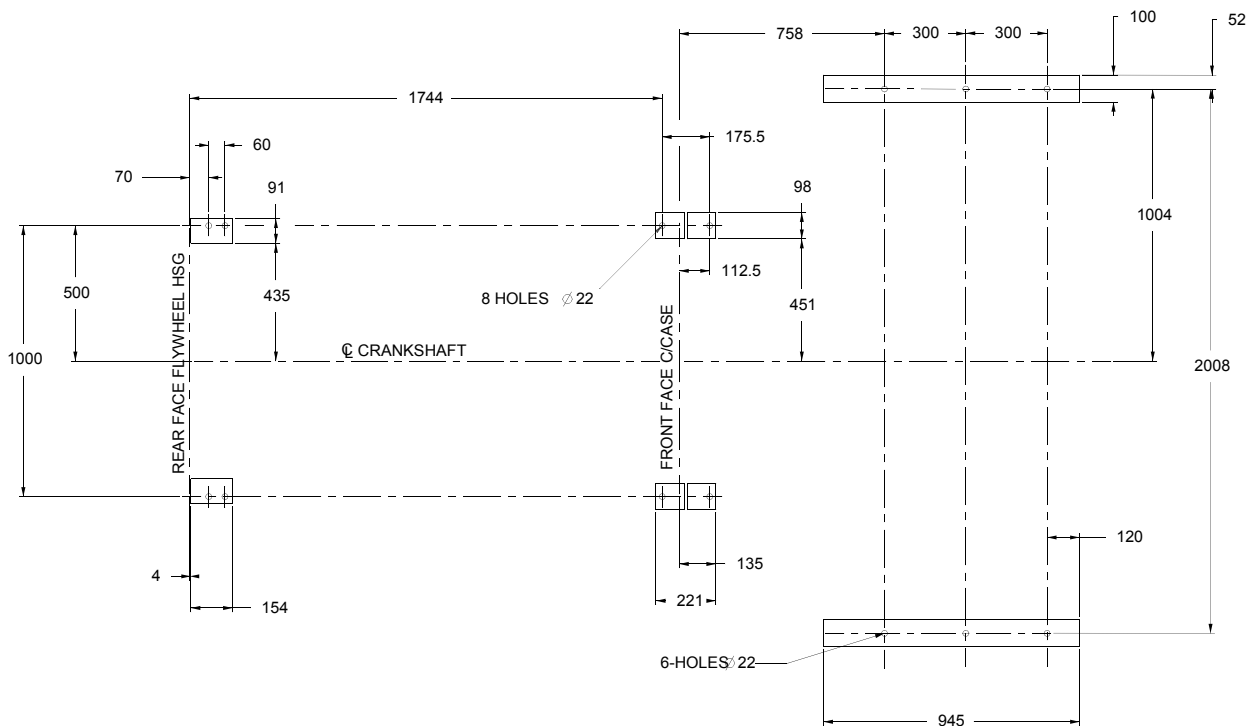
4012-46TAG3A Temperate - Plan view of support pads, exhaust outlet flange and flywheel



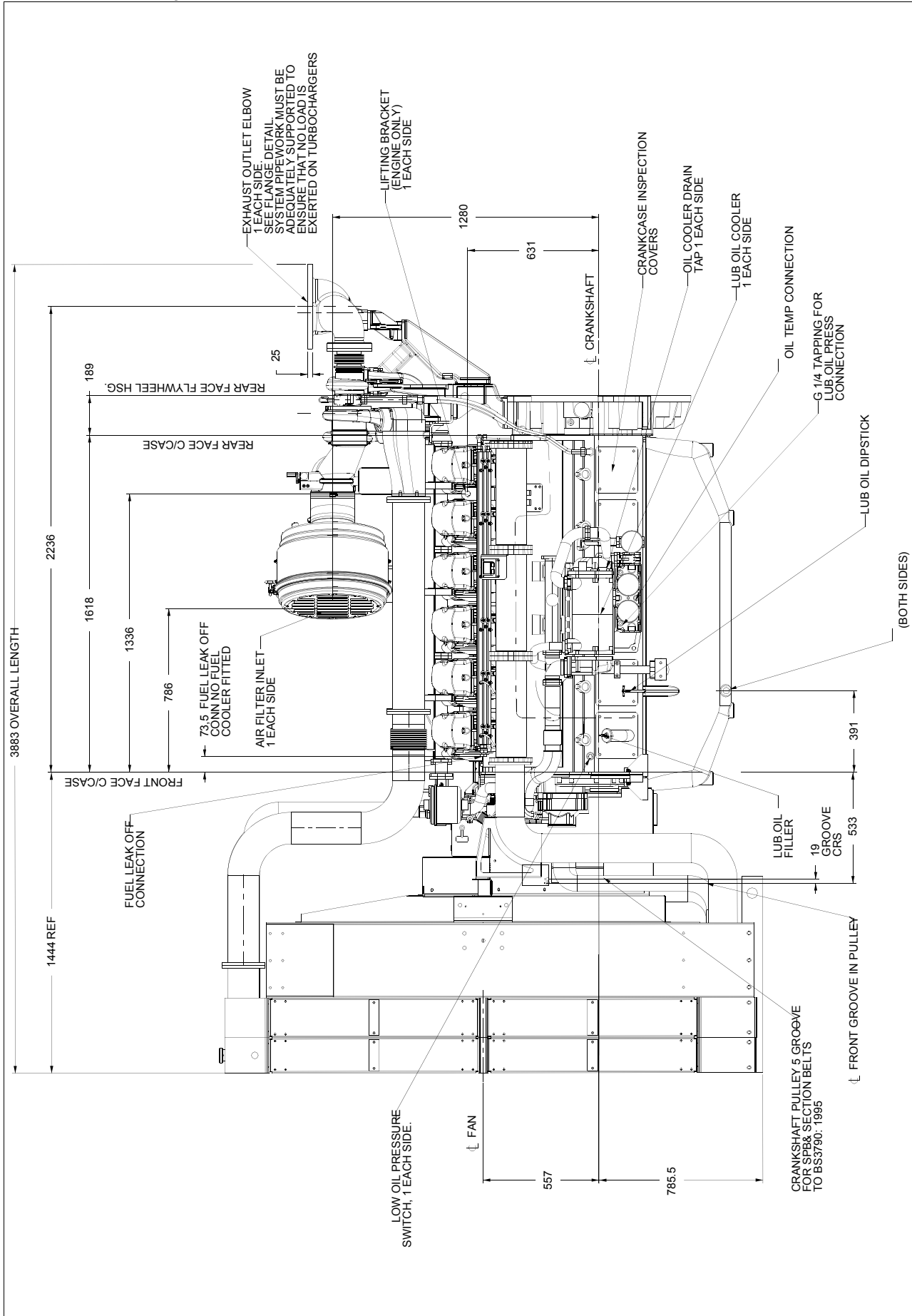
DETAIL OF EXHAUST OUTLET FLANGE
(B.S.10 TABLE D)
SCALE 1:5



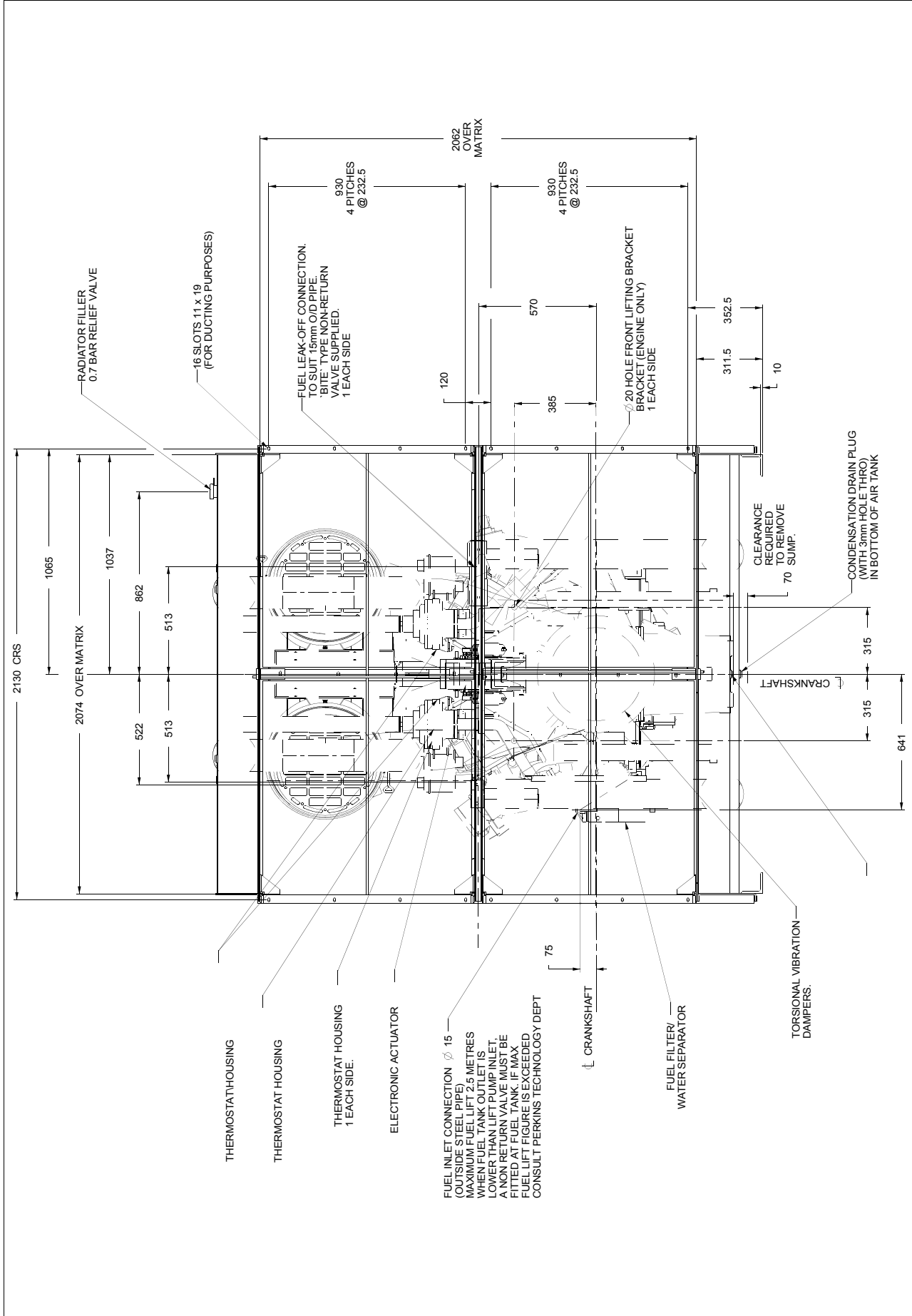
DETAIL OF SAE 518 FLYWHEEL
AND SAE 00 FLYWHEEL HOUSING
(METRIC TAPPINGS)
SCALE 1:5



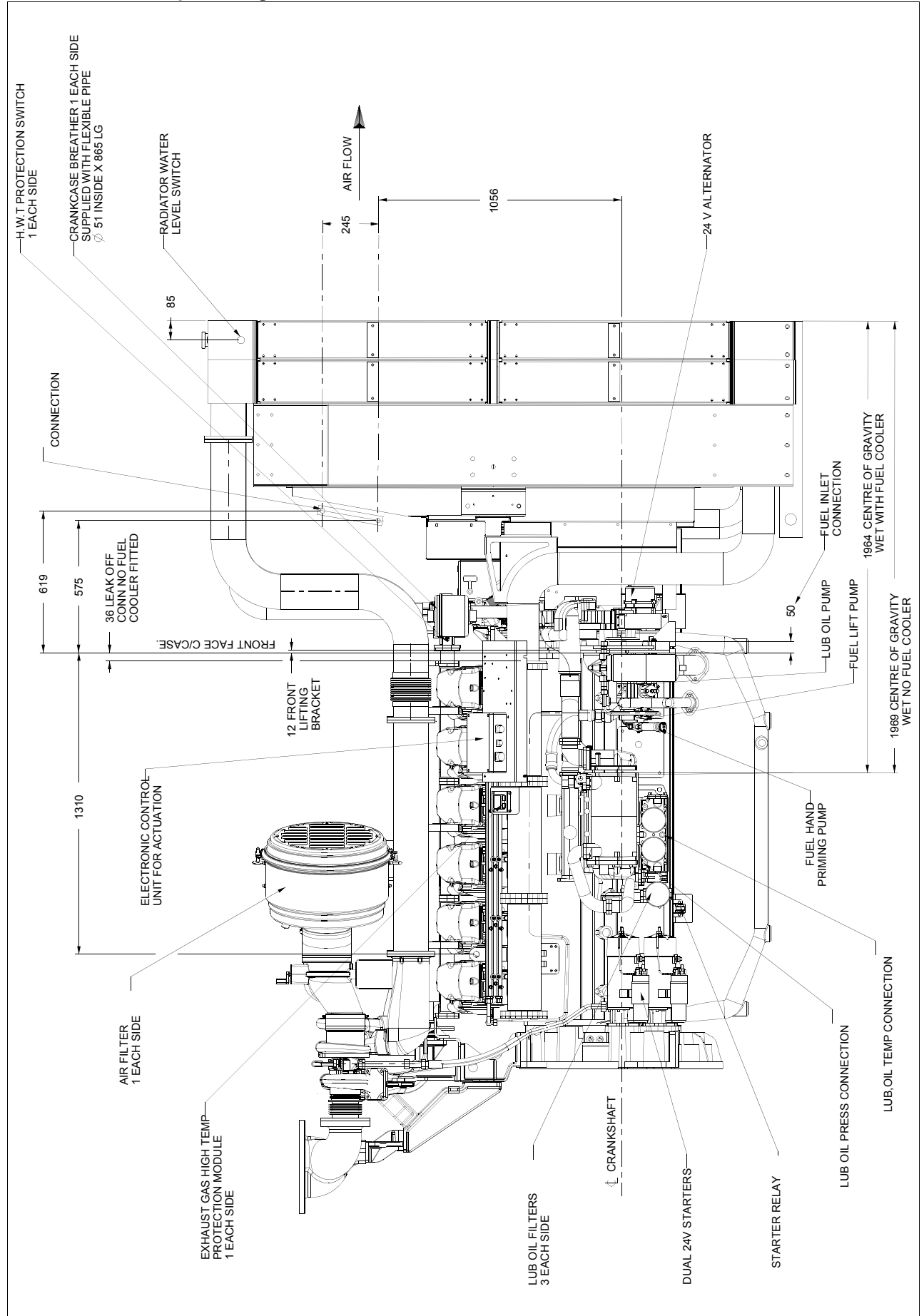
4012-46TAG3A Tropical - Left hand side view



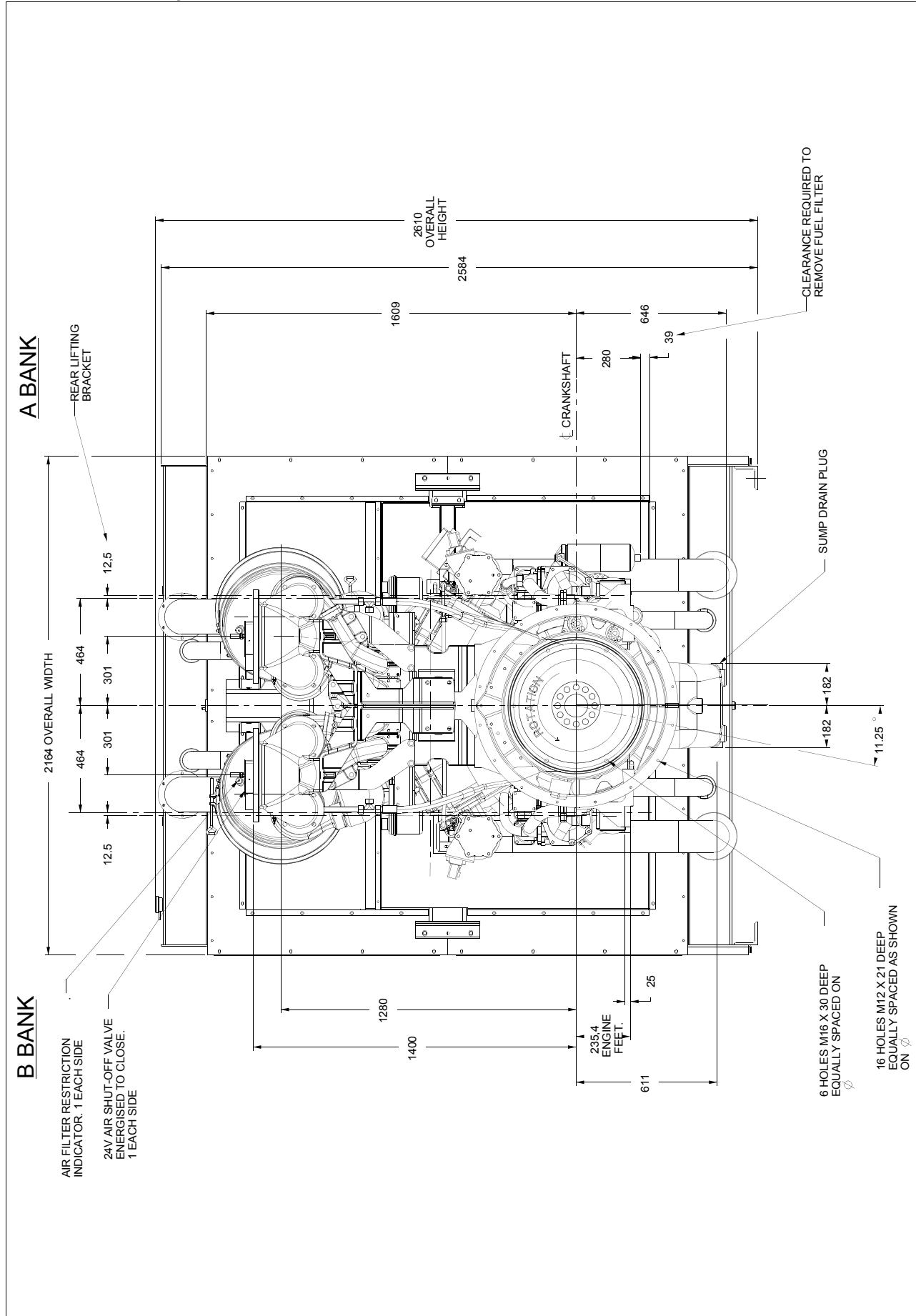
4012-46TAG3A Tropical - Front view



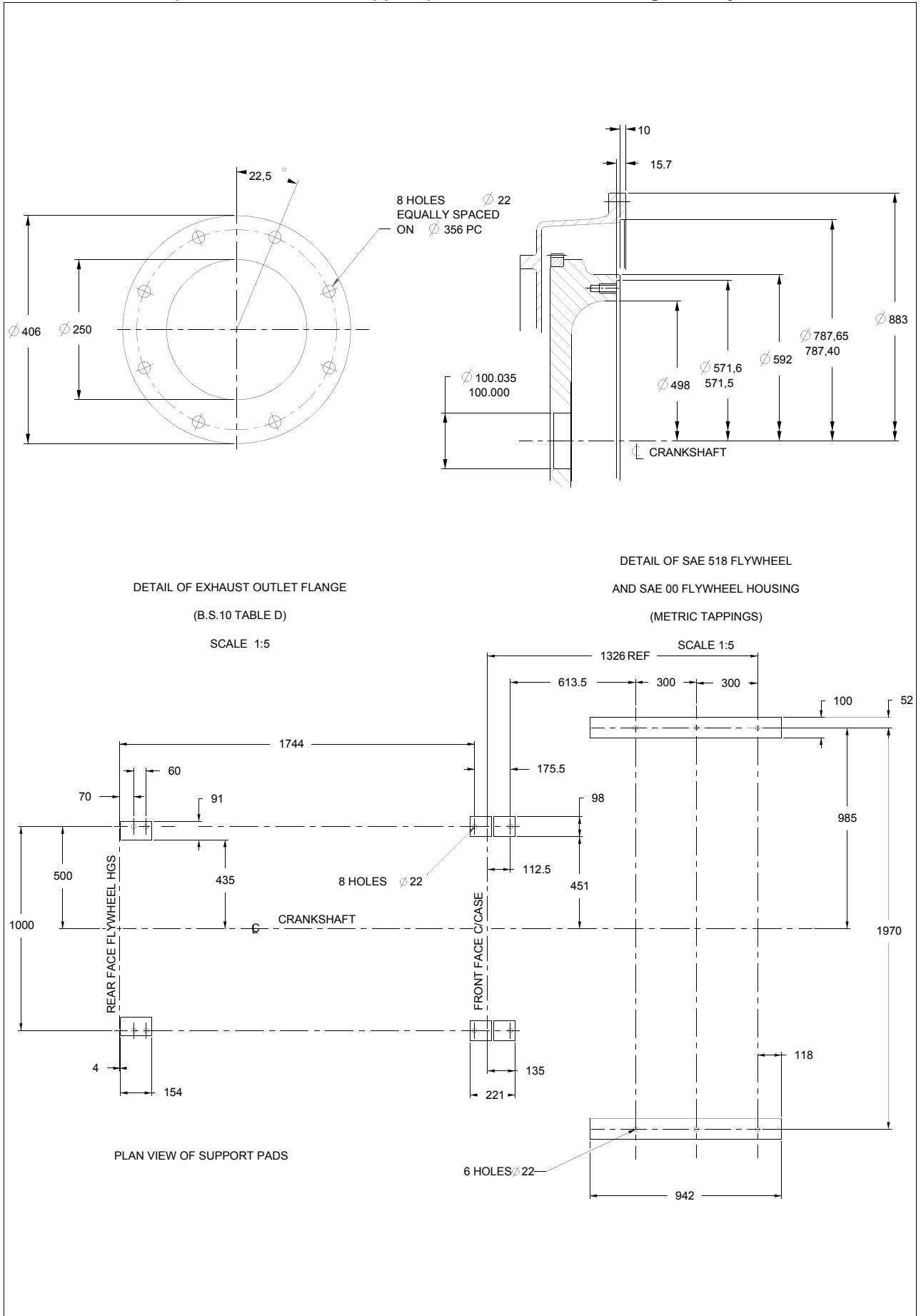
4012-46TAG3A Tropical - Right hand side view

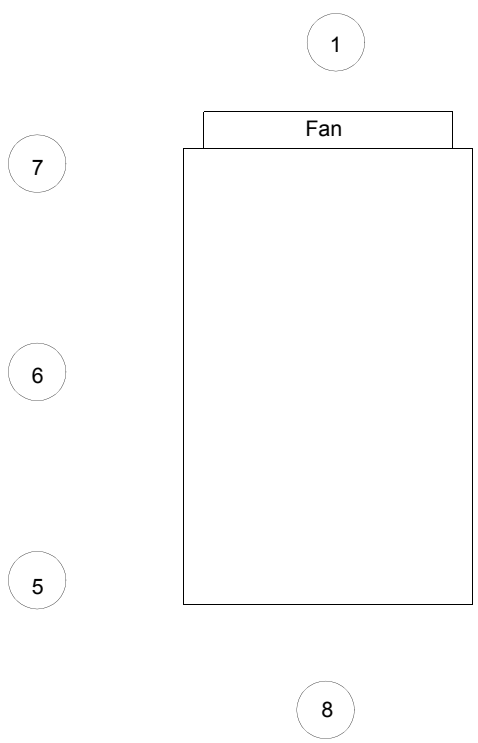


4012-46TAG3A Tropical - Rear view



4012-46TAG3A Tropical - Plan view of support pads, exhaust outlet flange and flywheel





ENGINE 1500 RPM POWER STANDBY
1/3 (1/1 bandwidth)OCTAVE ANALYSIS

SITE

POSN.	DBA	HZ	DB AT POSN ...6...
1	114	31.5	90.2
2	113	63	101
3	111	125	104
4	110	250	112
5	110.5	500	109
6	111	1k	107
7	110.5	2k	104
8	107	4k	101
		8k	100

POSN.	DBA	16k HZ	DB AT POSN ...6...
1	114	31.5	90.9
2	113	63	101
3	111	125	104
4	110	250	110
5	110	500	109
6	111	1k	106
7	110	2k	103
8	107	4k	100
		8k	99
		16k	98

POSN.	DBA	HZ	DB AT POSN ...6...
1	114	31.5	91
2	113	63	101
3	111	125	104
4	110	250	110
5	110	500	109
6	111	1k	106
7	110	2k	103
8	107	4k	100
		8k	99
		16k	98

Noise Levels
 The figures for total noise levels are typical for an engine running at Standby Power rating in a semi-reverberant environment and measured at a distance of one metre from the periphery of the engine.

Total Noise Level
 Sound pressure level re: -20x10 Pa
 Ambient noise level 79 dBA
 Octave analysis performed at the position of maximum noise.

AMBIENT NOISE...79.....DBA

Typical load acceptance (cold)

Engine type	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 kWe nett	Transient frequency deviation %	Frequency recovery time seconds	Prime power%	Load kWe nett	Transient frequency deviation %	Frequency recovery time seconds
4012-46TAG3A	63	860	≤ 10	5	37	505	≤ 10	5

The above figures were obtained under test conditions as follows:

Engine block temperature 40 °C
 Ambient temperature 25 °C
 Governing mode Isochronous
 Alternator inertia. 50 kgm²
 Under frequency roll off (UFRO) point set to 49,5
 UFRO rate set to 16 v/hz
 LAM on / off on

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.

The information given on this Technical Data Sheet is for standard engines, and for guidance only.

For ratings other than those shown contact Perkins Engines Company Limited, Stafford.

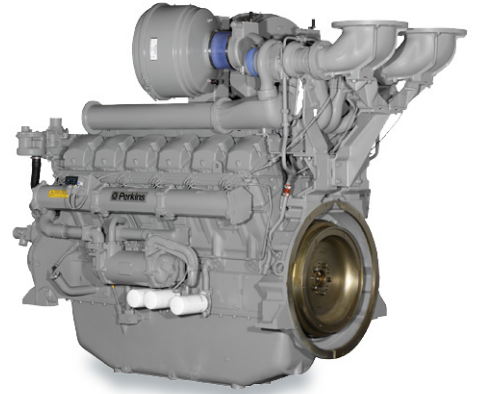
4000 Series 4012-46TAG3A Diesel Engine – ElectropaK

1583 kWm @ 1500 rpm

The Perkins 4000 Series family of 6, 8, 12 and 16 cylinder diesel engines was designed in advance of today's uncompromising demands within the power generation industry and includes superior performance and reliability.

The 4012-46TAG3A ElectropaK is a turbocharged, air-to-air charge cooled, 12 cylinder diesel engine.

Offered with either Temperate or Tropical cooling packages (with or without fuel oil cooling). Their premium design and specification features provide economic and durable operation as well as exceptional power to weight ratio, improved serviceability, low gaseous emissions, overall performance and reliability essential to the power generation market.



Specification				
Number of cylinders	12 60° Vee form			
Bore and stroke	160 x 190 mm	6.3 x 7.5 in		
Displacement	45.842 litres	2797 in ³		
Aspiration	Turbocharged and air to air charge cooled			
Cycle	4 stroke			
Combustion system	Direct injection			
Compression ratio	13.6:1			
Rotation	Anti-clockwise, viewed from flywheel end			
Total lubricating capacity	177 litres	46.7 US gal		
Cooling system	Water-cooled			
	Temperate		Tropical	
Total coolant capacity	207 litres	54.6 US gal	210 litres	55.5 US gal

4000 Series 4012-46TAG3A Diesel Engine – ElectropaK

1583 kWm @ 1500 rpm

Features and benefits

Economic power

- Individual four valve per cylinder heads give optimised gas flows, whilst digitally governed unit fuel injectors ensure ultra-fine fuel atomisation and hence controlled rapid combustion, for efficiency and economy
- Commonality of components with other engines in the 4000 Series family allows reduced parts stocking levels

Reliable power

- Developed and tested using latest engineering techniques
- Piston temperature are controlled by an advanced gallery jet cooling system
- All engines are tolerant of a wide range of temperatures without derate
- Perkins global product support is designed to enhance the customer experience of owning a Perkins powered machine. We deliver this through the quality of our distribution network, extensive global coverage and a range of Perkins supported OEM partnership options. So whether you are an end-user or an equipment manufacturer our engine expertise is essential to your success

Clean, efficient power

- Exceptional power to weight ratio and compact size for easier transportation and installation
- New designed radiator assemblies with corrosion inhibiting powder coated finish; fewer pipe joints and easier access to reduce maintenance times
- Designed to provide excellent service access for ease of maintenance
- Engines designed to comply with major international standards
- Low gaseous emissions that will satisfy the requirements of ½ TA Luft (1986)

Product support

- Perkins actively pursues product support excellence by ensuring our distribution network invest in their territory – strengthening relationships and providing more value to you, our customer
- Through an experienced global network of distributors and dealers, fully trained engine experts deliver total service support around the clock, 365 days a year. They have a comprehensive suite of web based tools at their fingertips covering technical information, parts identification and ordering systems, all dedicated to maximising the productivity of your engine
- Throughout the entire life of a Perkins engine, we provide access to genuine OE specification parts and service. We give 100% reassurance that you receive the very best in terms of quality for lowest possible cost .. wherever your Perkins powered machine is operating in the world

4000 Series 4012-46TAG3A Diesel Engine – ElectropaK

1583 kWm @ 1500 rpm

Technical information

Air inlet

- Mounted air filters and turbochargers

Fuel system

- Direct fuel injection system with fuel lift pump
- Governing to ISO 8528-5 class G2 with isochronous capability
- Full-flow spin-on fuel oil filters

Lubrication system

- Wet sump with filler and dipstick
- Full-flow spin-on oil filters
- Engine jacket water/lub oil temperature stabiliser

Cooling system

- Two twin thermostats
- System designed for ambients up to 50°C
- Powder coated radiator comprising: water radiator; air charge cooled radiator; fuel oil cooling (optional); all pipes, hoses and clips; fan; pulleys; fan belts and safety guards

Electrical equipment

- 24 volt starter motor and 24 volt alternator with integral regulator and DC output
- Overspeed switch and magnetic pickup
- Turbine inlet temperature shutdown switch
- Twin high coolant temperature shutdown switches
- Twin low oil pressure shutdown switches

Flywheel and housing

- Flywheel to SAE J620 size 18
- SAE 00 flywheel housing

Optional equipment

Choice of temperature or tropical radiators available dependant on operational cooling requirements

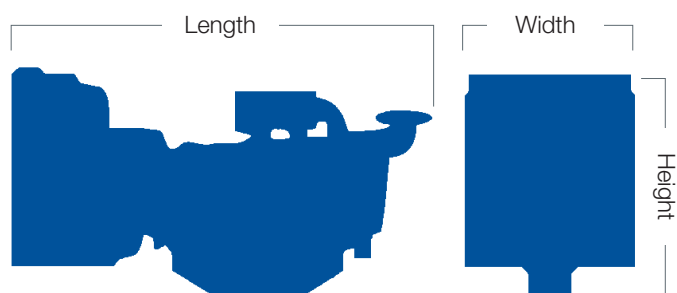
Fuel oil cooler integral to the radiator assembly

Immersion heater with thermostat

Note: This list is not exhaustive, for further options please contact your Perkins representative

4000 Series 4012-46TAG3A Diesel Engine – Electropak

1583 kWm @ 1500 rpm



Engine package weights and dimensions				
	Temperate		Tropical	
Length	3915 mm	154 in	3883 mm	153 in
Width	2198 mm	87 in	2164 mm	85 in
Height	2259 mm	89 in	2610 mm	85 in
Weight (dry)	4400 kg	9700 lb	4400 kg	9700 lb

4000 Series 4012-46TAG3A Diesel Engine – Electropak

1583 kWm @ 1500 rpm

Speed rpm	Type of operation	Typical generator output (Net)		Engine power			
				Gross		Net	
		kVA	kWe	kWm	hp	kWm	hp
1500	Baseload power	1425	1140	1260	1690	1200	1609
	Prime power	1710	1368	1500	2012	1440	1931
	Standby (maximum)	1880	1504	1643	2203	1583	2123

The above ratings represent the engine performance capabilities guaranteed within plus or minus 3% at the reference conditions equivalent to those specified in ISO 8528/1, ISO 3046/1, BS 5514/1.

Rating conditions: 25°C air inlet temperature, barometric pressure 100 kPa, relative humidity 30%. Please consult your distributor or the factory for ratings in other ambient conditions. *Note: For full ratings please refer to Perkins Engines Company Limited. All electrical ratings are based on an average alternator efficiency and a power factor of 0.8.* **Fuel specification:** BS2869: Class A2.

Rating definitions

Baseload power: Power available for continuous full load operation. No overload is permitted. **Prime power:** Power available for variable load with an average load factor not exceeding 80% of the prime power rating in any 24 hour period. Overload of 10% permitted for 1 hour in every 12 hours operation. **Standby (maximum):** Power available at variable load in the event of a main power network failure up to a maximum of 500 hours per year. No overload is permitted.

Percent of prime power	Fuel consumption at 1500 rpm g/kWh	Fuel consumption at 1500 rpm l/hr
Standby (maximum)	211	405
Prime power	208	370
Continuous baseload	207	310
75%	206	275
50%	202	187