

Technical Data

4000 Series

Diesel Engine - ElectropaK

4012TWG 4012TWG2

Basic technical data

Number of cylinders 12
 Cylinder arrangement..... 60°
 Cycle 4 stroke, compression ignition
 Induction system turbocharged
 Combustion system..... direct injection
 Compression ratio 13:6 nominal
 Bore..... 160 mm (6.3 in)
 Stroke..... 190 mm (7.5 in)
 Cubic capacity 45-482 litres
 Direction of rotation 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
 Cylinder 1 furthest from flywheel
Note: Cylinders designated 'A' are on the right hand side of the engine when viewed from the flywheel end

Cyclic irregularity

For engine/flywheel maximum:
 -4012TWG @ 1500 rev/min..... 1-737
 -4012TWG2 @ 1500 rev/min. 1-752

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 rev/min
 Static injection timing see engine number plate
 Cooling water exit temperature..... < 98 °C

Total weight of ElectropaK

	Units	Temperate	Tropical
Engine - dry	kg (lb)	4440 (9788.5)	4440 (9788.5)
ElectropaK - dry ¹	kg (lb)	5100 (11243.6)	5220 (11508.1)
ElectropaK - wet ^{1,2}	kg (lb)	5508 (12143.1)	5547 (12229.0)

1. Includes fuel cooler
2. Includes engine lubricating oil

Fuel data

To conform to BS 2869 class A2 or BS EN590.

Performance

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

Estimated sound pressure level at 1500 rev/min without inlet or exhaust at 1 metre. 111 d(B)A
Note: Noise levels represent highest recorded at 1500 rev/min

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 temperatures and / or altitude are available, please contact Perkins Applications Department

Overall dimensions of ElectropaK

	Units	Height	Length	Width
Temperate	mm (in)	2213 (87.1)	3691 (145.3)	1798 (70.8)
Tropical	mm (in)	2207 (86.9)	3703 (145.8)	1780 (70.1)

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) .. 3,0 kPa
 -maximum fuel temperature (inlet pump)..... 58 °C
 For test conditions relevant to data on load acceptance, please refer to page 17 of this document.

Moment of inertia (mk²)

	Units	4012TWG	4012TWG2
Flywheel	kgm ²	9,57	9,57
Engine	kgm ²	7,26	9,73

General installation - 4012TWG (Temperate)

Designation	Units	Type of operation and application		
		Spill Timing 22°		
		Base	Prime	Standby
50 Hz @ 1500 rev/min				
Gross engine power	kWm	714	892	981
Fan and battery charging alternator power	kW		32	
Net engine power	kWm	682	860	949
Brake mean effective pressure (gross)	kPa	862	1075	1179
Combustion air flow at ISO conditions	m ³ /min	92	112	120
Exhaust gas temperature (max) after turbo	°C		517	
Exhaust gas flow (max) at atmospheric pressure	m ³ /min		215	
Boost pressure ratio	-	2,30	2,45	2,65
Mechanical efficiency	%	86	88	89
Overall thermal efficiency (nett)	%		39	
Friction and pumping power losses	kWm		120	
Mean piston speed	m/s		9,5	
Engine coolant flow	l/min		948	
Typical GenSet electrical output (0.8pf)	kVA	810	1021	1127
	kWe	648	817	902
Assumed alternator efficiency	%		95	

General installation - 4012TWG (Tropical)

Designation	Units	Type of operation and application		
		Spill Timing 22°		
		Base	Prime	Standby
		50 Hz @ 1500 rev/min		
Gross engine power	kWm	714	892	981
Fan and battery charging alternator power	kW	51		
Net engine power	kWm	663	841	930
Brake mean effective pressure (gross)	kPa	12,5	15,6	17,1
Combustion air flow at ISO conditions	m³/min	92	112	120
Exhaust gas temperature (max) after turbo	°C	517		
Exhaust gas flow (max) at atmospheric pressure	m³/min	215		
Boost pressure ratio	-	2,30	2,45	2,65
Mechanical efficiency	%	86	88	89
Overall thermal efficiency (nett)	%	39		
Friction and pumping power losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/min	948		
Typical GenSet electrical output (0.8pf)	kVA	787	999	1104
	kWe	630	799	884
Assumed alternator efficiency	%	95		

General installation - 4012TWG2 (Temperate)

Designation	Units	Type of operation and application		
		Spill Timing 22°		
		Base	Prime	Standby
		50 Hz @ 1500 rev/min		
Gross engine power	kWm	878	1097	1207
Fan and battery charging alternator power	kW	32		
Net engine power	kWm	846	1065	1175
Brake mean effective pressure (gross)	kPa	15,3	19,1	21,1
Combustion air flow at ISO conditions	m³/min	76	91	97
Exhaust gas temperature (max) after turbo	°C	460		
Exhaust gas flow (max) at atmospheric pressure	m³/min	245		
Boost pressure ratio	-	2,70	3,10	3,30
Mechanical efficiency	%	88	90	91
Overall thermal efficiency (nett)	%	41,5	41,0	41,0
Friction and pumping power losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/min	948		
Typical GenSet electrical output (0.8pf)	kVA	1015	1278	1410
	kWe	812	1022	1128
Assumed alternator efficiency	%	96		

General installation - 4012TWG2 (Tropical)

Designation	Units	Type of operation and application		
		Spill Timing 22°		
		Base	Prime	Standby
		50 Hz @ 1500 rev/min		
Gross engine power	kWm	878	1097	1207
Fan and battery charging alternator power	kW	51		
Net engine power	kWm	827	1046	1156
Brake mean effective pressure (gross)	kPa	15,3	19,1	21,1
Combustion air flow at ISO conditions	m ³ /min	92	112	120
Exhaust gas temperature (max) after turbo	°C	517		
Exhaust gas flow (max) at atmospheric pressure	m ³ /min	215		
Boost pressure ratio	-	2,30	2,45	2,65
Mechanical efficiency	%	86	88	89
Overall thermal efficiency (nett)	%	39		
Friction and pumping power losses	kWm	120		
Mean piston speed	m/s	9,5		
Engine coolant flow	l/min	948		
Typical GenSet electrical output (0.8pf)	kVA	992	1255	1387
	kWe	794	1004	1110
Assumed alternator efficiency	%	96		

Note: Not to be used for combined heat and power (CHP) design purposes (indicative figures only). Consult Perkins Engines Stafford Limited. Assumes complete combustion.

Rating definitions

Continuous baseload power

Available for continuous full load operation

Prime power

Available for unlimited hours per year with a variable load of which the average engine load factor is 80% of the published power rating, incorporation of a 10% overload for 1 hour in every 12 hours of operation which is permitted.

Standby power

Available 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 please 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.

Emissions capability

All 4012TWG / 4012TWG2 ratings are 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

4012TWG - Temperate

Designation	Units	1500 rev/min		
		Baseload power	Prime power	Standby power
Energy in fuel	kW	1822	2260	2546
Energy in power output (gross)	kW	714	892	981
Energy to cooling fan	kW	32		
Energy in power output (nett)	kW	682	860	949
Energy to exhaust	kW	575	772	891
Energy to coolant and oil	kW	333	370	407
Energy to radiation	kW	70	84	110
Energy to charge cooler	kW	130	142	157

4012TWG - Tropical

Designation	Units	1500 rev/min		
		Baseload power	Prime power	Standby power
Energy in fuel	kW	1822	2260	2546
Energy in power output (gross)	kW	714	892	981
Energy to cooling fan	kW	51		
Energy in power output (nett)	kW	663	841	930
Energy to exhaust	kW	575	772	891
Energy to coolant and oil	kW	333	370	407
Energy to radiation	kW	70	84	110
Energy to charge cooler	kW	130	142	157

4012TWG2 - Temperate

Designation	Units	1500 rev/min		
		Baseload power	Prime power	Standby power
Energy in fuel	kW	2116	2657	2959
Energy in power output (gross)	kW	878	1097	1207
Energy to cooling fan	kW	32		
Energy in power output (nett)	kW	846	1065	1175
Energy to exhaust	kW	697	866	963
Energy to coolant and oil	kW	316	410	467
Energy to radiation	kW	85	100	109
Energy to charge cooler	kW	140	184	213

4012TWG2 - Tropical

Designation	Units	1500 rev/min		
		Baseload power	Prime power	Standby power
Energy in fuel	kW	2116	2657	2959
Energy in power output (gross)	kW	878	1097	1207
Energy to cooling fan	kW	51		
Energy in power output (nett)	kW	827	1046	1156
Energy to exhaust	kW	697	866	963
Energy to coolant and oil	kW	316	410	467
Energy to radiation	kW	85	100	109
Energy to charge cooler	kW	140	184	213

Note: Not to be used for combined heat and power (CHP) purposes (indicative figures only), if required, please consult Perkins Engines Company Limited.

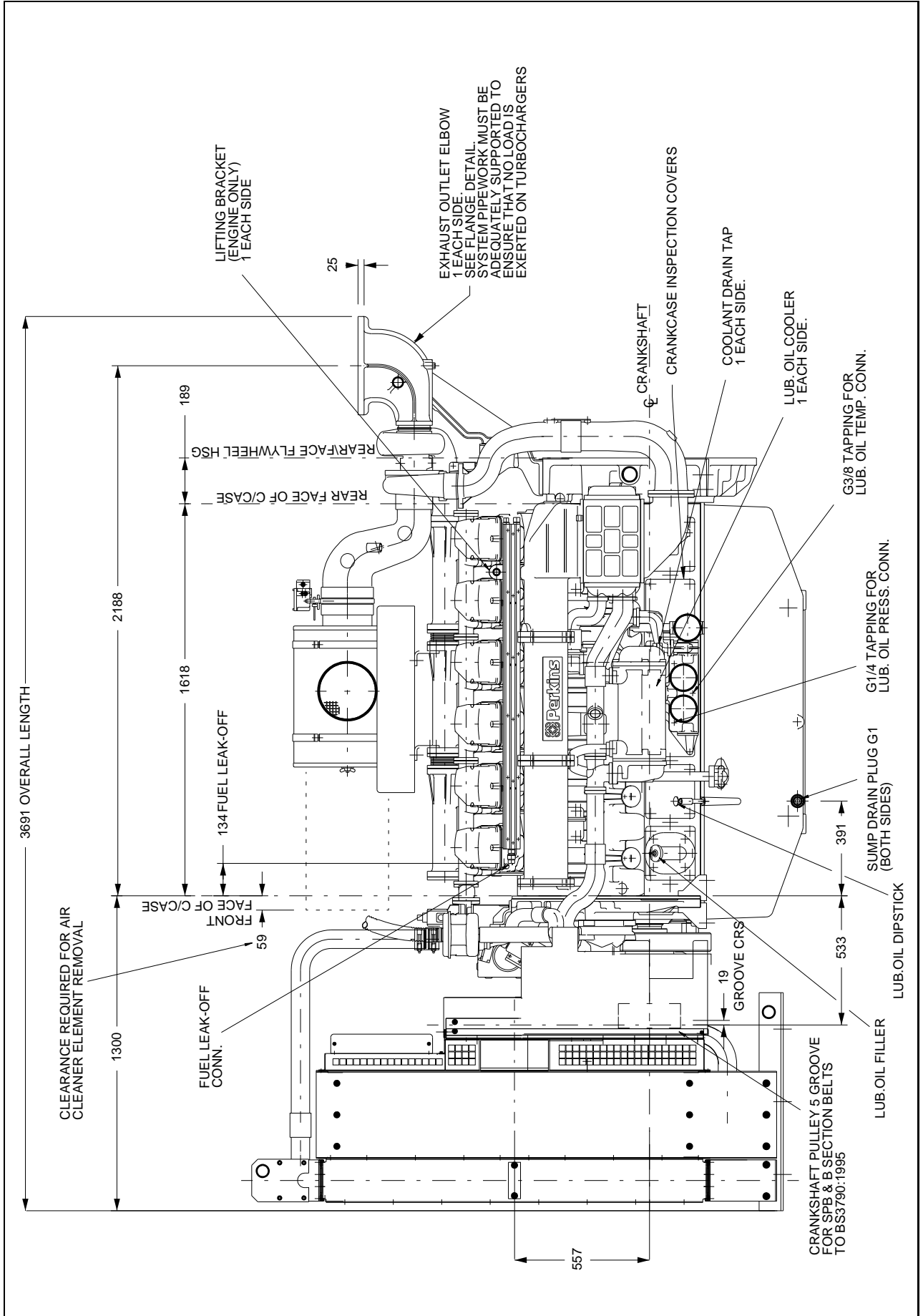
Exhaust system

Outlet size (internal) ... 2 x 254 mm
 Outlet flange size ... 10" table D
 Back pressure for total system ... 93 Pa
 For recommended pipe sizes, refer to the Installation Manual.

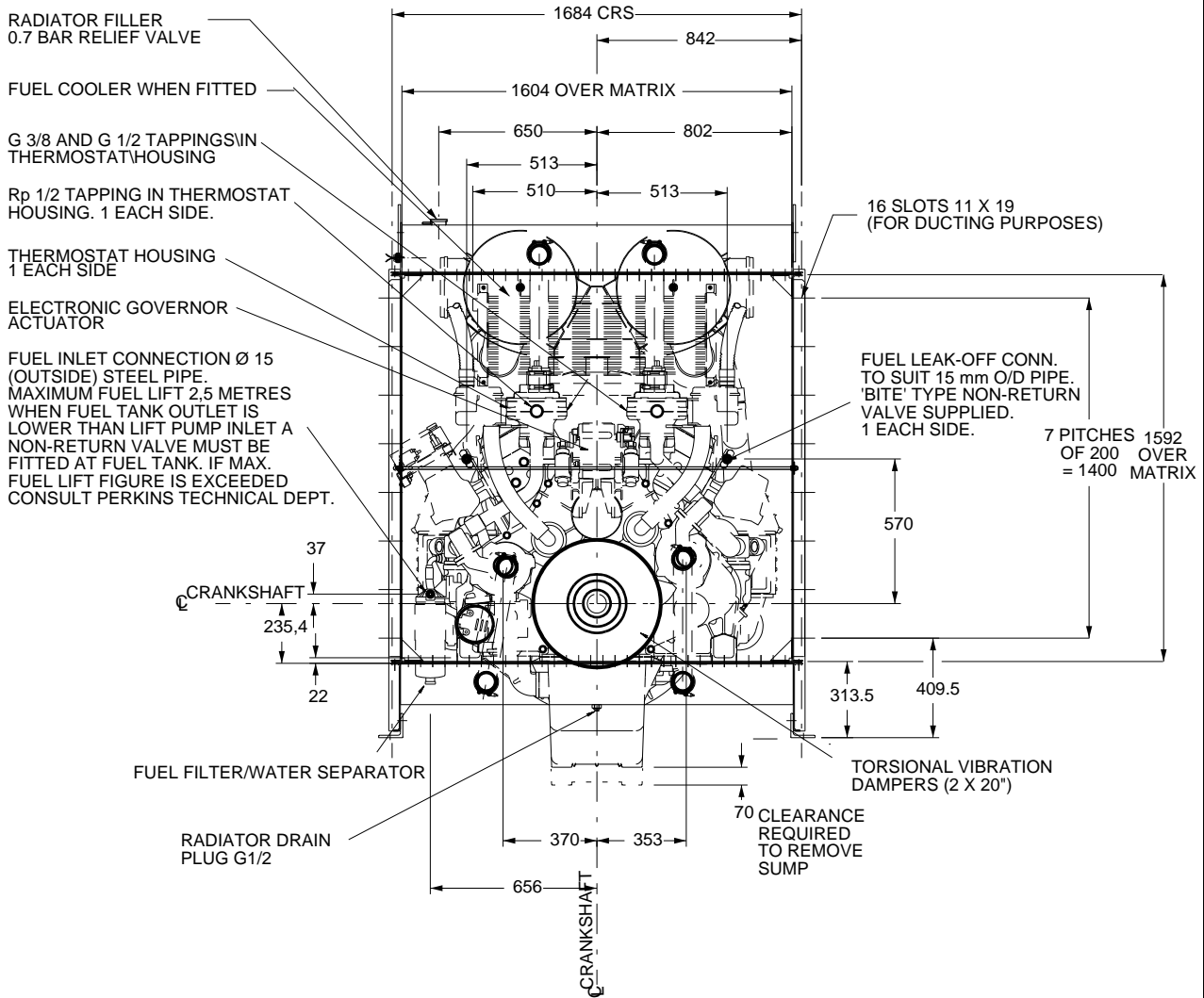
Induction system

Emissions data with combustion air temperature of 25 °C
 Maximum air intake restriction of engine:
 -clean filter ... 12,4 Pa
 -dirty filter ... 37,2 Pa
 -air filter type ... cylindrical paper pleat

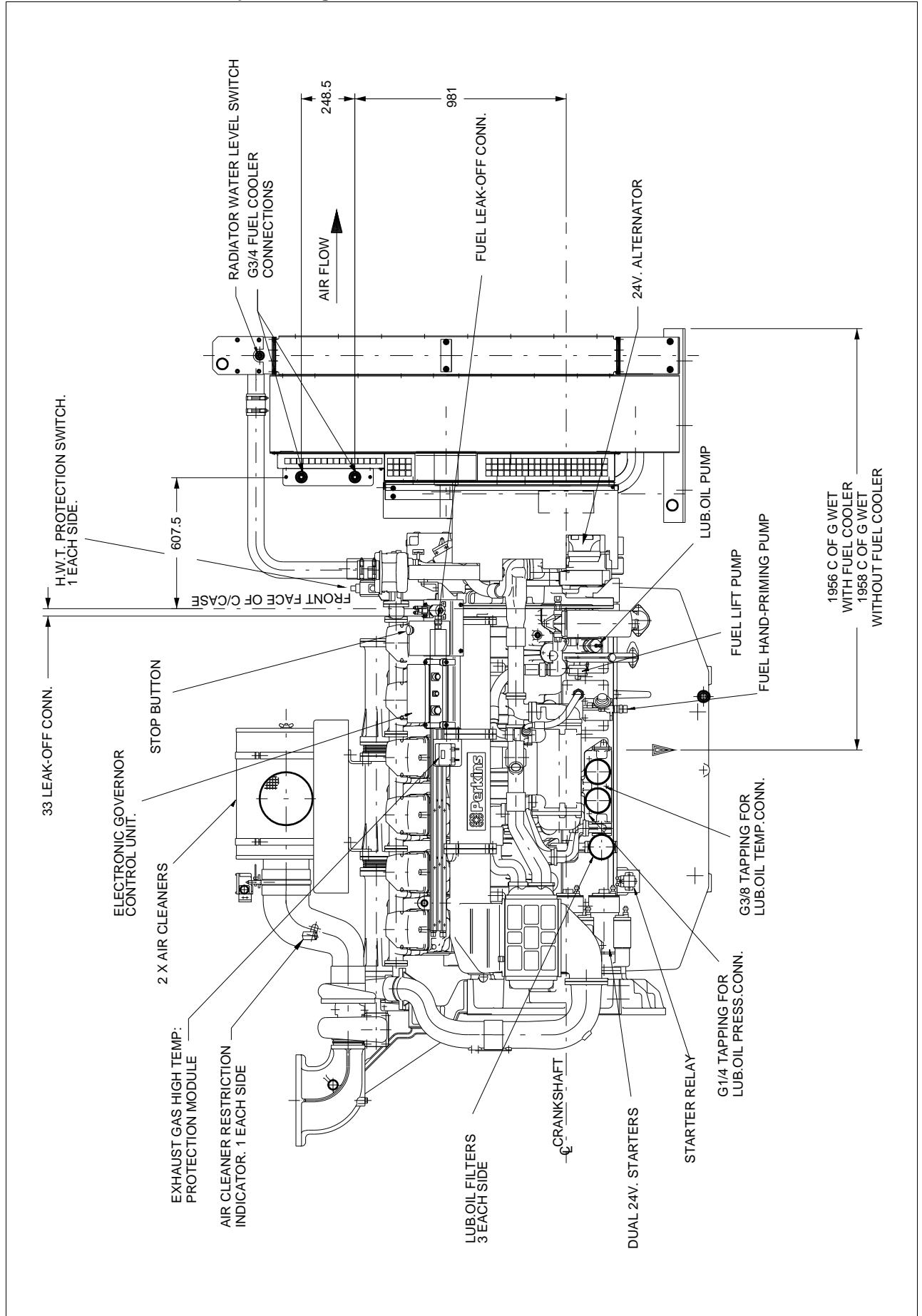
4012TWG / 4012TWG2 Temperate - left view



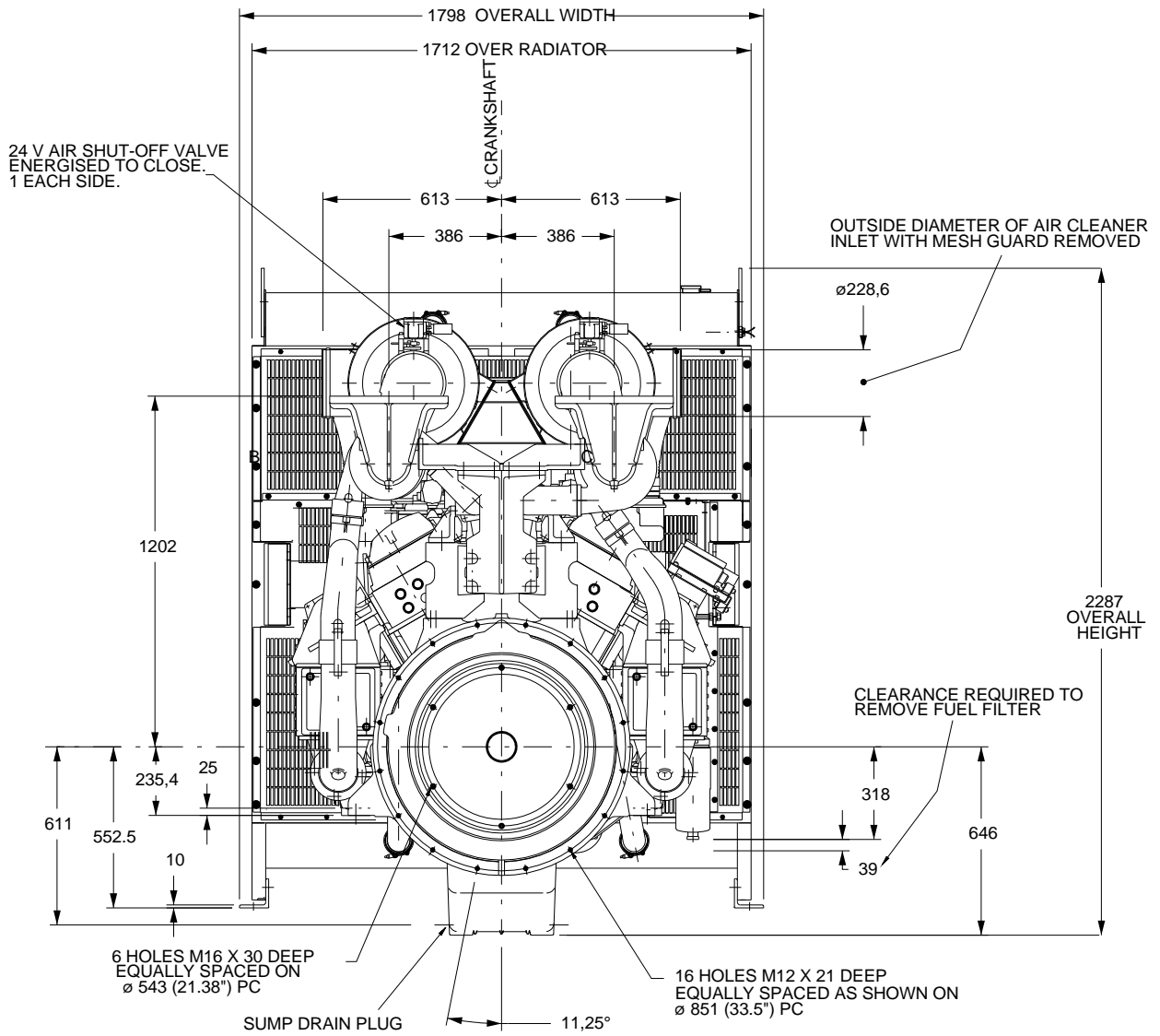
4012TWG / 4012TWG2 Temperate - front view



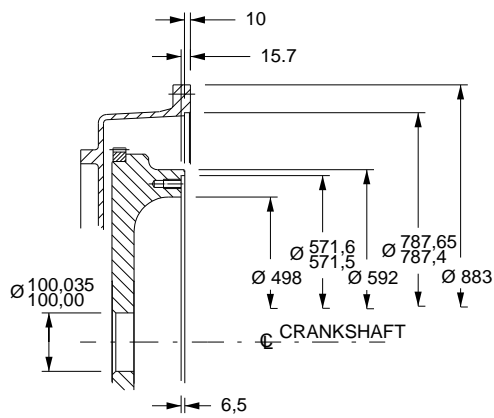
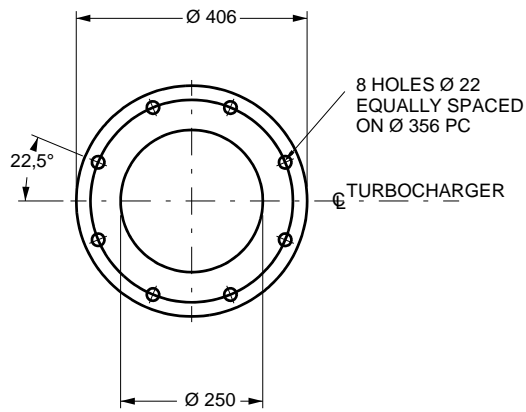
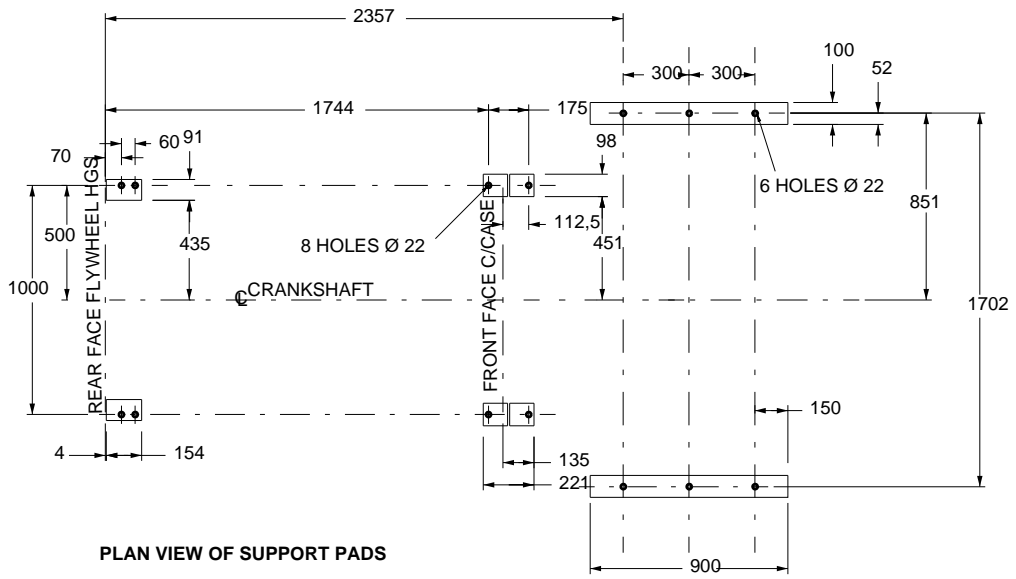
4012TWG / 4012TWG2 Temperate - right view



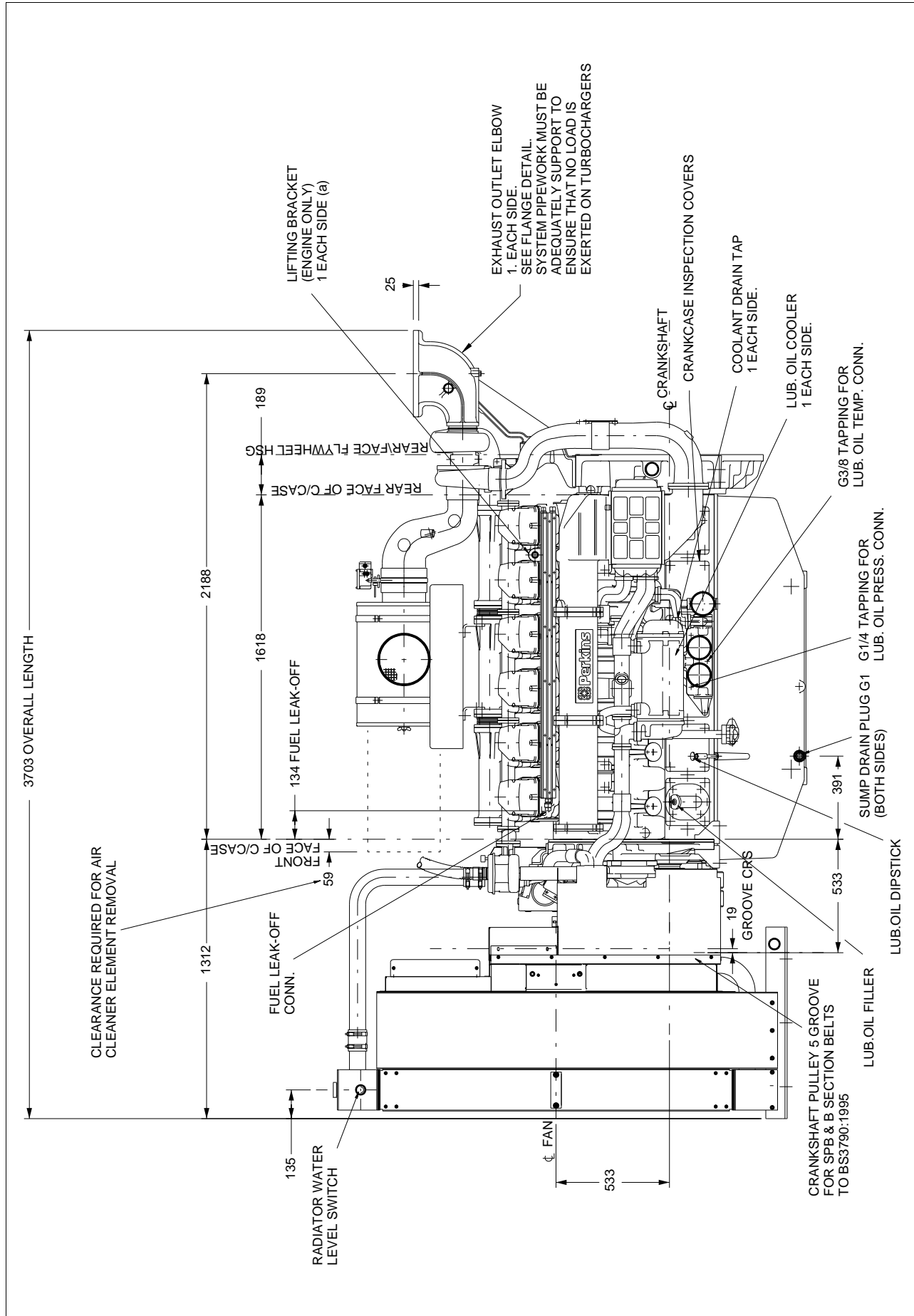
4012TWG / 4012TWG2 Temperate - rear view



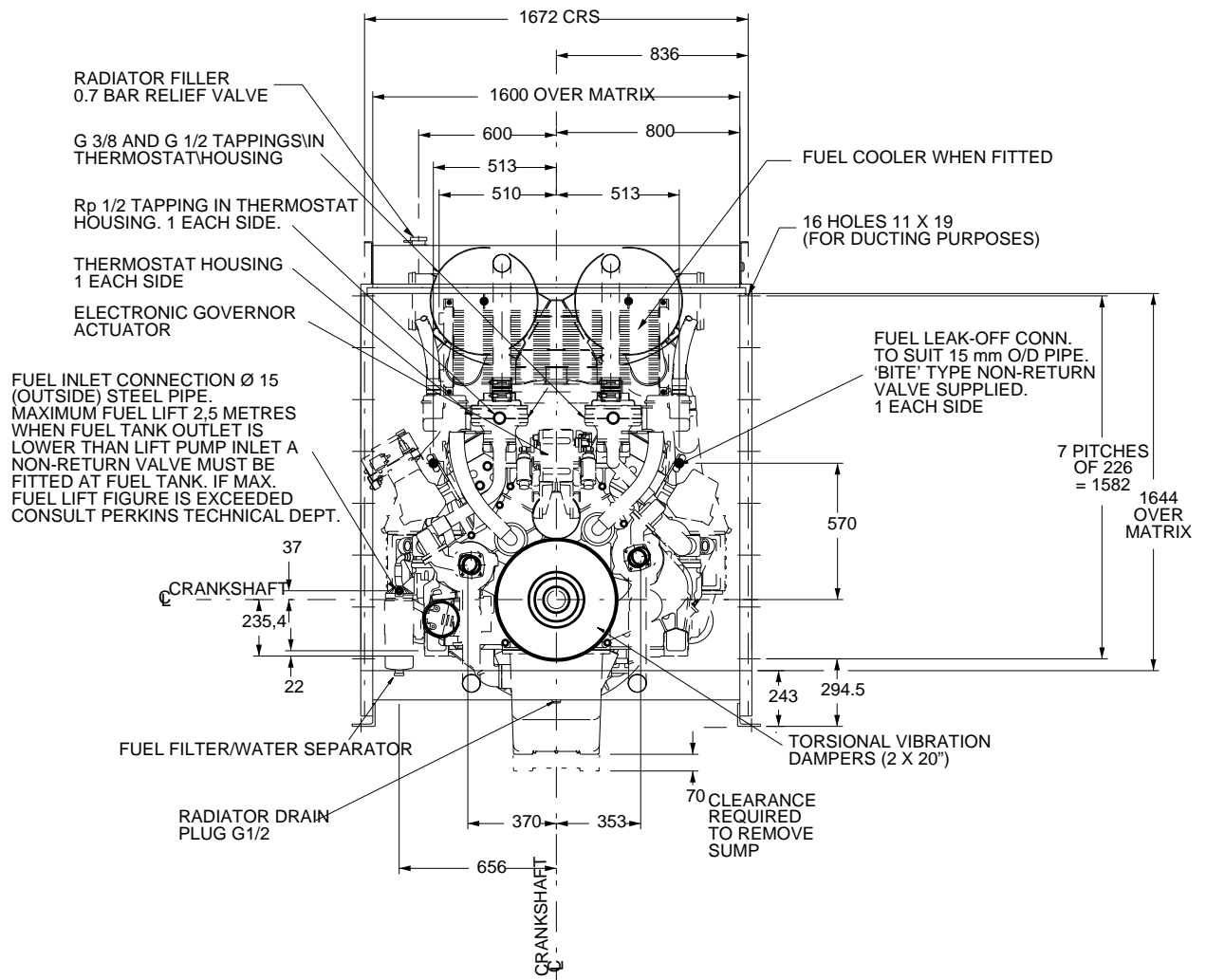
4012TWG / 4012TWG2 Temperate - plan view of support pads, exhaust outlet flange and flywheel details



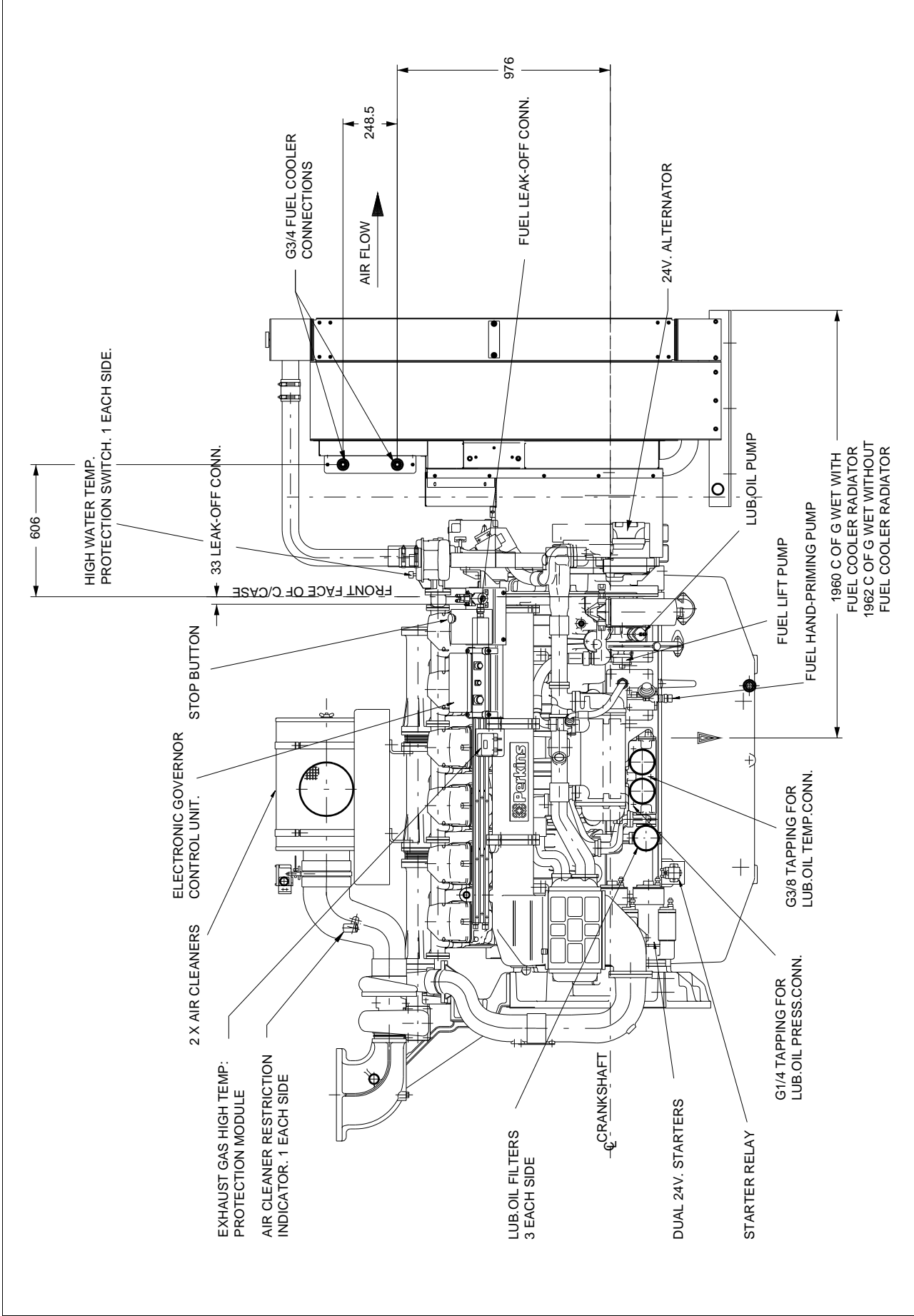
4012TWG / 4012TWG2 Tropical - left view



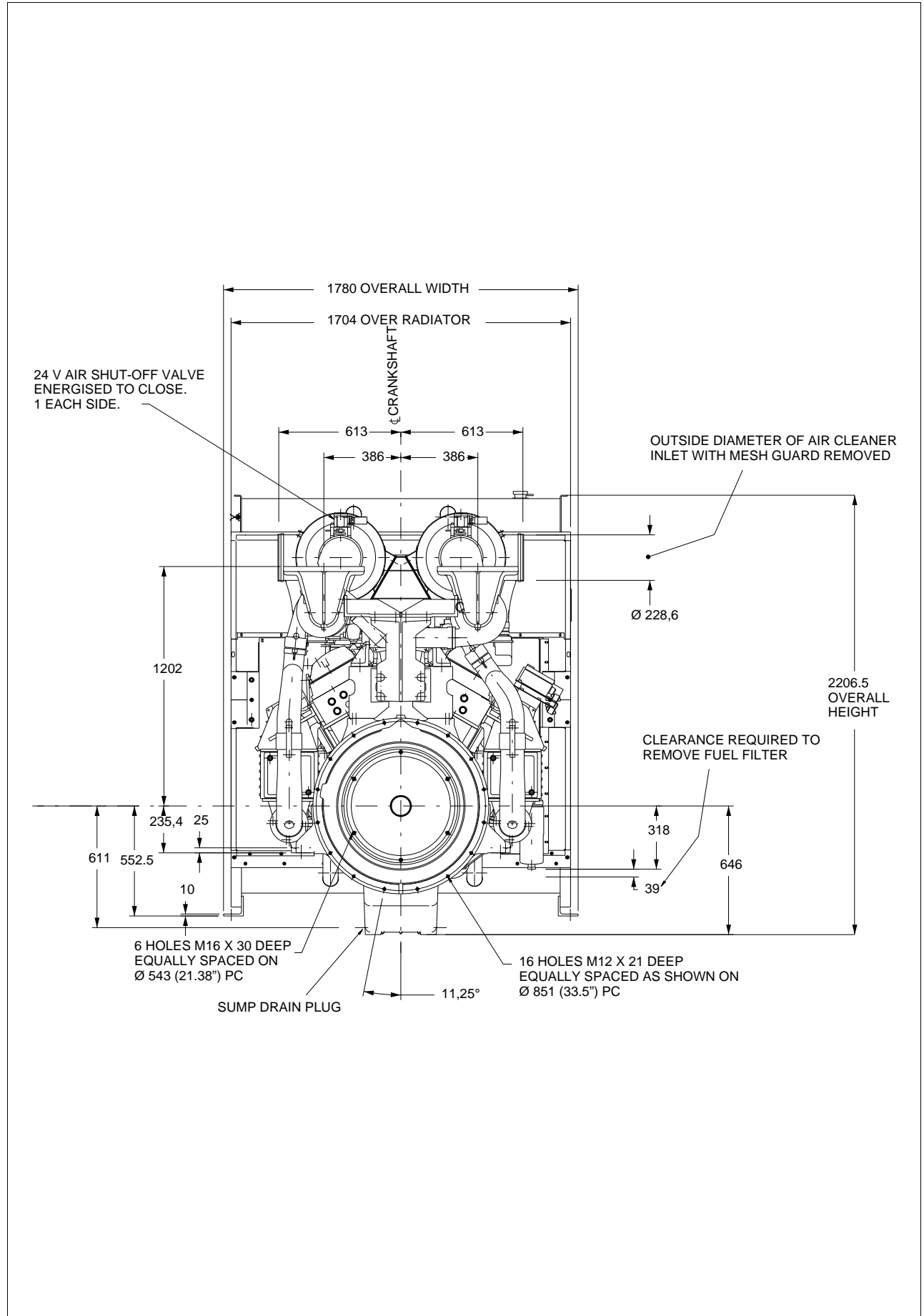
4012TWG / 4012TWG2 Tropical - front view



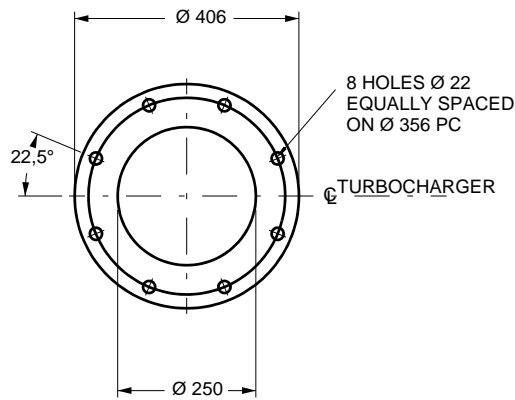
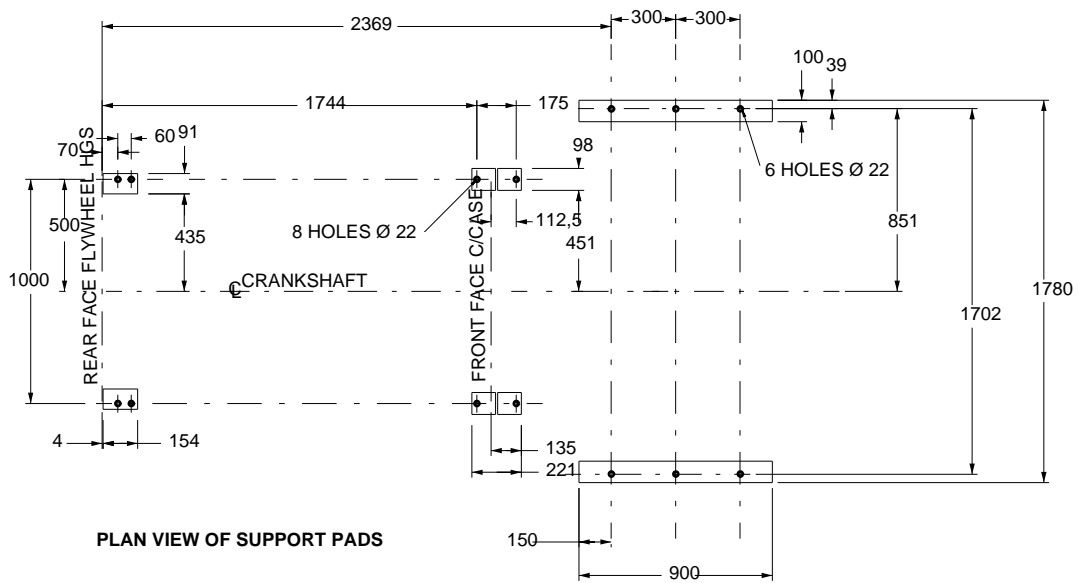
4012TWG / 4012TWG2 Tropical - right view



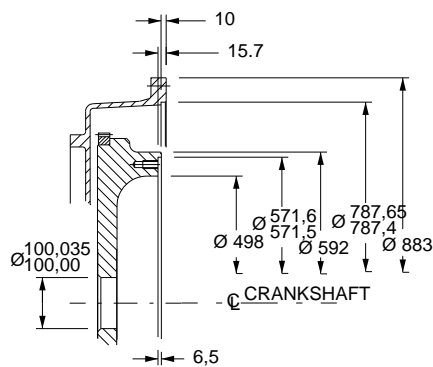
4012TWG / 4012TWG2 Tropical - rear view



4012TWG / 4012TWG2 Tropical - plan view of support pads, exhaust outlet flange and flywheel details



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

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 of Perkins inhibitor in the cooling system. The inhibitor is available in 1 litre bottles from all Perkins Distributors.

Maximum

- pressure in crankcase water jacket... 170 kPa
- top tank temperature (standby) ... 98 °C
- static pressure on pump... 70 kPa
- pressure cap setting... 69 kPa

Total coolant capacity

Electronit (engine only) ... 73 litres
ElectropaK

- temperate (engine and radiator) ... 196 litres
- tropical (engine and radiator) ... 196 litres
- Maximum permissible restriction to coolant pump flow ... 20 kPa
- Thermostat operating range... 71 - 85 °C
- Shutdown switch setting ... 101 °C
- Coolant immersion heater capacity... 2 x 4 kW

Radiator

	Unit	Temperate	Tropical
Face area	mm ²	2553568	2630400
Number of rows and material		200	226
Fins per inch and material		7	7
Width of matrix	mm	1604	1600
Height of matrix	mm	1592	1644
Weight (dry)	kg	740	780
Total coolant capacity	litres	123	123
Pressure cap setting (min)	kPa	69	69

Water jacket cooling data

	Unit	4012TWG	4012TWG2
Coolant flow	l/s	948	948
Coolant exit temperature (max)	°C	98	98
Coolant inlet temperature (min)	°C	70	70
Coolant inlet temperature (max)	°C	85	80

Coolant pump

- speed ... 1.4 x e rev/min
- method of drive ... engine driven

Fan

	Unit	Temperate	Tropical
Type		engine driven	engine driven
Diameter	mm	1400	1400
Number of blades		12	12
Material		Aluminium	Aluminium
Drive ratio		1:1	1:1

Cooling clearance

4012TWG - Temperate

Maximum additional restriction (duct allowance) to cooling airflow (TWG temperate standby power) and resultant min airflow				
Description	rev/min	°C	mmH ₂ O	m ³ /min
Ambient clearance: Inhibited coolant	1500	35	N/A	N/A
Duct allowance	1500	35	25	N/A
Minimum airflow	1500	35	25	1338

4012TWG - Tropical

Maximum additional restriction (duct allowance) to cooling airflow (TWG tropical standby power) and resultant min airflow				
Description	rev/min	°C	mmH ₂ O	m ³ /min
Ambient clearance: Inhibited coolant	1500	50	N/A	N/A
Duct allowance	1500	50	12	N/A
Minimum airflow	1500	50	12	1695

4012TWG2 - Temperate

Maximum additional restriction (duct allowance) to cooling airflow (TWG2 temperate standby power) and resultant min airflow				
Description	rev/min	°C	mmH ₂ O	m ³ /min
Ambient clearance: Inhibited coolant	1500	35	N/A	N/A
Duct allowance	1500	35	25	N/A
Minimum airflow	1500	35	25	1338

4012TWG2 - Tropical

Maximum additional restriction (duct allowance) to cooling airflow (TWG2 tropical standby power) and resultant min airflow				
Description	rev/min	°C	mmH ₂ O	m ³ /min
Ambient clearance: Inhibited coolant	1500	50	N/A	N/A
Duct allowance	1500	50	12	N/A
Minimum airflow	1500	50	12	1695

Cold start recommendations

Temperature range	
Down to 0 °C (32 °F)	Oil: API CG 15W40 Starter: 2 x 24 volts Battery: 4 x 12V 286 Ah Max breakaway current: 1600 amps Cranking current: 810 amps Aids: N/A 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.

Lubrication system

The recommended SAE viscosity is a multigrade oil (15W40) which adequately meets the specifications of API CG4.

Lubricating oil capacity

Total system... ..177 litres
 Sump maximum... ..157,5 litres
 Sump minimum... ..115 litres
 Oil temperature at normal operating conditions... .. 95 °C
 Oil temperature (in rail) - maximum continuous operation... 105 °C

Lubricating oil pressure

In main bearing gallery (at 80 °C minimum)... .. 340 kPa
 Oil filter screen spacing... .. 40 microns
 Sump drain plug tapping size... .. G1
 Oil pump speed and drive method... 1.4 x e rev/min engine driven
 Shutdown switch - pressure setting (where fitted)... .. 193 kPa

Normal operating angles

-fore and aft... .. 5°
 -side tilt... .. 10°

Designation		4012TWG	4012TWG2
Oil consumption (prime power)		1500 rev/min	
After running-in (typically after 250 hours)	g/kWhr	0,52	0,52
Oil flow rate from oil pump	l/s	6,0	6,0

Fuel system

Injection system... .. direct injection
 Fuel injection pump... .. delphi
 Injector type... .. unit injector
 Injector pressure... .. 23,4 MPa

Fuel lift pump

Delivery flow... .. 1020 litres/hr
 Heat retained in fuel to tank
 -4012TWG... .. 8,0 kW
 -4012TWG2... .. 8,5 kW
 Fuel inlet temperature to be less than... .. 58 °C
 Delivery pressure... .. 300 kPa
 Maximum suction head at pump inlet... .. 24,5 kPa
 Maximum static pressure head... .. see manual
 Fuel filter spacing... .. 10 microns
 Governing type... .. electronic
 Governing... .. to ISO 8528-5 2005
 Torque at the governor output shaft... .. 1-631
 Tolerance on fuel consumption... .. to ISO 8528-1 1993

Fuel specification

Recommended fuel to conform to:
 -BS2869 1998 class A2 or BS EN590

Fuel consumption

4012TWG - Temperate

Designation	Fuel consumption calculated on nett rated powers @ 1500 rev/min	
	g/kWh	litres/hr
Standby	219	253
Prime power	215	226
Baseload power	216	181
At 75% of Prime power	219	172
At 50% of Prime power	229	120

4012TWG - Tropical

Designation	Fuel consumption calculated on nett rated powers @ 1500 rev/min	
	g/kWh	litres/hr
Standby	223	258
Prime power	220	231
Baseload power	222	186
At 75% of Prime power	225	177
At 50% of Prime power	236	123

4012TWG2 - Temperate

Designation	Fuel consumption calculated on nett rated powers @ 1500 rev/min	
	g/kWh	litres/hr
Standby	204	289
Prime power	201	260
Baseload power	199	206
At 75% of Prime power	205	194
At 50% of Prime power	233	133

4012TWG2 - Tropical

Designation	Fuel consumption calculated on nett rated powers @ 1500 rev/min	
	g/kWh	litres/hr
Standby	207	294
Prime power	205	265
Baseload power	204	211
At 75% of Prime power	210	198
At 50% of Prime power	238	136

Note: All based on assumed density of TBA

Electrical system

Alternator	
-type	insulated return
-voltage	24 volts
-output	40 amps
Starter	
-type	electric
-motor voltage	24 volts
-motor power	16,4 kW
Number of teeth on	
-flywheel	156
-starter motor	12
Minimum cranking speed	120 rev/min
Starter solenoid	
-pull in current @ -25 °C max	30 amps
-hold in current @ -25 °C max	9 amps
Engine stop solenoid voltage	24 volts

Engine mounting

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

Centre of gravity

Bare engine (wet)	
-forward of rear face of cylinder block	771 mm
-above crankshaft centre line	32 mm
ElectropaK (wet) - Temperate	
-forward of rear face of cylinder block	1207 mm
-above crankshaft centre line	32 mm
ElectropaK (wet) - Tropical	
-forward of rear face of cylinder block	1222 mm
-above crankshaft centre line	32 mm

Load acceptance (cold)

For details of load acceptance values, contact the applications department at Perkins Engines Company Limited, Stafford.

Noise levels

The figures for total noise levels are typical for an engine running at the standby 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).

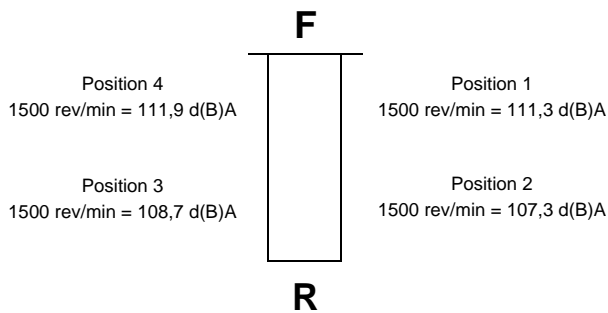
Speed. 1500 rev/min
Ambient noise level ... 70 d(B)A

Octave analysis

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

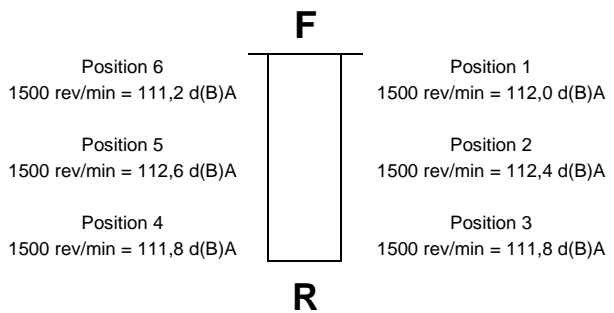
4012TWG / 4012TWG2 - Temperate

Noise measured at points 1 to 4 at 1154 kWb

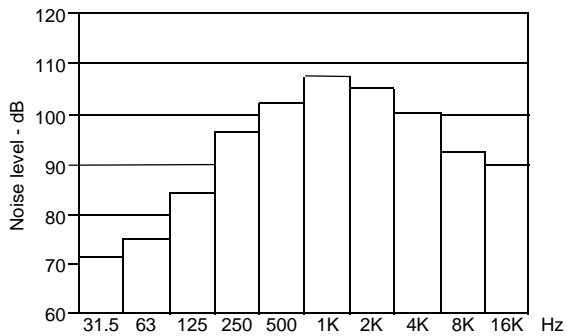


4012TWG / 4012TWG2 - Tropical

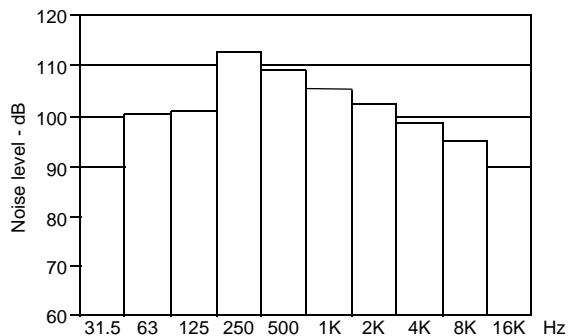
Noise measured at points 1 to 6 at 1154 kWb



Frequency analysis at position 4 1154 kWb



Frequency analysis at position 5 1154 kWb



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

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