

Technical Data

4000 Series

Diesel Engine - Electropak

4012-46TAG1A

4012-46TAG2A

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 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

Approximate weights

Description	unit	Tropical	Temperate
Engine (dry)	Kg	4400	4400
Electropak (wet) + fuel cooler	Kg	6086	5949
Electropak (wet) - fuel cooler	Kg	6070	5933

Overall dimensions of Electropak

	unit	Tropical	Temperate
Height	mm	2258	2255
Length	mm	3915	3916
Width	mm	2198	1775

Moment of inertia

Engine 9,73 kgm²
Flywheel 9,57 kgm²

Cyclic irregularity for engine/flywheel maximum

4012-46TAG1A 1:714
4012-46TAG2A 1:669

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
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 17.

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 18 of this document

General installation

4012-46TAG1A - Temperate

Designation	Units	Type of operation and application		
		Baseload power	Prime power	Standby power
Gross engine power	kWm	973	1212	1327
Fan and battery charging alternator power	kW	42		
Nett engine power	kWm	931	1170	1285
Brake mean effective pressure (gross)	kPa	1694	2110	2309
Combustion air flow at ISO conditions	m³/min	92	112	120
Exhaust gas temperature (max) after turbo	°C	425		
Exhaust gas flow (max) at atmospheric pressure	m³/min	280		
Boost pressure ratio	-	2,60	2,93	3,20
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,0	41,5	41,0
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	1106	1389	1526
	kWe	884	1112	1221
Assumed alternator efficiency	%	95		

4012-46TAG1A - Tropical

Designation	Units	Type of operation and application		
		Baseload power	Prime power	Standby power
Gross engine power	kWm	973	1212	1327
Fan and battery charging alternator power	kW	64		
Nett engine power	kWm	909	1148	1263
Brake mean effective pressure (gross)	kPa	1694	2110	2309
Combustion air flow at ISO conditions	m³/min	92	112	120
Exhaust gas temperature (max) after turbo	°C	425		
Exhaust gas flow (max) at atmospheric pressure	m³/min	280		
Boost pressure ratio	-	2,60	2,93	3,20
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,0	41,5	41,0
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	1080	1364	1500
	kWe	864	1091	1200
Assumed alternator efficiency	%	95		

General installation

4012-46TAG2A - Temperate

Designation	Units	Type of operation and application		
		Baseload power	Prime power	Standby power
Gross engine power	kWm	1069	1331	1459
Fan and battery charging alternator power	kW	42		
Nett engine power	kWm	1027	1289	1417
Brake mean effective pressure (gross)	kPa	1861	2317	2538
Combustion air flow at ISO conditions	m³/min	100	120	128
Exhaust gas temperature (max) after turbo	°C	455		
Exhaust gas flow (max) at atmospheric pressure	m³/min	320		
Boost pressure ratio	-	2,8	3,1	3,4
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,0	41,5	41,0
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	1220	1531	1683
	kWe	976	1225	1346
Assumed alternator efficiency	%	95		

4012-46TAG2A - Tropical

Designation	Units	Type of operation and application		
		Baseload power	Prime power	Standby power
Gross engine power	kWm	1069	1331	1459
Fan and battery charging alternator power	kW	64		
Nett engine power	kWm	1005	1267	1395
Brake mean effective pressure (gross)	kPa	1861	2317	2538
Combustion air flow at ISO conditions	m³/min	100	120	128
Exhaust gas temperature (max) after turbo	°C	455		
Exhaust gas flow (max) at atmospheric pressure	m³/min	320		
Boost pressure ratio	-	2,8	3,1	3,4
Mechanical efficiency	%	89	91	92
Overall thermal efficiency (nett)	%	41,0	41,5	41,0
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	1194	1505	1656
	kWe	955	1204	1325
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

4012-46TAG1A - Temperate

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2217	2817	3137
Energy in power output (gross)	kW	973	1212	1327
Energy to cooling fan	kW	42		
Energy in power output (nett)	kW	931	1170	1285
Energy to exhaust	kW	750	900	1010
Energy to coolant and oil	kW	252	370	406
Energy to radiation	kW	67	85	94
Energy to charge coolers	kW	175	250	300

4012-46TAG1A - Tropical

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2217	2817	3137
Energy in power output (gross)	kW	973	1212	1327
Energy to cooling fan	kW	64		
Energy in power output (nett)	kW	909	1148	1263
Energy to exhaust	kW	750	900	1010
Energy to coolant and oil	kW	252	370	406
Energy to radiation	kW	67	85	94
Energy to charge coolers	kW	175	250	300

4012-46TAG2A - Temperate

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2450	3200	3750
Energy in power output (gross)	kW	1069	1331	1459
Energy to cooling fan	kW	42		
Energy in power output (nett)	kW	1027	1289	1417
Energy to exhaust	kW	805	1015	1080
Energy to coolant and oil	kW	288	457	501
Energy to radiation	kW	74	96	107
Energy to charge coolers	kW	214	301	423

4012-46TAG2A - Tropical

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2450	3200	3570
Energy in power output (gross)	kW	1069	1331	1459
Energy to cooling fan	kW	64		
Energy in power output (nett)	kW	1005	1267	1395
Energy to exhaust	kW	805	1015	1080
Energy to coolant and oil	kW	288	457	501
Energy to radiation	kW	74	96	107
Energy to charge coolers	kW	214	301	423

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

Electrounit (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 ... 2,57 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 ... 1,608 m

Height of matrix... 1,601 m

Weight of radiator... 1117 kg

Pressure cap setting (min) ... 70 kPa

Radiator tropical

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

Pressure cap setting (min) ... 70 kPa

Water jacket cooling data

Temperate and Tropica

-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 ... 1530 mm

-Tropical ... 1600 mm

Number of blades... 12

Material ... Aluminium

Drive ratio... 0.93:1

4012-46TAG1A - 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)
35 °C	250	20,2

4012-46TAG1A - 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	200	32,4

4012-46TAG2A - 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)
35 °C	250	20,2

4012-46TAG2A - 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	200	32,4

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... 159 litres

-sump minimum... 136 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/kW hr	0,52
Oil flow rate from pump	litres/sec	6

Induction system

Maximum air intake restriction of engine:

-clean filter. 2 kPa
-dirty filter 4 kPa
-air filter type paper element

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.

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

-4012-46TAG1A/-4012-46TAG2A. 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
4012-46TAG1A, Temperate & Tropical		
Standby	199	308
Prime	196	281
Baseload	196	224
75% Prime	195	212
50% Prime	204	154
4012-46TAG2A, Temperate & Tropical		
Standby	202	335
Prime	200	301
Baseload	200	242
75% Prime	201	237
50% Prime	203	162

Note: Fuel consumption calculated on gross rated powers.

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.

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.

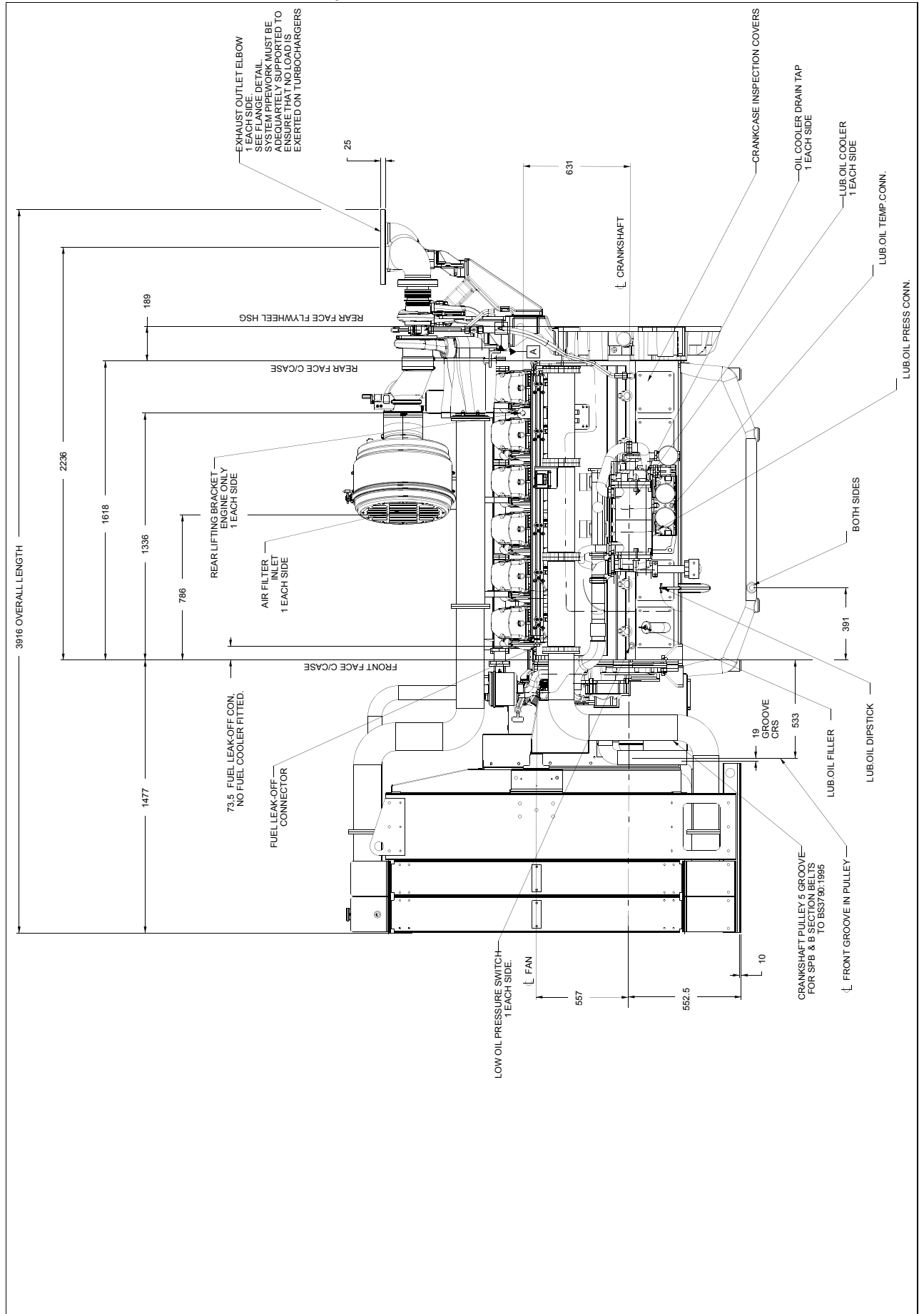
Engine mounting

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

4012-46TAG1A / 4012-46TAG2A Temperate - Left hand side view



802

837

650

513

513

510 FUEL COOLER CONN

RADIATOR FILLER 0.7 BAR RELIEF VALVE

18 SLOTS 19 WIDE x 19 HIGH (FOR DUCTING PURPOSES)

FUEL LEAK-OFF CONN TO SUIT 15mm O/D PIPE. 'BITE' TYPE NON RETURN VALVE SUPPLIED 1 EACH SIDE (NO FUEL COOLER)

1200 6 PITCHES OF 200

1500

1597 OVER MATRIX

570

385

150

311

359.5

70 CLEARANCE REQUIRED TO REMOVE SUMP.

CRANKSHAFT

315

315

641

IN THERMOSTAT HOUSING 1 EACH SIDE

THERMOSTAT HOUSING 1 EACH SIDE

THERMOSTAT HOUSING 1 EACH SIDE

ELECTRONIC ACTUATOR

FUEL INLET CONNECTION $\phi 15$ (OUTSIDE) STEEL PIPE. MAXIMUM FUEL LIFT 2.5 METRES WHEN FUEL TANK OUTLET IS LOWER THAN LIFT PUMP INLET A NON-RETURN VALVE MUST BE FITTED AT FUEL TANK. IF MAX FUEL LIFT FIGURE IS EXCEEDED CONSULT PERKINS TECHNICAL DEPT.

75

CRANKSHAFT

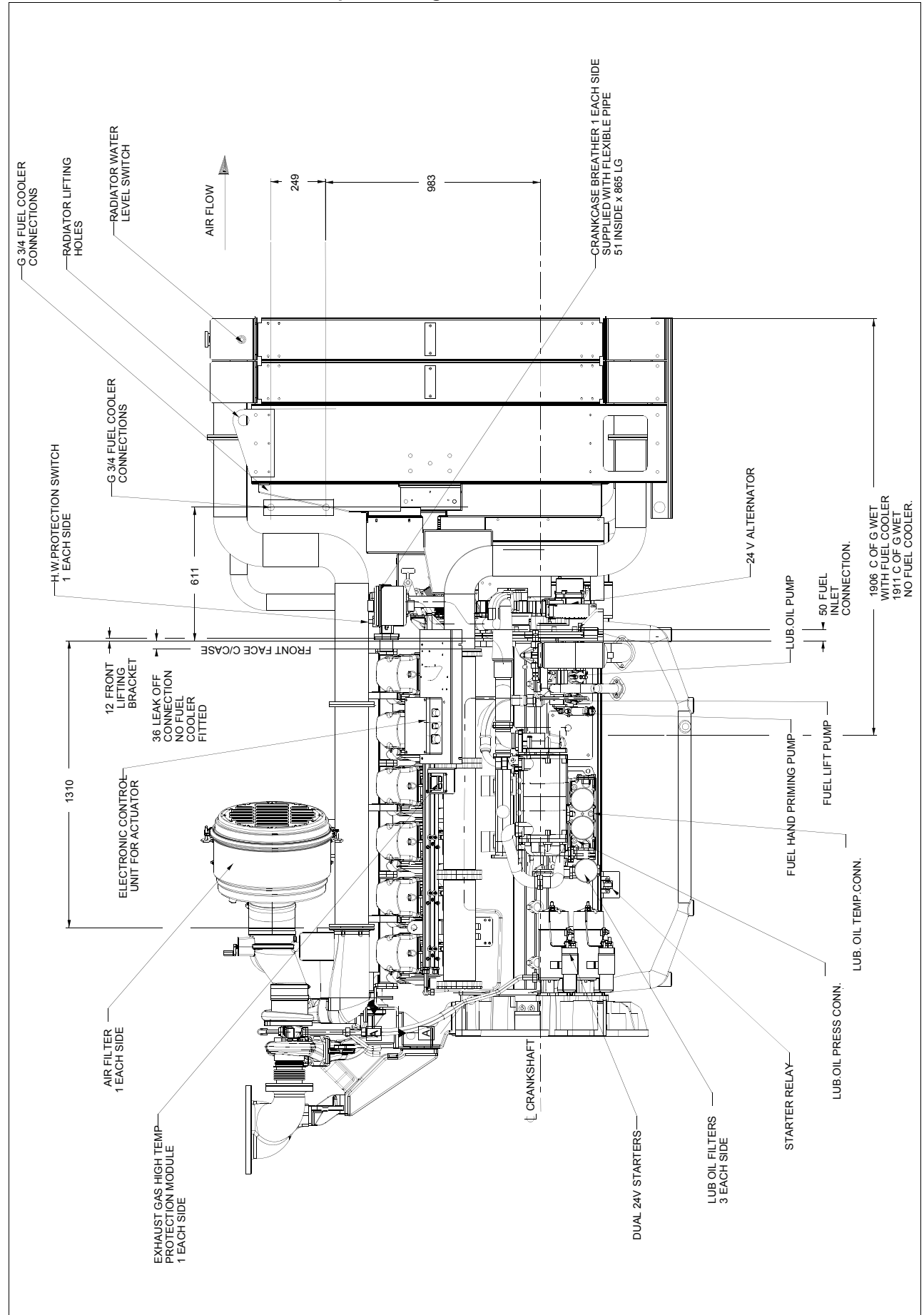
FUEL FILTER/WATER SEPARATOR

TORSIONAL VIBRATION DAMPERS

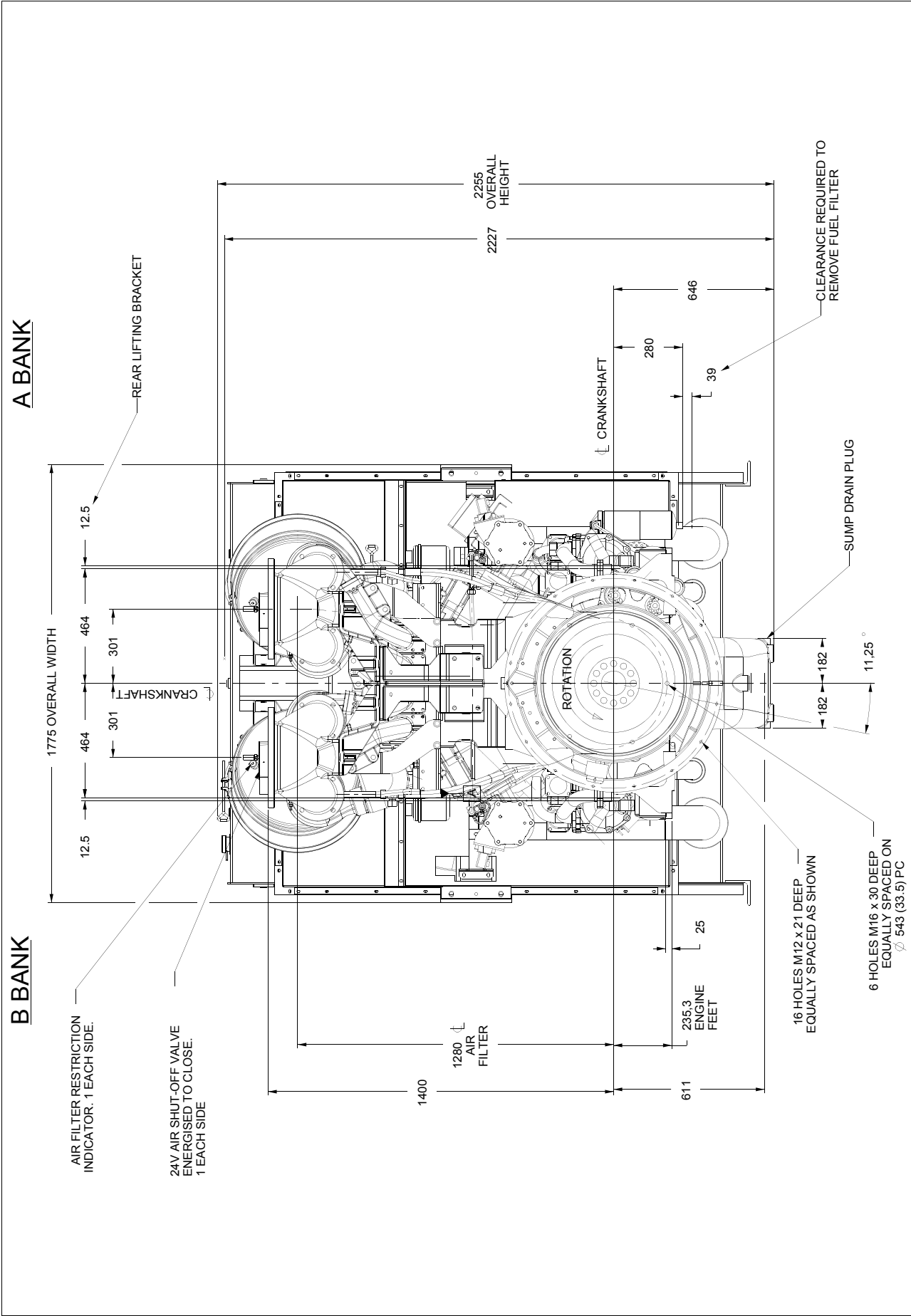
RADIATOR DRAIN PLUG G1/2

CONDENSATE DRAIN PLUG (WITH 3mm HOLE THRO) IN BOTTOM OF AIR TANK

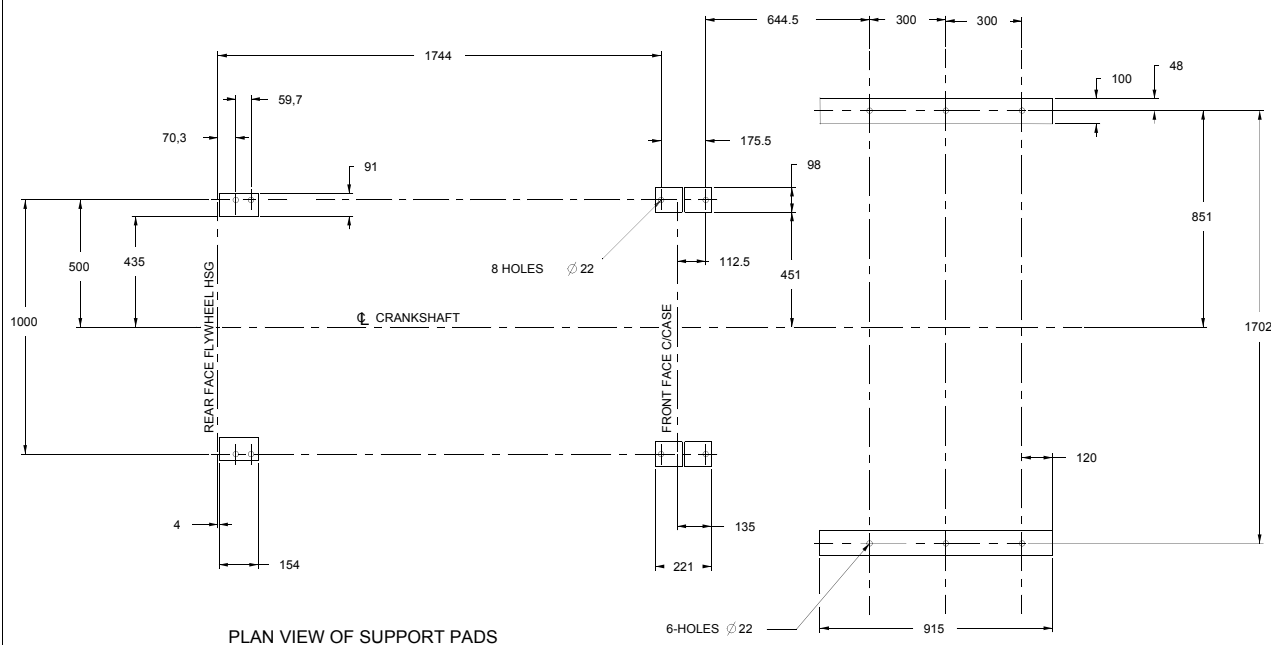
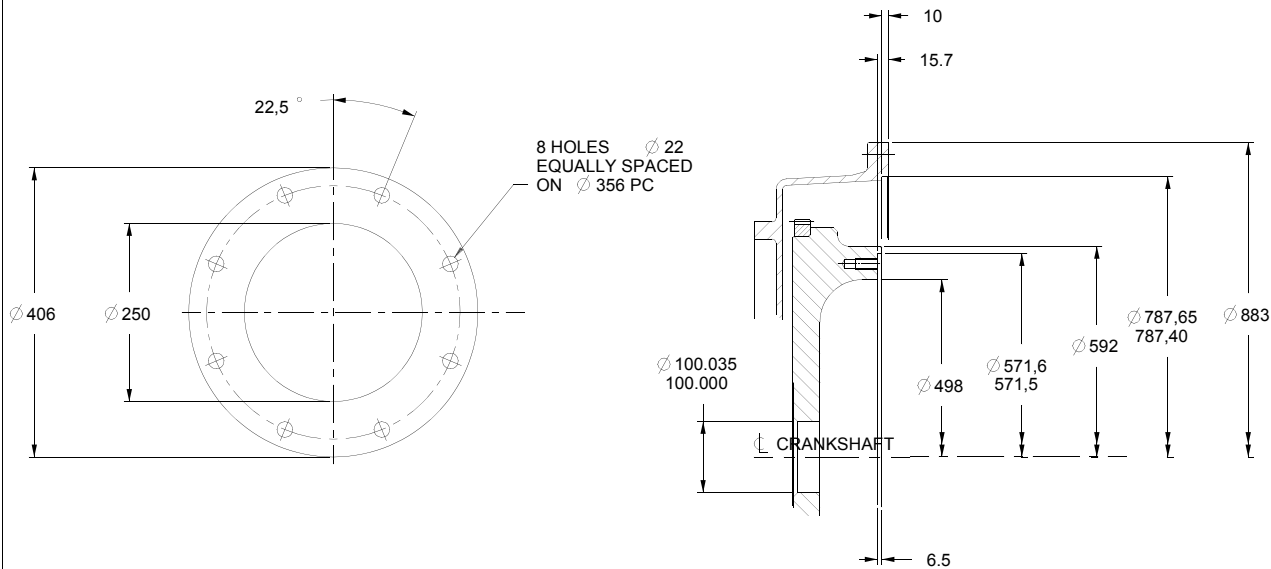
4012-46TAG1A / 4012-46TAG2A Temperate - Right hand side view



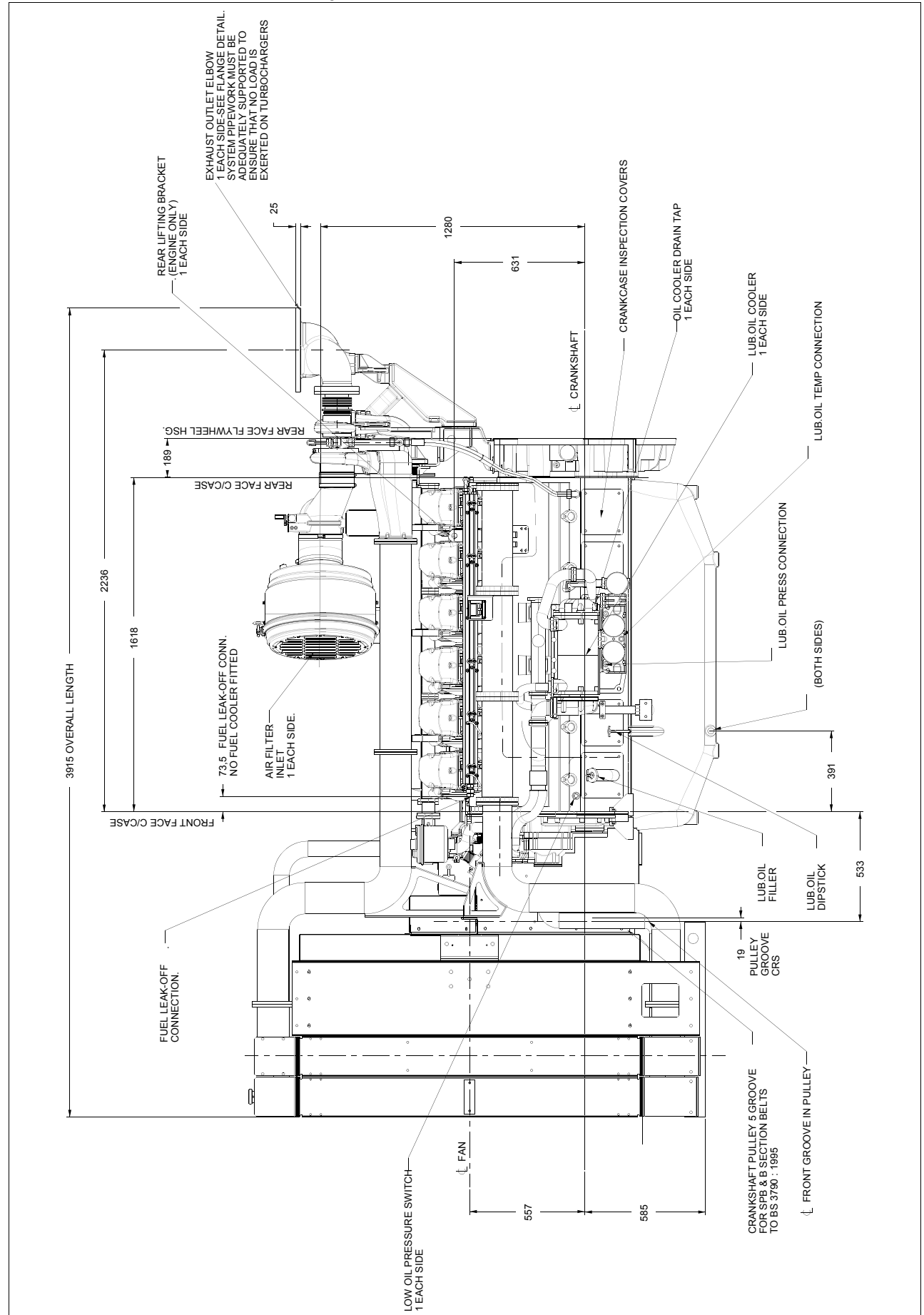
4012-46TAG1A / 4012-46TAG2A Temperate - Rear view



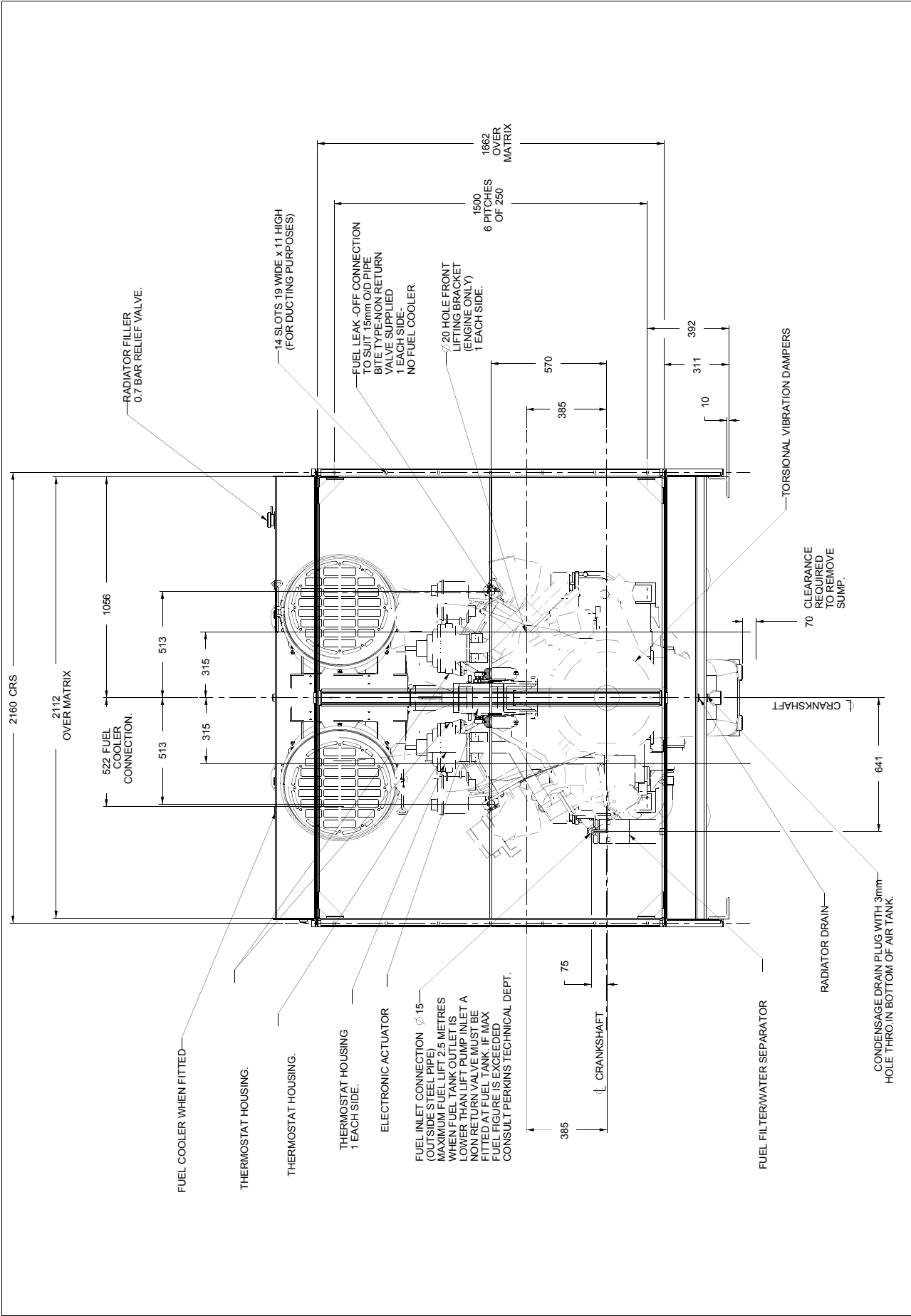
4012-46TAG1A / 4012-46TAG2A Temperate - Plan view of support pads, exhaust outlet flange and flywheel



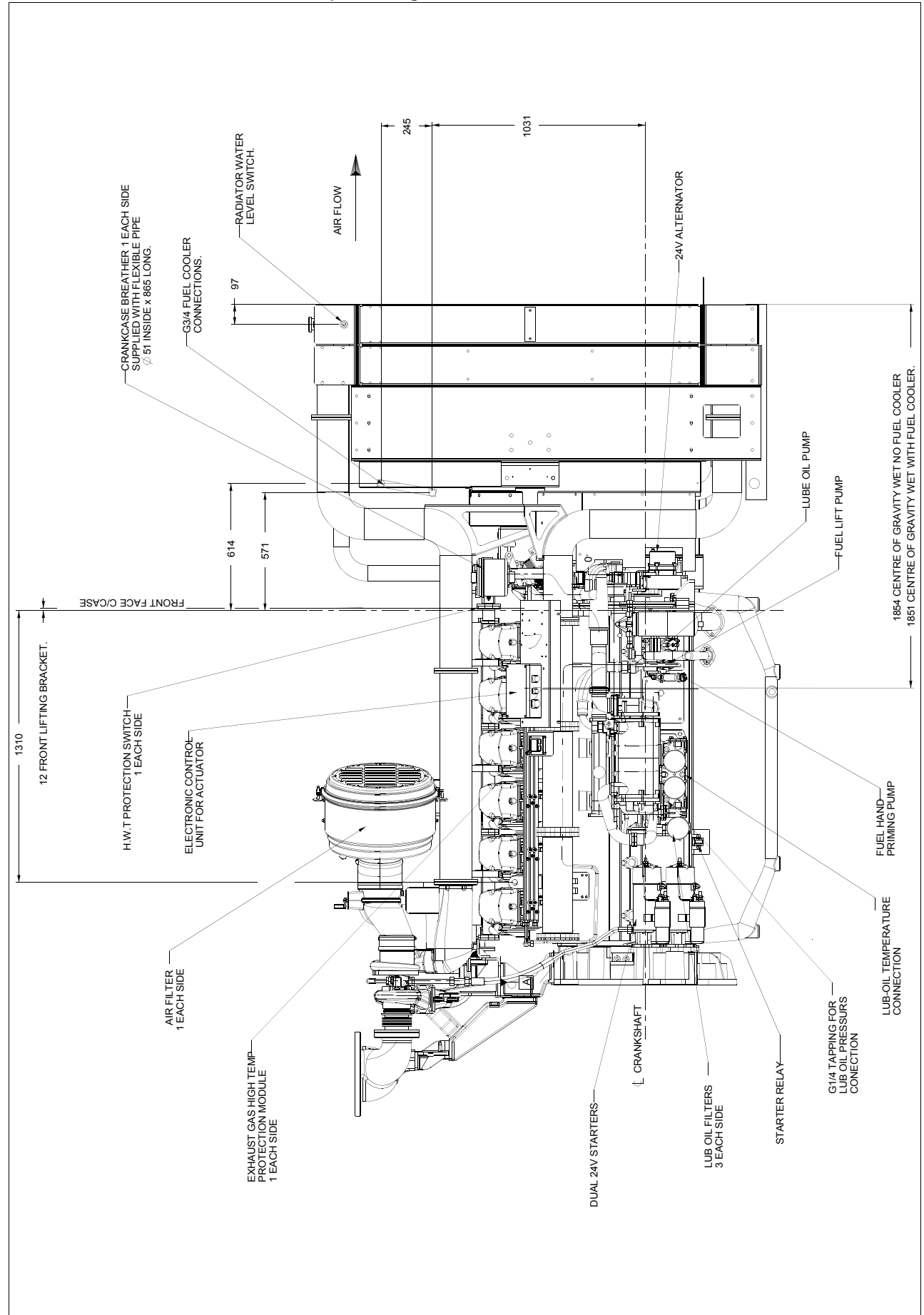
4012-46TAG1A / 4012-46TAG2A Tropical - Left hand side view



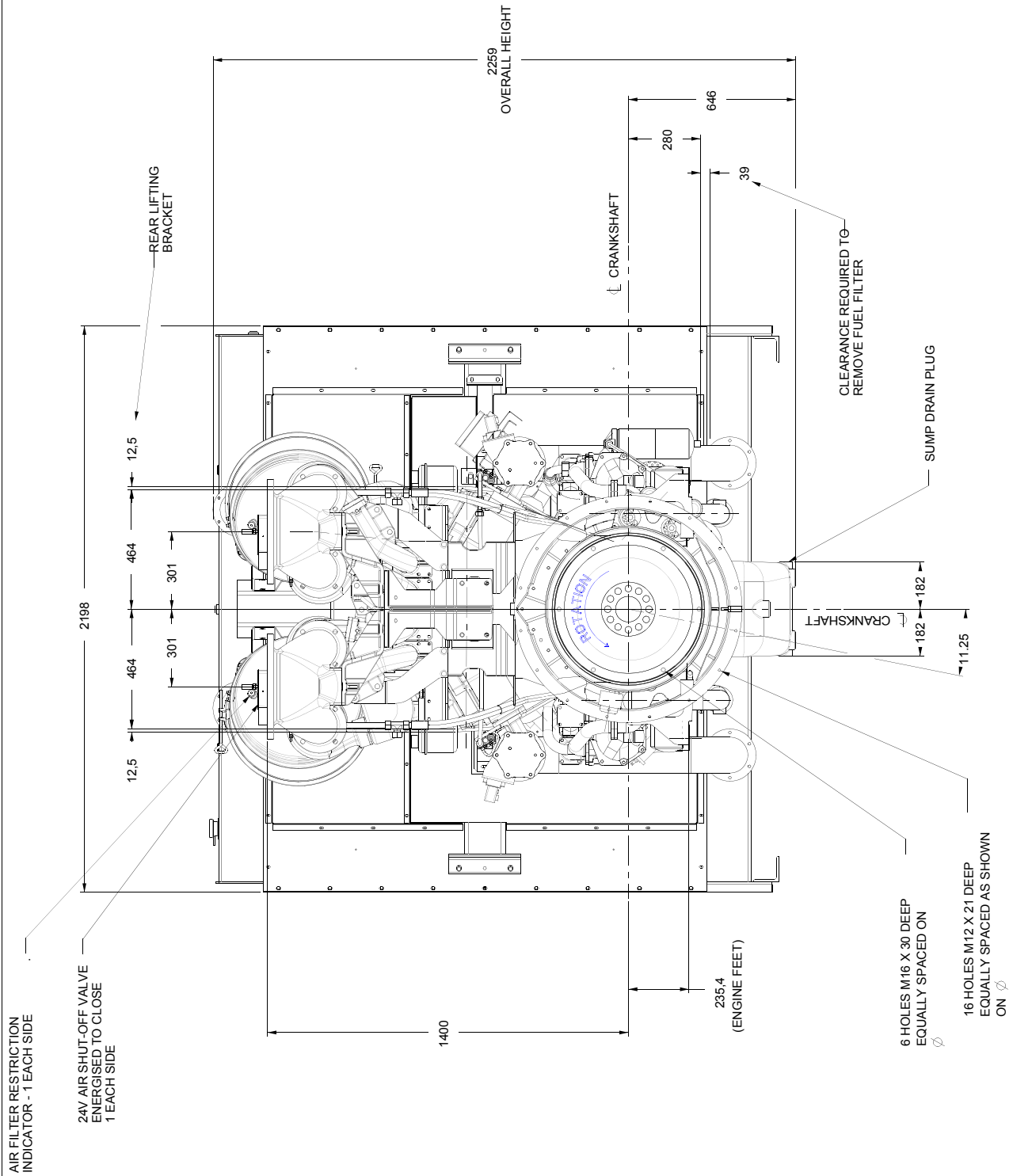
4012-46TAG1A / 4012-46TAG2A Tropical - Front view



4012-46TAG1A / 4012-46TAG2A Tropical - Right hand side view



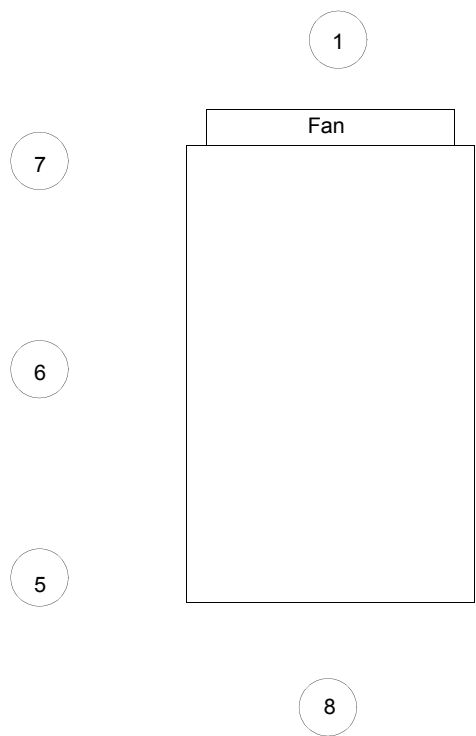
4012-46TAG1A / 4012-46TAG2A Tropical - Rear view



Technical drawing of a crankshaft assembly showing front and rear views with dimensions. The drawing includes the following dimensions and features:

- Front View (Top):**
 - Overall width: 1744
 - Distance from centerline to front face: 758
 - Distance from centerline to rear face: 984
 - Distance from centerline to crank pin: 175.5
 - Distance from centerline to crank pin: 112.5
 - Distance from centerline to crank pin: 451
 - Distance from centerline to crank pin: 98
 - Distance from centerline to crank pin: 135
 - Distance from centerline to crank pin: 221
 - Distance from centerline to crank pin: 120
 - Distance from centerline to crank pin: 945
 - Distance from centerline to crank pin: 1004
 - Distance from centerline to crank pin: 52
 - Distance from centerline to crank pin: 100
 - Distance from centerline to crank pin: 300
 - Distance from centerline to crank pin: 300
 - Distance from centerline to crank pin: 78
 - Distance from centerline to crank pin: 15.7
 - Distance from centerline to crank pin: 10
 - Distance from centerline to crank pin: 6.5
 - Distance from centerline to crank pin: 787.65
 - Distance from centerline to crank pin: 787.40
 - Distance from centerline to crank pin: 592
 - Distance from centerline to crank pin: 571.6
 - Distance from centerline to crank pin: 571.5
 - Distance from centerline to crank pin: 498
 - Distance from centerline to crank pin: 100.035
 - Distance from centerline to crank pin: 100.000
- Rear View (Bottom):**
 - Overall width: 1744
 - Distance from centerline to rear face: 758
 - Distance from centerline to front face: 984
 - Distance from centerline to crank pin: 175.5
 - Distance from centerline to crank pin: 112.5
 - Distance from centerline to crank pin: 451
 - Distance from centerline to crank pin: 98
 - Distance from centerline to crank pin: 135
 - Distance from centerline to crank pin: 221
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 - Distance from centerline to crank pin: 787.40
 - Distance from centerline to crank pin: 592
 - Distance from centerline to crank pin: 571.6
 - Distance from centerline to crank pin: 571.5
 - Distance from centerline to crank pin: 498
 - Distance from centerline to crank pin: 100.035
 - Distance from centerline to crank pin: 100.000
- Other Dimensions:**
 - Distance from centerline to crank pin: 70
 - Distance from centerline to crank pin: 60
 - Distance from centerline to crank pin: 91
 - Distance from centerline to crank pin: 435
 - Distance from centerline to crank pin: 500
 - Distance from centerline to crank pin: 1000
 - Distance from centerline to crank pin: 4
 - Distance from centerline to crank pin: 154
- Notes:**
 - 8 HOLES $\phi 22$ EQUALLY SPACED ON $\phi 356$ PC
 - CRANKSHAFT
 - CRANKCASE
 - REAR FACE FLYWHEEL HSG
 - FRONT FACE CRANKCASE
 - 6-HOLES $\phi 22$

Noise



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.

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

		16k	98
POSN.	DBA	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

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 kW _e nett	Transient frequency deviation %	Frequency recovery time seconds	Prime power%	Load kW _m nett	Transient frequency deviation %	Frequency recovery time seconds
4012-46TAG1A	73	800	≤ 10	5	27	291	≤ 10	5
4012-46TAG2A	71	860	≤ 10	5	29	344	≤ 10	5

The above figures were obtained under test conditions as follows:

Engine block temperature40 °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.

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All information in the document is substantially correct at the time of printing but may be subsequently altered by the company.

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