

# 4012-46TAG1A

973 - 1327 kWm (Gross) @ 1500 rpm

# 4012-46TAG2A

1069 - 1459 kWm (Gross) @ 1500 rpm

# Electropak

# 4000

## Series

### Basic technical data

Number of cylinders .....12  
 Cylinder arrangement..... 60° Vee  
 Cycle .....4 stroke, compression ignition  
 Induction system..... Turbocharged  
 Compression ratio ..... 13:1 nominal  
 Bore ..... 160 mm  
 Stroke ..... 190 mm  
 Cubic capacity ..... 45.842 litres  
 Direction of rotation..... Anti-clockwise viewed on flywheel  
 Firing order ..... 1<sup>A</sup>, 6<sup>B</sup>, 5<sup>A</sup>, 2<sup>B</sup>, 3<sup>A</sup>, 4<sup>B</sup>, 6<sup>A</sup>, 1<sup>B</sup>, 2<sup>A</sup>, 5<sup>B</sup>, 4<sup>A</sup>, 3<sup>B</sup>  
 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 Electropak

#### Temperate

Dry ..... 4400 kg  
 Wet + fuel cooler..... 5949 kg  
 Wet - fuel cooler..... 5933 kg

#### Tropical

Dry ..... 4400 kg  
 Wet + fuel cooler..... 6086 kg  
 Wet - fuel cooler..... 6070 kg

### Overall dimensions of Electropak

#### Temperate

Length..... 3916 mm  
 Width ..... 1775 mm  
 Height ..... 2255 mm

#### Tropical

Length..... 3915 mm  
 Width ..... 2198 mm  
 Height ..... 2258 mm

#### Moment of inertia

Engine..... 9.73 kgm<sup>2</sup>  
 Flywheel..... 9.57 kgm<sup>2</sup>

#### Cyclic irregularity, engine/flywheel Prime power

4012-46TAG1A ..... 1.714  
 4012-46TAG2A ..... 1.669

### 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 rpm  
 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

Sound pressure level 1500 rpm ..... 108 / 109 dB(A)

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

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 (nominal) ..... 3.0 kPa  
 Fuel temperature (inlet pump)..... .58°C maximum

## General installation

### 4012-46TAG1A - Temperate

Designation	Units	Baseload power	Prime Power	Standby power
Gross engine power	kWb	973	1212	1327
Fan power	kWm		42	
Net engine power	kWm	931	1170	1285
BMEP gross	bar	1694	2110	2309
Combustion air flow	m <sup>3</sup> /min	85	100	110
Exhaust gas temperature, after turbo	°C	470	470	470
Exhaust gas flow (max) at atmospheric pressure	m <sup>3</sup> /min		280	
Boost pressure ratio	-	2.6	2.93	3.2
Mechanical efficiency	%	89	91	92
Overall thermal efficiency	%	41.0	41.5	41
Friction power and pumping losses	kWm		120	
Mean piston speed	m/s		9.5	
Engine coolant flow (minimum)	l/s		17	
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kVA	1106	1389	1526
	kWe	884	1112	1221
Assumed alternator efficiency	%		95	

### 4012-46TAG1A - Tropical

Designation	Units	Baseload power	Prime Power	Standby power
Gross engine power	kWb	973	1212	1327
Fan power	kWm		64	
Net engine power	kWm	909	1148	1263
BMEP gross	bar	1694	2110	2309
Combustion air flow	m <sup>3</sup> /min	85	100	110
Exhaust gas temperature, after turbo	°C	470	470	470
Exhaust gas flow (max) at atmospheric pressure	m <sup>3</sup> /min		280	
Boost pressure ratio	-	2.6	2.93	3.20
Mechanical efficiency	%	89	91	92
Overall thermal efficiency	%	41.0	41.5	41.0
Friction power and pumping losses	kWm		120	
Mean piston speed	m/s		9.5	
Engine coolant flow (minimum)	l/s		17	
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kVA	1080	1364	1500
	kWe	864	1091	1200
Assumed alternator efficiency	%		95	

## 4012-46TAG2A - Temperate

Designation	Units	Baseload power	Prime Power	Standby power
Gross engine power	kWb	1069	1331	1459
Fan power	kWm	42		
Net engine power	kWm	1027	1289	1417
BMEP gross	bar	18.61	23.17	25.38
Combustion air flow	m <sup>3</sup> /min	90	105	120
Exhaust gas temperature, after turbo	°C	500	500	500
Exhaust gas flow (max) at atmospheric pressure	m <sup>3</sup> /min	309		
Boost pressure ratio	-	2.8	3.4	3.6
Mechanical efficiency	%	89	91	92
Overall thermal efficiency	%	39.5	38.8	38.6
Friction power and pumping losses	kWm	120		
Mean piston speed	m/s	9.5		
Engine coolant flow (minimum)	l/s	17		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kVA	1220	1531	1682
	kWe	976	1225	1346
Assumed alternator efficiency	%	95		

## 4012-46TAG2A - Tropical

Designation	Units	Baseload power	Prime Power	Standby power
Gross engine power	kWb	1069	1331	1459
Fan power	kWm	64		
Net engine power	kWm	1005	1267	1395
BMEP gross	bar	18.61	23.17	25.38
Combustion air flow	m <sup>3</sup> /min	90	105	120
Exhaust gas temperature, after turbo	°C	500	500	500
Exhaust gas flow (max) at atmospheric pressure	m <sup>3</sup> /min	309		
Boost pressure ratio	-	2.8	3.4	3.6
Mechanical efficiency	%	89	91	92
Overall thermal efficiency	%	39.5	38.8	38.6
Friction power and pumping losses	kWm	120		
Mean piston speed	m/s	9.5		
Engine coolant flow (minimum)	l/s	17		
Typical Genset electrical output 0.8pf 25°C (100 kPa)	kVA	1194	1505	1656
	kWe	955	1204	1325
Assumed alternator efficiency	%	95		

**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 hours period. A 10% overload is available for 1 hour in every 12 hours 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.

### 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

**Note:** Not to be used for CHP design purposes. (Indicative figures only). Consult Perkins Engines Company Limited. Assumes complete combustion.

### 4012-46TAG1A - Temperate

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2328	2962	3330
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	1020	1150
Energy to coolant and oil	kW	335	365	413
Energy to radiation	kW	70	75	100
Energy to charge coolers	kW	200	290	340

### 4012-46TAG1A - Tropical

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2328	2962	3330
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	1020	1150
Energy to coolant and oil	kW	335	365	413
Energy to radiation	kW	70	75	100
Energy to charge coolers	kW	200	290	340

### 4012-46TAG2A - Temperate

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2548	3320	3740
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	1160	1250
Energy to coolant and oil	kW	387	428	499
Energy to radiation	kW	76	100	112
Energy to charge coolers	kW	210	301	420

### 4012-46TAG2A - Tropical

Designation	Units	Baseload power	Prime power	Standby power
Energy in fuel	kW	2548	3320	3740
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	1160	1250
Energy to coolant and oil	kW	387	428	499
Energy to radiation	kW	76	100	112
Energy to charge coolers	kW	210	301	420

**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

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

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

### Total coolant capacity:

Engine only ... 73 litres  
 ElectropaK (engine/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 m<sup>2</sup>  
 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 m<sup>2</sup>  
 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 Tropical

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, 2110 rpm  
 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  
 Maximum additional restriction (duct allowance) to cooling airflow (Stand-by power applications) and resultant minimum airflow.

	Ambient clearance 50% glycol	Duct allowance (Pa)	Min airflow m <sup>3</sup> /sec
4012-46TAG1A - Temperate	35°C	250	20.2
4012-46TAG1A - Tropical	50°C	200	32.4
4012-46TAG2A - Temperate	35°C	250	20.2
4012-46TAG2A - Tropical	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 ... 157.5 litres  
 Sump minimum ... 115 litres  
 Oil temperature at normal operating conditions to bearings 105 °C

### Lubricating 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 rpm  
 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

## Induction system

### Maximum air intake restriction of engine

Maximum air intake restriction of engine:

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

## Exhaust system

### Maximum back pressure for total 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%

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

### Fuel consumption

Ratings	g/kW/hr	litres/hr
<b>4012-46TAG1A, temperate and tropical</b>		
Standby	219	338
Prime	218	307
Baseload	216	244
75% Prime	218	230
50% Prime	232	164
<b>4012-46TAG2A, temperate and tropical</b>		
Standby	209	378
Prime	207	342
Baseload	207	270
75% Prime	208	252
50% Prime	212	178

## Electrical system

Type..... Insulated return  
 Alternator.....24 volts with integral regulator  
 Alternator output ..... 55 amps, 28 volts at 20°C ambient  
 Starter motor ..... 24 volts  
 Starter motor type .....Axial  
 Starter motor power ..... 16.4 kW  
 Number of teeth on flywheel ..... 156  
 Number of teeth on starter motor..... 12  
 Minimum cranking speed (0°C) ..... 120 rpm  
 Pull in current of starter motor solenoid @ -25 °C max <sup>(1)</sup>. 30 amps  
 Hold in current of starter motor solenoid @ -25 °C max <sup>(1)</sup> ..9 amps  
 Engine stop solenoid. .... 24 volts  
 Hold-in current of stop solenoid .....1.1 amps  
 (1) All leads rated to 10 amps minimum.

## 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

## Cold start recommendations

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

Oil..... 15W/40 CH4  
 Starter ..... 2 x 24V  
 Battery..... 4 x 12 volts x 286 Ah  
 Max breakaway current. .... 1600 amps  
 Cranking current .....810 amps  
 Aids..... Block heaters  
 Min mean cranking speed. .... 120 rpm

**Note:** Battery capacity is defined by the 20 hour rate at 0°C

- 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 transient current which may be up to double the steady cranking current.

## 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 <sub>e</sub> nett	Transient frequency deviation %	Frequency recovery time seconds	Prime power%	Load kW <sub>m</sub> 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 temperature ... 40 °C  
 Ambient temperature ... 25 °C  
 Governing mode ... Isochronous  
 Alternator inertia ... 50 kgm<sup>2</sup>  
 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.

## Emissions chart

Spill timing 12°	German TA-Luft @ <3 MW	German TA-Luft Limit @ >3 MW	French limits 2000 @ <500 hours/year	French limits 1500 @ >500 hours/year
Rating	Spill timing 12°			
4012-46TAG1A				
Baseload	Yes	Yes	Yes	No
Prime power	Yes	Yes	Yes	No
Standby	N/A	Yes	Yes	No
4012-46TAG2A				
Baseload	Yes	Yes	Yes	No
Prime power	N/A	Yes	Yes	No
Standby	N/A	Yes	Yes	No

### German TA Luft legislation (1986) limits:

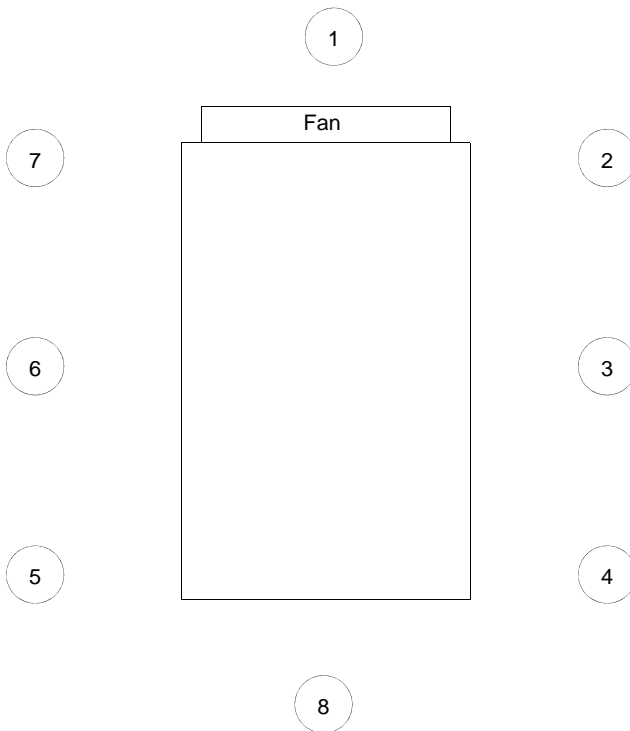
- NO<sub>x</sub> ≤ 2000 mg/Nm<sup>3</sup>
- CO ≤ 650 mg/Nm<sup>3</sup>
- HC ≤ 150 mg/Nm<sup>3</sup>
- PM ≤ 50 mg/Nm<sup>3</sup>.

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 above data complies with the requirements of classifications 3 and 4 of ISO 8528-2 and G2 Operating Limits stated in ISO 8528-5.

**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.**

## Noise data

### Octave analysis performed at the position of maximum 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

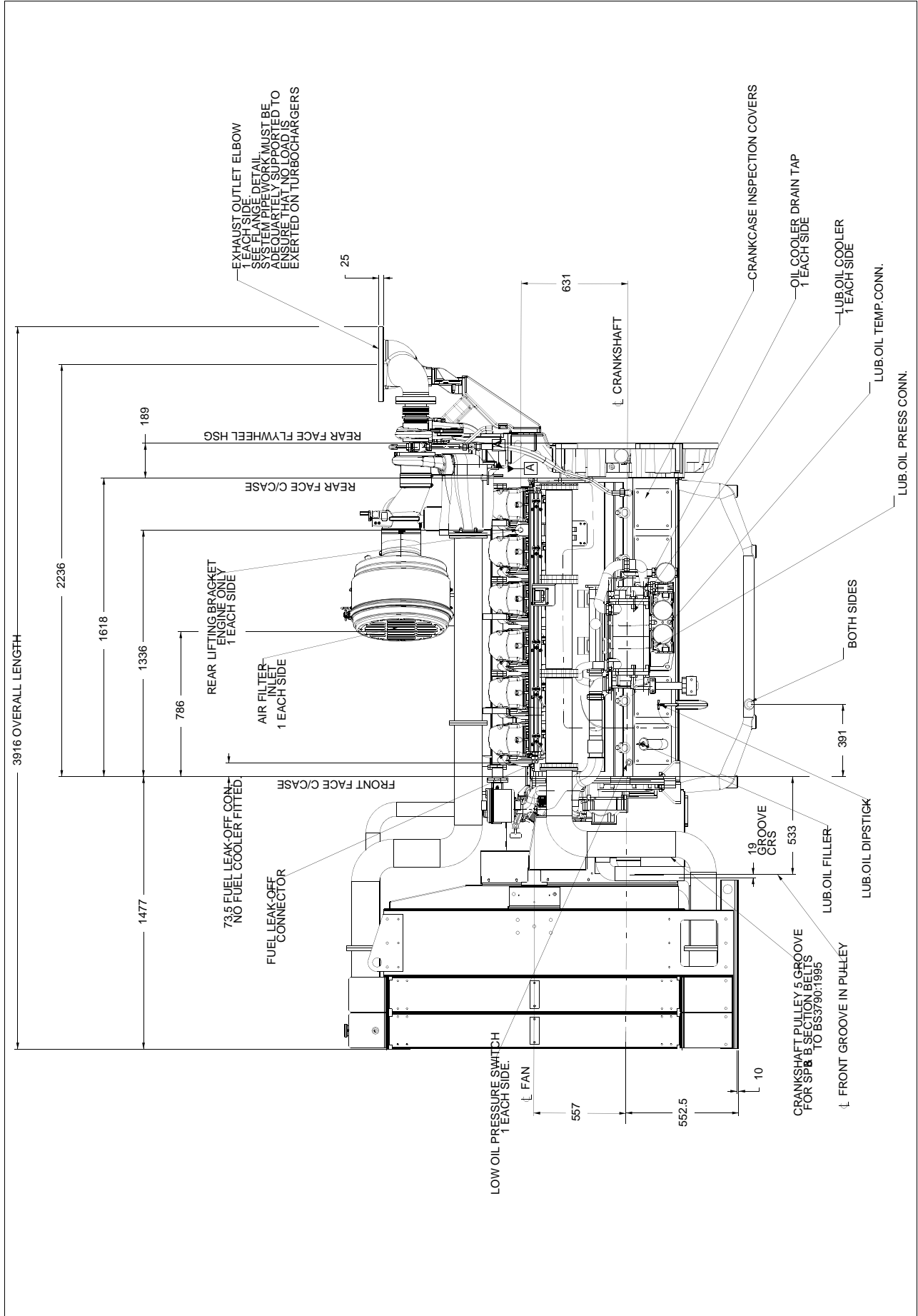
Sound pressure level re:  $20 \times 10^{-12}$  Pa  
Ambient noise level 79 dBA

Octave analysis performed at the position of maximum noise.

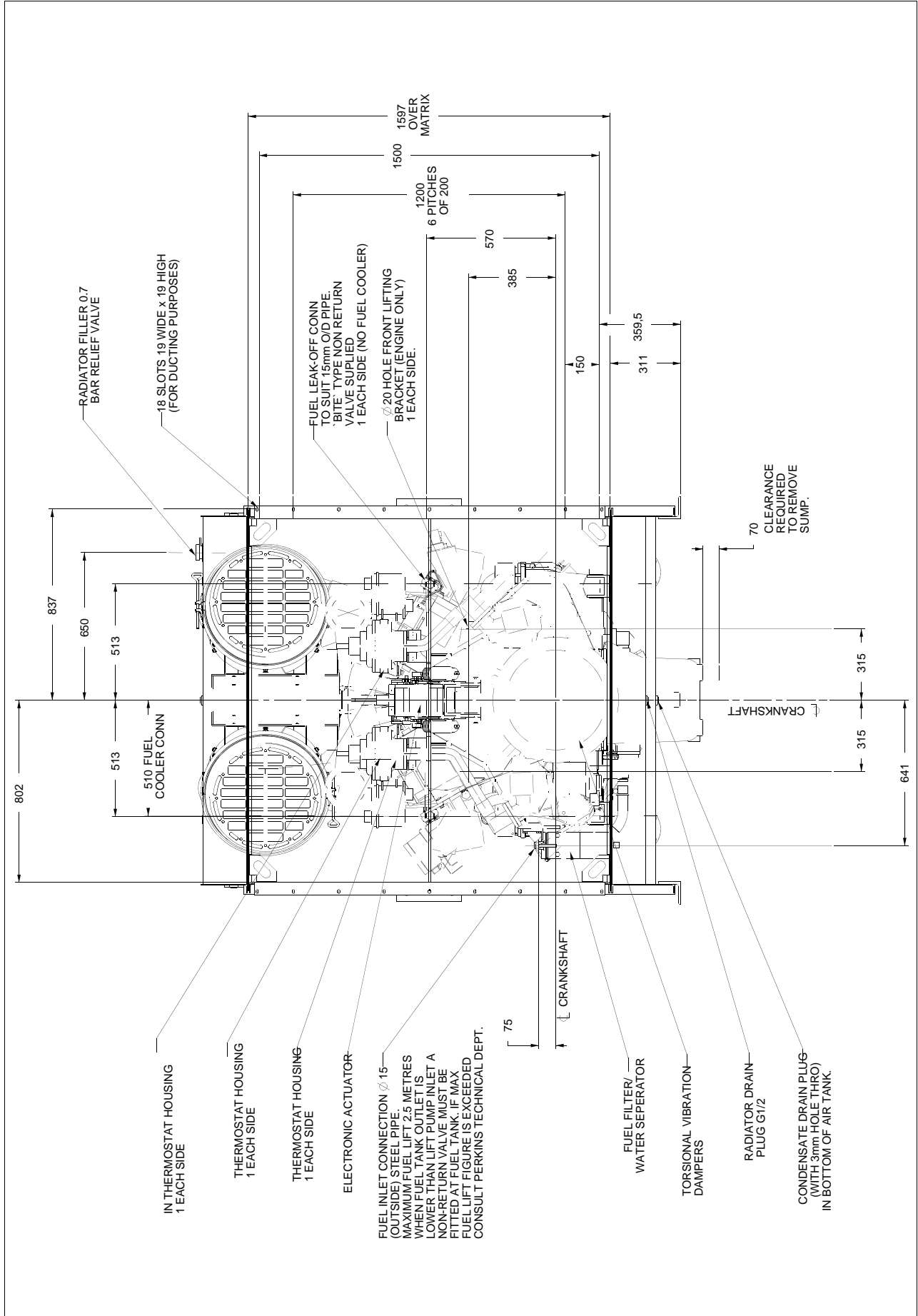
ENGINE		1500 RPM	POWER
	1/3 (1/1 bandwidth) Octave analysis		
<b>Temperate</b>			
POSN.	DBA	HZ	DB AT POSN ...6...
1	114	31.5	90.2
2	113	63	101
3	111	125	104
4	110	250	112
5	110.5	500	109
6	111	1k	107
7	110.5	2k	104
8	107	4k	101
		8k	100
		16k	98
<b>Tropical</b>			
POSN.	DBA	HZ	DB AT POSN ...6...
1	114	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



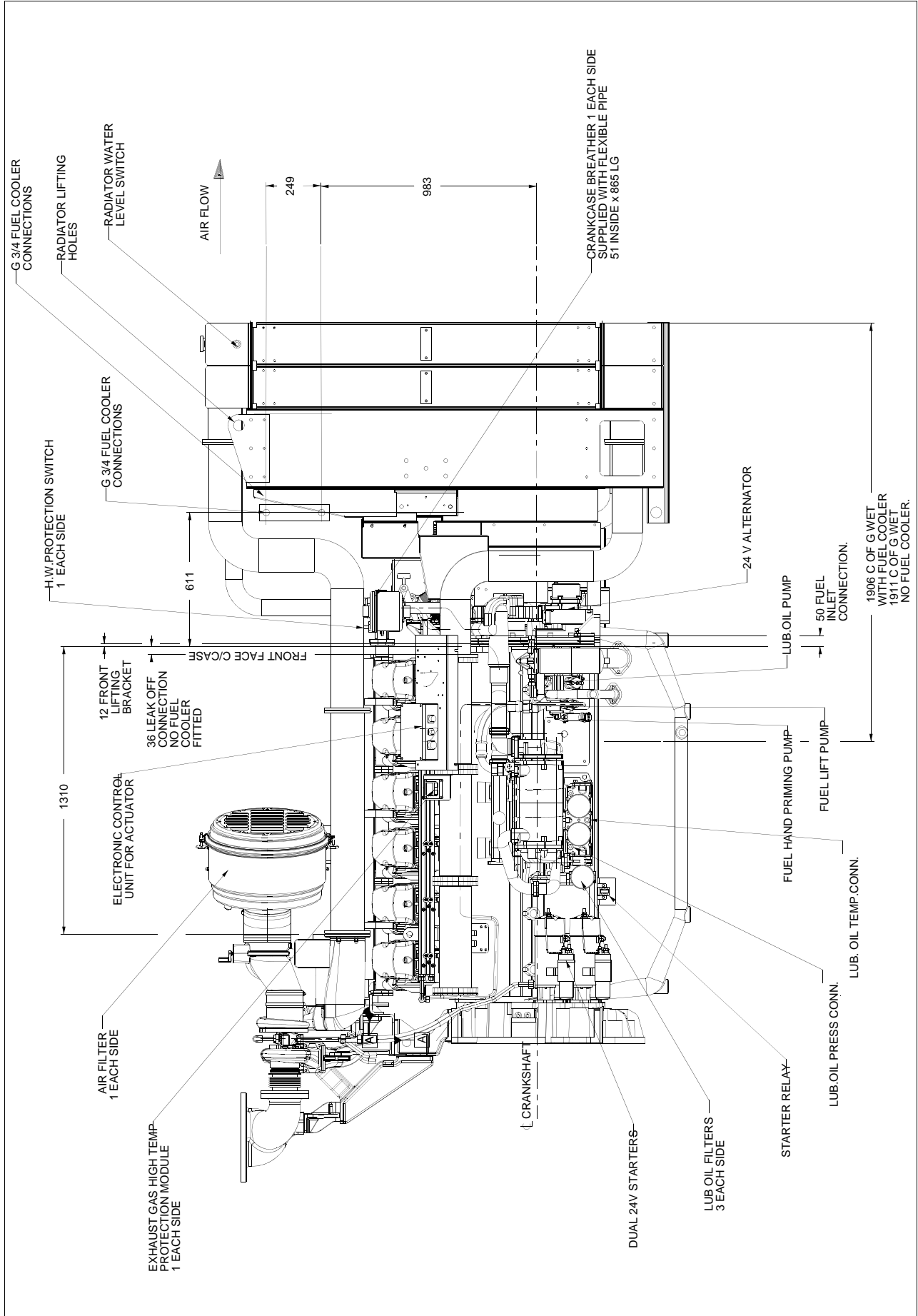
4012-46TAG1A / 4012-46TAG2A Temperate - Left hand side view



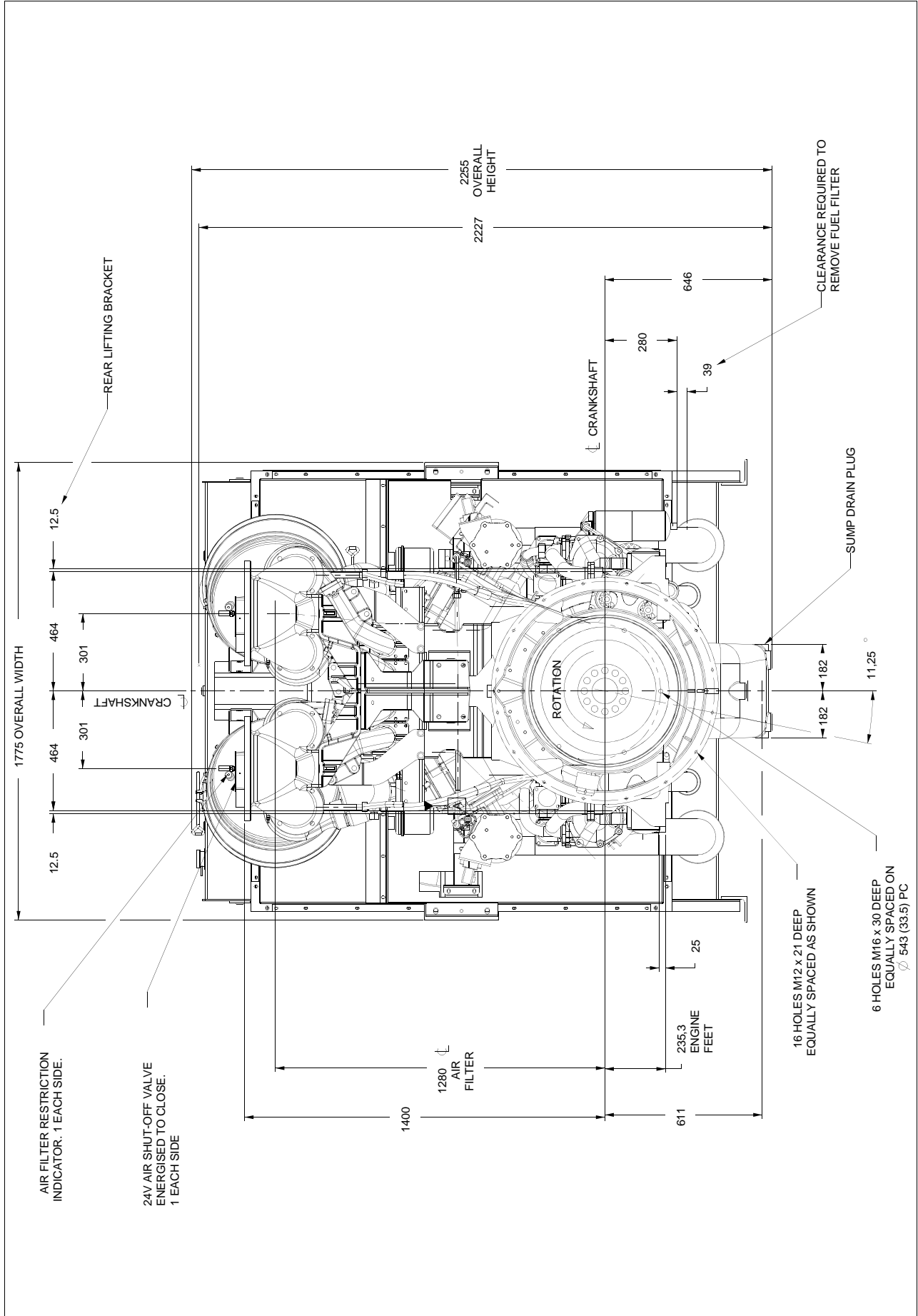
4012-46TAG1A / 4012-46TAG2A Temperate - Front view



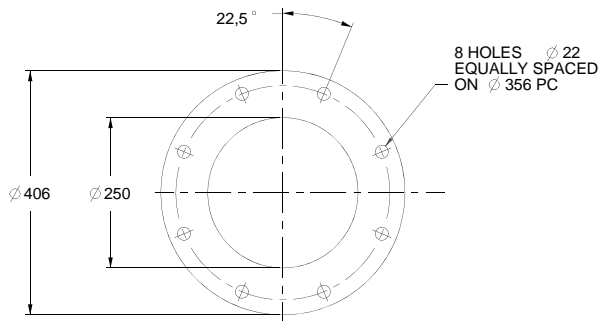
4012-46TAG1A / 4012-46TAG2A Temperate - Right hand side view



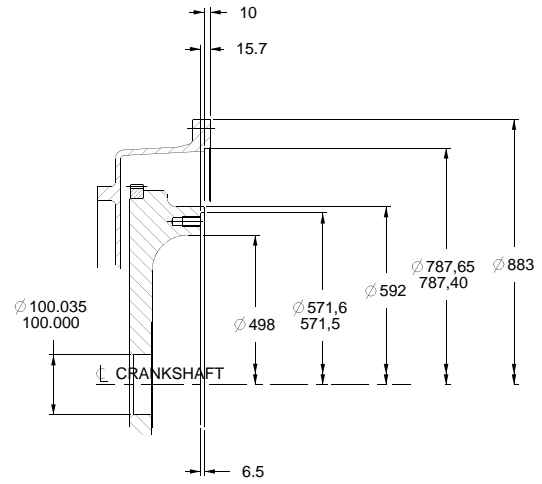
4012-46TAG1A / 4012-46TAG2A Temperate - Rear view



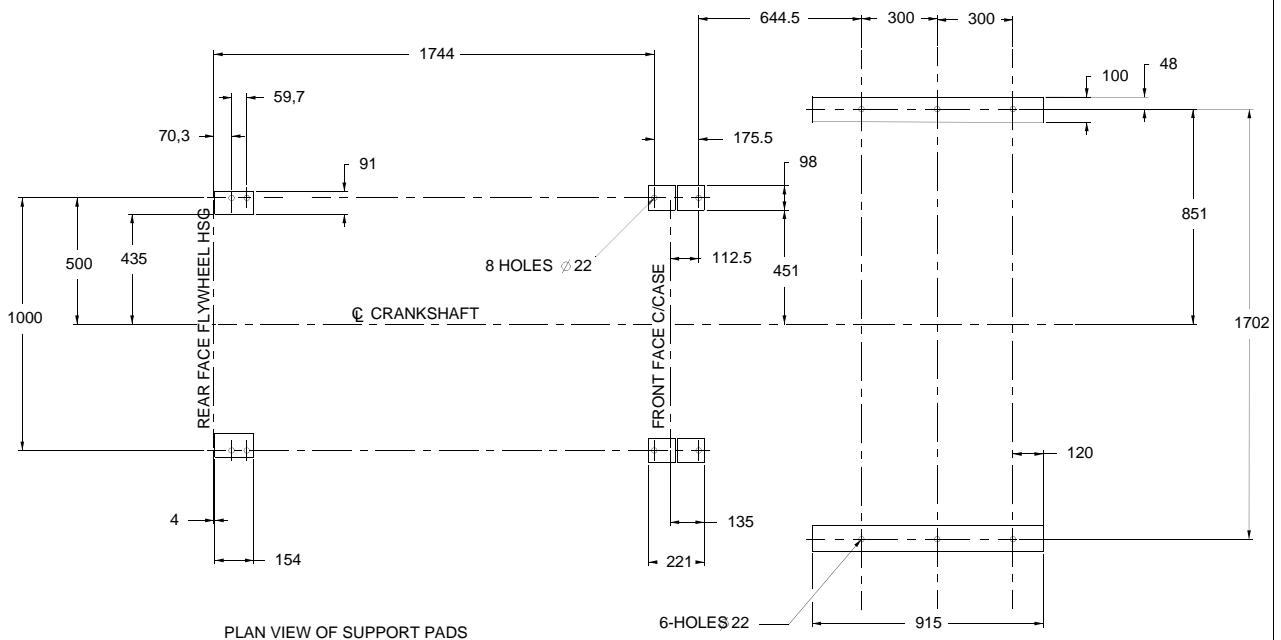
4012-46TAG1A / 4012-46TAG2A Temperate - Plan view of support pads, exhaust outlet flange and flywheel



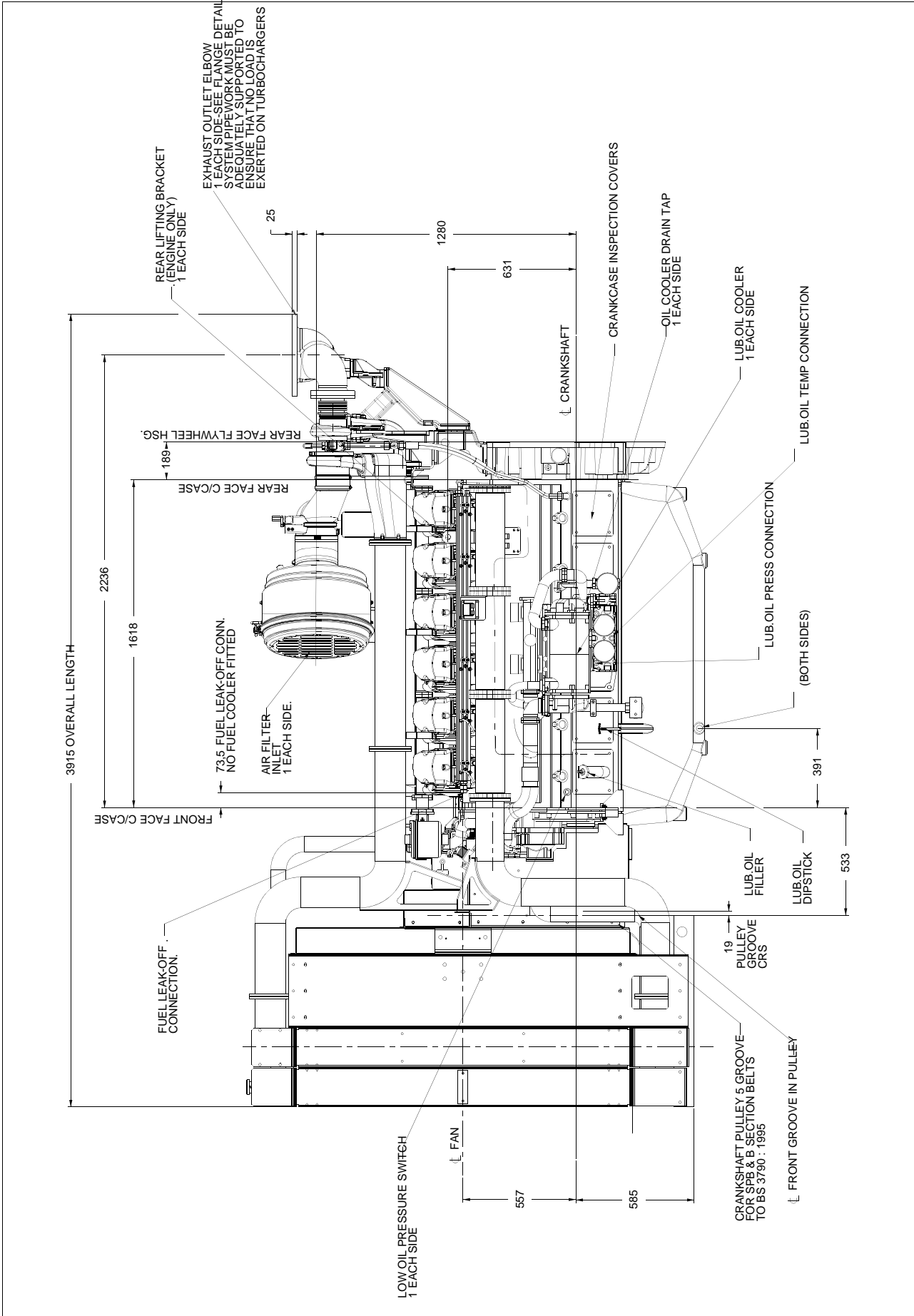
DETAIL OF EXHAUST OUTLET FLANGE  
(B.S.10 TABLE D)  
SCALE 1:5



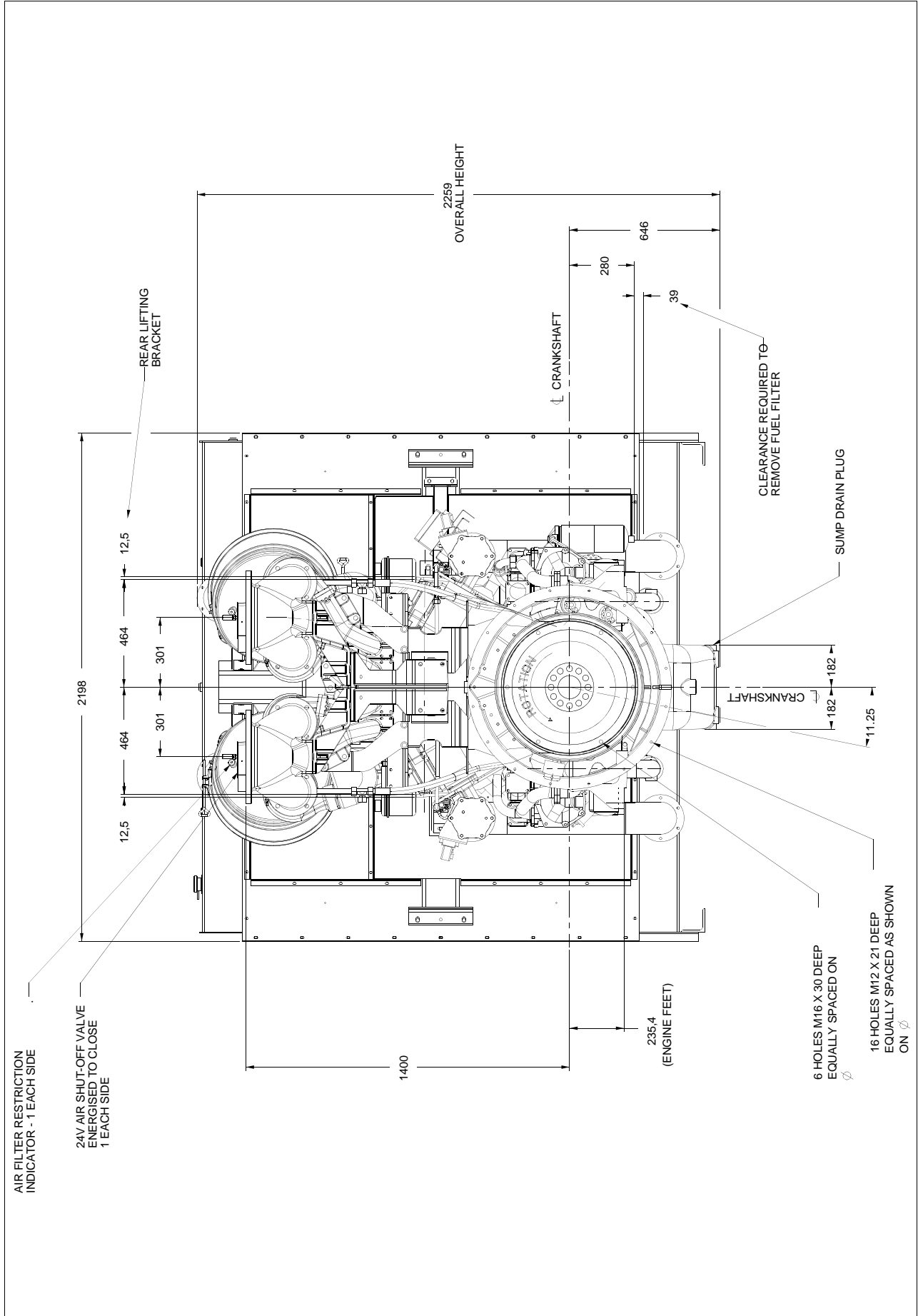
DETAIL OF SAE 518 FLYWHEEL  
AND SAE 00 FLYWHEEL HOUSING  
(METRIC TAPPINGS)  
SCALE 1:5



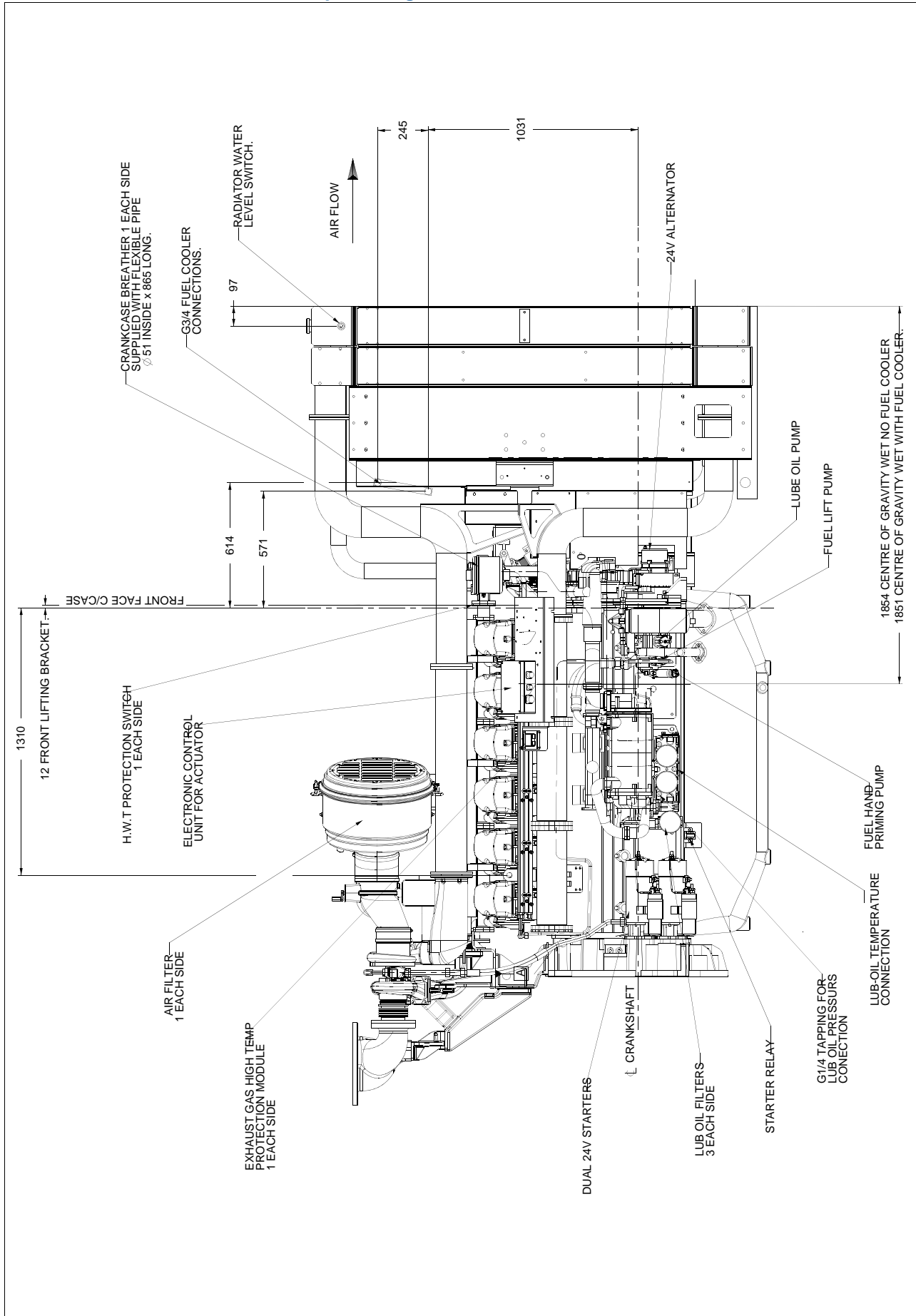
4012-46TAG1A / 4012-46TAG2A Tropical - Left hand side view



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

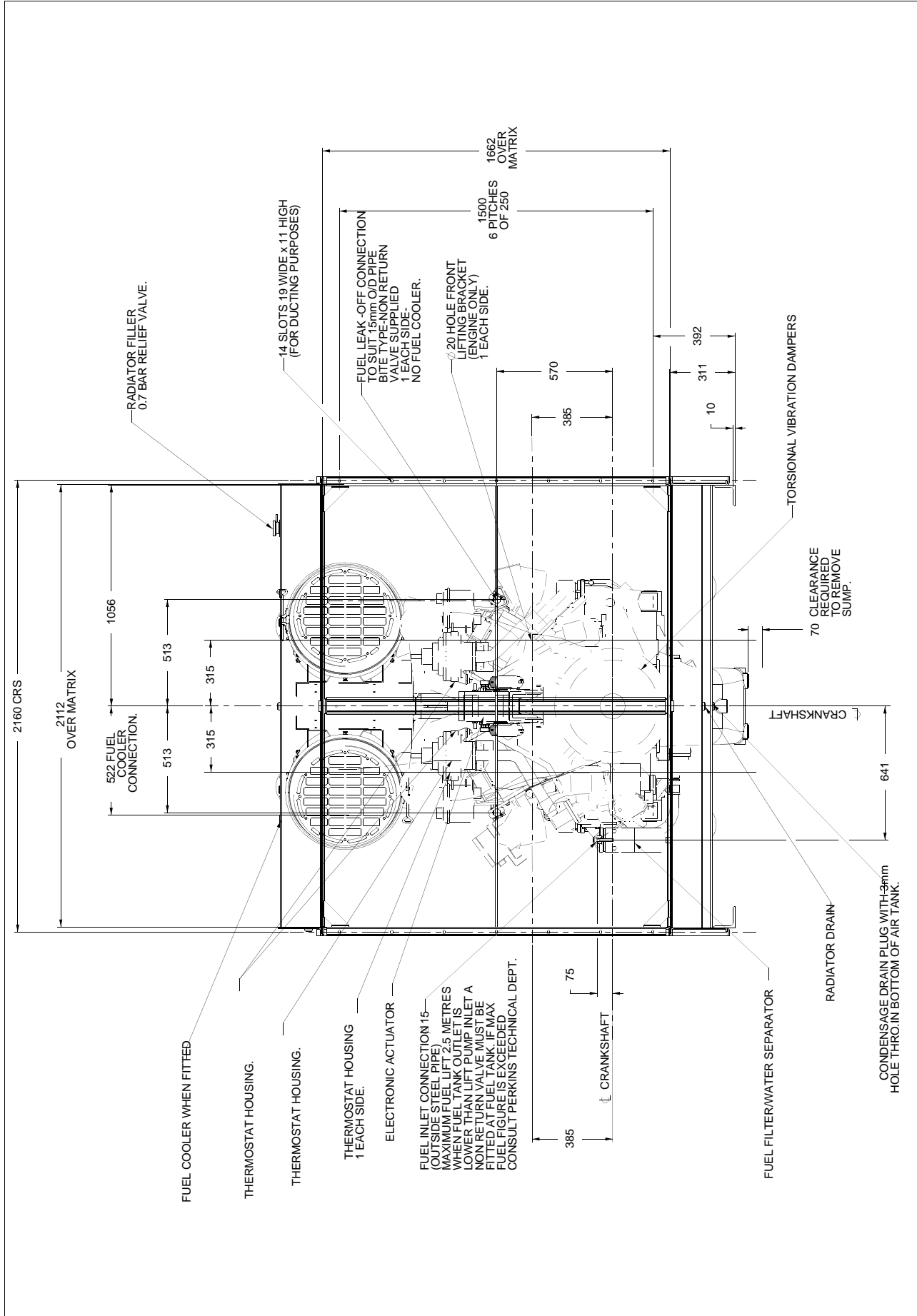


4012-46TAG1A / 4012-46TAG2A Tropical - Right hand side view

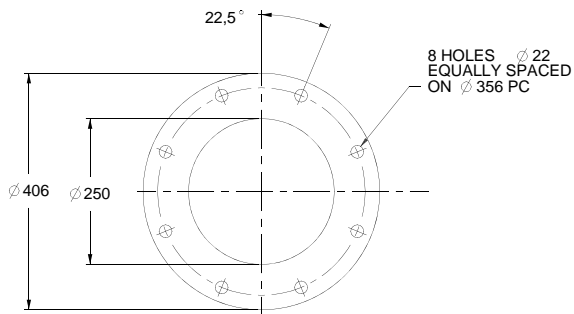




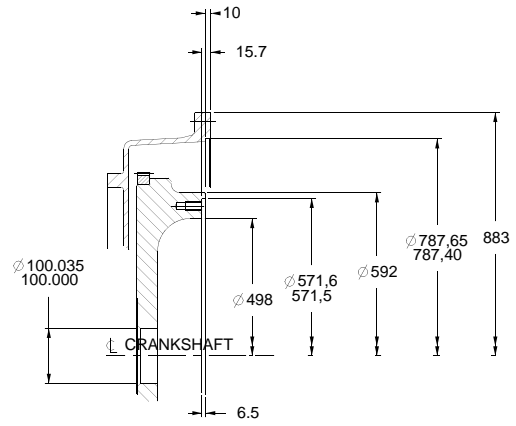
4012-46TAG1A / 4012-46TAG2A Tropical - Rear view



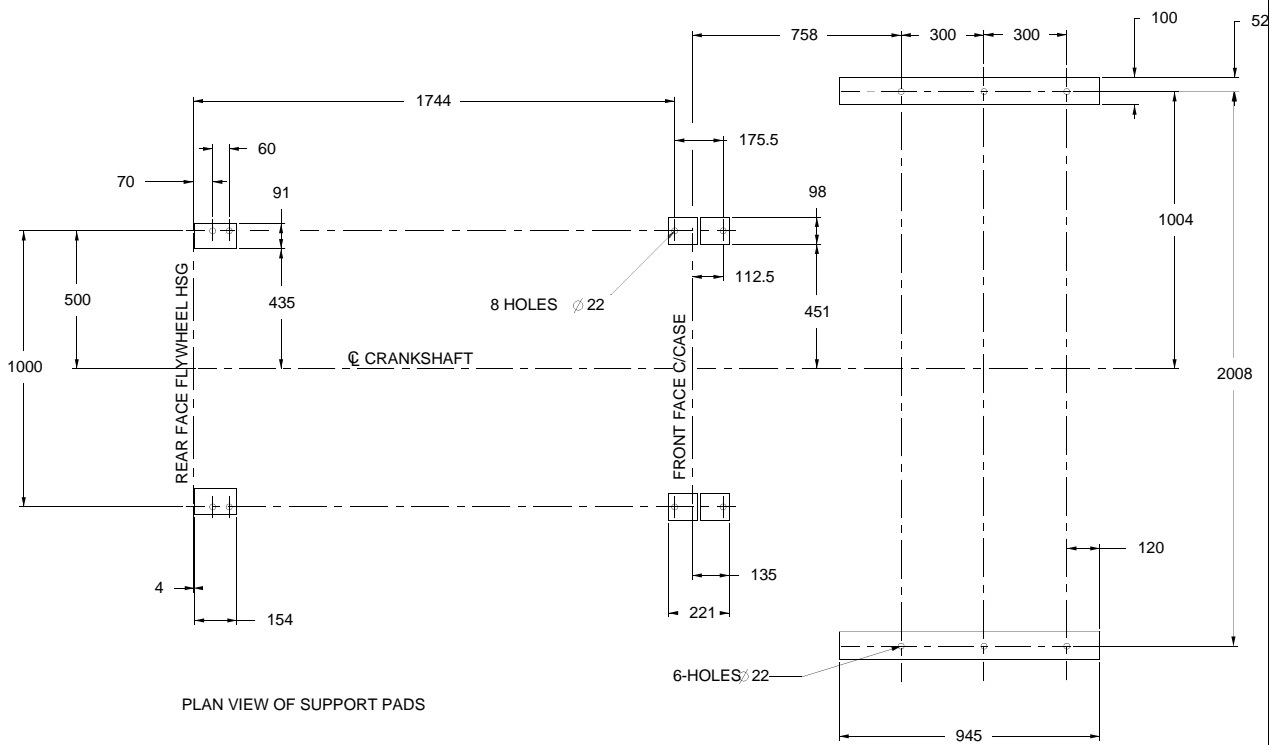
4012-46TAG1A / 4012-46TAG2A Tropical - Plan view of support pads, exhaust outlet flange and flywheel



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



PLAN VIEW OF SUPPORT PADS