

Technical Data

4000 Series

Diesel Engine - ElectropaK

4008TAG1A

Used for 900kVA generator

4008TAG2A

Used for 1000kVA generator

Basic technical data

Number of cylinders 8
 Cylinder arrangement In line
 Cycle 4 stroke, compression ignition
 Induction system Turbocharged
 Compression ratio 13.6:1 nominal
 Bore 160 mm
 Stroke 190 mm
 Cubic capacity 30,561 litres
 Direction of rotation Anti-clockwise viewed on flywheel
 Firing order 1, 4, 7, 6, 8, 5, 2, 3
 Cylinder 1 furthest from flywheel

Total weight of ElectropaK		
	Tropical	Temperate
	kg	kg
Dry	4320	4270
Wet	4618	4558

Overall dimensions of ElectropaK		
	Tropical	Temperate
	mm	mm
Height	2146	2067
Length	3711	3852
Width	2046	2046

Moment of inertia

-engine 9,60 kgm²
 -flywheel 6,02 kgm²
 Cyclic irregularity for engine/flywheel (Prime power):

	TAG1A	TAG2A
1500 rev/min	1,195	1,180

Ratings

Steady state speed stability at constant load $\pm 0.25\%$
 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 $< 98\text{ }^{\circ}\text{C}$

Fuel data

To conform to BS2869 class A2 or BS EN590.

Performance

Sound pressure level 1500 rev/min 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 $25\text{ }^{\circ}\text{C}$
 Barometric pressure 100 kPa
 Relative humidity 30%
 Air inlet restriction at maximum power (nominal) 2,5 kPa
 Exhaust back pressure (nominal) 3,0 kPa

General installation

4008TAG1A - Tropical

Designation	Units	50 Hz 1500 rev/min		
		Baseload power	Prime Power	Standby power
Gross engine power	kWb	640	800	877
Fan power	kWm	38		
Net engine power	kWm	602	762	839
BMEP gross	bar	16,5	20,6	22,6
Combustion air flow	m ³ /min	57	69	73
Exhaust gas temperature (after turbo)	°C	400	422	438
Exhaust gas flow maximum (after turbo)	m ³ /min	183		
Boost pressure ratio	-	2,85	3,40	3,60
Mechanical efficiency	%	88	91	92
Overall thermal efficiency	%	41,5	41	40
Friction power and pumping losses	kWm	80		
Mean piston speed	m/s	9,5		
Engine coolant flow (minimum)	l/s	10		
Typical Genset electrical output 0,8pf 25 °C (100 kPa)	kVA	715	905	996
	kWe	572	724	797
Assumed alternator efficiency	%	95		

4008TAG1A - Temperate

Designation	Units	50 Hz 1500 rev/min		
		Baseload power	Prime Power	Standby power
Gross engine power	kWb	640	800	877
Fan power	kWm	27		
Net engine power	kWm	613	773	850
BMEP gross	bar	16,5	20,6	22,6
Combustion air flow	m ³ /min	57	69	73
Exhaust gas temperature (after turbo)	°C	400	422	438
Exhaust gas flow maximum (after turbo)	m ³ /min	183		
Boost pressure ratio	-	2,85	3,40	3,60
Mechanical efficiency	%	88	91	92
Overall thermal efficiency	%	41,5	41	40
Friction power and pumping losses	kWm	80		
Mean piston speed	m/s	9,5		
Engine coolant flow (minimum)	l/s	10		
Typical Genset electrical output 0,8pf 25 °C (100 kPa)	kVA	728	918	1009
	kWe	582	734	807
Assumed alternator efficiency	%	95		

General installation

4008TAG2A - Tropical

Designation	Units	50 Hz 1500 rev/min		
		Baseload power	Prime Power	Standby power
Gross engine power	kWb	719	899	985
Fan power	kWm	38		
Net engine power	kWm	681	861	947
BMEP gross	bar	18,5	23,2	25,4
Combustion air flow	m ³ /min	64	75	80,5
Exhaust gas temperature (after turbo)	°C	405	438	465
Exhaust gas flow maximum (after turbo)	m ³ /min	200		
Boost pressure ratio	-	3,18	3,70	4,0
Mechanical efficiency	%	90	92	92
Overall thermal efficiency	%	41,5	41	40
Friction power and pumping losses	kWm	80		
Mean piston speed	m/s	9,5		
Engine coolant flow (minimum)	l/s	10,0		
Typical Genset electrical output 0,8pf 25 °C (100 kPa)	kVA	809	1022	1125
	kWe	647	818	900
Assumed alternator efficiency	%	95		

4008TAG2A - Temperate

Designation	Units	50 Hz 1500 rev/min		
		Baseload power	Prime Power	Standby power
Gross engine power	kWb	719	899	985
Fan power	kWm	27		
Net engine power	kWm	692	872	958
BMEP gross	bar	18,5	23,2	25,4
Combustion air flow	m ³ /min	64	75	80,5
Exhaust gas temperature (after turbo)	°C	405	438	465
Exhaust gas flow maximum (after turbo)	m ³ /min	200		
Boost pressure ratio	-	3,18	3,70	4,0
Mechanical efficiency	%	90	92	92
Overall thermal efficiency	%	41,5	41	40
Friction power and pumping losses	kWm	80		
Mean piston speed	m/s	9,5		
Engine coolant flow (minimum)	l/s	10,0		
Typical Genset electrical output 0,8pf 25 °C (100 kPa)	kVA	821	1035	1138
	kWe	657	828	910
Assumed alternator efficiency	%	95		

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

Continuous Baseload rating: Power available for continuous full load operation.

Prime Power rating is 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 rating is 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 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.

Energy balance

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

4008TAG1A - Tropical

Designation	Units	50 Hz 1500 rev/min		
		Baseload Power	Prime Power	Standby Power
Energy in fuel	kWt	1535	1947	2182
Energy in power output (gross)	kWb	640	800	877
Energy to cooling fan	kWm	38	38	38
Energy in power output (net)	kWm	602	762	839
Energy to exhaust	kWt	490	605	711
Energy to coolant and oil	kWt	244	297	312
Energy to radiation	kWt	29	70	90
Energy to charge coolers	kWt	132	175	192

4008TAG1A - Temperate

Designation	Units	50 Hz 1500 rev/min		
		Baseload Power	Prime Power	Standby Power
Energy in fuel	kWt	1535	1947	2182
Energy in power output (gross)	kWb	640	800	877
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Energy to coolant and oil	kWt	244	297	312
Energy to radiation	kWt	29	70	90
Energy to charge coolers	kWt	132	175	192

4008TAG2A - Tropical

Designation	Units	50 Hz 1500 rev/min		
		Baseload Power	Prime Power	Standby Power
Energy in fuel	kWt	1733	2209	2498
Energy in power output (gross)	kWb	719	899	985
Energy to cooling fan	kWm	38	38	38
Energy in power output (net)	kWm	681	861	947
Energy to exhaust	kWt	548	698	807
Energy to coolant and oil	kWt	273	332	349
Energy to radiation	kWt	40	80	100
Energy to charge coolers	kWt	153	200	257

4008TAG2A - Temperate

Designation	Units	50 Hz 1500 rev/min		
		Baseload Power	Prime Power	Standby Power
Energy in fuel	kWt	1733	2209	2498
Energy in power output (gross)	kWb	719	899	985
Energy to cooling fan	kWm	27	27	27
Energy in power output (net)	kWm	692	872	958
Energy to exhaust	kWt	548	698	807
Energy to coolant and oil	kWt	273	332	349
Energy to radiation	kWt	40	80	100
Energy to charge coolers	kWt	153	200	257

Cooling system

Recommended coolant: 50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. For combined heat and power 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 Perkins.

Nominal jacket water pressure in crankcase. 170 kPa

The following is a guide based on ambient air conditions of 52 °C on a Perkins supplied radiator.

Total coolant capacity:

Electronit (engine only)48 litres

ElectropaK (engine/radiator):

-tropical149 litres

-temperate.143 litres

Pressure cap setting69 kPa

Fan Incorporated in radiator

Diameter:

-tropical 1400 mm (pusher)

-temperate. 1214 mm (pusher)

Ambient cooling clearance (open ElectropaK Prime power) based on air temperature at fan 3 °C above ambient.

4008TAG1A - Tropical

Maximum additional restriction (duct allowance) to cooling airflow (Prime Power Applications) and resultant minimum airflow		
Ambient clearance 50% glycol	Duct allowance mm H ₂ O	Min airflow m ³ /min
rev/min	rev/min	rev/min
1500	1500	1500
50 °C	21	1248

4008TAG1A - Temperate

Maximum additional restriction (duct allowance) to cooling airflow (Prime Power Applications) and resultant minimum airflow		
Ambient clearance 50% glycol	Duct allowance mm H ₂ O	Min airflow m ³ /min
rev/min	rev/min	rev/min
1500	1500	1500
41 °C	25	1095

4008TAG2A - Tropical

Maximum additional restriction (duct allowance) to cooling airflow (Prime Power Applications) and resultant minimum airflow		
Ambient clearance 50% glycol	Duct allowance mm H ₂ O	Min airflow m ³ /min
rev/min	rev/min	rev/min
1500	1500	1500
50 °C	18	1350

4008TAG2A - Temperate

Maximum additional restriction (duct allowance) to cooling airflow (Prime Power Applications) and resultant minimum airflow		
Ambient clearance 50% glycol	Duct allowance mm H ₂ O	Min airflow m ³ /min
rev/min	rev/min	rev/min
1500	1500	1500
35 °C	25	1095

Coolant pump speed and

method of drive1,4 x e rev/min gear driven

Maximum static pressure head on pump

above engine crank centre line 7 m

Maximum external permissible restriction

to coolant pump flow 20 kPa

Thermostat operating range. 71-85 °C

Shutdown switch setting 101 °C rising

Coolant immersion heater capacity. 4 kW x 1

Jacket cooling water data	Units	1500 rev/min
Coolant flow 4008TAG1A/2A	l/s	10
Coolant exit temperature (max)	°C	98
Coolant entry temperature (min)	°C	70
Coolant entry temperature (max)	°C	86

Lubrication system

Recommended lubricating oil to conform with the specification of API CG4 15W/40

Lubricating oil capacity

-sump maximum 153 litres

-sump minimum. 127 litres

Lubricating oil temperature maximum to bearings 105 °C

Lubricating oil pressure

-at 80 °C temperature to bearing gallery (minimum) 0,34 MPa

4008TAG1A

Oil consumption Prime power	Units	1500 rev/min
After running-in*	g/kWhr	0,50
Oil flow rate from pump	l/s	3,70

4008TAG2A

Oil consumption Prime power	Units	1500 rev/min
After running-in*	g/kWhr	0,52
Oil flow rate from pump	l/s	3,70

*Typical after 250 hours

Sump drain plug tapping size G1

Oil pump speed and method of drive . 1.4 x e rev/min, gear driven

Shutdown switch setting 1,93 bar falling

Normal operating angles

Fore and aft 5°

Side tilt 10°

Fuel system

Recommended fuel to conform to:

... BS2869 1998 Class A2 or BS EN590
 Type of injection system ... Direct injection
 Fuel injection pump ... Combined unit injector
 Fuel injector ... Combined unit injector
 Fuel injector opening pressure... 234 bar
 Fuel lift pump ... Tuthill TCH 1-054
 Delivery/hour at 1500 rev/min ... 660 litres
 Heat retained in fuel to tank ... 4,5 kW
 Temperature of fuel at lift pump to be less than. ... 58 °C
 Fuel lift pump pressure ... 300 kPa
 Fuel lift pump maximum suction head ... 2.5 m
 Fuel lift pump maximum pressure head (see Installation Manual)
 Fuel filter spacing... 10 microns
 Governor type ... Electronic
 Torque at the governor output shaft... 0,917 kgm
 Static injection timing. ... See engine number plate
 Tolerance on fuel consumption... To ISO 8528-1 1993

4008TAG1A - Tropical

Fuel consumption (gross)		
Designation	g/kWh	Litres/hr
rev/min	1500	1500
At Standby Max power rating	210	217
At Prime Power rating	206	194
At Continuous Baseload rating	203	153
At 75% of Prime Power rating	201	142
At 50% of Prime Power rating	207	97
At 25% of Prime Power rating	217	51

4008TAG1A - Temperate

Fuel consumption (gross)		
Designation	g/kWh	Litres/hr
rev/min	1500	
At Standby Max power rating	210	217
At Prime Power rating	206	194
At Continuous Baseload rating	203	153
At 75% of Prime Power rating	201	142
At 50% of Prime Power rating	207	97
At 25% of Prime Power rating	217	51

4008TAG2A - Tropical

Fuel consumption (gross)		
Designation	g/kWh	Litres/hr
rev/min	1500	
At Standby Max power rating	214	248
At Prime Power rating	208	220
At Continuous Baseload rating	204	173
At 75% of Prime Power rating	202	160
At 50% of Prime Power rating	205	108
At 25% of Prime Power rating	216	57

4008TAG2A - Temperate

Fuel consumption (gross)		
Designation	g/kWh	Litres/hr
rev/min	1500	
At Standby Max power rating	214	248
At Prime Power rating	208	220
At Continuous Baseload rating	204	173
At 75% of Prime Power rating	202	160
At 50% of Prime Power rating	205	108
At 25% of Prime Power rating	216	57

Induction system

Maximum air intake restriction of engine:

-clean filter... 127 mm H₂O
 -dirty filter... 380 mm H₂O
 -air filter type ... cylinder paper pleat

Exhaust system

Maximum back pressure for total system.

Designation	Units	1500 rev/min
4008TAG1A	mmH ₂ O	949
4008TAG2A	mmH ₂ O	816

Exhaust outlet flange size ... 2 x 152 mm
 For recommended pipe sizes, refer to the Installation Manual.

Electrical system

Type ... Insulated return
 Alternator ... 24 volts with integral regulator
 Alternator output... 40 amps at a stabilised output
 28 volts at 20 °C ambient
 Starter motor ... 24 volts
 Starter motor power... 8,2 kW
 Number of teeth on flywheel ... 190
 Number of teeth on starter motoer ... 12
 Minimum cranking speed (0 °C)... 120 rev/min
 Pull-in current of starter motor solenoid ... 30 amps at 24 volts
 Hold-in current of starter motor solenoid ... 9 amps at 24 volts
 Engine stop solenoid... 24 volts
 Pull-in current of stop solenoid ... 60 amps at 24 volts
 Hold-in current of stop solenoid... 1,1 amps at 24 volts

Engine mounting

Position of centre of gravity (wet engine) forward
 from rear face of crankcase. ... 900 mm
 Engine vertical centre line above crankshaft centre line ... 140 mm
 Maximum additional load applied to flywheel
 due to all rotating components ... 650 Kg

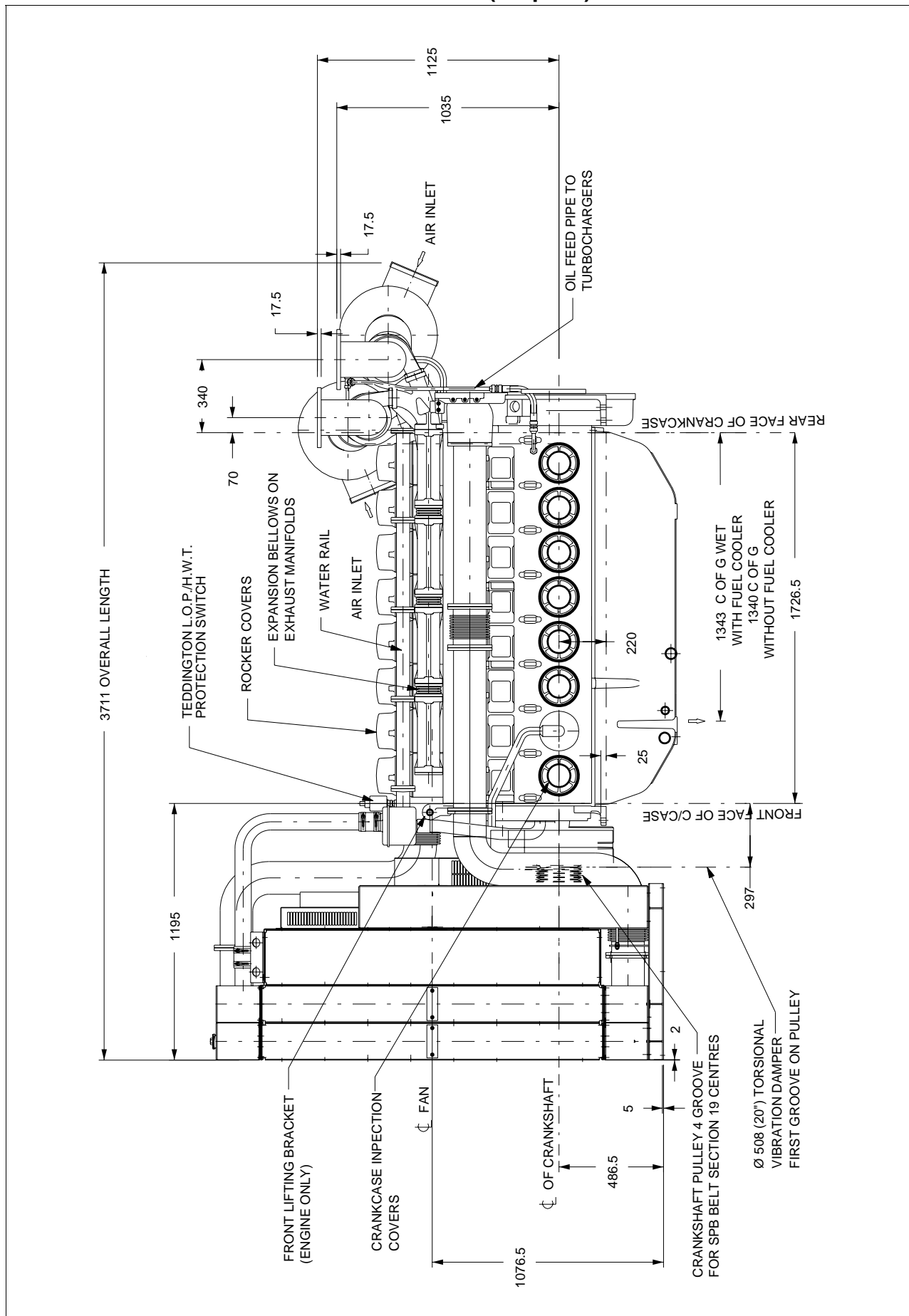
Starting requirements

Temperature range	
Range Down to 0 °C (32 °F)	Oil: API CG4 15W/40 Starter: 1 x 24V Battery: 2 x 12 volts x 178 Ah Max breakaway current: 1400 amps Cranking current: 750 amps Aids: Not necessary Starter cable size: 70 mm ² Maximum length: 6 m

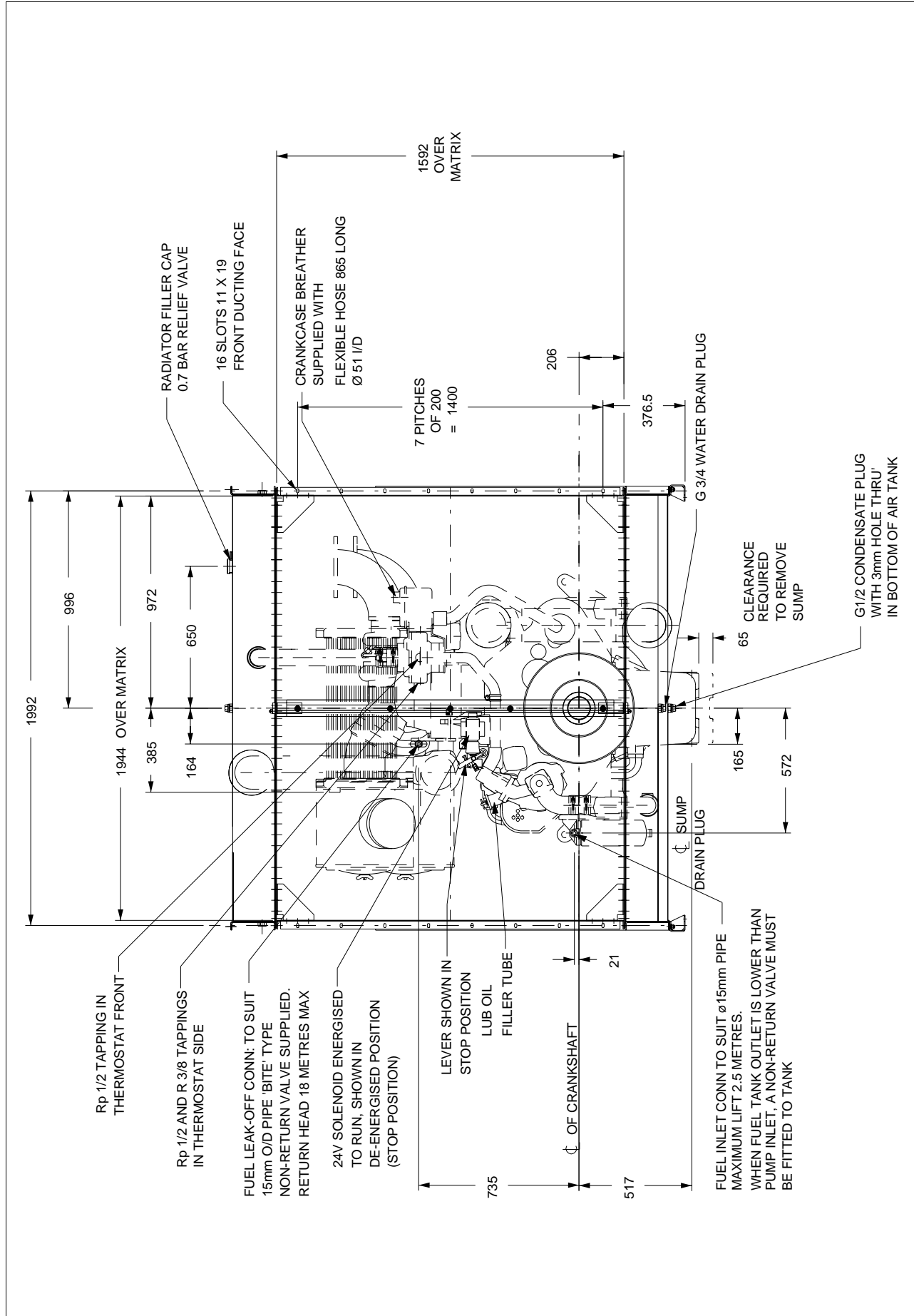
Notes:

- 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.

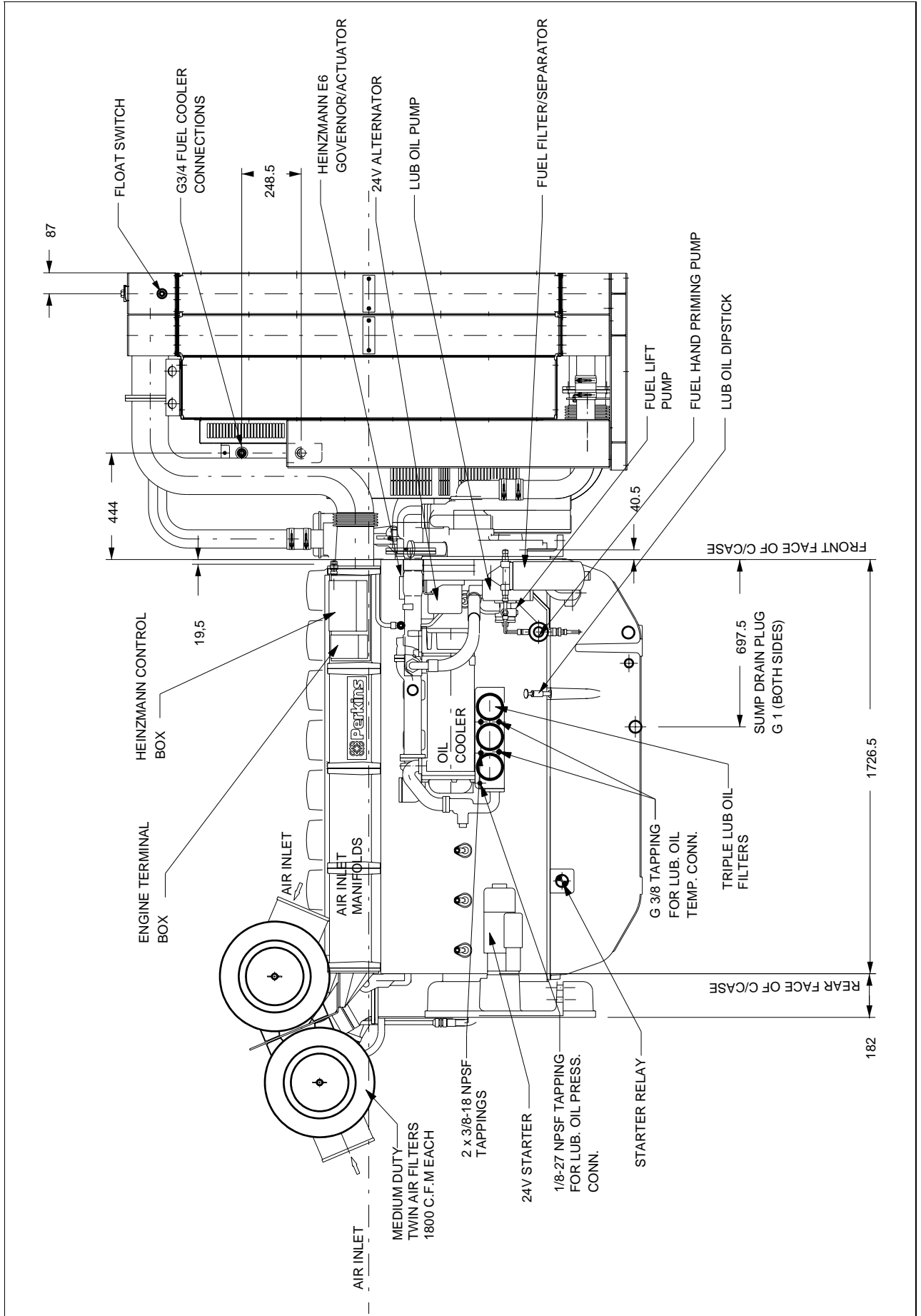
4008TAG1A and 4008TAG2A - left hand side (Tropical)



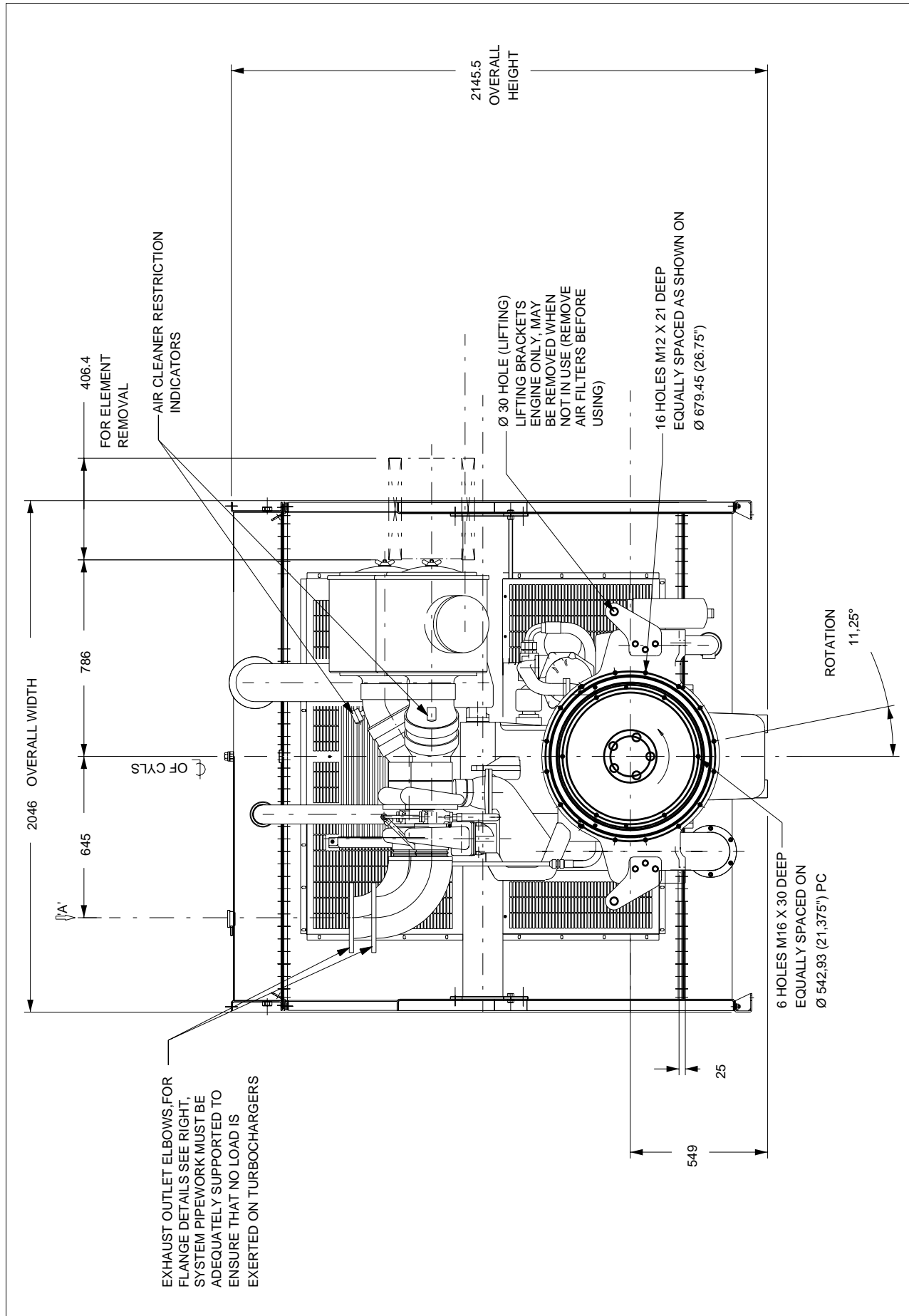
4008TAG1A and 4008TAG2A - front (Tropical)



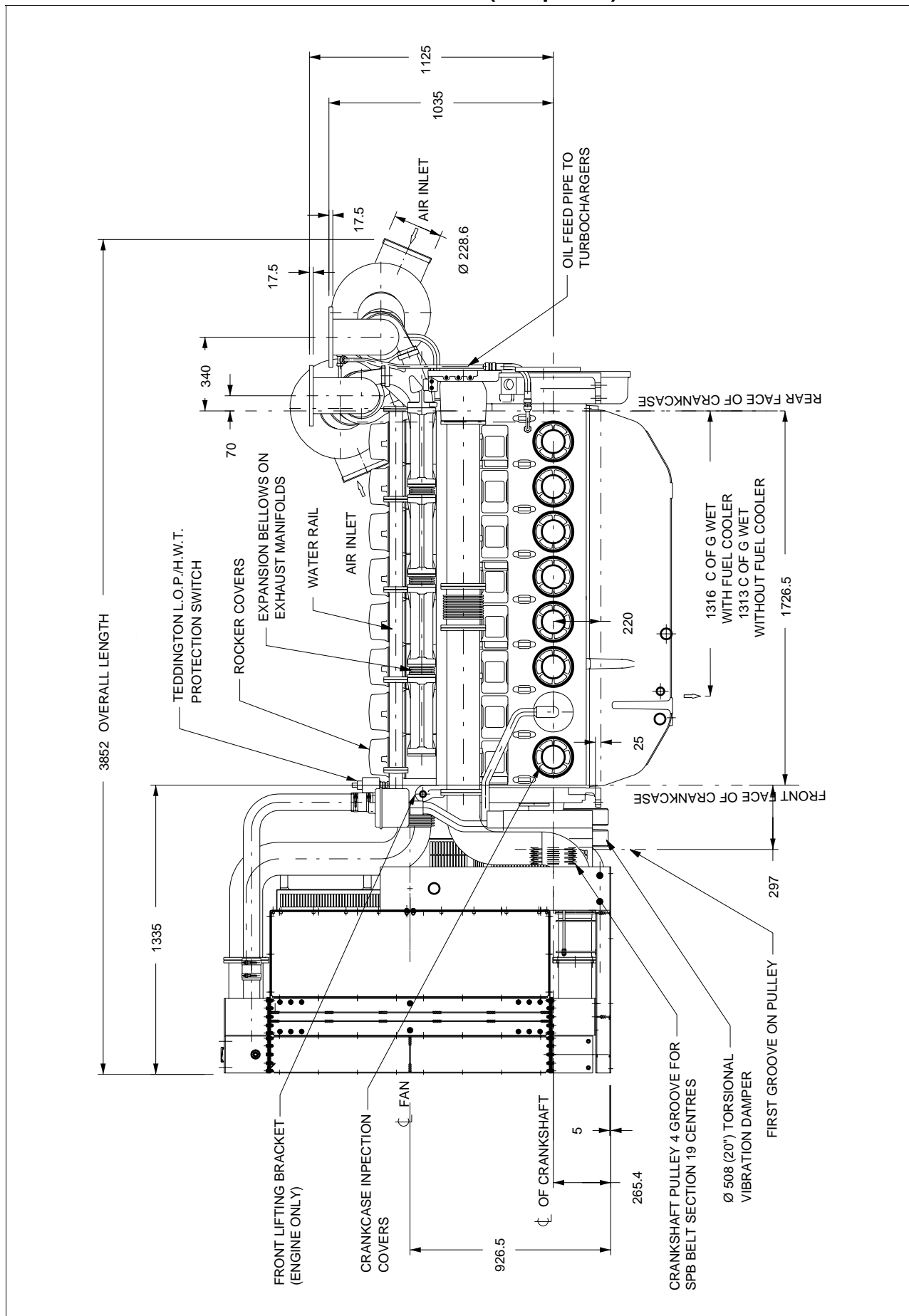
4008TAG1A and 4008TAG2A - right hand side (Tropical)



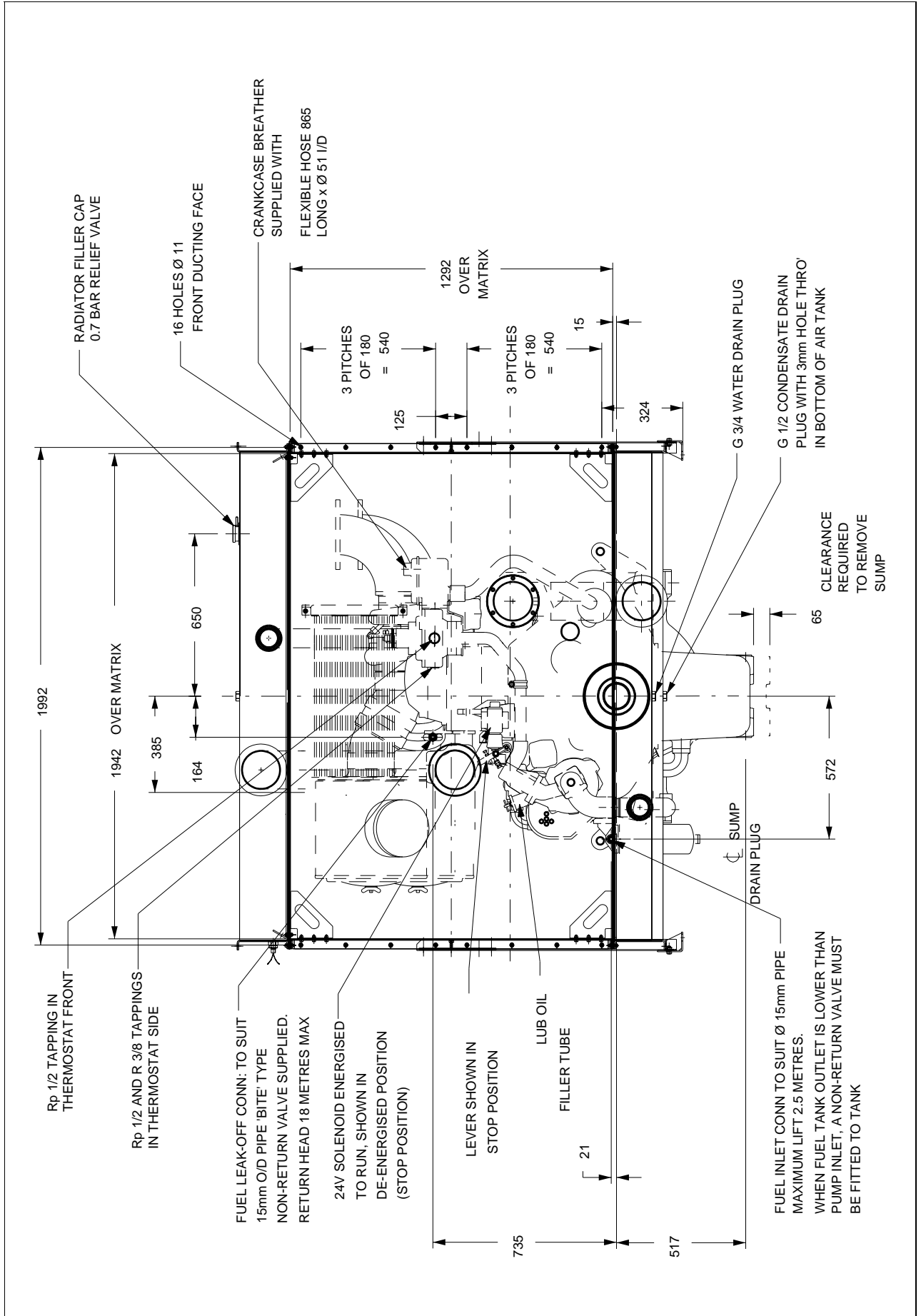
4008TAG1A and 4008TAG2A - rear (Tropical)



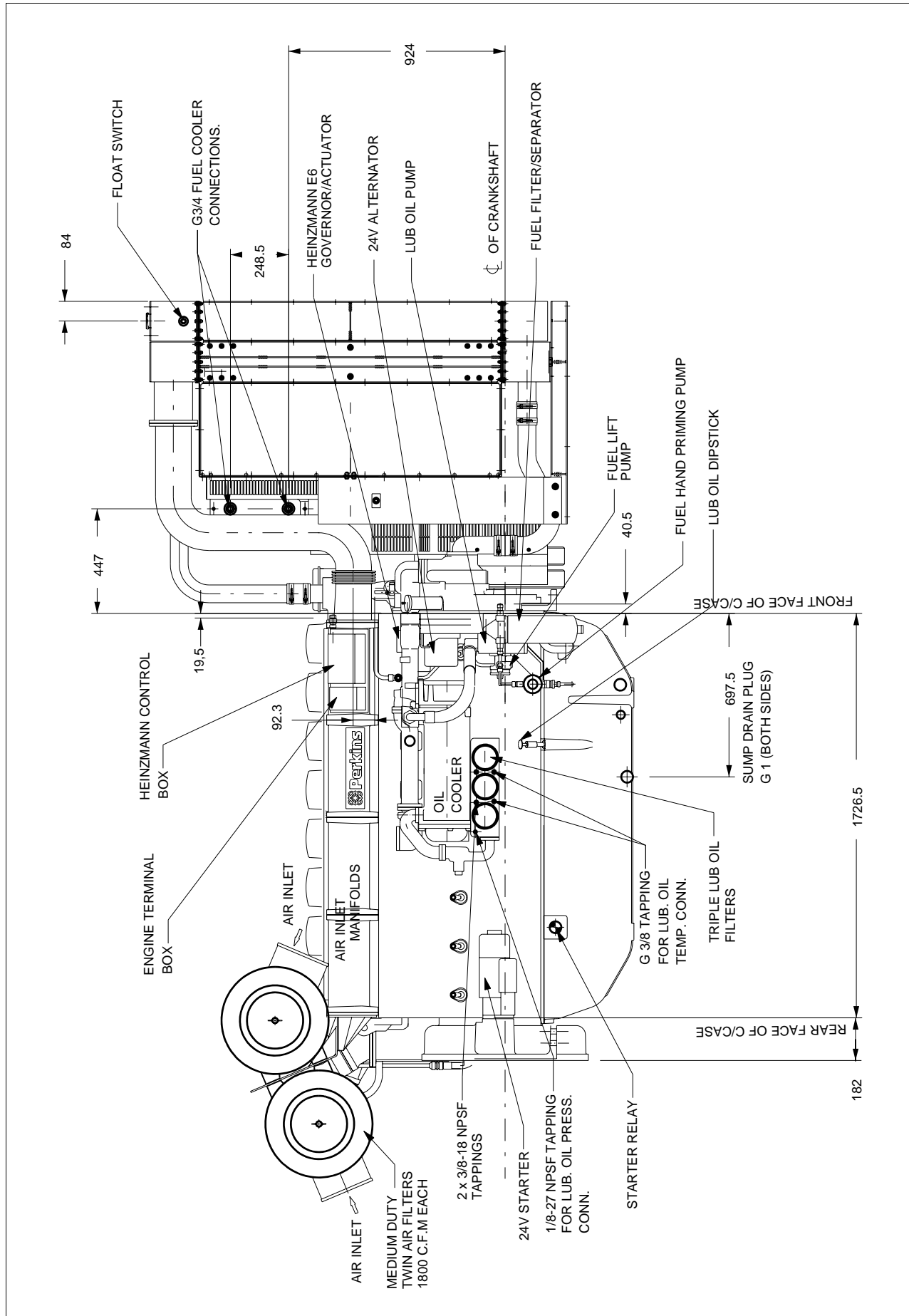
4008TAG1A and 4008TAG2A - left hand side (Temperate)



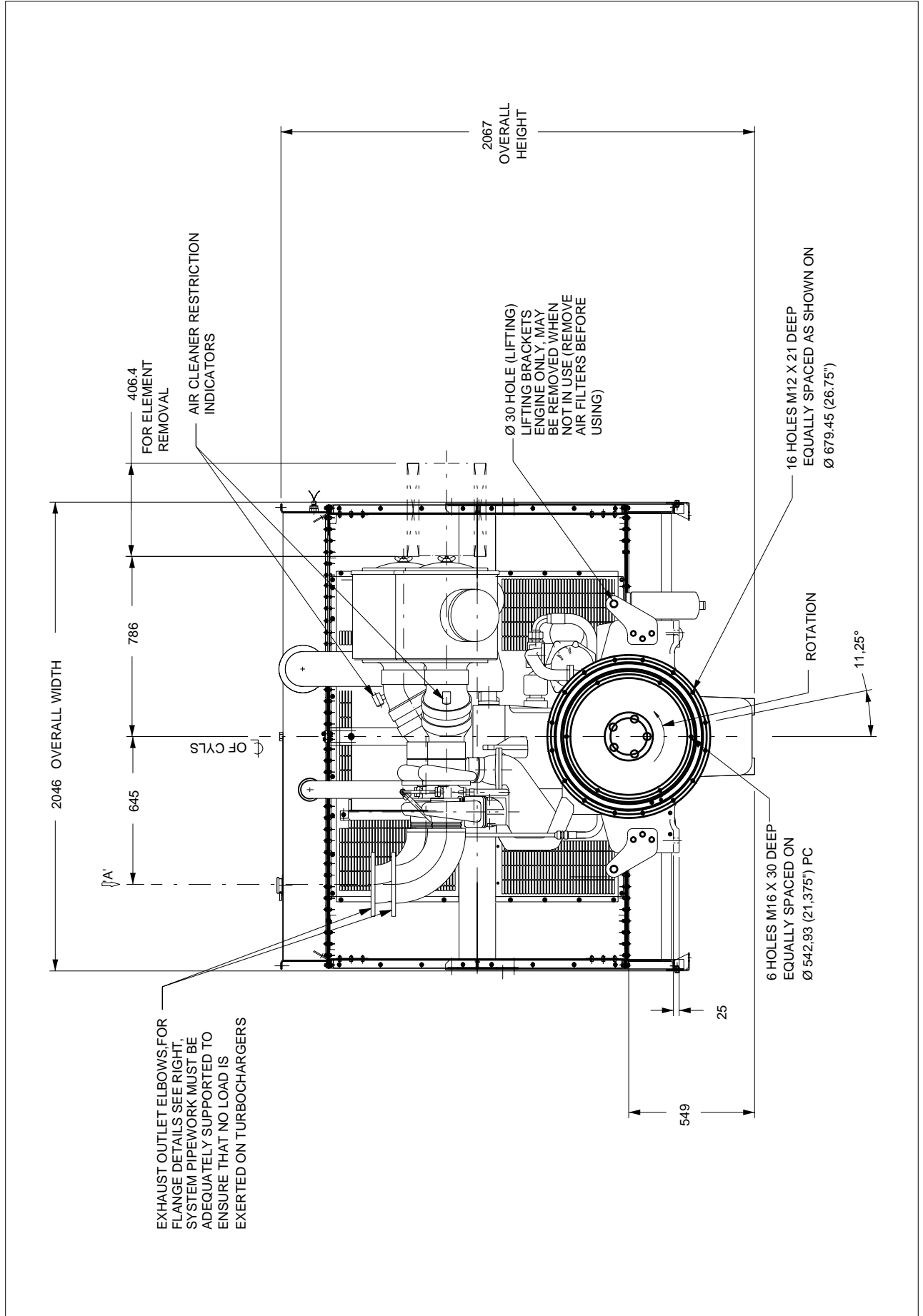
4008TAG1A and 4008TAG2A - front (Temperate)



4008TAG1A and 4008TAG2A - right hand side (Temperate)



4008TAG1A and 4008TAG2A - rear (Temperate)



Load acceptance (cold)

4008TAG1A

At 1500 rev/min

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 kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds
64	490 / 466	≤ -10	5	36	272 / 258	≤ -10	5

4008TAG2A

At 1500 rev/min

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 kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds
57	490 / 466	≤ -10	5	43	371 / 352	≤ -10	5

The above complies with the requirements of Classification 3 & 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5.

The above figures were obtained under test conditions as follows:

Engine block temperature 45 °C

Alternator efficiency 96%

Minimum ambient temperature 10 °C

Isosynchronous governing

Under frequency roll off (UFRO) set to 1 Hz below rated frequency

Typical alternator inertia. 50 Kgm²

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

Noise levels

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

Octave analysis

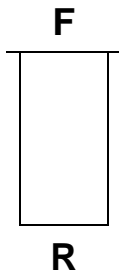
The following histograms show an octave band analysis at the position of the maximum noise level.

Total noise level

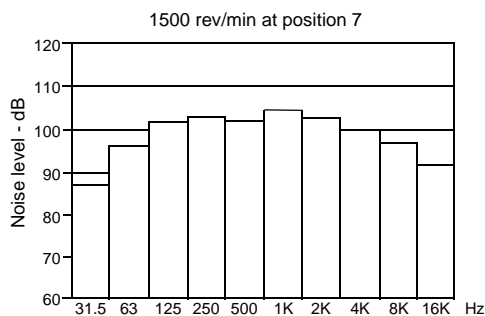
Sound pressure level re: -20×10^{-6} pa
 Speed 1500 rev/min Ambient noise level 79 dB(A) 4008TAG1A
 Octave analysis performed at the position of maximum noise.

4008TAG1A / 4008TAG2A

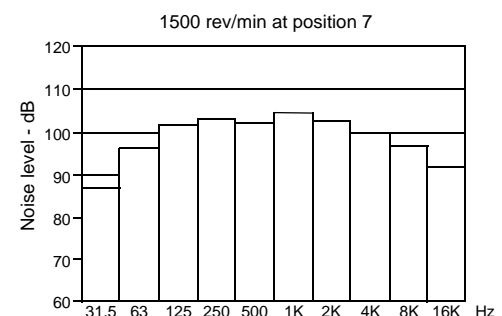
			POSITION 1				
		Temperate	1500 rev/min 103 - dBA		4008TAG1A		
			1500 rev/min 104 - dBA		4008TAG2A		
		Tropical	1500 rev/min 105 - dBA		4008TAG1A		
			1500 rev/min 105 - dBA		4008TAG2A		
	POSITION 7					POSITION 2	
Temperate	1500 rev/min 108 - dBA	4008TAG1A			Temperate	1500 rev/min 108 - dBA	4008TAG1A
	1500 rev/min 109 - dBA	4008TAG2A				1500 rev/min 109 - dBA	4008TAG2A
Tropical	1500 rev/min 110 - dBA	4008TAG1A			Tropical	1500 rev/min 109 - dBA	4008TAG1A
	1500 rev/min 110 - dBA	4008TAG2A				1500 rev/min 109 - dBA	4008TAG2A
	POSITION 6					POSITION 3	
Temperate	1500 rev/min 108 - dBA	4008TAG1A			Temperate	1500 rev/min 108 - dBA	4008TAG1A
	1500 rev/min 109 - dBA	4008TAG2A				1500 rev/min 109 - dBA	4008TAG2A
Tropical	1500 rev/min 109 - dBA	4008TAG1A			Tropical	1500 rev/min 109 - dBA	4008TAG1A
	1500 rev/min 110 - dBA	4008TAG2A				1500 rev/min 110 - dBA	4008TAG2A
	POSITION 5					POSITION 4	
Temperate	1500 rev/min 107 - dBA	4008TAG1A			Temperate	1500 rev/min 107 - dBA	4008TAG1A
	1500 rev/min 108 - dBA	4008TAG2A				1500 rev/min 108 - dBA	4008TAG2A
Tropical	1500 rev/min 107 - dBA	4008TAG1A			Tropical	1500 rev/min 108 - dBA	4008TAG1A
	1500 rev/min 109 - dBA	4008TAG2A				1500 rev/min 108 - dBA	4008TAG2A



4008TAG1A - Temperate



4008TAG2A - Temperate



The information given on this technical data sheet are for standard ratings only. For ratings other than shown, please contact Perkins Engines Company Limited, Stafford

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