

Technical Data

400 Series

Industrial Open Power Unit

404D-22T

41.5 kW @ 2800 rev/min

42.1 kW @ 3000 rev/min

Basic technical data

Number of cylinders	4
Cylinder arrangement	Vertical in-line
Cycle	4
Induction system	Turbo charged
Combustion system.....	Indirect injection
Compression ratio	23.3:1
Bore.....	84 mm (3.3 in)
Stroke	100 mm (3.9 in)
Cubic capacity.....	2.216 litres (135.2 in ³)
Direction of rotation when viewed from flywheel	anti-clockwise
Firing order	1, 3, 4, 2

Estimated total weight

dry	230,0 kg (507.1 lb)
wet	247.7 kg (546.1 lb)

Overall dimensions

-height	973.1
-length (from rear of air cleaner to front face of radiator)	972.3
-width	589.6

Moments of inertia (kgm²)

-engine includes fan pulleys, fan and flywheel:	
-Engine rotational components	0.444444 kgm ²
-crankshaft pulley	N/A kgm ²
-flywheel (option DD002).....	1.07 kgm ²

Centre of gravity

-forward from rear of block	147 mm
-above block centre line	78 mm
-offset to RHS of crankshaft centre line.....	3 mm

Performance

Note: All data based on operation to ISO/TR14396 standard reference conditions

Test conditions

-air temperature.....	25 °C (77 °F)
-barometric pressure	100 kPa (14.5 lb/in ²)
-relative humidity	30 %

Sound level

average sound pressure level for bare engine (without inlet and exhaust) at 1 metre:

-44.7 kW gross @ 2800 rev/min	85,13 dbA
-45.5 kW @ 3000 rev/min	86,66 dbA

Air inlet restriction at maximum power (nominal)

5.0 kPa

Exhaust back pressure at maximum power (nominal)

9.0 kPa

Fuel temperature (inlet pump)

40 °C

All ratings certified to within

± 5%

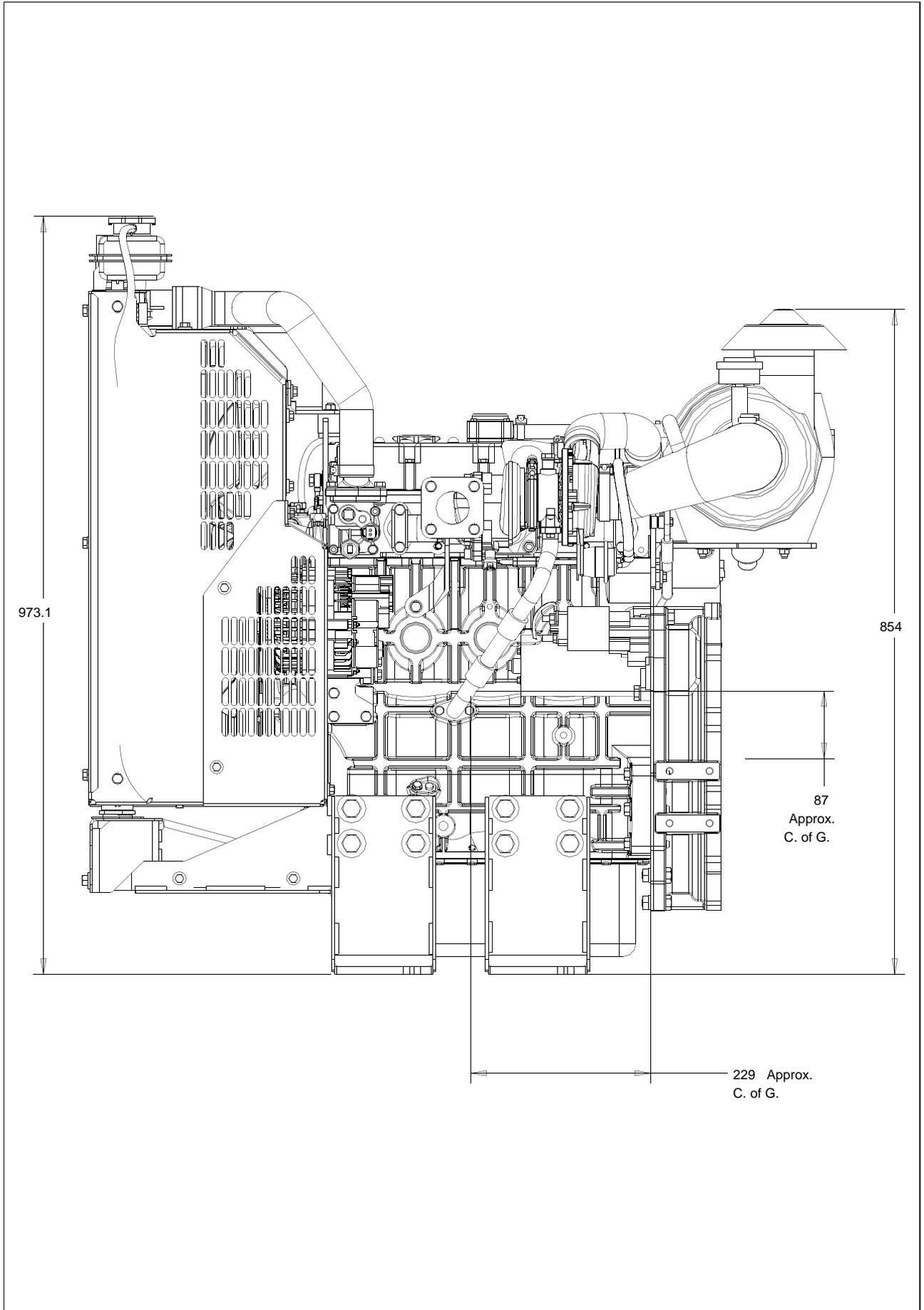
If the engine is to operate in ambient conditions other than those of the test conditions, suitable adjustments must be made for these changes. For full details, contact Perkins Technical Service Department.

General installation,

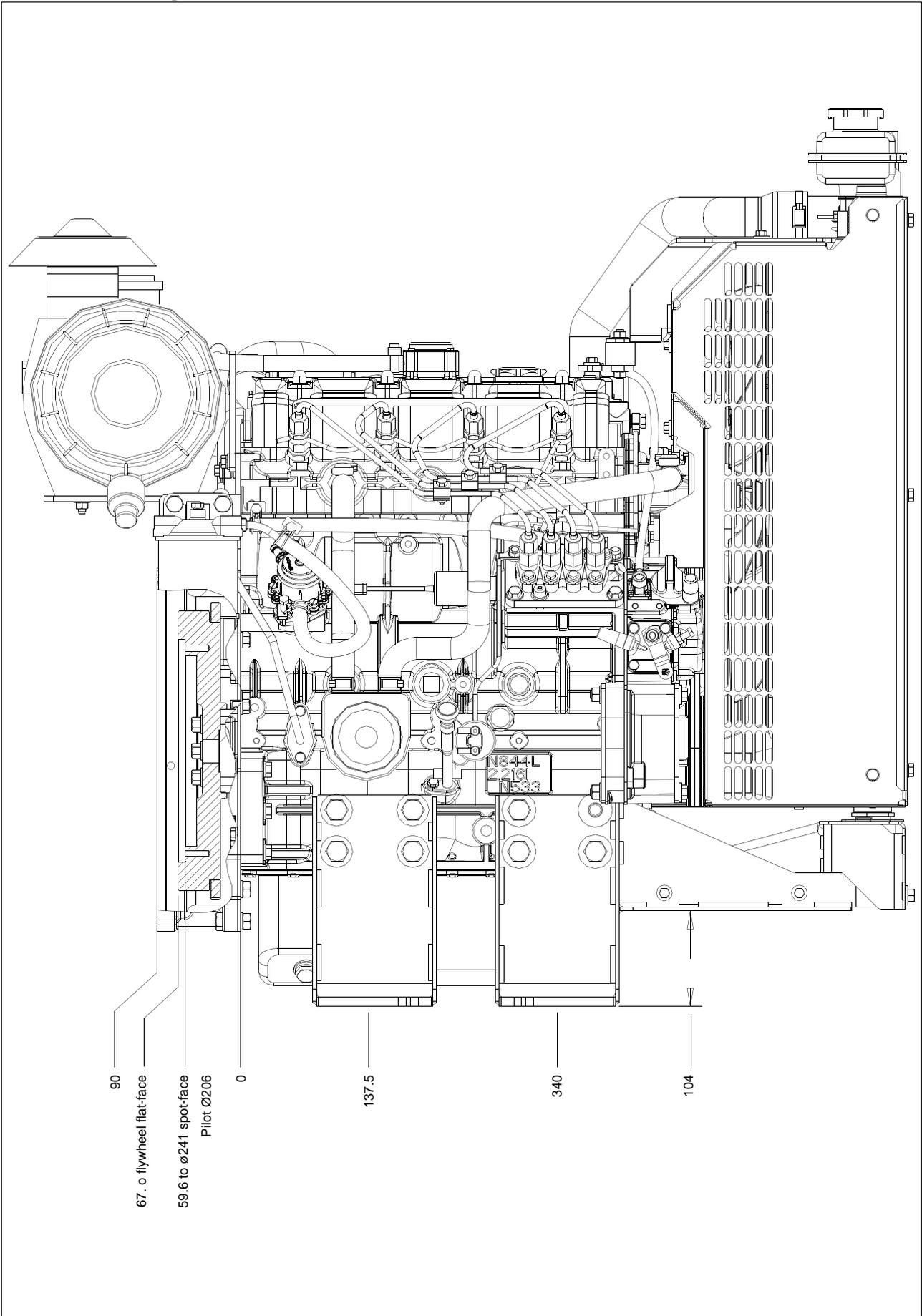
Designation	Units	Engine speed rev/min	
		2800	3000
Gross engine power	kW (bhp)	44.7 (59.94)	45.5 (61.01)
Brake mean effective pressure	kPa (lbf/in ²)	864.7 (125.4)	821.5 (119.2)
Mean piston speed	m/s (ft/s)	9.3 (30.5)	10. (32.8)
Fan power absorption	kWm (bhp)	3.2 (4.3)	3.4 (4.6)
IOPU net engine power	kW (bhp)	41.5 (55.7)	42.1 (56.5)
Engine coolant flow, against a 90 kPa restriction @ Rated Speed with 1.25 : 1 pulley ratio	l/min (UK gal/min)	99.5 (21.9)	105.5 (23.2)
Combustion air flow	m ³ /min(ft ³ /min)	3.72 (131.4)	3.9 (137.7)
Exhaust gas flow (Max.)	m ³ /min (ft ³ /min)	10.9 (384.9)	11.4 (402.6)
Exhaust gas temperature (Max.)	°C (°F)	620 (1148)	620 (1148)
Energy balance			
Energy in fuel (fuel heat of combustion)	kW (bhp)	137.7 (184.7)	142.2 (190.69)
Gross engine power	kW (bhp)	44.7 (59.94)	45.5 (61.01)
Fan power absorption	kWm (bhp)	3.2 (4.3)	3.4 (4.6)
Energy net engine power	kW (bhp)	41.5 (55.7)	42.1 (56.5)
Energy to coolant and lubricating oil	KW (bhp)	48.2 (64.6)	51.4 (68.9)
Energy to exhaust	KW (bhp)	34.9 (46.8)	35.3 (47.3)
Heat to radiation	KW (bhp)	9.9 (13.3)	10.0 (13.4)

Caution: The airflows shown in this table will provide acceptable cooling for an open power unit operating in ambient temperatures of up to 53 °C (46 °C if a canopy is fitted with an airflow restriction of up to 0,125 kPa). If the power unit is to be enclosed totally, a cooling test must be done to check that the engine cooling is acceptable. If there is insufficient cooling, contact your Perkins Distributor or Perkins Technical Service Department.

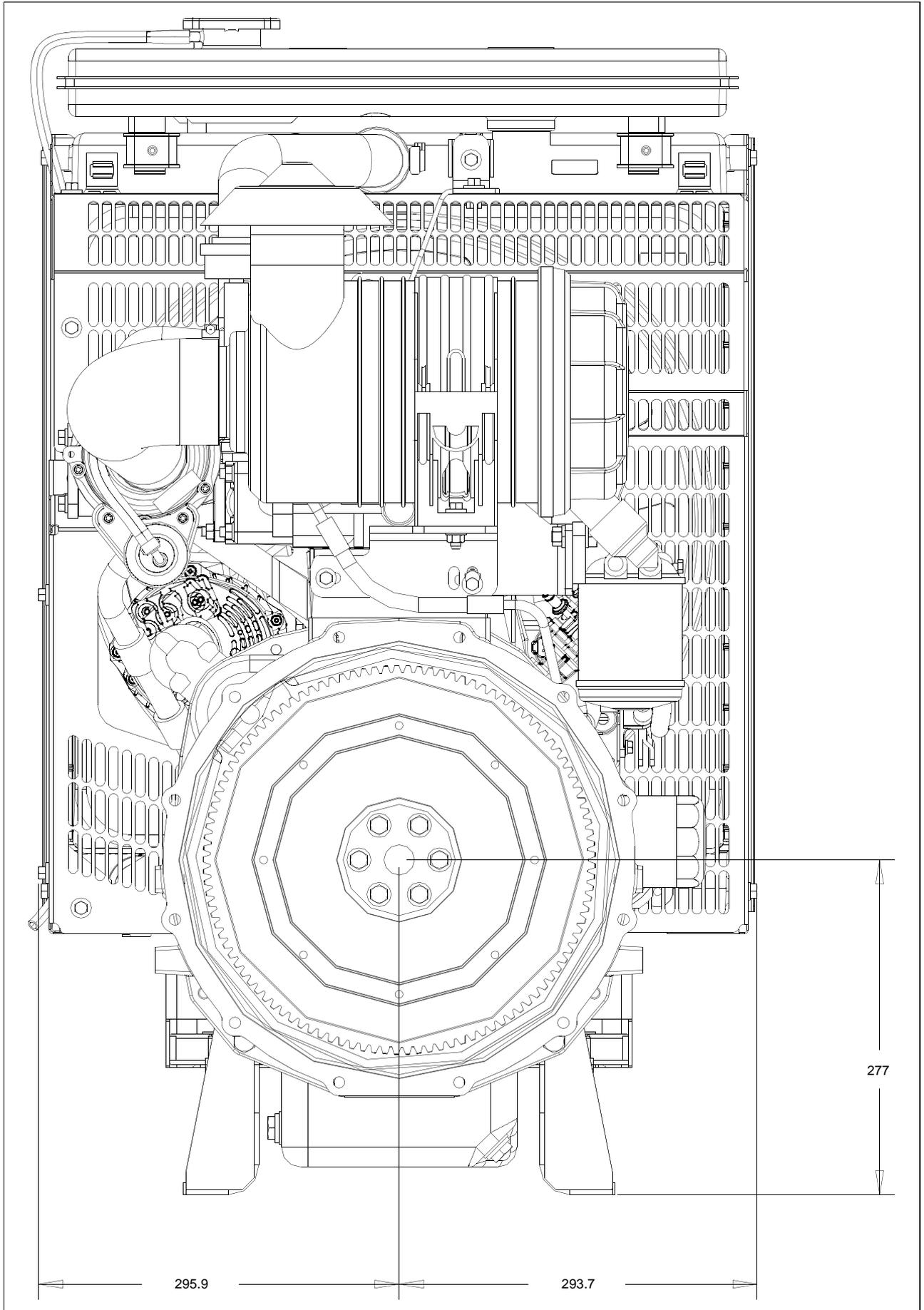
404D-22T IOPU - left side view



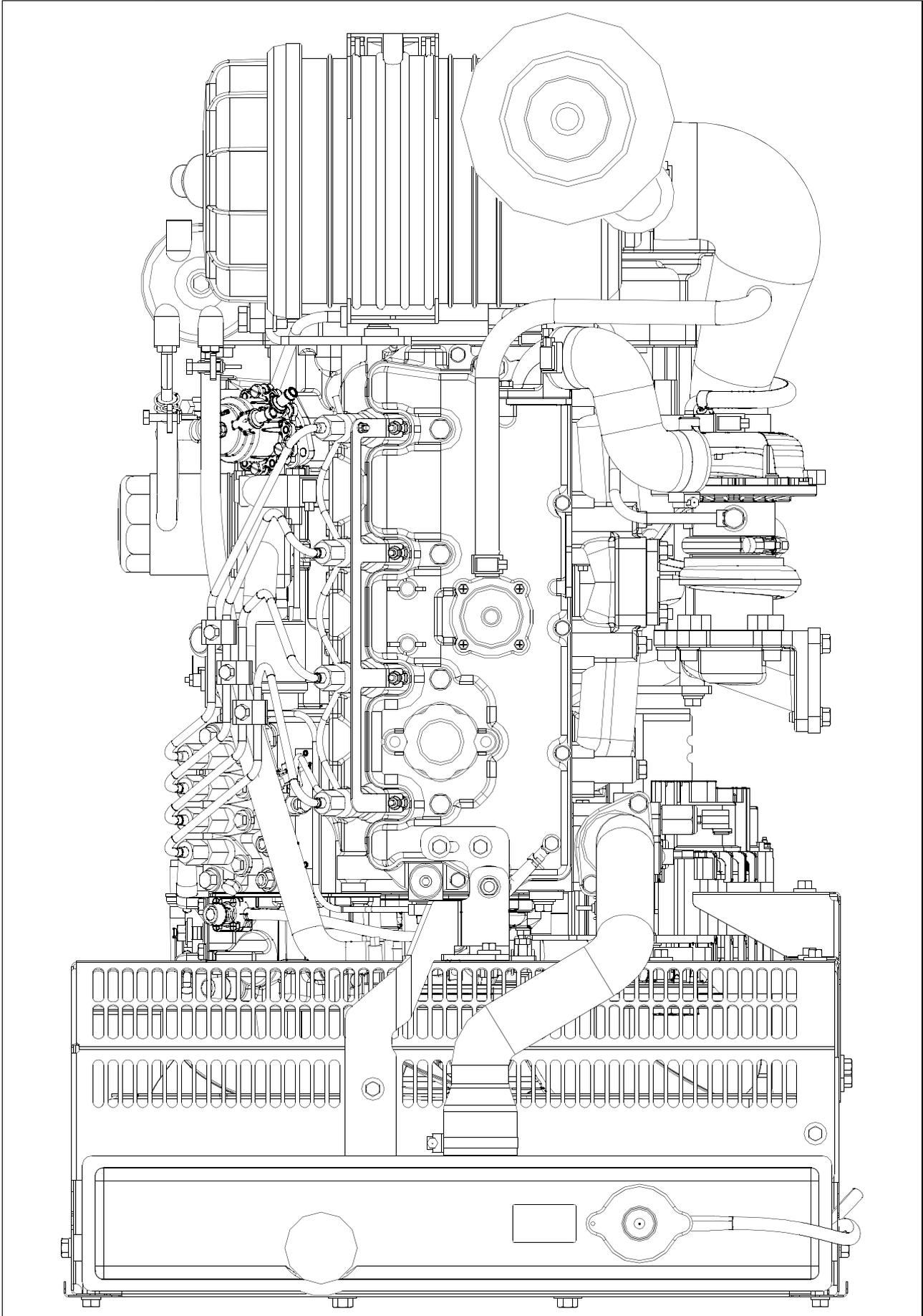
404D-22T IOPU - right view



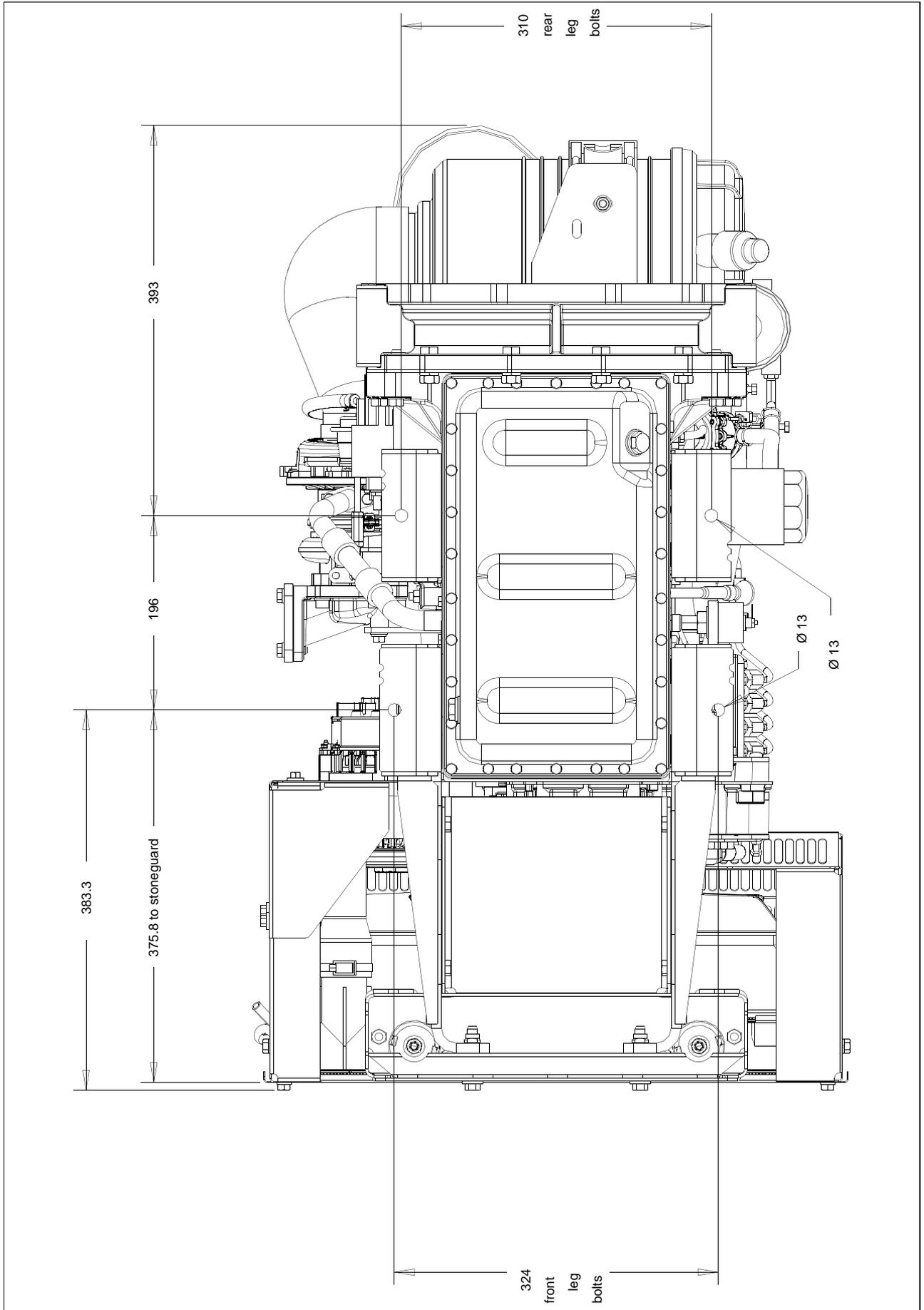
404D-22T IOPU - rear view



404D-22T IOPU - plan view



404D-22T IOPU - view from below



Cooling system

Radiator

-face area ... 0.3 m² (3.229 ft²)
 -rows and materials ... 1 row, Aluminium
 -matrix density and material ... 54 tubes /row, 12.57 fins per inch, Aluminium
 -height of matrix ... 524.2 mm (20.7 in)
 -width of matrix ... 570.0 mm (22.5 in)
 -pressure cap setting ... 110 kPa (13.1 lb/in²)

Fan

-diameter ... 457 mm (18 in)
 -drive ratio ... 1-25:1
 -number of blades ... 7
 -material ... plastic
 -type ... puller
 Airflow at rated speed
 -2800 rev/min ... 67.8 m³/min
 -3000 rev/min ... 72.4 m³/min
 Airflow at maximum torque speed ... 39.9 m³/min

Coolant

Recommended coolant: BS6580 - 1992, ASTM D3306 and Perkins ELC coolants to 1E1966
 Total system capacity
 -with radiator ... 8.45 litres (14.9 pt)
 -without radiator ... 3.6 litres (6.3 pt)
 Maximum permissible external system resistance ... TBA kPa
 Maximum top tank temperature ... 110 °C (230 °F)
 Thermostat rise across engine ... TBA °C (°F)
 Thermostat operation range ... 82 - 95 °C (179.6 - 203.0 °F)
 Coolant pump drive type and ratio ... belt driven, 1-25:1
 Maximum static pressure head on water pump ... 30.4 kPa

Electrical system

Voltage ... 12 V, negative ground
 Alternator output ... 65 amps
 Starter motor power ... 2.0 kW
 Number of teeth on flywheel ... 126
 Number of teeth on pinion ... 9
 Starter solenoid pull-in current ... TBA amps
 Starter solenoid hold-in current ... TBA amps

Note: For further information on the electrical system, refer to the Application and Installation Manual.

Cold start recommendations

Temperature Range	5 to -7 °C	-7 to -10 °C	-7 to -15 °C	-15 to -20 °C
Oil	20W	20W	10W	5W
Starter	2 kW	2 kW	2 kW	2 kW
Battery	647	647	647	655
Max breakaway current	TBA	TBA	TBA	TBA
Cranking current	TBA	TBA	TBA	TBA
Aids	Glowplugs			
Minimum mean cranking speed	180 rev/min			

Notes:

- Battery capacity is defined by the 20 hour rate
- If a change to a low viscosity oil is made, the cranking torque necessary at low ambient temperatures is much reduced. The starting equipment has been selected to take advantage of this. It is important to change to the appropriate multigrade oil in anticipation of operating in low ambient temperatures
- Breakaway current is dependent on battery capacity available. Cables should be capable of handling the transient current which may be up to double the steady cranking current.

Exhaust system

Maximum back pressure for total system ... 10.2 kPa (1.5 lb/in²)
 Inside diameter of outlet flange ... 42 mm (1.65 in)

Fuel system

Type of:

- injection ... Indirect
- fuel injection pump ... cassette type
- fuel atomiser ... pintle nozzle
- Nozzle opening pressure ... 14,7 MPa (2132 lbf/in²)

Fuel lift pump

- flow/hour ... 1.05 litres/min (1.85 pints/min)
- pressure ... 10 kPa (1.45 lbf/in²)
- Maximum suction head at pump inlet ... 0,8 m
- Maximum static pressure head ... 3,0 m
- Governor type ... Mechanical

Fuel specification

USA FED Off Highway

- Density ... 0.840 - 0.865 (kg/l @ 15 °C)
- Viscosity ... 2.0 - 3.2 (mm²/s @ 40 °C)
- Sulphur content ... 0.0007 - 0.0015 (% mass)
- Cetane No. ... 40 - 50

Europe Off Highway

EU 2004/26/EC Stage 3B/4

- Density ... 0.833 - 0.837 (kg/l @ 15 °C)
- Viscosity ... 2.3 - 3.3 (mm²/s @ 40 °C)
- Sulphur content ... 0.001 Max. (% mass)
- Cetane No. ... 54 Max.

Fuel consumption (typical)

Fuel consumption @ 100% power rating @ specified speed		
rev/min	2800	3000
litres/hour	10,2	10,5

Induction system

Maximum air intake restriction

- clean filter. ... 3,0 kPa
- dirty filter ... 8,0 kPa
- air filter type ... dry element type

Lubrication system

Lubricating oil capacity

- maximum ... 10,6 litres (18.7 pt)
- minimum ... 8,9 litres (15.7 pt)

Maximum engine operating angles -

- front up, front down, right side, left side ... 35°
- Sump drain plug tapping size ... M16
- Shutdown switch:

-pressure setting (when fitted) 29.4 to 68.6 kPa (4.26 to 9.95 lbf/in²)

Lubricating oil flow at rated speed:

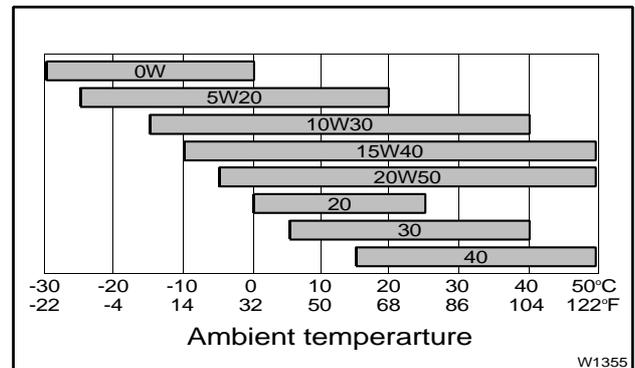
- @ 2800 rev/min ... 20,4 litres/min (4.5 gal/min)
- @ 3000 rev/min ... 21,9 litres/min (4.8 gal/min)

Lubricating oil pressure

- relief valve opens ... 304 - 500 kPa (44 - 72 lbf/in²)
- at maximum no-load speed ... 196 - 392 kPa (28 - 57 lbf/in²)
- at rated no-load speed ... 120 - 392 kPa (17 - 57 lbf/in²)
- at minimum speed ... 49 kPa (7.1 lbf/in²)
- Maximum continuous oil temperature (in rail) ... 125 °C (257 °F)

Recommended SAE viscosity

A multi grade lubricating oil which conforms to API CH4 or ACEA E5 must be used, see illustration below:



Note: For additional notes on lubricating oil specifications, refer to the Operation and Maintenance Manual

Mountings

- Max bending moment ...
- Maximum static bending moment at rear face of block ... TBA Nm (lbf ft)

Torque capability

- Continuous ... 75.3 Nm
- Intermittent ... 89.7 Nm



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