Technical Data

404D-22

IOPU

Basic technical data

Number of cylinders ... 4
Cylinder arrangement ... Verticle in line
Cycle ... 4 Strokes
Induction system ... N/A
Compression ratio ... 23.3:1
Bore ... 84.0 mm (3.30 in)
Stroke ... 100.0 mm (3.93 in)
Cubic capacity ... 2.216 litres (135 in³)
Direction of rotation ... Anti - Clockwise
Firing order ... 1, 3, 4, 2
Estimated total weight (dry) ... 218 kg (480 lb)
Estimated total weight (wet) ... 234.2 kg (516 lb)

Overall dimensions

-length (from x - x) ... 946.0 mm (37.2 in)
-width (widest point) ... 513.4 mm (20.2 in)
-height ... 854.0 mm (33.6 in)

Moments of inertia

-engine Includes fan pulleys, fan and flywheel: ...
-flywheel ... 1.07 kgm² (0.21 lbft²)
-rotational components ... 0.44444 kgcm²

Centre of gravity (dry)

-forward from rear of block ... 207 mm
-above block centre line ... 75 mm

Performance

Notes:

- All data based on operation to ISO/TR14396, ISO3046/1 standard reference conditions
- 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.
- All ratings certified to within 5 ± %.

Test conditions

-air temperature ... 25°C (°F)
-barometric pressure ... 100 kPa (14.50 lb/in²)
-relative humidity ... 30.0%

Sound level

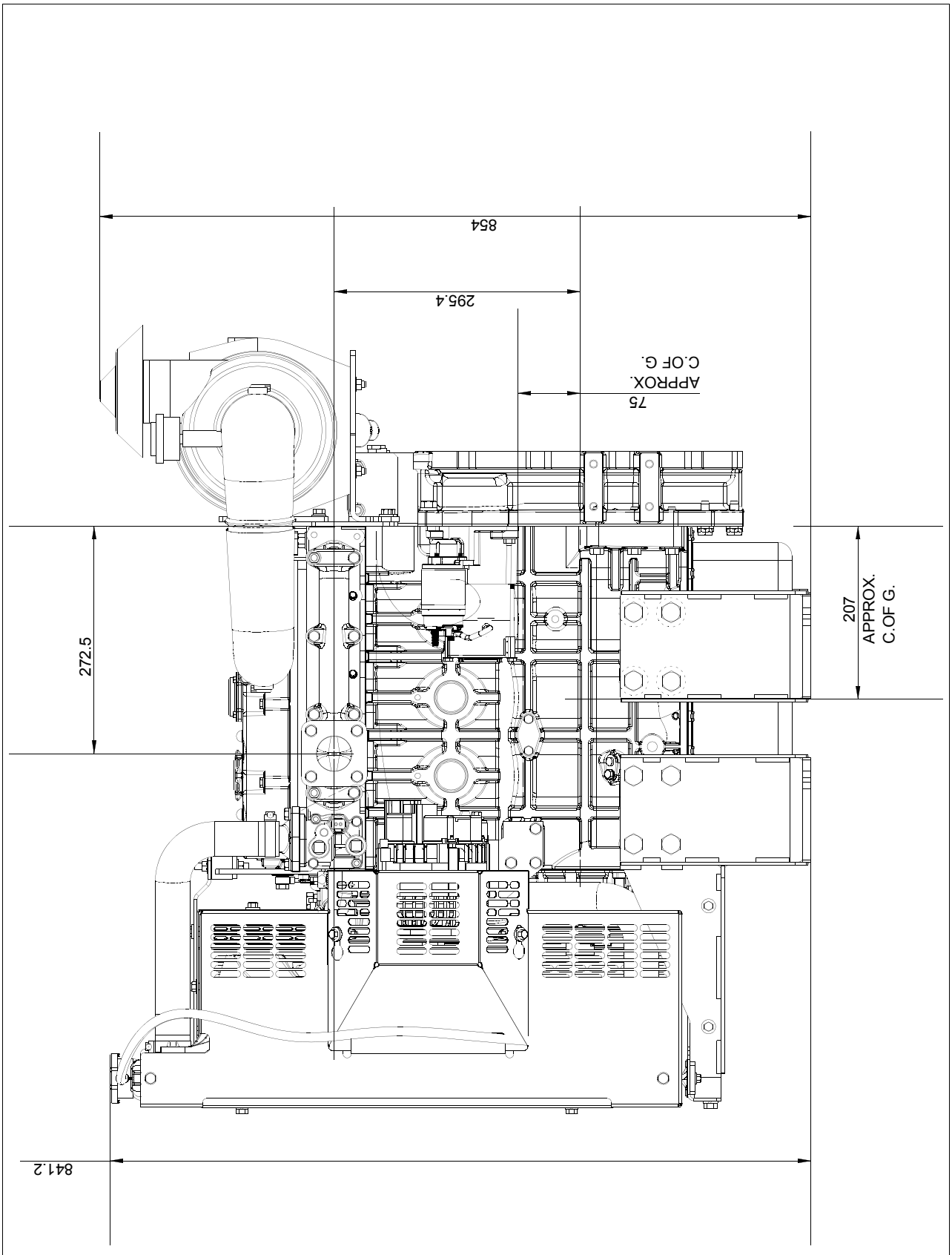
Average sound pressure level for bare engine (without inlet and exhaust) at 1 metre ... 82.9 dB(TBA A)

General installation

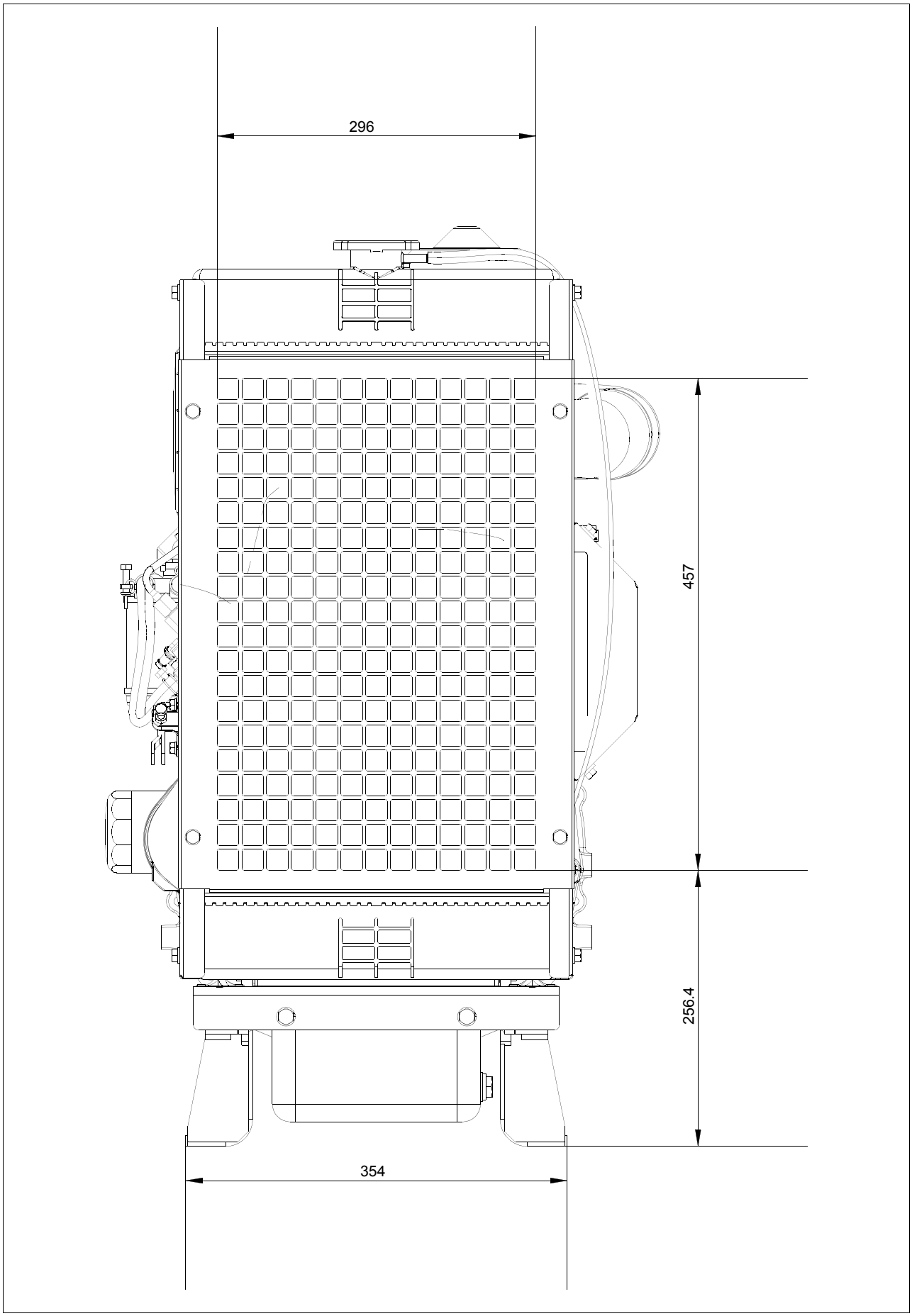
Designation	Units	Type of operation and application				
		Engine speed rev/min				
		2200	2400	2600	2800	3000
Gross engine power	kW	31.0	34.1	35.7	37.3	38.0
Brake mean effective pressure	kPa	763.3	769.6	743.8	721.6	686.1
Mean Piston speed	m/s	7.3	8.0	8.6	9.3	10.0
IOPU net engine power	kW	30.20	33.06	34.40	35.67	36.00
Engine coolant flow 35 kPa restriction	l/min	59.0	64.7	70.5	75.8	80.3
Combustion air flow	m³/min	2.15	2.34	2.54	2.73	2.93
Exhaust gas flow Max.	m³/min	6.17	7.00	7.71	8.27	8.85
Exhaust gas temperature Max.	°C	680	680	670	680	700
Cooling fan air flow (Pusher)	m³/min	52.7	56.5	61.4	67.8	72.4
Energy balance						
Energy in fuel (Fuel heat of combustion)	KW	90.5	107.8	111.9	113.3	115.5
Energy to power	KW	31.0	34.1	35.7	37.3	38.0
Energy to coolant and lubricating oil	KW	28.6	33.4	34.6	37.8	38.0
Energy to exhaust	KW	23.5	30.6	31.6	29.0	30.0
Energyto radiation	KW	7.4	9.7	10.0	9.2	9.5

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 fitted). If the power unit is to be enclosed totally, a cooling test should be done to check that the engine cooling is acceptable. If there is insufficient cooling, contact Perkins Technical Service Department.*

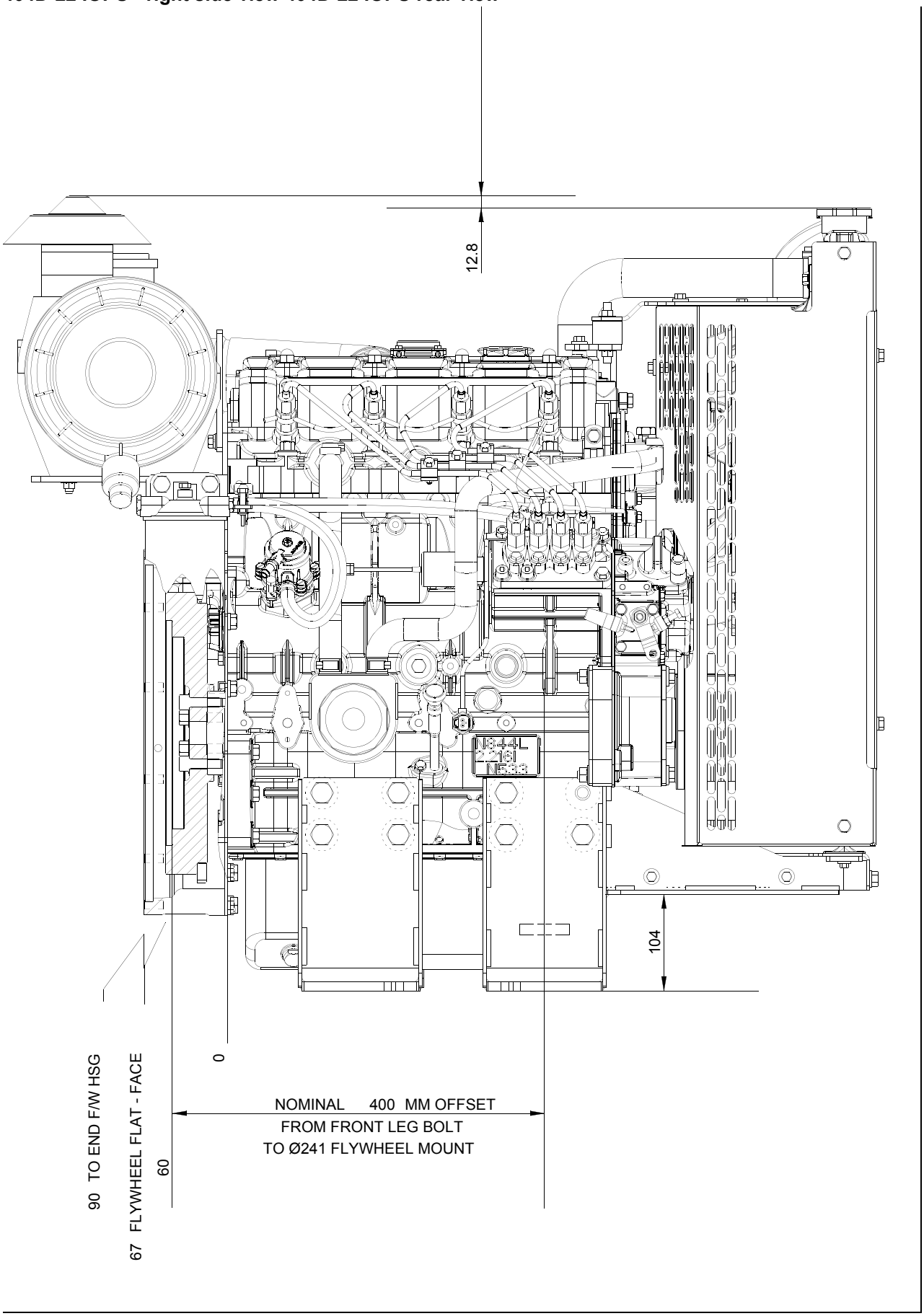
404D-22 IOPU - left side view

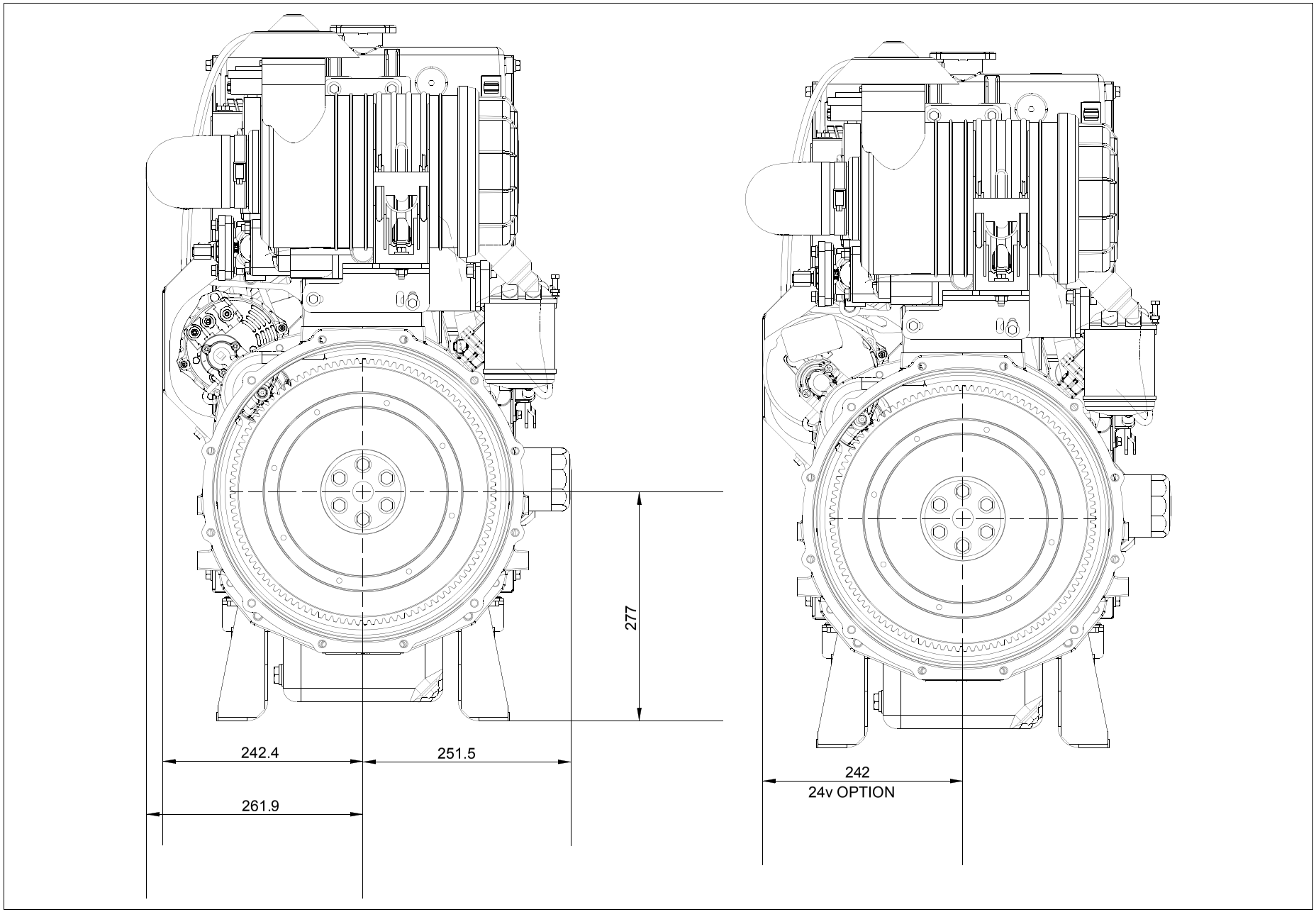


404D-22 IOPU front view

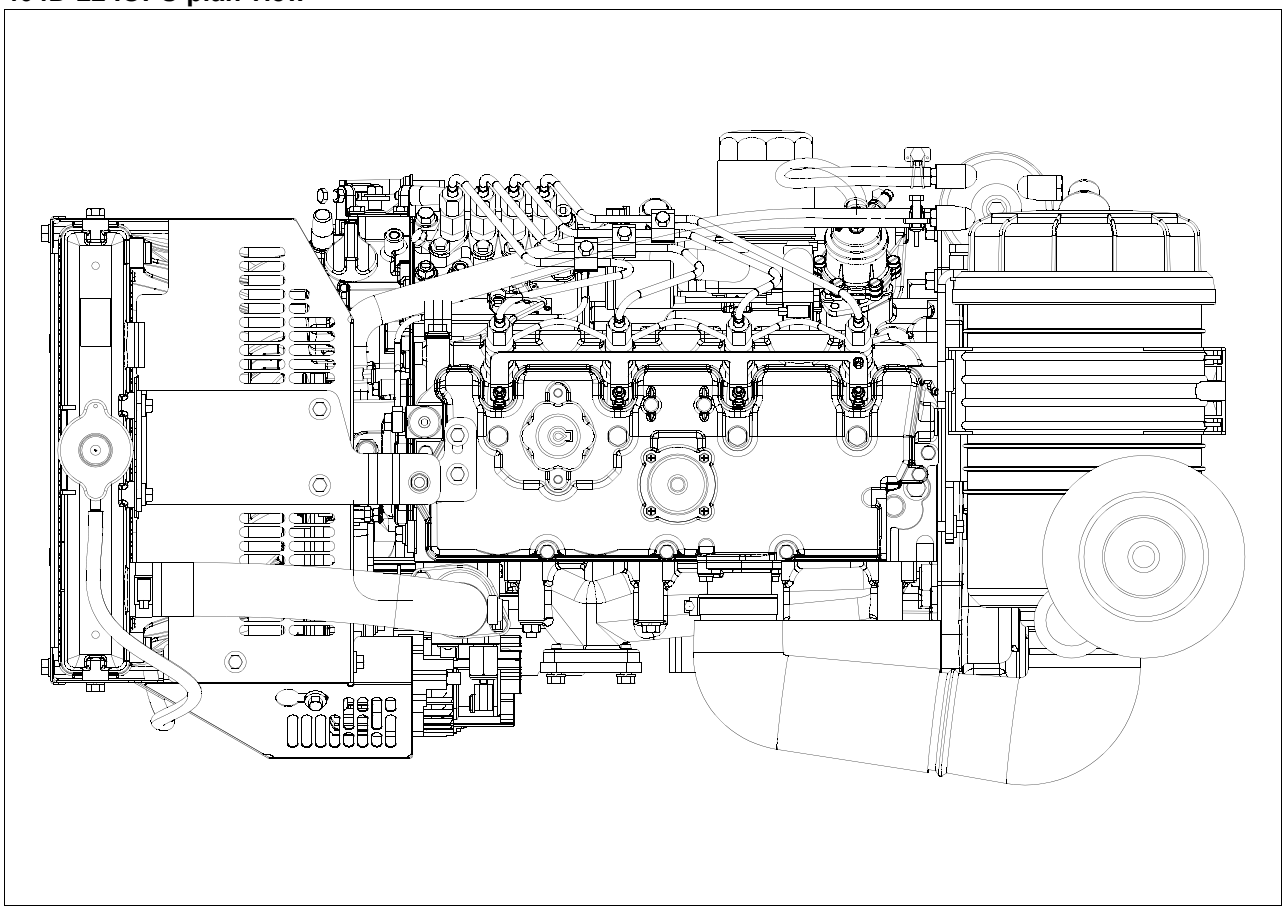


404D-22 IOPU - right side view 404D-22 IOPU rear view

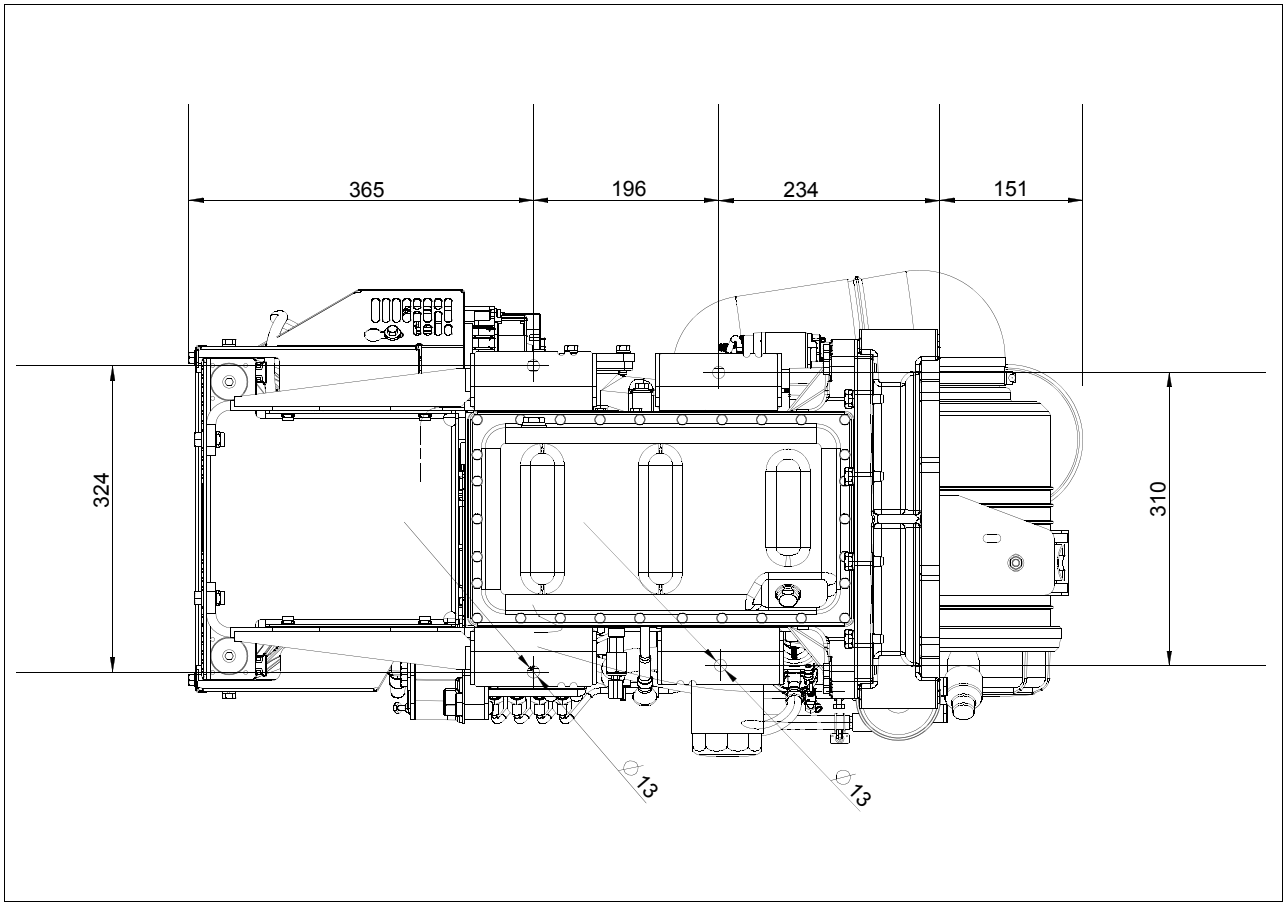



277
242.4
251.5
261.9
242
24v OPTION

404D-22 IOPU plan view



404D-22 IOPU underneath view



Cooling system

Radiator

-face area .. ..0.165 m² (1.78 ft)
-rows and materials. ... ... 2 rows Aluminium
-gills/inch and material ... ... 14.5 Aluminium fins per inch
-width of matrix ... ... 330.0 mm (13.0 in)
-height of matrix .. .. 500.0 mm (19.6 in)
-pressure cap setting. ... ... 95.0 kPa (13.8 lb/in²)

Fan

-diameter. ... ... 320 mm (12.6 in)
-drive ratio ... ... 1.25 :1
-number of blades 7
-material .. .. Plastic
-type ... ...Pusher

Coolant

Recommended coolant: 50% ethylene glycol with a corrosion inhibitor (BS 658 :1992 or MOD AL39) and 50% clean fresh water.
Total system capacity
-with radiator ... ... 6.98 l (12.3 pt)
-without radiator .. .. 3.6 l (6.34 pt)
Maximum top tank temperature .. .. 110°C (230 °F)
Thermostat operation range ... ... 82 - 95°C (179.6 - 203°F)

Electrical system

-alternator ... ... 12V standard (24V optional)
-starter motor .. .. 12V standard (24V optional)

Cold start recommendations

Minimum cranking speed ... ... 180 rpm

Battery type

Minimum starting temperature	Grade of engine lubricating oil	Battery specifications			
		BS3911 cold start amps	SAEJ537 cold cranking amps	Number of batteries required	Commercial reference
0°C	20W	540	740	1	647
- 15°C	10W	540	740	1	647
- 20°C	5W	600	780	1	655

Exhaust system

Maximum back pressure for total system . ... 10.2 kPa (1.47 /in²)
Inside diameter of outlet flange. ... ... 42.0 mm (1.65 in)

Fuel system

Type of injection ... ... Pintle nozzle
Fuel injection pump ... ...Cassette type
Nozzle opening pressure .. .. 14.7 MPa (2132 lb/in²)

Fuel lift pump

-flow/hour .. .. 63.0 l/hr (13.8 g/hr)
-pressure ... ... 10.0 kPa (lb/in²)
Maximum suction head. ... ... 0.8 m using 6 mm Ø bore pipe
Maximum pressure head .. .. 3m using 6 mm Ø bore pipe
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 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

Fuel consumption given 100% power rating @ rev/min					
rev/min	2200	2400	2600	2800	3000
sfc g/kWh	260	263	258	266	272
litres/ hour	9.7	10.8	11.1	11..9	12.4

Induction system

Maximum permissible air intake restriction

-clean filter ... ... 3.0 kPa
-dirty filter .. .. 6.4 kPa
-air filter type . ... Dry Element Type

Lubrication system

Lubricating oil capacity

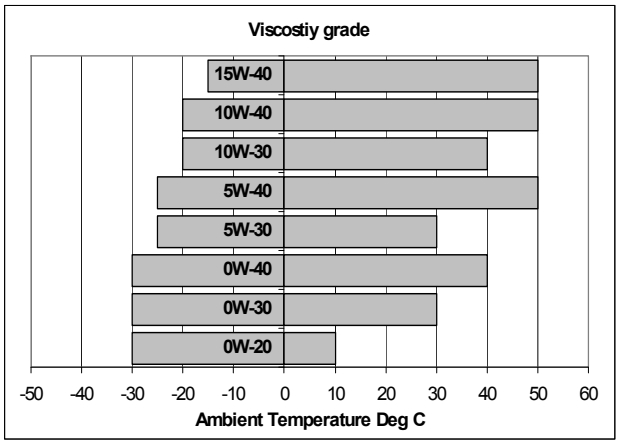
-total system... ... ... 10.6l (18.65 pt) unbalanced
-minimum .. .. 8.9 l (15.6 pt) unbalanced
Maximum engine operating angles ... ... 35° unbalanced

Lubricating oil pressure

-relief valve opens.. ... ... 304 - 500 kPa (44 - 73 lb/in²)
-at maximum no - load speed ... . 196 - 470 kPa (28 - 68 lb/in²)
Max continuous oil temperature. ... 125°C Max, 135°C intermittent

Recommended SAE viscosity

A single or multi grade lubricating oil which conforms to API CG4 / CH4 or ACEA E3 / E5 must be used, see illustration below:



Mountings

Maximum bending moment at
rear face of block . ... Nm (lbf ft)

Perkins®
Perkins Engines Company Limited
Peterborough PE1 5NA United Kingdom
Telephone +44 (0) 1733 583000
Fax +44 (0) 1733 582240
www.perkins.com

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

Distributed by

Publication No. TPD1765E1, 16 May 2011. © Perkins Engines Company Limited.