

400 Series 404D-22G ElectropaK

23.9 kWm @ 1800 rpm

The Perkins® 400 Series engine family continues to set new standards in the compact engine market. Developed alongside customers to fulfill their needs in the generator set, compressor, agricultural and general industrial markets.

These new ElectropaKs provide compact power, from a robust family of 3 and 4 cylinder diesel engines designed to provide economic and durable operation at prime and standby duties, hitting the key power nodes required by the power generation industry.



Emissions statement

Constant Speed Engines for use in Industrial, IOPU and ElectropaK applications: Certified against the requirements of EU Stage IIIA (Directives 97/68/EC, as last amended, for mobile applications).

Specification		
Number of cylinders	4 vertical in-line	
Bore and stroke	84 x 100 mm	3.3 x 3.9 in
Displacement	2.216 litres	135.2 in ³
Aspiration	Naturally aspirated	
Cycle	4 stroke	
Combustion system	Indirect injection	
Compression ratio	23.3:1	
Rotation	Anti-clockwise, viewed on flywheel	
Total lubricating capacity	10.6 litres	2.8 US gal
Cooling system	Water cooled	
Total coolant capacity	7.0 litres	1.8 US gal

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Final weight and dimensions will depend on completed specification.

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 **Perkins®**

THE HEART OF EVERY GREAT MACHINE

400 Series 404D-22G ElectropaK

23.9 kWm @ 1800 rpm

Features and benefits

Powered by your needs

- The 404D-22G ElectropaK is a powerful but quiet 2.2 litre naturally aspirated 4-cylinder compact package

Compact, clean, efficient power

- Design features on the 400D range of ElectropaKs ensures clean rapid starting in all conditions whilst delivering impressive performance with low operating costs in a small, efficient package size

Lower operating costs

- Approved for operation on biodiesel* concentrations of up to 20%
- Oil and filter changes are 500 hours, dependent on load factor
- Engine durability and reliability, the warranty offering and ease of installation combine to drive down the cost of ownership

Long-term power solution

- The 400D range of ElectropaKs has been designed to fully comply with stringent EU emissions regulations, providing an emissions compliant power solution for the future

Product support

- With highly trained Perkins distributors in thousands of communities in over 180 countries, you are never far away from expert product knowledge, genuine parts and a range of advanced diagnostic technology for keeping your engine in peak condition
- To find your local distributor: www.perkins.com/distributor

*Subject to conformance with ASTM D6751 and EN14214

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THE HEART OF EVERY GREAT MACHINE

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Technical information

Air inlet

- Mounted air filter

Fuel system

- Mechanically governed cassette type fuel injection pump
- Split element fuel filter

Lubrication system

- Wet steel sump with filler and dipstick
- Spin-on full-flow lub oil filter

Cooling system

- Thermostatically-controlled system with belt driven coolant pump and pusher fan
- Mounted radiator, piping and guards

Electrical equipment

- 12 volt starter motor and 12 volt 65 amp alternator with DC output
- Oil pressure and coolant temperature switches
- 12 volt shut-off solenoid energised to run
- Glow plug cold start aid and heater/starter switch

Flywheel and housing

- High inertia flywheel to SAE J620 Size 7½ Heavy
- Flywheel housing SAE 4 Long

Mountings

- Front and rear engine mounting bracket

Optional equipment

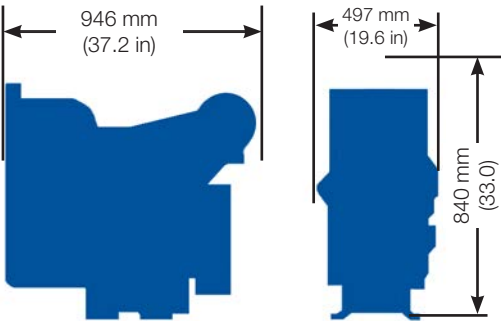
- Parts book

Option groups

A selection of optional items is available to enable you to prepare a specification precisely matched to your needs.

400 Series 404D-22G Electropak

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Engine package weights and dimensions		
Length	948 mm	37.3 in
Width	498 mm	19.6 in
Height	841 mm	33.1 in
Weight (dry)	242 kg	533 lb

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Speed rpm	Type of operation	Typical generator output (Net)		Engine power			
				Gross		Net	
		kVA	kWe	kWm	hp	kWm	hp
1800	Prime power	24.2	19.2	22.0	29.5	21.6	29.1
	Standby power	26.6	21.3	24.3	32.6	23.9	32.1

The above ratings represent the engine performance capabilities to conditions specified in ISO 8528/1, ISO 3046/1:1986, BS 5514/1. **Derating may be required for conditions outside these; consult Perkins Engines Company Limited.**

Generator powers are typical and are based on typical alternator efficiencies and a power factor (cos θ) of 0.8. **Fuel specification:** BS 2869: Part 2 1998 Class A2 or ASTM D975 D2.

Rating definitions: Prime power: Power available at variable load in lieu of a main power network. Overload of 10% is permitted for 1 hour in every 12 hours operation. Standby (maximum): Power available at variable load in the event of a main power network failure. No overload is permitted.

Percent of prime power	Fuel consumption at 1800 rpm g/kWh	Fuel consumption at 1800 rpm l/hr
Standby power	235	6.9
Prime power	233	6.2
75%	240	4.8
50%	262	3.5

Technical Data

400 Series

404D-22G

Electropak

Basic technical data

Number of cylinders	4
Cylinder arrangement	Vertical in-line
Cycle	four stroke
Induction system	Naturally aspirated
Compression ratio	23,3:1
Bore	84 mm
Stroke	100 mm
Cubic capacity	2.216 litres
Direction of rotation	anti-clockwise when viewed from flywheel
Firing order	1, 3, 4, 2
Estimated total weight of Electropak (dry)	242 kg

Overall dimensions of Electropak

-height	840 mm
-length	915 mm
-width	477 mm

Moments of inertia (GD²)

-engine rotational components	TBA kg m ²
-flywheel	2,55 kg m ²

Centre of gravity (fan face to flywheel housing)

-forward from rear of block	147 mm
-above crank centre line	79 mm
-offset to RHS of centre line	3 mm

Performance

Note: All data based on operation to ISO 3046-1:2002 standard reference conditions

Speed variation at constant load	± 0,5%
Cyclic irregularity	
-at 110% stand-by power	TBA

Test conditions

-air temperature	25°C
-barometric pressure	100 kPa
-relative humidity	31,5%
-air inlet restriction at maximum power (nominal)	3 kPa
-exhaust back pressure at maximum power (nominal)	10,2 kPa
-fuel temperature (inlet pump)	40°C

Sound level

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

79 dB(A)

-all ratings certified to within

± 5%

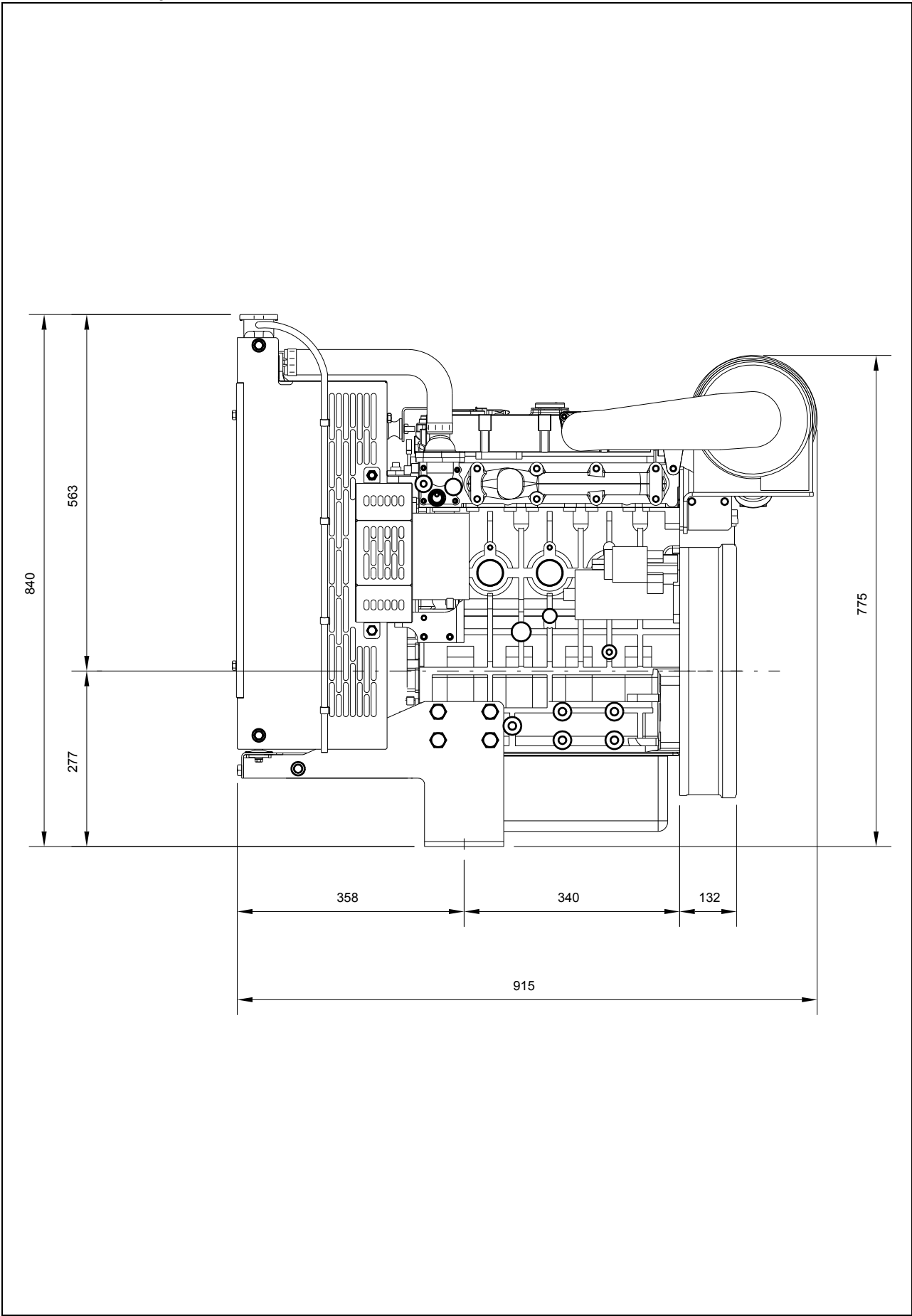
If the engine is to operate in ambient conditions other than those of the test conditions, suitable adjustments must be made for these changes. For full details, contact Perkins Technical Service Department.

Emissions Statement: Certified against the requirements of EU2007 (EU97/68/EC Stage II) and EPA Interim Tier 4 (EPA 40 CFR Part 1039 Interim Tier 4) legislation for non-road mobile machinery, powered by constant speed engines.

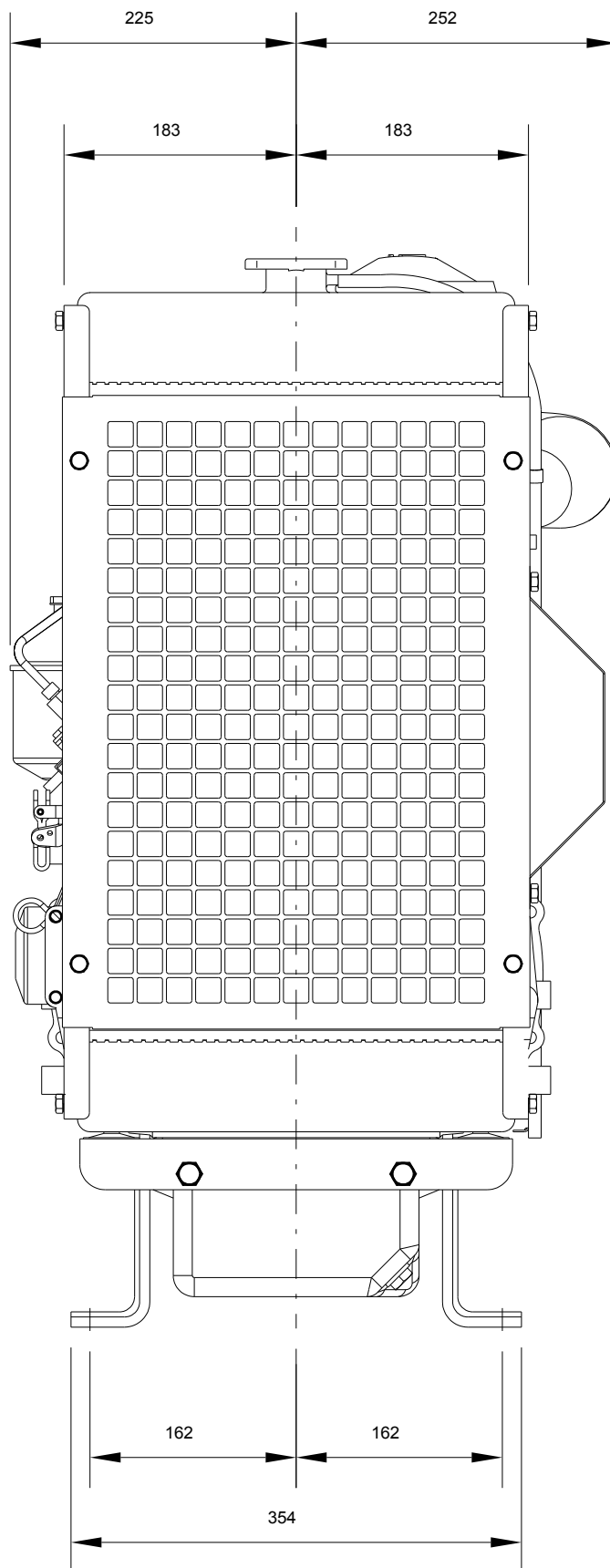
General installation - 404D-22G @ 1800 rev/min

Designation	Units	Type of operation and application	
		Prime	Stand-by
		60Hz	60Hz
Gross engine power	kWb	22	24,3
ElectropaK nett engine power	kWm	21,6	23,9
Brake mean effective pressure	kPa	657,9	731
Engine coolant flow (coolant pump ratio 1:25:1)	l/min	55,2	
Combustion air flow	m³/min	1,74	
Exhaust gas flow (max)	m³/min	4,34	4,76
Exhaust gas temperature (max)	°C	440	510
Overall thermal efficiency (nett)	%	35	35
Typical genset electrical output (0.8 pf 25°C)	kWe	19,2	21,3
	kVA	24,0	26,6
Assumed alternator efficiency	%	89	
Energy balance			
Energy in fuel	kWt	62,2	69,5
Energy to power output (gross)	kWb	22	24,3
Energy to cooling fan	kWm	0,4	0,4
Energy to power output (nett)	kWm	21,6	23,9
Energy to coolant and lubricating oil	kWt	19,9	22,2
Energy to exhaust	kWt	16,6	18,3
Energy to radiation	kWt	3,8	4,6

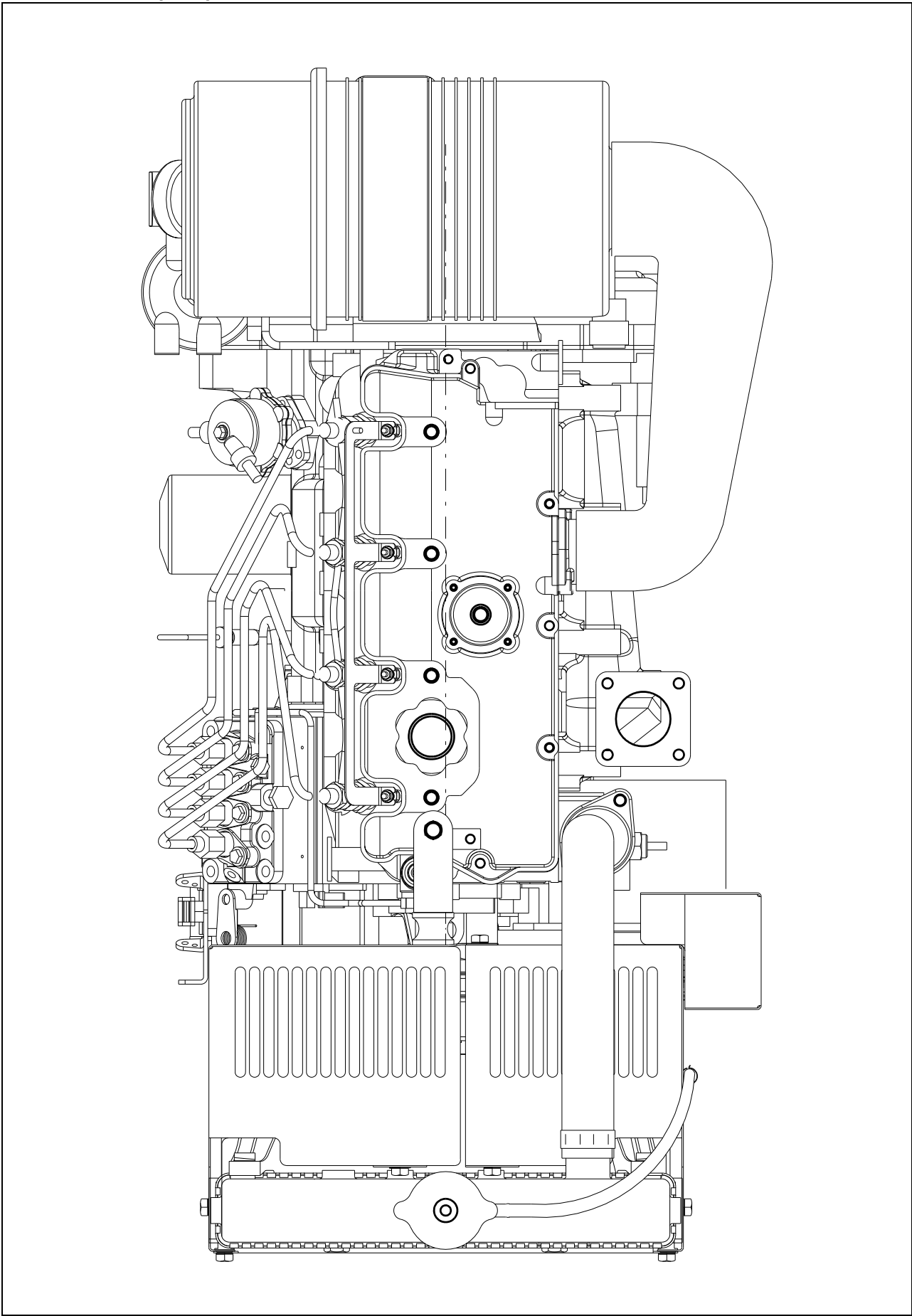
404D-22G ElectropaK, left side view



404D-22G ElectropaK, front view



404D-22G ElectropaK, plan view



Cooling system

Radiator

-face area .. 0,167 m²
-rows and materials .. 2 rows aluminium
-matrix density and material .. 14.5 fins per inch, aluminium
-width of matrix .. 334,2 mm
-height of matrix .. 500 mm
-pressure cap setting .. 90 kPa
Estimated cooling air flow reserve .. 0,125 kPa

Fan

-diameter .. 320 mm
-drive ratio .. 1,25:1
-number of blades .. 7
-material .. Plastic
-type .. Pusher

Coolant

Total system capacity
-with radiator .. 7,0 litre
-without radiator .. 3,6 litres
Maximum top tank temperature .. 112°C
Temperature rise across engine .. TBA °C
Max permissible external system resistance .. TBA kPa
Thermostat operation range .. 82 - 95°C
Recommended coolant: 50% anti freeze / 50% water. For complete details of recommended coolant specifications, refer to the Operation and Maintenance Manual for this engine model.

Duct allowance

Maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow		
Ambient clearance 50% Glycol	Duct allowance Pa	m ³ /sec
53°C	0	0,87
46°C	125	0,69

Electrical system

-alternator .. 65 amps, 12 V
-starter motor .. 2 kW, 12 V

Cold start recommendations

Minimum cranking speed .. TBA rev/min

Minimum starting temperature	Grade of engine lubricating oil	Battery specifications			
		BS3911 Cold start amps	SAEJ537 Cold cranking amps	Number of batteries needed	Commercial ref number
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 .. 10,2 kPa
Exhaust outlet size .. 42 mm

Fuel system

Type of injection .. Indirect injection
Fuel injection pump .. Cassette type
Fuel injector .. Pintle nozzle
Nozzle opening pressure .. 14,7 MPa

Fuel lift pump

-flow/hour .. 63 litres/hr
-pressure .. 10 kPa
Maximum suction head .. 0,8 m
Maximum static pressure head .. 3 m
Governor type .. Mechanical

Fuel specification

USA Fed Off Highway - EPA2D 89.330-96

Europe Off Highway - CEC RF-06-99

Note: For further information on fuel specifications and restrictions, refer to the OMM Fuels section for this engine model.

Fuel consumption

Power rating%			
g/kWh (l/h)			
110%	100%	75%	50%
235 (6.9)	233 (6.2)	240 (4.8)	262 (3.5)

Induction system

Maximum air intake restriction

- clean filter 3,0 kPa
- dirty filter 6,4 kPa
- air filter type Dry element type

Lubrication system

Lubricating oil capacity

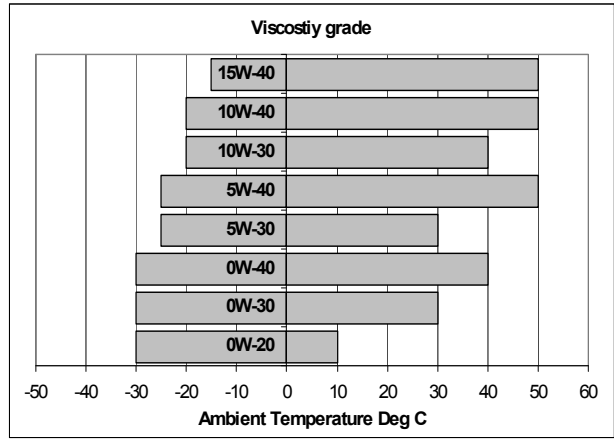
- Total system. 10,6 litres
- Minimum 8,9 litres
- Maximum engine operating angles
- front up, front down, right side or left side. 35° continuous

Lubricating oil pressure

- relief valve opens. 352 - 448 kPa
- at maximum no-load speed TBA
- Normal oil temperature 125°C
- oil consumption at full load (as a% of fuel consumption)

Recommended SAE viscosity

A single or multigrade oil must be used which conforms API-CH-4 or ACEA E5.



Maximum static bending moment

at rear face of block 1400 Nm

Load acceptance

The below complies with the requirements of classification 3 and 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5

Initial load application: When engine reaches rated speed (15 seconds maximum after engine starts to crank)		
Descriptor	Units	60 Hz
% of prime power	%	tba
Load	kWm (kWe)	tba
Transient frequency deviation	%	
Frequency recovery	Seconds	tba

The above figures were obtained under the following test conditions:

- minimum engine block temperature tba °C
- alternator efficiency 87%
- ambient temperature tba °C
- governing mode isochronous
- alternator inertia tba kgm²
- under frequency roll off (UFRO) point set to 1 Hz below rated
- UFRO rate set to 2% voltage / 1% frequency
- LAM on/off off

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

Note: The general arrangement drawings shown in this data sheet are for guidance only. For installation purposes, latest versions should be requested from the Applications Dept., Perkins Engines Stafford, ST16 3UB United Kingdom.



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