404D-22G

24.3 kWm @ 1800 rpm (Gross)

ElectropaK

**Basic technical data**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cylinders</td>
<td>4</td>
</tr>
<tr>
<td>Cylinder arrangement</td>
<td>Vertical inline</td>
</tr>
<tr>
<td>Cycle</td>
<td>4 stroke</td>
</tr>
<tr>
<td>Induction system</td>
<td>Naturally aspirated</td>
</tr>
<tr>
<td>Compression ratio</td>
<td>23.3:1</td>
</tr>
<tr>
<td>Bore</td>
<td>84 mm</td>
</tr>
<tr>
<td>Stroke</td>
<td>100 mm</td>
</tr>
<tr>
<td>Cubic capacity</td>
<td>2.216 litres</td>
</tr>
<tr>
<td>Direction of rotation when viewed from flywheel</td>
<td>Anticlockwise</td>
</tr>
<tr>
<td>Firing order</td>
<td>1, 3, 4, 2</td>
</tr>
</tbody>
</table>

**Weight of ElectropaK**

- Dry: 242 kg

**Overall dimensions of ElectropaK**

- Height: 841 mm
- Length (from rear of air cleaner to front face of radiator): 948 mm
- Width (including mounting brackets): 498 mm

**Moments of inertia (mk²)**

- Engine rotational component: TBA kgm²
- Flywheel: 2.55 kgm²

**Centre of gravity (engine only)**

- Forward from rear of block: 147 mm
- Above centre line of block: 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% standby power: TBA

**Test conditions**

- Air temperature: 25°C
- Barometric pressure: 100 kPa
- Relative humidity: 31.5%
- Air inlet restriction at maximum power (nominal): 3.0 kPa
- Exhaust back pressure at maximum power (nominal): 10.2 kPa
- Fuel temperature (inlet pump): 40°C
- All ratings certified to within: ± 5% CRH

**Sound level**

Average sound pressure level for bare engine (without inlet and exhaust) at 1 metre: 79.0 dB(A)

**Notes:**

- 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 nonroad mobile machinery, powered by constant speed engines.
General installation, 404D-22G ElectropaK @ 1800 rpm

<table>
<thead>
<tr>
<th>Designation</th>
<th>Units</th>
<th>Type of operation and application</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>60 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prime</td>
</tr>
<tr>
<td>Gross engine power</td>
<td>kWb</td>
<td>22.0</td>
</tr>
<tr>
<td>ElectropaK nett engine power</td>
<td>kWm</td>
<td>21.6</td>
</tr>
<tr>
<td>Brake mean effective pressure</td>
<td>kPa</td>
<td>657.9</td>
</tr>
<tr>
<td>Engine coolant flow (cooler pump ratio 1.33:1)</td>
<td>l/min</td>
<td>58.7</td>
</tr>
<tr>
<td>Combustion air flow</td>
<td>m³/min</td>
<td>1.74</td>
</tr>
<tr>
<td>Exhaust gas flow (maximum)</td>
<td>m³/min</td>
<td>4.34</td>
</tr>
<tr>
<td>Exhaust gas temperature outlet (maximum)</td>
<td>°C</td>
<td>440</td>
</tr>
<tr>
<td>Overall thermal efficiency (nett)</td>
<td>%</td>
<td>35</td>
</tr>
<tr>
<td>Typical genset electrical output (0.8 pf 25°C)</td>
<td>kWe</td>
<td>19.2</td>
</tr>
<tr>
<td></td>
<td>kVA</td>
<td>24.0</td>
</tr>
<tr>
<td>Assumed alternator efficiency</td>
<td>%</td>
<td>89</td>
</tr>
</tbody>
</table>

Energy balance

<table>
<thead>
<tr>
<th>Designation</th>
<th>Units</th>
<th>Type of operation and application</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>60 Hz</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Prime</td>
</tr>
<tr>
<td>Energy in fuel (heat of combustion)</td>
<td>kWt</td>
<td>62.2</td>
</tr>
<tr>
<td>Energy in power output (gross)</td>
<td>kWb</td>
<td>22.0</td>
</tr>
<tr>
<td>Energy to cooling fan</td>
<td>kWm</td>
<td>0.4</td>
</tr>
<tr>
<td>Energy in power output (nett)</td>
<td>kWb</td>
<td>21.6</td>
</tr>
<tr>
<td>Energy to coolant and lubricating oil</td>
<td>kWt</td>
<td>19.9</td>
</tr>
<tr>
<td>Energy to exhaust</td>
<td>kWt</td>
<td>16.6</td>
</tr>
<tr>
<td>Energy to radiation</td>
<td>kWt</td>
<td>3.8</td>
</tr>
</tbody>
</table>

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 with an airflow restriction of up to 80 Pa). 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.
Cooling system

**Radiator**
- Radiator face area: 0.167 m²
- Number of rows and materials: 2 rows, Aluminium
- Matrix density and material: 14.5 fins/inch, Aluminium
- Width of matrix: 334.2 mm
- Height of matrix: 500.0 mm
- Pressure cap setting: 90 kPa
- Estimated cooling airflow reserve: 0.125 kPa

**Fan**
- Diameter: 320 mm
- Drive ratio: 1.33:1
- Number of blades: 6
- Material: Plastic

**Coolant (total system capacity)**
- With radiator: 7.0 litres
- Without radiator: 3.6 litres
- Maximum top tank temperature: 112°C
- Temperature rise across engine: 7.5°C
- Maximum permissible external system resistance: 15 kPa

**Note:** 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.

**Maximum static bending moment**
At rear face of bloc: 1400 Nm

**Duct allowance**

<table>
<thead>
<tr>
<th>Ambient clearance</th>
<th>Duct allowance</th>
<th>m³/sec</th>
</tr>
</thead>
<tbody>
<tr>
<td>53°C</td>
<td>0</td>
<td>0.78</td>
</tr>
<tr>
<td>46°C</td>
<td>80</td>
<td>0.73</td>
</tr>
</tbody>
</table>

**Notes:**
- thermal capability needs to be considered as a function of canopy design
- all data assumes 3°C air temperature rise over ambient into radiator

**Electrical system**
- Alternator: 65 amps, 12 volts
- Starter motor: 2 kW, 12 volts

**Exhaust system**
- Maximum back pressure for total system: 10.2 kPa
- Inside diameter of outlet flange: 42 mm

**Induction system**
- Maximum air intake restriction
  - Clean filter: 3.0 kPa
  - Dirty filter: 6.4 kPa
  - Air filter type: Dry element type

**Cold start recommendations**

<table>
<thead>
<tr>
<th>Minimum starting temperature</th>
<th>Grade of engine lubricating oil</th>
<th>Battery specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Grade of engine lubricating oil</td>
<td>BS3911 Cold start amps</td>
</tr>
<tr>
<td>0°C</td>
<td>20 W</td>
<td>540</td>
</tr>
<tr>
<td>-15°C</td>
<td>10 W</td>
<td>540</td>
</tr>
<tr>
<td>-20°C</td>
<td>5 W</td>
<td>600</td>
</tr>
</tbody>
</table>

**Battery specifications**
- Grade of engine lubricating oil: 20 W, 10 W, 5 W
- BS3911 Cold start amps: 540
- SAEJ537 Cold starting amps: 740
- Number of batteries required: 1
- Commercial reference number: 647, 647, 655

**Notes:** Minimum cranking speed: TBA rev/min

**Battery specifications**
- Grade of engine lubricating oil: 20 W, 10 W, 5 W
- BS3911 Cold start amps: 540
- SAEJ537 Cold starting amps: 740
- Number of batteries required: 1
- Commercial reference number: 647, 647, 655

**Cold start recommendations**
- Minimum starting temperature: 0°C, -15°C, -20°C
- Grade of engine lubricating oil: 20 W, 10 W, 5 W
- Battery specifications
  - BS3911 Cold start amps: 540
  - SAEJ537 Cold starting amps: 740
  - Number of batteries required: 1
  - Commercial reference number: 647, 647, 655

**Notes:** Minimum cranking speed: TBA rev/min

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Fuel system
Type of injection .............................................................. Indirect
Fuel injection pump ...................................................... Cassette type
Fuel atomiser................................................................. Pinte nozzle
Nozzle opening pressure .................................................. 14.7 MPa

Fuel lift pump
Flow/hour ........................................................................... 63 litres/hour
Pressure ........................................................................... 10 kPa
Maximum suction head .................................................... 0.8 metre
Maximum static pressure head .......................................... 3.0 metre
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 section for this engine model.

Fuel consumption

<table>
<thead>
<tr>
<th>Power rating</th>
<th>1800 rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>g/kWh</td>
</tr>
<tr>
<td>110%</td>
<td>235</td>
</tr>
<tr>
<td>100%</td>
<td>233</td>
</tr>
<tr>
<td>75%</td>
<td>240</td>
</tr>
<tr>
<td>50%</td>
<td>262</td>
</tr>
</tbody>
</table>

Recommended SAE viscosity
A single or multigrade oil conforming to API-CH-4 or ACEA E5 must be used.

Lubrication system
Lubricating oil capacity
Maximum ................................................................. 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
Minimum oil pressure ..................................................... 120 kPa
At maximum no-load speed .................................................... TBA
Oil flow at rated speed ..................................................... 109 litres/min
Normal oil temperature ...................................................... 125°C

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

<table>
<thead>
<tr>
<th>Descriptor</th>
<th>Units</th>
<th>60 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>% of prime power</td>
<td>%</td>
<td>TBA</td>
</tr>
<tr>
<td>Load</td>
<td>kWm (kWe)</td>
<td>TBA</td>
</tr>
<tr>
<td>Transient frequency deviation</td>
<td>%</td>
<td>TBA</td>
</tr>
<tr>
<td>Frequency recovery</td>
<td>Seconds</td>
<td>TBA</td>
</tr>
</tbody>
</table>

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 .................................................................... sochronous
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

Notes:
- all tests were conducted using an engine which was installed and serviced to Perkins Engines Company Limited recommendations.
- 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.

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

Viscosity grade (Perkins)

Ambient Temperature Deg °C

-50 -40 -30 -20 -10 0 10 20 30 40 50 60

15W-40
10W-40
5W-40
5W-30
0W-40
0W-30
0W-20

5W-20
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404D-22G ElectropaK - Plan view