

4016-61TRG3X

2183 kW Gross @ 1500 rpm

Electropak

4000

Series

Basic technical data

Number of cylinders 16
Cylinder arrangement V
Cycle 4 stroke
Induction system Quad turbocharged, aftercooled
Compression ratio 12.8:1
Bore 160 mm
Stroke 190 mm
Displacement 61.12 litres
Direction of rotation (viewed from flywheel) Anticlockwise
Firing order (cylinder 1 furthest from flywheel)
..... 1A, 1B, 3A, 3B, 7A, 7B, 5A, 5B, 8A, 8B, 6A, 6B, 2A, 2B, 4A, 4B

Weight of Electropak

Temperate

Dry (estimated) 7733 kg
Wet (estimated) 8331 kg

Tropical

Dry (estimated) 8153 kg
Wet (estimated) 8811 kg

Overall dimensions of Electropak

Temperate

Height 3175 mm
Length 4542 mm
Width 2185 mm

Tropical

Height 3736 mm
Length 4562 mm
Width 2185 mm

Centre of gravity of Electropak

Forward from rear of block 1077 mm

Moments of inertia (mk²)

Engine rotational components (excluding flywheel) 10.89 kgm²
Flywheel and starter ring 9.55 kgm²

Operation

Steady state stability at constant load ISO 8528-5 Class 3
All ratings certified to within $\pm 1.5\%$
Cyclic irregularity for standby engine (110%) 1.204

Notes:

- Perkins maintains ISO9001:2000 certified quality management systems for engine test facilities to assure accurate calibration of test equipment
- all data based on operation to ISO 3046-1:2002 standard reference conditions
- for engines operating at increased ambient temperature and/or altitude conditions please refer to the relevant derate tables
- all data is subject to a tolerance of $\pm 5\%$ in addition to the stated power delivery tolerance
- unless otherwise stated all measurements and limits are quoted for Standby power conditions
- please refer to the relevant Operation and Maintenance Manual (OMM) for engine servicing details including coolant, fuel, oil and Diesel Exhaust Fluid (DEF) requirements where applicable
- for additional product information please contact Perkins Applications Engineering

Optional document version control

This document should be used as reference guide for installation purposes and where required can be submitted as part of business tender submissions. The table below may be used upon request to validate that this Technical Data Sheet is the latest version available.

Project name/tender name	Date	Perkins authorised sign

General installation

Designation		Units	Type of application
			50 Hz @ 1500 rpm
			Prime/DCP
Gross engine power output		kW	2183
Gross BMEP		kPa	2857
Mean piston speed		m/s	9.5
Nett mechanical power output	Temperate	kW	2083
	Tropical	kW	2083
Combustion air flow		m³/min	175
Exhaust gas temperature at manifold outlet		°C	560
Exhaust gas flow at conditions stated above		m³/min	525
Overall thermal efficiency (gross)		%	38.1
Typical generator set electrical output (0.8pf)		kWe	2000
		kVA	2500
Assumed alternator efficiency		%	96

Test conditions

Air temperature 25°C
 Barometric pressure 100 kPa

Relative humidity 30%
 Fuel temperature (inlet pump) 58°C (maximum)

Energy balance¹

Designation		Units	Type of application
			50 Hz @ 1500rpm
			Prime/DCP
Energy in fuel		kWt	5458
Energy in power output (gross)		kW	2183
Energy to cooling fan and battery charging alternator	Temperate	kWm	100
	Tropical	kWm	100
Energy to exhaust ²		kWt	1535
Energy to charge air coolant		kWt	750
Energy to coolant radiator		kWt	830
Energy to radiation (atmosphere) ³		kWt	160

Rating definitions

Prime power

Unlimited hours usage with an average load factor of 70 percent of the published Prime power over each 24-hour period.
 No overload is permitted.

Data Centre Power (DCP)⁴

Power available for variable or continuous electrical loads in a Data Centre application. Up to 100 percent load factor is permitted for unlimited time.
 No overload is permitted. DCP Power definition relies on ISO8528-1 2018 standard to be followed by generator set manufacturer, and will support Tier I to Tier IV classifications of Data Centres as per UPTIME institute guidelines.

Footnotes:

1. Data included in the energy balance table should not be used for combined heat and power (CHP) purposes.
2. Not to be utilised for heat recovery, does include energy input from combustion air.
3. Includes heat rejected to fuel via return to tank flow.
4. All Data Centre projects must be approved by Perkins, prior to tender submission. Project details must be submitted to Perkins sales representative to obtain approval.

Cooling system

ElectropaK coolant capacity (with radiator) -		
Temperate	275 litres	
Tropical	297 litres	
Engine coolant capacity (without radiator)		95 litres
Maximum top tank temperature		98°C
Maximum static pressure head on pump		70 kPa
Coolant temperature rise across engine		9°C
Thermostat operation range (closed to fully open)		71-85°C
Water temperature switch or alarm setting		103°C

Specifications	Units	50 Hz @ 1500 rpm
Engine coolant flow at maximum restriction	litres/min	1150
Engine coolant circuit - maximum allowed restriction	kPa	30
Secondary coolant flow	litres/min	720
Maximum permissible external restriction on secondary coolant pump	kPa	60
Compressor outlet temperature at standard 25°C test condition	°C	235
Compressor outlet pressure at standard 25°C test condition	kPa	310
Charge air cooler outlet temperature at standard 25°C test condition	°C	Refer to derate chart

Radiator

Temperate

Radiator face area	5.2 m ²
Core material	Copper/Brass
Number of rows	5
Fins per inch	11
Width of matrix	2100 mm
Height of matrix	2470 mm
Weight of radiator	2100 kg
Pressure cap setting	70 kPa

Tropical

Radiator face area	6.4 m ²
Core material	Copper/Brass
Number of rows	5
Fins per inch	13
Width of matrix	2100 mm
Height of matrix	3030 mm
Weight of radiator	2520 kg
Pressure cap setting	70 kPa

Fan type

Temperate

Fan type	Mechanical, fixed
Configuration	Pusher
Diameter (tip to tip)	1905 mm
Number of blades	13
Material	Metallic
Drive ratio	0.6:1

Tropical

Fan type	Mechanical, fixed
Configuration	Pusher
Diameter (tip to tip)	1905 mm
Number of blades	13
Material	Metallic
Drive ratio	0.6:1

Secondary cooling circuit

ElectropaK coolant capacity (with radiator) -		
Temperate	161 litres	
Tropical	205 litres	
Maximum pressure in secondary cooling unit		115 kPa
Maximum static pressure head on pump.. . . .		70 kPa
Maximum temperature rise across the charged cooling circuit ...		17°C
Radiator pressure cap setting		70 kPa
Radiator number of rows -		
Temperate	5	
Tropical	6	
Radiator fins per inch -		
Temperate	14	
Tropical	14	

Duct allowance

Temperate

		Units	50 Hz @ 1500 rpm
Duct allowance ⁵		Pa	250
Ambient clearance ⁶	Prime	°C	43
Resultant minimum airflow		m ³ /sec	2630

Tropical

		Units	50 Hz @ 1500 rpm
Duct allowance ⁵		Pa	125
Ambient clearance ⁶	Prime	°C	50
Resultant minimum airflow		m ³ /sec	3320

Footnotes:

5. Maximum additional cooling airflow restriction.
6. Ambient clearance allows for 5°C rise above ambient temperature at fan.

Fuel system

Fuel injection pump	Unit injection
Fuel injector type	Mechanical
Mechanical injector opening pressure	23.4 MPa
Filtration media size	10 µm
Fuel lift pump type	Mechanical
Maximum low-pressure system fuel flow rate	1710 litres/hr
Maximum low-pressure system pressure	300 kPa
Pressure measured at fuel inlet to engine	300 kPa
Maximum fuel temperature at fuel inlet	58°C
Governor type	Electronic
Fuel cooler included ⁷	Yes

Fuel specification

Recommended fuel conformity	BS2869 A2 or BSEN590
Maximum sulphur in fuel limit	0.5%

Fuel consumption⁸

Prime/DCP load condition %	2183 kW @ 1500 rpm Prime/DCP
	g/kWh
100	209
75	201
50	202

Load acceptance⁹

The engine speed governing complies with the requirements of classification 3 and 4 of ISO 8528-12 and to G2 and G3 operating limits stated under ISO 8528-5.

Lubricating system

Total system capacity

Maximum sump capacity (maximum dipstick mark)	213 litres
Minimum sump capacity (minimum dipstick mark)	157 litres
Maximum oil temperature (continuous operation)	105°C
Maximum oil temperature (intermittent operation)	110°C

Lubricating oil

Relief valve opening pressure	550 kPa
Minimum oil pressure	340 kPa
Oil pressure at maximum no load speed	400 kPa
Oil flow at rated speed	402 litres/min
Oil consumption (typical after 250 hours)	0.25% of fuel
Oil grade	API-CH-4

Maximum engine operating angles

Front up, front down	5°
Right side up, right side down	10°

Induction system

Maximum air intake restriction (clean filter)	1.24 kPa
Maximum air intake restriction (dirty filter)	3.71 kPa
Maximum temperature rise to air filter	5°C
Air filter type	Dry
Number of air filters	4

Footnotes:

7. Where fuel cooler is provided, component details can be found on GA drawing.
8. For conversion to litres/hr use the following formula with the correct fuel density:
- $$\frac{\text{SFC (kg/kWh)}}{\text{Fuel density (kg/litre)}} \times \text{Power (kW)} = \text{Fuel Consumption (litres/hr)}$$
9. Please contact Perkins Applications Engineering for any further information.

Exhaust system

Number of exhaust outlets2
Exhaust outlet diameter254mm
Exhaust outlet flange size and type..... 10 inch, Table D
Maximum back pressure at exhaust outlet.....4 kPa

Electrical system

Alternator output voltage..... 24 V
Alternator output current..... 55 amps
Starter motor input voltage..... 24 V
Starter motor power draw 16.4 kW
Number of teeth on flywheel 156
Number of teeth on starter pinion..... 12
Minimum average cranking speed 120 rpm
Engine stop method Electronic

Engine mounting

Maximum static bending moment at rear face of block..... 1356 Nm
Maximum static bending moment for exhaust outlet
(for muffler design)0 Nm
Maximum additional load applied to flywheel
due to all rotating components 850 kg

Cold start recommendations¹⁰

Minimum starting temperature	Engine oil grade	Minimum battery cold cranking amps with block heaters
°C		CCA
0	15W/40	720 amps
Maximum battery cold cranking amps (CCA)	15W/40	720 amps

Footnotes:

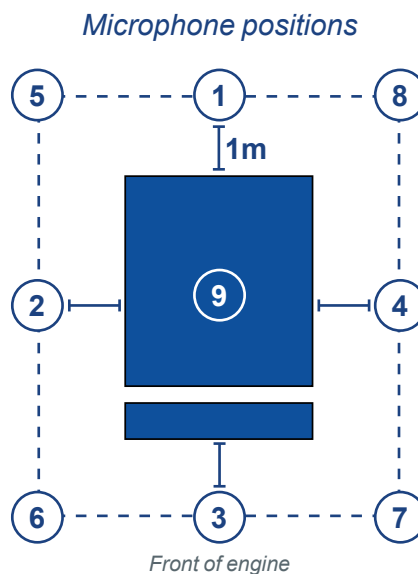
10. Cold cranking Amps as per SAEJ537.

Noise data of the ElectropaK, this excludes exhaust outlet noise except where specifically stated, measured in a semi-anechoic environment. Measurements taken in accordance with ISO 6798-1:2020.

Average sound pressure level ^{11,12} (L _{pA}) at 1m (dBA)
50 Hz @ 1500 rpm
111

Exhaust sound power level ¹³ (L _{WA}) (dBA)
50 Hz @ 1500 rpm
132

Position (reference diagram)	Sound pressure level (L_{pA}) at 1m (dBA)
	50 Hz @ 1500 rpm
1	not measured
2	111
3	107
4	111
5	111
6	111
7	112
8	111
9	not measured



11. Sound pressure reference level: 20 μPa .
12. Average 1m sound pressure level to sound Power conversion add 15.1 dB.
13. Sound power reference level: 1pW.

Spectral data

1/3 Octave sound data for the ElectropaK and exhaust outlet noise level at turbocharger outlet.

	1/3 Octave sound data (Hz)																										
	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8k	10k	12.5k	16k	20k
Exhaust noise L _{WA} dBA 50 Hz at 1500 rpm	88.0	89.1	92.7	104.0	109.8	108.8	108.6	111.8	116.6	117.9	119.2	121.3	119.0	120.3	120.4	121.5	121.7	122.3	121.4	120.1	119.2	119.3	118.2	117.6	116.5	112.0	103.4
ElectropaK noise L _{pA} at 1m dBA 50 Hz at 1500 rpm		77.8			94.9			101.4			104.8			106.0			107.2			104.0			101.9			91.4	

Sound spectra

