

*ENGINE DATASHEET*



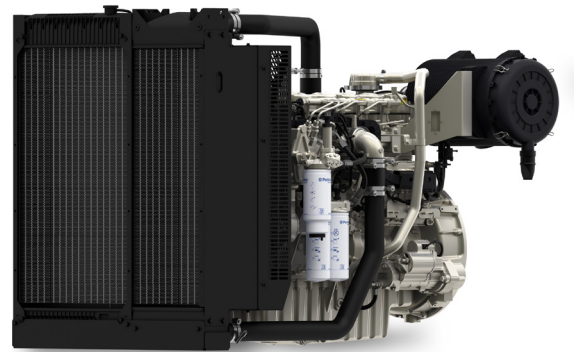
# 1706D-E93TAG Electric Power Engines

**Power range 1800 rpm** 294-354 kWm (engine gross power)

**Emissions** U.S. EPA Tier 3

The Perkins® 1700 Series is engineered to provide class leading performance and maximise competitive advantage for our customers.

Developed on a latest generation 9.3 litre core, the 1706 offers greater capability and more flexibility to our customers from a simple plug and play product.



## Features and benefits

- A high power density product that combines dependable power and high efficiency coupled with proven core engine designs assures **maximum durability, reliability** and quiet operation.
- Designed to provide more flexibility to our customers and offer a simple plug and play product allowing for **easier installation**.
- With fuel consumption optimized to both prime power and continuous running applications and the requirement for no additional fluids or additives result in **lower cost of ownership**.
- Throughout the life of a Perkins engine, we provide access to genuine OE specification parts along with vee belts and 500-hour oil change intervals enabling **low-cost maintenance**.
- Perkins offer a range of flexible solutions to help provide appropriate support, either to the OEM's network or directly to the machine customer. Our information systems enable our distributors to quickly diagnose engine faults and identify the right parts supported by the Perkins logistics operation ability to dispatch more than 45,000 different parts from stock, reaching the customer within 24 hours helping to **maximise the productive life** of your engine.
- Perkins takes pride in manufacturing all products globally to the same **high quality standard**. All of our products are manufactured in world class facilities to ensure highest quality for your peace of mind.

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 **Perkins**®

THE HEART OF EVERY GREAT MACHINE

# 1706D-E93TAG Electric Power Engines

**Power range 1800 rpm 294-354 kWm** (engine gross power)

**Emissions U.S. EPA Tier 3**

## Specification

	Model	
	1706D-E93TAG1	1706D-E93TAG2
Configuration	ElectropaK	
Cylinders	6 vertical in-line	
Displacement, litres (in <sup>3</sup> )	9.29 (567)	
Aspiration	Turbocharged aftercooled	
Bore and stroke, mm (in)	114 x 149 (4.5 x 5.9)	
Combustion system	Direct injection	
Compression ratio	16.5:1	
Exhaust aftertreatment	N/A	
Rotation (viewed from flywheel)	Anti-clockwise, viewed on flywheel	
Total lubricating oil capacity, litres (US gal)	26-30 (6.9-7.9)	
Cooling system	Liquid	
Total coolant capacity, litres (US gal)	35.8 (9.5)	

## Technical information

Model	Speed	Type of Operation	Engine Power		Typical Generator Output* (Net)		Prime Fuel Consumption				
			Gross	Net			110%	100%	75%	50%	25%
	rpm		kWm (hp)	kWm (hp)	kVA	kWe	g/kWh	g/kWh	g/kWh	g/kWh	g/kWh
1706D-E93TAG1	1800	Prime	267 (358)	254 (341)	292	234	213	215	224	246	259
		Standby	294 (394)	281 (377)	323	259					
1706D-E93TAG2	1800	Prime	322 (432)	309 (415)	356	284	215	217	218	235	253
		Standby	354 (475)	341 (458)	393	314					

\*Generator powers are typical and based on typical alternator efficiencies and a power factor (cos  $\theta$ ) or 0.8.

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**Emissions U.S. EPA Tier 3**

## Standard equipment

	Model	
	1706D-E93TAG1	1706D-E93TAG2
Electro unit or electropaK	ElectropaK	ElectropaK
Radiator fitted	✓	✓
Fuel filter, engine mounted	✓	✓
Water separator	✓	✓
Fuel priming pump (manual/electric)	Manual	Manual
Fuel cooler	N/A	N/A
Air filter, engine mounted	✓	✓
Engine ECM, engine mounted	✓	✓
Wiring harness to ECM	✓	✓
Wiring harness (all connectors to single customer interface)	✗	✗
Starter motor	✓	✓
Battery charging alternator	✓	✓
Flywheel housing	✓	✓
Flywheel	✓	✓
Fan	✓	✓
Fan guard	✓	✓
Temp and oil pressure for automatic stop/alarm configurable	✓	✓

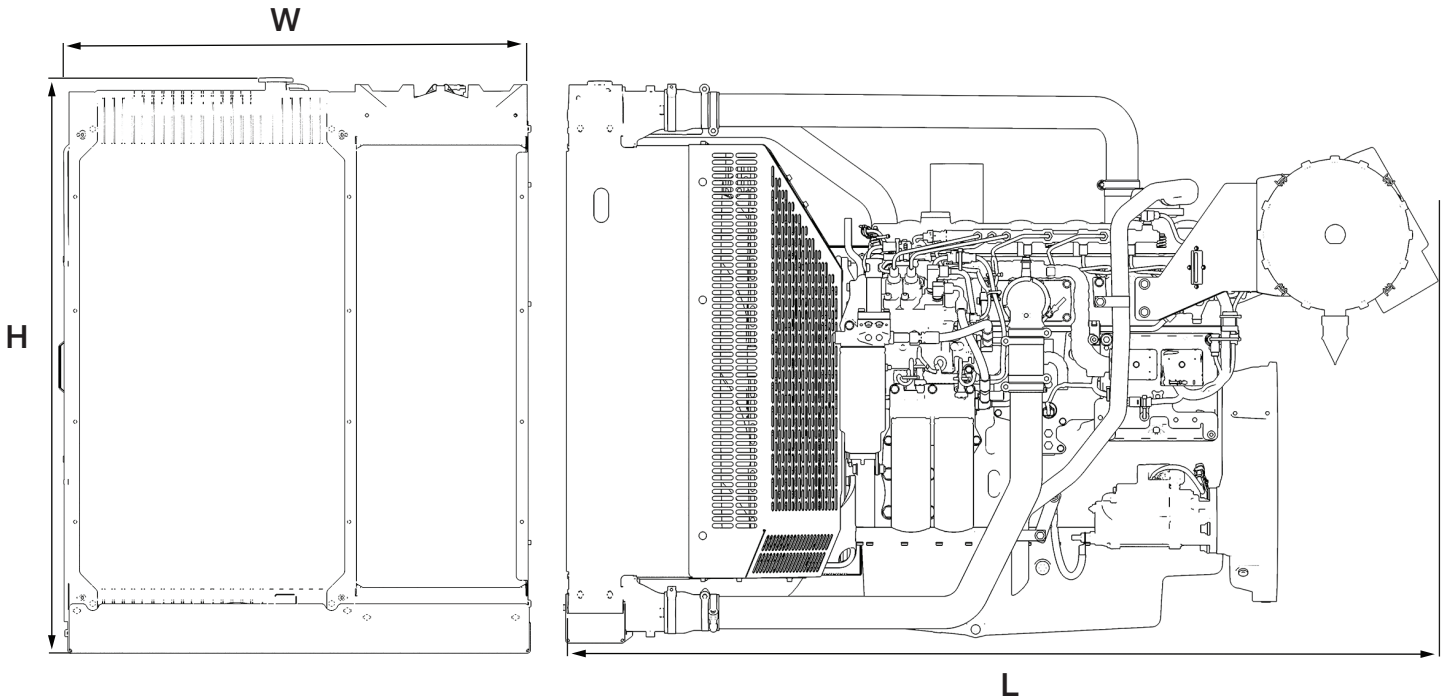
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# 1706D-E93TAG Electric Power Engines

**Power range 1800 rpm 294-354 kWm (engine gross power)**

**Emissions U.S. EPA Tier 3**

## Engine package weights and dimensions



	Model	
	1706D-E93TAG1	1706D-E93TAG2
Configuration	Electropak	
Dimensions, H x L x W, mm (in)	1311 x 2083 x 1091 (51.6 x 81.9 x 42.9)	
Dry weight, kg (lb)	1070 (2359)	

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 of operation.

Standby (maximum): Power available at variable load in the event of a main power network failure. No overload is permitted.

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# 1706D-E93TAG1

294.00 kWb (Gross) @ 1800 rpm

## U.S. EPA Tier 3 ElectropaK

# 1700

## Series

### Basic technical data

Number of cylinders .....	6
Cylinder arrangement .....	Inline
Cycle .....	4 stroke
Induction system.....	Turbocharged, aftercooled
Compression ration.....	16.5:1
Bore .....	115 mm
Stroke .....	149 mm
Displacement .....	9.29 litres
Direction of rotation (viewed from flywheel face) .....	Anticlockwise
Firing order.....	1, 5, 3, 6, 2, 4

### Weight of ElectropaK (estimate)

Dry .....	1070 kg
Wet .....	1126 kg

### Overall dimensions of ElectropaK

Height .....	1311 mm
Length.....	2082.6 mm
Width .....	1090.8 mm

### Centre of gravity

Forward from rear of block .....	550.7 mm
Above crankshaft centre line.....	290.3 mm

### Moments of inertia

Engine rotational components (excluding flywheel) .....	1.067 kgm <sup>2</sup>
Flywheel .....	1.664 kgm <sup>2</sup>
Total engine (flywheel & engine) .....	2.731 kgm <sup>2</sup>

### Cyclic irregularity for engine standby power

At 110% .....	0.271
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### Ratings

Steady state speed stability at constant load.....	± 0.25%
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### Electrical output

Electrical output frequency.....	60 Hz
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### Performance

Average sound pressure level for ElectropaK including raw exhaust noise at 1 metre .....	115.0 dB(A)
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### Notes

- all data based on operation to ISO 3046/1:2002 standard reference conditions.
- for engines operating in ambient conditions other than the standard reference conditions stated below, a suitable must be applied.
- Derate tables for increased ambient temperature and/or altitude are available, please contact Perkins Applications Department.

### Test conditions

Air temperature .....	25°C
Barometric pressure .....	101.325 kPa
Relative humidity .....	30%
Air inlet restriction at maximum power (nominal) .....	6.2 kPa
Exhaust back pressure at maximum power (nominal).....	10 kPa
Fuel temperature (inlet pump) .....	40°C
All ratings certified to within. ....	± 3%
Engine coolant restriction .....	45 kPa

**Note:** For engine servicing information, refer to the Engine Operation and Maintenance manual

## General installation

Designation	Units	60 Hz @ 1800 rpm		
		Baseload power	Prime power	Standby power
Gross engine power output	kWb		267.30	294.00
Gross BMEP	kPa	N/A	1919	2111
Mean piston speed	m/s	8.9		
ElectropaK nett engine power	kW	N/A	254.30	281.00
Engine coolant flow against 45 kPa restriction	l/min	330.0		
Intake air flow	m³/min		26.72	28.01
Exhaust gas flow (maximum) at atmospheric pressure	m³/min		58.60	62.80
Exhaust gas temperature (maximum)	°C		482.0	496.0
Overall thermal efficiency	%		0.4	0.4
Typical generator set electrical output (0.8 pf)	kWe	N/A	233.96	258.52
	kVA	N/A	292.45	323.15
Assumed alternator efficiency	%		92.0	92.0

## Rating definition

### Baseload power

Unlimited hours usage with an average load factor of 100% of the published baseload power. No overload is permitted on baseload power.

### Prime power

Unlimited hours usage with an average load factor of 70% of the published prime power over each 24 hour period. A 10% overload is available for 1 hour in every 12 hours operation.

### Standby power

Limited to 500 hours annual usage with an average load factor of 70% of the published standby power rating over each 24 hour period

**Note:** Not to be used for combined heat and power (CHP) purposes (indicative figures only). If necessary, consult Perkins Engines Company

## Energy balance

Designation	Units	60 Hz @ 1800 rpm		
		Baseload power	Prime power	Standby power
Power input from fuel	kWt		739.67	808.41
Gross engine power output	kWb	N/A	267.30	294.00
Cooling fan parasitic loss	kWm	13.00		
Nett power output	kWm	N/A	254.30	281.00
Energy flow through exhaust	kWt		252.27	280.71
Energy flow through coolant and oil	kWt		109.24	117.20
Radiative power loss	kWt		43.16	39.17
Energy to aftercooler	kWt		68.00	77.33

## Cooling system

### Total coolant capacity

ElectropaK (with radiator) .....	35.8 litres
ElectropaK (without radiator) .....	20.3 litres
Maximum top tank temperature .....	107°C
Maximum static pressure head on pump .....	170 kPa
Coolant temperature rise across engine .....	N/A°C
Maximum permissible external system resistance .....	35 kPa
Thermostat operation range (closed to fully open) .....	87-98°C

### Recommended coolant

Perkins Extended Life Coolant, 50% antifreeze/50% water.

For details of recommended coolant specifications, please refer to the Operation and Maintenance Manual (OMM) for this engine model.

### Radiator

Radiator face area .....	0.62 m <sup>2</sup>
Core material .....	Aluminium
Number of rows .....	4
Fins per inch .....	10
Width of matrix .....	1071 mm
Height of matrix .....	1318 mm
Pressure cap setting .....	110 kPa

### Fan

Fan type .....	Mechanical, fixed
Configuration .....	Pusher
Diameter (tip to tip) .....	813 mm
Number of blades .....	9
Material .....	Plastic
Drive ratio .....	1:1

### Duct allowance

Description	Units	Engine speed rpm
		60 Hz @ 1800 rpm
Ambient clearance	°C	72
Duct allowance <sup>(1)</sup>	Pa	125
Cooling fan airflow	m <sup>3</sup> /min	482

1. maximum additional cooling airflow restriction

## Cold start recommendations

Minimum starting temperature	Engine oil grade	Battery specifications with glowplugs		Battery specifications without glowplugs	
		Cold start Amps (A)	Cold cranking Amps (A)	Cold start Amps (A)	Cold cranking Amps (A)
10°C	15W-40 API CH-4	N/A	N/A	N/A	1000
0°C	15W-40 API CH-4	N/A	N/A	N/A	1000
-5°C	15W-40 API CH-4	N/A	N/A	N/A	1000
-10°C	15W-40 API CH-4	N/A	N/A	N/A	1000
-15°C	0W-30 API CH-4	N/A	N/A	N/A	1125
-20°C	0W-30 API CH-4	N/A	N/A	N/A	1125
-25°C	0W-30 API CH-4	N/A	N/A	N/A	1125

**Note:** Cold start amps as per BS3911 and cold cranking amps as per SAEJ537.

## Fuel system

### System specification

Type of injection .....	Electronic
Fuel injection pump .....	Common rail
Fuel injector .....	Electronic
Nozzle opening pressure .....	20.2 MPa
Filtration media size .....	4 µm
Fuel lift pump type .....	N/A
Fuel flowrate .....	480 l/h
Pressure .....	800 kPa
Maximum suction head .....	1 – 2 m
Maximum static pressure head .....	1.5 – 2.5 m
Maximum fuel temperature at lift pump inlet .....	80°C
Governor type .....	Electronic
Speed control conformity .....	ISO 8528-5 Class G3

### Fuel specification

BS 2869 1998 CLASS A2 or BSEN590.

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

### Fuel consumption data

	60 Hz @ 1800 rpm
Prime power	267.30
<b>Load condition</b>	<b>g/kWh</b>
Standby (110% Prime)	213
Prime	215
75% Prime	224
50% Prime	246
25% Prime	259

**Note:** For conversion to l/h use the following formula with the correct fuel density: (SFC [kg/kWh] ÷ Fuel density [kg/l]) × Power [kW] = SFC [l/h]



## Lubrication system

### Total system capacity

(Maximum sump capacity (maximum dipstick mark))	30 litres
Minimum sump capacity (minimum dipstick mark)	26 litres
Maximum oil temperature (continuous operation)	110°C
Maximum oil temperature (intermittent operation)	115°C

### Lubricating oil

Relief valve opening pressure	662 kPa
Minimum oil pressure	38 kPa
Oil pressure at maximum no-load speed	350 kPa
Oil flow at rated speed	130 l/min

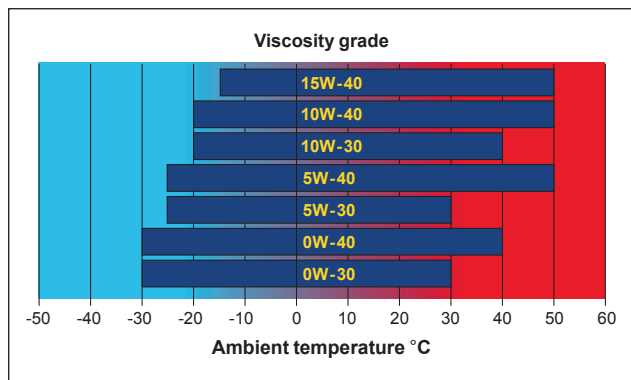
### Maximum engine operating angles

Front up, front down	35°
Right side up, right side down	20°

**Note:** A single or multigrade oil conforming to API-CH-4 or ACEA E5 must be used.

## Recommended SAE viscosity

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



## Induction system

### Maximum air intake restriction

Clean filter	3.7 kPa
Dirty filter	6.2 kPa
Air filter type	Dry
Number of air filters	1

## Exhaust system

Number of exhaust outlets	1
Exhaust outlet diameter	127 mm
Minimum back pressure	2 kPa
Maximum back pressure	10 kPa

## Electrical system

Alternator output voltage	24 volts
Alternator output current	45 amps
Starter motor input voltage	24 volts
Starter motor power draw	8 kW
Number of teeth on flywheel	113
Number of teeth on starter pinion	11
Engine stop method	Electronic

## Engine mounting

Maximum static bending moment at rear face of block	1920 Nm
Maximum static bending moment for exhaust outlet (for muffler design)	0.4 Nm

## Noise data

### Noise level

The figures for total noise levels are typical for an ElectropaK running at prime power rating in a semi-reverberant environment and measured at a distance of one metre

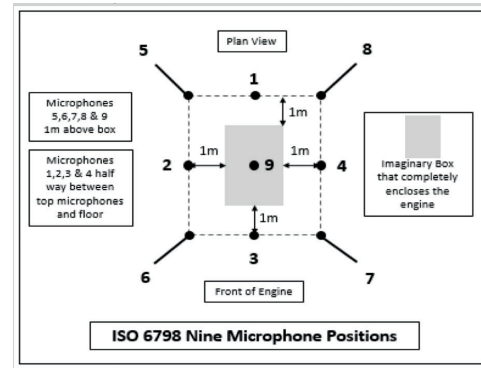
### Total noise levels

Total noise levels	60 Hz @ 1800 rpm db(A)
Ambient noise level	38.9

Noise level measurement (9 mic)	
Position (reference diagram)	60 Hz @1800 rpm
	SWL, dB(A)
1	93.1
2	97.6
3	102.6
4	98.9
5	92.4
6	95.7
7	95.5
8	93.7
9	99.5
Average	97.8

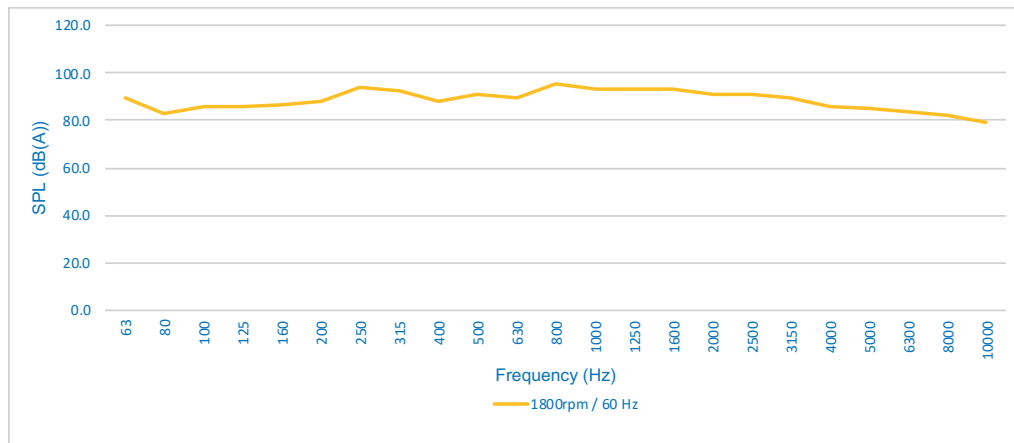
### Noise data

Average sound pressure level for engine	60 Hz @ 1800 rpm db(A)
Without inlet and exhaust (Pusher fan)	97.8
With inlet and exhaust (Pusher fan)	115.0



### Octave analysis

The following figure shows a third octave band analysis at the position of the maximum noise level:



### 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.
- Sound pressure reference level: 20  $\mu$ Pa.
- One third octave analysis performed at the position where the highest noise levels were measured.