

*ENGINE DATASHEET*



# 1100 Series 1104D-E44TAG1 Diesel Engine – ElectropaK

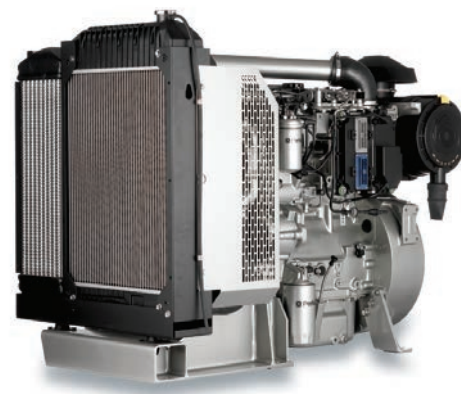
82 kWm (110 hp) net prime power @ 1800 rpm

90.8 kWm (122 hp) net standby power @ 1800 rpm

The Perkins® 1104D-E44TAG ElectropaKs are the latest addition to the 1100 Series Electric Power line-up. Offering improved power density from a compact package, these ElectropaKs build on Perkins reputation within the power generation industry.

These ultra clean engines are assembled on a new high technology production line. Frequent computerised checks during the production process ensure high build quality is maintained throughout.

Hitting the key power nodes required by the market, the 1104D ElectropaK product line-up consists of three models offering a power solution for both Prime and Standby applications, in 60 Hz territories.



## Emissions

Certified against the requirements of U.S. EPA Tier 3 legislation for non-road mobile machinery, powered by constant speed engines (EPA 40 CFR Part 89 Tier 3).

Specification		
Number of cylinders	4 in-line	
Bore and stroke	105 x 127 mm	4.1 x 5.0 in
Displacement	4.41 litres	269 in <sup>3</sup>
Aspiration	Turbocharged air-to-air chargecooled	
Cycle	4 stroke	
Combustion system	Direct injection	
Compression ratio	16.2:1	
Rotation	Anti-clockwise, viewed on flywheel	
Total lubricating capacity	8 litres	2.1 US gal
Cooling system	Water-cooled	
Total coolant capacity	17 litres	4.5 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

# 1100 Series 1104D-E44TAG1 Diesel Engine – ElectropaK

82 kWm (110 hp) net prime power @ 1800 rpm

90.8 kWm (122 hp) net standby power @ 1800 rpm

## Features and benefits

### Power to meet your needs

- Hitting the key power nodes required by the market, the 1104D-E44TAG1 ElectropaK has been developed to provide a clean and cost effective power solution

### State of the art design

- The 1104D utilises the latest common-rail fuel system technologies with a closely optimised air-management system, which is overseen by the latest generation of electronic engine control. This allows the 1104D range to deliver high power density and excellent fuel economy with low exhaust emissions and minimum heat rejection

### Worldwide power solution

- The 1104D has been designed to be worldwide fuel tolerant, and 5% biofuel (RME) options are available to meet local market needs

### Lower operating costs

- The 1104D maintains Tier 2 fuel economy, allowing customers to keep existing fuel tanks
- Service intervals are 500 hours standard
- **Warranties and Service Contracts**

We provide one-year warranties for constant speed engines and two-year warranties for variable speed models, as standard. These are supported by multilevel Extended Service Contracts that can be bought additionally

Discover more: [www.perkins.esc](http://www.perkins.esc)

- Low usage warranty package is also available

### Product support

- Perkins actively pursues product support excellence by ensuring our distribution network invest in their territory – strengthening relationships and providing more value to you, our customer
- Through an experienced global network of distributors and dealers, fully trained engine experts deliver total service support around the clock, 365 days a year. They have a comprehensive suite of web based tools at their fingertips covering technical information, parts identification and ordering systems, all dedicated to maximising the productivity of your engine
- Throughout the entire life of a Perkins engine, we provide access to genuine OE specification parts and service. We give 100% reassurance that you receive the very best in terms of quality for lowest possible cost .. wherever your Perkins powered machine is operating in the world
- To find your local distributor: [www.perkins.com/distributor](http://www.perkins.com/distributor)

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82 kWm (110 hp) net prime power @ 1800 rpm

90.8 kWm (122 hp) net standby power @ 1800 rpm

## Technical information

### Air inlet

- Mounted air filter and turbocharger

### Cooling system

- 22 inch belt-driven pusher fan and guards
- Radiator (incorporating air-to-air charge cooler)
- Water pump

### Electric system

- 12 volt starter motor
- 12 volt, 65 amp alternator with DC output

### Flywheel and housing

- High inertia flywheel to SAE J620 Size 10/11
- SAE3 flywheel housing

### Fuel system

- Electronic governing (conforms to Class G3 ISO 8528-5)
- Fuel filter

### Literature

- Users Handbook

### Lubrication system

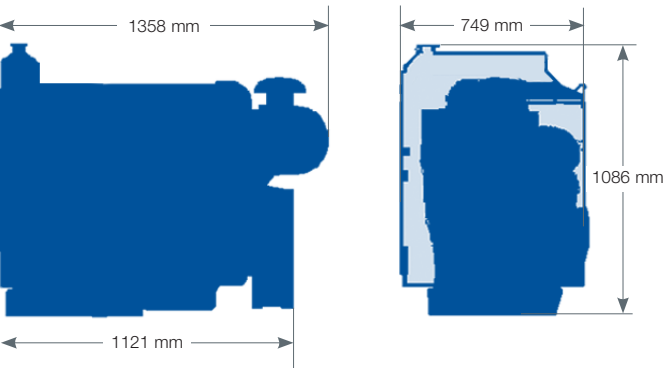
- Wet cast iron sump with filler and dipstick
- Oil filter

### Start aids

- Glow plugs

# 1100 Series 1104D-E44TAG1 Diesel Engine – ElectropaK

82 kWm (110 hp) net prime power @ 1800 rpm  
90.8 kWm (122 hp) net standby power @ 1800 rpm



Engine package weights and dimensions		
Length	1358 mm	53.4 in
Width	749 mm	29.5 in
Height	1086 mm	42.7 in
Weight (dry)	465 kg	1025 lb

# 1100 Series 1104D-E44TAG1 Diesel Engine – ElectropaK

82 kWm (110 hp) net prime power @ 1800 rpm

90.8 kWm (122 hp) net standby power @ 1800 rpm

Speed rpm	Type of operation	Typical generator output (Net)		Engine power			
				Gross		Net	
		kVA	kWe	kWm	hp	kWm	hp
1800	Prime power	92.0	73.8	88.0	118.0	82.0	110
	Standby (maximum)	102	81.7	96.8	129.8	90.8	122

The above ratings represent the engine performance capabilities to conditions specified in ISO 8528/5. **Derating may be required for conditions outside the test conditions; consult Perkins Engines Company Limited.**

Generator powers are typical and are based on typical alternator efficiencies and a power factor. **Fuel specification:** Consult Perkins Engines Company Limited (various fuel specifications are available). **Lubricating oil:** multi-grade oil conforming to API-CH4/CI4 must be used.

## 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
110%	220.8	25.5
100%	224.2	23.7
75%	237.7	18.7
50%	257.8	13.5

# Technical Data

## 1100 Series

1104D-E44TAG1

90,8 kWm @ 1800 rev/min

### Diesel Engine Electropak

#### Basic technical data

Number of cylinders ... 4  
 Cylinder arrangement ... vertical in-line  
 Cycle ... four stroke  
 Induction system ... turbocharged, air to air charge cooled  
 Compression ratio ... 16,2 : 1  
 Bore ... 105 mm  
 Stroke ... 127 mm  
 Cubic capacity ... 4,4 litres  
 Direction of rotation ... anti-clockwise when viewed from flywheel  
 Firing order ... 1, 3, 4, 2  
 Estimated total weight (fan to flywheel)  
 -dry ... 465 kg  
 -wet ... 474 kg

#### Overall dimensions (Electropak)

-height ... 1086 mm  
 -length ... 1358 mm  
 -width (includes mounting brackets) ... 749 mm

#### Moments of inertia (mk<sup>2</sup>)

-engine rotational components ... 0,124 kgm<sup>2</sup>  
 -flywheel ... 1,31 kgm<sup>2</sup>

#### Centre of gravity (fan to flywheel)

-forward from rear of block ... 237,0 mm  
 -above centre line of block ... 167,0 mm  
 -offset to RHS of centre line ... -1,5 mm

#### Performance

**Note:** All data based on operation to ISO/TR14396, BS5514, ISO3046/1 and DIN 6271 standard reference conditions.

-all ratings certified to within ...  $\pm 3\%$   
 Cyclic irregularity at rated power with 1,31 kgm<sup>2</sup> flywheel ... TBA

#### Test conditions

-air temperature ... 25 °C  
 -barometric pressure ... 100 kPa  
 -relative humidity ... 30%  
 -air inlet restriction at rated speed ... 5 kPa  
 -exhaust back pressure at rated speed (nominal) ... 15 kPa

#### Sound level

Estimated Electropak sound power level @ 1 metre  
 without inlet and exhaust ... 105,5 dB(A)  
 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.

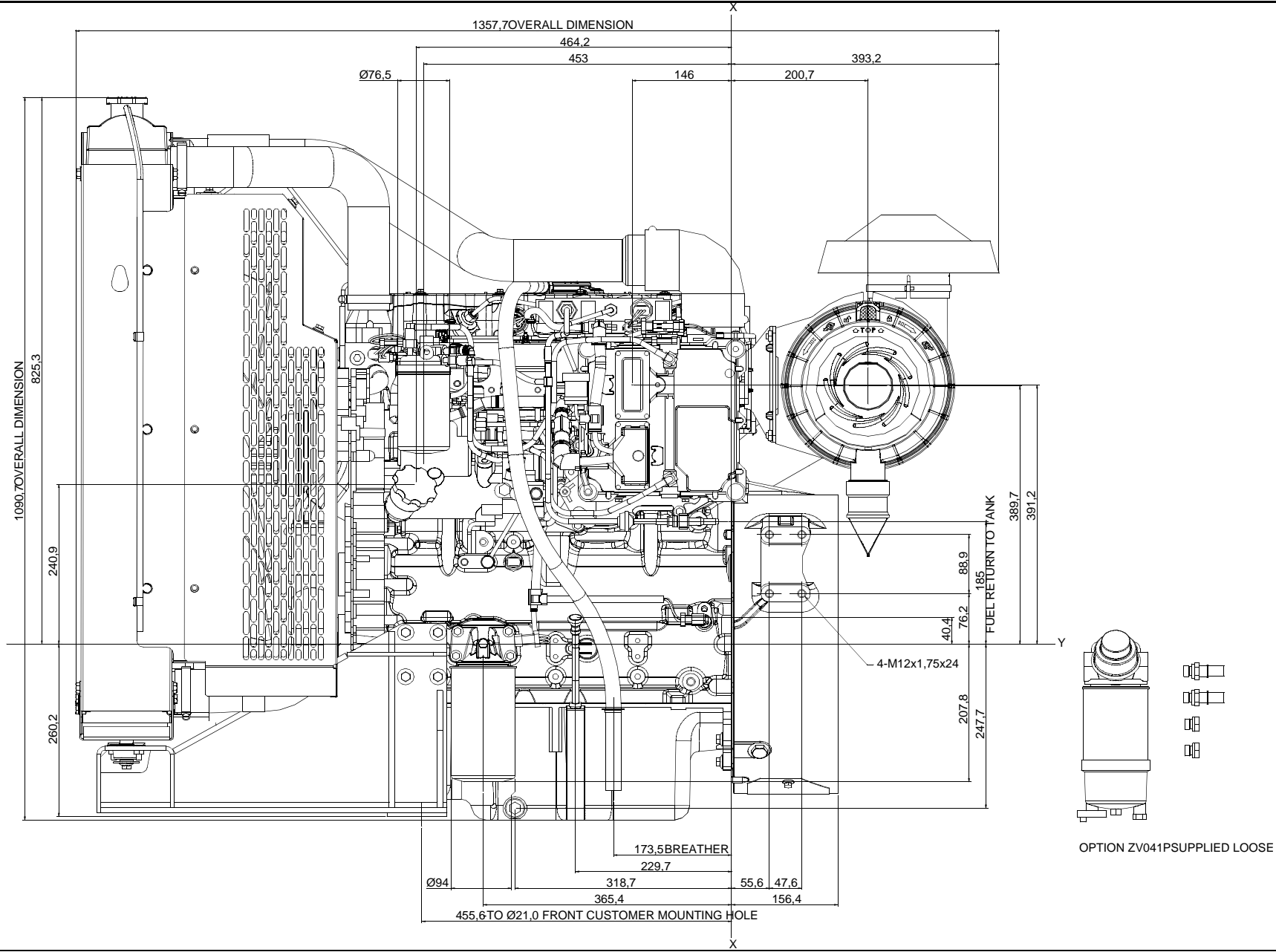
For details of load acceptance values, refer to page 8 of this publication.

**Emissions capability:** Certified against the requirements of Tier 3 legislation for non-road mobile machinery, powered by constant speed engines (EPA 40 CFR Part 89 Tier 3).

#### General installation

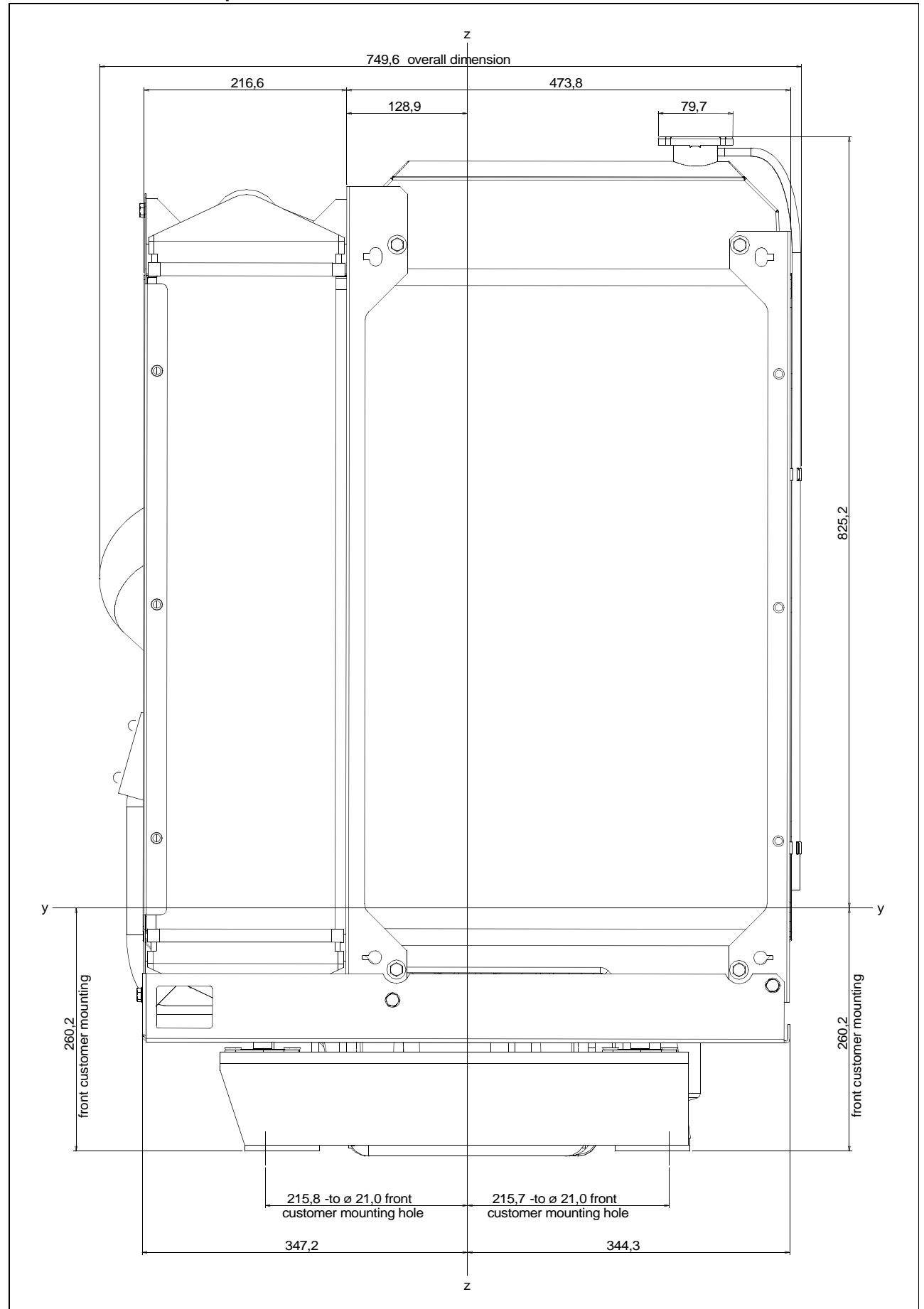
Designation	Units	Prime	Standby
Gross engine power	kWb	88,0	96,8
Electropak nett engine power	kWm	82,0	90,8
Brake mean effective pressure	kPa	1335	1467
Engine coolant flow (against 35 kPa restriction)	l/min	169,0	169,0
Cooling fan air flow (200 kPa external restriction)	m³/min	224,4	224,4
Combustion air flow (at rated speed)	m³/min	7,6	7,7
Exhaust gas flow (max.)	m³/min	17,0	17,9
Exhaust gas mass flow (max.)	kg/min	9,1	9,3
Exhaust gas temperature in manifold Max.	°C	470	492
Boost pressure ratio	-	2,5	2,6
Overall thermal efficiency (nett)	%	34,6	35,4
Typical genset electrical output (0.8 pf 25 °C)	kWe	73,8	81,7
	kVA	92,0	102
Assumed alternator efficiency	%	90	
Energy balance			
Energy in fuel	kWt	236,9	256,3
Energy in power output (gross)	kWt	88,0	96,8
Energy to cooling fan	kWm	6,0	6,0
Energy in power output (nett)	kWm	82,0	90,8
Energy to exhaust	kWt	70,6	76,1
Energy to coolant and oil	kWt	50,2	53,6
Energy to radiation	kWt	15,3	15,9
Energy to charge cooler	kWt	12,8	13,9

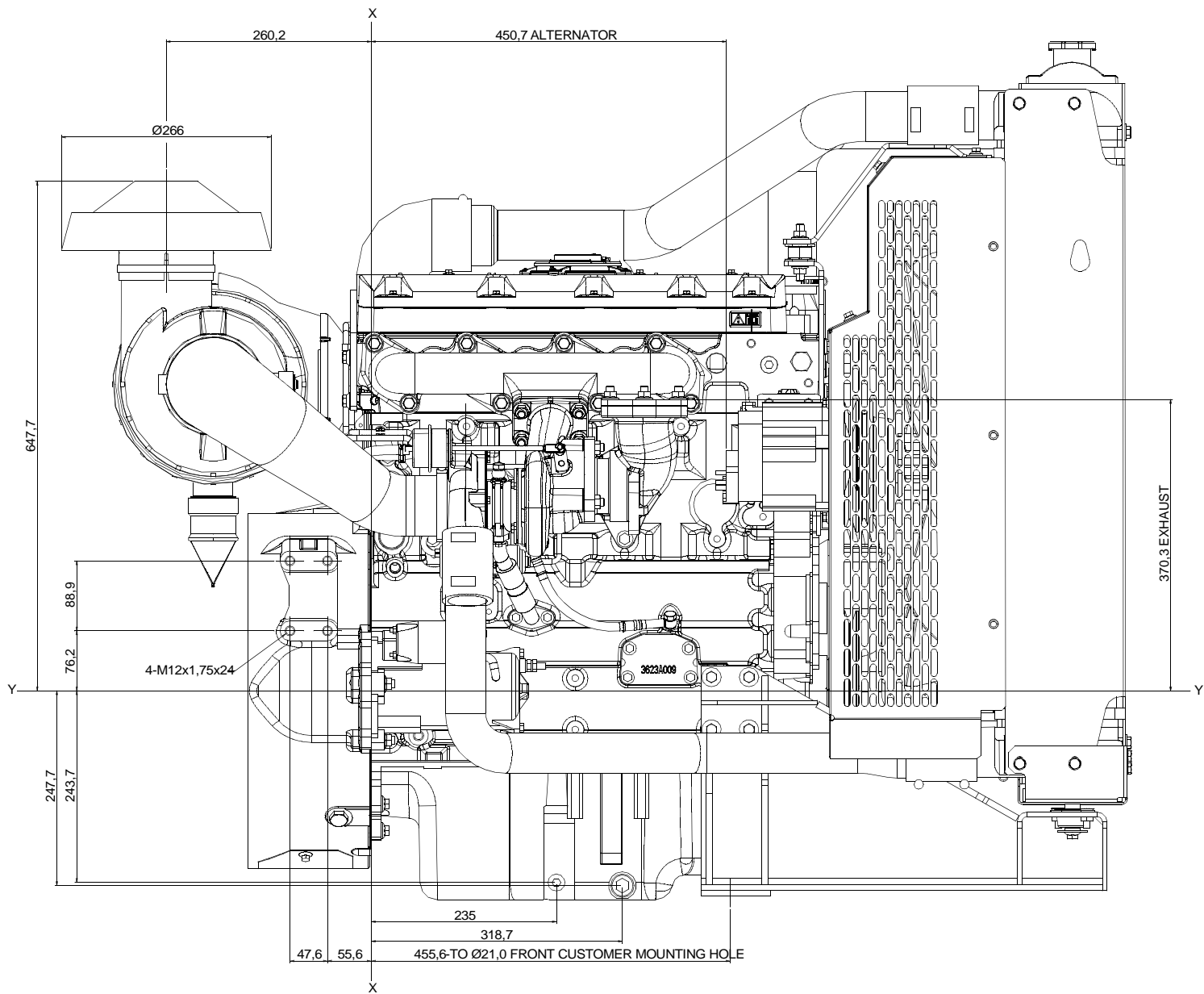
1104D-E44TAG1 Electropak - left side view





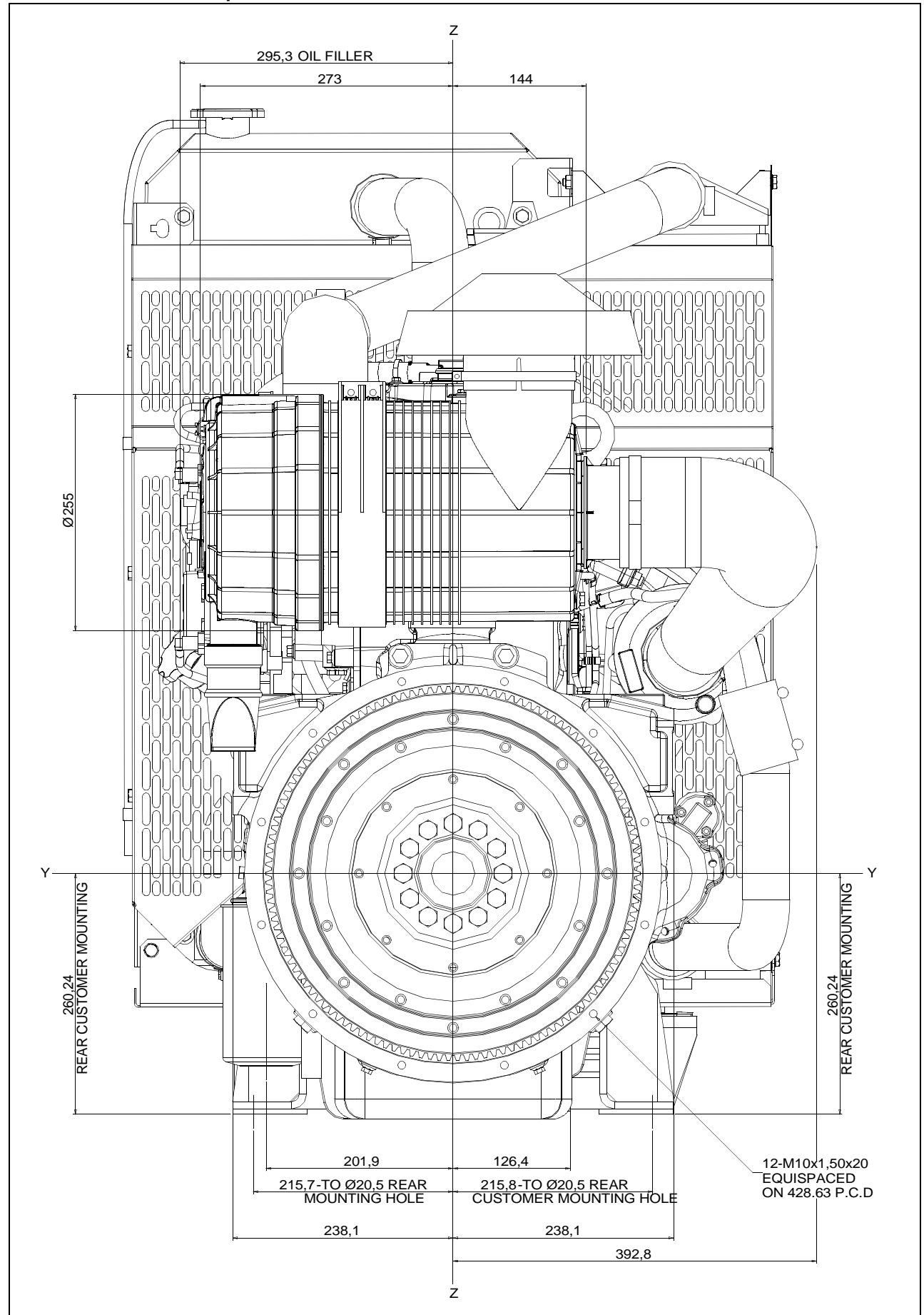
# 1104D-E44TAG1 ElectropaK - front view





1104D-E44TAG1 Electropak - right side view

# 1104D-E44TAG1 ElectropaK - rear view



## Cooling system

### Cooling pack

-overall weight (wet) ... ..	68,5 kg
-overall face area of matrix ... ..	0,43 m <sup>2</sup>
-width of matrix... ..	629 mm
-height of matrix . ... ..	690 mm

### Radiator

-face area... ..	0,3 m <sup>2</sup>
-number of rows and material ... ..	38 aluminium
-matrix density and material... ..	10,0 aluminium fins per inch
-width of matrix... ..	438 mm
-height of matrix . ... ..	690 mm
-pressure cap setting . ... ..	100 kPa

### Charge cooler

-face area... ..	0,13 m <sup>2</sup>
-number of rows and material ... ..	9 aluminium
-matrix density and material... ..	7,5 aluminium fins per inch
-width of matrix... ..	191 mm
-height of matrix . ... ..	690 mm

### Fan

-diameter ... ..	559 mm
-drive ratio... ..	1,25:1
-number of blades... ..	7
-material . ... ..	composite
-type ... ..	pusher

### Coolant

Total system capacity	
-with radiator .. ..	17 litres
-without radiator . ... ..	7,0 litres
Coolant pump drive ... ..	gear
Coolant pump drive ratio ... ..	2:1
Maximum top tank temperature . ... ..	112 °C
Temperature rise across engine (rating dependent)... ..	6,6 - 7,0 °C
Thermostat operation range... ..	85 - 95 °C
Recommended coolant: 50% ethylene glycol with a corrosion inhibitor (BS 658 :1992 or MOD AL39) and 50% clean fresh water.	

Duct allowance with 50% glycol		
°C	kPa	m <sup>3</sup> /min
53	120	182
46	200	154

## Electrical system

-type ... ..	12 Volt negative earth
-alternator type... ..	Denso A115i
-alternator voltage... ..	12V
-alternator output ... ..	65A
-starter motor type... ..	Denso P95
starter motor voltage . ... ..	12V
-starter motor power... ..	3,0 kW
-number of teeth on flywheel... ..	115
-number of teeth on starter pinion... ..	10
-minimum cranking speed... ..	80 rev/min
-starter solenoid maximum pull-in current @ 0°C... ..	TBA
-starter solenoid maximum hold-in current @ 0°C... ..	TBA

## Cold start recommendations

Temp °C	Battery type and viscosity used					Starter aid	Min average cranking speed	Battery quantity
	20W	15W	10W	5W	0W			
-5		B				None	130	1
-10		D		A		None	130	2
-15			B			Gp	100	2
-15				A		Gp	100	2
-20			B			Gp	100	2
-20				B		Gp	100	2
-25						Gp	100	2

**Note:** Gp = Glowplugs

## Battery selection

Battery type	Perkins code	Battery minimum performance		
		Cold cranking current (Amps)		
		BS 3911 <sup>(1)</sup>	SAE J537 <sup>(2)</sup>	DIN 43539 <sup>(3)</sup>
643	A	440	660	400
647	B	510	770	465
069	D	340	540	300
655	E	570	810	490

1. Voltage no less than 7,5 volts after 10 seconds after 90 seconds at -18 °C across each 12 volt battery
2. Voltage no less than 7,2 volts after 30 seconds at -18 °C across 12 volt battery
3. Voltage no less than 6 volts after 150 seconds at -18 °C across 12 volt battery

### Notes:

- Battery to starter lead resistance must not be more than 0,0017 Ohms (12V system)
- Battery capacity is defined by the 20 hour rate
- If a change to a low viscosity engine oil is made, the required cranking torque at low ambient temperature is much reduced. The starting equipment has been selected to take advantage of this. It is important to change to the appropriate multigrade oil in anticipation of operating in low ambient temperature
- Breakaway current is dependent on the battery capacity. Cables should be capable of handling the transient current which may be double the steady cranking current

## Exhaust system

Maximum back pressure . ... ..	15 kPa
Exhaust outlet size ... ..	64 mm

## Induction system

### Maximum air intake restriction

-clean filter... ..	5 kPa
-dirty filter. ... ..	8 kPa
-air filter type ... ..	2 stage cyclonic/paper element

## Fuel system

Type of injection ... direct  
Fuel injection pump ... common rail  
Fuel atomiser ... unit injector / multi-hole  
Nozzle opening pressure ... 18,5 MPa

## Fuel lift pump

-max flow through customer filter ... 130 litres/hour  
-max fuel supply restriction at lift pump ... 40 kPa  
-max fuel return restriction @ low idle ... 50 kPa  
-max fuel return flow ... 0,8 m³/min  
Maximum suction head ... 17 kPa (1.7 m)  
Maximum static pressure head ... 10 kPa (1.0 m)  
Governor type ... control by ECM  
Speed control to ... ISO 8528, G3

## Fuel specification

USA Fed Off Highway EPA2D 89.330-96

Density (kg/l @ 15°C) ... 0,845 - 0,855  
Viscosity (mm²/s @ 40 °C) ... 2,0 - 3,2  
Sulphur Content ... 0,03 - 0,04  
Cetane Number ... 40 - 48

## Fuel consumption litres/hour

Power Rating				
Speed	110%	100%	75%	50%
60 Hz	25,55	23,69	18,74	13,55

## Lubrication system

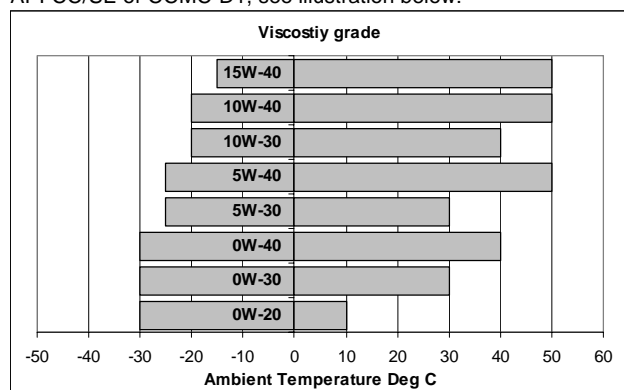
Lubricating oil capacity total system ... 8,0 litres  
Maximum sump capacity ... 7,0 litres  
Minimum sump capacity ... 5,5 litres  
Maximum engine operating angles  
-front up, front down, right side or left side ... 25°

## Lubricating oil pressure

-relief valve opens ... 450 kPa  
-at maximum no-load speed ... 280 - 340 kPa  
oil temperature (continuous operation) ... 125 °C  
-oil temperature (maximum intermittent operation) ... 135 °C  
Oil consumption at full load as a % of fuel consumption ... 0.15%

## Recommended SAE viscosity

A single or multigrade oil must be used which conforms to API-CC/SE or CCMC-D1, see illustration below:



## Mountings

Maximum static bending moment at rear face of block ... 791 Nm

## Load acceptance

Initial load application when engine reaches rated speed, 15 seconds (maximum) after engine starts to crank		
Prime Power %	Transient frequency deviation %	Frequency recovery time seconds
80	7,1	1,02

## Notes:

- The above complies with the requirements of classifications 3 and 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5
- The above figures were obtained under test conditions as follows:

Minimum engine block temperature ... 45 °C  
Alternator efficiency ... 90%  
Ambient temperature ... 15 °C  
Governing mode ... Isochronous  
Mechanical governing ... 4% ± 1%  
Alternator inertia ... 8 kgm²  
Flywheel inertia ... 1.14 kgm²  
Under frequency roll off point (UFRO) set to ... 1Hz 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.



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