

# Technical Data

## 2500 Series

# 2506A-E15TAG3

# 2506A-E15TAG4

### Diesel Engine - ElectropaK

#### Basic technical data

Number of cylinders ..... 6  
 Cylinder arrangement..... Vertical, In-line  
 Cycle ..... 4 stroke  
 Induction system ..... turbocharged, air to air charge cooling  
 Combustion system..... direct injection  
 Compression ratio ..... 16:1  
 Bore..... 137 mm  
 Stroke..... 171 mm  
 Cubic capacity..... 15,2 litres  
 Direction of rotation ..... anti-clockwise viewed on flywheel  
 Firing order (cylinder 1 furthest from flywheel) ..... 1, 5, 3, 6, 2, 4

#### Total weight of ElectropaK

-dry (engine only) ..... 1633 kg  
 -wet..... 1714 kg

#### Overall dimensions

-height ..... 1718 mm  
 -length ..... 2657 mm  
 -width ..... 1120 mm

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

Engine  
 -1500 rev/min ..... 2.3291 kgm<sup>2</sup>  
 -1800 rev/min ..... 2.3291 kgm<sup>2</sup>  
 Flywheel  
 -1500 rev/min ..... 1.96355 kgm<sup>2</sup>  
 -1800 rev/min ..... 1.96355 kgm<sup>2</sup>

#### Performance

**Note:** All data based on operation to ISO 3046/1, BS5514 and DIN 6271 standard reference conditions.

#### Cyclic irregularity

Engine / Flywheel maximum:  
 -1500 rev/min. .... 1:44  
 -1800 rev/min. .... 1:60

#### Ratings

Steady state stability at constant speed ..... ± 0,25 %  
 Electrical ratings are based on average alternator efficiency and are for guidance only (0.8 power factor being used)

#### Operating point

Engine speed ..... 1500 & 1800 rev/min  
 Cooling water maximum exit temperature ..... < 107 °C

#### Fuel data

To conform to ..... BS2869 class A2 or BS EN590

#### Test conditions

-air temperature ..... 25 °C  
 -barometric pressure ..... 100 kPa  
 -relative humidity ..... 30%  
 -air inlet restriction at maximum power (nominal)..... 2,5 kPa  
 -exhaust back pressure at maximum power (nominal)..... 6,8 kPa  
 -maximum fuel temperature (inlet pump)..... 40 °C

**Note:** 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 test conditions relevant to data on load acceptance, refer to the bottom of page 14.

#### Sound level

Estimated sound pressure level at 1 metre:  
 -1500 rev/min. .... 103 dB(A)  
 -1800 rev/min. .... 105 dB(A)

## General installation

### 2506A-E15TAG3

Designation	Units	Type of operation and application			
		Prime	Standby	Prime	Standby
		50 Hz @ 1500 rev/min		60 Hz @ 1800 rev/min	
Gross engine power	kWb	407	451	469	514
Fan power	kWm	8,8		15,5	
Restriction losses	kWm	7,2	7,8	7,8	8,9
ElectropaK nett engine power	kWm	391	435	446	490
Gross brake mean effective pressure	kPa	2211	2447	2143	2339
Combustion air flow	m³/min	24,5	27,0	34,3	38,0
Exhaust gas temperature (max)	°C	N/A	590	N/A	590
Exhaust gas flow	m³/min	71,0	80,0	96,0	105,3
Boost pressure ratio	-	2,45	2,69	2,73	2,99
Overall thermal efficiency (nett)	%	44	44	46	43
Friction and pumping power losses	kWm	45		51	
Mean piston speed	m/s	8		10	
Engine coolant flow	l/min	6,1		7,2	
Cooling fan air flow (zero duct allowance)	m³/min	722		866	
Typical Gen Set electrical output (0.8 pf)	kWe	360	400	410	450
	kVA	450	500	513	563
Assumed alternator efficiency	%	92		92	

### 2506A-E15TAG4

Designation	Units	Type of operation and application			
		Prime	Standby	Prime	Standby
		50 Hz @ 1500 rev/min		60 Hz @ 1800 rev/min	
Gross engine power	kWb	407	451	519	568
Fan power	kWm	8,8		15,5	
Restriction losses	kWm	7,2	7,8	8,9	9,5
ElectropaK nett engine power	kWm	391	435	495	543
Gross brake mean effective pressure	kPa	2211	2447	2307	2524
Combustion air flow	m³/min	24,5	27,0	39	42
Exhaust gas temperature (max)	°C	N/A	590	N/A	590
Exhaust gas flow	m³/min	71,0	80,0	102	112
Boost pressure ratio	-	2,45	2,69	3,3	3,5
Overall thermal efficiency (nett)	%	44	44	41,0	41,2
Friction and pumping power losses	kWm	45		57	
Mean piston speed	m/s	8		10	
Engine coolant flow	l/min	6,1		7,2	
Cooling fan air flow (zero duct allowance)	m³/min	722		866	
Typical Gen Set electrical output (0.8 pf)	kWe	360	400	455	500
	kVa	450	500	569	624
Assumed alternator efficiency	%	92		92	

## Rating definitions

### Prime power

Variable load. Unlimited hours usage with an average load factor of 80% of the published Prime Power rating over each 24 hour period. A 10% overload is available for 1 hour in every 12 hours operation

### Standby power

Variable load. Limited to 500 hours annual usage up to 300 hours of which may be continuous running. No overload is permitted

### Emissions capability

All 2506A ratings are optimised for 'best fuel consumption' and do not comply to Harmonised International Regulated Emission Limits. More information on these statements can be obtained by contacting the applications department at Perkins Engines Company Limited.

## Energy balance

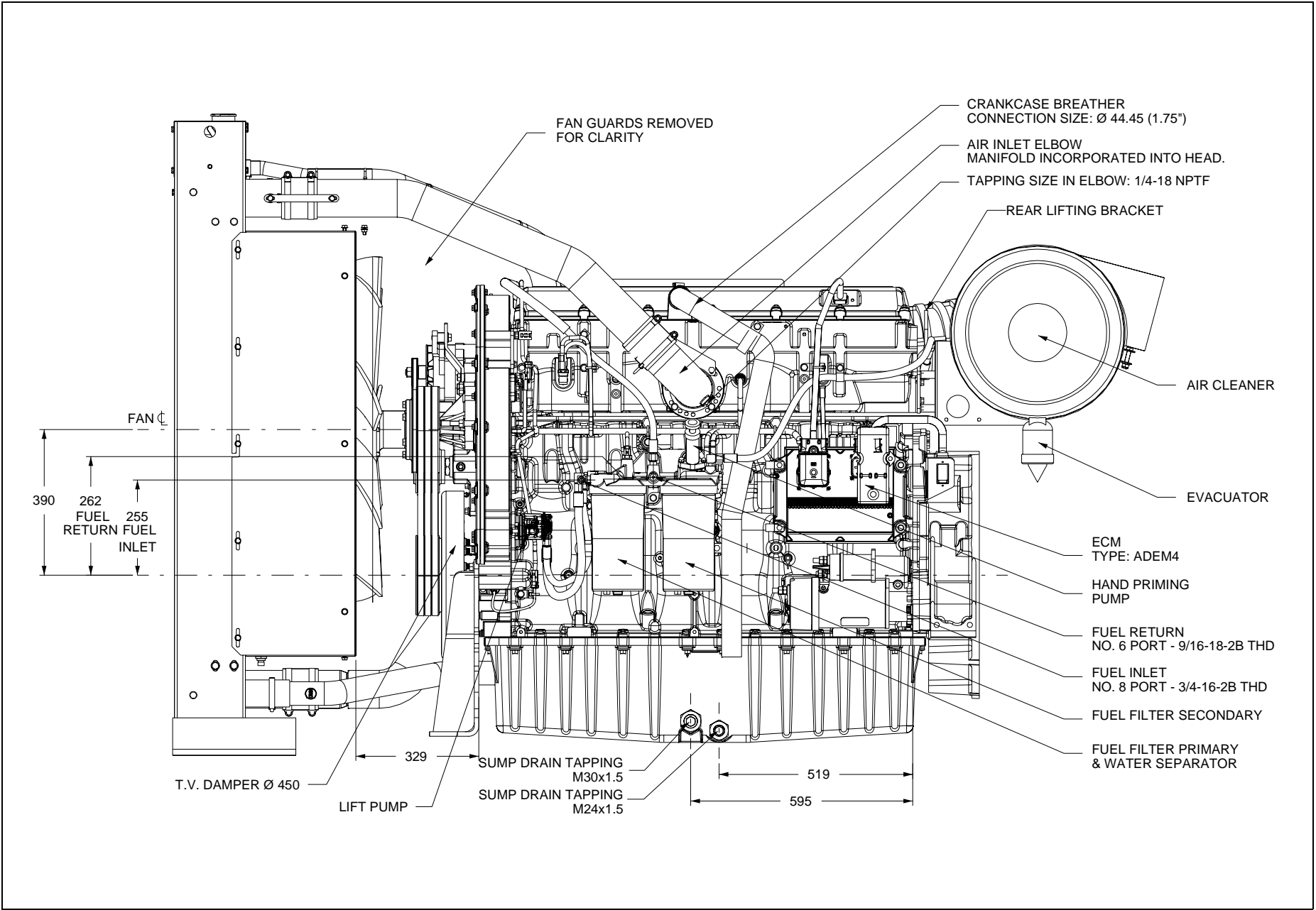
### 2506A-E15TAG3

Designation	Units	Type of operation and application			
		Prime	Standby	Prime	Standby
		50 Hz @ 1500 rev/min		60 Hz @ 1800 rev/min	
Energy in fuel	kWt	940	1030	1075	1200
Energy in power output (gross)	kWb	407	451	469	514
Energy to cooling fan and restrictions	kWm	16,0	17,0	23,3	24,4
Energy in power output (nett)	kWm	391	435	446	490
Energy to exhaust	kWt	296	323	324	375
Energy to coolant and oil	kWt	151	157	161	173
Energy to radiation	kWt	29,2	31,2	33,5	37,5
Energy to charge cooler	kWt	48	59	72	85

### 2506A-E15TAG4

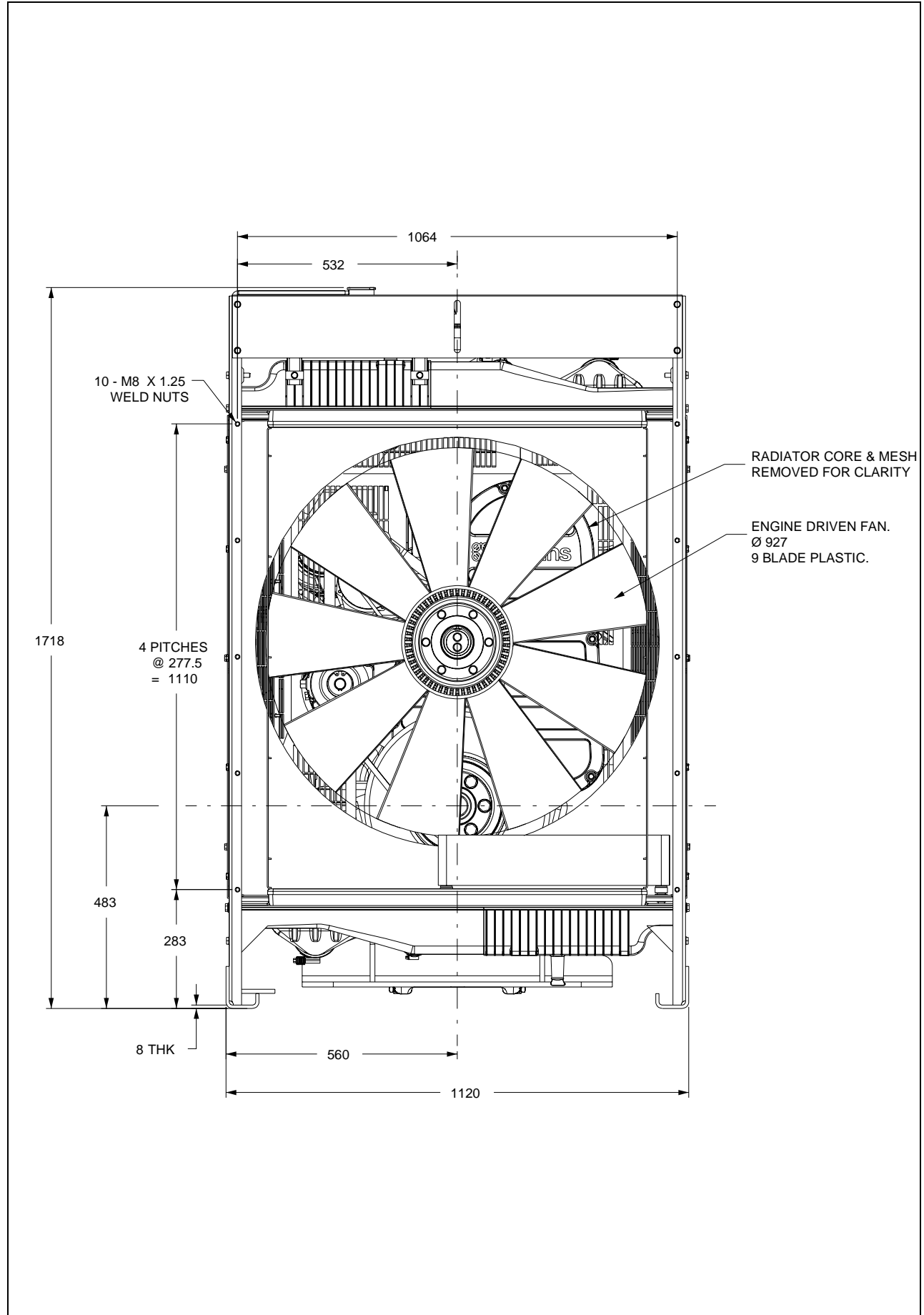
Designation	Units	Type of operation and application			
		Prime	Standby	Prime	Standby
		50 Hz @ 1500 rev/min		60 Hz @ 1800 rev/min	
Energy in fuel	kWt	940	1030	1175	1330
Energy in power output (gross)	kWb	407	451	519	568
Energy to cooling fan and restrictions	kWm	16,0	17,0	24,4	25,0
Energy in power output (nett)	kWm	391	435	495	543
Energy to exhaust	kWt	296	323	355	410
Energy to coolant and oil	kWt	151	157	158	185
Energy to radiation	kWt	29,2	31,2	32,5	41,5
Energy to charge cooler	kWt	48	59	95	110

2506A-E15TAG3 and 2506A-E15TAG4 - left side view



Note: This drawing is for reference only. For installation purposes, please refer to the relevant General Installation drawing (Z13579).

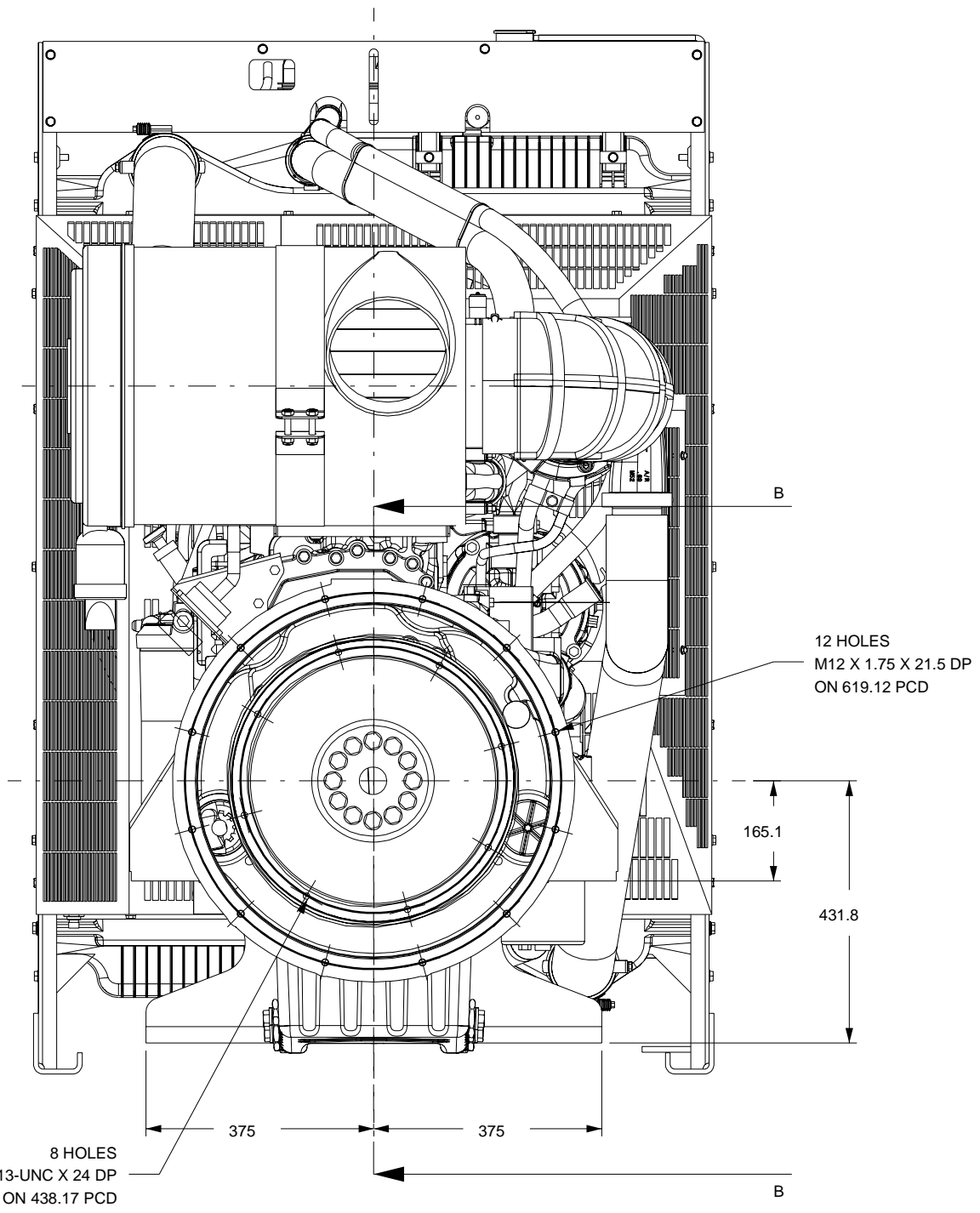
2506A-E15TAG3 and 2506A-E15TAG4 - front view



Note: This drawing is for reference only. For installation purposes, please refer to the relevant General Installation drawing (Z13579).

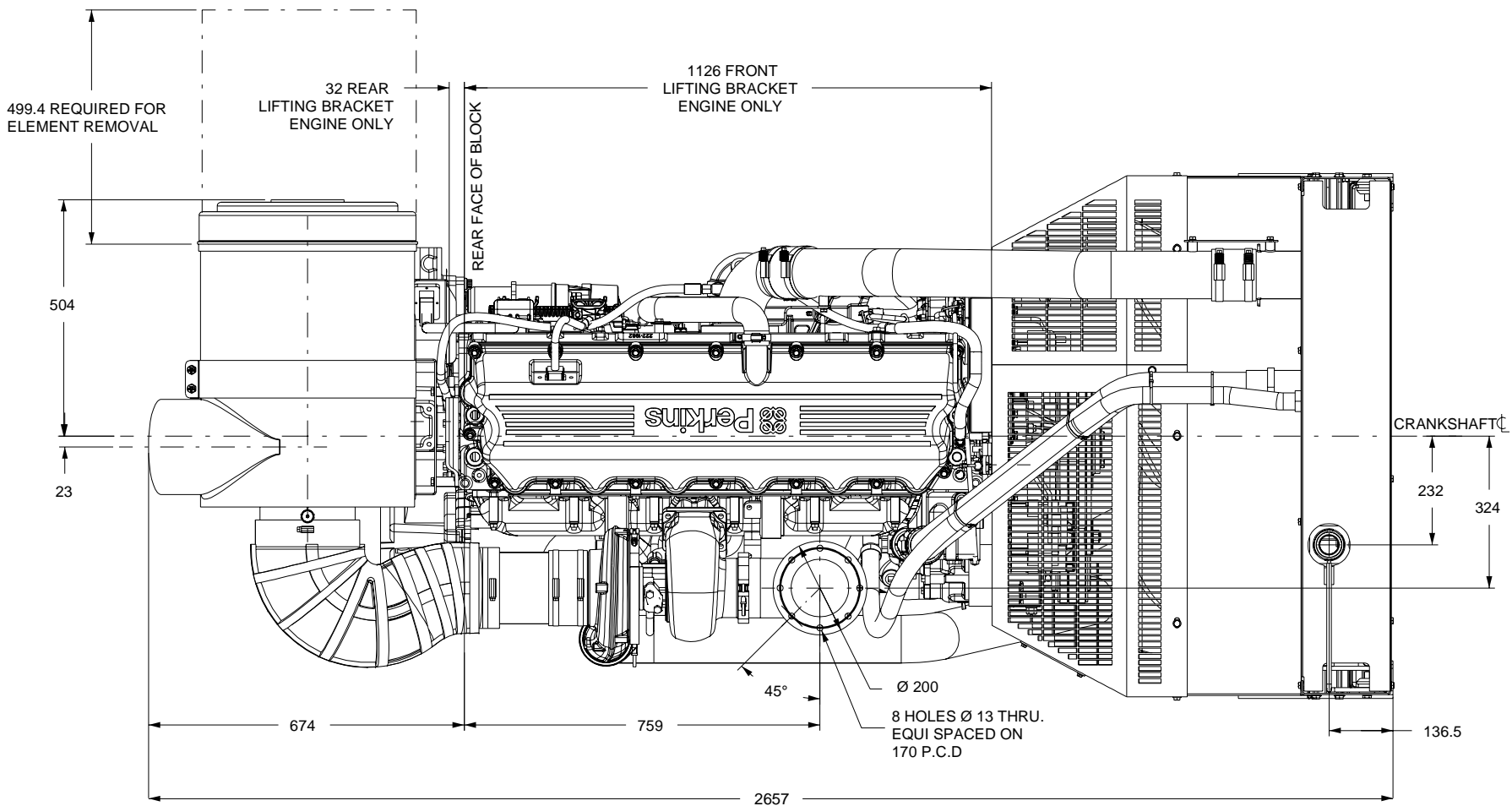


2506A-E15TAG3 and 2506A-E15TAG4 - rear view



Note: This drawing is for reference only. For installation purposes, please refer to the relevant General Installation drawing (Z13579).

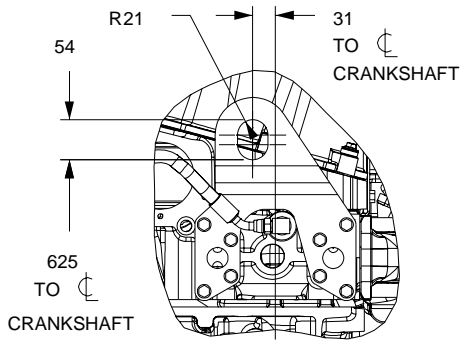
2506A-E15TAG3 and 2506A-E15TAG4 - plan view



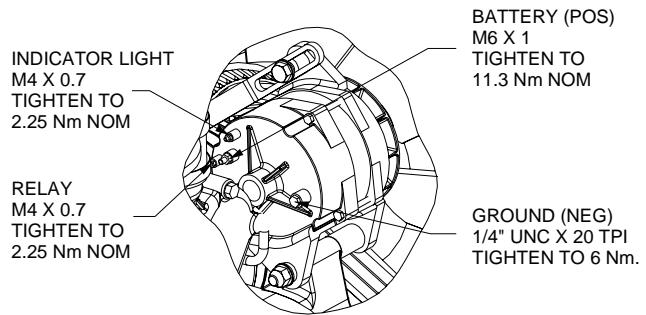
Note: This drawing is for reference only. For installation purposes, please refer to the relevant General Installation drawing (Z13579).



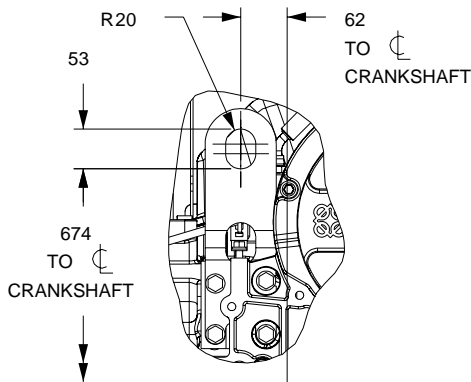
**2506A-E15TAG3 and 2506A-E15TAG4 - miscellaneous views**



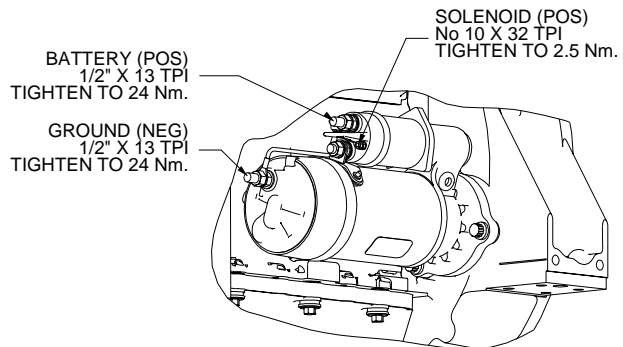
**SCRAP VIEW SHOWING  
DETAILS OF REAR LIFTING  
EYE**



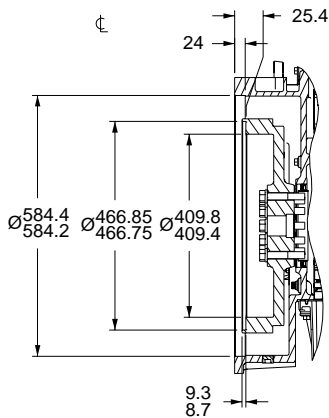
**SCRAP VIEW SHOWING ALTERNATOR CONNECTIONS.  
FAN GUARDS & THERMOSTAT REMOVED FOR CLARITY.  
SCALE 1:3**



**SCRAP VIEW SHOWING  
DETAILS OF FRONT LIFTING  
EYE**



**SCRAP VIEW SHOWING  
STARTER MOTOR CONNECTIONS  
SCALE 1:3**



**SECTION B-B  
DETAILS OF SAE 1 / 2 FLYWHEEL HOUSING  
AND SAE J620 SIZE 14 FLYWHEEL**

**Note:** This drawing is for reference only. For installation purposes, please refer to the relevant General Installation drawing (Z13579).

## Cooling system

Recommended coolant:

50% inhibited ethylene glycol or 50% inhibited propylene glycol and 50% clean fresh water. Where there is no likelihood of ambient temperatures below 10 °C, clean 'soft' water may be used, treated with 1% by volume of Perkins inhibitor in the cooling system. The inhibitor is available from all Perkins Distributors.

Total system coolant capacity ... 58,0 litres

Maximum pressure:

-in crankcase water jacket ... 276 kPa

Maximum top tank temperature ... 107 °C

Maximum static pressure on pump ... 170 kPa

Maximum permissible restriction:

-to coolant pump flow ... 30 kPa

Temperature rise across engine with inhibited coolant:

-standby power @ 1500 and 1800 rev/min ... 10 °C

-prime power @ 1500 and 1800 rev/min ... 9 °C

Thermostat operation range ... 88 to 98 °C

Radiator

-face area ... 1-238 m<sup>2</sup>

-weight (dry) ... 132 kg

-rows and materials ... 2 rows, Aluminium

-matrix density and material ... 12 fins per inch, Aluminium

-width of matrix ... 1048 mm

-height of matrix ... 1100 mm

-pressure cap setting (minimum) ... 69 kPa

### Charge cooler with integral radiator

-face area ... 1-006 m<sup>2</sup>

-number of rows and material ... 1 row, Aluminium

-matrix density and material ... 12,5 fins per inch, Aluminium

-width of matrix ... 915 mm

-height of matrix ... 1100 mm

### Coolant pump

Speed:

-1500 rev/min ... 1622 rev/min

-1800 rev/min ... 1946 rev/min

Method of drive ... gear

### Fan

-diameter ... 927 mm

-drive ratio ... 0-92:1

-number of blades ... 9

-material ... B3WG6 or PA6GF30 Nylon 6 glass filled 30%

-type ... ACS 367500

## Cooling clearance

Ambient cooling clearance (standby power) based on air temperature at fan of 6 °C above the ambient

2506A-E15TAG3 maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow			
Duct allowance with inhibited coolant at 50 °C			
Description	rev/min	Units	Standby
Duct allowance	1500	kPa	0-125
	1800	kPa	0-125
Minimum airflow	1500	m <sup>3</sup> /min	660
	1800	m <sup>3</sup> /min	822
Duct allowance with 50% glycol at 43 °C			
Duct allowance	1500	kPa	0-200
	1800	kPa	0-200
Minimum airflow	1500	m <sup>3</sup> /min	576
	1800	m <sup>3</sup> /min	792

2506A-E15TAG4 maximum additional restriction (duct allowance) to cooling airflow and resultant minimum airflow			
Duct allowance with inhibited coolant at 50 °C			
Description	rev/min	Units	Standby
Duct allowance	1500	kPa	0-125
	1800	kPa	0-125
Minimum airflow	1500	m <sup>3</sup> /min	660
	1800	m <sup>3</sup> /min	822
Duct allowance with 50% glycol at 43 °C			
Duct allowance	1500	kPa	0-200
	1800	kPa	0-200
Minimum airflow	1500	m <sup>3</sup> /min	576
	1800	m <sup>3</sup> /min	792

## Electrical system

Type ... 12V negative earth

Alternator

-type ... 22SI

-voltage ... 24 volts

-output ... 70 amps

Starter

-type ... 42MT

-motor voltage ... 24 volts

-motor power ... 7,5 kW

Number of teeth

-on the flywheel ... 113

-on starter pinion ... 11

Minimum cranking speed ... 100 rev/min

Pull-in current of starter motor solenoid

@ -25 °C max <sup>(1)</sup> ... 57 amps

Hold-in current of starter motor solenoid

@ -25 °C max <sup>(1)</sup> ... 16 amps

1. All leads to rated at 10 amps minimum

## Cold start recommendations

Temperature Range	
5 to -10 °C (41 to 14 °F)	Oil: 15W40 Starter: 42MT Battery: 2x 12V 128 Ah Max breakaway current: 1250 amps Cranking current: 676 amps Aids: None Minimum mean cranking speed: 120 rev/min

Temperature Range	
-11 to -25 °C (12.2 to -13 °F)	Oil: 0W40 Starter: 42MT Battery: 2x 12V 128 Ah Max breakaway current: 1250 amps Cranking current: 880 amps Aids: block heater 1.5 kW Minimum mean cranking speed: 120 rev/min

- Battery capacity is defined by the 20 hour rate
- The oil specification should be for the minimum ambient temperature as the oil will not be warmed by the immersion heater
- Breakaway current is dependent on battery capacity available. Cables should be capable of handling the transient current which may be up to double the steady cranking current.

## Exhaust system

Maximum back pressure ... 6,8 kPa  
Exhaust outlet size (internal)... 150 mm

### Recommended exhaust pipe diameter

length	1500 rev/min	1800 rev/min
	mm	mm
up to 10m	125	150
10m to 20m	150	150
20m to 30m	150	200

## Fuel system

Type of injection ... MEUI  
Injector type ... MEUI  
Injector pressure... 200 MPa

### Fuel lift pump

type... gear driven  
Delivery flow:  
-1500 rev/min ... 413 litres/hr  
-1800 rev/min ... 457 litres/hr  
Pressure... 550 kPa  
Maximum suction head at pump inlet... 3 m  
Maximum static pressure head ... 4 m  
Fuel inlet temperature to be less than ... 55 °C  
Governor type... electronic  
Governing to ... ISO 8528-5 class G3 steady state

### Fuel filtration level

-primary ... 10 µm  
-secondary... 2 µm

## Fuel consumption

### 2506A-E15TAG3

Designation	Fuel consumption calculated on nett rated powers			
	g/kWh		litres/hr	
	1500 rev/min	1800 rev/min	1500 rev/min	1800 rev/min
Standby	198	200	100	114
Prime + 10%	198	200	100	114
Prime	199	196	90	101
At 75% of Prime	202	205	69	80
At 50% of Prime	213	220	48	57

### 2506A-E15TAG4

Designation	Fuel consumption calculated on nett rated powers			
	g/kWh		litres/hr	
	1500 rev/min	1800 rev/min	1500 rev/min	1800 rev/min
Standby	198	198	100	125
Prime Power + 10%	198	198	100	125
Prime Power	199	200	90	115
At 75% of Prime Power	202	205	69	88
At 50% of Prime Power	213	217	48	62

## Induction system

### Maximum air intake restriction

- clean filter. .... 3,7 kPa
- dirty filter .. 6,2 kPa
- air filter type . . . . . paper element 457 mm

## Lubrication system

The recommended SAE viscosity is a multigrade oil (15W40) which adequately meets the specifications of API C14

- Total system capacity ... 62,0 litres
- Maximum sump capacity... 53,0 litres
- Minimum sump capacity ... 45,0 litres

### Lubricating oil pressure

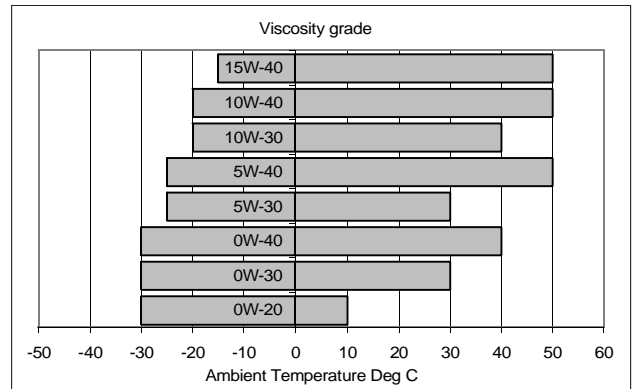
- at rated speed.. 420 kPa
- Nominal (minimum) ... 200 kPa
- Oil relief valve opens. .... 620 kPa
- Oil filter screen spacing. .... 30 µm
- Sump drain plug tapping size ... M24
- Oil pump speed and drive method ... 1,16 x engine speed, gear
- Oil flow:
- 1500 rev/min ... 2,9 litres/sec
- 1800 rev/min ... 3,4 litres/sec
- Oil consumption at full load rated speed... 0,1%
- Oil temperature (in rail)
- maximum continuous operation... 114 °C

### Normal operating angles

- front and rear ... 7°
- side tilt.. 7°

## Recommended SAE viscosity

A single or multigrade oil must be used which conforms API C14 or ACEA E5.



## Mountings

Maximum static bending moment at rear face of block ... 1356 Nm

## Centre of gravity (bare dry engine)

- forward of rear face of cylinder block ... 570 mm
- above crankshaft centre line ... 240 mm

## Engine management system

Full electronic engine management system controlling:

- speed governing
- air / fuel ratio
- start / stop sequence
- engine protection and diagnostics

## Typical load acceptance

### 2506A-E15TAG3

Engine speed	Initial Load Acceptance When engine reaches rated speed (15 seconds maximum after engine starts to crank)				2nd Load Application Immediately after engine has recovered to rated speed (5 seconds after initial load application)			
	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds
1500 rev/min	65	237	≤ 10	5	60	218	≤ 10	5
1800 rev/min	65	266	≤ 10	5	60	245	≤ 10	5

### 2506A-E15TAG4

Engine speed	Initial Load Acceptance When engine reaches rated speed (15 seconds maximum after engine starts to crank)				2nd Load Application Immediately after engine has recovered to rated speed (5 seconds after initial load application)			
	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds	Prime Power %	Load kWm (kWe) Nett	Transient Frequency Deviation %	Frequency recovery time seconds
1500 rev/min	65	237	≤ 10	5	60	218	≤ 10	5
1800 rev/min	60	273	≤ 10	5	55	250	≤ 10	5

The above figures were obtained under test conditions as follows:

Engine block temperature . . . . . 45 °C  
 Ambient temperature . . . . . 15 °C  
 Governing mode . . . . . Isochronous  
 Alternator inertia. . . . . 8 kgm<sup>2</sup>  
 Under frequency roll off (UFRO) point set to . . . . . 1 Hz below rated frequency  
 UFRO rate set to . . . . . 2 % voltage / 1% frequency  
 LAM on / off . . . . . off

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

The applied load is a percentage of generator electrical output, using alternator efficiencies as published in the general installation section of this Technical Data Sheet.

**The information given on this Technical Data Sheet is for standard ratings only. For ratings other than those shown, please contact Perkins Engines Company Limited, Stafford.**

The information given in this document is for guidance only.

**Notes**



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