

Technical Data

2300 Series

Diesel Engine - Electropak

2306A-E14TAG1
2306A-E14TAG2
2306A-E14TAG3

Basic technical data

Number of cylinders ... 6
Cylinder arrangement ... Vertical, in line
Cycle ... 4 stroke, compression ignition
Induction system ... Turbocharged
Compression ratio
-2306A-E14TAG1 ... 14.6:1 nominal
-2306A-E14TAG2 and 2306A-E14TAG3 ... 15.9:1 nominal
Bore ... 137 mm
Stroke ... 165 mm
Cubic capacity ... 14,6 litres
Direction of rotation ... Anti-clockwise viewed on flywheel
Firing order ... 1, 5, 3, 6, 2, 4
Cylinder 1 furthest from flywheel
Total weight Electropak
-dry ... 1690 kg
-wet ... 1792 kg

Overall dimensions

-height ... 1614 mm
-length ... 2422 mm
-width ... 1107 mm

Moment of inertia (mk²)

-flywheel ... 1,95 kgm²
-engine ... 1,4883 kgm²

Cyclic irregularity for engine/flywheel (Prime)

-1500 rev/min ... 0,0185
-1800 rev/min ... 0,0109

Ratings

Steady state speed stability at constant load ... ± 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 exit temp ... <103 °C

Performance

Estimated average sound pressure level, without inlet or exhaust, at 1 metre 1500/1800 rev/min ... 113,5/114,5 dB(A)

Note: All data based on operation to ISO 3046/1, BS 5514 and DIN 6271 standard reference conditions.

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 (nominal) ... 3,0 kPa
Fuel temperature (inlet pump) ... 40 °C.
For test conditions relevant to data on load acceptance, refer to page 8 of this publication.

General installation - 2306A-E14TAG1

Designation	Units	50Hz @ 1500 rev/min			60Hz @ 1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Gross engine power	kWb	226	270	313	262	316	346
Fan power	kWm	9			17		
Nett engine power	kWm	217	261	304	245	299	329
BMEP gross	kPa	1220	1480	1710	1190	1430	1570
Combustion air flow	m ³ /min	16,3	18,5	21,3	29,3	33,9	35,2
Exhaust gas temperature max (after turbo)	°C	493	510	518	387	405	413
Exhaust gas flow (max)	m ³ /min	40,5	46,4	54,2	64,4	76,5	80,7
Boost pressure ratio	-	1,7	2,0	2,3	25	2,9	3,0
Overall thermal efficiency	%	40,9	44,1	43,1	40,1	40,0	40,5
Friction power and pumping losses	kWm	24			40		
Mean piston speed	m/s	8,28			9,91		
Engine coolant flow	l/s	5,2			6,2		
Cooling fan airflow	m ³ /min	438			530		
Typical Genset electrical output 0.8pf 25 °C (100 kPa)	kVA	250	300	350	281	344	379
	kWe	200	240	280	225	275	303
Assumed alternator efficiency	%	92					

General installation - 2306A-E14TAG2

Designation	Units	50Hz @ 1500 rev/min			60Hz @ 1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Gross engine power	kWb	248	313	353	289	365	393
Fan power	kWm	9			17		
Nett engine power	kWm	239	304	344	272	348	376
BMEP gross	kPa	13,6	17,1	19,3	13,1	16,6	17,9
Combustion air flow	m³/min	17,4	21,3	23,7	31,3	35	35,8
Exhaust gas temperature max (after turbo)	°C	503	518	516	398	418	430
Exhaust gas flow (max)	m³/min	43,3	54,2	60,4	70	80,7	84,2
Boost pressure ratio	-	1,88	2,3	2,57	2.70	3.01	3.11
Overall thermal efficiency	%	42,8	43,1	41,8	40,1	41,8	42,2
Friction power and pumping losses	kWm	24			40		
Mean piston speed	m/s	8,28			9,91		
Engine coolant flow	l/s	5,2			6,2		
Cooling fan airflow	m³/min	438			530		
Typical Genset Electrical Output 0.8pf 25 °C (100 kPa)	kVA	275	350	400	313	400	438
	kWe	220	280	320	250	320	350
Assumed alternator efficiency	%	92	92	93	92	92	93

General installation - 2306A-E14TAG3

Designation	Units	50Hz @ 1500 rev/min			60Hz @ 1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Gross engine power	kWb	270	353	396	316	393	447
Fan power	kWm	9			17		
Nett engine power	kWm	261	344	387	299	376	430
BMEP gross	kPa	14,8	19,3	21,7	14,3	17,9	20,3
Combustion air flow	m³/min	20,5	23,8	26,2	32,5	36,0	37,6
Exhaust gas temperature max (after turbo)	°C	504	509	522	401	429	453
Exhaust gas flow (max)	m³/min	51,0	60,2	66,3	73,1	83,9	91,6
Boost pressure ratio	-	2,03	2,58	2,86	2,80	3,11	3,29
Overall thermal efficiency	%	42,0	42,1	43,2	40,9	41,0	42,3
Friction power and pumping losses	kWm	24			40		
Mean piston speed	m/s	8,28			9,91		
Engine coolant flow	l/s	5,2			6,2		
Cooling fan airflow	m³/min	438			530		
Typical Genset Electrical Output 0.8pf 25 °C (100 kPa)	kVA	300	400	450	344	438	500
	kWe	240	320	360	275	350	400
Assumed alternator efficiency	%	92	93	93	92	93	93

Note: Not to be used for CHP design purposes. (indicative figures only). Consult Perkins Engines Company Limited. Assumes complete combustion.

Overall thermal efficiency: Based on 43,8 MJ/kg calorific value for diesel conforming to specification BS2869 Class A2.

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.

Baseload power

Unlimited hours usage with an average load factor of 100% of the published Baseload rating. A 10% overload is available for 1 hour in every 12 hours of 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 2306A ratings are optimised for 'best fuel consumption' and do not comply to Harmonised International Regulation Emission Limits. More information on these statements can be obtained by contacting the applications department at Perkins Engines Company Limited.

Energy balance

2306A-E14TAG1

Designation	Units	1500 rev/min			1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	547	616	745	652	789	853
Energy in power output (gross)	kWb	226	270	313	262	316	346
Energy to cooling fan	kWm	9			17		
Energy in power output (nett)	kWm	217	261	304	245	299	329
Energy to exhaust	kWt	187	219	259	208	255	277
Energy to coolant and oil	kWt	103	105	122	114	132	135
Energy to radiation	kWt	12	14	14	13	16	16
Energy to charge coolers	kWt	19	28	37	55	70	79

2306A-E14TAG2

Designation	Units	1500 rev/min			1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	583	732	844	719	892	953
Energy in power output (gross)	kWb	248	313	353	289	365	393
Energy to cooling fan	kWm	9			17		
Energy in power output (nett)	kWm	239	304	344	272	348	376
Energy to exhaust	kWt	197	246	297	234	291	304
Energy to coolant and oil	kWt	103	122	131	116	136	146
Energy to radiation	kWt	13	14	15	15	17	19
Energy to charge coolers	kWt	22	37	48	65	83	91

2306A-E14TAG3

Designation	Units	1500 rev/min			1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	646	840	922	789	953	1068
Energy in power output (gross)	kWb	290	353	396	316	393	447
Energy to cooling fan	kWm	9			17		
Energy in power output (nett)	kWm	261	344	387	299	376	430
Energy to exhaust	kWt	230	293	297	255	304	340
Energy to coolant and oil	kWt	105	131	150	132	146	163
Energy to radiation	kWt	14	15	16	16	19	21
Energy to charge coolers	kWt	27	48	63	70	91	97

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 temperature below 10 °C then clean 'soft' water may be used, treated with 1% by volume of Perkins inhibitor in the cooling system.

Maximum jacket water pressure in crankcase ... 276 kPa
Maximum top tank temperature (Standby power) ... 103 °C
Maximum static pressure head on pump ... 173 kPa
Draw down capacity ... 7,0 litres
Maximum permissible restriction to coolant pump flow ... 30 kPa
Thermostat operating range ... 88 - 98 °C
Ambient cooling clearance (Standby power) based on air temp at fan 6 °C above ambient

Temperature rise across engine (Standby power) Inhibited coolant
-1500 rev/min ... 6,8 °C
-1800 rev/min ... 6,3 °C

Maximum additional restriction (duct allowance) to cooling airflow (TAG3 Standby power) and resultant minimum airflow					
Ambient clearance: Inhibited coolant		Duct allowance kPa		Min airflow m³/min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
50 °C	50 °C	0,12	0,12	378	462

Maximum additional restriction (duct allowance) to cooling airflow (TAG3 Standby power) and resultant minimum airflow					
Ambient clearance: 50% glycol		Duct allowance kPa		Min airflow m³/min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
43 °C	43 °C	0,20	0,20	345	396

Radiator

-face area ... 0,996 m²
Rows and material ... 2 Aluminium
Fins per inch and material ... 15 Aluminium
Width and height of matrix
-height ... 1048,4 mm
-width ... 950 mm
Weight (dry) radiator ... 120 kg
Total coolant capacity ... 47 litres
Pressure cap setting ... 70 kPa
Coolant exit temperature (Max.) ... 103 °C

Charge cooler, integral with radiator

Face area ... 0,66 m²
Rows and material ... 1 Aluminium
Fins per inch and material ... 14 Aluminium
Width and height of matrix ... 755,2 x 870 mm

Coolant pump

Speed ... 1.081 x e rev/min
Method of drive ... Gear

Fan

Type ... Pusher
Diameter ... 813 mm
Number of blades ... 9
Material ... Plastic
Drive ratio ... 1.055:1

Lubrication system

Recommended lubricating oil:
multigrade oil (15W/40) which adequately meets the specifications of API CG4.

Lubricating oil capacity

Total system ... 68 litres
Sump maximum ... 60 litres
Sump minimum ... 45 litres

Lubricating oil temperature (sump)

Normal ... 95 °C
Maximum ... 113 °C

Lubricating oil pressure

At rated speed ... 460 kPa
Minimum ... 200 kPa
Oil relief valve opens ... 610 kPa
Oil filter spacing ... 30 µm
Sump drain plug tapping size ... M24
Oil pump speed and method of drive ... 1.16 x engine speed, gear
Oil pump flow
-1500 rev/min ... 2,90 litres/sec
-1800 rev/min ... 3,48 litres/sec
Oil consumption as a percentage of full load fuel consumption less than ... 0.1%

Normal operating angles:

Front and rear ... 7° maximum
Side tilt ... 7° maximum

Electrical system

Type ... Insulated return
Alternator output ... 24 volts/70 amps
Starter motor power ... 24 volt/7,65 kW
Number of teeth
-on flywheel ... 113
-on starter motor ... 11
Minimum cranking speed ... 120 rev/min
Pull-in current of starter motor solenoid ... 57 amps at 20V
Hold-in current of starter motor solenoid ... 13 amps at 20V

Starting requirements

2306A-E14TAG1

Temperature range	
Down to 0 °C (32 °F)	Oil: 15W/40 Starter: 24 volt Battery: 2 x 12V 128 Ah Max breakaway current: 1250 Amps Cranking current: 560 A at -10 °C Aids: Not necessary

2306A-E14TAG2 and 2306A-E14TAG3

Temperature range	
Down to -10 °C (14 °F)	Oil: 15W/40 Starter: 24 volt Battery: 2 x 12V 128 Ah Max breakaway current: 1250 Amps Cranking current: 560 A at -10 °C Aids: Not necessary

Notes:

- The battery capacity is defined by the 20 hour rate at 0 °C
- The oil specification should be for the minimum ambient temperature as the oil will not be warmed by the immersion heater
- The breakaway current is dependant on the battery capacity available. Cables should be capable of handling the transient current which may be up to double the steady cranking current.

Fuel system

Fuel to conform to: BS2869 class A2 or BS EN590
Type of injection system MEUI
Fuel injector MEUI
Fuel injector pressure 200 MPa
Fuel lift pump gear driven
Fuel pump delivery/hour
-@ 1500 rev/min 413 litres/hour
-@ 1800 rev/min 457 litres/hour
Fuel delivery
-pump delivery pressure 600 kPa
-pump maximum suction head 3 m
-pump maximum pressure head 4 m
Fuel filter spacing
-primary 10 mm
-secondary 2 mm
Governor type Electronic

Fuel consumption

2306A-E14TAG1

Fuel consumption calculated on engine nett rated powers				
Rating	g/kWh		Litres/hr	
	1500	1800	1500	1800
Standby	197	218	71	84
Prime + 10%	195	218	66	84
Prime	201	221	62	77
Baseload + 10%	204	219	57	69
Baseload	203	224	52	64
At 75% of Prime	208	226	47	58
At 50% of Prime	224	237	32	39

2306A-E14TAG2

Fuel consumption calculated on engine nett rated powers				
Rating	g/kWh		Litres/hr	
	1500	1800	1500	1800
Standby	201	208	81	91
Prime + 10%	200	208	80	93
Prime	197	211	71	86
Baseload + 10%	202	218	62	77
Baseload	204	222	56,2	70
At 75% of Prime	203	219	53	66
At 50% of Prime	213	232	38	45

2306A-E14TAG3

Fuel consumption calculated on engine nett rated powers				
Rating	g/kWh		Litres/hr	
	1500	1800	1500	1800
Standby	196	206	88	104
Prime + 10%	199	207	88	101
Prime	201	214	81	94
Baseload + 10%	195	218	66	87
Baseload	201	221	62	79
At 75% of Prime	199	222	61	72
At 50% of Prime	218	229	42	48

Note: Assumed fuel density 0,862 kg/l.

Induction system

Emissions data with combustion air temperature of 25 °C.
Maximum air intake restriction of engine:
-clean filter 2.5 kPa
-dirty filter 6.2 kPa
Air filter type Paper element Ø 381 mm

Exhaust system

Exhaust outlet size (internal)
2306A-E14TAG1 Ø 123 mm
2306A-E14TAG2 and 2306A-E14TAG3 Ø 150 mm
Exhaust back pressure for total system 6.76 kPa

Recommended exhaust pipe sizes	Up to 10 metres	10 - 20 metres	20 - 30 metres
1500 rev/min	125 mm	150 mm	150 mm
1800 rev/min	150 mm	150 mm	200 mm

For the above size, allowance has been made for a Peco maxim 31 or 41 type silencer with 2 x 90° bends up to 10 m, or 4 x 90° bends up to 20 m, or 6 x 90° bends up to 30 m.

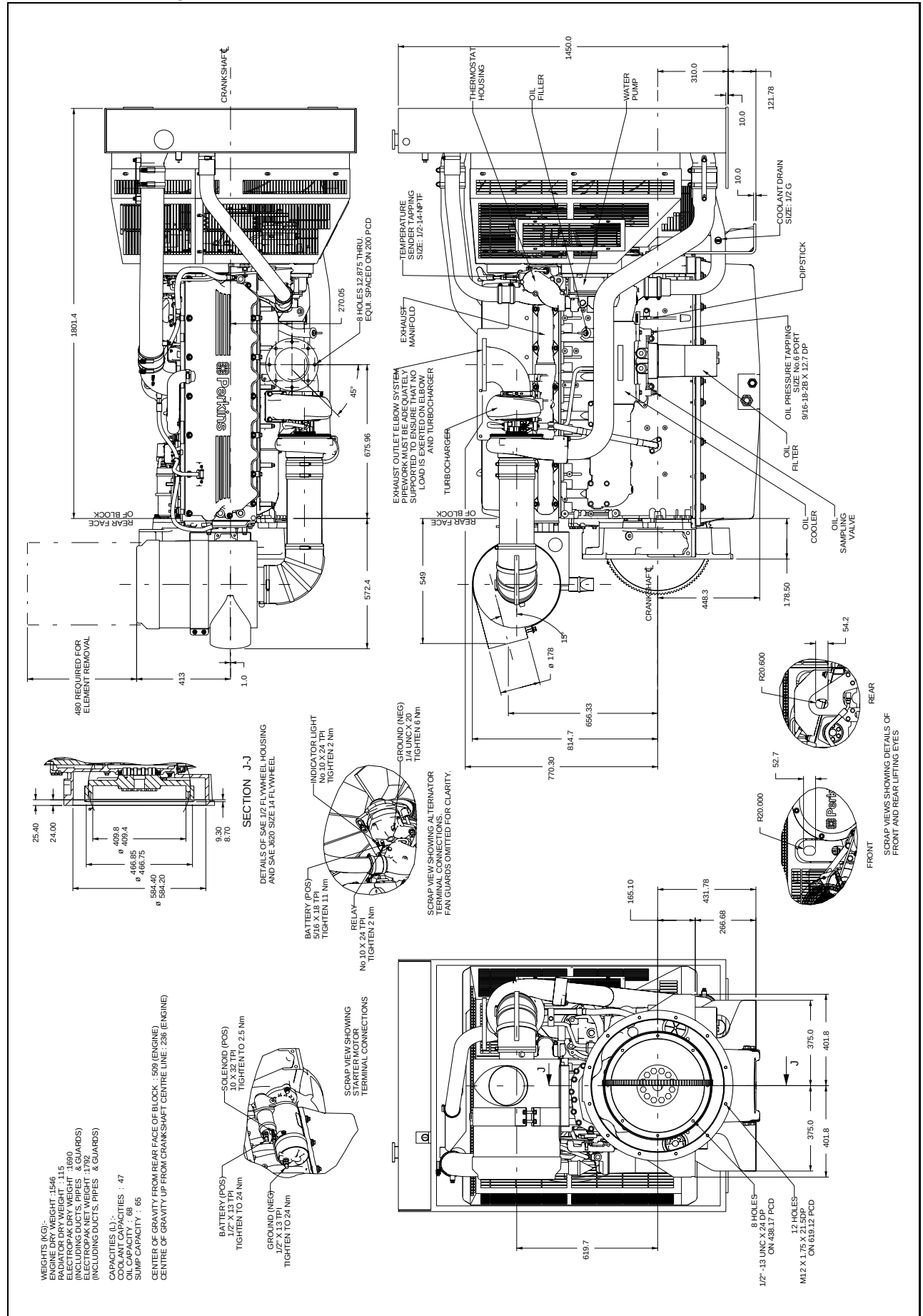
Engine mounting

Maximum bending moment at rear face
of the engine crankcase 1356 Nm
Position of centre of gravity (bare dry engine) forward
of the rear face of the crankcase 509 mm
Above crankshaft centre line 236 mm

Engine management system

- Full electronic engine management system controlling:
- Speed governing
 - Air/fuel ratio
 - Start/stop sequence
 - Engine protection and diagnostics.

Installation drawing - 2306A-E14TAG2 and 2306A-E14TAG3



Typical load acceptance**2306A-E14TAG1**

Prime %	1500 rev/min				1800 rev/min			
	Load on		Load off		Load on		Load off	
	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)
20	2,2	0,1	2,1	0,2	1,0	0,1	1,3	0,2
40	3,7	0,4	3,9	0,3	1,8	0,3	2,6	0,2
60	5,5	0,4	5,7	0,5	2,8	0,3	4,2	0,4
75	7,4	0,9	7,8	0,6	5,8	0,6	5,0	0,5
80	9,4	1,2	8,6	0,8	6,8	0,8	6,2	0,7
100	16,6	1,9	10,8	0,9	15,9	1,5	8,4	0,8

2306A-E14TAG2

Prime %	1500 rev/min				1800 rev/min			
	Load on		Load off		Load on		Load off	
	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)
20	0,5	1,5	1,0	0,5	1,5	2,0	0,5	0,5
40	0,6	1,6	1,6	1,2	1,8	2,0	0,8	1,0
60	1,5	1,8	2,3	1,6	2,2	3,1	1,5	1,7
75	2,8	2,5	2,0	2,0	3,0	3,4	1,7	2,2
80	3,6	2,5	3,5	2,5	4,4	3,5	1,8	2,2
100	7,5	5,7	4,0	2,7	6,0	3,5	2,0	2,5

2306A-E14TAG3

Prime %	1500 rev/min				1800 rev/min			
	Load on		Load off		Load on		Load off	
	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)	Transient % speed change	Speed recovery time (sec)
20	1,2	1,6	1,3	0,5	0,5	0,9	0,4	0,5
40	2,6	2,0	1,8	1,0	1,3	1,0	0,8	1,0
60	4,8	2,6	2,5	2,0	2,2	1,5	1,1	1,3
75	8,0	2,7	3,4	2,4	4,0	2,0	1,4	1,8
80	-	-	-	-	5,0	2,2	1,8	2,3
100	-	-	-	-	8,3	3,0	2,3	2,6

The above complies with requirements of Classification 3 & 4 of ISO 8528 - 12 and G2 operating limits stated in ISO 8528 - 5.

The above figures were obtained under test conditions as follows:

Engine block temperature: 45 °C

Alternator Efficiency: 92%

Minimum ambient temperature: 10 °C

Isochronous Governing

Under frequency roll off (UFRO) set to 1 Hz below rated frequency

Typical alternator inertia: 6,02 kgm²

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

The information given on Technical Data Sheets is for standard ratings only and is for guidance only. For ratings other than shown contact Perkins Engines Company Limited, Stafford.

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