

Technical Data

2300 Series

Diesel Engine - ElectropaK

2306C-E14TAG1

2306C-E14TAG2

2306C-E14TAG3

Basic technical data

Number of cylinders ... 6
 Cylinder arrangement ... Vertical, in line
 Cycle ... 4 stroke, compression ignition
 Induction system ... Turbocharged
 Compression ratio
 -2306C-E14TAG1 ... 14-6:1 nominal
 -2306C-E14TAG2 and 2306C-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 - 2306C-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	22	25	32	29,3	33,9	35,2
Exhaust gas temperature max (after turbo)	°C	390	390	400	350	360	370
Exhaust gas flow (max)	m ³ /min	55	63	74	64,4	76,5	80,7
Boost pressure ratio	-	2,3	2,8	3,2	2,6	3,0	3,2
Overall thermal efficiency	%	40,3	40,9	41,0	38,0	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 - 2306C-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	14	17	19	13	17	18
Combustion air flow	m³/min	23	29	32	31	35	36
Exhaust gas temperature max (after turbo)	°C	453	449	461	398	418	430
Exhaust gas flow (max)	m³/min	55	70	79	70	81	84
Boost pressure ratio	-	2,35	2,96	3,30	2,70	3,01	3,11
Overall thermal efficiency	%	41	41	40	40	42	42
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 - 2306C-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	15	19	22	14	18	20
Combustion air flow	m³/min	25	32	35	32	36	38
Exhaust gas temperature max (after turbo)	°C	454	462	474	401	429	453
Exhaust gas flow (max)	m³/min	60	80	87	73	84	91
Boost pressure ratio	-	2,52	3,30	3,54	2,80	3,11	3,29
Overall thermal efficiency	%	40	40	40	41	41	42
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

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.

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

Certified against the requirements of EU2007 legislation for non-road mobile machinery, powered by constant speed engines (EU 97/68/ EC Stage II). These engines also comply with the 1/2 TA Luft (1986) NOx limits of 2000 mg/nm³

Energy balance

2306C-E14TAG1

Designation	Units	1500 rev/min			1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	558	672	786	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	178	215	250	203	240	266
Energy to coolant and oil	kWt	106	110	127	114	132	135
Energy to radiation	kWt	14	15	16	13	16	16
Energy to charge coolers	kWt	34	62	80	60	85	90

2306C-E14TAG2

Designation	Units	1500 rev/min			1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	608	763	876	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	192	250	291	234	291	304
Energy to coolant and oil	kWt	108	122	135	116	136	146
Energy to radiation	kWt	15	16	17	15	17	19
Energy to charge coolers	kWt	45	62	80	65	83	91

2306C-E14TAG3

Designation	Units	1500 rev/min			1800 rev/min		
		Baseload	Prime	Standby	Baseload	Prime	Standby
Energy in fuel	kWt	662	876	985	789	953	1068
Energy in power output (gross)	kWb	270	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	215	291	329	255	304	340
Energy to coolant and oil	kWt	110	135	148	132	146	163
Energy to radiation	kWt	15	17	19	16	19	21
Energy to charge coolers	kWt	52	80	93	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 m ³ /min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
46 °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 m ³ /min	
rev/min		rev/min		rev/min	
1500	1800	1500	1800	1500	1800
41 °C	43 °C	0,20	0,20	345	396

Radiator

-face area	0,996 m ²
-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 flow	
-1500 rev/min	5,2 litres/s
-1800 rev/min	6,2 litres/s
Coolant exit temperature (Max.)	103 °C

Charge cooler, integral with radiator

Face area	0,66 m ²
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
-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

2306C-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	

2306C-E14TAG2 and 2306C-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
-maximum suction head	3 m
-maximum pressure head	4 m
Fuel filter spacing	
-primary	10 mm
-secondary	2 mm
Governor type	Electronic

Fuel consumption

2306C-E14TAG1

Fuel consumption calculated on engine net rated powers				
Rating	g/kWh		Litres/hr	
	1500	1800	1500	1800
Standby	211	218	75	84
Prime + 10%	212	218	71	84
Prime	213	221	65	77
Baseload + 10%	215	219	60	69
Baseload	217	224	55	64
At 75% of Prime	220	226	50	58
At 50% of Prime	234	237	35	39

2306C-E14TAG2

Fuel consumption calculated on engine net rated powers				
Rating	g/kWh		Litres/hr	
	1500	1800	1500	1800
Standby	213	208	86	91
Prime + 10%	213	208	84	93
Prime	212	210	75	86
Baseload + 10%	213	218	66	77
Baseload	215	222	60	70
At 75% of Prime	218	219	57	66
At 50% of Prime	229	232	40	45

2306C-E14TAG3

Fuel consumption calculated on engine net rated powers				
Rating	g/kWh		Litres/hr	
	1500	1800	1500	1800
Standby	213	206	96	104
Prime + 10%	213	207	95	101
Prime	214	214	86	94
Baseload + 10%	212	218	72	87
Baseload	213	221	64	79
At 75% of Prime	214	222	64	72
At 50% of Prime	227	229	44	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)

2306C-E14TAG1 Ø 123 mm

2306C-E14TAG2 and 2306C-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

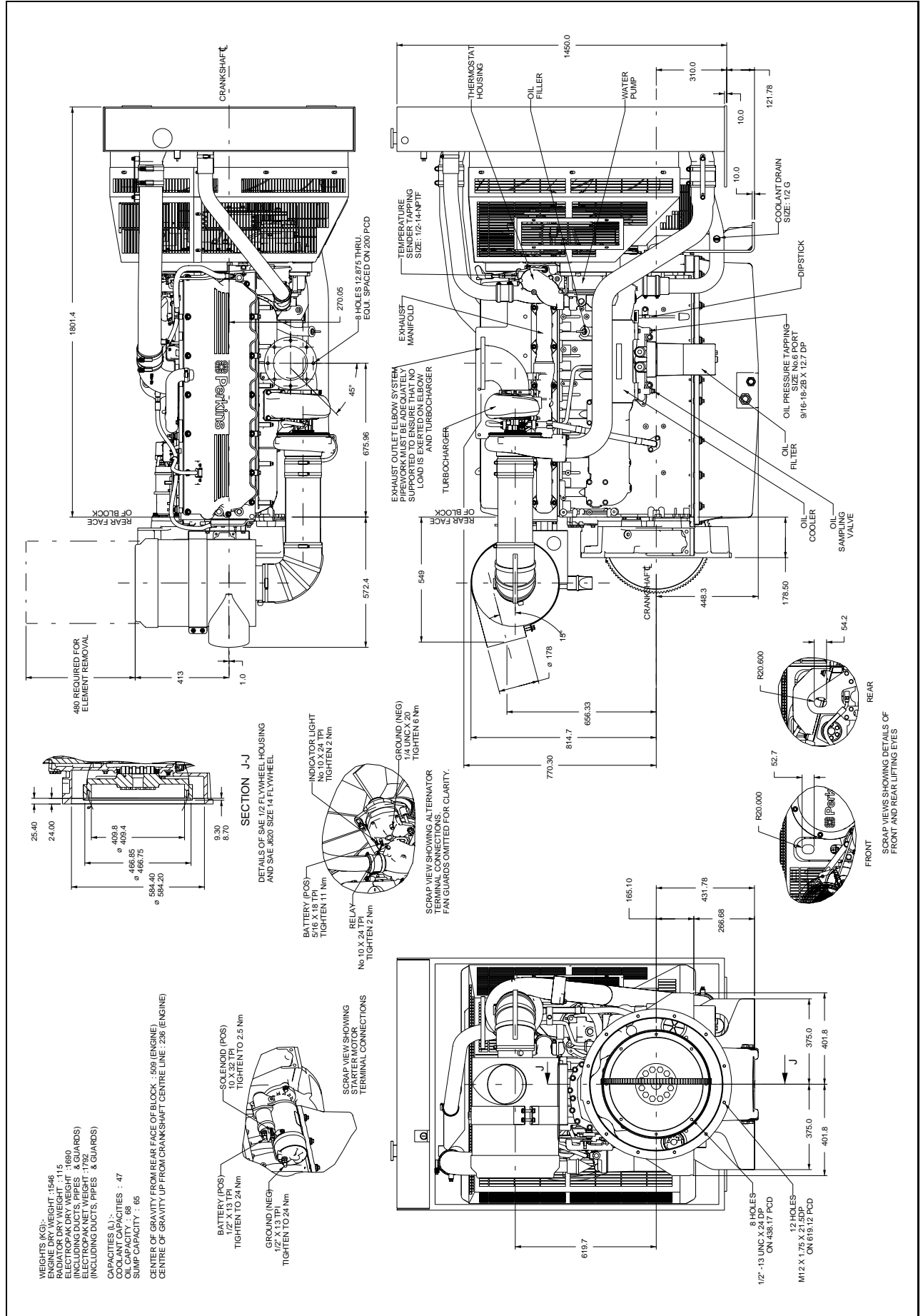
Above crankshaft centre line 236 mm

Engine management system

Full electronic engine management system controlling:

- Speed governing
- Air/fuel ratio
- Start/stop sequence
- Engine protection and diagnostics.

Installation drawing - 2306C-E14TAG2 and 2306C-E14TAG3



Typical load acceptance

2306C-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

2306C-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	0,5	1,5	2	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

2306C-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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