

TS90, TS100, TS110 REPAIR MANUAL CONTENTS

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SECTION 1

GENERAL INFORMATION

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ENGINE SPECIFICATIONS

Model		TS80	TS90	TS90	TS100	TSS110
(T=Turbocharged)		N/A	N/A	N/A	TURBO	TURBO
Emissionised		NO	NO	YES	YES	YES
No of Cylinders		4 (450 NF)	4 (450 NA)	4 (450 NE)	4 (450 T/PF)	4 (450 T/PD)
Bore	mm	111.8	111.8	111.8	111.8	111.8
	ins	4.4	4.4	4.4	4.4	4.4
Stroke	mm	127.0	127.0	127.0	127.0	127.0
	ins	5.0	5.0	5.0	5.0	5.0
Displacement	cu cm	4987	4987	4987	4987	4987
	cu in	304	304	304	304	304
Compression Ratio		17:5-1	17:5-1	17:5-1	17:5-1	17:5-1
Cylinder Bore Compression at cranking speed of 200 R.P.M	bar	25.5	25.5	25.5	25.5	25.5
	lbs in ²	375	375	375	375	375
Firing Order		1342	1342	1342	1342	1342
Idle Speed Revs/min $\pm$ 50		750	750	750	750	750
Maximum no Load Speed Revs/min		2320	2320	2320	2320	2320
Rated Engine Speed		2170	2170	2170	2170	2070

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SECTION 1 – GENERAL INFORMATION

CYLINDER BLOCK

Taper of Cylinder Bore	0.025mm (0.001 in) Repair Limit 0.127mm (0.005 in) Wear Limit
Cylinder Bore out of Round	0.03mm (0.0015 in) Repair Limit 0.127mm (0.005 in) Wear Limit
Cylinder Bore Diameters	111.778–111.841mm (4.4007–4.4032 in)
Rear Oil Seal Bore Diameter	140.77–140.87mm (5.542–5.546 in)
Block to Head Surface Flatness	0.08mm (0.003 in) in any 152mm (6 in) 0.03mm (0.001 in) in any 25.40mm (1 in)

CYLINDER HEAD

Valve Guide Bore Diameter	9.469–9.495mm (0.3728–0.3738 in)
Head to Block Surface Flatness	0.03mm (0.001 in) in any 25.4mm (1 in), or 0.127mm (0.005in) overall limit

EXHAUST VALVES

Face Angle	44°15'–44°30' Relative to the Head of Valve
Stem Diameter	Std :9.401–9.421mm (0.3701–0.3709 in) 0.076mm (0.003 in) Oversize :9.477–9.497mm (0.3731–0.3739 in) 0.38mm (0.015 in) Oversize :9.781–9.802mm (0.3851–0.3859 in) 0.030 in (0.76mm) Oversize :10.163–10.183mm (0.4001–0.4009 in)
Head Diameter	42.88–43.13mm (1.688–1.698 in)
Stem to Guide Clearance	0.048–0.094mm (0.0019–0.0037 in)
Lash Clearance (Cold)	0.43–0.53mm (0.017–0.021 in)

INTAKE VALVES

Face Angle	29°15'–29°30' Relative to Head of Valve
Stem Diameter	Std :9.426–9.446mm (0.3711–0.3719 in) 0.076mm (0.003 in) Oversize :9.502–9.522mm (0.3741–0.3749 in) 0.381mm (0.015 in) Oversize :9.807–9.827mm (0.3861–0.3869 in) 0.762mm (0.030 in) Oversize :10.188–10.208mm (0.4011–0.4019 in)
Head Diameter	47.37–47.63mm (1.865–1.875 in)
Stem to Guide Clearance	0.023–0.069mm (0.0009–0.0027 in)
Lash Clearance (Cold)	0.36–0.46mm (0.014–0.018 in)

VALVE SPRINGS

Number per Valve	1
Free Length	60.7mm (2.39 in)
Length, loaded at 27.7–31.3kg (61.69 lb)	48.26mm (1.900 in)
Length, loaded at 61–69kg (135–153 lb)	35.69mm (1.405 in)

SECTION 1 – GENERAL INFORMATION

VALVE TIMING

Intake Opening	12° Before Top Dead Centre
Intake Closing	38° After Bottom Dead Centre
Exhaust Opening	48° Before Bottom Dead Centre
Exhaust Closing	12° After Top Dead Centre

VALVE INSERTS

Insert Oversize	Exhaust Valve Insert Counter bore Diameter in Cylinder Head	Intake Valve Seat Insert Counter bore Diameter in Cylinder Head
0.254mm (0.010 in)	44.17–44.20mm (1.739–1.740 in)	50.01–50.04mm (1.969–1.970 in)
0.508mm (0.020 in)	44.42–44.45mm (1.749–1.750 in)	50.27–50.29mm (1.979–1.980 in)
0.762mm (0.030 in)	44.68–44.70mm (1.759–1.760 in)	50.52–50.55mm (1.989–1.990 in)

VALVE SEATS

Exhaust Valve Seat Angle	45°00' – 45°30'
Intake Valve Seat Angle	30°00' – 30°30'
Interference Valve Face Angle to Valve Seat Angle	0°30' – 1°15'
Concentricity With Guide Diameter	0.051mm (0.002 in) Total Indicator Reading Max
Seat Width Exhaust Valve	1.8–2.3mm (0.072–0.092 in)
Intake Valve	1.9–2.5mm (0.078–0.098 in)

CAMSHAFT IDLER GEAR

Number of teeth	47
End Play	0.076–0.35mm (0.003–0.014 in)
Bushing Inside Diameter	50.813–50.838mm (2.005–2.0015 in)
Adaptor Outside Diameter	50.762–50.775mm (1.9985–1.9990 in)
Backlash with Crankshaft Gear	0.15–0.46mm (0.006–0.018 in)
Backlash with Camshaft Gear	0.025–0.381mm (0.001–0. 015 in)
Backlash with Fuel Injection Pump	0.10–0.15mm (0.004–0.006 in)

CAMSHAFT GEAR

Number of Teeth	52
Timing Gear Backlash	0.025–0.38mm (0.001–0.015 in)

SECTION 1 – GENERAL INFORMATION

ROCKER ARM SHAFT

Shaft Diameter	25.40–25.43mm (1.000–1.001 in)
Shaft Support Internal Diameter	25.45–25.20mm (1.002–1.004 in)

ROCKER ARM

Inside Diameter	25.48–25.50mm (1.003–1.004 in)
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TAPPETS

Clearance to Bore	0.015–0.053mm (0.0006–0.0021 in)
Tappet Diameter	25.118–25.130mm (0.9889–0.9894 in)
Tappet Bore Diameter	25.15–25.17mm (0.9900–0.9910 in)

CAMSHAFT

Bearing Journal Diameter	60.693–60.719mm (2.3895–2.3905 in)
Bearing Clearance	0.025–0.076mm (0.0010–0.0030 in)
End Play	0.051–0.18mm (0.0020–0.0070 in)

CONNECTING RODS

Small End Bushing (Internal Diameter)	
Normally Aspirated	38.113–38.120mm (1.5005–1.5008 in)
Turbocharged	41.288–41.259mm (1.6255–1.6258 in)
Clearance Bushing to Piston Pin	0.013–0.025mm (0.0005–0.0010 in)
Side Float	0.13–0.33mm (0.0050–0.0130 in)
Maximum Twist	0.30mm (0.0120 in)
Maximum Bend	0.10mm (0.0040 in)

PISTON PIN

Outside Diameter	
Normally Aspirated Engine	38.095–38.100mm (1.4998–1.5000 in)
Turbocharged Engine	41.270–41.275mm (1.6248–1.6250 in)

PISTONS

Skirt to Cylinder Clearance	
Naturally Aspirated	0.140–0.171mm (0.0055–0.0067 in) – <i>New, unrun engines</i> 0.140–0.28mm (0.0055–0.011 in) – <i>Run engines</i>
Skirt to Cylinder Clearance	
Turbocharged	0.162–0.188mm (0.0064–0.0074 in) – <i>New, unrun engines</i> 0.162–0.28mm (0.0064–0.011 in) – <i>Run engines</i>
Taper (Out of Round)	0.063–0.127mm (0.0025–0.0050 in)
Grading Diameter (at Right Angles to Piston Pin)	111.64–111.74mm (4.3951–4.3991 in) 0.0127mm (in increments of 0.0005 in)
Piston Pin Clearance	0.0030–0.0140mm (0.00012–0.00055 in) at 21°C (70°F)
Piston Crown to Block Face,	
Naturally Aspirated	0.28–0.58mm (0.011–0.023 in)
Turbocharged	0.0–0.3mm (0.0–0.012 in)

SECTION 1 - GENERAL INFORMATION

PISTON RINGS

Compression rings, Number and Location	2 off -1st and 2nd from the top of the piston
Naturally Aspirated, Top Compression Ring 2nd Compression Ring	Parallel Sides-Inner Chamfer or no Chamfer Straight Face-Inner Step
Turbocharged, Top Compression Ring 2nd Compression Ring	Keystone Tapered With Internal Chamfer to Top Straight Face-Inner Step
Oil Control, Number and Location Type	1 off,-Directly above the Piston Pin, Slotted With Expander
Side Face Clearance To Ring Groove, Top Compression Ring 2nd Compression Ring Oil Control Ring	0.112-0.155mm (0.0044-0.0061 in) 0.099-0.142mm (0.0039-0.0056 in) 0.061-0.104mm (0.0024-0.0041 in)
Gap Width, Top Compression Ring 2nd Compression Ring Oil Control Ring	0.38-0.84mm (0.015-0.033 in) 0.66-1.12mm (0.026-0.044 in) 0.38-0.84mm (0.015-0.033 in)

CRANKSHAFT

Main Journal Diameter-	85.631mm (3.3713 in) 85.656mm (3.3723 in)
Main Journal Length (except thrust, rear, or intermediate)	36.96-37.21mm (1.455-1.465 in)
Main Journal Wear Limits	0.127mm (0.005 in) Maximum
Main and Crankpin Fillet Radius	3.048-3.556mm (0.12-0.14 in)
Thrust Bearing Journal Length	37.06-37.11mm (1.459-1.461 in)
Intermediate Bearing Journal Length	36.96-37.21mm (1.455-1.465 in)
Rear Bearing Journal Length	37.97-38.48mm (1.495-1.515 in)
Crankpin Journal Length	42.62-42.72mm (1.678-1.682 in)
Crankpin Diameter	69.840-69.850mm (2.749-2.7500 in)
End Play	0.10-0.20mm (0.004-0.008 in)
Crankpin Out of Round	0.005mm (0.0002 in) Total Indicator Reading
Taper Surface Parallel to Centre Line of Main Journal	0.005mm (0.0002 in)
Crankshaft Rear Oil Seal Journal Diameter	122.12-122.28mm (4.808-4.814 in)
Crankshaft Pulley Journal Diameter	44.45-44.48mm (1.750-1.751 in)
Crankshaft Timing Gear Journal Diameter	46.23-46.25mm (1.820-1.821 in)
Crankshaft Flange Runout	0.038mm (0.0015 in) Maximum

SECTION 1 – GENERAL INFORMATION

CRANKSHAFT DRIVE GEAR

Number of teeth	26
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MAIN BEARING

Liner length (except thrust liner)	27.94–28.19mm (1.10–1.11 in)
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Liner Length (Thrust Liner)	39.91–39.96mm (1.453–1.455 in)
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Vertical Assembled Bearing Clearance	0.055–0.117mm (0.0021–0.0046 in)
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CRANKPIN BEARINGS

Liner Length	35.56–35.81mm (1.40–1.41 in)
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Vertical Assembled Bearing Clearance	0.035–0.094mm (0.0014–0.0037 in)
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CRANKSHAFT RE-GRINDING

When re-grinding a crankshaft the main and crankpin journal diameters should be reduced the same amount as the undersize bearings used, and the following dimensions apply. The rear end of the crankshaft should be located on the 60° Chamfer of the pilot bearing bore.

UNDERSIZE BEARING AVAILABLE

0.051mm (0.002 in)

0.254mm (0.010 in)

0.508mm (0.020 in)

0.762mm (0.030 in)

1.016mm (0.040 in)

UNDERSIZE BEARING AVAILABLE

0.051mm (0.002 in)

0.254mm (0.010 in)

0.508mm (0.020 in)

0.762mm (0.030 in)

1.016mm (0.040 in)

BALANCER

Gear Backlash	0.05–0.25mm (0.002–0.010 in)
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Shaft to bushing clearance	0.0127.0–0.038mm (0.0005–0.0015in)
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Shaft Diameter	25.133–25.40mm (0.9895–1.000 in)
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Backlash between balancer / crankshaft gear	0.05–0.20mm (0.002–0.008 in)
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End float balancer gear to support	0.20–0.51mm (0.008–0.020 in)
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FLYWHEEL

Ring Gear Runout	0.63mm (0.025 in)
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Flywheel Runout	0.27mm (0.005 in)
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Maximum depth to be skimmed from face	3 mm (0.118 in)
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MAIN JOURNAL DIAMETERS

85.580–85.593mm (3.3693–3.3698 in)

85.390–85.402mm (3.3618–3.3623 in)

85.136–85.148mm (3.3518–3.3523 in)

84.882–84.894mm (3.3418–3.3423 in)

84.628–84.640mm (3.3318–3.3323 in)

CRANKPIN JOURNAL DIAMETERS

69.789–69.799mm (2.7476–2.7480 in)

69.956–69.606mm (2.7400–2.7404 in)

69.342–69.352mm (2.7300–2.7304 in)

69.088–69.098mm (2.7200–2.7204 in)

68.834–68.844mm (2.7100–2.7104 in)

SECTION 1 – GENERAL INFORMATION

OIL PUMP

Rotor Clearance	0.025–0.15mm (0.001–0.006 in)
Rotor to Pump Housing Clearance	0.15–0.28mm (0.006–0.011 in)
Rotor End Play	0.025–0.089mm (0.001–0.0035 in)
Oil Pressure	1.24 bar (18 lbs in ²) minimum at idle speed, 2.76 bar (40 lbs in ²) minimum at rated speed
Pump Gear to Camshaft Gear Backlash	0.40–0.56mm (0.016–0.022 in)

OIL FILTER SUPPORT

Relief Valve, Operating Pressure	4.0 bar (59 lb in ²)
Flow Rate	68 litres/min (15 imp gals/min) 18 US gals/min
Relief Valve, Spring Free Length	52.8mm (2.08 in)

Temperature	Oil Viscosity and Type	API Classification	Engine Oil & Filter Change Period (hours)
-12°C (Below 10°F)	Low Ash , SAE 5W or Low Ash SAE 5W/20 or SAE 10W-30	SF/CD / CF-4	150 150 150
-12°C to 4°C (10°F to 40°F)	Low Ash , SAE 10W Series 3 or SAE 10W-30	SF/CD / CF-4	150 300
0°C to 32°C (32°F to 90°F)	Low Ash , SAE 30W Series 3 or SAE 10W-40	SF/CD / CF-4	300 300
Above 24°C (75°F)	Low Ash , SAE 30W Series 3 or SAE 15W-40	SF/CD / CF-4	300

NOTE: When using diesel fuel with a sulphur content below 1.0%, Series 3 diesel engine oil with an A.P.I. classification of CD may be used instead of CF-4 oil , but the oil and filter interval must be reduced to 150 hours .

When using diesel fuel with a sulphur content between 1% and 1.3% use only oils listed above but reduce the oil and filter change period to every 50 hours .

ENGINE OIL CAPACITIES (With Oil Filter)

Model	Litres	Imp Gals	U.S. Gals
4 CYL	11.4	2.5	3.0

THERMOSTAT

Opening Temperature	79–83°C (174–181°F)
Fully Open	93–96°C (199–205°F)

RADIATOR CAP

Opening Pressure	0.9 bar (13 lbs in ²)
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WATER PUMP

Type	Centrifugal
Drive	Multi V Belt

SECTION 1 - GENERAL INFORMATION

COOLING SYSTEM CAPACITIES

Model	Litres	Imp gals	U.S. gals
4 CYL (with cab)	16	3.5	4.2
4 CYL (less cab)	14.5	3.2	3.8

COOLING FLUID

Content Mixture - Use Anti-freeze (50%) plus clean, soft water (50%)
 Type Ambra Agriflu (NH 900 A)

MINIMUM HARDWARE TIGHTENING TORQUES

IN FOOT POUNDS (NEWTON-METERS) FOR NORMAL ASSEMBLY APPLICATIONS

INCH HARDWARE AND LOCKNUTS

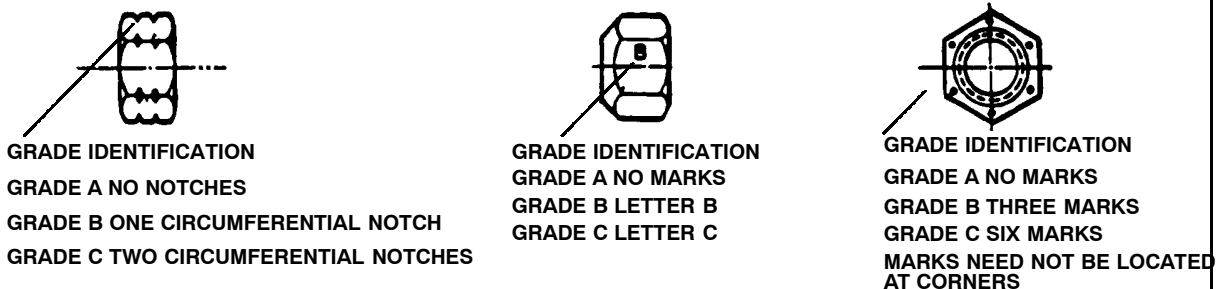
NOMINAL SIZE	SAE GRADE 2		SAE GRADE 5		SAE GRADE 8		LOCKNUTS		NOMINAL SIZE
	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	UNPLATED or PLATED SILVER	PLATED W/ZnCr GOLD	GR.B w/GR5 BOLT	GR.C w/GR8 BOLT	
1/4	55* (6.2)	72* (8.1)	86* (9.7)	112* (13)	121* (14)	157* (18)	61* (6.9)	86* (9.8)	1/4
5/16	115* (13)	149* (17)	178* (20)	229* (26)	250* (28)	324* (37)	125* (14)	176* (20)	5/16
3/8	17 (23)	22 (30)	26 (35)	34 (46)	37 (50)	48 (65)	19 (26)	26 (35)	3/8
7/16	27 (37)	35 (47)	42 (57)	54 (73)	59 (80)	77 (104)	30 (41)	42 (57)	7/16
1/2	42 (57)	54 (73)	64 (87)	83 (113)	91 (123)	117 (159)	45 (61)	64 (88)	1/2
9/16	60 (81)	77 (104)	92 (125)	120 (163)	130 (176)	169 (229)	65 (88)	92 (125)	9/16
5/8	83 (112)	107 (145)	128 (174)	165 (224)	180 (244)	233 (316)	90 (122)	127 (172)	5/8
3/4	146 (198)	189 (256)	226 (306)	293 (397)	319 (432)	413 (560)	160 (217)	226 (306)	3/4
7/8	142 (193)	183 (248)	365 (495)	473 (641)	515 (698)	667 (904)	258 (350)	364 (494)	7/8
1	213 (289)	275 (373)	547 (742)	708 (960)	773 (1048)	1000 (1356)	386 (523)	545 (739)	1

NOTE: Torque values shown with * are inch pounds.

IDENTIFICATION CAP SCREWS AND CARRIAGE BOLTS



LOCKNUTS



SECTION 1 - GENERAL INFORMATION

TORQUE VALUES - VARIOUS	Nm	lbf ft	Kgf m
Main Bearing Bolts	197	145	20.0
Connecting Rod Bolts	149	110	15.2
Cylinder Head Bolts (with Engine Cold)	217	160	22.0
Intake Manifold-to-Cylinder Head	35	26	3.5
Exhaust Manifold-to-Cylinder Head	38	28	3.9
Exhaust Pipe-to-Flange	31	23	3.2
Flywheel-to-Crankshaft	197	145	20.0
Oil Pan Drain Plug	41	30	4.2
Valve Rocker Cover Bolts	24	18	2.4
Crankshaft Pulley-to-Crankshaft	224	210	23.0
Self-Locking Screw - Valve Rocker Arm	24	18	2.4
Injector Attachment Bolts	23	17	2.3
Cover Bolts	31	23	3.1
Oil Pump to Block	23	17	2.3
Water Pump-to-Cylinder Block	48	35	3.6
Water Pump Cover-to-Pump	27	20	2.8
Oil Pan-to-Cylinder Block (Cast)	38	28	3.9
Injector Line Nuts	24	18	2.4
Leak-off Tube Banjo Fitting Bolts	11	8	1.1
Injection Pump-to-Front Cover	24	18	2.4
Camshaft Idler Drive Gear-to-Block	237	175	24.0
Front Cover-to-Cylinder Block	24	18	2.4
Thermostat Housing Bolts	24	18	2.4
Camshaft Gear Bolt	69	51	7.0
Camshaft Rear Gear Plate Bolts	47	35	4.8
Oil Filter Adaptor Bolts	42	31	4.2
Oil Filter Mounting Bolt Insert	34	25	3.5
Starting Motor-to-Rear Adaptor Plate	31	23	3.2
Injection Pump-to-Gear Nut	79	58	8.0
Oil Pressure Switch Assembly	31	23	3.2
Turbocharger-to-Exhaust Manifold Nut	44	33	4.5
Fan Blade to Support Body	27	21	2.8
Crankshaft Rear Oil Seal Retainer -			
Initial Tightening	12	9	1.2
Final Tightening	23	17	2.3
Belt Tensioner Pulley Bolt	54	40	5.5
Temperature Senders	20	15	2.0
Tensioner to Water Pump Bolt	54	40	5.5
Idler Pulley Bolt	54	40	5.5
Pump Connector to Block	24	18	2.4

SECTION 1 - GENERAL INFORMATION

CYLINDER BLOCK PLUG TORQUES	Nm	lbf ft	Kgf m
1/4 in-27 NPT	11	8	1.1
1/4 in-18 NPT	29.8	22	3.0
3/4 in-18 NPT	38	28	3.8
3/4 in-14 NPT	27	20	2.7

COOLING

THERMOSTAT

Opening Temperature
Fully Open

79-83°C (174-181°F)
93-96°C (199-205°F)

RADIATOR CAP

Opening Pressure

0.9 bar (13 lbs in²)

WATER PUMP

Type
Drive

Centrifugal
Multi 'V'

COOLING SYSTEM CAPACITIES

Model	Litres	Imp Gals	U.S. Gals
4 CYL with cab	16	3.5	4.2
4 CYL less cab	14.5	3.2	3.8

COOLING FLUID

Content Mixture - Water 50%, Antifreeze 50% . If the recommended antifreeze is not used, a heavy duty antifreeze must be used with a 5% solution of Inhibitor. This inhibitor must be added to the cooling system and is available from Dealers Part No FW 15.

SECTION 1 - GENERAL INFORMATION

TORQUES

TORQUE VALUES - VARIOUS	Nm	lbf ft	Kgf m
Water Pump-to-Cylinder Block	48	35	3.6
Water Pump Cover-to-Pump	27	20	2.8
Thermostat Housing Bolts	24	18	2.4
Fan Blade to Support Body	27	21	2.8
Temperature Senders	20	15	2.0

LUBRICATION

Oil Pump

Rotor Clearance	0.025–0.15mm (0.001–0.006 in)
Rotor to Pump Housing Clearance	0.15–0.28mm (0.006–0.011 in)
Rotor End Play	0.025–0.089mm (0.001–0.0035 in)
Oil Pressure	1.24 bar (18 lb/in ²) minimum at idle speed, 2.76 bar (40 lb/in ²) minimum at rated speed
Pump Gear to Camshaft Gear Backlash	0.40–0.56mm (0.016–0.022 in)

Oil Filter Support

Relief Valve, Operating Pressure	4.0 bar (59 lbs in ²)
Flow Rate	68 litres/min (15 imp gals/min) 18 US gals/min

Oil Type

Temperature	Oil Viscosity and Type	API Classification	Engine Oil & Filter Change Period (hours)
-12°C (Below 10°F)	Low Ash , SAE 5W or Low Ash SAE 5W/20 or SAE 10W-30	CF-4/SG	150 150 150
-12°C to 4°C (10°F to 40°F)	Low Ash , SAE 10W Series 3 or SAE 10W-30	CF-4/SG	150 300
0°C to 32°C (32°F to 90°F)	Low Ash , SAE 30W Series 3 or SAE 10W-40	CF-4/SG	300 300
Above 24°C (75°F)	Low Ash , SAE 30W Series 3 or SAE 15W-40	CF-4/SG	300

SECTION 1 - GENERAL INFORMATION

When using diesel fuel with a sulphur content between 1% and 1.3% use only oils listed above but reduce the oil and filter change period to every 50 hours .

ENGINE OIL CAPACITIES (With Oil Filter)

Model	Litres	Imp Gals	U.S Gals
4 CYL	11.4	2.5	4.8

TORQUE VALUES

TORQUE VALUES - VARIOUS	Nm	lbf ft	Kgf m
Oil Pan Drain Plug	41	30	4.2
Oil Pump to Block	23	17	2.3
Oil Filter Adaptor Bolts	42	31	4.2
Oil Filter Mounting Bolt Insert	34	25	3.5
Oil Pressure Switch Assembly	31	23	3.2
Idler Pulley Bolt	54	40	5.5
Pump Connector to Block	24	18	2.4

FUEL GENERAL

Turbocharger type:

Garrett T250

LUCAS C.A.V. pump

Type

DPS or DPS 200 Series, integral speed governor and advance device

SECTION 1 - GENERAL INFORMATION

Fuel System - General	MODEL				
	8×2	16×4	12×12	24×24	16×16
Fuel Tank Capacity	130 litres 28 imp. galls 34 U.S. galls		160 litres 35 imp. galls 42 U.S. galls		
Fuel Filter Type	Single Disposable Element and Separator				
Fuel Filter Change Interval	600 hours	600 hours	600 hours	600 hours	600 hours
Injector Nozzle Opening Pressure Reset at	DPS = 240-250 bar (3480-3590 lbs in ²) 225 bar (3260 lbs in ²)		DP200 = 290 - 300 bar (4230-4350 lbs in ²) -275 bar (-3990 lbs in ²)		
Injection Pump Type	DPS Distributor	DPS Distributor	DP203 Distributor	DP203 Distributor	DP203 Distributor
Pump Rotation Firing Order	Clockwise 1342	Clockwise 1342	Clockwise 1342	Clockwise 1342	Clockwise 1342
Injector Change Interval	1200 hours	1200 hours	1200 hours	1200 hours	1200 hours
Maximum No-Load Speed	2320 (except TS110 Turbo = 2220)				
Idle Speed ± 50	750	750	750	750	750
Rated Speed	2170 (except TS110 Turbo = 2070)				

TORQUE VALUES

DESCRIPTION	N·m	ft. lbs.	kgf/m
Throttle Cable Locknuts	50	37	5.1
Throttle Lever Stop Bolt Locknut	10	7	1.0
Fuel Tank Strap Retaining Nut	2.5	1.8	0.25
Fuel Tank Strap Locknut	25	18	2.5
Fuel Tank Shutoff Valve	14	10	1.4
Fuel Tank Leak-Off Elbow	14	10	1.4
Leak-Off Pipe to Elbow	24	18	2.4
Thermostart Plug	37	27	3.8
Thermostart Pipe Union	10	7	1.0
Leak-Off Pipe to Injector Line	24	18	2.4
Fuel Tank Sender Retaining Screws	2.5	1.8	0.25
Fuel Filter Element Retaining Bolt	10	7	1.0
Fuel Filter Retaining Bolts	30	22	3.1
Exhaust Muffler Retaining Clamp	35	26	3.6
Air Cleaner Retaining Bolts	55	40	5.6
Air Cleaner Hose Clamps	2.5	1.8	0.25
Air Cleaner Restriction Indicator Switch	12	9	1.2

AIR CLEANERS

AIR CLEANER

Type	Dry, Dual Element
Change Interval	600 hours (or more frequently when operating in adverse conditions)
Type	Oil Bath
Service Interval	10 and 50 hours
Oil Type	API CF-4 15G

TORQUE VALUES

DESCRIPTION	ft. lbs.	N·m	kgf/m
Air Cleaner Retaining Bolts	40	55	5.6
Air Cleaner Hose Clamps	1.8	2.5	0.25
Air Cleaner Restriction Indicator Switch	9	12	1.2

ELECTRIC LIFT PUMP

Type	Filter head mounted 12 volt supply Electric Lift Pump
Pump operation	Mechanically Actuated
Output Pressure at 2000 revs/min	0.27-0.47 bar (3-6 lbs in ²)



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INJECTORS

INJECTORS

LUCAS C.A.V.

Adjustment	Variable
Quantity, nozzle holes	5 Hole
Pressure Setting	240–250 bar (3480–3590 lbs in ²) (non emissionized). 290–300 bar (4230–4350 lbs in ²) (emissionized)
Injector change interval	1200 hours

TORQUE VALUES

Application	Nm	ft. lbs.	kgf/m
Injector Nozzle Retaining Nut	48	35	4.9
Injector Retaining Bolts	22	17	2.2
Injector Leak-Off Line Banjo Bolts	12	10	1.2
High Pressure Gland Nuts at Injector	32	23	3.3
High Pressure Gland Nuts at Fuel Pump	33	23	3.3

INJECTION PUMP

LUCAS C.A.V. pump

Type DPS/DP203	Series Distributor type, integral speed governor and advance device
Pump rotation	Clockwise
Firing order	1342

Model	TS80	TS90	TS90	TS100	TS110
Pump Type	DPS	DPS	DP203	DP203	DP203
Engine Timing BTDC Engine Position	-	-	28°	28°	28°
Pump Timing, Locking Bolt Position Overcheck	-	-	29°	29°	29°
Pump Scribe Mark to Engine Plate Timing Mark	0°	0°	-	-	-
Pump Internal Timing	262	263	-	-	-

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