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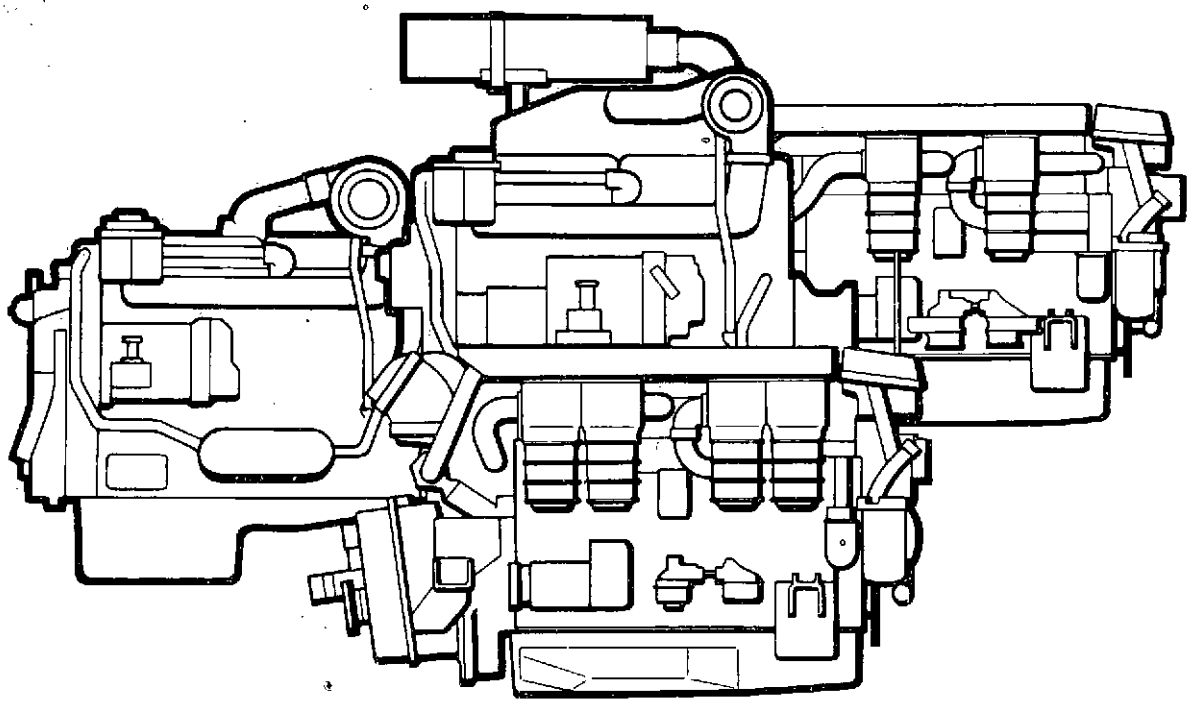
WORKSHOP MANUAL

Industrial diesel engines

TD61A, -ACE, -AG, -AP, -AW
TID61AG
TD71A, -ACE, -AG, -AP, -AW
TID71A, -AG, -AP

Marine diesel engines

TAMD61A
TAMD71A



VOLVO

Contents

Explanation of engine designations

T = Turbocharger
A = "Aftercooler" (charge air cooler, marine engines)
I = "Intercooler" (charge air cooler, industrial engines)
M = Marine engine
D = Diesel engine
6, 7 = Swept volume (6 and 7 litres)
1 = Number of generation
A = Series designation
CE = "Construction equipment"
G = Generator set engine
P = "Power-Pack"
W = "Wastegate" (relief valve) – mobile version

TECHNICAL DATA

General

	61 series	71 series
Number of cylinders	6	6
Bore	98.425 mm (3.875")	104.77 mm (4.125")
Stroke	120 mm (4.724")	130 mm (5.118")
Displacement, total	5.48 dm^3 (litres) (334 in^3)	6.73 dm^3 (litres) (411 in^3)
Compression ratio, industrial engines	15:1	14.5:1
marine engines	15:1	14:1
Compression pressure at starter motor speed:		
industrial engines	2.2 MPa (22 kp/cm^2) (313 p.s.i.)	2.2 MPa (22 kp/cm^2) (313 p.s.i.)
marine engines	2.1 MPa (21 kp/cm^2) (299 p.s.i.)	2.2 MPa (22 kp/cm^2) (313 p.s.i.)
Order of firing (No. 6 cylinder nearest to flywheel)	1-5-3-6-2-4	
Direction of rotation (viewed from front)	Clockwise	
Output	See applicable engine diagram	
Torque	See applicable engine diagram	
Weight, engine without reverse gear or clutch, approx.:		
TD61AP and T(I)D71AP	870 kg (1918 lbs)	1022 kg (2253 lbs)
other T(I)D61 and T(I)D71 models	630 kg (1389 lbs)	760 kg (1675 lbs)
TAMD61A and TAMD71A	770 kg (1698 lbs)	900 kg (1984 lbs)
Low idle	See appropriate adjustment data in the Service Bulletin file)	
Governor overrun/high idle		

* Appr. 300 rpm. Use Moto-Meter compression meter with a non-return valve.

Turbocharger

Make:		
TD61A, -ACE, -AP and TD71AG, TID71AG	Holset	
other industrial engines	Garrett AiResearch	
Marine engines	K.K.K. (Kühnle, Kopp & Kausch)	
Type:		
TD61A,-ACE,-AP* and TD71AG	H2A 8243AB/H16JA8	
TD61AG, TID61AG and TID71AG	T31/50/0.82A/R/57T	H2A 8253AB/H16JA8
TD61AW and TD71AW	T31/60/0.48 LTRIM	
TD71A, -ACE, -AP	–	T04E/44/1.15–76
TID71A, -AP	–	T04E/46/1.15A/R/76T
TAMD61A and TAMD71A	K27-3467 MOA 12.71	
Lubricating system	Pressure lubrication from engine	
Cooling (applies to marine engines)	Fresh-water cooled turbine housing	
Axial clearance:		
Holset	0.10–0.16 mm (0.0039–0.0063")	
Garrett AiResearch	0.03–0.10 mm (0.0012–0.0039")	
K.K.K.	max. 0.16 mm (0.0063")	
Radial clearance:		
Holset H1C	0.30–0.46 mm (0.0118–0.0181")	
Holset H2A	0.31–0.47 mm (0.0122–0.0185")	
Garrett AiResearch (measured on the shaft between the bearings)	0.08–0.17 mm (0.0031–0.0067")	
K.K.K. (turbine side)	max. 0.46 mm (0.018")	
TD61AW, TD71AW:		
The Wastegate valve should start opening at a charging pressure of	99–105 kPa (1.01–1.07 kp/cm^2) (14.3–15.3 p.s.i)	77–83 kPa (0.79–0.85 kp/cm^2) (11.1–12.1 p.s.i.)

* Earlier version: H1C 7284Z/E21 F11.

Charging pressure

Charging pressure, min. values (measured at engine intake manifold) with 100 % load and full throttle and approx. +20°C (68°F) air temperature. If the measuring is done at other temperature, the measured turbo pressure must be corrected according to the diagram on page 103 in the Workshop Manual for 60 and 70 series engines.

If full output cannot be obtained the pressure will be considerable lower.

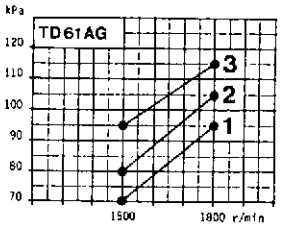
Curve 1: Output according to curve 3 in the engine diagram or point 1 in the overrun curve (industrial engines), and heavy duty, output curve HD (marine engines).

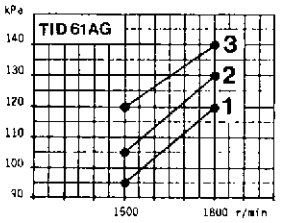
Curve 2: Output according to curve 2 in the engine diagram or point 2 in the overrun curve (industrial engines), and medium duty, output curve MD (marine engines).

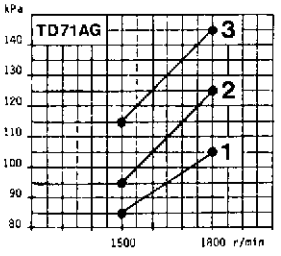
Curve 3: Output according to point 3 in the overrun curve (industrial engines), and light duty, output curve LD (marine engines).

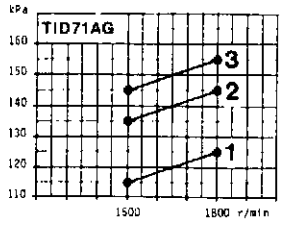
100 kPa ≈ 1 kp/cm^2 ≈ 14.5 p.s.i.

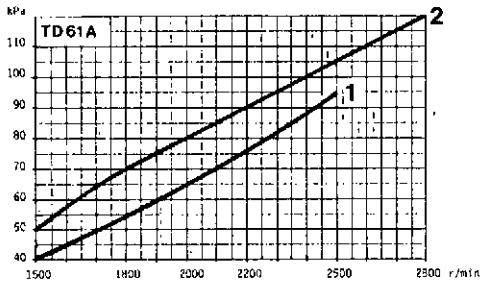
TD61ACE: min. 90 kPa (13 p.s.i.) at 2100 r.p.m.
TD71ACE: min. 100 kPa (14.5 p.s.i.) at 2000 r.p.m.

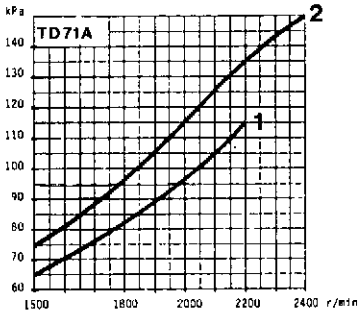


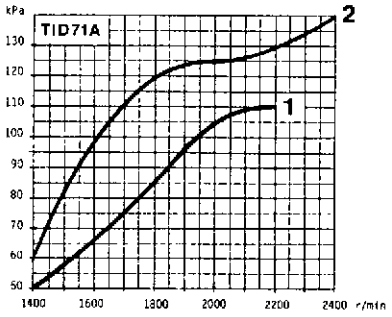


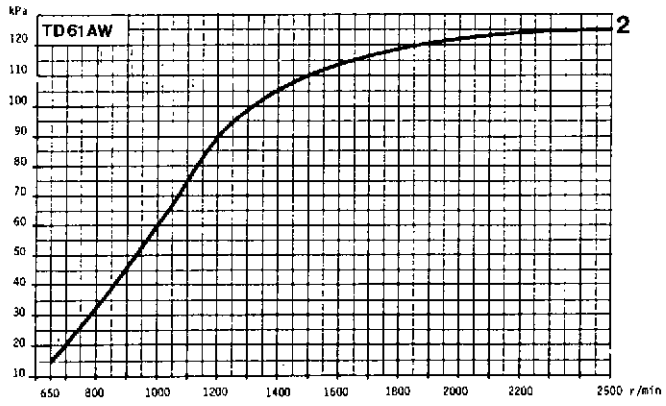


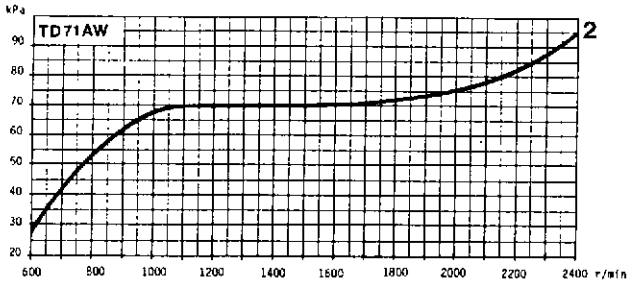


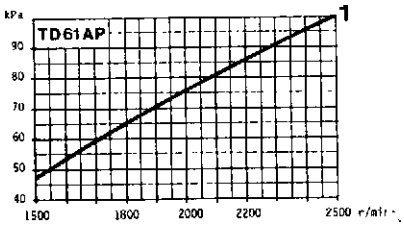


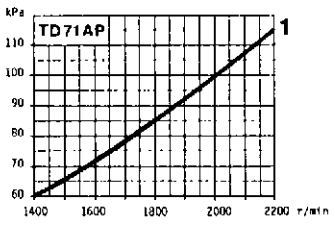


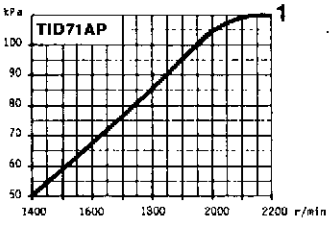


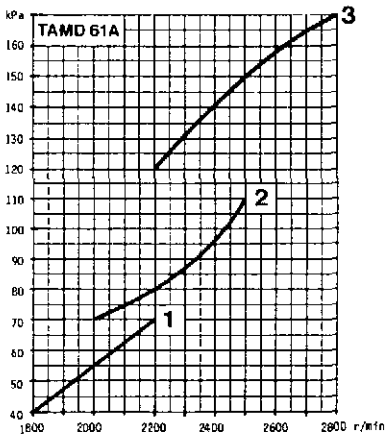


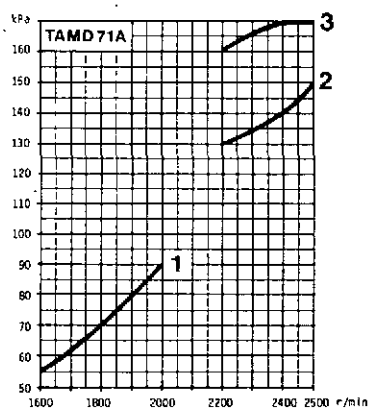












Exhaust temperature at power output acc. to curve 3 on engine diagram, °C (°F):	TD61A	TD61AG*	TD61AP	TD61AW*	TID61AG*	TD71AW*
600 r.p.m.	–	–	–	–	–	475 (887)
650 r.p.m.	–	–	–	405 (761)	–	–
1000 r.p.m.	–	–	–	485 (905)	–	550 (1022)
1200 r.p.m.	–	–	–	455 (851)	–	550 (1022)
1500 r.p.m.	520 (968)	440 (824)	565 (1049)	460 (860)	450 (842)	575 (1067)
1800 r.p.m.	500 (932)	465 (869)	540 (1004)	–	440 (824)	–
2000 r.p.m.	490 (914)	–	525 (977)	–	–	–
2200 r.p.m.	–	–	515 (959)	–	–	–
2400 r.p.m.	–	–	–	–	–	650 (1202)
2500 r.p.m.	480 (896)	–	500 (932)	550 (1022)	–	–

	TD71A	TD71AG*	TD71AP	TID71A	TID71AG*	TID71AP
1400 r.p.m.	–	–	560 (1040)	–	–	550 (1022)
1500 r.p.m.	540 (1004)	500 (932)	540 (1004)	560 (1040)	550 (1022)	535 (995)
1800 r.p.m.	510 (950)	490 (914)	510 (950)	520 (968)	550 (1022)	510 (950)
2000 r.p.m.	490 (914)	–	490 (914)	500 (932)	–	490 (914)
2200 r.p.m.	480 (896)	–	480 (896)	480 (896)	–	480 (896)

* Output acc. to curve 2 in the engine diagram or point 1 in the overrun curve.

Exhaust temp at full output:	TD61ACE	TD71ACE
2000 r.p.m.	–	560°C (1040°F)
2100 r.p.m.	540°C (1004°F)	–

Exhaust temp at output acc. to the engine diagram's curve	TAMD61A LD	TAMD61A MD	TAMD61A HD	TAMD71A LD	TAMD71A MD	TAMD71A HD
1600 r.p.m.	568°C (1054°F)	478°C (892°F)	444°C (831°F)	530°C (986°F)	499°C (930°F)	460°C (860°F)
1800 r.p.m.	541°C (1006°F)	470°C (878°F)	444°C (831°F)	484°C (903°F)	457°C (855°F)	427°C (801°F)
2000 r.p.m.	505°C (941°F)	452°C (846°F)	435°C (815°F)	451°C (844°F)	424°C (795°F)	401°C (754°F)
2200 r.p.m.	472°C (882°F)	423°C (793°F)	410°C (770°F)	435°C (815°F)	399°C (750°F)	–
2400 r.p.m.	–	–	–	437°C (819°F)	390°C (734°F)	–
2500 r.p.m.	447°C (837°F)	404°C (759°F)	–	449°C (840°F)	391°C (736°F)	–
2800 r.p.m.	432°C (810°F)	–	–	–	–	–

Max. permitted counter pressure in exhaust line, mm water column:	TD61A,-ACE	TD61AG	TD61AP	TD61AW	TID61AG	TD71AW
600 r.p.m.	–	–	–	–	–	100
650 r.p.m.	–	–	–	80	–	–
1000 r.p.m.	–	–	–	100	–	200
1200 r.p.m.	–	–	–	150	–	300
1500 r.p.m.	200	500	300	200	500	500
1800 r.p.m.	300	700	450	–	700	–
2000 r.p.m.	400	–	600	–	–	–
2200 r.p.m.	–	–	700	–	–	–
2400 r.p.m.	–	–	–	–	–	900
2500 r.p.m.	800	–	900	800	–	–
2800 r.p.m.	1000	–	–	–	–	–

	TD71A,-ACE	TD71AG	TD71AP	TID71A	TID71AG	TID71AP
1400 r.p.m.	–	–	500	–	–	500
1500 r.p.m.	500	500	500	500	500	500
1800 r.p.m.	650	700	650	650	700	650
2000 r.p.m.	800	–	800	800	–	800
2200 r.p.m.	900	–	900	900	–	900
2400 r.p.m.	900	–	–	1000	–	–

	TAMD61A	TAMD71A
Max. permitted counter pressure in exhaust line, mm water column	1000	1000

Cylinder liners

	61 series	71 series
Type	Wet, replaceable	
Bore (no oversizes available)	98.425 mm (3.875")	104.77 mm (4.125")
Height of cylinder liner above cylinder block surface	0.38–0.43 mm (0.0150–0.0169")	
Recommended height when replacing liners	0.40–0.43 mm (0.0157–0.0169")	
Max difference in height between liners 1, 2 and 3 and between liners 4, 5 and 6 respectively	0.02 mm (0.0008")	
Liner collar thickness	9.63–9.66 mm (0.3791–0.3803")	
Depth of liner recess from the block surface to liner shelf	9.23–9.25 mm (0.3634–0.3642")	
Seals for cylinder liners:		
Number of rubber rings, upper	1	
Thickness	1.5–1.7 mm (0.0591–0.0669")	
Number of rubber rings, lower	3	
Thickness	5.67–5.93 mm (0.2232–0.2335")	

Pistons

Material	Light alloy with cast-iron ring carrier	
Marking on top of piston, T(I)D61	Yellow colour line	–
Combustion chamber, diameter, T(I)D61 and T(I)D71	57 mm (2.2441")	60 mm (2.3622")
TAMD61 and TAMD71	59.5 mm (2.3425")	65 mm (2.5591")
depth, T(I)D61 and T(I)D71	23.5 mm (0.9252")	26.2 mm (1.0315")
TAMD61 and TAMD71	21.8 mm (0.8583")	22.9 mm (0.9016")
Overall height	124.15–124.65 mm (4.8878–4.9075")	140.8–141.3 mm (5.5433–5.5630")
Height from centre of gudgeon pin to top of piston	79.35–79.45 mm (3.1240–3.1279")	88.40–88.50 mm (3.4803–3.4842")
Piston clearance, T(I)D61 and T(I)D71	0.13–0.15 mm (0.0051–0.0059")	0.09–0.125 mm (0.0035–0.0049")
TAMD61 and TAMD71	0.11–0.13 mm (0.0043–0.0051")	0.09–0.11 mm (0.0035–0.0043")
Front marking	Arrow pointing towards front end	
Height above cylinder block surface when piston fitted in engine	0.05–0.55 mm (0.0020–0.0217")	0.20–0.70 mm (0.0079–0.0276")

Piston rings

	61-series	71-series
Compression rings:		
Number	2	3
Upper compression ring, height, TAMD61A*	3.16 mm (0.1244")	–
all other engines	2.362–2.375 mm (0.0930–0.0935")	2.362–2.375 mm (0.0930–0.0935")
2nd compression ring, height	3.137–3.150 mm (0.1235–0.1240")	3.124–3.150 mm (0.1230–0.1240")
3rd compression ring, height	–	3.124–3.150 mm (0.1230–0.1240")
Oil scraper ring:		
Number	1	
Height, TAMD61A	4.722–4.737 mm (0.1859–0.1865")	–
all other engines	4.724–4.737 mm (0.1860–0.1865")	
Piston ring gap measured in cylinder liner at ∅ 98.425 mm (3.875") (61 series) and ∅ 104.78 mm (4.1252") (71 series):		
Compression rings, lower	0.25–0.40 mm (0.0098–0.0157")	0.33–0.58 mm (0.0130–0.0228")
others	0.25–0.50 mm (0.0098–0.0197")	0.33–0.58 mm (0.0130–0.0228")
Oil-scraper ring, TAMD61A	0.30–0.60 mm (0.0118–0.0236")	–
all other engines	0.25–0.58 mm (0.0098–0.0228")	0.33–0.71 mm (0.0130–0.0280")

* Piston ring of "Keystone" type.

Gudgeon pins

Clearance, gudgeon pin – connecting rod bushing	0.014–0.022 mm (0.0006–0.0009")	0.016–0.024 mm (0.0006–0.0009")
gudgeon pin – gudgeon pin hole	Max. 0.008 mm (0.0003")	
Grip fit, gudgeon pin – gudgeon pin hole	Max. 0.004 mm (0.0002")	
Gudgeon pin diameter, standard	40.000–40.004 mm (1.5748–1.5750")	45.000–45.004 mm (1.7717–1.7718")
Connecting rod bushing, inner diameter	40.018–40.022 mm (1.5755–1.5757")	45.020–45.024 mm (1.7724–1.7726")
Gudgeon pin hole, diameter in piston	40.000–40.008 mm (1.5748–1.5751")	45.000–45.008 mm (1.7717–1.7720")

Cylinder heads

Height	101 mm (3.9764")	109 mm (4.2913")

Crankshaft with bearings

(Replaceable bearing shells for main and big-end bearings)

Crankshaft end float	0.064–0.264 mm (0.0025–0.0104")	0.068–0.268 mm (0.0027–0.0106")
Main bearings, radial clearance	0.063–0.121 mm (0.0025–0.0048")	0.065–0.119 mm (0.0026–0.0047")

Main bearings

Main bearing journals

Diameter, standard	76.149–76.162 mm (2.9980–2.9985")	82.535–82.550 mm (3.2494–3.2500")
undersize 0.010"	75.895–75.908 mm (2.9880–2.9885")	82.281–82.296 mm (3.2394–3.2400")
0.020"	75.641–75.654 mm (2.9780–2.9785")	82.027–82.042 mm (3.2294–3.2300")
0.030"	75.387–75.400 mm (2.9680–2.9685")	81.773–81.788 mm (3.2194–3.2200")
0.040"	75.133–75.146 mm (2.9580–2.9585")	81.519–81.534 mm (3.2094–3.2100")
0.050"	74.879–74.892 mm (2.9480–2.9485")	81.265–81.280 mm (3.1994–3.2000")

	61-series	71-series
Width on crankshaft for pilot bearing with separate thrust washers:		
Standard	43.975–44.025 mm (1.7313–1.7333")	45.975–46.025 mm (1.8100–1.8120")
Oversize, 0.2 mm (thrust washers 0.1 mm oversize)	44.175–44.225 mm (1.7392–1.7411")	46.175–46.225 mm (1.8179–1.8199")
0.4 mm (thrust washers 0.2 mm oversize)	44.375–44.425 mm (1.7470–1.7490")	46.375–46.425 mm (1.8258–1.8278")
0.6 mm (thrust washers 0.3 mm oversize)	44.575–44.625 mm (1.7549–1.7569")	46.575–46.625 mm (1.8337–1.8356")

Main bearing shells

Diameter, bearing shell position in block	81.051–81.076 mm (3.1910–3.1920")	88.483–88.508 mm (3.4836–3.4846")
Thickness, standard	2.403–2.413 mm (0.0946–0.0950")	2.925–2.934 mm (0.1152–0.1155")
oversize 0.010"	2.530–2.540 mm (0.0996–0.1000")	3.052–3.061 mm (0.1202–0.1205")
0.020"	2.657–2.667 mm (0.1046–0.1050")	3.179–3.188 mm (0.1252–0.1255")
0.030"	2.784–2.794 mm (0.1096–0.1100")	3.306–3.315 mm (0.1302–0.1305")
0.040"	2.911–2.921 mm (0.1146–0.1150")	3.433–3.442 mm (0.1352–0.1355")
0.050"	3.038–3.048 mm (0.1196–0.1200")	3.560–3.569 mm (0.1402–0.1405")

Big-end bearings

Big-end bearing journals

Big-end bearings, radial clearance	0.057–0.103 mm (0.0022–0.0041")	0.068–0.112 mm (0.0027–0.0044")
Length of bearing journals	41.900–42.000 mm (1.6496–1.6535")	43.900–44.000 mm (1.7283–1.7323")
Diameter, standard	63.449–63.462 mm (2.4980–2.4985")	69.837–69.850 mm (2.7495–2.7500")
undersize 0.010"	63.195–63.208 mm (2.4880–2.4885")	69.583–69.596 mm (2.7395–2.7400")
0.020"	62.941–62.954 mm (2.4780–2.4785")	69.329–69.342 mm (2.7295–2.7300")
0.030"	62.687–62.700 mm (2.4680–2.4685")	69.075–69.088 mm (2.7195–2.7200")
0.040"	62.433–62.446 mm (2.4580–2.4585")	68.821–68.834 mm (2.7095–2.7100")
0.050"	62.179–62.192 mm (2.4480–2.4485")	68.567–68.580 mm (2.6995–2.7000")

Big-end bearing shells

Thickness, standard	1.892–1.902 mm (0.0745–0.0749")	1.902–1.911 mm (0.0749–0.0752")
oversize 0.010"	2.019–2.029 mm (0.0795–0.0799")	2.029–2.039 mm (0.0799–0.0803")
0.020"	2.146–2.156 mm (0.0845–0.0849")	2.156–2.166 mm (0.0849–0.0853")
0.030"	2.273–2.283 mm (0.0895–0.0899")	2.283–2.293 mm (0.0899–0.0903")
0.040"	2.400–2.410 mm (0.0945–0.0949")	2.410–2.420 mm (0.0949–0.0953")
0.050"	2.527–2.537 mm (0.0995–0.0999")	2.537–2.547 mm 0.0999–0.1003")

Connecting rods

Marked 1 to 6. The "FRONT" marking on the shank must face forwards.
Fitted with replaceable bearing shells.

Diameter, connecting rod bushing bearing recess	43.043–43.068 mm (1.6946–1.6956")	49.887–49.912 mm (1.9641–1.9650")
bearing shell recess	67.323–67.336 mm (2.6505–2.6510")	73.740–73.753 mm (2.9032–2.9037")
gudgeon pin bushing	See under "Gudgeon pins"	
Axial clearance, connecting rod–crankshaft	0.15–0.35 mm (0.0059–0.0138")	

Flywheel

	61 series	71 series
Flywheel ring gear	140 teeth	

Camshaft

Type av drive	Gear	
Number of bearings	7	
Front bearing journal, diameter	68.996–69.015 mm (2.7164–2.7171")	
2nd bearing journal, diameter	66.621–66.640 mm (2.6229–2.6236")	
3rd bearing journal, diameter	64.233–64.252 mm (2.5289–2.5296")	
4th bearing journal, diameter	63.446–63.465 mm (2.4979–2.4986")	
5th bearing journal, diameter	61.058–61.077 mm (2.4039–2.4046")	
6th bearing journal, diameter	60.271–60.290 mm (2.3729–2.3736")	
7th bearing journal, diameter	56.296–56.315 mm (2.2164–2.2171")	
End float	0.05–0.18 mm (0.002–0.007")	
Radial clearance	0.035–0.079 mm (0.0014–0.0031")	
Camshaft lift (cam height), intake	8.000 mm (0.3150")	8.006 mm (0.3152")
exhaust	8.000 mm (0.3150")	8.268 mm (0.3255")
Checking camshaft setting (cold engine and valve clearance = 0)		
With the flywheel at 10° after T.D.C., the inlet valve for No. 1 cylinder should have opened as follows*	1.95 mm (0.0768")	3.60 mm (0.1417")

* Tolerance for all measured values ±0.25 mm (0.0098").

Camshaft bearings

Front bearing, diameter	69.050–69.075 mm (2.7185–2.7195")
2nd bearing, diameter	66.675–66.700 mm (2.6250–2.6260")
3rd bearing, diameter	64.287–64.312 mm (2.5310–2.5320")
4th bearing, diameter	63.500–63.525 mm (2.5000–2.5010")
5th bearing, diameter	61.112–61.137 mm (2.4060–2.4070")
6th bearing, diameter	60.325–60.350 mm (2.3750–2.3760")
7th bearing, diameter	56.350–56.375 mm (2.2185–2.2195")

Timing gears

Backlash	0.03–0.17 mm (0.0012–0.0067")
Journal for idler gear, diameter	92.084–92.106 mm (3.6254–3.6262")
Bushing for idler gear, diameter	92.131–92.166 mm (3.6272–3.6286")
Radial clearance for idler gear	0.025–0.082 mm (0.0010–0.0032")
Axial clearance for idler gear	0.05–0.15 mm (0.002–0.006")
Crankshaft gear	30 teeth
Idler gear	51 teeth
Camshaft gear	60 teeth
Drive gear for injection pump	60 teeth
Drive gear for coolant pump	23 teeth
Idler gear for lubrication pump	48 teeth
Drive gear for lubrication pump	27 teeth
Drive gear for sea water pump, marine engines	33 teeth
Drive gear for air compressor (optional), industrial engines	33 teeth
Drive gear for hydraulic pump (optional), industrial engines	19 teeth
marine engines	35 teeth

Valve system

Valves

	61 series	71 series
Intake:		
Valve disc, diameter	41 mm (1.6142")	43 mm (1.6929")
Valve stem, diameter	7.960–7.975 mm (0.3134–0.3140")	10.982–11.000 mm (0.4324–0.4331")
Valve seat angle	29.5°	
Seat angle in cylinder head	30°	
Valve clearance (cold engine or at operating temperature)	0.40 mm (0.0157")	
Exhaust:		
Valve disc, diameter	37 mm (1.4567")	37 mm (1.4567")
Valve stem, diameter	7.935–7.950 mm (0.3124–0.3130")	10.966–10.984 mm (0.4317–0.4324")
Valve seat angle	44.5°	
Seat angle in cylinder head	45°	
Valve clearance (cold engine or at operating temperature)	0.55 mm (0.0217")	

Valve seats

Valve seat for intake valves:		
Diameter (dimension A), standard	43.574–43.590 mm (1.7155–1.7161")	46.064–46.080 mm (1.8135–1.8142")
oversize	43.774–43.790 mm (1.7234–1.7240")	46.264–46.280 mm (1.8214–1.8220")
Height (dimension B)	6.05–6.15 mm (0.2382–0.2421")	6.1–6.2 mm (0.2402–0.2441")
Recess for valve seat, intake valves:		
Diameter (dimension C), standard	43.500–43.525 mm (1.7126–1.7136")	46.000–46.025 mm (1.8110–1.8120")
oversize	43.700–43.725 mm (1.7205–1.7215")	46.200–46.225 mm (1.8189–1.8199")
Depth (dimension D)	8.7–8.8 mm (0.3425–0.3465")	9.95–10.05 mm (0.3917–0.3957")
Bottom radius of recess, (dimension R)	0.5–0.8 mm (0.0197–0.0315")	0.4–0.7 mm (0.0157–0.0276")
The measurement between the valve disc and the cylinder head surface should be	0.7–1.1 mm (0.0276–0.0433")	2.0–2.4 mm (0.0787–0.0945)
Valve seat for exhaust valves:		
Diameter (dimension A), standard	41.574–41.590 mm (1.6368–1.6374")	44.056–44.082 mm (1.7345–1.7355")
oversize	41.774–41.790 mm (1.6446–1.6453")	44.256–44.282 mm (1.7424–1.7434")
Height (dimension B)	8.8–8.9 mm (0.3465–0.3504")	8.8–9.0 mm (0.3465–0.3543")
Recess for valve seat, exhaust valves:		
Diameter (dimension C), standard	41.500–41.525 mm (1.6339–1.6348")	44.000–44.025 mm (1.7323–1.7333")
oversize	41.700–41.725 mm (1.6417–1.6427")	44.200–44.225 mm (1.7402–1.7411")
Depth (dimension D)	11.7–11.8 mm (0.4606–0.4646")	9.8–9.9 mm (0.3858–0.3898")
Bottom radius of recess (dimension R)	0.5–0.8 mm (0.0197–0.0315")	0.4–0.7 mm (0.0157–0.0276")
The dimension between the valve disc and the cylinder head surface should be	0.7–1.1 mm (0.0276–0.0433")	1.0–1.4 mm (0.0394–0.0551")

Diagram of seat and recess for valve seat

Valve guides

	61 series	71 series
Length	64.5 mm (2.54")	66 mm (2.60")
Inside diameter (fitted)	8.000–8.015 mm (0.3150–0.3156")	11.032–11.050 mm (0.4343–0.4350")
parts version	8.000–8.022 mm (0.3150–0.3158")	11.032–11.059 mm (0.4343–0.4354")
Height over cylinder head spring plane, production	23 mm (0.9055")	21 mm (0.8268")
when overhauling	23 mm (0.9055")	22 mm (0.8661")
Clearance, valve stem–valve guide:		
Intake valve	0.025–0.060 mm (0.0010–0.0024")	0.032–0.068 mm (0.0013–0.0027")
Exhaust valve	0.050–0.090 mm (0.0020–0.0035")	0.048–0.084 mm (0.0019–0.0033")

Valve springs

Single valve springs

Length unloaded	62.8 mm (2.47")	–
with loading of 334–374 N (34–38 kp = 75–84 lbf)	51 mm (2.01")	–
with loading of 676–754 N (69–77 kp = 152–170 lbf)	39 mm (1.54")	–
fully compressed max.	34.8 mm (1.37")	–

Double valve springs

Outer valve springs:		
Length unloaded	–	64.1 mm (2.52")
with loading of 273–313 N (27.8–31.9 kp = 61–70 lbf)	–	48.6 mm (1.91")
with loading of 491–571 N (50.1–58.2 kp = 110–128 lbf)	–	36 mm (1.42")
fully compressed max.	–	32 mm (1.26")
Inner valve springs:		
Length unloaded	–	60.1 mm (2.37")
with loading of 111–131 N (11.3–13.4 kp = 25–30 lbf)	–	44.6 mm (1.76")
with loading of 200–240 N (20.4–24.5 kp = 45–54 lbf)	–	32 mm (1.26")
fully compressed max.	–	28 mm (1.10")

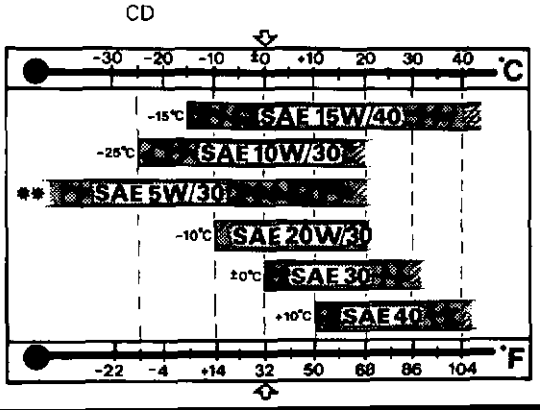
Rocker arm mechanism

Rocker arm bushing, diameter after pressing in and machining	22.020–22.041 mm (0.8669–0.8678")	25.020–25.042 mm (0.9850–0.9859")

Lubricating system

Oil pressure, hot engine, operating speed	300–500 kPa (3–5 kp/cm^2 = 43–71 p.s.i.)	
Oil pressure, idling speed	min. 150 kPa (1.5 kp/cm^2 = 21.5 p.s.i)	
Engines with piston cooling:		
Oil pressure (piston cooling) at operating speed	80–120 kPa, (0.8–1.2 kp/cm^2 = 11.4–17.1 p.s.i.)*	80–120 kPa, (0.8–1.2 kp/cm^2 = 11.4–17.1 p.s.i)
Oil quality in accordance with API-system	CD	
Viscosity at various ambient air temperatures		

(The temperature values apply to constant outside air temperature)



* Applies to TAMD61A.
** Applies to synthetic or semi-synthetic oil.
NOTE! **Only** SAE 5W/30 must be used.

Oil capacity, incl. lubricating oil filter,* approx.:	61 series	71 series
Industrial engines		
Standard oil sump	22 litres (4.8 Imp. gals = 5.8 US gals)	29 litres** (6.4 Imp. gals = 7.7 US gals)
Capacity difference Min-Max	6 litres (1.3 Imp. gals = 1.6 US gals)	8 litres (1.8 Imp. gals = 2.1 US gals)
Shallow oil sump	14 litres (3.1 Imp. gals = 3.7 US gals)	19 litres (4.2 Imp. gals = 5.0 US gals)
Capacity difference Min-Max	5 litres (1.1 Imp. gals = 1.3 US gals)	7 litres (1.5 Imp. gals = 1.8 US gals)
Deep oil sump for large inclinations	20 litres (4.4 Imp. gals = 5.3 US gals)	–
Capacity difference Min-Max	6 litres (1.3 Imp. gals = 1.6 US gals)	–
Oil sump of vehicle version	–	27 litres (5.9 Imp. gals = 7.1 US gals)
Capacity difference Min-Max	–	7 litres (1.5 Imp. gals = 1.8 US gals
Marine engines		
No engine inclination	20 litres (4.4 Imp. gals = 5.3 US gals)	30 litres (6.6 Imp. gals = 7.9 US gals
18° engine inclination	13 litres (2.9 Imp. gals = 3.4 US gals)	19 litres (4.2 Imp. gals = 5.0 US gals)

* **Industrial engines:** The lubrication oil filter holds approx. 2 litres (0.4 Imp. gals/0.5 US gals). The by-pass filter holds approx. 3 litres (0.7 Imp. gals/= 0.8 US gals), (optional equipment on 61-series).
Marine engines: The lubrication oil filter and by-pass filter (optional equipment) each contain approx. 0.5 litre (1 pint).

** For version for large inclinations 25 litres (5.5 Imp. gals/6.6 US gals) applies. Capacity difference Min-Max, 7 litres (1.5 Imp. gals/1.8 US gals).

Lubricating oil pump, type	Gear	
number of teeth	11	
end float, pump gear	0.07–0.15 mm (0.0028–0.0059")	
backlash, pump gear	0.15–0.35 mm (0.0059–0.0138")	
diameter, idler gear bearing sleeve	63.97–64.00 mm (2.5185–2.5197")	
diameter, idler gear bushing	64.03–64.06 mm (2.5209–2.5220")	
radial clearance for idler gear	0.03–0.09 mm (0.0012–0.0035")	
diameter, oil pump bushings	18.050–18.068 mm (0.7106–0.7113")	
clearance, pump bracket–oil pump drive gear	1.0 (+0.5) mm (0.0394" +0.0197")	
number of teeth, drive gear	27	
number of teeth, idler gear	48	
Relief valve, colour marking	Blue	
Oil cooling valve (T(I)D61), colour marking	Red	–
Piston cooling valve, colour marking	White*	White
Overflow valve spring:		
Length unloaded	68.8 mm (2.71")	
with loading of 13–15 N (1.3–1.5 kp = 2.9–3.3 p.s.i)	40 mm (1.58")	
with loading of 16.9–18.9 N (1.7–1.9 kp = 3.8–4.2 p.s.i.)	32 mm (1.26")	

* Applies to TAMD61A.

Fuel system

Direction of rotation of injection pump viewed from the front	Clockwise
Order of injection	1-5-3-6-2-4
Injection quantity	See governor data plate or appropriate adjustment data in Service Bulletine file
Feed pressure	100–150 kPa (1.0–1.5 kp/cm^2 = 14–21 p.s.i.)

Relief valve

Make and type	Bosch PVE 53S 5Z

Fuel filter

Number of filter inserts	*2 connected in parallel*

Injection pump

TD61A, -ACE

Make, type (flange mounted)	Bosch PES6MW100/320RS1132
Lift height from base radius at beginning of delivery (stroke position)	2.9 (+0.1) mm (0.1142 +0.0039")
Setting	25°±0.5° B.T.D.C.
Pump element, diameter	10 mm (0.394")
Governor, TD61A	Bosch RSV325–1400MW2A 314-1
TD61ACE	Bosch RSV300–1050MW4A 308-2
Feed pump	Bosch FP/KG 24 MW200

TD61AG

Make, type (flange mounted)	Bosch PES6MW100/320RS1132
Lift height from base radius at beginning of delivery (stroke position)	2.9 (+0.1) mm (0.1142 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	10 mm (0.394")
Governor	Bosch RSV650–750MW4/311-1
Feed pump	Bosch FP/KG 24 MW200

TD61AP

Make, type (flange mounted)	Bosch PES6MW100/320RS1132
Lift height from base radius at beginning of delivery (stroke position)	2.9 (+0.1) mm (0.1142 +0.0039")
Setting	25°±0.5° B.T.D.C.
Pump element, diameter	10 mm (0.394")
Governor	Bosch RSV325–1250MW2A 308-3
Feed pump	Bosch FP/KG 24 MW200

TD61AW

Make, type (flange mounted)	Bosch PES6MW100/320RS 1135
Lift height from base radius at beginning of delivery (stroke position)	2.9 (+0.1) mm (0.1142 +0.0039")
Setting	22°±0.5° B.T.D.C.
Pump element, diameter	10 mm (0.394")
Governor	Bosch RSV325–1250MW2A 308-3
Feed pump	Bosch FP/KG 24 MW200

TID61AG

Make, type (flange mounted)	Bosch PES6MW100/320RS 1132
Lift height from base radius at beginning of delivery (stroke position)	2.9 (+0.1) mm (0.1142 +0.0039")
Setting	18° B.T.D.C.
Pump element, diameter	10 mm (0.394")
Governor	Bosch RSV650–750MW4/311-2
Feed pump	Bosch FP/KG 24 MW200

TD71A, -ACE

Make, type	Bosch PE6P110A320RS497
Lift height from base radius at beginning of delivery (stroke position)	3.0 (+0.1) mm (0.1181 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor, TD71A	Bosch RSV200–1200P1A 374-1
TD71ACE	Bosch RSV200–1000P1A
Feed pump	Bosch FP/KG 24 P200

TD71AG

Make, type	Bosch PE6P110A320RS3147
Make, type (early prod. engines with el. governor, opt. equipm.)	Bosch PE6P110A320RS3109
Lift height from base radius at beginning of delivery (stroke position)	3.5 (+0.1) mm (0.1378 +0.0039")
Setting	16° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV650–750 P4/421-2
Governor, electric (optional equipment)	U.T. AGB 250 A-6
Feed pump	Bosch FP/KG 24 P200
Feed pump (early prod. engines with el. governor)	Bosch FP/K22P22

TD71AP

Make, type	Bosch PE6P110A320RS492
Lift height from base radius at beginning of delivery (stroke position)	3.0 (+0.1) mm (0.1181 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV200–1100 P1A 305-1
Feed pump	Bosch FP/KG 24 P200

TD71AW

Make, type	Bosch PE6P110A320RS492-1
Lift height from base radius at beginning of delivery (stroke position)	3.0 (+0.1) mm (0.1181 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV200–1200 P1A 305
Feed pump	Bosch FP/KG 24 P200

TID71A

Make, type	Bosch PE6P110A320RS497
Lift height from base radius at beginning of delivery (stroke position)	3.0 (+0.1) mm (0.1181 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV200–1200 P1A 374-2
Feed pump	Bosch FP/KG 24 P200

TID71AG

Make, type	Bosch PE6P110A320RS3147
Make, type (early prod. engines with el. governor, opt. equipm.)	Bosch PE6P110A320RS3109
Lift height from base radius at beginning of delivery (stroke position)	3.5 (+0.1) mm (0.1378 +0.0039")
Setting	12° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV650–750 P4/421
Governor, electrical (optional equipment)	U.T. AGB 250 A-6
Feed pump	Bosch FP/KG 24 P200
Feed pump (early prod. engines with el. governor)	Bosch FP/K22P22

TID71AP

Make, type	Bosch PE6P110A320 RS 492
Lift height from base radius at beginning of delivery (stroke position)	3.0 (+0.1) mm (0.1181 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV200–1100 P1A 305-2
Feed pump	Bosch FP/KG 24 P200

TAMD61A

Make, type	Bosch PE6P110A320RS499
Lift height from base radius at beginning of delivery (stroke position)	2.8 (+0.1) mm (0.1102 +0.0039")
Setting	18°±0.5° B.T.D.C.
Pump element, diameter	11 mm (0.433")
Governor	Bosch RSV325–1400P2A 374-3
Feed pump	Bosch FP/KG 24 P200

TAMD71A

Make, type	Bosch PE6P120A320 RS 3163
Lift height from base radius at beginning of delivery (stroke position)	2.8 (+0.1) mm (0.1102 +0.0039")
Setting	20°±0.5° B.T.D.C.
Pump element, diameter	12 mm (0.472")
Governor	Bosch RSV250–1250P0A 374
Feed pump	Bosch FP/KG 24 P200

Injectors

TD61A, -ACE, -AG, -AP, TID61AG, TD71A, -ACE, -AP

Nozzle holders, make and type	Bosch KBEL 98 P 27
Nozzles	Bosch DLLA 143 P 122
Injector complete, number marking	806
Opening pressure	25 MPa (255 kp/cm^2 = 3627 p.s.i.)
Adjusting pressure (new spring)	25.5–26.3 MPa (260–268 kp/cm^2 = 3698–3812 p.s.i.)
Nozzle hole diameter	4 pcs 0.34 mm (0.0134")

TD61AW, TD71AW

Nozzle holders, make and type	Bosch KBEL 98 P 27
Nozzles	Bosch DLLA 143 P 121
Injector complete, number marking	807
Opening pressure	25 MPa (255 kp/cm^2 = 3627 p.s.i.)
Adjusting pressure (new spring)	25.5–26.3 MPa (260–268 kp/cm^2 = 3698–3812 p.s.i.)
Nozzle hole diameter	4 pcs 0.32 mm (0.0126")

TD71AG, TID71A, -AG, -AP, TAMD61A

Nozzle holders, make and type	Bosch KBEL 98 P 27
Nozzles	Bosch DLLA 143 P 123
Injector complete, number marking	805
Opening pressure	25 MPa (255 kp/cm^2 = 3627 p.s.i.)
Adjusting pressure (new spring)	25.5–26.3 MPa (260–268 kp/cm^2 = 3698–3812 p.s.i.)
Nozzle hole diameter	4 pcs 0.38 mm (0.0150")

TAMD71A

Nozzle holders, make and type	Bosch KBEL 98 P 27
Nozzles	Bosch DLLA 150 P 43
Injector complete, number marking	792
Opening pressure	27 MPa (275 kp/cm^2 = 3911 p.s.i.)
Adjusting pressure (new spring)	27.5–28.3 MPa (280–289 kp/cm^2 = 3983–4111 p.s.i.)
Nozzle hole diameter	4 pcs 0.40 mm (0.0157")

Cooling system

	61 series	71 series
Type	Pressure type, closed cooling system	
Capacity incl. heat exchanger or V.P. standard radiator, approx.:		
Industrial engines	36 litres (7.9 Imp. gals = 9.5 US gals)	39 litres (8.6 Imp. gals = 10.3 US gals)
Marine engines	30 litres (6.6 Imp. gals = 7.9 US gals)	35 litres (7.7 Imp. gals = 9.3 US gals)
Filler cap's pressure valve opens at:		
Industrial engines:		
radiator	23–31 kPa (0.23–0.32 kp/cm^2 = 3.3–4.6 p.s.i.)	
expansion tank (plastic), optional equipment	30 kPa (0.3 kp/cm^2 = 4.3 p.s.i.)	
Marine engines:		
expansion tank	43–53 kPa (0.44–0.54 kp/cm^2 = 6.2–7.7 p.s.i.)	
expansion tank (plastic), optional equipment	23–31 kPa (0.23–0.32 kp/cm^2 = 3.3–4.6 p.s.i.)	

Thermostat

Type	Wax
Number	1 pc
Colour marking	Red
Starts opening at	80–84°C (176–183°F)
Fully open at	93–97°C (199–207°F)

Electrical system

System voltage:		
Industrial engines	24 V	
Marine engines	12V (or 24V)	24V (or 12V)
Battery capacity:		
With 24V system voltage	2 connected in series 12V, max. 143 Ah*	
With 12V system voltage	2 connected in parallel 12V, max. 110 Ah* (totally max. 220 Ah*)	
Density of battery electrolyte at +20°C (68°F):		
fully charged battery	1.265–1.29 g/cm^3	
battery to be recharged at	1.230 g/cm^3	
Electrical pre-heater, output approx.:		
TD61, TD71 and TAMD61, TAMD71	2.8 kW	
TID61, TID71	2.2 kW	
Stop solenoid for injection pump, breaker point settings:		
Industrial engines	See instructions on page 29	
Marine engines: With the pull rod fully pushed in, the pin at the rear of the solenoid should be pushed out approx.	1.5–2 mm (0.059–0.079")	

* According to DIN 72311.

Alternator

Industrial engines:	
Make	Paris-Rhône
Voltage/max. current	28V/55 A
Output, approx.	1500 W
Brush length	min. 3 mm (0.118")
Make (optional equipment)	Bosch
Voltage/max. current	28V/45 A
Output, approx.	1200 W
Brush length	min. 14 mm (0.551")

	61 series	71 series
Marine engines:		
Make	Paris-Rhône	
Voltage/max. current	14V/50A (or 28V/55A)	28V/55A (or 14V/50A)
Output, approx.	700W (or 1500W)	1500W (or 700W)
Brush length	min. 3 mm (0.118")	
Make (optional equipment)	Motorola	
Voltage/max. current	14V/130A	
Output, approx.	1800W	
Brush length	min. 5 mm (0.197")	
Voltage/max. current	28V/100A	
Output, approx.	2800W	
Brush length	min. 5 mm (0.197")	

Starter motor

Make, type	Bosch KB
Brush length	min. 17.5 mm (0.689")
Brush spring force	12–14 N (1.2–1.4 kp = 2.6–3.1 lbf)

Wear tolerances

Cylinder heads

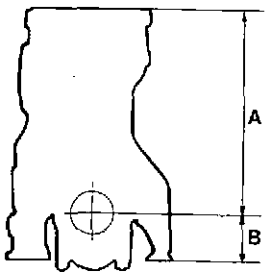
Height	min. 100.65 mm (3.963")	min. 108.65 mm (4.278")

Cylinder

Cylinder liners and pistons with piston rings should be replaced when wear is 0.35–0.40 mm (0.014–0.016").

The piston rings should be replaced when the piston ring gap, measured below the bottom turning point, is 1.5 mm (0.059") or more.

Cylinder block



Height, top block surface – crankshaft centerline (A)	min. 368.9 mm (14.524")	min. 402.9 mm (15.862")
bottom block surface – crankshaft centerline (B)	min. 89.9 mm (3.539")	min. 89.9 mm (3.539")

Crankshaft

Max. permissible out-of-round on main and big-end bearing journals	0.08 mm (0.0032")
Max. permissible taper on main and big-end bearing journals	0.05 mm (0.0020")
Max. end float on crankshaft	0.40 mm (0.0157")

Valves

	61 series	71 series
Valve stems, max. permissible wear	0.02 mm (0.0008")	
Max. permissible clearance valve stem–valve guide:		
Intake valves	0.15 mm (0.0059")	
Exhaust valves	0.17 mm (0.0067")	
The valve disc edge should be, min.:		
Intake valves	1.2 mm (0.047")	2.0 mm (0.079")
Exhaust valves	1.2 mm (0.047")	1.0 mm (0.039")
The valve seat may be ground until the distance from the valve disc (new valve) to the cylinder head surface is, max.:		
Intake	1.5 mm (0.059")	3.0 mm (0.118")
Exhaust	1.5 mm (0.059")	2.0 mm (0.079")

Camshaft

Max. permissible out-of round (with new bearings)	0.05 mm (0.0020")	
Bearings, max. permissible wear	0.05 mm (0.0020")	
Camshaft lift (cam height), intake	min. 7.4 mm (0.2913")	
exhaust	min. 7.4 mm (0.2913")	min. 7.7 mm (0.3031")

Tightening torques in Nm (kpm/lbf.ft)

Cylinder heads	see footnote*	
Main bearings	150 (15/108)	
Big-end bearings	190 (19/137)	
Bearing bracket, rocker arm shaft	65 (6.5/47)	
Flange, front camshaft bearing	65 (6.5/47)	
Camshaft gear	70 (7/50)	
Pump drive gear, TD61, TID61	35 (3.5/25)	–
all other engines	70 (7/50)	
Idler gear journal	90 (9/65)	
Bearing sleeve for lubricating oil pump idler gear	33 (3.3/24)	
Pump housing for lube oil pump	22 (2.2/16)	
Bracket, lubricating oil pump	65 (6.5/47)	
Valve cover	24 (2.4/17)	
Inspection cover, valve lifters	24 (2.4/17)	
Auxiliary drive gear casing	33 (3.3/24)	
Cleaning plugs, cylinder heads and cylinder block	70 (7/50)	
Oil sump	24 (2.4/17)	
Drain plug, oil sump	80 (8/58)	
Flywheel casing	140 (14/101)	
Flywheel	190 (19/137)	
Vibration damper, attaching bolts	90 (9/65)	
polygon hub, centre bolt	260 (26/188)	
Injection pump:		
clamp bolt for coupling, TD71, TID71 and all marine engines	60 (6/43)	
drive hub, TD61, TID61	90 (9/65)	–
pressure valve retainers, TD61, TID61	50–60 (5–6/36–43)**	–
all other engines	85 (8.5/61)	
element units, attaching nuts, TD61, TID61	20–25 (2.0–2.5/14.5–18)	–
Injectors, attaching nut	50 (5/36)	

* The cylinder heads are tightened in a combination of torque tightening (in stages) and angle tightening (60°). See tightening scheme on next page. Cylinder head bolts must be dipped **completely** (including bolt heads) in a rustproofing compound a maximum of 24 hours prior to assembly. The bolts should not drip at all when fitted.

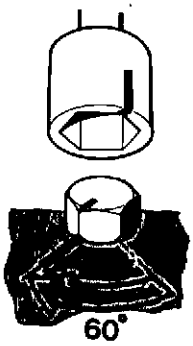
** The grooves shall be smeared with special grease (Bosch art. No. 5 963 340 110) prior to assembly.

1st tightening: 30 Nm (3 kpm/21.7 lbf.ft) in numbered sequence.

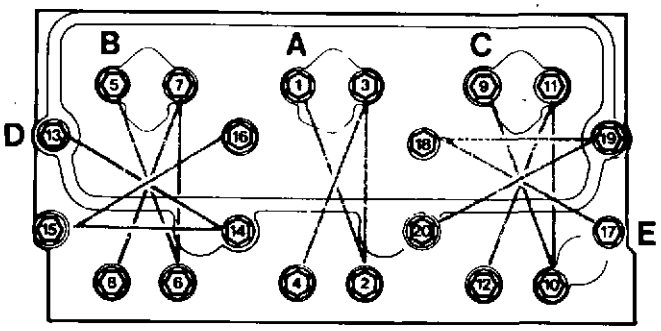
2nd tightening, 61 series: 85 Nm (8.5 kpm/61 lbf.ft) in numbered sequence.
71 series: 90 Nm (9 kpm/65 lbf.ft) in numbered sequence.

3rd tightening, 61 series: 85 Nm (8.5 kpm/61 lbf.ft) in numbered sequence (torque check).
71 series: 90 Nm (9 kpm/65 lbf.ft) in numbered sequence (torque check).

Final tightening: Angle tighten the bolts 60° in numbered sequence.



Angle tightening



Tightening scheme, 61 and 71 series

SPECIAL TOOLS

No. 999-	
1084-6	Drift for removing valve guides, 71 series.
1459-0	Drift for removing valve guides, 61 series.
1801-3	Standard handle 18x200 mm for drifts.
1819-5	Puller for ball bearing in flywheel.
1867-4	Drift for removing and fitting bushings in rocker arm, 61 series.
2013-4	Drift for fitting bearing in flywheel. Used together with 1801.
2071-2	Drift for removing and fitting gudgeon pins.
2124-9	Expander plugs for pressure-testing of cylinder heads (8 pcs.)
2178-5	Puller plate for cylinder liner puller 6645, 71 series.
2267-6	Drift for fitting ball bearings in bearing housing, drive for injection pump, 71 series and TAMD61.
2479-7	Holder for dial indicator when checking liner collar height above block face.
2497-9	Drift for removing and fitting bushings in connecting rods, 71 series. Used together with 1801.
2655-2	Puller for crankshaft polygon hub.
2658-6	Puller for crankshaft gear.
2661-0	Drift for fitting valve guides, 71 series.
2669-3	Drift for removing and fitting bushings in connecting rods, 61 series. Used together with 1801.
2670-1	Hydraulic pump (manually operated). Used together with 2671 and 6161.
2671-9	Hydraulic cylinder for pressing coolant pump apart.
2677-6	Drift for removing and fitting bushings in rocker arm, 71 series.
2679-2	Puller for camshaft gear, and for the 71 series and TAMD61 also injection pump drive gear.
6065-0	Pressure gauge with hose for connection to banjo nipple 6066 when checking fuel feed pressure, or for checking turbo charging pressure.*
6066-8	Banjo nipple with rapid-coupling for connection to 6065.
6087-4	Puller plate for cylinder liner puller 6645, 61 series.
6159-1	Pin for hydraulic cylinder 6161.
6161-7	Hydraulic cylinder for fitting cylinder liners.
6169-0	Drift for fitting valve guides, 61 series.
6394-4	Supports (2) for puller 6645.
6400-9	Slide hammer. Can be used together with 6419 and 6657.
6402-5	Drift for fitting copper sleeve for injectors.
6419-9	Puller for copper sleeve steel ring.
6420-7	Drift for fitting copper sleeve and steel ring, 71 series.
6421-5	Drift for fitting copper sleeve and steel ring, 61 series.
6433-0	Adapter (cap). Used with 6662 on all engines except engines with separate plastic expansion tank.
6437-1	Tool for fitting rear crankshaft seal.
6441-3	Adapter (cap). Used with 6662 on engines with separate plastic expansion tank.
6606-1	Yoke for hydraulic cylinder 6161.
6643-4	Puller for injectors.
6645-9	Puller for cylinder liner excl. of puller plate. Used together with 6394 (2 pcs).
6650-9	Milling cutter for cleaning of injector's copper sleeve seat (step II).
6651-7	Milling cutter for cleaning of injector's copper sleeve seat (step I).
6657-4	Puller for copper sleeve for injector.
6662-4	Testing device** for checking cylinder heads, oil cooler and cooling system with compressed air.
6772-1	Tool for checking camshaft wear. Used with 998 9876.
6778-8	Tool for pressing sealing ring in pump drive, 71 series and TAMD61.
6779-6	Puller for sealing ring in pump drive, 71 series and TAMD61.
6839-8	Fitting ring for piston, 71 series.
6840-6	Fitting ring for piston, 61 series.
6841-4	Milling tool for cutting the sealing grooves in cylinder heads, 61 series.
6842-2	Milling tool for cutting the sealing grooves in cylinder heads, 71 series.
6845-5	Fixture for pressure-testing oil cooler.
6847-1	Press tool (2 pcs) for cylinder liner when measuring liner collar's height above block face.
6848-9	Tool for setting pre-injection angle. Used together with 998 9876.
6852-1	Connecting washer with rapid-coupling for pressure-testing cylinder heads.
6853-9	Bolts (2 pcs) for yoke 6606.
6854-7	Pressure plate for fitting cylinder liners. Used with 6161.
6855-4	Drift for fitting sealing ring in timing gear cover.
6860-4	Puller for oil pump drive gear.
6861-2	Pressing tool for fitting copper sleeve and steel ring. Used with 6402, 6420 and 6421.
6863-8	Drift for fitting sealing ring in thermostat housing.
6867-9	Support when pulling out steel ring and copper sleeve, 61-series. Used with 6419 and 6657.
6882-8	Adapter for measuring compression pressure.

* NOTE! The same tool must not be used for checking of both fuel feed pressure and boost pressure. Two separate tools must be used.

** Must be used with kit 998 9860-3 (only applicable for Sweden).

No. 999-	
6883-6	Tool for pressing coolant pump apart.
6884-4	Drift for pressing coolant pump apart.
9179-6	Tool for removing fuel and oil filters.
9508-6	Milling cutter for reconditioning cylinder liner recess, 71 series.
9514-4	Expander for rotating cylinder liner, 71 series.
9538-3	Expander for rotating cylinder liner, 61 series.
9553-2	Milling cutter for reconditioning cylinder liner recess, 61 series.

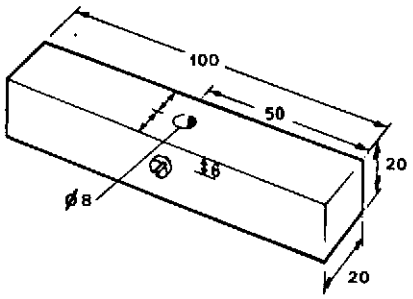
Part No.	
884 542-2	Flange kit complete, for measuring exhaust counter pressure, engines TAMD61A, TAMD71A.
884 872-3	Flange kit complete, for measuring exhaust counter pressure, engines T(I)D61AG.
884 900-2	Flange kit complete, for measuring exhaust counter pressure, engines TD61A, -ACE, -AP*, T(I)D71A, -AG, -AP, TD71ACE.
884 907-7	Flange kit complete, for measuring exhaust counter pressure, engines TD61AW, TD71AW.
884 948-1	Pressing tool for fitting crankshaft gear.
884 949-9	Tool for fitting polygon hub on crankshaft.
998 9876-9	Dial indicator.

* Use flange kit 884 872-3 for engines with 4-bolt exhaust flange (turbocharger of early prod.).

Turbocharger

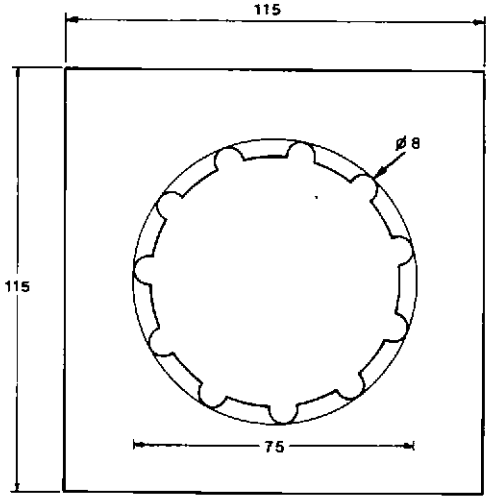
The tools shown in figures below are not sold by Volvo Penta, but can be made by the individual workshop.

Dimensions in mm

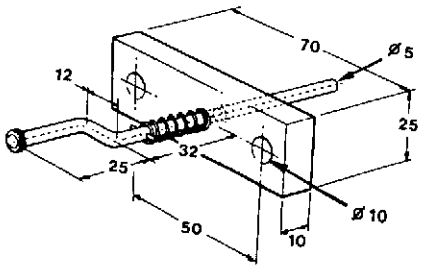


Sketch of special tool

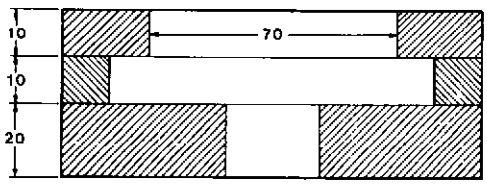
Holder for dial indicator when measuring axial clearance.



AiResearch



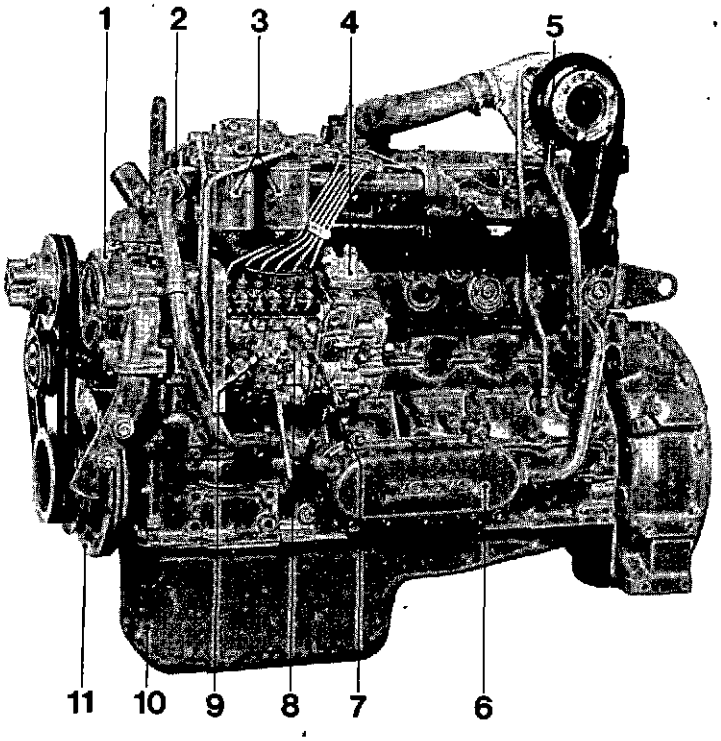
Sketch of special tool AiResearch



Sketch of special tool AiResearch

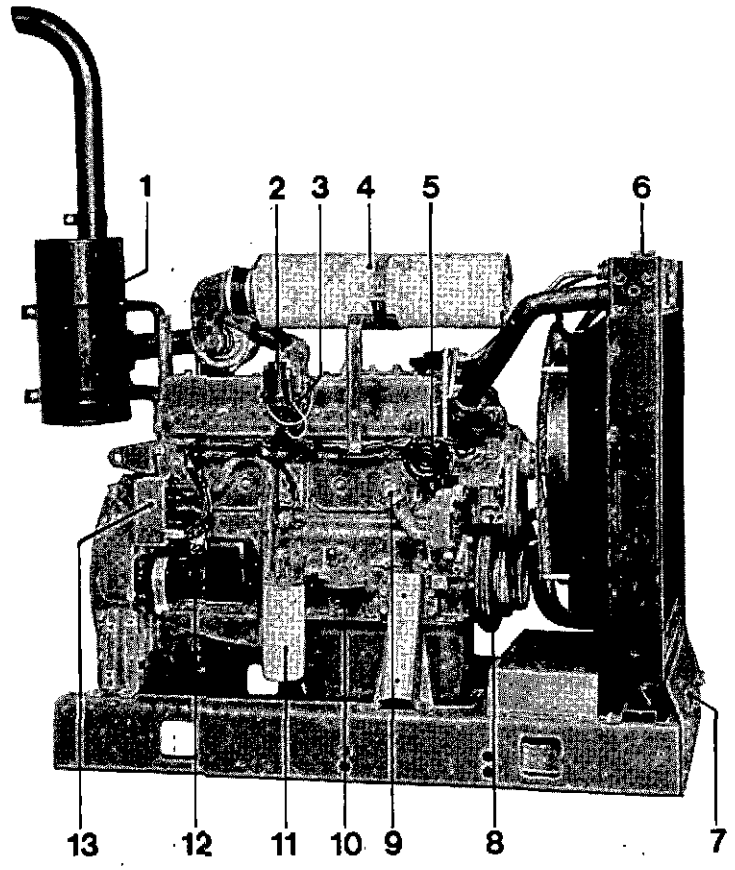
The fixture is made of plywood, hardwood or aluminium

PRESENTATION



TD61A

1. Coolant pump
2. Thermostat housing
3. Fuel filters
4. Smoke limiter
5. Turbocharger
6. Oil cooler
7. Oil dipstick
8. Fuel injection pump
9. Fuel feed pump (manual)
10. Oil pan
11. Torsional vibrations damper

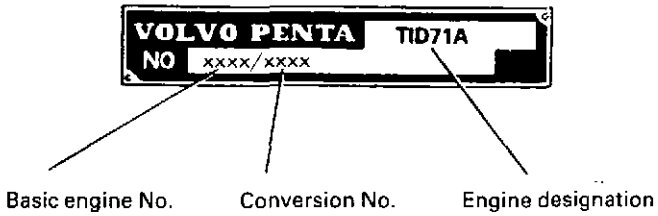


TD61AP

1. Silencer
2. Relay for pre-heater
3. Pre-heater
4. Air filter
5. Signal horn
6. Coolant filler cap
7. Battery box (can pull out)
8. Automatic belt tensioner
9. Oil filler cap (located above the lubricating oil filter on certain engine models)
10. By-pass filter connection for lubricating oil (optional)
11. Lubricating oil filter
12. Starter motor
13. Connector box with fuses

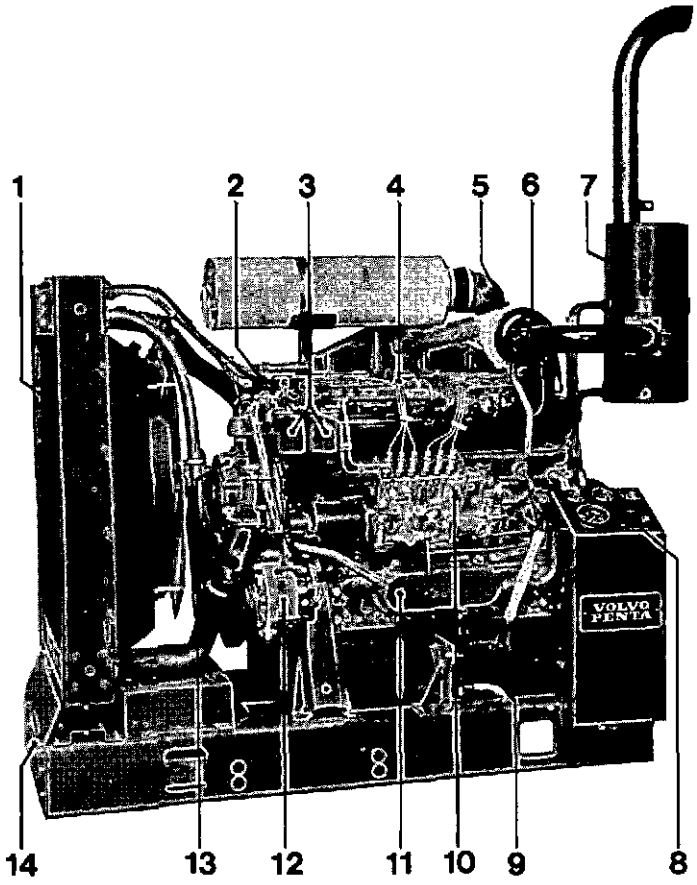
Location of number plate, industrial engines:

On the left hand side of the engine block, the rear part (below the exhaust manifold).



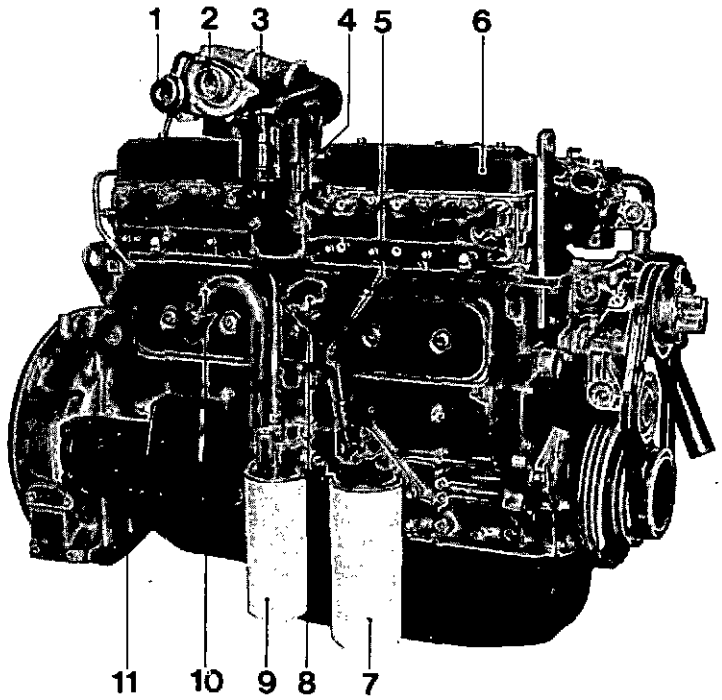
Number plate (early prod.),* example

* Late prod., see page 23



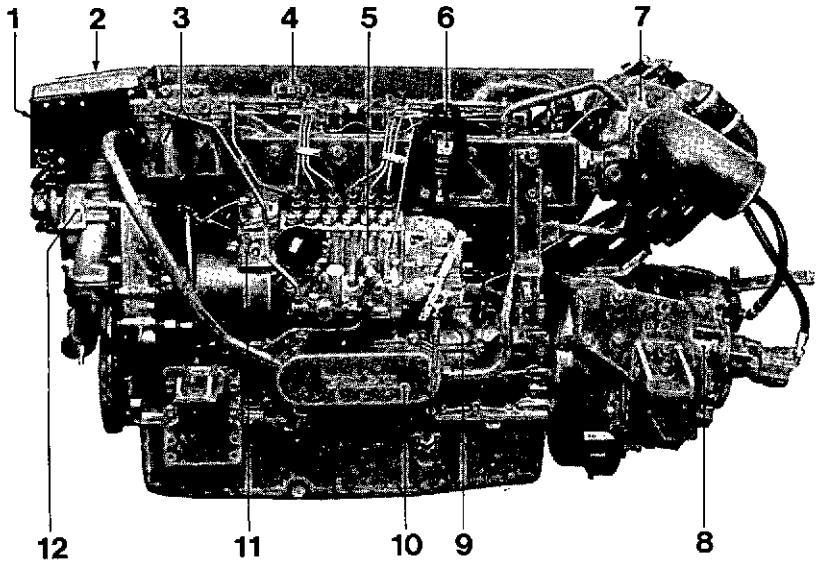
TID71AP

1. Radiator
2. Thermostat housing
3. Fuel filters
4. Charge air cooler (intercooler)
5. Pressure drop indicator
6. Turbocharger
7. Silencer
8. Instrument panel
9. Oil scavenging pump
10. Fuel injection pump
11. Oil cooler
12. Alternator
13. Coolant pump
14. Battery box (can pull out)



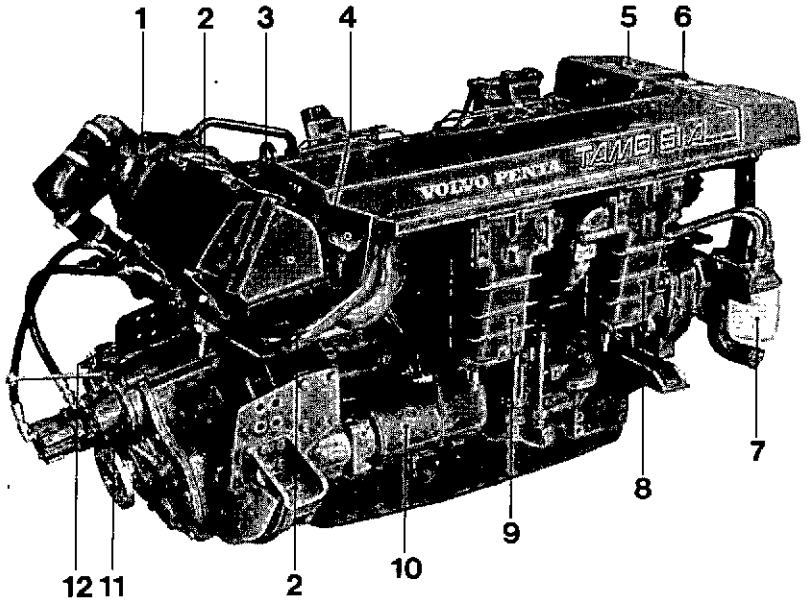
TD71AW

1. Actuator for the wastegate valve
2. Turbocharger
3. Relay for pre-heater
4. Pre-heater
5. Oil dipstick
6. Valve cover
7. By-pass filter for the lubricating oil
8. Filler cap for lubricating oil (located at the rear of the timing gear casing on certain engine models)
9. Lubricating oil filter
10. Crankcase ventilation
11. Starter motor



TAMD61A

1. Connector box with semi-automatic fuses
2. Coolant filler cap
3. Fuel fine filters
4. Oil filler cap
   (also at front end of engine)
5. Injection pump
6. Stop solenoid
7. Turbocharger
8. Reverse gear TD MG507A
9. Oil dipstick (alternative location)
10. Oil cooler, engine
11. Smoke limiter
12. Circulation pump

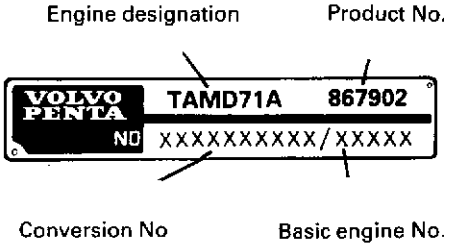


TAMD61A

1. Turbocharger
2. Air filter
3. Relay for pre-heater
4. By-pass valve (guides the air flow through the charge air cooler)
5. Expansion tank
6. Coolant filler cap
7. Lubricating oil filter
8. Heat exchanger
9. Charge air cooler (aftercooler)
10. Starter motor
11. Oil dipstick, reverse gear TD MG507A
12. Oil filler cap, reverse gear

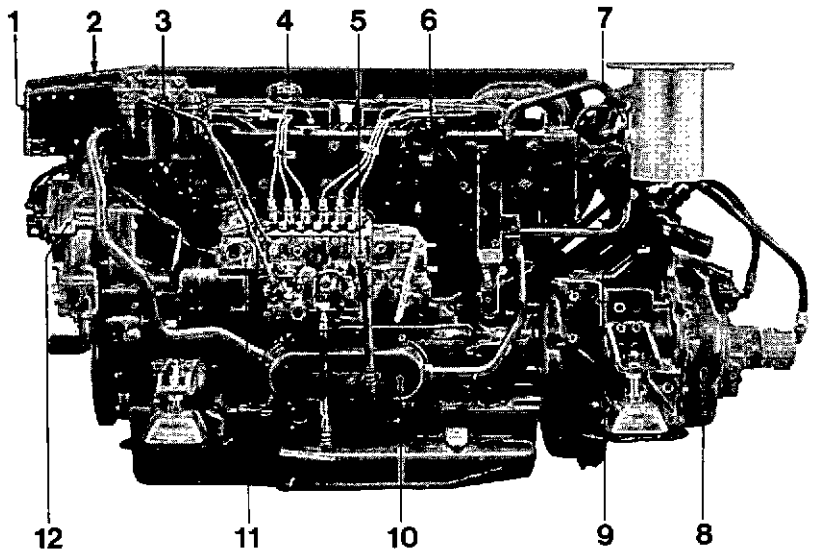
Location of number plate, marine engines:

On the left hand side of the engine block, rear part (between the engine's oil cooler and the flywheel cover).



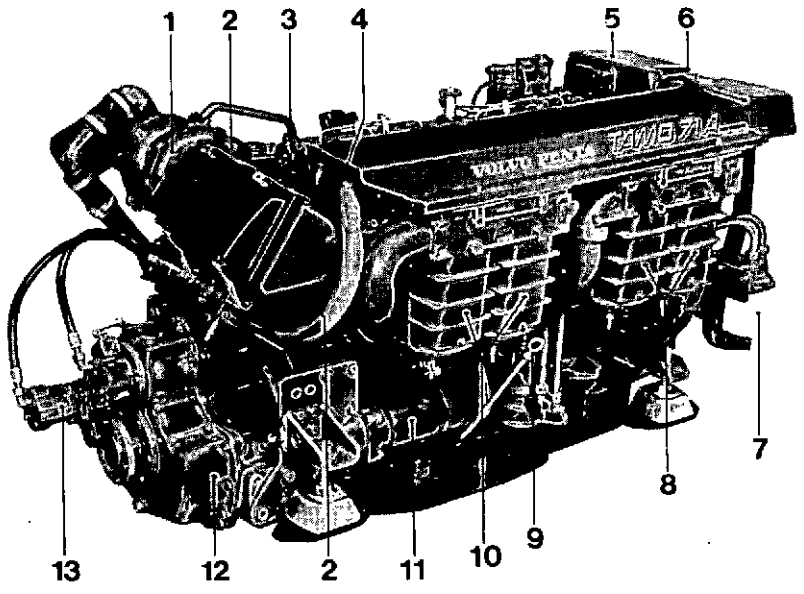
Number plate (late prod.),* example

* Early prod., see page 21



TAMD71A

1. Connector box with semi-automatic fuses
2. Coolant filler cap
3. Fuel fine filters
4. Oil filler cap
   (also at front end of engine)
5. Injection pump
6. Stop solenoid
7. Turbocharger
8. Reverse gear TD MG507
9. Oil cooler, reverse gear
10. Oil cooler, engine
11. Smoke limiter
12. Circulation pump



TAMD71A

1. Turbocharger
2. Air filter
3. Relay for pre-heater
4. By-pass valve (guides the air flow through the charge air cooler)
5. Expansion tank
6. Coolant filler cap
7. Lubricating oil filter
8. Heat exchanger
9. Oil dipstick
10. Charge air cooler (aftercooler)
11. Starter motor
12. Reverse gear TD MG507
13. Oil pump

The major alterations compared with the respective engines of the 60 and 70 series are, except for higher output and reduced exhaust gas emissions, as follows:

Engine body

General

All bolt unions have metric threads except the flywheel housing connection which has SAE standard and the rocker arm's ball bolts.

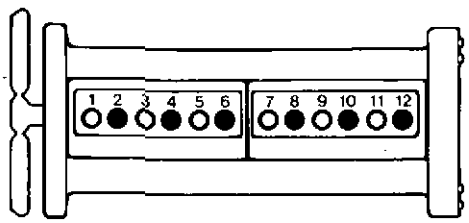
The asbestos gaskets are replaces by gaskets of expanded graphite and sealing paste. Sealing paste is used instead of gaskets in the following locations:

- Inlet manifold (TD61, TD71)
- *Timing gear casing*
- Timing gear cover
- Cover between the inspection covers at the valve lifters
- Intermediate part, cylinder block–coolant pump
- Flywheel cover

Cylinder heads

New cylinder heads with, among others, symmetrically located valves, inlet and exhaust channels. (Separate exhaust channels for each cylinder also for the 61 series.) Improved cooling (each cylinder head is cooled separately).

71 series: The recess for the inlet valve seats is deepened by 1 mm (0.039").

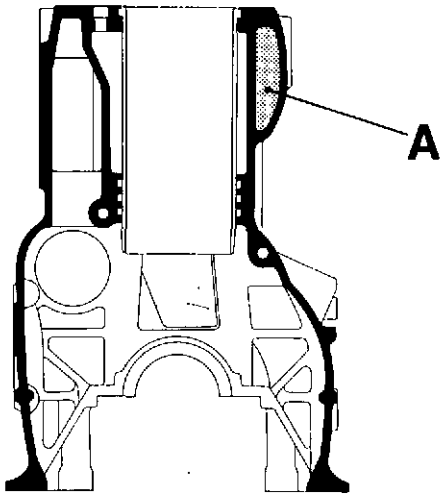


Valve location

○ Intake ● Exhaust

Cylinder block

New reinforced cylinder block with improved cooling of the cylinder liners. A lengthwise distribution channel in the cylinder block with pressed-in calibrated nipples, which guide the coolant flow towards each cylinder liner and giving a more even cooling.



Cylinder block with distribution channel (A)

Pistons and piston rings

The pistons for the **T(I)D61 and T(I)D71** are of the same type as for TID60D and T(I)D70G engines respectively.

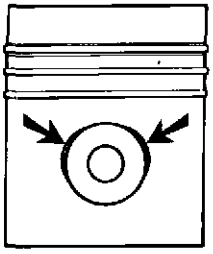
TAMD61 and TAMD71 have new pistons with a lower compression ratio. The pistons for TAMD61 are also provided with channels for piston cooling and are designed for the new upper compression ring.

An expansion space in the gudgeon pin hole (side-relief) has been introduced on the pistons for the **61 series** which reduces the stresses on the piston during the combustion phase. (The same advantages have been achieved for the 71 series as on the T(I)D70G engines by the trapezoidal gudgeon pin end of the connecting rod).

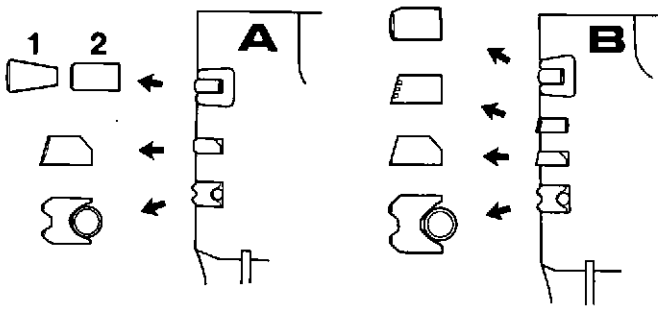
The piston rings are partly of a new version.

The oil ring (chromed) is fitted first and can be turned to face any direction. The opening in the expander spring should be placed opposite the gap of the oil ring.

61 series: The second compression ring (chromed) is tapered and has an internal chamfer. The ring must be fitted with the TOP marking facing upwards.

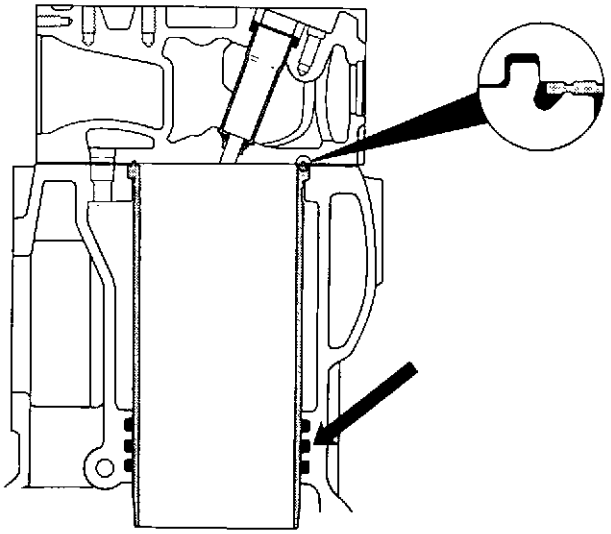


61 series: Gudgeon pin hole with "side-relief"

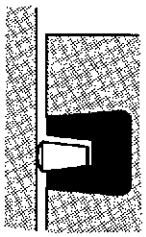


Positioning the piston rings

A. 61 series **B. 71 series**
1. TAMD61
2. Others



TD61, TID61: The upper compression ring (chromed) can be turned to face any direction. The upper compression ring for the **TAMD61** is of the "Keystone" type (trapezoidal shape). The ring has a molybdenum coating and must be fitted with the TOP marking facing upwards.



TAMD61: Upper compression ring, "Keystone" type.

71 series: The second and third compression rings are tapered and must be fitted with the TOP or (–) marking facing upwards. The rings are surface treated with ferrox. The second compression ring has also three ferrox filled grooves and the third has an internal chamfer. The upper compression ring (chromed) has a bevel machined on the outside and is to be fitted with the TOP or (–) marking facing upwards.

Cylinder liners

New plateau honed cylinder liners with so called flame barrier.

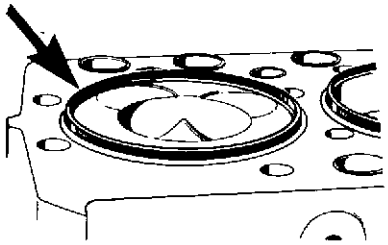
More efficient sealing between cylinder liners–cylinder heads. The cylinder liner's flame edge locates in the corresponding groove in the cylinder heads. In the space between the flame edge and the cylinder head the combustion pressure is "checked" so as to reduce the stress on the cylinder head gasket. The cylinder heads also have grooves, made from two concentrical, wide grooves (same as for 70 series).

The cylinder heads are attached by 20 bolts per head (M11). New tightening method with angle tightening for both 61 and 71 engines when overhauling (yield-point tightened in production).

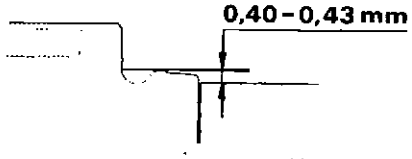
The lower cylinder liner sealing is improved (3 sealing rings compared with 2 before). **Both lower** sealing rings are similar and made of fluoric rubber (**marked with a green or yellow paint dot**). The **upper** sealing ring in the lower liner seal is made of ethylene-propylene rubber (EPDM) and is marked with **2 white paint dots.**

Note: All lower sealing rings in the parts kits are similar and of fluoric rubber (with green or yellow pain dot).

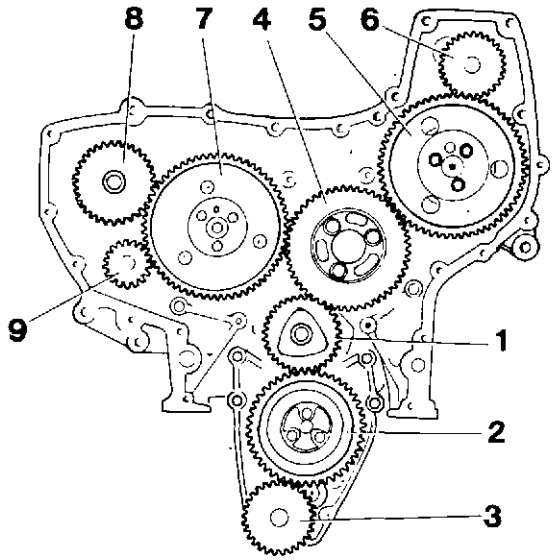
61 series: Altered cylinder liner height (same as for 71 series and late versions of the 70 series).



Cylinder liner with flame barrier.

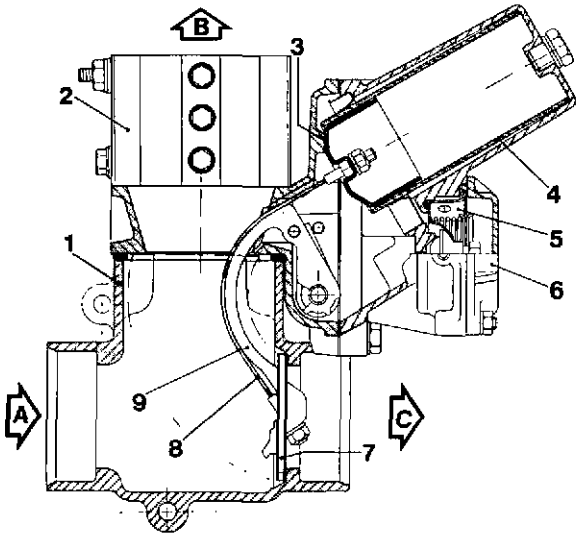


Cylinder liner height above the block face



Timing gears

1. Crankshaft drive gear
2. Intermediate drive for oil pump
3. Oil pump drive
4. Idler gear
5. Injection pump drive
6. Coolant pump drive
7. Camshaft drive
8. Sea-water pump drive (marine engines), or air compressor drive (industrial engines, optional equipment)
9. Servo-pump drive (industrial engines, optional equipment)



TAMD61A, TAMD71A: By-pass valve

A. From the air filter
B. To the inlet pipe
C. To the after-cooler

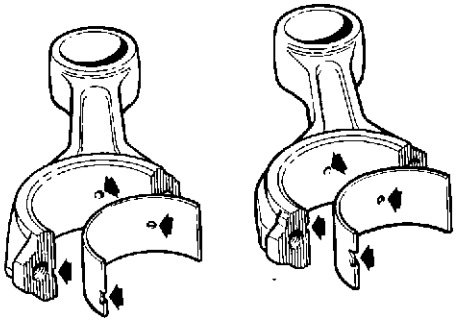
1. Butterfly valve housing
2. Pre-heater
3. Piston
4. Liner
5. Delay valve
6. Cover
7. Butterfly valve
8. Pulling cable
9. Butterfly valve lever

Timing gears

New common timing gears (with amongst other things, altered number of teeth).

Connecting rods and connecting rod bearings

61 series: New connecting rods with altered oil hole drilling, which has given new connecting rod bearings with altered location of the locating lug.



60 series 61 series

Connecting rods and connecting rod bearings

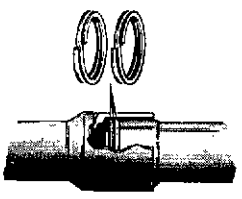
Inlet and exhaust system

Industrial engines: More effective sealing between the forward and rear exhaust manifolds ("key-ring sealings").

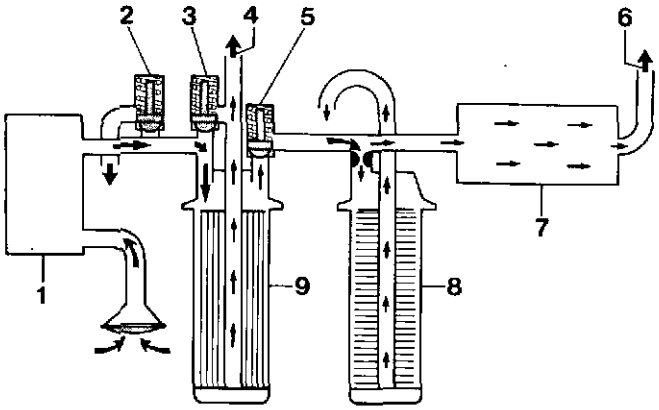
Note! When installing the exhaust manifold the gaskets must be turned so that the graphite side is towards the cylinder head and the metal surface towards the exhaust manifold. See fig.

TD61, TID61: Two piece exhaust manifold.

Marine engines: A by-pass valve guides the air flow through the after-cooler. At low loads, at boost pressure below abt. 30 kPa (0.3 kp/cm^2 = 4.3 p.s.i.), the passage through the after-cooler is closed. The heated air from the turbo is instead led directly (through the pre-heater) into the engine's inlet manifold which helps reduce the exhaust emissions.

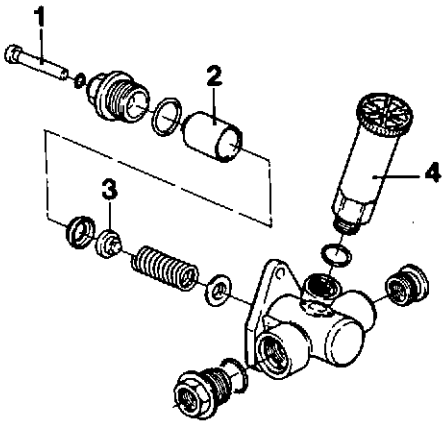


Industrial engines: "Key ring seals" for exhaust manifold



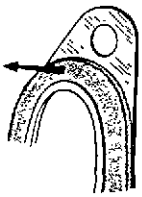
Lubricating system

1. Oil pump
2. Relief valve
3. Overflow valve
4. Pressure oil to the lubricating system
5. Piston cooling valve
6. Pressure oil to piston cooling (to the oil sump on TD61, TID61)
7. Oil cooler
8. By-pass filter
9. Oil filter



Feed pump

1. Pressure rod
2. Piston
3. Valve
4. Hand pump



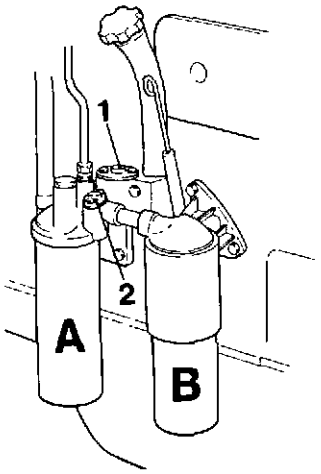
Industrial engines: Gaskets for exhaust manifold
The graphite side to face the cylinder head

Flywheel housing

Industrial engines: New flywheel housing with the cover for the timing marks on the left hand side ("pump side").

Lubricating system

- New oil pumps with higher capacity and thicker shaft.
- New plate oil cooler.
- New relief valve with altered location (filter bracket).
- **71 series:** New piston cooling valve with altered location (filter bracket).
- **TAMD61:** Piston cooling introduced.
- **TD61, TID61:** One more relief valve located in the filter bracket guides the oil flow through the oil cooler (corresponds to the piston cooling valve for the other engines).
- By-pass (part flow) filter for lubricating oil, standard for TD71, TID71 (optional for the other engines).
- Industrial engines: New oil sumps with increased oil capacity.



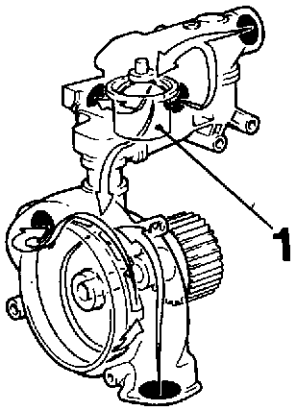
1. Relief valve
2. TD61, TID61: Oil cooling valve
   Others: Piston cooling valve

A. Oil filter (full flow type)
B. By-pass filter

Fuel system

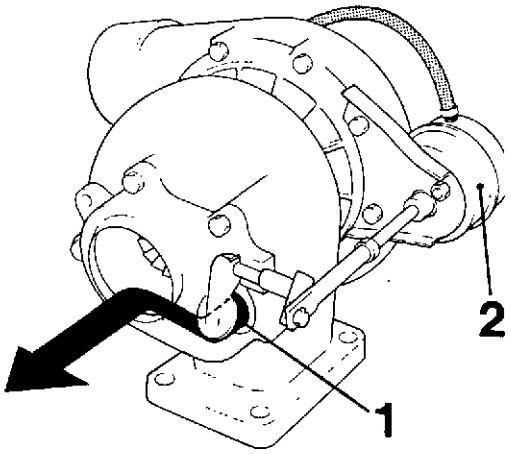
- Altered injection equipment.
  TD61, TID61: Reinforced injection pump. Twin fuel filters.

  T(I)D71AG: Electronic UT governor as optional equipment.
  TAMD61: The injection pump is mounted on a bracket and driven through a pump coupling (as for 71 series).



Thermostat housing and coolant pump

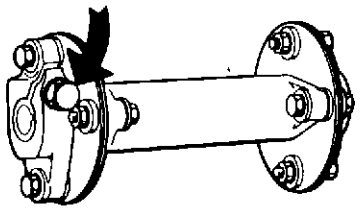
1. Piston thermostat



TD61AW, TD71AW: Turbocharger

1. Wastegate valve 2. Actuator

- **71 series (and TAMD61)**: Altered pump drive (the key in the shaft journal is deleted) and a new pump coupling. Setting of the injection angle can be carried out after loosening the clamp bolt in the pump coupling (same as for 121 series).
- Smoke limiter standard for TD61A, T(I)D71A and for the marine engines.
- New feed pumps giving more even pressure.
- Altered injectors (the pressure pipe connection on top).



71 series and TAMD61: Clamp bolt in the pump coupling

Turbocharger

- New turbochargers
- **TD61AW, TD71AW** (mobile version): Turbocharger with wastegate valve (relief valve).

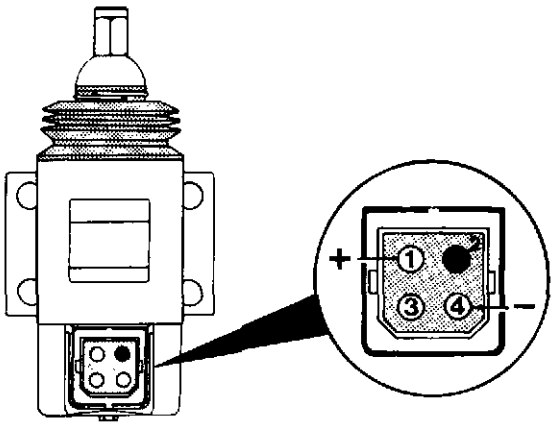
  By fitting the turbocharger with a wastegate, a smaller turbocharger can be used. A small turbo gets sufficient amount of exhaust gases to give a high turbo speed/high charging pressure already at low engine speeds, i.e. the engine get a greatly improved torque at low speed at the same time as it reacts quicker to load changes. In order not to race the smaller turbocharger at higher engine speeds, a wastegate valve is installed. It is controlled by an actuator (pressure sensor) which reacts to the charging pressure through a hose from the compressor housing. A spring loaded membrane, inside the actuator, senses the difference in pressure on both sides. The charging pressure increases gradually to a certain value, when the pressure against the outside of the membrane overpowers the spring force, the valve opens and allows some of the exhaust past the turbine wheel direct to the exhaust manifold.

Cooling system

- **One** new piston thermostat replaces two previous thermostats.
- New gear driven coolant pump with plastic impeller.
- Industrial engines: New automatic belt tensioner for the fan belts.
- Marine engines: New heat exchangers and aftercoolers with identical housings and inserts.

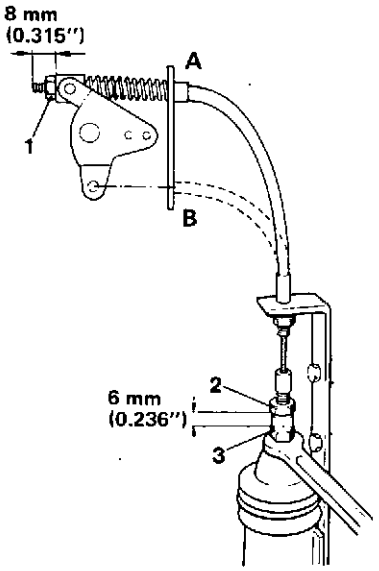
Electrical system

- 2-pole starter motor introduced on all engine versions.
- Altered wiring diagrams (engine), see pages 30 and 31.
- Industrial engines: New stop solenoid.
- Marine engines: Electrical pre-heater introduced. The pre-heater is controlled by a time relay and heats the "by-pass air". See fig. on page 26.



Industrial engines: Terminal block, stop solenoid

Pin 1. Plus (+)
Pin 2. Not used
Pin 3. Connector for control light
Pin 4. Minus (–)



Stop solenoid, industrial engines

A. Solenoid live when stopped
B. Solenoid live during running

1, 2. Locking nut 3. Adjuster nut

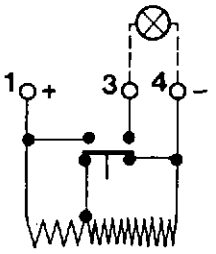
Adjusting the stop solenoid

(applies to industrial engines)

If the stop solenoid has been removed or replaced the following check must be carried out after fitting.

1. Remove the connecting block at the stop solenoid.
2. Adjust the cube on the stop lever to the basic setting of 8 mm (0.315"), see fig. Lock with locking nut (1).
3. Fit the stop cable and the cube:
   Upper position (A) is when solenoid is live when stopped.
   Lower position (B) is when solenoid is live during running.
4. Hold the cable and screw on the stop solenoid's adjuster nut (3) to the basic setting of 6 mm (0.236").
5. Push in the pulling rod (plunger) until it bottoms in the stop solenoid. Check that the injection pump's stop lever has about 1 mm (0.039") left before the end-stop for the stop (applies when solenoid is live when stopped), or 3 mm (0.118") left before the end-stop (when the solenoid is live during running). Adjust if necessary as in points 2 or 4.
6. Connect terminal 4 on the solenoid to minus (–). Connect a control lamp between terminals 3 and 4.
7. Connect power to terminal 1 (+), (stop solenoid is engaged) and check that **the indicator lamp lights.** This shows that the solenoid has pulled to the holding winding.

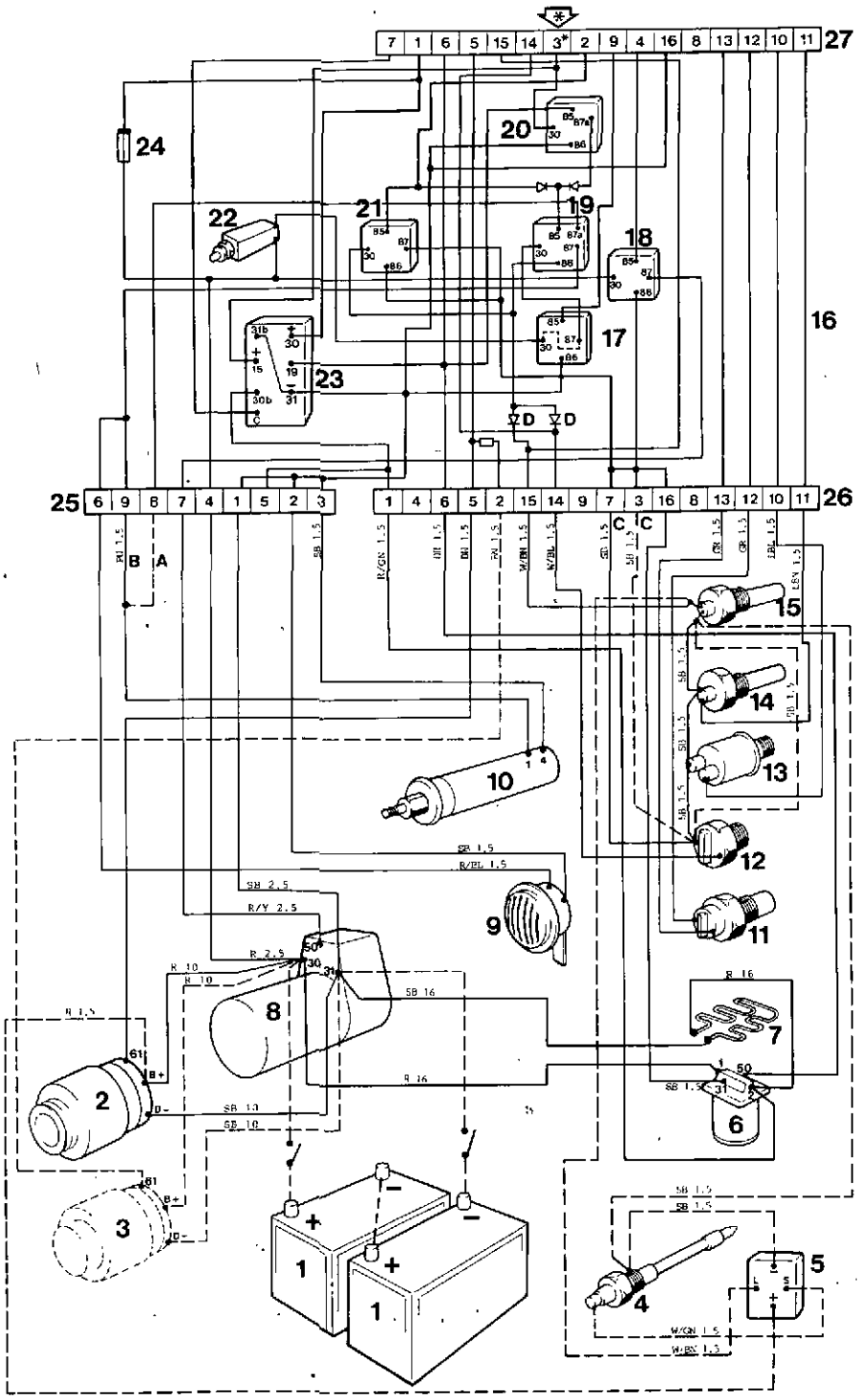
   Disconnect power and re-adjust if lamp does not light. The solenoid has not "pulled to bottom" and the solenoid (pulling winding) can burn out after abt. 1/2 minute.



Industrial engines: Wiring diagram, stop solenoid

Wiring diagram – Industrial engines

TD61, TID61, TD71, TID71



ENGINE

1. Battery
2. Alternator
3. *Optional alternator*
4. Coolant level switch
5. Relay
6. Relay for pre-heater
7. Pre-heater
8. Starter motor
9. Horn
10. Stop solenoid
11. Tachometer sender
12. Oil pressure switch
13. Oil pressure sender
14. Coolant temperature sender
15. Coolant temperature switch
16. Circuit card
17. Stop relay,** (installed only when the stop solenoid is live during operation. When the stop solenoid is to be live when stopping, a cut-over is made between 30 and 87 – the dotted line)
18. Start relay**
19. Stop relay**
20. Interlocking relay (-P-exec.)**
21. Ground relay**
22. Semi-automatic fuse, 8A** (horn and stop solenoid)
23. Time relay**
24. Fuse, 5A** (controlling currents)
25. 9-pole connector**
26. 16-pole.connector**
27. 16-pole connector** (for instrument panel harness)

* Should be dead during starting.
** Located in the connector box.

A. Connected when the stop solenoid is to be live when running
B. Connected when the stop solenoid is to be live when stopping
C. Minus connections
D. Diodes (only on engines with automatic stop)

Cable areas in mm²

Relation mm²/AWG*

* American Wiring Gauge

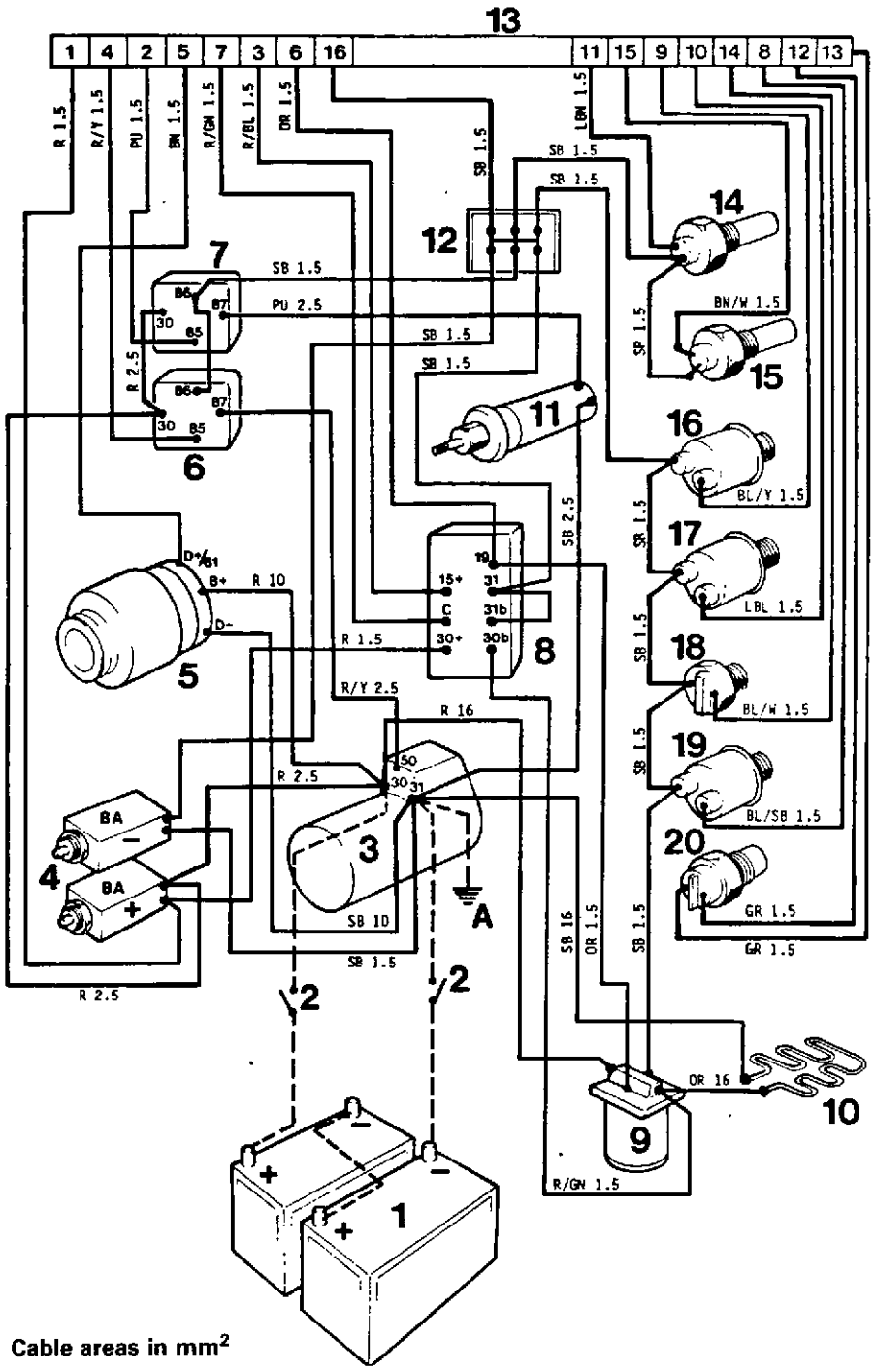
mm²	1.0	1.5	2.5	10	16
AWG	16 (17)	15 (16)	13	7	5

Wire colours

BL	= Blue	OR	= Orange
LBL	= Light blue	PU	= Purple
BN	= Brown	R	= Red
LBN	= Light brown	SB	= Black
GN	= Green	W	= White
GR	= Grey	Y	= Yellow

Wiring diagrams – Marine engines

TAMD61A, TAMD71A



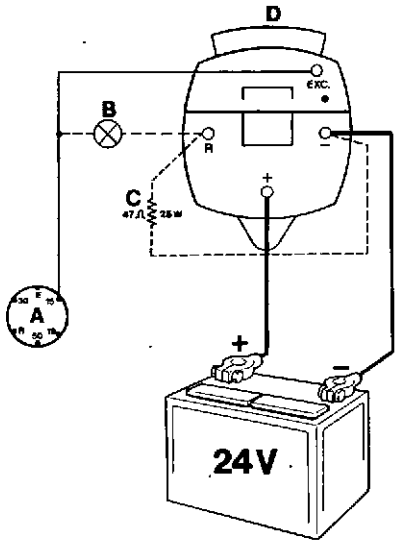
Cable areas in mm²

ENGINE

1. Battery
2. Main switch
3. Starter motor
4. Semi-automatic fuses*
5. Alternator
6. Start relay (16MS)*
7. Stop relay (16S)*
8. Time relay*
9. Relay for pre-heater
10. Pre-heater
11. Stop solenoid
12. Earth plinth*
13. Connector, 16-pole*
14. Coolant temperature sender
15. Coolant temperature switch
16. Pressure sender, turbocharger
17. Oil pressure sender, engine
18. Oil pressure switch
19. Oil pressure sender, reverse gear
20. Rev. counter sender

* Located in the connector box.

A. On single-pole systems connector 31 is earthed.



A. Key switch
B. Charging warning lamp
C. Resistance (47Ω/25W)
D. Alternator 28V/100A

Cable colours

BL	= Blue	OR	= Orange
LBL	= Light blue	PU	= Purple
BN	= Brown	R	= Red
LBN	= Light brown	SB	= Black
GN	= Green	W	= White
GR	= Grey	Y	= Yellow

Optional alternator

A charging warning lamp can not be used for the 14V/130A Motorola alternator. For the 28V/100A alternator however, a warning lamp (B) can be used. A resistance "C" (47Ω/25W) must then be connected as shown in the diagram above.

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