

## General Specifications

### General

Engine management		EEC IV / EFI
Emissions standard		93 EEC
Identification code		N7A
Firing order		1-3-4-2
Bore	mm	86,0
Stroke	mm	86,0
Cubic capacity	Effective cc	1998
Compression ratio		10,3:1
Power output (EEC)	kW	110
Power output (EEC)	(PS)	(150)
Power output (EEC) at	rev/min	6000
Torque (EEC)	Nm	190
Torque (EEC) at	rev/min	4500
Idle speed	rev/min	950
Max. permissible engine speed, continuous	rev/min	5950
Max. permissible engine speed, short-term	rev/min	6175
Spark plugs		AGPR 22 C1
Electrode gap	mm	1,0

### Dimensions

Cylinder block		
Cast mark		20
Cylinder bore diameter, standard class 1 mm	mm	86,000 - 86,02
Cylinder bore diameter, standard class 2 mm	mm	86,010 - 86,02
Cylinder bore diameter, oversize 0,15 mm, class A	mm	86,150 - 86,16
Cylinder bore diameter, oversize 0,15 mm, class B	mm	86,160 - 86,17
Cylinder bore diameter, oversize 0,5 mm	mm	86,500 - 86,51

Number of main bearings		5
Centre main bearing width (without thrust half rings), standard	mm	21,12 - 21,23
Vertical inside diameter - main bearing shells, service standard	mm	54,261 - 55,00
Vertical inside diameter - main bearing shells, standard	mm	54,983 - 55,00
Vertical inside diameter - main bearing shells - 1st undersize 0,05 mm	mm	54,961 - 54,98
Vertical inside diameter - main bearing shells - 2nd under size 0,25 mm	mm	54,761 - 54,78
Vertical inside diameter - main bearing shells - 3rd undersize 0,50 mm	mm	54,511 - 54,53
Vertical inside diameter - main bearing shells - 4th undersize 0,75 mm	mm	54,261 - 54,28
Main bearing parent bore diameter, standard	mm	59,287 - 59,30
Main bearing parent bore diameter, oversize 0,40 mm, black	mm	59,687 - 59,70

#### Dimensions

Crankshaft		
End float	mm	0,093 - 0,303
Main bearing journal diameter, standard (yellow)	mm	54,98 - 54,99
Main bearing journal diameter, (red)	mm	54,99 - 55,00
Main bearing journal diameter, undersize (green)	mm	54,73 - 54,75
Clearance - main bearing journal/bearing shell	mm	0,011 - 0,048
Big-end bearing journal diameter, standard	mm	50,89 - 50,92
Big-end bearing journal diameter, undersize 0,25 mm (green)	mm	50,64 - 50,66
Thrust half washer thickness, standard	mm	2,301 - 2,352
Thickness of thrust half rings, oversize 0,38 mm (yellow)	mm	2,491 - 2,542
Centre main bearing journal width, standard	mm	26,025 - 26,07
Centre main bearing journal width, oversize 0,38 mm (yellow)	mm	26,405 - 26,45

#### Dimensions

Connecting rods		
Bore diameter, big end	mm	53,890 - 53,92
Bore diameter, small end	mm	20,589 - 20,60
Vertical insides diameter - big-end bearing journal, service, standard	mm	49,916 - 50,92

Vertical inside diameter - big-end bearing journal, standard	mm	50,916 - 50,918
Vertical inside diameter - big-end bearing journal, 1st undersize 0,025 mm	mm	50,892 - 50,918
Vertical inside diameter - big-end bearing journal, 2nd undersize 0,25 mm	mm	50,652 - 50,682
Vertical inside diameter - big-end bearing journal, 3rd undersize 0,50 mm	mm	50,416 - 50,418
Vertical inside diameter - big-end bearing journal, 4th undersize 0.75 mm	mm	50,166 - 50,202
Vertical inside diameter - big-end bearing journal, 5th undersize 1,00 mm	mm	49,916 - 49,918
Clearance - big-end bearing journal/bearing shell	mm	0,006 - 0,008
Big-end bearing end float	mm	0,090 - 0,310

#### Dimensions

Pistons		
Piston diameter, service, standard	mm	85,980 - 86,000
Piston diameter, standard 1	mm	85,970 - 85,980
Piston diameter, standard 2	mm	85,980 - 85,990
Piston diameter, oversize 0,15 mm	mm	86,130 - 86,150
Piston diameter, oversize 0,50 mm	mm	86,470 - 86,490
Piston installation clearance, production	mm	0,02 - 0,04
Piston installation clearance, service	mm	0,01 - 0,04
Piston pin length	mm	63,4
Piston pin diameter (white)	mm	20,622 - 20,624
Piston pin diameter (red)	mm	20,625 - 20,627
Piston pin diameter (blue)	mm	20,628 - 20,630
Piston pin diameter (yellow)	mm	20,631 - 20,633
Clearance in piston (colour match)	mm	0,008 - 0,010
Interference fit in connecting rod	mm	0,018 - 0,030
Piston ring gap (fitted), upper compression ring	mm	0,30 - 0,60
Piston ring gap (fitted), lower compression ring	mm	0,50 - 0,80
Piston ring gap (fitted), oil scraper ring (three parts)	mm	0,40 - 1,50
Ring gap position	Stagger the piston ring gaps at 120° to another around the piston circumference. This also applies to the intermediate ring gap.	

the oil scraper ring in relation to the expander gap.

#### Dimensions

Cylinder head and valve seats		
Cast mark		20
Upper correction angle (prod.), inlet/exhaust		70°
Valve seat angle		44°30"
Lower correction angle (prod.), inlet/exhaust		30°
Valve seat width, inlet	mm	1,33 - 2,19
Valve seat width, exhaust	mm	1,68 - 2,54
Stem bore diameter (inlet/exhaust)	mm	7,063 - 7,094
Camshaft bearing parent bore diameter	mm	26,00 - 26,03

#### Dimensions

Camshafts		
Number of camshaft bearings		2 x 5
Drive	Single roller chain, hydraulic chain tensioner	
Camshaft end float	mm	0,02 - 0,26
Cam lift, inlet	mm	9,99
Cam lift, exhaust	mm	9,16
Cam length (between heel and tip), inlet	mm	51,87 - 52,10
Cam length (between heel and tip), exhaust	mm	51,04 - 51,27
Valve timing, inlet opens before TDC		9°
Valve timing, inlet closes after BDC		59°
Valve timing, exhaust opens before BDC		57°
Valve timing, exhaust closes after TDC		11°
Camshaft bearing journal diameter	mm	25,96 - 25,98
Inside diameter of bearing	mm	26,00 - 26,03

#### Dimensions

Valves		
Valve control		DOHC
Valve Clearances		Hydraulic tappet

Hydraulic tappet diameter	mm	30
Hydraulic tappet clearance in housing	mm	0,025 - 0,075
Valve length, inlet	mm	111,67 - 112,7
Valve length, exhaust	mm	111,37 - 111,8
Valve head diameter, inlet	mm	33,5
Valve head diameter, exhaust	mm	30
Valve stem diameter, standard inlet	mm	7,025 - 7,045
Valve stem diameter, standard exhaust	mm	6,999 - 7,019
Valve stem diameter, oversize 0,2, exhaust	mm	7,199 - 7,219
Valve stem diameter, oversize 0,4, inlet	mm	7,425 - 7,445
Valve stem diameter, oversize 0,4, exhaust	mm	7,399 - 7,419
Valve stem guide clearance, inlet	mm	0,020 - 0,060
Valve stem guide clearance, exhaust	mm	0,046 - 0,096
Valve spring free length	mm	44,8
Spring force - inlet and exhaust are identical		
Spring force, valve open	N	635
Spring force, valve closed	N	210
Spring length (compressed)		
Spring length, valve open	mm	28,0
Spring length, valve closed	mm	38,0
Valve spring inside diameter	mm	17,2
Valve spring wire diameter	mm	3,7
Number of turns		7,4

#### Dimensions

Engine Lubrication/Cooling		
Oil pressure at 750 rev/min (SAE 10W/30 and 80°C oil temp.)	bar	1,60
Oil pressure at 2000 rev/min (SAE 10W/30 and 80°C oil temp.)	bar	3,10
Pressure relief valve opens at	bar	3,70 - 4,60
Oil pressure warning light comes on at	bar	0,30 - 0,50
Oil pump rotor/housing clearance	mm	0,154 - 0,304
Inner/outer rotor gap	mm	0,05 - 0,20

Rotor mating face end float	mm	0,039 - 0,104
Coolant temperature switch comes on at	°C	99
Coolant temperature switch goes off at	°C	94
Thermostat opening temperature	°C	88

#### Dimensions

Steering		
Power steering pressure switch closes at	bar	38 - 48
Power steering pressure switch opens at	bar	14 - 30

\* The location of the angle on the valve seat is explained in the section Description and Operation.

#### Spacer plates for the sump

Equalisation range	Available spacer plates	Colour coding
0,00 - 0,25 mm	No spacer required	
0,26 - 0,29 mm	0,15 mm	silver
0,30 - 0,44 mm	0,30 mm	light blue
0,45 - 0,59 mm	0,45 mm	red
0,60 - 0,75 mm	0,60 mm	black

#### Lubricants, Adhesives and Sealers

Description	Ford Specification
Coolant	ESD-M97B-49A
Transmission fluid (MTX 75)	ESD-M2C186A
Transmission fluid for transfer box (4x4)	SQM-2C9008-A
Transmission fluid for rear differential (4x4)	SQM-2C9002-A
Sealer for crankshaft front oil seal carrier (Loctite 518)	WSK-M2G348-A
Sealer for sump (Hylosil 502)	WSK-M4G320-A
Adhesive sealer for coolant pump angle connector (Loctite 243)	WSK-M2G349-A
Adhesive sealer for coolant temperature sensor (Loctite 243)	WSK-M2G349-A
Adhesive for oil dipstick tube	SPM-2G9123-A
Lubricant for O-ring of engine speed/crankshaft position sensor (CKP sensor)	SM1C-115-A
Lubricant for release bearing guide sleeve	ESD-M1C-220-2
Lubricant for transmission input shaft splines	ESD-M1C-220-2
Power steering hydraulic fluid	SQM-2C-9010-2

Thread-locking compound (Loctite 270)	SDM-M4G9107-2
Spark plug threads (Never Seeze)	ESE-M1244-A
Heated oxygen sensors (Never Seeze)	ESE-M1244-A-2
Thread locking compound - power steering pump to bracket	SDM-M4G9107-2

#### Fill Capacity

Description	Litres
Engine oil, initial fill capacity incl. filter	4,75
Engine oil, oil change incl. filter change (every 10.000km)	4,5
Engine oil, oil change excl. filter change	4,0
Coolant	7,5

#### Engine oil

Viscosity/Ambient temperature	Designation	Specification
Recommended engine oil:		
SAE 5W30 / less than -20 °C to over 40 °C	Ford Formula E Economy Engine Oil	ACEA A1-96/B1-96 and WSS-M2C912
Alternative engine oils:		
SAE 10W30 / -20 °C to over 40 °C	Ford Super Multigrade Engine Oil	ACEA A1-96/B1-96 or A2-96/B2-96 API/SH/CD EC
SAE 10W40 / -20 °C to over 40 °C	Ford XR+ High-performance High-lubricity Engine Oil	ACEA A3-96/B3-96 or API/SH/CD
SAE 5W40 / less than -20 °C to over 40 °C	Ford Formula S Synthetic Motor Oil	ACEA A3-96/B3-96 or API/SH/CD

If engine oils with these specifications are not available, only engine oils which at least meet the API/SH/CD EC specification may be used.

#### Torques

General	Nm	lbf.ft
Hose clamps	4	3
Fuel feed pipe to cylinder head	25	18
Ground cable to engine lifting eye	9	7

#### Torques

Intake system	Nm	lbf.ft
Studs in cylinder head	16	12
Inlet manifold to cylinder head	22	16

Intake air temperature sensor in intake pipe (IAT sensor)	15	11
Bracket for pulse air system air cleaner/air conditioning dehydrator to radiator crossmember	9	7
Air cleaner to body	9	7
Pulse air system air cleaner to bracket	9	7

**Torques**

Exhaust	Nm	lbf.ft
Exhaust manifold to catalytic converter	44	32
Studs in cylinder head	14	10
Exhaust manifold to cylinder head	23	17

**Torques**

Alternator	Nm	lbf.ft
Alternator to bracket (M8)	25	18
Alternator to bracket (M10)	44	32
Positive lead	23	17
Lead for ignition warning light	11	8
Alternator heat shield	6	4

**Torques**

Transmission	Nm	lbf.ft
Ground cable to flange bolt	44	32
Negative lead to transmission	26	19
Starter motor to transmission	35	26
Starter motor to engine	32	24
Engine/transmission flange bolts	40	30
Driveshaft to rear axle extension	38	28
Driveshaft centre bearing to body	19	14
Clutch pressure plate	29	21
Oil drain and oil check plug - manual transmission	45	33
Oil check plug - transfer box	45	33
Gearshift stabiliser bar to transmission	55	41
Shift rod to transmission	23	17
Shift rod clamp bolt to selector shaft	16	12



**Torques**

Air Conditioning	Nm	lbf.ft
Air conditioning compressor to bracket	26	19
Air conditioning compressor bracket to cylinder block	47	35
Air conditioning compressor pipes to radiator crossmember and bracket	9	7
Dehydrator to bracket	9	7

**Torques**

Coolant circuit	Nm	lbf.ft
Expansion tank to body	9	7
Radiator crossmember to right- and left-hand body side member	23	17
Cooling fan shroud to radiator	9	7
Coolant pump	23	17
Coolant pipe bracket to cylinder block	9	7
Temperature gauge sender unit	6	4
Thermostat housing	20	15
Coolant temperature switch (CTS)	29	21
Engine coolant temperature sensor (ECT sensor)	12	9
Coolant pump angle connector	14	10
Coolant pump blanking plug	16	12
Coolant outlet blanking cover to cylinder head	20	15

**Torques**

Steering	Nm	lbf.ft
Power steering pump to bracket	23	17
Lower power steering pump bracket to cylinder block	25	18
Upper power steering pump bracket to cylinder block	25	18
Upper to lower power steering pump bracket	25	18
Power steering pipe to cylinder block	44	32
Power steering pipe to cylinder head cover/engine lifting eye	9	7

**Torques**

Engine mounting	Nm	lbf.ft
Rear right-hand engine mounting to body	69	51

Rear left-hand engine mounting to side member	69	51
Front right-hand engine mounting to cylinder block	69	51
Front right-hand engine mounting to body	78	58
Engine roll restrictor to body	69	51
Bracket to transmission	44	32
Engine support bracket to engine mounting/axle beam	69	51

#### Torques

Oil circuit	Nm	lbf.ft
Oil drain plug	25	18
Oil pressure switch to cylinder block	14	10
Oil filter mounting to cylinder block	37	27
Oil filter to oil filter mounting	15	11
Oil baffle to cylinder block	19	14
Oil pump to cylinder block	10	7
Oil intake pipe to cylinder block	11	8
Oil intake pipe to main bearing bracket	19	14
Sump to cylinder block (studs)	7	5
Sump to cylinder block (nuts)	9	7

#### Torques

Belt drive	Nm	lbf.ft
Coolant pump pulley	23	17
Belt pulley to power steering pump	25	18
Vibration damper belt pulley to vibration damper hub	34	25
Belt pulley cover to power steering pump	9	7
Multi-groove belt cover to body	11	8
Multi-groove belt idler pulley to bracket	49	36

#### Torques

Cylinder block	Nm	lbf.ft
Lower timing chain cover	10	7
Alternator/power steering pump bracket to cylinder block	47	35
Rear oil seal carrier	10	7

Front support bracket to cylinder block	26	19
Timing chain guide, M8	26	19
Positive crankcase ventilation	9	7
Main bearing cap	97	72
Big-end bearing cap		
Stage 1	7	5
Stage 2	16	12
Stage 3	90°	90°
Vibration damper hub to crankshaft		
Stage 1	52	38
Stage 2	85°	85°
Flywheel	87	64
Crankshaft position sensor (CKP sensor)	4	3
Oil pump chain tensioning arm	12	9
Oil pump sprocket	18	13
Engine oil dipstick tube	10	7

#### Torques

Cylinder head	Nm	lbf.ft
Timing chain guide, upper	12	9
Timing chain guide, lower	26	19
MAP sensor bracket	9	7
Cover to cylinder head cover	5	4
Cylinder head cover		
Stage 1	3	2
Stage 2	6	4
Cylinder head		
Stage 1	40	30
Stage 2	55	41
Stage 3	90°	90°
Stage 4	90°	90°
Auxiliary cylinder head bolts (x 3)	38	28

Upper timing chain cover to cylinder head	11	8
Lower timing chain cover to cylinder block	10	7
Camshaft bearing cap to cylinder head	24	18
Camshaft sprockets to camshafts	59	44
Engine lifting eyes to cylinder head	25	18
Camshaft bearing studs in cylinder head (x 20)	20	15
Cylinder head cover studs in cylinder head (x 4)	6	4
Oil circuit blanking plugs in cylinder head	52	38
Coolant blanking cover in cylinder head	20	15
Spark plugs	18	13
Ignition coils to cylinder head cover	11	8

**Torques**

Front axle	Nm	lbf.ft
Wheel bolts	85	63
Driveshaft nut to wheel hub	235	173
Brake caliper to spindle carrier	58	43
Track rod end to spindle carrier	26	19
Stabiliser link rod to suspension strut	50	37
Lower suspension arm ball joint to spindle carrier	70	52