

<b>VOLVO PENTA</b>	Document No	Issue Index
<b>TAD1345VE</b>	<b>21340729</b>	<b>02</b>

## General

In-line four stroke diesel engine with direct injection. Rotation direction, anti-clockwise viewed towards flywheel

Number of cylinders			6
Displacement, total		liters in <sup>3</sup>	12.78 780
Firing order			1-5-3-6-2-4
Bore		mm in	131 5.16
Stroke		mm in	158 6.22
Compression ratio			18.1:1
Wet weight	Engine only	kg lb	
	Power pac	kg lb	

Performance				rpm	1500	1800	2000	2100
IFN Power	394 kW	without fan		kW	361	394	394	394
				hp	491	536	536	536
		with fan 890 mm		kW	352	377	372	368
				hp	479	513	506	500
ICFN Power	394 kW	without fan		kW	361	394		
				hp	491	536		
		with fan 890 mm		kW	352	377		
				hp	479	513		
Torque at:		IFN Power 394 kW		Nm	2298	2090	1881	1792
				lbf ft	1695	1542	1387	1321
		ICFN Power 394 kW		Nm	2298	2090		
				lbf ft	1695	1542		
Max torque at engine speed			1260 rpm	Nm lbf ft	2325 1715			
Mean piston speed				m/s ft/sec	7.9 25.9	9.5 31.1	10.5 34.6	11.1 36.3

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<b>Performance</b>		<b>rpm</b>	<b>1500</b>	<b>1800</b>	<b>2000</b>	<b>2100</b>
Effective mean pressure at:	IFN Power 394 kW	MPa	2.26	2.06	1.85	1.76
		psi	328	298	268	255
	ICFN Power 394 kW	MPa	2.26	2.06		
		psi	328	298		
Max combustion pressure at:	IFN Power 394 kW	MPa	16.7	16.1	15.2	15
		psi	2422	2335	2204	2175
	ICFN Power 394 kW	MPa	16.7	16.1		
		psi	2422	2335		
Total mass moment of inertia, J (mR <sup>2</sup> )		kgm <sup>2</sup> lbft <sup>2</sup>	3.43 81.4			
Friction Power		kW	30	43	54	60
		hp	41	58	73	82
<b>Derating see Technical Diagrams</b>						

**Cold start performance**

*Cold start ambient temperature limit and time from start to no load speed	without starting aid	°C / sec.	20	3s
		°F / sec.	68	
	with manifold heater 4 kW	°C / sec.	-5	4s
		°F / sec.	23	
	with manifold heater 4 kW and block heater	°C / sec.	-15	4.5s
		°F / sec.	5	
*Specify oil and fuel quality	Mk1 fuel, VDS2 oil. 15w40 above -15°C, 10w30 below -15°C			
Usage of manifold heater:	<b>Time preheating, minutes</b>	<b>Time post heating, minutes</b>		
<b>Block heater type</b>	<b>Make</b>	<b>Power kW</b>	<b>Engaged hours</b>	<b>Cooling water temp engine block</b>
	Volvo	2	12	10°C 50°F

\* See also general section in the Sales Support Tool

**Lubrication system**

Lubricating oil consumption at max rpm at:	IFN Power 394 kW	liter/h	0.02
		US gal/h	0.005
	ICFN Power 352 kW	liter/h	0.02
		US gal/h	0.005
Oil system capacity including filters		liter	36
		US gal	9.51
Oil sump capacity:	Max	liter	30
		US gal	7.93
	Min	liter	19
		US gal	5.02
Oil change intervals/specifications	VDS 3	h	600
	VDS 2	h	400
		h	
Engine angularity limits:	front up	°	11
	front down	°	11
	side tilt	°	11
Oil pressure at rated speed		kPa	300 - 650
		psi	44 - 94
Oil pressure shut down switch setting		kPa	130
		psi	19

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**Lubrication system**

Lubrication oil temperature in sump:	max	°C	130
		°F	266
Oil filter micron size		μ	40

**Fuel system**

		rpm	1500	1800	2000	2100
<b>IFN Power 394 kW</b> Specific fuel consumption at:	25%	g/kWh lb/hph	213 0.345	225 0.365	235 0.381	250 0.405
	50%	g/kWh lb/hph	197 0.319	208 0.337	215 0.349	220 0.357
	75%	g/kWh lb/hph	194 0.314	206 0.334	212 0.344	216 0.350
	100%	g/kWh lb/hph	197 0.319	204 0.331	213 0.345	219 0.355
<b>ICFN Power 394 kW</b> Specific fuel consumption at:	25%	g/kWh lb/hph	213 0.345	225 0.365		
	50%	g/kWh lb/hph	197 0.319	208 0.337		
	75%	g/kWh lb/hph	194 0.314	206 0.334		
	100%	g/kWh lb/hph	197 0.319	204 0.331		
Fuel to conform to			ASTM-D975-No1 and 2D JIS KK 2204, EN 590			

**Fuel system**

System supply flow at max. speed	liter/h	100
	US gal/h	26.4
Fuel supply line max. restriction (Measured at fuel inlet connection)	kPa	10
	psi	1.5
Fuel supply line max. pressure, engine stopped	kPa	0
	psi	
System return flow at max. speed	liter/h	18.0
	US gal/h	4.8
Fuel return line max. restriction (Measured at fuel return connection)	kPa	20
	psi	2.9
Max. allowable inlet fuel temp (Measured at fuel inlet connection)	°C	60
	°F	140
Prefilter / Water separator micron size	μ	10
Fuel filter micron size	μ	5
Governor type/make, standard	Volvo / EMS 2.2	
Injection pump type/make	Delphi E3	

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Intake and exhaust system		Inlet air temp	rpm	1500	1800	2000	2100
Air consumption at: (+25°C and 100kPa)	IFN Power 394 kW	25°C 77°F	m³/min cfm	27 954	30 1059	33 1165	34 1201
	ICFN Power 394 kW	25°C 77°F	m³/min cfm	27 954	30 1059		
Max allowable air intake restriction including piping			kPa psi	3 0.4			
Heat rejection to exhaust at:	IFN Power 394 kW		kW BTU/min				
	ICFN Power 394 kW		kW BTU/min				
Exhaust gas temperature after turbine at:	IFN Power 394 kW		°C °F	435 815	435 815	435 815	435 815
	ICFN Power 394 kW		°C °F	435 815	435 815		
Max allowable back pressure in exhaust line			kPa psi	11 1.6	13 1.9	14 2.0	15 2.2
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	IFN Power 394 kW		m³/min cfm	60 2119	69 2437	77 2719	81 2861
	ICFN Power 394 kW		m³/min cfm	60 2119	69 2437		
Exhaust gas smoke	IFN Power 394 kW		*Bosch Units	0.3	0.4	0.6	0.7
	ICFN Power 394 kW			0.3	0.4		
Heat rejection radiation from engine at:	IFN Power 394 kW		kW BTU/min				
	ICFN Power 394 kW		kW BTU/min				
Heat rejection to coolant at:	IFN Power 394 kW		kW BTU/min				
	ICFN Power 394 kW		kW BTU/min				
Coolant			Volvo Penta coolant "ready mix" or Volvo Penta coolant mixed with clean fresh water 40 / 60				
Radiator cooling system type				Closed circuit			
Standard radiator core area			m² foot²	0.8 8.61			
Fan diameter	890 mm		mm	890			
			in	35.04			

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Cooling system		rpm	1500	1800	2000	2100
Fan power consumption	890 mm	kW hp	9.0 12	17.0 23	22.0 30	26.0 35
Fan drive ratio	fan Ø890		0,99 : 1			
Coolant capacity:	engine	liter US gal	20 5.3			
	std. 0,8m² radiator with hoses	liter US gal	24 6.3			
Coolant pump		drive/ratio	Belt / 1.43:1			
Coolant flow with standard system		l/s US gal/s				
Minimum coolant flow		l/s US gal/s	5.6 1.5	6.7 1.8	7.4 2.0	7.8 2.1
Maximum outer circuit restriction incl. piping		kPa psi	55.0 8.0			
Thermostat:	start to open	°C	82			
		°F	180			
	fully open	°C	92			
		°F	198			
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa psi	100 14.5			
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa psi	70 10.2			
Standard pressure cap setting		kPa psi	70 10.2			
Maximum top tank temperature		°C °F	107 225			
Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still are functioning	with std. 0,8 m² radiator	liter US gal	1.8 0.5			
		liter				
		US gal				

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Charge air cooler system		rpm	1500	1800	2000	2100
Heat rejection to charge air cooler	IFN Power 394 kW	kW BTU/min				
	ICFN Power 394 kW	kW BTU/min				
Charge air mass flow	IFN Power 394 kW	kg/s	0.52	0.58	0.64	0.66
	ICFN Power 394 kW	kg/s	0.52	0.58		
Charge air inlet temp. (Charge air temp after turbo compressor)	IFN Power 394 kW	°C	188	178	187	189
		°F	370	352	369	372
	ICFN Power 394 kW	°C	188	178		
		°F	370	352		
Charge air outlet temp. (Charge air temp after charge air cooler)	IFN Power 394 kW	°C	38	40	43	46
		°F	100	104	109	115
	ICFN Power 394 kW	°C	38	40		
		°F	100	104		
Maximum pressure drop over charge air cooler incl. piping		kPa psi	8 1.16			
Charge air pressure (After charge air cooler)		kPa psi				
Standard charge air cooler core area		m² foot²	0.8 8.61			

**Cooling performance: 0.8 m<sup>2</sup> radiator and 890 mm fan**

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

Engine speed	Engine power	IFN Power 352 kW					
		Air on temp		Air flow		External restriction	
		°C	°F	m <sup>3</sup> /s	ft <sup>3</sup> /s	Pa	psi
2100 (STD 0,99)		57	135	7.6	268.4	650	0.094
		59	138	8.2	289.6	400	0.058
		62	144	9.1	321.4	0	
1800 (STD 0,99)		55	131	6.9	243.7	284	0.041
		57	135	7.3	257.8	162	0.023
		59	138	7.9	279.0	0	

**Cooling performance: 0.8 m<sup>2</sup> radiator and 890 mm fan**

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 107°C TTT and 40% coolant. Valid at 1 atm.

Engine speed	Engine power	ICFN Power 352 kW					
		Air on temp		Air flow		External restriction	
		°C	°F	m <sup>3</sup> /s	ft <sup>3</sup> /s	Pa	psi
1800 (STD 0,99)		55	131	6.9	243.7	284	0.041
		57	135	7.3	257.8	162	0.023
		59	138	7.9	279.0	0	
1500 (STD 0,99)							

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**Engine management system**

Functionality	Alternatives	Default setting
Governor mode	Isochronous / Droop	
Governor droop	0-8 %	
Governor response	Adjustable PID-constants (VODIA)	Standard
Idle speed	600-1200	
Stop function	Energized to Run / Stop	
Preheating function	On / Off	
Lamp test	On / Off	

Engine sensors and switch settings		Alarm level		Engine protection	
Parameter	Unit	Setting range	Default setting	Level	Action. Default/Alternative
Oil temp	°C	120 - 130	125	Setting +5	Shut down. ON/OFF*
Oil pressure	kPa	-	150	-20	Shut down. ON/OFF*
	kPa	-	250	-20	Shut down. ON/OFF*
Oil level		-	Min level	-	-
Piston cooling pressure >1000 rpm	kPa	-	150	150	Shut down. ON/OFF*
Coolant temp	°C	95 - 102	102	Setting +5	Shut down. ON/OFF*
Coolant level		See cooling system	On	Low level	Shut down. ON/OFF*
Fuel feed pressure	kPa	-	100	-	-
	kPa	-	300	-	-
Water in fuel		-	High level	-	-
Crank case pressure	kPa	-	-	Rapid pres inc	Shut down. ON/OFF*
Air filter pressure drop	kPa	-	5	-	-
Altitude, above sea	m	-	-	-	Automatic derating, see section derating
Charge air temp	°C	-	80	85	Shut down. ON/OFF*
Charge air pressure**	kPa	-	310	+10	Shut down. ON/OFF*
Engine speed	rpm	100 - 120% of rated speed	120% of rated speed	Alarm level	

\* Off means no shut down, alarm only

\*\* Pabs, 2100 rpm at sea level.

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**Electrical system**

Voltage and type			24V / insulated from earth
Alternator:	make		Bosch
	output	A	80
	tacho output	Hz/alternator rev.	6
	drive ratio		5,3:1
Starter motor:	make		Melco
	type		105P70
	output	kW	7
		hp	9.5
Number of teeth on:	flywheel		153
	starter motor		12
Max wiring resistance main circuit		mΩ	2
Cranking current at +20°C		A	180
Crank engine speed at 20°C		rpm	155
Starter motor battery capacity	max	Ah/A	2x225
	min at +5°C	Ah/A	-
Inlet manifold heater (at 20 V)		kW	4
Power relay for the manifold heater		A	1

**Power take off**

Timing gear at compressor PTO max:	Nm	160
	lbf ft	118
Speed ratio direction of rotation viewed from flywheel side		0,91:1/clockwise
Timing gear at servo pump PTO max:	Nm	100
	lbf ft	74
Speed ratio direction of rotation viewed from flywheel side		1,58:1/clockwise
Max allowed bending moment in flywheel housing	Nm	15000
	lbf ft	11063
Max. rear main bearing load	N	4000
	lbf	899.2