

# Technical data TAD1642VE

## General

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

Number of cylinders			6	
Displacement, total		liters	16,12	
		in <sup>3</sup>	984	
Firing order			1-5-3-6-2-4	
Bore		mm	144	
		in	5,67	
Stroke		mm	165	
		in	6,50	
Compression ratio			17,5:1	
Dry weight	Engine only, excluding cooling system	kg	1440	
		lb	3175	
	Power pac	kg	1840	
		lb	4057	
Wet weight	Engine only, excluding cooling system	kg	1510	
		lb	3329	
	Power pac	kg	2000	
		lb	4409	

<b>Performance</b>		<b>r/min</b>	<b>1200</b>	<b>1500</b>	<b>1600</b>	<b>1800</b>	
ICFN Power	494 kW	without fan	kW	396	494	494	494
			hp	539	672	672	672
	890 mm	with fan	kW	392	486	484	480
			hp	532	661	658	653
Torque at:	ICFN Power 494 kW		Nm	3151	3145	2948	2621
			lbf ft	2324	2319	2174	1933
Max torque at engine speed	rpm 1200		Nm	3151			
			lbf ft	2324			
Mean piston speed		m/s	6,6	8,3	8,8	9,9	
		ft/sec	21,7	27,1	28,9	32,5	

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<b>Performance</b>		<b>r/min</b>	<b>1200</b>	<b>1500</b>	<b>1600</b>	<b>1800</b>
Effective mean pressure at:	ICFN Power 494 kW	Mpa	2,46	2,45	2,30	2,04
		psi	356	355	333	296
Max combustion pressure at:	ICFN Power 494 kW	Mpa	15,8	17,5	17,5	17,1
		psi	2291	2538	2538	2480
Total mass moment of inertia, J (mR <sup>2</sup> )		kgm <sup>2</sup> lbft <sup>2</sup>	4,1 97,3			
Degree of irregularity at:	ICFN Power 494 kW		1:23	1:38	1:48	1:80
Friction Power		kW	25	38	43	55
		hp	34	52	58	75

### Derating

The engine may be operated up to 2130 m altitude without derating.
For operation at higher altitudes the power will be derated according to the graph below.
There is no derating for ambient temperature or humidity.

### Cold start performance

		<b>r/min</b>	<b>1500</b>	<b>1800</b>	
Time from start to stay within 0.5% of no load speed at ambient temperature:	°C	20	s	6,5	8,4
		5	s	6,7	8,7
		-15*	s	7,3	9,8
Time from start to stay within 0.8% of no load speed at ambient temperature:	°C	20	s	5,6	7,5
		5	s	6,2	8,2
		-15*	s	6,7	9,2

\* With manifold heater kW engaged, lubrication oil 10W/30, block heater and MK1 fuel.

Usage of manifold heater:	Time preheating, minutes	Time postheating, minutes		
	0,5	1,7		
Ambient temp. °C	Block heater type and Make	Power kW	Engaged hours	Cooling water temp engine block, °C
-15	External Volvo	2	12	17

### Lubrication system

		<b>r/min</b>	<b>1200</b>	<b>1500</b>	<b>1600</b>	<b>1800</b>
Lubricating oil consumption at max rpm at:	ICFN Power 494 kW	liter/h	0,10			
		US gal/h	0,026			
Oil system capacity including filters		liter	48			
		US gal	12,68			
Oil sump capacity:	Max	liter	42			
		US gal	11,10			
	Min	liter	32			
		US gal	8,45			
Oil change intervals/specifications	VDS-2	h	600			
	VDS, ACEA, E3	h	400			
	ACEA E2, API CF, CF-4, CG-4	h	200			

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### Lubrication system

Engine angularity limits:	front up	°	30
	front down	°	30
	side tilt	°	30
Oil pressure at rated speed		kPa	300 -- 650
		psi	44 -- 94
Lubrication oil temperature in sump:	max	°C	130
		°F	266
Oil filter micron size		mm	0,040

### Fuel system

		r/min	1200	1500	1600	1800
ICFN Power 494 kW Specific fuel consumption at:	25%	g/kWh	215	218	223	237
		lb/hph	0,349	0,353	0,361	0,383
	50%	g/kWh	203	199	201	207
		lb/hph	0,329	0,323	0,325	0,336
	75%	g/kWh	197	195	197	202
		lb/hph	0,320	0,315	0,319	0,328
	100%	g/kWh	201	201	201	206
		lb/hph	0,326	0,326	0,326	0,333
Fuel to conform to			ASTM-D975-No2, DIN 51601, EN 590			
System return flow at max. speed		liter/h	25			
		US gal/h	6,6			
System supply flow at max. speed		liter/h	185			
		US gal/h	48,9			
Fuel supply line max. restriction		kPa	10			
		psi	1,5			
Fuel supply line max. pressure, engine stopped		kPa	0,0			
		psi	0,0			
Fuel return line max. restriction		kPa	20			
		psi	2,9			
Max. allowable inlet fuel temp		°C	60			
		°F	140			
Prefilter / Waterseparator micron size		mm	0,010			
Governor type/make, standard		VOLVO / EMS2				
Injection pump type/make		Delphi E1				

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Intake and exhaust system		Inlet air temp	r/min	1200	1500	1600	1800
Air consumption at:	ICFN Power 494 kW	25°C 77°F	m <sup>3</sup> /min cfm	27 936	37 1314	39 1381	42 1469
Air intake restriction, clean filter(s)			kPa In wc	1,8 7,2			
Max allowable air intake restriction			kPa In wc	5 20,1			
Air filter type			Single stage paper cartridge				
Air filter cleaning efficiency			%	99,85			
Heat rejection to exhaust at:	ICFN Power 494 kW		kW BTU/min	285 16208	351 19961	351 19961	366 20814
Exhaust gas temperature after turbine at:	ICFN Power 494 kW		°C °F	518 965	466 871	445 834	442 827
Max allowable back pressure in exhaust line			kPa In wc	8,5 34,1	13,0 52,2	13,5 54,2	15,0 60,2
Exhaust gas flow at:	ICFN Power 494 kW		m <sup>3</sup> /min cfm	71 2493	88 3090	89 3140	92 3245
Exhaust gas smoke	ICFN Power 494 kW		*Bosch	0,4	0,2	0,1	0,1

**\*N.B!** Bosch units are calculated values. Measured values are acc. to ISO 10054 in FSN units

Cooling system		r/min	1800
Heat rejection radiation from engine at:	ICFN Power 494 kW	kW BTU/min	22 1251
Heat rejection to coolant at:	ICFN Power 494 kW	kW BTU/min	204 11601
Coolant	Volvo coolant or Volvo anticorrosion additive together with clean fresh water		
Radiator cooling system type	Closed circuit		

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Cooling system		r/min	1200	1500	1600	1800
Standard radiator core area		m <sup>2</sup>	1,32			
		foot <sup>2</sup>	14,21			
Standard radiator core thickness		mm	52			
		in	2,05			
Fan diameter	890 mm	mm	890			
		in	35,04			
Fan power consumption	890 mm	kW	4,5	8,0	10,0	14,0
		hp	6	11	14	19
Fan drive ratio	fan Ø890		0,97 : 1			
Coolant capacity:	engine	liter	33			
		US gal	8,7			
	std. 1,32m <sup>2</sup> radiator with hoses	liter	60			
		US gal	15,9			
Coolant pump		drive/ratio	belt/1,85:1			
Coolant flow with standard system		l/s	5,4	6,8	7,2	8,1
		US gal/s	1,4	1,8	1,9	2,1
Minimum coolant flow		l/s	5,4	6,8	7,2	8,1
		US gal/s	1,4	1,8	1,9	2,1
Maximum external coolant system restriction incl. piping		kPa	55,0			
		In wc	220,8			
Thermostat:	start to open	°C	86			
		°F	187			
	fully open	°C	96			
		°F	205			
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa	100			
		in wc	402			
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa	70			
		in wc	281			
Standard pressure cap setting		kPa	75			
		In wc	301			
Maximum top tank temperature		°C	103			
		°F	217			
Draw down capacity		4% of total cooling system capacity				

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Intercooler system		r/min	1800
Cooling power	ICFN Power 494 kW	kW BTU/min	125 7109
Combustion air inlet temp. (Charge air temp after turbo compressor)	ICFN Power 494 kW	°C	220
		°F	428
Max allowable Comb. Air temp after CAC at 25 degree ambient. (Charge air temp after intercooler)	ICFN Power 494 kW	°C	45
		°F	113
Maximum pressure droop over intercooler, incl. piping		kPa	12
		psi	1,74
Boost pressure at rated power 1800rpm.		kPa	225
		psi	32,63
Standard intercooler core area		m <sup>2</sup>	1,3
		foot <sup>2</sup>	13,99
Standard intercooler core thickness		mm	68
		in	2,68

### Cooling performance: 1,31 m<sup>2</sup> radiator and 890 fan

Cooling air flow and maximum additional external restriction at different radiator air temperatures based on 103°C TTT and 40% antifreeze

Engine speed	Engine power	Air on temp		Air flow		External restriction	
				kg/s	lb/s	Pa	psi
1800 rpm	494 kW	62	144	10,8	23,8	0	0,0
	672 hp	60	140	9,9	21,8	184	0,027
		55	131	8,5	18,7	696	0,101
		50	122	7,4	16,3	796	0,115
		45	113	6,6	14,6	819	0,119
		40	104	5,9	13,0	872	0,126

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## Engine management system

Functionality	Alternatives	Default setting
Governor mode	Isochronous/droop Switchable during operation	Isochronous
Governor droop	0 - 5%	0
Governor response	Adjustable PID-constants	
Idle speed	550 - 800 rpm	600 rpm
Stop function	Energized to run / stop	Energized to stop
Preheating function	ON/OFF	OFF
Lamp test	ON/OFF	ON

Engine protection		Alarm level		Engine protection		
Parameter	Unit	Setting range	Default setting	Protection at	Protective action	
Oil temperature	°C	120 - 130	125	Setting +5	Shut down / off *	
Oil pressure	Low idle	kPa	-	160	Default -30	Shut down / off *
	Rated speed	kPa	-	300	Default -30	Shut down / off *
Oil level		-	Min level	-	-	
Piston cooling pressure >1000 rpm	kPa	-	150	150	Shut down / off *	
Coolant temp	°C	95 - 101	98	Setting +5	Shut down / off *	
Coolant level		-	On	Low level	Shut down / off *	
Fuel feed pressure	Low idle	kPa	-	100	-	-
	Rated speed		-	300	-	-
Water in fuel		-	High level	-	-	
Crank case pressure	kPa	-	-	-	Shut down	
Air filter pressure drop	kPa	-	5,0	-	-	
Altitude, above sea	m			-	Automatic derating, see section derating	
Charge air temp	°C	-	80	+5	Shut down	
Charge air pressure	kPa	-	290	340	Shut down	
Engine speed	rpm	100 - 120% of rated	120% / off *	Alarm level	Shut down / on	
Low voltage	V	-	25,5	-	-	

\*Off means no shutdown , alarm only.

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## Electrical system

Voltage and type			24V / Insulated from earth	
Alternator:	make		Bosch	
	output	Amp	80	
	tacho output	Hz/alternator rev.	6	
	drive ratio		3,9 : 1	
Starter motor:	make		Melco	
	type		105P70	
	output	kW	7	
		hp	9,5	
Starter motor solenoid:	pull current	Amp	-	
	hold current	Amp	2,3	
Number of teeth on:	flywheel		153	
	starter motor		12	
Inrush current at +20°C		Amp	700	
Cranking current at +20°C		Amp	280	
Crank engine speed at +20°C		rpm	150	
Starter motor battery capacity	max	Ah	2x 225	
	min at +5°C	Ah		
Inlet manifold heater (at 20 V)		kW	4	
Power relay for the manifold heater		Amp	1	

## Power take off

		r/min	1200	1500	1600	1800
Front end in line with crank shaft max:		Nm lbf ft	TBD			
Front end belt pulley load. Direction of load viewed from flywheel side:	max left	kW	26	33	35	40
		hp	35	45	48	54
	max down	kW	60	75	80	90
		hp	82	102	109	122
	max right	kW	26	33	35	40
		hp	35	45	48	54
Timing gear at compressor PTO max:		Nm lbf ft	160 118			
Speed ratio direction of rotation viewed from flywheel side			1,31:1/ anti-clockwise			
Timing gear at servo pump PTO max:		Nm lbf ft	100 74			
Max allowed bending moment in flywheel housing		Nm lbf ft	15000 11063			
Max. rear main bearing load		N lbf	5000 1124,0			