

Technical data TAD1641VE

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

Performance		r/min	1200	1500	1600	1800
ICFN Power 420 kW	without fan	kW hp	340 462	420 571	420 571	420 571
	with fan 890 mm	kW hp	336 456	412 560	410 558	406 552
Torque at:	ICFN Power 420 kW	Nm lbf ft	2706 1995	2674 1972	2507 1849	2228 1643
Max torque at engine speed	rpm 1200	Nm lbf ft	2706 1996			
Mean piston speed		m/s ft/sec	6,6 21,7	8,3 27,1	8,8 28,9	9,9 32,5

Technical data TAD1641VE

Performance

		r/min	1200	1500	1600	1800
Effective mean pressure at:	ICFN Power 420 kW	Mpa	2,11	2,08	1,95	1,74
		psi	306	302	283	252
Max combustion pressure at:	ICFN Power 420 kW	Mpa	14,7	15,8	15,7	15,3
		psi	2132	2291	2277	2219
Total mass moment of inertia, J (mR ²)		kgm ² lbft ²	4,1 97,3			
Degree of irregularity at:	ICFN Power 420 kW		1:28	1:47	1:61	1:103
Friction Power		kW	25	38	43	55
		hp	34	52	58	75

Derating

The engine may be operated up to 4130 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

		r/min	1500	1800	
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 heat

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

		r/min	1200	1500	1600	1800
Lubricating oil consumption at max rpm at:	ICFN Power 420 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			

Technical data TAD1641VE

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 420 kW Specific fuel consumption at:	25%	g/kWh	220	226	232	249
		lb/hph	0,357	0,366	0,376	0,404
	50%	g/kWh	206	203	205	212
		lb/hph	0,334	0,329	0,332	0,344
	75%	g/kWh	200	196	199	205
		lb/hph	0,324	0,318	0,323	0,332
	100%	g/kWh	200	198	199	205
		lb/hph	0,324	0,321	0,323	0,332
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	165			
		US gal/h	43,6			
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				

Technical data TAD1641VE

Intake and exhaust system		Inlet air temp	r/min	1200	1500	1600	1800
Air consumption at:	ICFN Power 420 kW	25°C 77°F	m ³ /min cfm	23,0 812	33,0 1165	34 1201	38 1342
Air intake restriction, clean filter(s)			kPa In wc	1,5 6,0			
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 420 kW		kW BTU/min	240 13649	287 16321	291 16549	307 17459
Exhaust gas temperature after turbine at:	ICFN Power 420 kW		°C °F	518 964	445 833	430 806	417 783
Max allowable back pressure in exhaust line			kPa In wc	8,0 32,1	12,0 48,2	13,0 52,2	15,0 60,2
Exhaust gas flow at:	ICFN Power 420 kW		m ³ /min cfm	60,5 2137	74,8 2642	76,6 2705	80,3 2836
Exhaust gas smoke	ICFN Power 420 kW		*Bosch	0,2	0,1	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 420 kW	kW BTU/min	20 1137
Heat rejection to coolant at:	ICFN Power 420 kW	kW BTU/min	178 10123
Coolant	Volvo coolant or Volvo anticorrosion additive together with clean fresh water		
Radiator cooling system type	Closed circuit		

Technical data TAD1641VE

Cooling system		r/min	1200	1500	1600	1800
Standard radiator core area		m ²	1,32			
		foot ²	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 ² 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			

Technical data TAD1641VE

Intercooler system		r/min	1800
Cooling power	ICFN Power 420 kW	kW BTU/min	101 5744
Combustion air inlet temp. (Charge air temp after turbo compressor)	ICFN Power 420 kW	°C °F	194 381
Max allowable Comb. Air temp after CAC at 25 degree ambient. (Charge air temp after intercooler)	ICFN Power 420 kW	°C °F	45 113
Maximum pressure droop over intercooler, incl. piping		kPa psi	10 1,45
Boost pressure at rated power 1800rpm.		kPa psi	193 27,99
Standard intercooler core area		m ² foot ²	1,3 13,99
Standard intercooler core thickness		mm in	68 2,68

Cooling performance: 1,32 m² 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 rpm	Engine power kW hp	Air on temp		Air flow		External restriction	
		°C	°F	kg/s	lb/s	Pa	psi
1800	420 571	68	154	11,1	24,5	0	0
		65	149	9,3	20,5	544	0,079
		60	140	7,9	17,4	816	0,118
		55	131	6,8	15,0	853	0,124
		50	122	6	13,2	920	0,133
		45	113	5,3	11,7	1003	0,145
		40	104	4,8	10,6	1080	0,157

Technical data TAD1641VE

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 pressurer	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.

Technical data TAD1641VE

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	2 x 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			