

General

4-stroke direct injected, turbocharged and aftercooled diesel engine

Number of cylinders		6
No of valves		24
Displacement, total	litres in ³	12,78 779,7
Firing order		1-5-3-6-2-4
Rotational direction, viewed from the front		Clockwise
Bore	mm in	131 5,16
Stroke	mm in	158 6,22
Compression ratio		16.7:1
Max. static forward inclination:	°	0
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	5
Max. intermittent backward inclination while running:	°	17
Max. intermittent side inclination while running:	°	30
Idling speed	rpm	600 + 200 / -50
Rated speed R3	rpm	2300
Propeller selection range R3	rpm	2250-2370
Dry weight engine BT	kg lb	1450 3197

Performance	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Crankshaft power 1), 5)	3	kW	66	113	209	323	377	431	484	515	515	515
		hp	90	154	284	439	513	586	658	700	700	700
Propeller shaft power 1) (At full load) With drive	3	kW	63	108	201	310	362	414	465	494	494	494
		hp	86	148	273	422	492	563	632	672	672	672
Propellershaft power at prop. load x ^{2,5}	3	kW	17	35	62	97	143	200	268	349	394	494
		hp	23	48	84	132	194	271	364	474	536	672
Propellershaft power at prop. load x ³	3	kW	9	21	41	70	112	166	237	325	376	494
		hp	12	28	55	95	152	226	322	442	512	672
Torque at crankshaft 2)	3	Nm	1050	1349	1996	2570	2571	2572	2568	2459	2342	2138
		lbf ft	775	995	1472	1896	1897	1897	1894	1814	1727	1577
Mean piston speed		m/s	3,2	4,2	5,3	6,3	7,4	8,4	9,5	10,5	11,1	12,1
		ft/s	10,4	13,8	17,3	20,7	24,2	27,6	31,1	34,6	36,3	39,7
Effective mean pressure 2)	3	MPa	1,03	1,33	1,96	2,53	2,53	2,53	2,53	2,42	2,30	2,10
		psi	149,8	192,4	284,7	366,6	366,8	366,9	366,3	350,8	334,0	305,0
Max combustion pressure 2)	3	MPa	10,5	12,3	17,3	19,4	18,9	19,2	19,8	20	19,8	19,3
		psi	1523	1784	2509	2814	2741	2785	2872	2901	2872	2799

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,05
Max. oil volume including filters for all allowed installation inclinations:	litres	45
	US gal	11,89
Max. oil volume excluding filters for all allowed installation inclinations:	litres	40
	US gal	10,57
Min. oil volume excluding filters for all allowed installation inclinations:	litres	32
	US gal	8,45

1) ISO 3046, fuel temp 40°C.

ISO 8665 (=SAE J 1228=ICOMIA 28-83)

2) At power according to 1).

3) If reverse gear is used, 4% in heat rejection will be added for its oil cooler.

4) Acc. to ISO 3744

5) At installed back pressure

VOLVO PENTA D13-700 R3 700hp, SST, IB	Document No	Issue Index
	21410453	07

Fuel system	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Specific fuel consumption 2)	3	g/kWh lb/hph	227 0,367	219 0,355	215 0,348	200 0,324	190 0,307	188 0,305	193 0,312	199 0,322	203 0,329	212 0,343
Fuel consumption, Test cycle E3	3	g/kWh lb/hph	207,8 0,34									
Fuel consumption at prop. load x ^{2.5}	3	l/h US gal/h	5,4 1,4	9,9 2,6	16,5 4,4	25,1 6,6	36,2 9,6	49,6 13,1	66,3 17,5	87,9 23,2	100,3 26,5	131,3 34,7

Fuel system	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Fuel consumption at prop. load x ³	3	l/h US gal/h	3,1 0,8	6,3 1,7	11,3 3,0	18,6 4,9	28,7 7,6	41,5 11,0	58,7 15,5	81,3 21,5	96,2 25,4	130,6 34,5
Fuel consumption at full load	3	l/h US gal/h	17,9 4,7	29,7 7,8	53,7 14,2	77,4 20,4	85,5 22,6	97,2 25,7	111,7 29,5	122,5 32,4	125,1 33,1	130,4 34,5

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300	
Specific exhaust heating effect in percent of crankshaft power	3	%	63	69	75	70	64	62	64	67	70	75	
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	3	°C	482	563	642	595	485	429	414	422	424	439	
		°F	900	1045	1188	1103	905	804	777	792	795	822	
Permitted back pressure in the exhaust line at rated speed. (Installed back pressure)	3	kPa psi								Max	15 2,2		
		kPa psi								Min			

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA and relative humidity 30%.	3	m³/min cu.ft./min	4 139	6 214	11 377	16 579	23 799	30 1042	36 1265	40 1396	41 1437	42 1487
		m³/min cu.ft./min										
Charge air pressure Inlet manifold	3	kPa psi	15 2,2	33 4,8	86 12,5	140 20,3	181 26,3	224 32,5	254 36,8	256 37,1	252 36,5	238 34,5
Exhaust gas flow	3	m³/min cu.ft./min	11 388,5	18 635,7	35 1236	49 1730	58 2048	67 2366	78 2755	85 3002	87 3072	91 3214

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Cooling system	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Radiated heat in percent of crankshaft power.	3	%	13	8	4	2	2	2	2	2	2	3
Heat rejection to charge air cooler in percent of crankshaft power.	3	%	5	7	10	13	16	19	22	24	24	25
Coolant heat rejection to HE, incl. engine oil cooler and charge air cooler, in percent of crankshaft power.	3	%	125	105	83	68	66	67	69	69	72	74
Coolant flow with fully open thermostat and std cooling system		l/min cu.ft./min	90 3,2	150 5,3	252 8,9	312 11,0	357 12,6	402 14,2	480 17,0	516 18,2	528 18,6	600 21,2
Max. permissible temperature on coolant in engine outlet		°C °F	98 208									
Coolant volume engine, including heat exchanger and charge air cooler		litres US gal.	51 13,47									
Max. additional coolant for cabin heater etc. with std. Expansion tank		litres US gal.	15 3,96									
Maximum coolant flow to cabin heater etc.		l/min cu.ft./min	42 1,48									
Thermostat, start open at		°C °F	82 180									
Thermostat, fully open at		°C °F	92 198									

Raw water circuit	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Nominal raw water design flow	l/min cu.ft./min	157 5,5	208 7,3	261 9,2	317 11,2	365 12,9	408 14,4	442 15,6	443 15,6	437 15,4	424 15,0
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa psi	18 2,6	30 4,4	45 6,5	65 9,4	84 12,2	104 15,1	123 17,8	123 17,8	120 17,4	113 16,4
Maximum raw water pump suction head	kPa psi	30 4,4									
Maximum raw water temperature entering heat exchanger	°C °F	32 90									

Emissions	Rating	rpm	600	800	1000	1200	1400	1600	1800	2000	2100	2300
Smoke at prop. load $x^{2.5}$	3	*BSU	0,1	0,1	0,3	0,3	0,3	0,3	0,1	0,1	0,1	0,2
Smoke at prop. load x^3	3	*BSU	0,0	0,0	0,1	0,2	0,3	0,3	0,2	0,1	0,1	0,2
Noise at prop. load $x^{2.7}$. 4)	3	dB(A)	101,8	104,4	107,2	109,7	110,9	111,6	112,9	114,7	115,4	116,9

*NB.I BSU are calculated values. Measured values are acc. to ISO 10054 in FSN units

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Sensors Control and Monitoring System							Switches Engine Shutdown System	
Sensors	Signal	Unit	Range	Warning Initial Delay / Warning Delay	Warning Level	Derating Level	Shutdown Initial Delay / Shutdown Delay	Shutdown Level (Tolerance)
Coolant level switch	Digital		ON/OFF	75% of 100 sec	Low (OFF/Open contact)	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	- 40 - 140 ±1.5°C	30 sec from start / 3 sec	98° C	101° C (soft 1)	NA	NA
Coolant temperature (SDU)	Digital	°C	ON/OFF	NA	NA	NA	1 sec. from start / 1 sec	105 (±2°C) SDU Ch. S1
Charge air temperaure	50-0 kΩ	°C	-40 - 130±4%	90 sec from start / 23 sec	80° C	85° C (soft 2)	NA	NA
Engine speed cam	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Engine speed crank	Frequency	rpm		Instant	Lost signal	NA	NA	NA
Eng. overspeed SDU 2300+15%	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	2645 / 6745 Hz (-1 to 0%)
Exhaust gas temperature	PT200	°C	- 40 - 750 ± 2.5%	30 sec from start / 1 sec	645° C	670° C (soft 3)	NA	NA
Gear oil temperature (EVC)	50-0 kΩ	°C	-40 - 140 ± 2.5%	NA	NA	NA	NA	NA
Gear oil pressure (EVC)	0,5-4,5V	kPa	0 - 3000 ±3%	60 sec from start / 7 sec	700 kPa	NA	NA	NA
Oil level sensor	Analouge		±1.9mm	30 sec from start / 5 sec	Low level	NA	NA	NA
Oil temperature	50-0 kΩ	°C	-40 - 140	30 sec from start / 22 sec	130° C	135 (soft 4)	NA	NA
Gear oil pressure (SDU) (Shutdown Unit Channel S2)	Digital	kPa	ON/OFF	NA	NA	NA	11 s ±20% from start/ 1 s	400±20 <u>Shutdown Unit Setting</u> S2, S3 : 510 rpm ±2% 1300 Hz ±2% 153 pulses / revolution

NA = Not applicable

Run detection S4 should be set to same value as S2, S3

Sensors (rpm dependent)	Signal	Unit	Range	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map					Notes
					600 rpm	1000 rpm	1500 rpm	2000 rpm	2300 rpm	
Charge air pressure	0,5-4,5 V	kPa	50 - 600 ± 4.2kPa		600 rpm	1000 rpm	1500 rpm	2000 rpm	2300 rpm	
Warning Level		kPa		30 sec from start / 2 sec	120	190	265	255	245	Relative Pressure
Derating Level (50% of diff between Max Torque map and Engine Protection Map .)		kPa		Instant after warning	130	200	275	265	255	Relative Pressure
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Seawater pressure	0,5-4,5 V	kPa	0-300 ± 3%		600 rpm	1000 rpm	1500 rpm	2000 rpm	2300 rpm	Only HE
Warning Level		kPa		30 sec from start / 8 sec	5	20	40	60	60	
Derating Level (35% of diff between Max Torque map and Engine Protection Map .)		kPa		Instant after warning	NA	10	30	50	50	
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Coolant pressure	0,5-4,5 V	kPa	0-300 ± 3%		600 rpm	1000 rpm	1500 rpm	2000 rpm	2300 rpm	
Warning Level		kPa		30 sec from start / 4 sec	5	30	55	100	125	
Derating Level (50% of diff between Max Torque map and Engine Protection Map .)		kPa		Instant after warning	NA	20	45	90	115	
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	Run detection S4=S2, S3
Fuel pressure	0,5-4,5 V	kPa	0-700 ± 1.5%		600 rpm	1000 rpm	1500 rpm	2000 rpm	2300 rpm	
Warning Level		kPa		30 sec from start / 5 sec	180	240	270	270	270	
Derating Level		kPa		NA	N/A	N/A	N/A	N/A	N/A	
Oil pressure	0,5-4,5 V	kPa	0-700 ± 1.5%		600 rpm	1000 rpm	1500 rpm	2000 rpm	2300 rpm	
Warning Level		kPa		30 sec from start / 3 sec	135	200	265	265	265	
Derating Level (-70% of diff between Max Torque map and Engine Protection map .)		kPa		Instant after warning	105	170	235	235	235	
Shutdown Level (Shutdown Unit Channel S3)	Digital	kPa	ON/OFF	11 s ±20% from start/ 1 s	NA	NA	150 ±20	150 ±20	150 ±20	<u>Shutdown Unit Setting</u> S2, S3: 510 rpm ±2% 1300 Hz ±2% 153 pulses / revolution

Warning = Yellow Lamp active

Derating = Red Lamp active

Remarks

	Speed / °C	101°C	103°C	106°C
Soft 1) Soft derate Coolant temperature Remaining torque in %	1200 rpm	100%	100%	100%
	1800 rpm	100%	75%	50%
	2300 rpm	100%	75%	50%

	Speed / °C	85°C	90°C	95°C
Soft 2) Charge air temperaure Remaining torque in %	1200 rpm	100%	96%	94%
	1800 rpm	100%	50%	30%
	2300 rpm	100%	50%	30%

	Speed / °C	670°C	675°C	680°C	685°C
Soft 3) Soft derate Exhaust temperature Remaining torque in %	1200 rpm	100%	98%	97%	96%
	1800 rpm	100%	70%	60%	50%
	2300 rpm	100%	70%	60%	50%

	Speed / °C	135°C	137°C	139°C
Soft 4) Soft derate Oil temperature Remaining torque in %	1200 rpm	100%	100%	100%
	1800 rpm	100%	50%	30%
	2300 rpm	100%	50%	30%

Max Torque map	Speed	500 rpm	600 rpm	700 rpm	800 rpm	900 rpm	1000 rpm	1100 rpm	1200 rpm	1300 rpm	1400 rpm
	Torque	1000 Nm	1050 Nm	1200 Nm	1350 Nm	1600 Nm	2050 Nm	2450 Nm	2800 Nm	2930 Nm	2930 Nm
	Speed	1700 rpm	1800 rpm	1900 rpm	2000 rpm	2100 rpm	2200 rpm	2300 rpm	2370 rpm	2415 rpm	2450 rpm
	Torque	2930 Nm	2870 Nm	2800 Nm	2750 Nm	2675 Nm	2578 Nm	2478 Nm	2405 Nm	2360 Nm	0 Nm

Engine Protection map	Speed	400 rpm	600 rpm	700 rpm	800 rpm	900 rpm	1000 rpm	1100 rpm	1200 rpm	1400 rpm	1500 rpm
	Torque	1000 Nm	1050 Nm	1200 Nm	1350 Nm	1600 Nm	2050 Nm	2450 Nm	2570 Nm	933 Nm	0 Nm
	Speed	1600 rpm	1900 rpm	2100 rpm	2200 rpm	2300 rpm	2400 rpm	2500 rpm	2600 rpm	2625 rpm	2670 rpm
	Torque	0 Nm	0 Nm	0 Nm	0 Nm	0 Nm	0 Nm	0 Nm	0 Nm	0 Nm	0 Nm













