

VOLVO PENTA D13B-E MH (R2-600), D13B-E MH (FE) (R2-600)	Document No	Issue Index
	21720666	03

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		18,5
Compression pressure at 240 rpm	MPa psi	3,5 508
Max. static forward inclination:	°	0
Max. static backward inclination:	°	10
Max. intermittent forward inclination while running:	°	35
Max. intermittent backward inclination while running:	°	35
Max. intermittent side inclination while running:	°	35
Idling speed	rpm	550 - 800
Rated speed R2	rpm	1900
Propeller selection range R2	rpm	1870-1970
Dry weight engine BT	kg lb	HE=1520, KC=1480 HE=3351, KC=3263

Performance	Rating	rpm	600 800 1000 1200 1400 1500 1600 1800 1900								
Crankshaft power 1), 5)	2	kW	80,6	164	249	299	352	374	399	441	441
		hp	110	223	338	406	478	508	542	599	600
Propeller shaft power 1) (At full load) With drive Twin Disc 5114	2	kW	77	157	239	287	338	359	383	423	424
		hp	105	214	324	390	459	488	521	575	576
Propellershaft power at prop. load x ³ With drive Twin Disc 5114	2	kW	13	32	62	107	170	209	253	360	424
		hp	18	43	84	145	231	284	344	490	576
Torque at crankshaft 2)	2	Nm	1283	1958	2373	2375	2399	2379	2380	2337	2218
		lbf ft	946	1444	1750	1752	1769	1755	1755	1724	1636
Mean piston speed		m/s	3,2	4,2	5,3	6,3	7,4	7,9	8,4	9,5	10,0
		ft/s	10,4	13,8	17,3	20,7	24,2	25,9	27,6	31,1	32,8
Effective mean pressure 2)	2	MPa	1,26	1,93	2,33	2,34	2,36	2,34	2,34	2,30	2,18
		psi	183,0	279,2	338,5	338,8	342,2	339,4	339,4	333,3	316,4
Max combustion pressure 2)	2	MPa	11,7	15,2	16,0	16,5	17,6	18,0	18,3	17,0	16,5
		psi	1697	2205	2321	2393	2553	2611	2654	2466	2393

Lubricating system

Specific lubricating oil consumption.	g/kWh	0,06
Max. oil volume including filters for all allowed installation inclinations:	litres	49
	US gal	12,94
Max. oil volume excluding filters for all allowed installation inclinations:	litres	44
	US gal	11,62
Min. oil volume excluding filters for all allowed installation inclinations:	litres	35
	US gal	9,25

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

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Fuel system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Specific fuel consumption US EPATier 3	2	g/kWh	234	215	198	195	197	199	201	207	213
		lb/hph	0,38	0,35	0,32	0,32	0,32	0,32	0,33	0,34	0,34
Specific fuel consumption IMO Tier II	2	g/kWh	236	215	197	189	189	191	195	202	205
		lb/hph	0,38	0,35	0,32	0,31	0,31	0,31	0,32	0,33	0,33
Fuel consumption at prop. load x ³ US EPATier 3	2	l/h	5	9	17	28	43	53	64	94	112
		US gal/h	1,3	2,4	4,5	7,4	11,4	14,0	16,9	24,8	29,6
Fuel consumption at prop. load x ³ IMO Tier II	2	l/h	4	9	17	27	41	50	61	88	106
		US gal/h	1,1	2,4	4,5	7,1	10,8	13,2	16,1	23,2	28,0
Fuel consumption at prop. load x ³ US EPATier 3	2	l/h	4	9	17	28	44	53	64	94	111
		US gal/h	1,2	2,4	4,4	7,3	11,5	14,0	17,0	24,9	29,4
Fuel consumption at prop. load x ³ IMO Tier II	2	l/h	5,0	9,0	17,0	27,0	42,0	50,0	61,0	89,0	108,0
		US gal/h	1,3	2,4	4,5	7,1	11,1	13,2	16,1	23,5	28,5
Fuel consumption at full load US EPATier 3	2	l/h	23	42	59	70	83	89	96	109	112
		US gal/h	6,0	11,1	15,5	18,4	21,9	23,6	25,4	28,8	29,7
Fuel consumption at full load IMO Tier II	2	l/h	22,7	42,3	58,7	67,6	79,5	85,6	93,0	106,4	108,3
		US gal/h	6,0	11,2	15,5	17,8	21,0	22,6	24,6	28,1	28,6

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Specific exhaust heating effect in percent of crankshaft power	2	%	73	69	63	61	62	62	64	74	76
Exhaust temperature at the exhaust pipe connecting flange after the turbo charger.	2	°C	576	573	494	423	406	409	424	512	519
		°F	1069	1063	921	793	763	768	795	954	966
Permitted back pressure in the exhaust line at rated speed. (Installed back pressure)		kPa							Max	12	
		psi								1,7	
		kPa							Min	0	
		psi								0,0	

Intake and exhaust system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Engine air consumption at 25°C / 77°F atmospheric pressure 100kPA and relative humidity 30%.	2	m³/min	4,8	8,9	14,8	20,8	26,0	27,5	29,0	29,7	29,8
		cu.ft./min	170	314	523	735	918	971	1024	1049	1052
Charge air pressure Inlet manifold	2	kPa	40,0	99,0	168,0	220,0	254,0	257,0	259,0	236,0	224,0
		psi	5,8	14,4	24,4	31,9	36,8	37,3	37,6	34,2	32,5
Exhaust gas flow	2	m³/min	14,9	27,4	40	49,5	58,7	61,9	66,1	75,7	76,8
		cu.ft./min	526	968	1413	1748	2073	2186	2334	2673	2712

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Cooling system	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Radiated heat in percent of crankshaft power.	2	%	5,8	5,1	4,6	4,5	4,7	4,7	4,9	5,1	5
Heat rejection to charge air cooler in percent of crankshaft power.	2	%	1,4	5	11,9	19,3	22,9	23,5	22,4	20	20,4
Coolant heat rejection to HE, incl. engine oil cooler and excl. charge air cooler, in percent of crankshaft power.	2	%	82,6	68	56,4	49	48,5	49,5	50,4	53,5	50
Coolant flow with fully open thermostat and std cooling system		l/min cu.ft./min	120 4,2	192 6,8	246 8,7	306 10,8	360 12,7	384 13,6	408 14,4	450 15,9	480 17,0
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.	16 4,23								
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	1500	1600	1800	1900
Nominal raw water design flow	l/min	161	216	273	320	368	392	414	456	468
	cu.ft./min	5,7	7,6	9,6	11,3	13,0	13,8	14,6	16,1	16,5
Nominal raw water pump pressure head at design flow. (measured before and after pump)	kPa	19	30	49	66	84	95	107	131	136
	psi	2,8	4,4	7,1	9,6	12,2	13,8	15,5	19,0	19,7
Maximum raw water pump suction head	kPa	-30								
	psi	-4,4								
Maximum raw water temperature entering heat exchanger	°C	32								
	°F	90								

2 circuit keel cooling system, LT	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Maximum temperature to charge air cooler from external LT-cooling system circuit	2	°C									42
		°F									107,6
Coolant flow through keel cooler, LT-cooling system circuit	2	l/min	33	45	58	70	81	85	90	96	98
		cu.ft./min	1,2	1,6	2,0	2,5	2,9	3,0	3,2	3,4	3,5
Pressure drop in external LT-cooling system circuit, including piping		kPa	85								
		psi	12,3								
Coolant volume charge air cooler		litres	5								
		US gal.	1,32								

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2 circuit keel cooling system, HT	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Design point for keel cooler, engine outlet temperature	2	°C									88
		°F									190
Maximum temperature to engine from external HT-cooling system circuit	2	°C									70
		°F									158
Coolant flow through keel cooler, HT-cooling system circuit at design point	2	l/min									182
		cu.ft./min									6,4
Maximum coolant flow through keel cooler, HT-cooling system circuit	2	l/min									295
		cu.ft./min									10,4
Pressure drop in external HT-cooling system circuit, including piping		kPa	85								
		psi	12,3								
Coolant volume engine, excl. heat exchangers		litres	28								
		US gal.	7,40								

Emissions	Rating	rpm	600	800	1000	1200	1400	1500	1600	1800	1900
Smoke at prop. load x ³	2	*BSU	0,04	0,08	0,21	0,23	0,15	0,13	0,11	0,24	0,42
Noise at prop. load x ³ . 4)	2	dBA	100,5	104,5	107,1	109,8	111,5	#N/A	112,3	114	114,9

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

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Rating	Power (Hk)	Rpm
R2	600	1900
R2	441	1900

Sensors Control and Monitoring System							Switches Engine Shutdown System	
Sensors	Signal	Unit	Range	Initial Delay / Warning Delay	Warning Level	Derating Level	Shutdown Initial Delay / Shutdown Delay	Shutdown Level (Tolerance)
Coolant level switch	Digital		ON/OFF	30 sec from start / 75 sec	Low (ON / Closed)	NA	NA	NA
Coolant temperature	50-0 kΩ	°C	- 40 - 140 ±1.5°C	30 sec from start / 3 sec	98	101 (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
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 1900 rpm+15%	Frequency	rpm / Hz	153 puls./rev.	Instant	Lost signal	NA	Instant	2185 rpm / 5572 Hz (-1 to 0%)
Exhaust gas temperature	PT200	°C	- 40 - 750 ± 2.5%	30 sec from start / 22 sec	575	600 (soft 2)	NA	NA
Crankcase pressure	0,5-4,5 V		0-15 kPa	20 sec from start / Instant	Rapid Pressure Increase	0-75% @ >1200 rpm	NA	NA
Oil level sensor	Analogue	%	±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	135 (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	NA	NA	NA
Gear oil pressure (SDU)	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

Sensors Alarm	Signal	Unit	Range	Initial Delay / Delay	Warning Level / Derating Level / Shutdown Level rpm Map (relative pressure)					Derating / Notes
					600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Charge air pressure	0,5-4,5 V	kPa	50 - 600 ± 4.2 kPa		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / 2 sec	310	310	299	282	256	
Derating Level		kPa		Instant	320	320	309	292	266	0-50% @ 1200-1900rpm
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Charge air Temperature	50 - 0 kΩ	°C	-40 - 130°C ±4%		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		°C		90 sec from start / 22 sec	80	80	80	78	75	
Derating Level		°C		Instant	85	85	85	83	80	Soft derate 4
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Coolant pressure	0,5-4,5 V	kPa	0-300 kPa		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / 4 sec	5	30	55	72	90	
Derating Level		kPa		Instant	-5	20	45	62	80	0-50% @ 1200-1900rpm /
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	Run detection S4=S2,S3
Seawater pressure	0,5-4,5 V	kPa	0-300 kPa		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / 7.5 sec	5	15	40	40	40	
Derating Level		kPa		Instant	-5	5	30	30	30	0-35% @ 1200-1900rpm
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Fuel pressure	0,5-4,5 V	kPa	0-700 kPa		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / Instant	180	240	270	270	270	
Derating Level		kPa		NA	NA	NA	NA	NA	NA	
Shutdown Level	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Oil pressure	0,5-4,5 V	kPa	0-700 kPa		600 rpm	1000 rpm	1500 rpm	1700 rpm	1900 rpm	
Warning Level		kPa		30 sec from start / 3 sec	136	200	265	265	265	
Derating Level		kPa		Instant	106	170	235	235	235	0-70% @ 1200-1900rpm
Shutdown Level (Shutdown Unit Channel S3)	Digital	kPa	ON/OFF	11 s ±20% from start / 1 s	120 ±20	120 ±20	120 ±20	120 ±20	120 ±20	<u>Shutdown Unit Setting</u> S2,S3: 510 rpm ±2% 1300 Hz ±2% 153 pulses / revolution

Remarks

1) Soft derate Coolant temp	Speed / °C	101°C	103°C	106°C
Remaining torque in %	1200 rpm	100%	100%	100%
	1500 rpm	100%	77%	54%
	1900 rpm	100%	75%	50%

2) Soft derate Exhaust temp	Speed / °C	600°C	605°C	610°C	615°C
Remaining torque in %	1200 rpm	100%	100%	100%	100%
	1500 rpm	100%	72%	63%	54%
	1900 rpm	100%	70%	60%	50%

3) Soft derate Oil temp	Speed / °C	135° C	137°C	139°C
Remaining torque in %	1200 rpm	100%	100%	100%
	1500 rpm	100%	54%	35%
	1900 rpm	100%	50%	30%

4) Soft derate Charge air Temp	Speed / °C	80°C	85°C	90° C
Remaining torque in %	1200 rpm	100%	100%	100%
	1500 rpm	100%	54%	35%
	1900 rpm	100%	50%	30%