Important

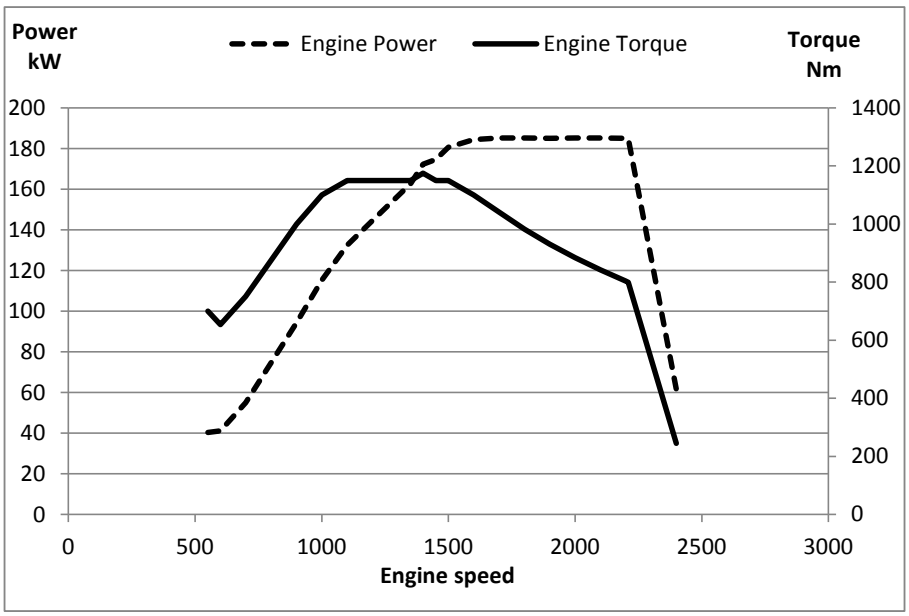
This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

Requirements marked with ⚠ are considered as critical for exhaust emissions compliance according to the design specification in the Volvo Penta application for certification.

Failing to follow and meet these instructions and requirements when installing a certified engine in a piece of nonroad equipment for use in the United States violates U.S. federal law (40 CFR 1068.105(b)), subject to fines or other penalities as described in the Clean Air Act.

In-line four stroke-cycle diesel with common rail direct injection. Rotation direction counterclockwise viewed towards flywheel.

Peak Power		kW	185
		hp	252
		rpm	2200
Peak Torque		Nm	1175
		rpm	1400
Dimensions	L	mm	1229
	W	mm	876
	H	mm	1030



Consumption data

		rpm	1500	1800	2000	2200
Specific fuel consumption at:	25%	g/kWh	226	248	264	283
		lb/hph	0,37	0,40	0,43	0,46
	50%	g/kWh	201	212	223	235
		lb/hph	0,33	0,34	0,36	0,38
	75%	g/kWh	197	203	210	220
		lb/hph	0,32	0,33	0,34	0,36
	100%	g/kWh	196	200	205	213
		lb/hph	0,32	0,32	0,33	0,35

Specific AdBlue®/DEF consumption of diesel consumption, NRTC	Vol%	6,40

CO_2 emission declaration

Carbon dioxide (CO_2) emissions determined during the EU type approval process and recorded in EU type approval certificate, NRTC.	g/kWh	695,40

General

Number of cylinders			6
Displacement, total		liters in^3	7,70 470
Firing order			1-4-2-6-3-5
Bore		mm in	110 4,33
Stroke		mm in	135 5,31
Compression ratio			17.2:1
Wet weight	Engine only	kg lb	723 1594
	The weight includes: The engine is weighed with components that consist of the minimum running weight including standard flywheel and excluding cooling package, hoses and air filters. For a clearer description, contact your regional application engineer.		
	Power pack	kg lb	N/A N/A
	The weight includes: N/A		
	Exhaust aftertreatment muffler DPF	kg lb	32 71
	Exhaust aftertreatment muffler SCR	kg lb	41 90

Performance

Rated power	kW	185
	rpm	2200
IFN Power	kW	N.A
ICFN Power	kW	185

For ICFN please see Techincal data for	N/A

The engine performance corresponds to ISO 3046.

			rpm	1500	1800	2000	2200
Power	without fan		kW	181	185	185	185
			hp	246	252	252	252
For performance with fan see options technical data for the desired module.							
Torque (IFN)	without fan		Nm	1150	982	884	803
			lbf ft	848	724	652	592
Max torque at engine speed	1400	rpm	Nm	1175			
			lbf ft	867			
Power tolerance			%	+/-2			
Max combustion pressure at:			MPa	15,8	15,6	15,3	14,9
			psi	2291596	2262588	2219077	2161062
Total mass moment of inertia, J (mR2) for two mass calculations			kgm²	0,398			
(not including flywheel)			lbft²	9,4			
Total mass moment of inertia, J (mR^2) for transient load response calculations			kgm²	0,398			
(not including flywheel)			lbft²	9,4			
Friction Power warm engine			kW	17	23	28	34
			hp	23	31	38	46

Engine brake performance option		rpm	1500	2200	2500	2800
Brake power:	without fan	kW	66	132	160	183
		hp	90	180	218	249
Brake torque:	without fan	Nm	420	574	613	625
		lbf ft	309	423	452	461
Engine speed range for engine brake activation:		rpm	900-2800			
Engine brake automatically deactivates at:		rpm	≤880			
Min oil temperature for engine brake activation:		°C	55			

Cold start performance

Cold start limit temperature	Preheater required @	°C	-15
	Preheater 4 kW	°F	5
	Preheater + block heater req @ Blockheater: TYP UI 701 1500W / ~230V or ~115V	°C °F	-30 -22
Cold start oil specification	T>-20°C VDS4.5 10W/30 T<-20°C VDS4.5 5W/30		
Cold start fuel specification	EN590 98/70/EC (For details see Volvo Penta Industrial fuel bulletin.)		

Lubrication system

Lubricating oil consumption of diesel consumption (average)		Vol %	0,020
Oil change intervals/specifications	VDS4.5	h	1000
		h	
Oil pressure at rated speed	Max	kPa psi	475 69
Oil pressure at rated speed	Min	kPa psi	275 40
Lubrication oil temperature in oil pan:	Max	°C °F	130 266
Oil filter filtration efficiency (in accordance with ISO 4548-12)	75%	µ	22
	90%	µ	26

For oil system capacity and angularity limits see technical data per options

Fuel system

Suction line fuel flow at maximum output (Measured at fuel inlet connection)		liter/h	116
		US gal/h	30,7
Fuel supply line max. restriction (measured at fuel inlet connection)		kPa	20,0
		psi	2,90
Fuel supply line max. pressure, during engine running		kPa	20,0
(measured at fuel inlet connection @ engine)		psi	2,90
Fuel supply line max. pressure, during engine stand still		kPa	20,0
(measured at fuel inlet connection @ engine)		psi	2,90
Fuel supply line min. pressure, during engine stand still		kPa	-55
(measured at fuel inlet connection @ engine)		psi	-8
Maximum system return flow		liter/h	67
		US gal/h	17,75
Fuel return line max. restriction (measured at fuel return connection)		kPa	40,0
		psi	5,80
Max. allowable inlet fuel temp (Measured at fuel inlet connection)		°C	80
		°F	176
Prefilter / Water separator filtration efficiency	90%	µ	30
	75%	µ	10
Fuel filter filtration efficiency	90%	µ	5
	75%	µ	4
Injector type		Denso G4S	
Fuel to conform to		EN590 98/70/EC (For details see Volvo Penta Industrial fuel bulletin.)	

Intake system	**rpm**	**1500**	**1800**	**2000**	**2200**
Air consumption at: (+25°C and 100kPa)	m³/min	11,9	13,8	15,1	16,4
	cfm	420	487	533	579
⚠ **See front page for important information**	kPa	6			
Max allowable air intake restriction including piping	psi	0,9			

Exhaust system	rpm	1500	1800	2000	2200
Heat rejection to exhaust:	kW	130	134	141	148
	BTU/min	7398	7629	7999	8408
Exhaust gas temperature after turbine at:	°C	479	458	444	429
	°F	894	856	831	804
⚠ **See front page for important information** Max allowable back pressure in exhaust line at full load (after turbine)	kPa	24	26	29	31
	psi	3,5	3,8	4,1	4,5
⚠ **See front page for important information** Max allowable temperature drop between turbine and muffler 1 inlet at exhaust temperature 495° C and exhaust gas flow 0.40 kg/s.	Δ°C	10	10	10	10
	Δ°F	18	18	18	18
⚠ **See front page for important information** Max allowable temperature drop between muffler 1 and muffler 2 at exhaust temperature 495° C and exhaust gas flow 0.40 kg/s.	Δ°C	5	5	5	5
	Δ°F	9	9	9	9
Muffler 1 pressure drop	kPa	7	8	10	11
(at exhaust gas flow and exhaust temp specified in this table)	psi	1,0	1,2	1,5	1,6
Muffler 2 pressure drop	kPa	11	12	13	14
(at exhaust gas flow and exhaust temp specified in this table)	psi	1,6	1,7	1,9	2,0
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	m^3/min	27,4	29,7	31,3	32,8
	cfm	968	1049	1105	1158
⚠ **See front page for important information** Engine speed during stand still regeneration	rpm	1400 ± 100			
⚠ **See front page for important information**	Nm	540			
Max allowed load during stand still regeneration	lb ft	398			

Cooling system		rpm	1500	1800	2000	2200
Heat rejection radiation from engine at:		kW	5,4	5,1	4,8	5,2
		BTU/min	306	290	272	296
Heat rejection to coolant at:		kW	90	95	99	103
		BTU/min	5111	5414	5650	5881
Coolant		Volvo Penta Coolant VCS (Yellow) Ready Mix 40/60 or Mix 40% Volvo Penta Coolant VCS (Yellow) + 60% tap Water*. * Tap water most fulfill Volvo quality standard VOLVO STD: 1285, 1				
Coolant capacity:	Engine only	liter	17			
For coolant capacity for engine and cooling packages see Technical data for the specific option.		US gal	4,5			
Coolant pump *(Engine is reference =1)*		drive/ratio	belt/1,40:1 cw			
Coolant pump curve see graphs at end						
Nominal engine coolant pressure before engine circuit coolant pump		kPa	54	55	55	57
		psi	7,8	8,0	8,0	8,3
Coolant pressure drop over complete engine circuit		kPa	6	10	13	16
(at coolant flow below)		psi	0,9	1,5	1,9	2,3
Coolant flow		l/s	3,60	4,30	4,80	5,30
		US gal/s	0,951	1,136	1,268	1,400
Minimum coolant flow		l/s	3,40	3,70	4,00	4,50
At fully opened thermostat		US gal/s	0,898	0,977	1,057	1,189
Maximum outer circuit restriction incl. piping		kPa	40			
		psi	5,8			
Thermostat:	start to open	°C	82			
		°F	180			
	fully open	°C	92			
		°F	197,6			
Maximum static pressure head (expansion tank height + pressure cap setting)		kPa	110			
		psi	16,0			
Minimum static pressure head (expansion tank height + pressure cap setting)		kPa	85			
		psi	12,3			
Maximum top tank temperature		°C	107			
		°F	224,6			
Recommended Draw down capacity. The difference between min coolant level in the expansion tank and the lowest level where the engine's coolant system still functioning		liter	2,00			
		US gal	0,528			

Charge air cooler system	rpm	1500	1800	2000	2200
Heat rejection to charge air cooler	kW	25	28	32	37
	BTU/min	1405	1575	1845	2097
Charge air mass flow	kg/s	0,23	0,27	0,31	0,34
Charge air inlet temp @ 25 °C (Charge air temp after turbo compressor)	°C	144	138	138	140
	°F	291	281	281	283
⚠ **See front page for important information** Max allowable Charge air outlet temp @ 25 °C ambient temperature (Charge air temp after charge air cooler)	°C	42	48	50	50
	°F	108	118	122	122
⚠ **See front page for important information** Maximum pressure drop over charge air cooler incl. piping	kPa	7	9	10,3	12
	psi	1,0	1,3	1,5	1,7
Charge air pressure - relative pressure at sea level (After charge air cooler)	kPa	142	137	136	137
	psi	20,6	19,8	19,7	19,9

Electrical system

Engine Management System			EMS 2.4			
Voltage and type			24V DC			
Battery and cable resistance Recommendations:	Temperature	°C		25	0	-15
		°F		77	32	5
	Maximum main circuit resistance @ 20°C	mΩ		5	5	4
	Minimum battery size	Ah (20h) / CCA (EN)		100 / 680	100 / 680	140 / 800

Power take off

Maximum allowed torque at individual PTO´s.If more then one PTO output is used simultaniusly, calculations needs to be performed to determine available maximum. Available torque depends on application inertia.

Front end in line with crankshaft	rpm	1400	1800	2000	2200
With a total added mass moment of inertia	J (mR2)	0.02 kgm2			
Max torque at continous load:	Nm	1064	743	740	833
	lbt ft	785	548	546	614
PTO at flywheel					
Max allowed bending moment in flywheel housing	Nm	4600			
	lbf ft	3393			
Max load on rear main bearing	N	4250			
	lbf	955			

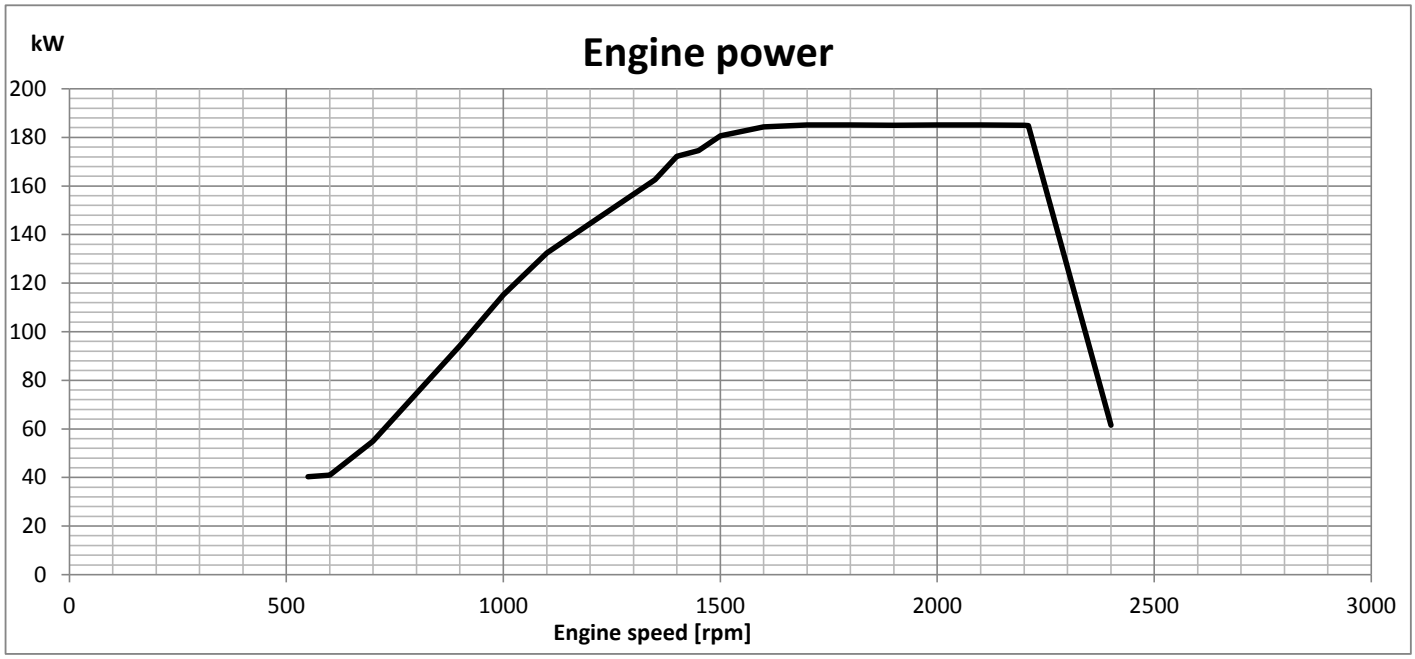
Engine Protection

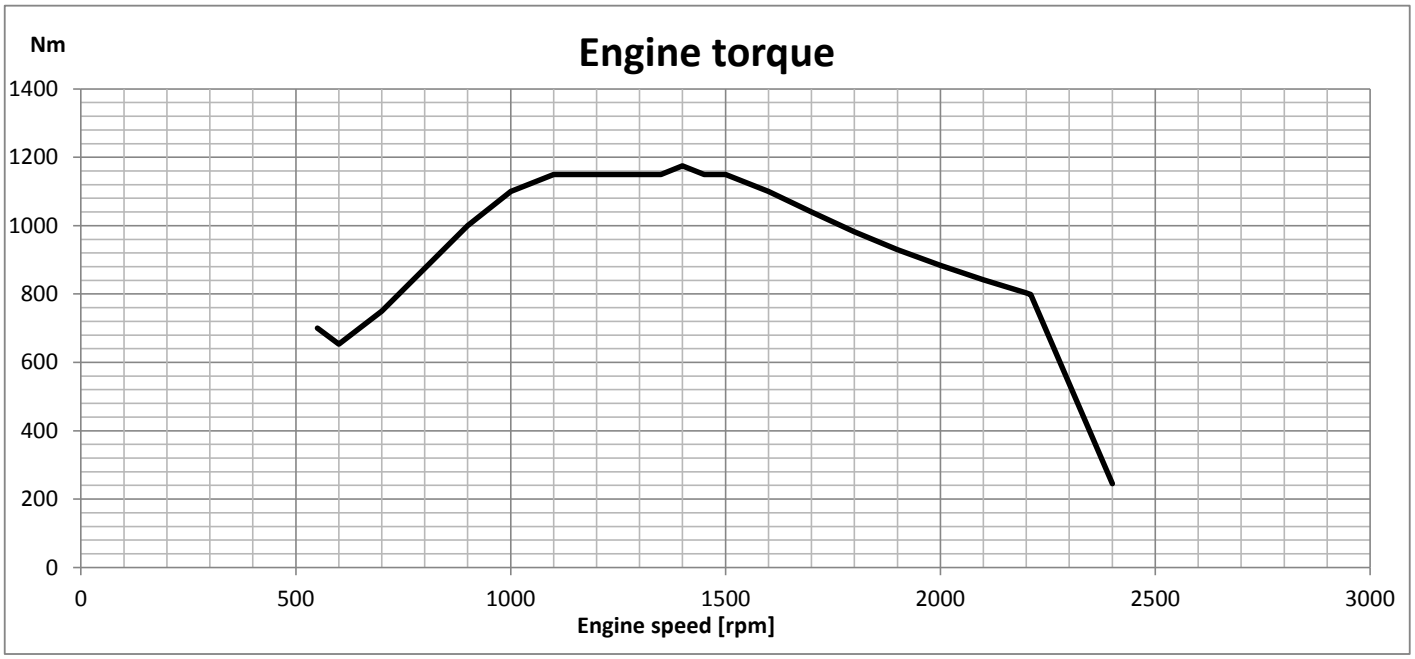
Warning implies that a Indication message is sent. Derate means an engine power derate.

Engine sensors				**Engine protection action**		
	Unit	**Warning level (Yellow)**	**Alarm level (Red)**	**Default**	Max derate, acc engine protection map	**Optional (Module or conversion kit)**
Fuel temperature[1]	°C	Not installed	Not installed	Not installed	Not installed	Not installed
Oil temperature	°C	125	130	Derate	132	Shut down
Coolant temperature	°C	105	107	Derate	108	Shut down
Charge Air Temperature (Boost temp)	°C	120	125	Derate	126	Shut down
Air filter temperature[1]	°C	Not installed	Not installed	Not installed	Not installed	Not installed
Exhaust gas temperature	°C	535	550	Shut down	550	Shut down
EGR temperature[1]	°C	Not installed	Not installed	Not installed	Not installed	Not installed
ECU temperature	°C	90	N/A	N/A	N/A	N/A
Fuel feed pressure[1]	kPa	Not installed	Not installed	Not installed	Not installed	Not installed
Fuel rail pressure[1]	kPa	Not installed	Not installed	Not installed	Not installed	Not installed
Oil Pressure	kPa	See below	See below	Shut down	See below	Shut down
Δ Piston Cooling Pressure[1]	kPa	Not installed	Not installed	Not installed	Not installed	Not installed
Δ Charge Air Press (Δ Boost pres)	kPa	See below	See below	Derate	See below	Shut down
Air filter pressure[1]	kPa	Not installed	Not installed	Not installed	Not installed	Not installed
EGR pressure[1]	kPa	Not installed	Not installed	Not installed	Not installed	Not installed
Crankcase pressure increase[1]	kPa	Not installed	Not installed	Not installed	Not installed	Not installed
DPF Differential Pressure	kPa	31	33	Derate	34	Shut down
Oil level[1]	Digital Switch	Not installed	Not installed	Not installed	Not installed	Not installed
Coolant level	Digital Switch	N/A	Low Level	Derate	Low Level	Shut down
DEF Injector Status	Digital Switch	N/A	Error Flag	Derate	Error Flag	Shut down
EATS System - Soot Regen Status	Status Flag	Warning	Stop Request	Derate	Stop Request	Shut down
Water in fuel[1]	Digital Switch	Not installed	Not installed	Not installed	Not installed	Not installed

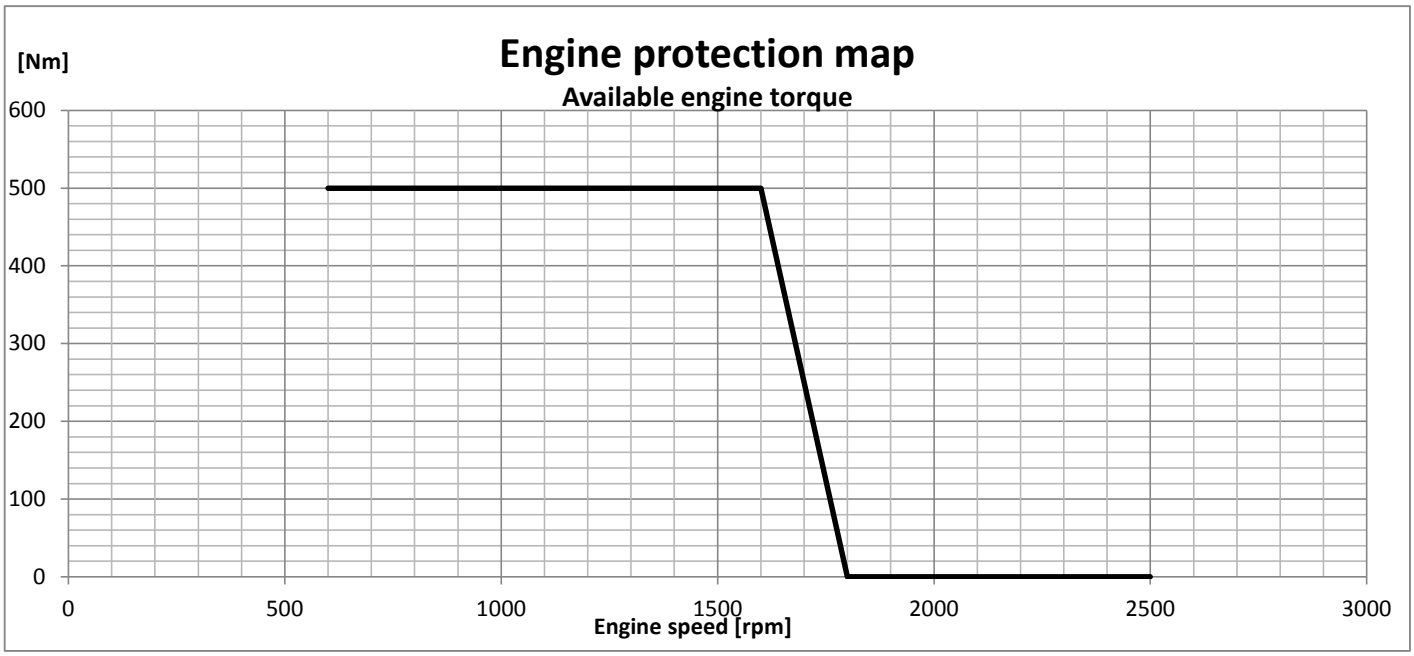
[1] Sensor not installed for this engine type

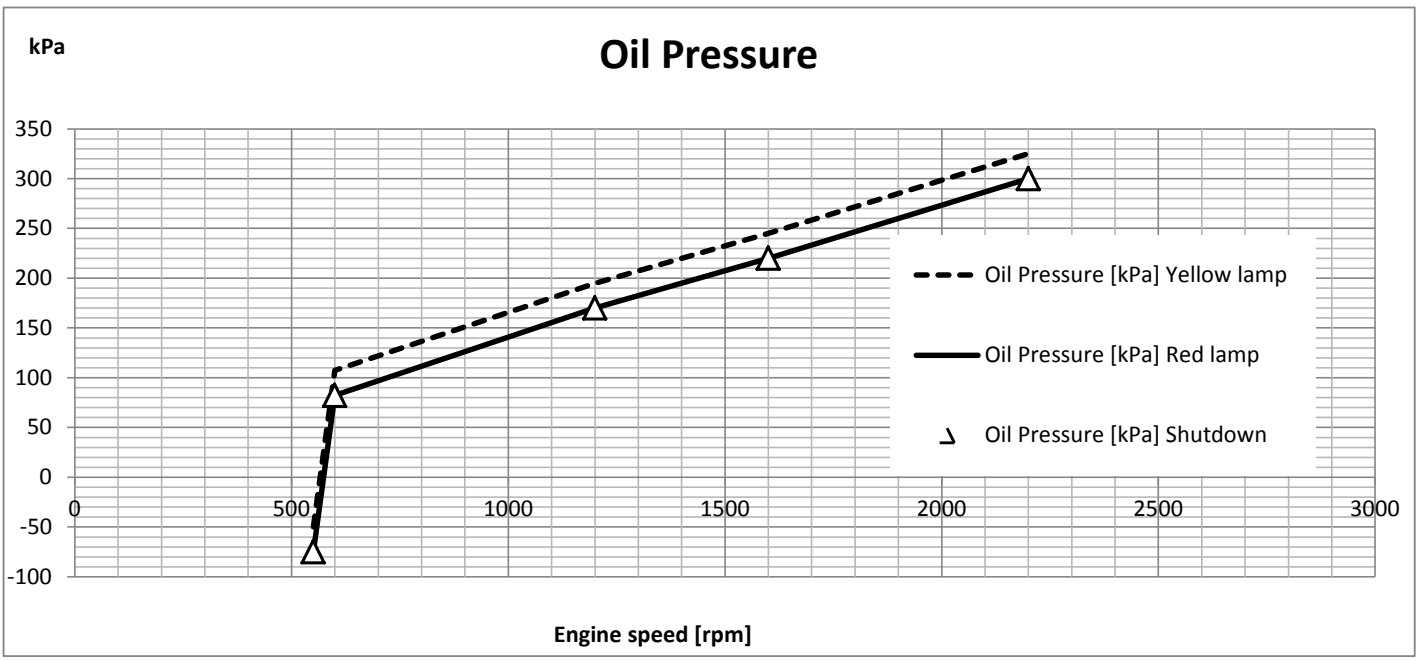
Graphs


kW
Engine power
200
180
160
140
120
100
80
60
40
20
0
0
500
1000
1500
2000
2500
3000
Engine speed [rpm]

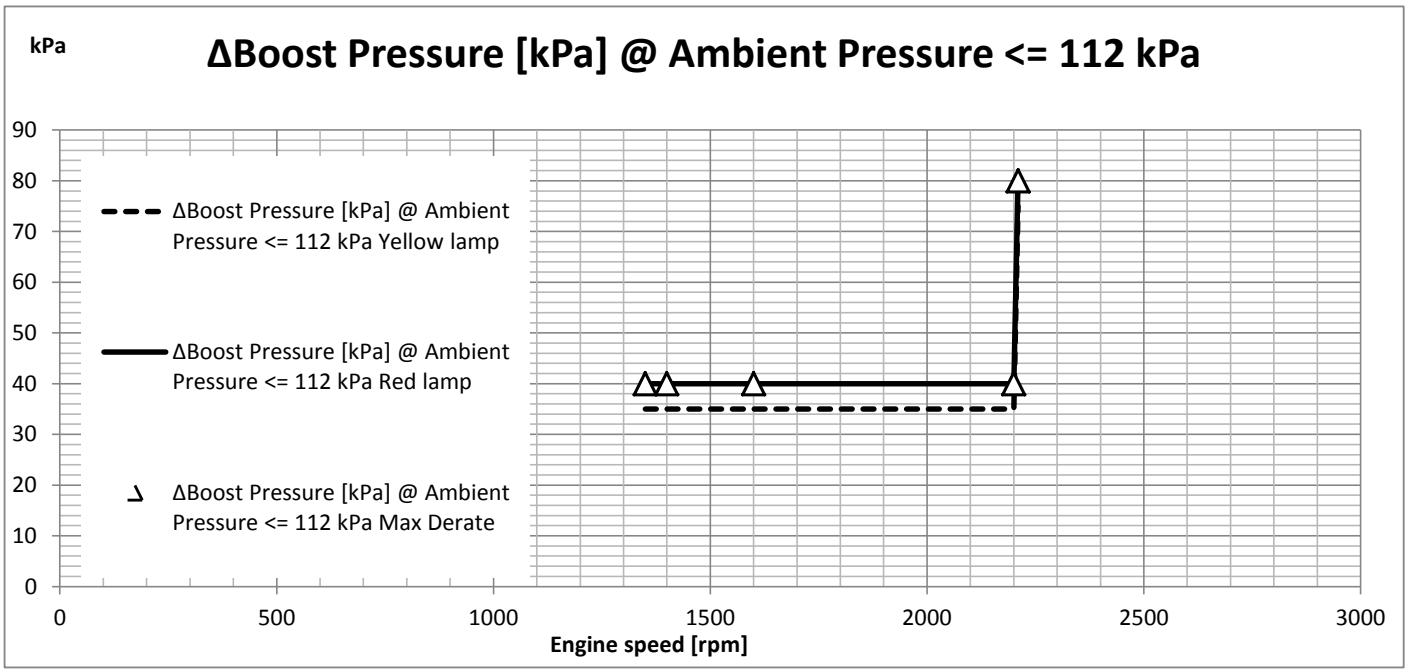

Nm
Engine torque
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
3000
Engine speed [rpm]

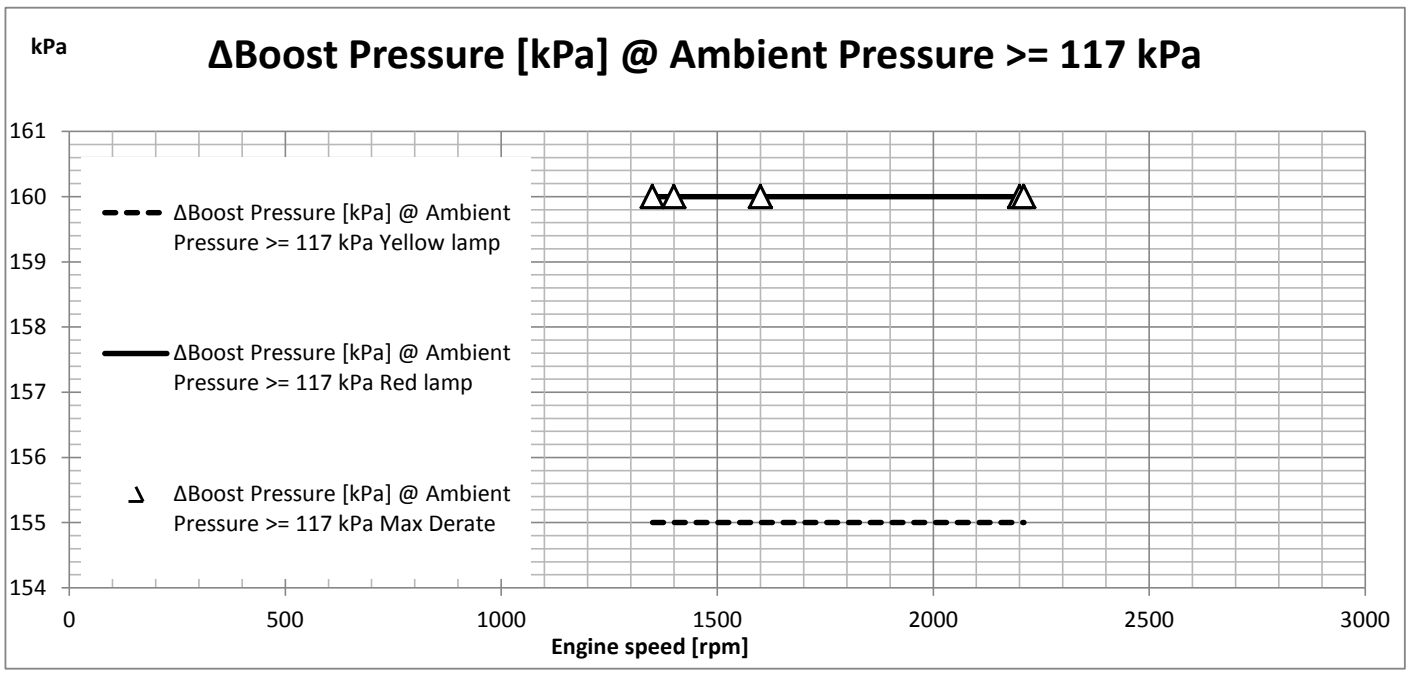
Warning and derate maps

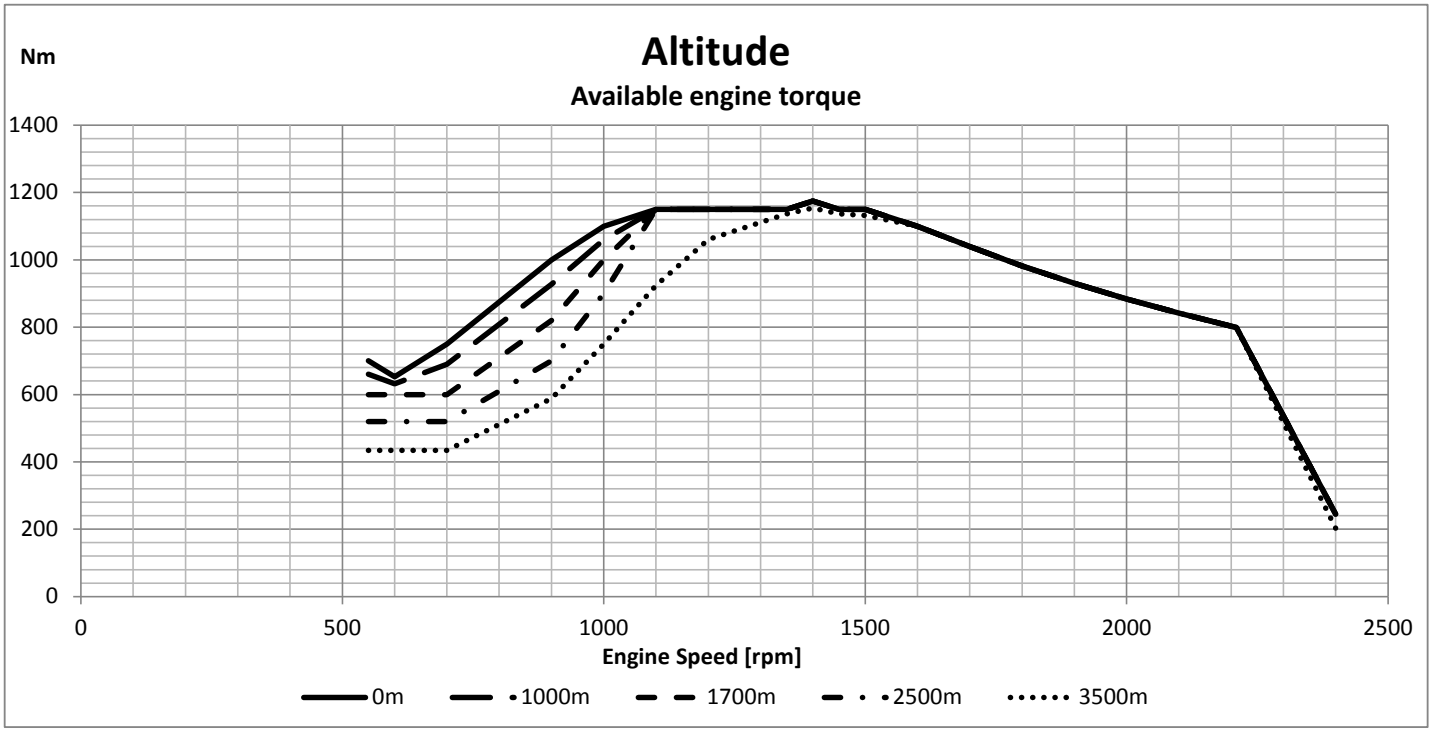


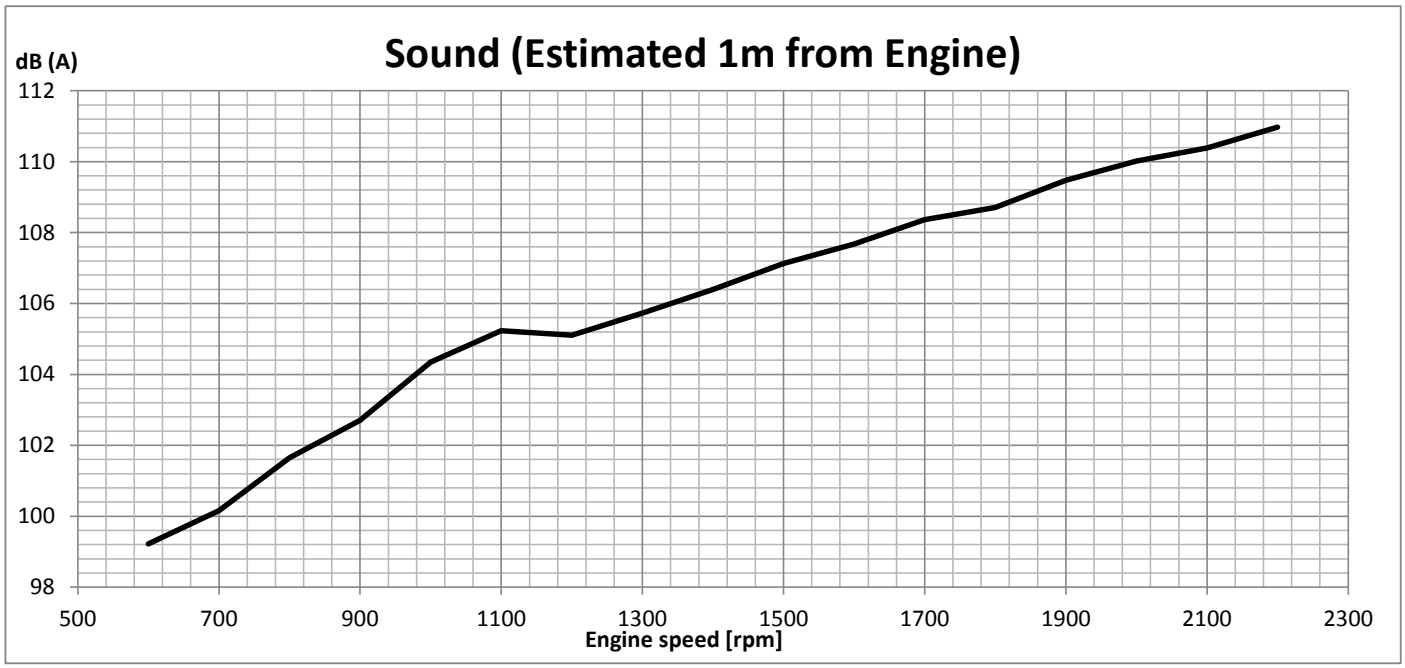


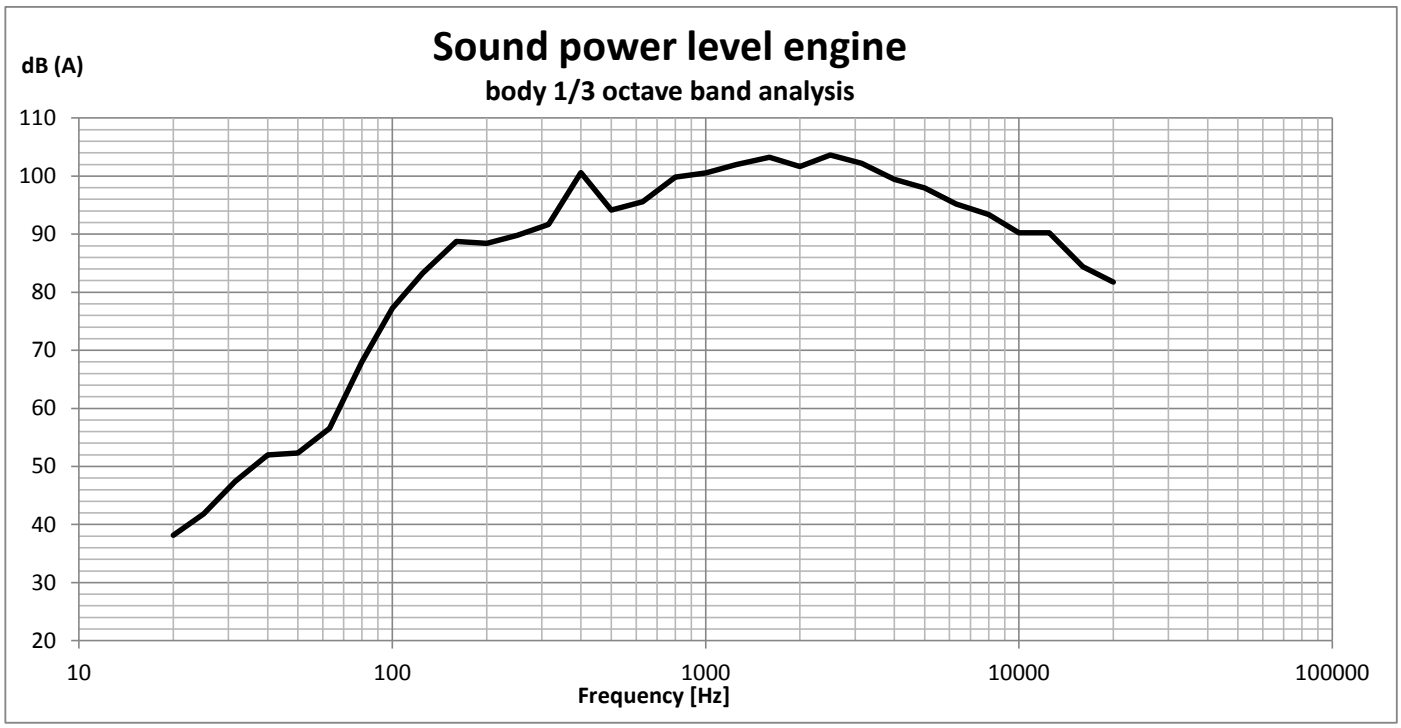
Engine protection for charge air pressure is complex and the trigger levels varies depending on engine mode, altitude and charge air temperature, ambient temperature.
Below is an example of engine protection limits for charge air pressure for normal operation engine mode, on the sea level with charge air temperature 50 degrees (normal charge cooler CAC efficiency) , and ambient temperature 25 degrees.
When engine speed increases above 1900 rpm (maximum power) charge pressure demand drops significantly but the actual charge pressure has a phycical delay to decrease therefore the fault limit is higher to avoid false alarm.

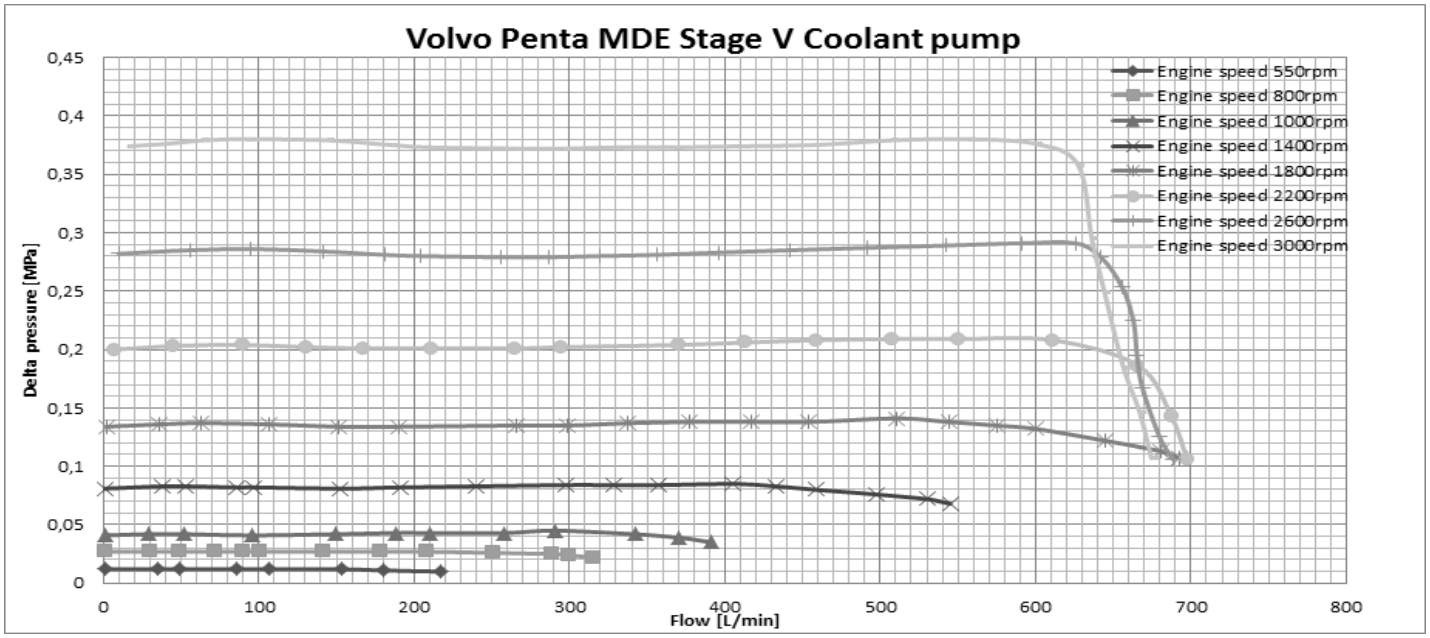


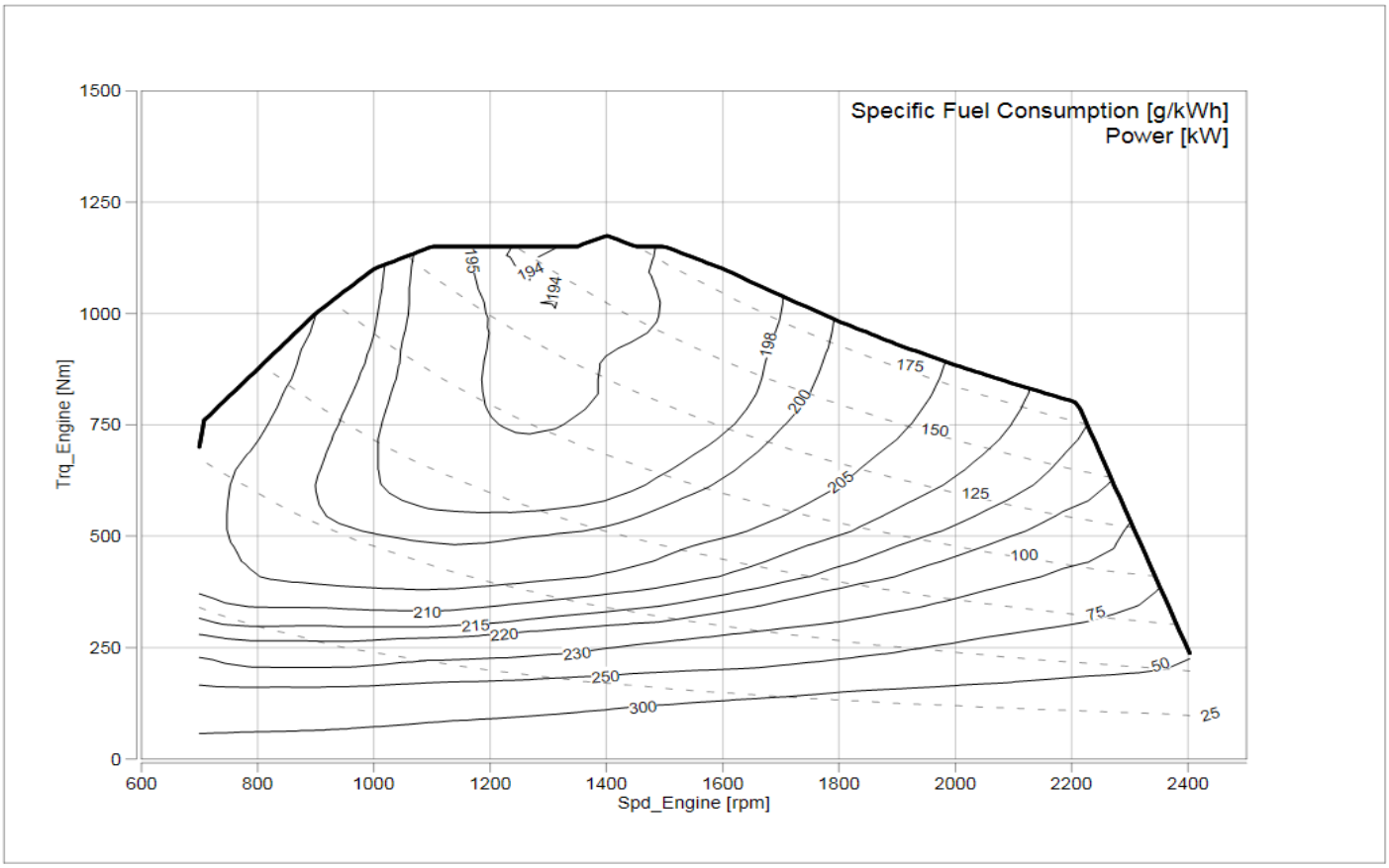


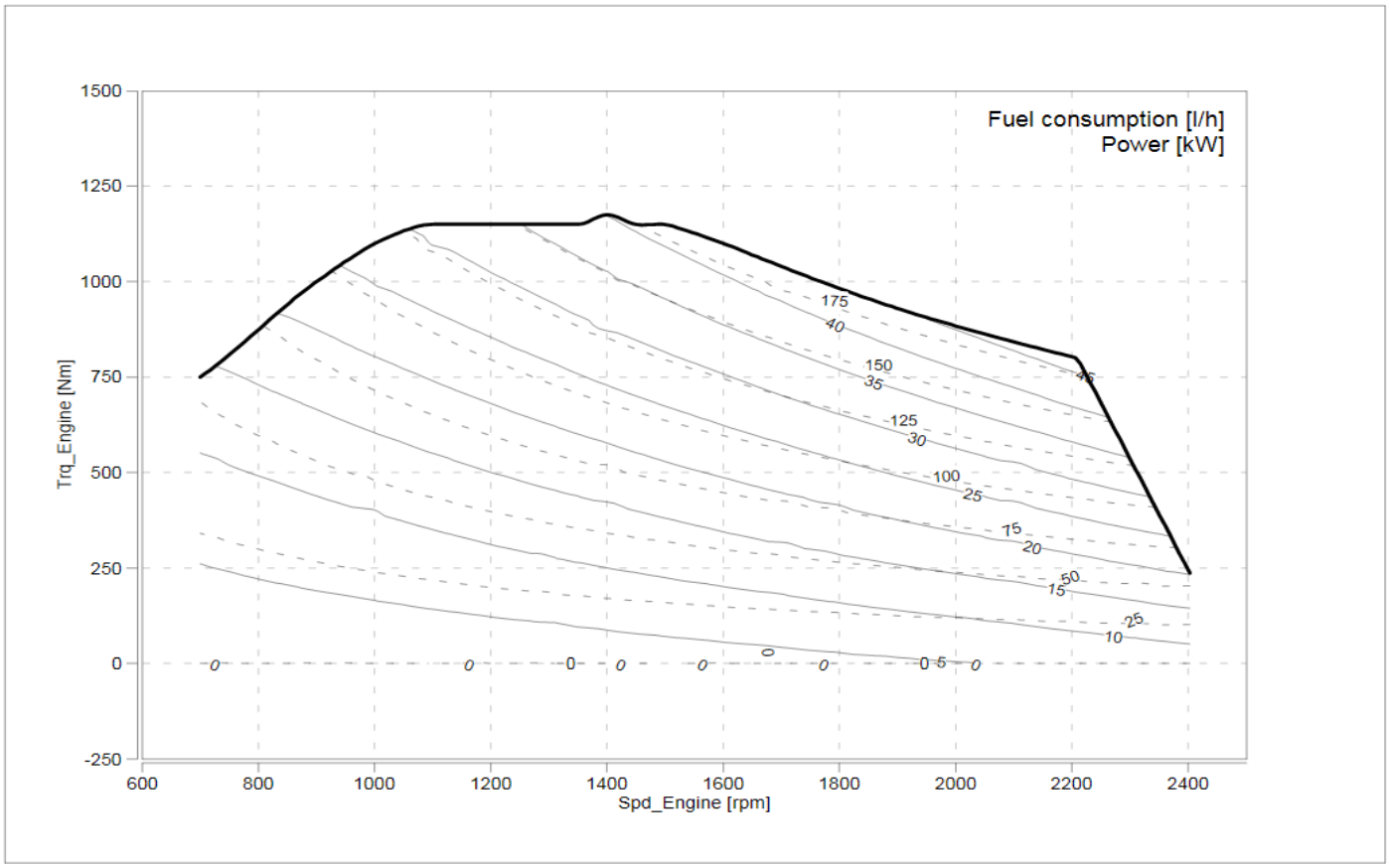

Altitude
Available engine torque
Nm
1400
1200
1000
800
600
400
200
0
0
500
1000
1500
2000
2500
Engine Speed [rpm]
0m
1000m
1700m
2500m
3500m


Sound (Estimated 1m from Engine)
dB (A)
112
110
108
106
104
102
100
98
500
700
900
1100
1300
1500
1700
1900
2100
2300
Engine speed [rpm]


Sound power level engine
body 1/3 octave band analysis
dB (A)
110
100
90
80
70
60
50
40
30
20
10
100
1000
10000
100000
Frequency [Hz]


Volvo Penta MDE Stage V Coolant pump
Delta pressure [MPa]
0,45
0,4
0,35
0,3
0,25
0,2
0,15
0,1
0,05
0
0
100
200
300
400
500
600
700
800
Flow [L/min]
Engine speed 550rpm
Engine speed 800rpm
Engine speed 1000rpm
Engine speed 1400rpm
Engine speed 1800rpm
Engine speed 2200rpm
Engine speed 2600rpm
Engine speed 3000rpm


Specific Fuel Consumption [g/kWh]
Power [kW]
Trq_Engine [Nm]
Spd_Engine [rpm]
1500
1250
1000
750
500
250
0
600
800
1000
1200
1400
1600
1800
2000
2200
2400
195
194
194
198
200
205
210
215
220
230
250
300
175
150
125
100
75
50
25


Fuel consumption [l/h]
Power [kW]
Trq_Engine [Nm]
Spd_Engine [rpm]
1500
1250
1000
750
500
250
0
-250
600
800
1000
1200
1400
1600
1800
2000
2200
2400
175
40
150
35
125
30
100
25
75
20
50
15
25
10
0
0
0
0
0
0
0
0
0
0