


Important

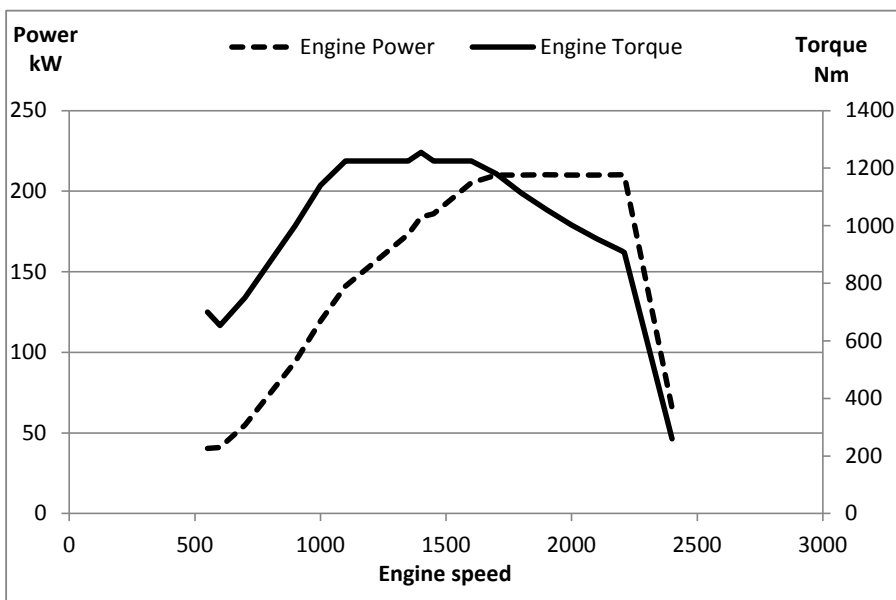
This Technical Data Sheet and the corresponding Installation Instructions provide important information to ensure the installed engine will operate according to the design specification in the Volvo Penta application for certification.

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 penalties 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	210
		hp	286
		rpm	2200
Peak Torque		Nm	1255
		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	223	239	255	274
		lb/hph	0,36	0,39	0,41	0,44
	50%	g/kWh	200	209	218	230
		lb/hph	0,32	0,34	0,35	0,37
	75%	g/kWh	197	201	207	216
		lb/hph	0,32	0,33	0,34	0,35
	100%	g/kWh	197	200	205	212
		lb/hph	0,32	0,32	0,33	0,34
Specific AdBlue®/DEF consumption of diesel consumption, NRTC		Vol%	7,00			

CO₂ emission declaration

Carbon dioxide (CO ₂) emissions determined during the EU type approval process and recorded in EU type approval certificate, NRTC.	g/kWh	679,50
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General

Number of cylinders			6
Displacement, total		liters	7,70
		in ³	470
Firing order			1-4-2-6-3-5
Bore		mm	110
		in	4,33
Stroke		mm	135
		in	5,31
Compression ratio			17,2:1
Wet weight	Engine only	kg	723
		lb	1594
	<u>The weight includes:</u> 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	N/A
		lb	N/A
<u>The weight includes:</u> N/A			
	Exhaust aftertreatment muffler DPF	kg	32
		lb	71
	Exhaust aftertreatment muffler SCR	kg	41
		lb	90

Performance

Rated power	kW	210
	rpm	2200
IFN Power	kW	210
ICFN Power	kW	185
For ICFN please see Technical data for		TAD881VE

The engine performance corresponds to ISO 3046.

		rpm	1500	1800	2000	2200
Power	without fan	kW	192	210	210	210
		hp	262	286	286	286
For performance with fan see options technical data for the desired module.						
Torque (IFN)	without fan	Nm	1225	1114	1003	912
		lbf ft	903	822	740	673
Max torque at engine speed	1400 rpm	Nm	1255			
		lbf ft	926			
Power tolerance		%	+/-2			
Total mass moment of inertia, J (mR ²) for two mass calculations (not including flywheel)		kgm ²	0,398			
		lbft ²	9,4			
Total mass moment of inertia, J (mR ²) for transient load response calculations (not including flywheel)		kgm ²	0,398			
		lbft ²	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 @	°C	-30
	Blockheater: TYP UI 701 1500W / ~230V or ~115V	°F	-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	475
		psi	69
Oil pressure at rated speed	Min	kPa	275
		psi	40
Lubrication oil temperature in oil pan:	Max	°C	130
		°F	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	123	
	US gal/h	32,5	
Fuel supply line max. restriction (measured at fuel inlet connection)	kPa	20,0	
	psi	2,90	
Fuel supply line max. pressure, during engine running (measured at fuel inlet connection @ engine)	kPa	20,0	
	psi	2,90	
Fuel supply line max. pressure, during engine stand still (measured at fuel inlet connection @ engine)	kPa	20,0	
	psi	2,90	
Fuel supply line min. pressure, during engine stand still (measured at fuel inlet connection @ engine)	kPa	-55	
	psi	-8	
Maximum system return flow	liter/h	67	
	US gal/h	17,8	
Fuel return line max. restriction (measured at fuel return connection)	kPa	40	
	psi	6	
Max. allowable inlet fuel temp (Measured at fuel inlet connection)	°C	80	
	°F	176	
Prefilter / Water separator filtration efficiency	98%	μ	30
	50%	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)	m ³ /min	12,5	15,0	16,2	17,3
	cfm	442	529	572	612
 See front page for important information	kPa	6			
	psi	0,87			
Max allowable air intake restriction including piping					

Exhaust system	rpm	1500	1800	2000	2200
Heat rejection to exhaust:	kW	139	155	163	144
	BTU/min	7903	8790	9292	8171
Exhaust gas temperature after turbine at:	°C	486	480	467	457
	°F	907	896	873	854
 See front page for important information					
Max allowable back pressure in exhaust line at full load (after turbine)	kPa	26	29	32	34
	psi	3,7	4,2	4,6	5,0
 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 (at exhaust gas flow and exhaust temp specified in this table)	kPa	8	10	11	12
	psi	1,2	1,5	1,6	1,7
Muffler 2 pressure drop (at exhaust gas flow and exhaust temp specified in this table)	kPa	12	14	15	16
	psi	1,7	2,0	2,2	2,3
Exhaust gas flow at: (temp and pressure after turbine at the corresponding power setting)	m ³ /min	28,6	32,2	33,5	35,0
	cfm	1010	1137	1183	1236
 See front page for important information					
Engine speed during stand still regeneration	rpm	1400 ± 100			
 See front page for important information					
Max allowed load during stand still regeneration	Nm	540			
	lb ft	398			

Cooling system		rpm	1500	1800	2000	2200
Heat rejection radiation from engine at:	kW		5,7	5,9	5,9	6,5
	BTU/min		323	336	337	368
Heat rejection to coolant at:	kW		94	105	109	114
	BTU/min		5323	5975	6221	6474
Coolant	Volvo Penta Coolant VCS (Yellow) Ready Mix 40/60 or Mix 40% Volvo Penta Coolant VCS (Yellow) + 60% tap Water*. * Tap water must fulfill Volvo quality standard VOLVO STD: 1285, 1					
Coolant capacity: Engine only <i>For coolant capacity for engine and cooling packages see Technical data for the specific option.</i>	liter		17			
	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 (at coolant flow below)	kPa		6	10	13	16
	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 At fully opened thermostat	l/s		3,50	3,90	4,40	4,80
	US gal/s		0,925	1,030	1,162	1,268
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	28	29	35	38
	BTU/min	1599	1664	1963	2163
Charge air mass flow	kg/s	0,25	0,28	0,32	0,35
Charge air inlet temp @ 25 °C (Charge air temp after turbo compressor)	°C	152	152	150	150
	°F	306	305	302	302
 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	6,76	9	10,46	12
	psi	1,0	1,3	1,5	1,7
Charge air pressure - relative pressure at sea level (After charge air cooler)	kPa	154	158	154	152
	psi	22,3	22,9	22,4	22,0

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 than one PTO output is used simultaneously, calculations need 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 continuous 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			

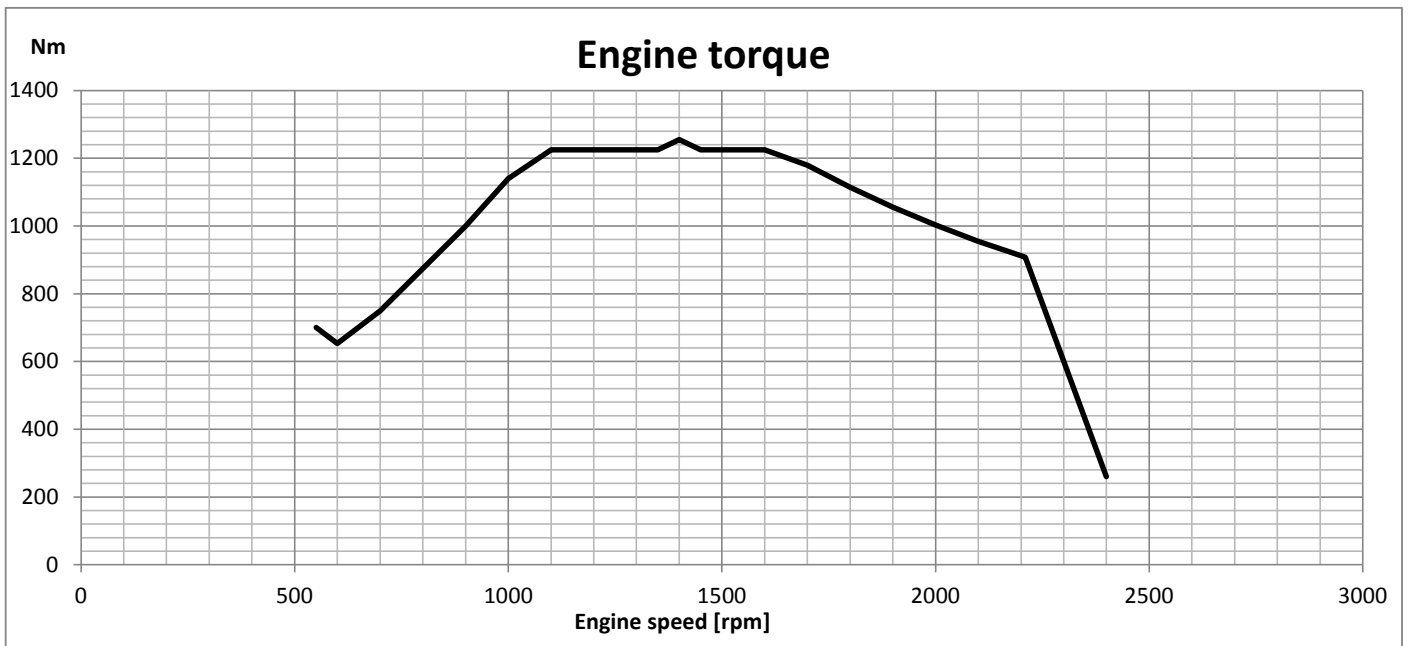
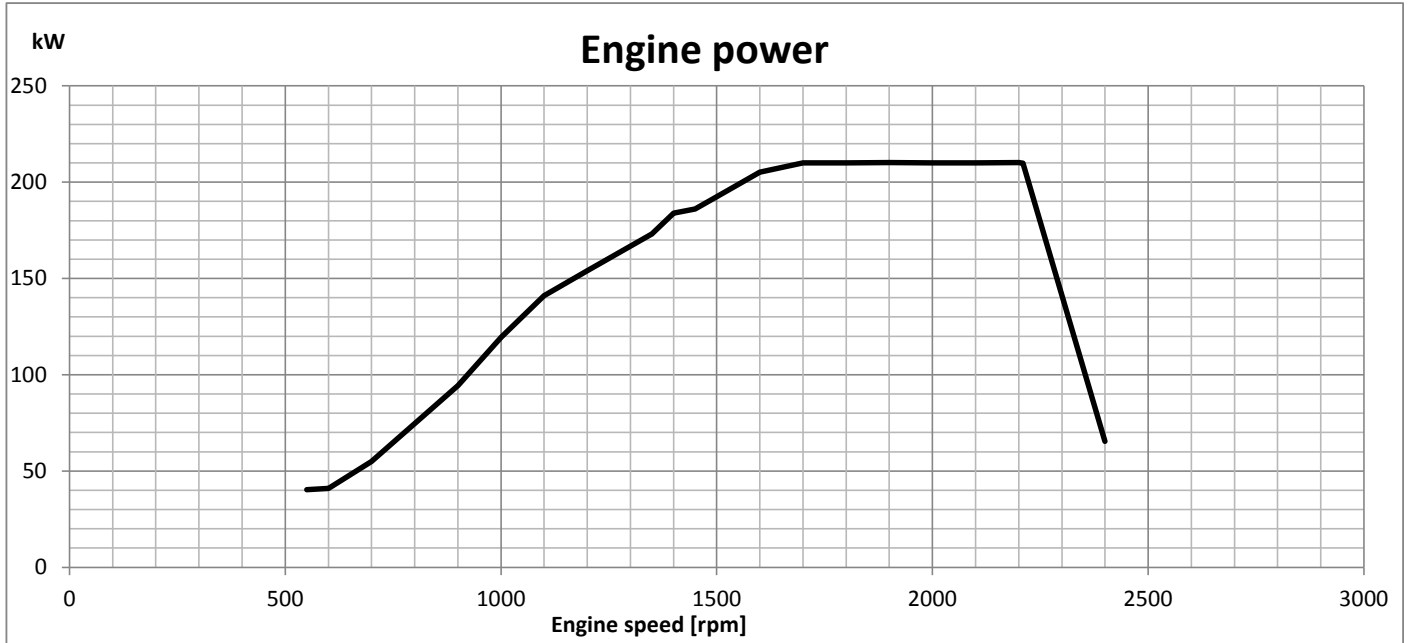
Engine Protection

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

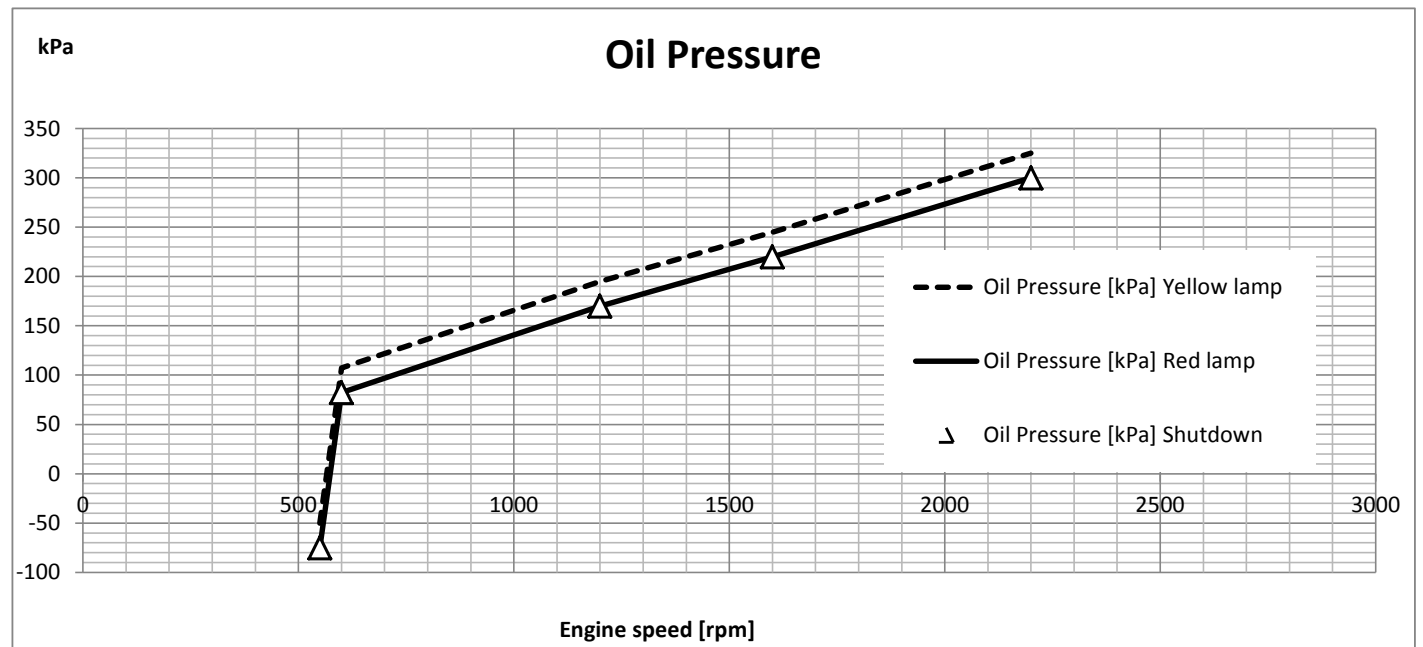
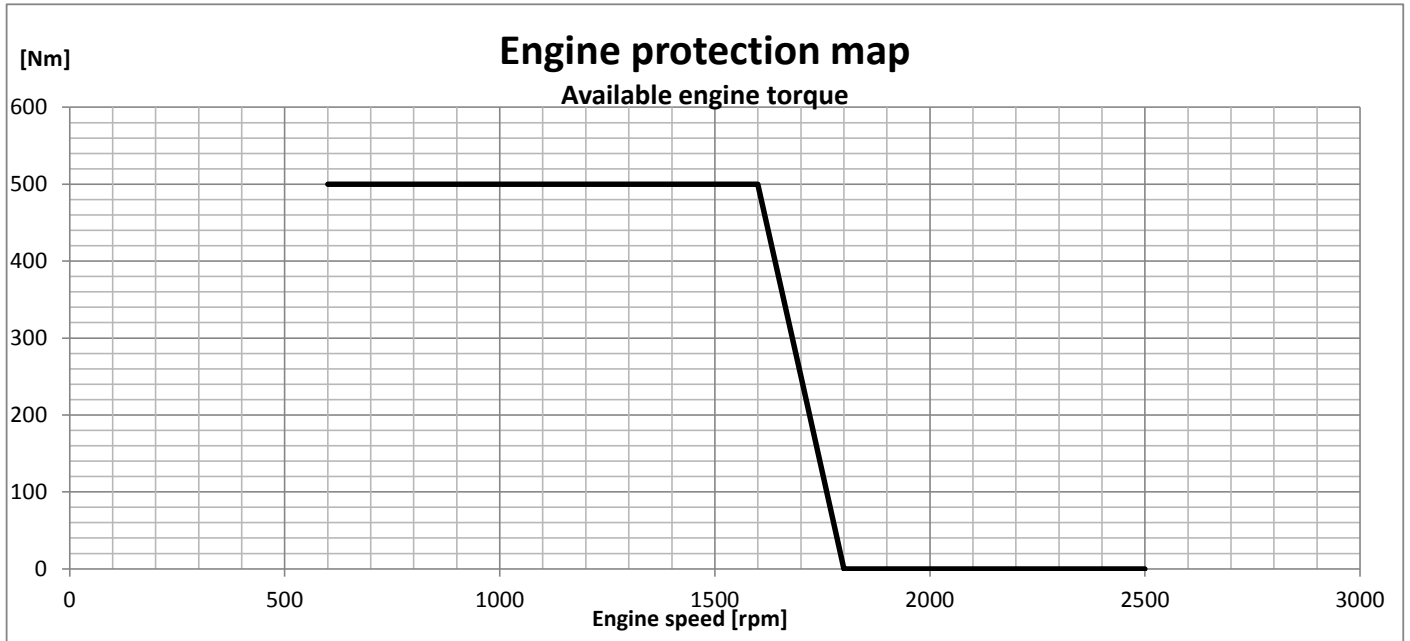
Engine sensors				Engine protection action		
	Unit	Warning level (Yellow)	Alarm level (Red)	Default	Max derate, acc engine protection map	Optional (Module or conversion kit)
Fuel temperature ¹	°C	Not installed	Not installed	Not installed	Not installed	Not installed
Oil temperature	°C	125	130	Derate	132	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



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 physical delay to decrease therefore the fault limit is higher to avoid false alarm.

