N67 IPU

129kW

Revision 1.1 Jul 2018

Brochure main description		
Application & symbol		Off road
Engine identication main		N67
Engine identication rating		129
Engine features		IPU
Emission feature		low emissions / R96

Main characteristics		
Emission certification		Tier3-Stage IIIA
Commercial code (for order)		N67MNTX20.00A800; N67MNTX20.00A801; N67MNTX20.00A804; N67MNTX20.00A805; N67MNTX20.00A806; N67MNTX20.00A807; N67MNTX20.00A808; N67MNTX20.00A809; N67MNTX20.00A811; N67MNTX20.00A816; N67MNTX20.01
Technical code (Pregnana productions, if needed)		n/a
Technical code (original plant engine code, on engine block)		F4GE9684A*J602
Oil consumption on mission (average)	% fuel comsumption	0.3
Cycle		Diesel 4 stroke
Air charging system pattern		TAA
Number of cylinder		6
Configuration (cyliinder arrangement)		in line
Bore	mm	104
Stroke	mm	132
Stroke / Bore		1.27
Displacement	l	6.728
Unit Displacement	l	1.121
Bore pitch	mm	120
Valves per cylinder		2
Cooling system pattern		liquid
Direction of rotation (looking flywheel)		anti-clockwise
Compression ratio		17.5:1
Firing order		1-5-3-6-2-4
Injection type		Mechanical
Engine brake configuration		-
Be10	h	8000
Cylinder Head		
Single / Multiple		single
Material		cast Iron
Head air circulation		standard
Intake valve dia.	mm	45
Exhaust valve dia.	mm	42
Camshaft		
Layout		specific patented for int EGR
Cam carrier		on inlet valve
Material and heat treatment		chilled cast iron
Valve train		mechanical tappet & push rod
Drivetrain (timing system)		gear tappet
Valve actuation		tappet & push rod
Variable valve actuation system		no
Cylinder block (crankcase)		structural & non structural
Material of cylinder block		grey cast Iron
Type of liners		no liners
Liners replaceable; (slip fit or interference fit)		no
Bearing caps		machined cast iron
Crankcase ventilation		yes
Oil separator		on engine
Crankshaft & counterweights		
Material		cast iron
Acceptable inertia (clutch)	kgm^2	n/a
Balancing		option if required

(continue...)

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Main characteristics	See Figure 1 and Figure 2	
Turbocharger & EGR system		
Turbocharger type		fixed geometry with Waste Gate valve
Turbocharger supplier		Holset
Turbocharger control		WG pneumatic control or fixed
Max turbine inlet temperature	°C	700
Max boost pressure	mbar	1550 (depending on rating)
Method of cooling the turbocharger		lubricated /Oil
Turbo protection devices		none
EGR		Internal EGR
EGR control strategy		none
Rate		-
Front Power take off		
PTO type		front and side
Max torque available from front of crankshaft (no side load)	Nm	150
Power take off on gear train		
SAE A 9 teeth		100
SAE A 11 teeth		150
SAE B 13 teeth		240
SAE B (DIN 5482)		-
SAE 2B 15 teeth (ANSI B92,1)		-
References values		
Engine dimension LxWxH (indicative values)	mm	1054x671x685
Max permissible engine inclination	deg	35 all direction
Engine Weight - Dry (no fluids, value purely indicative)	kg	530
Engine Weight - Wet (with fluids, value purely indicative)	kg	560

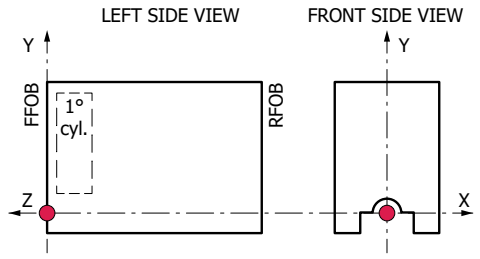

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Figure 1.

Center of gravity (FFOB or RFOB according to picture, standard engine layout)	X	mm	-4
	Y	mm	143
	Z	mm	-421
Principal moment of inertia (reference on center of gravity)	I_1	kgm²	7.10e+04
	I_2	kgm²	5.87e+04
	I_3	kgm²	2.62e+04
Principal moment of inertia (reference matrix based on center of gravity)	I_1x; I_1y; I_1z	kgm²	n/a
	I_2x; I_2y; I_2z	kgm²	n/a
	I_3x; I_3y; I_3z	kgm²	n/a
Center of gravity (FFOB or RFOB according to picture, standard IPU/G-Drive layout)	X	mm	n/a
	Y	mm	n/a
	Z	mm	n/a
Principal moment of inertia (reference on center of gravity ,standard IPU/G-Drive layout)	I_1	kgm²	n/a
	I_2	kgm²	n/a
	I_3	kgm²	n/a
Principal moment of inertia (reference matrix based on center of gravity,standard IPU/G-Drive layout)	I_1x; I_1y; I_1z	kgm²	n/a
	I_2x; I_2y; I_2z	kgm²	n/a
	I_3x; I_3y; I_3z	kgm²	n/a

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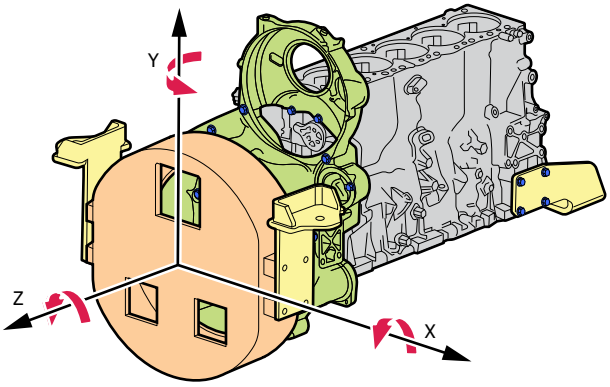

Figure 2. ***Components***

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COMPONENTS

Engine Block | Flywheel housing | Engine Supports | Bolts | Pump drive GearBox coupled with flywheel ousing

Main characteristics

References values			
Mass moment of inertia - rotating components (excluding flywheel)		kgm^2	0.33
Mass moment of inertia - standard flywheel		kgm^2	0.7-1.3
Bending moment on the flywheel housing	point 1	Within safety factor with mass @ max Z : 350 mm	
	point 2	Within safety factor with mass @ max Z : 750 mm	
	point 3	Within safety factor with mass @ max Z : 1050 mm	
Bending moment on PTO		Nm	n/a
Max static mounting surface load		N	n/a
Crankshaft thrust bearing pressure limit		MPa	n/a
Intermittent load:		MPa	n/a
Continuous load:		MPa	15
Rear main bearing load		MPa	n/a
Max bending moment available from front of the crankshaft:			
0 deg		Nm	100
90 deg		Nm	300
180 deg		Nm	300
Environmental operating conditions			
Max altitude for declared performances		m	2000
Max ambient temperaturefor declared performances		°C	25
Min guaranteed temperature for cold start w/o any aid (stand alone engine)		°C	-15
Min guaranteed temperature for cold start with grid heater (stand alone engine)		°C	-20
Min guaranteed temperature for cold start with grid heater and block heater (stand alone engine)		°C	-30
Time preheating for manifold heater		s	@ - 3°C : 0 ; -30°C : 21
Time post heating for manifold heater		s	@ - 3°C : 0 ; -20°C : 200
Low idle continuous operation time (recommended)		h	-

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(*) Engine performance			
Power reduction due to ambient conditions			
Temperature above xx°C		%/5°C	2
Altitude > 1000 < 3000m		%/500m	3
Altitude > 3000m		%/500m	6
Power limitation due to safety protections			
Max water temperature (switch on of the MIL lamp)		°C	-
Start derating: switch on of the warning coolant temperature lamp (amber color)		°C	-
Max derating (50% derating) switch on of the high coolant temperature lamp (redcolor)		°C	-
Altitude level: gradual reduction of transient response by smoke map correction from		m	-
Fuel temperature		°C	-
Intake manifold air temperature		°C	-
ATS max gas inlet temperature		°C	-
Max allowed exhaust temperature		°C	
Turbine overheating protection		°C	-
Turbine overspeed protection		rpm	-
Oil temperature protection		°C	-
Oil pressure protection		bar	-

Fuel System See Figure 5			
Fuel density		kg/l	0.835
Injection system type			mechanical
Injection pump manufacturer			BOSCH
Injection model type			BOSCH VE
Injection model pump			VE pump
Injection pressure		bar	up to 600 bar
Injector			n/a
Injector installation (sleeve, sealing flat or conical)			sleeve
Injector nozzle			Bosch DSLA145P1679
Engine fuel compatibility			see dedicated GOLD Book document on fluids
Feed pump			n/a
Max flow		l/h	110/1800rpm
Nominal feed pressure		bar	0,47-0,61/1800rpm
Fuel filter			single cartridge - left side
Delta pressure on fuel filter		bar	n/a
Max continuous allowable fuel temperature (without derating)	T_{1p}	°C	30
Max relative pressure at gear pump inlet	P_{1p}	bar	n/a
Min relative pressure at gear pump inlet	P_{1p}	bar	n/a
Max back flow relative pressure	P_{rl}	bar	n/a
Max back flow restriction		bar	n/a
Max heat rejection to return fuel		kW	n/a
Max fuel flow		kg/h	26
Min fuel tank venting requirement		m^3/h	n/a
Prefilter / Water separator micron size		µm	n/a

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Air Intake System	See Figure 4		
Aftercooling type (air to air or water to air)			air to air
Air filter rise temperature	$T_3 - T_1$		<10
Compressor inlet pressure (with new air filter)	P_3	bar	0.035
Compressor inlet pressure (with dirty air filter)	P_3	bar	0.045
Air filter type			-
Loads on turbocharger on compressor intake		kg	n/a
Loads on turbocharger on compressor outlet		kg	n/a
Charge air flow (max)		kg/h	n/a

Exhaust System	See Figure 4		
Max back pressure (after exhaust flap) @ rated power with clean system	P_{10}	bar	0.1
Max mechanical load on turbine flange		N - Nm	50 - 15
Max ambient temperature for exhaust flap actuator		°C	n/a
Max exhaust temperature After Treatment System		°C	-
Max exhaust flow rate		kg/h	906
Energy to exhaust		kW	-

Lubrication System			
Oil sump capacity			17
Max		l	15
Min		l	9
Oil system capacity including filter		l	n/a
Oil pump type			gear pump
Oil pump drive arrangement			gear pump forged of block
Min oil pump flow		l/min	12.2
Max oil pump flow (@rated speed)		l/min	75.9
Min oil pressure @ low idle (engine oil temp at 120°C)		kPa (bar)	0.7
Min oil pressure @ rated speed (engine oil temp at 120°C)		kPa (bar)	n/a
Max oil pressure @ rated speed (engine oil temp at 120°C)		kPa (bar)	3.5
Max oil temperature @ full load (in main gallery)		°C	140
Max oil pressure peak on cold engine		bar	15
Oil cooler type			water to oil
Transducer for indicating oil temperature and pressure			-
Max engine angularity - longitudinal / transversal (std oil pan)		0/360°	35°
Allowed engine gradability during installation on vehicle		°	±4
Oil servicing intervals		h	see dedicated GOLD Book document on fluids
Oil filter type			single cartridge - right side
Oil filter capacity		l	1
Max oil content admitted in blow by gas (after filter)		g/h	0.3
Approved engine oil specifications			see dedicated GOLD Book document on fluids
Oil for cold condition mission (T° ambient < -25°C)			see dedicated GOLD Book document on fluids

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Cooling system	See Figure 6		
Type (water to water or air to water)			liquid
Recommended coolant			see dedicated GOLD Book document on fluids
Min radiator cap pressure		kPa (bar)	0.7
Warnnig setting first threshold		°C	
Max additional restriction		Pa	n/a
Air to boil (prime power, open genset configuration)		°C	-
Air to boil (stand by, open genset configuration)		°C	-
EGR Cooler water flow (for ΔT=6°C)		l/s	-
LP-CAC water flow (for ΔT=6°C)		l/s	-
Fan			
Radiator			
Core dimensions LxWxh		mm	-
Dry weight		kg	-
Radiator coolant capacity		l	-
Optimum coolant temperature range @engine out (50% glycol)		°C	83 ÷ 99
Engine Water pump Type			centrifuge
Engine water pump drive			belt
Sea Water pump Type			-
See water pump drive			-
Coolant capacity (engine only)		l	10.5
Coolant capacity (radiator & hoses)		l	-
Thermostat type			Stant bypass system
Thermostat position			engine on cylinder head
Thermostat opening / fully open temperature		°C	83 ÷ 99
Recommended coolant circuit pressurization range (relative)		bar	0.7-1.20
Coolant engine pressure outlet – inlet (delta pressure, open thermostat, high idle conditions)	$P_9 - P_8$	bar	0.35
Coolant engine pressure outlet – inlet (only with remote thermostat, ex. retarder)	$P_9 - P_8$	bar	n/a
Min coolant pressure (no pressure cap and thermostat closed)		bar	n/a
Max back pressure on sea water pump (included pump and sea filter)			-
Sea water filter features			-
Sea water filter max back pressure			-
Max water pressure for water to water radiator (sea water)			-
Coolant water pump inlet pressure (water temperature 60-100°C)	P_8	bar	n/a
Coolant flow to radiator @rated speed		l/min	n/a
Coolant flow sea water pump @rated speed			-
Min coolant expansion space (% total cooling system capacity)		%	Expansion Tank volume (and max level) must consider also coolant thermal expansion to avoid coolant loss in high temperature conditions. This can be checked in ATB Power Test
Max coolant flow to accessories @ rated speed from cab heater		l/min	n/a
Engine out coolant to ambient @rated speed		delta °C	n/a
Engine out coolant to ambient @torque speed		delta °C	n/a
Charge air cooler outlet to ambient @max rpm - CAC dT		delta °C	n/a
Coolant engine flow		l/min	n/a

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Electrical, Electronic and Control Systems		
System voltage	V	-
Engine control unit		-
ECU Vehicle connection		-
ECU operating range	°C	-
Temperature of ECU case for <5' after power up	°C	-
ECU rated continuous temperature	°C	-
ECU communication protocol		-
Min power supply for ECU operation	V	-
Max power supply for ECU operation	V	-
Battery wire connection resistance value @20°C (from battery to ECU)	mΩ	-
Diagnostic system		-
Min cranking speed TDC @-30°C	rpm	75
Average cranking speed	rpm	115
N° tooth pinion/crown gear		10/132
Min battery voltage	V	9 (12V System) / 16 (24V System)
Mean battery voltage	V	11 (12V System) / 18.4 (24V System)
Min battery current	Ah	180
Mean battery current	Ah	-
Max starting circuit resistance (to starter)	mΩ	< 70

(****) Cold starting		
Without air preheating	°C	-15
With air preheating	°C	-25

Emission gaseus and particles		
NO_x	g/kWh	n/a
HC	g/kWh	n/a
NO_x+HC	g/kWh	n/a
CO	g/kWh	n/a
PT	g/kWh	n/a

(*****) Maintenance		
Oil drain interval	h	see dedicated GOLD Book document on fluids
Oil filter change	h	see dedicated GOLD Book document on fluids
Oil refilling time	h	Daily check to evaluate oil refill necessity
CCV filter change	h (y)	1500 (1)
Fuel filter change	h	see dedicated GOLD Book document on fluids
Fuel pre-filter change	h	see dedicated GOLD Book document on fluids
Belt replacement	h	1200
Valve lash check /adjustment	h	2400
AdBlue filter Change	h	-
DPF filter service	h	-
Coolant change	h	see dedicated GOLD Book document on fluids

(**) Engine Noise		
Overall sound pressure (engine only)	dBA	n/a
Overall sound pressure (with accessories only)	dBA	n/a
Exahust noise (w/o Muffler)	dBA	n/a
Noise spectrum (octave analysis performed at the position of maximum noise) - diagram	Table dB-Hz	n/a

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Design air handling system data	See Figure 4		
EGR flow		kg/h	-
EGR pressure		kPa	-
Boost pressure (compressor outlet)	P_4	kPa	-
Pressure drop on charge air cooling system	P_7-P_4	kPa	-
Max temperature after HP-Compressor		°C	-
RoA (Temperature raise between ambient and inlet to engine	T_7 –T_1	°C	≤ 30
Max intake manifold temperature	T_7	°C	≤ 60
Back pressure before DOC		kPa	-
Exhaust Gas Temp between HP-TC		°C	-
Max Exhaust Gas Temp (after TC)	T_{10}	°C	-
Max admitted back pressure after SCR		kPa	-
Max admitted back pressure after TC		kPa	-

(*) Value measured (tolerance ±3%) at flywheel according to one of more of the norms: ISO 3046/1, dir. 97/68 EC (w/o fan), DIN 6271, BS 5514, SAE J1349. Test conditions: 50 hours of run-in, fuel EN 590, turbo air inlet temperature 25°C, atmospheric pressure 100kPa, humidity 30% and other engine conditions in accordance to FPT Datasheets and Installation Guidelines.

(**) The figures for total noise levels are measured in Prime Power rating in a absorber environment condition and measured at a distance of one metre from the periphery of the engine.

(***) The impact load values comply with requirements of Classification 3 & 4 of ISO 8528-12 and G2 operating limits stated in ISO 8528-5 (% of Prime Power).
All tests were conducted using an engine installed and serviced to FPT recommendations, standard ambient condition. Generator powers are typical and are based on an average alternator efficiency and a power factor (cos. Θ) of 0.8 and are for guidance only.
kWe = kWm x gen. eff.
kVA = kWe / 0.8

(****) The above temperatures can be taken as references during vehicle cold tests. As the FPT tests are performed on bench not on vehicle, it is not granted same temperatures can be reached real vehicle tests. Without specific tests on vehicles, FPT grants starting only above 0°C ambient. The cold start performances can be reaches also only with the use of proper fluids according to FPTprescriptions.

(*****) For detail maintenance activities see use and maintenance manuals, workshop manuals and other dedicated FPT documentation.

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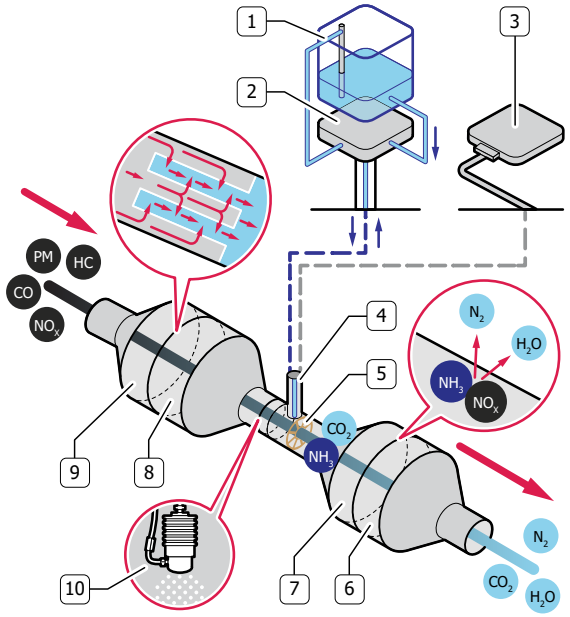

Figure 3. ***HI-eSCR - T4B and Euro VI*** 236552

1.	DEF - Urea tank	**6.**	CUC	**PM**	Particulate matter
2.	Supply module	**7.**	SCR /SCRoF	**HC**	Unburnt Hydrocarbons
3.	ECU	**8.**	DPF	**NO_x**	Nitrogen oxides
4.	Dosing module - Urea Injection	**9.**	DOC	**CO**	Carbon monoxide
5.	Mixer	**10.**	**AdBlue /DEF** $CO(NH_2)^2 + H_2O$	**N_2**	Nitrogen
				CO_2	Carbon dioxide
				H_2O	Water

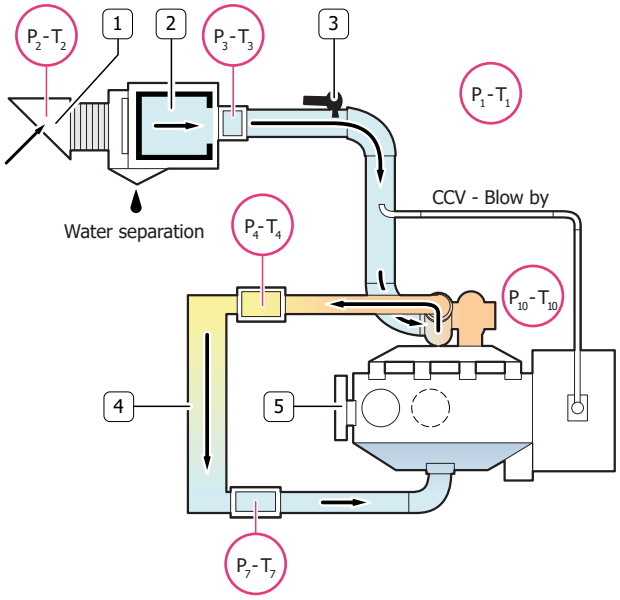

Figure 4. ***Generic Air Intake System layout*** 236534

1.	Snorkel
2.	Air filter
3.	Humidity sensor
4.	Intercooler
5.	Engine

Air temperature

T_1	Ambient
T_2	Filter air intake
T_3	After air filter
T_4	Before intercooler
T_7	Intake manifold
T_{10}	Exhaust temperature

Air Pressure

P_1	Ambient
P_2	Filter air intake
P_3	After air filter
P_4	Before intercooler
P_7	Intake manifold
P_{10}	Back pressure (after exhaust flap)

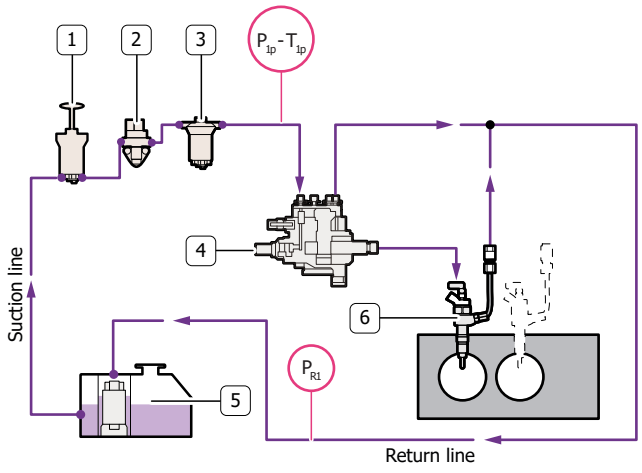

Figure 5. ***General fuel system scheme*** 270075

1.	Pre-filter
2.	Lift pump
3.	Fuel filter
4.	High pressure pump
5.	Fuel tank
6.	Injector

Fuel temperature

T_{1p}	Gear pump inlet

Fuel Pressure

P_{1p}	Gear pump inlet
P_{R1}	Back flow

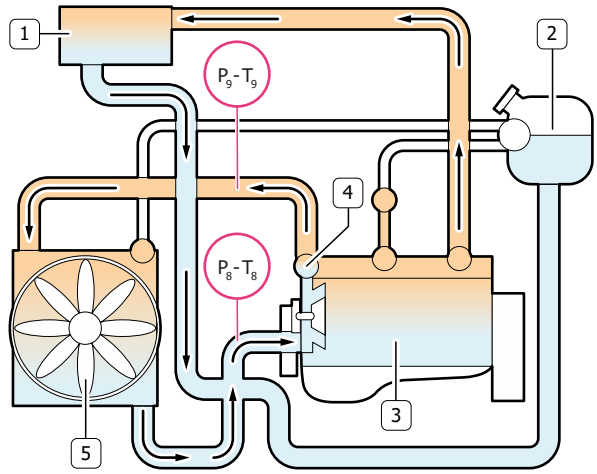

Figure 6. ***Cooling system with expansion tank (blue outline indicates rubber hoses)*** 270502

1.	Heating element
2.	Expansion tank
3.	Engine
4.	Thermostat
5.	Radiator

Cooling temperature

T_8	Water pump inlet
T_9	After thermostat

Cooling Pressure

P_8	Water pump inlet
P_9	After thermostat

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ACRONYMS LIST

Acronyms	Description
-	Not Needed
2stTC	Two Stage Turbo (sequential)
Ag	Agricultural
ASC	Ammonia Slip Catalyst (same as CUC)
ATS	After Treatment System
BSFC	Brake Specific Fuel Consumption
CAC	Charge Air Cooler
CCDPF	Close Coupled DPF
CCV	Crankcase Ventilation
CE	Construction Equipment
CI	Cast Iron
CRS	Common Rail System
CRSN	Common Rail System NKW (Commercial vehicles)
CUC	Clean Up Catalyst for ammonia (same as ASC)
DAVNT	Dual Axis Variable Nozzle Turbine
DCS	Drawing Coordinate System
DI	Direct Injection
DOC	Diesel Oxidation Catalyst
DOHC	Double Over Head Camshaft
DPF	Diesel Particulate Filter
ECEGR	External Cooled EGR
ECU	Engine Control Unit
EEGR	External EGR
EGR	Exhaust Gas Recirculation
epWG	Electro pneumatic WG
eVGT	Electrical VGT
eWG	Electrical WG
FFOB	Front Face of Block
FGT	Fixed Geometry Turbocharger (no WG)
FIE	Fuel Injection System
HD	Heavy Duty
HLA	Hydraulic Lash Adjusters
IDI	Indirect Injection

Acronyms	Description
iEGR	Internal EGR
ISC	Interstage Cooling
IPU	Industrial Power Unit
LD	Light Duty
LDCV	Light Duty Commercial Vehicles
LH	Left Hand Side
LWR	Laser Welded Rail
MD	Medium Duty
n/a	Not Available
NA	Natural Aspirated
NS	Non Structural
OHV	Over Head Valves
OPT	Option
PCP	Peak Cylinder Pressure
PTO	Power Take Off
RFOB	Rear Face of Block
RH	Right Hand Side
S	Structural
SAPS	Sulphated Ash, Phosphorus, Sulphur
SCR	Selective Catalytic Reduction catalyst
SCRoF	SCRon filter
SOHC	Single Over Head Camshaft
STD	Standard
TC	Turbocharged
TCA	Turbocharged, Charge Air Cooled
THM	Thermal Management
UFDPF	Under Floor DPF
UQS	Urea Quality Sensor
VE	Bosch Distributor Mechanical Pump
VFT	Variable Flow Turbine
VGT	Variable Geometry Turbocharger
WG	Waste Gate Turbocharger
XPI	Extra high Pressure Injection (Scania, Cummins)

Unit of misure according to international system of unit.
Engine accessories and Options available on Option List.
All data is subject to change without notice.

UPDATING

Revision	Description	Date
1.1	Updated document	Jul 2018