

Brochure main description		@1500rpm	@1800rpm
Application & simbol		Power Ger	neration
Engine identication main		F36	3
Engine identication rating	kW	85	94
Engine features		PG G-E	Drive
Emission feature		Stage	۷
Main characteristics		@1500rpm	@1800rpm
Emission certification		Stage	<u> </u>
Commercial code (for order)		F36ETVP	
Technical code (original plant engine code, on engine			
block)		F5MGL415	B*V001
Technical homologation code		F5MGL4	15B*V
Stand-by power (gross) [mech]	kW	85	94
Specific power	kW/I	23,6	26,1
Electric commercial power (estimation alternator power output)	kWe [kVA]	75 [94] (generator efficiency 0,91)	82 [102] (generator efficiency 0,91)
BMEP	bar	18,9	17,5
Oil consumption on mission (average)	% fuel comsumption	0.24	5
Cycle		diesel - 4	stroke
Air charging system pattern		Turbocharged	aftercooled
Number of cylinder		4	
Configuration (cylinder arrangement)		in lin	le
Bore	mm	102	2
Stroke	mm	110	)
Stroke / Bore		1,07	7
Displacement	I	3,6	
Unit Displacement	I	0,90	)
Bore pitch	mm	110	)
Valves per cylinder		4	
Cooling system type		liqui	d
Direction of rotation (looking flywheel)		anti-cloc	kwise
Compression ratio		18,5	:1
Firing order		1 - 3 - 4	4 - 2
Injection type		direct - electronio	c common rail
Be10		8000	h
Cylinder Head		N/A	١
Single / Multiple		sing	le
Material		cast i	ron
Head air circulation		reverse	-flow
Intake valve dia.	mm	32,5	5
Exhaust valve dia.	mm	32,	5
Camshaft		N/A	
Layout		OH	V
Cam carrier		on cylinde	er block
Material and Heat treatment		C53 bon - hardness	55 hrc on cammes
Valve train		OHV valve train with valve pu	ishrod and lower camshaft
Drivetrain (timing system)		gear ta	ppet
Valve actuation		tappet & p	ush rod



Main characteristics		@1500rpm	@1800rpm
Variable valve actuation system		n	<u> </u>
Cylinder block (crankcase)		No Stru	uctural
Material of cylinder block	cast iron		iron
Type of liners		parent metall of	cylinder block
Liners replaceable; (slip fit or interference fit)		no internet	•
Bearing caps		machined	cast iron
Crankcase Ventilation		clos	ed
Oil separator		centri	fugal
Crankshaft & counterweights		N/	A
Material		GH 90-52-05	AS 15-2218
Acceptable Inertia (clutch)	kgm <sup>2</sup>	О,	8
Balancing	-	N/	A
Turbocharger & EGR system		N/	A
Turbocharger type		fixed geometry with	n wastegate valve
Turbocharger supplier		BorgW	
Turbocharger control		WG pneum	atic control
Pressure after turbocharger compressor	mbar	260	00
Max turbine inlet temperature	°C	710 °C cont. /	760 °C peak
Temperature after turbocharger compressor	°C	N/	A
Method of cooling the turbocharger		oil lubr	icated
Turbo protection devices		wastegate and	ECU derating
EGR type		уе	S
EGR control strategy	external cooled EGR		oled EGR
Valve	Ø 21		
Cooler		water o	cooler
Control		from eng	ine ECU
Air mass measurement		no	)
Exhaust flap		N/	A
Switchability (1500-1800 rpm)		N/	A
Emission level 1500 rpm		Tier4B_	StageV
Emission level 1800 rpm		Tier4B_	StageV
Front power take off		N/	A
Power take off on gear train		N/	A
References values		N/.	A
Engine dimension LxWxH (indicative values)	mm	783 x 67	7 x 855
G-Drive Dimension LxWxH (indicative values)	mm	1110 x 73	5 x 1050
Max permissible engine inclination	deg	35	5
Engine Weight - Dry (no fluids, value purely indicative)	kg	33	0
Engine Weight - Wet (with fluids, value purely indicative)	kg	36	5
G-Drive Weight - Dry (no fluids, value purely indicative) G-Drive Weight - Wet (with fluids, value purely	kg	45	0
indicative)	kg	47	
Center of gravity (FFOB or RFOB according to picture, standard engine layout) Principal moment of inertia (reference on center of	mm	x = - 8 ; y = 1	
gravity standard engine layout) Center of gravity (FFOB or RFOB according to	kgm <sup>2</sup>	l1 = 14 kgm²; l2 =	-
picture, standard IPU/G-Drive layout)	mm	x = 6 ; y = 16	8 ; z = - 281



Main characteristics		@1500rpm	@1800rpm
Principal moment of inertia (reference on center of		@1500rpm	@1800rpm
gravity ,standard IPU/G-Drive layout)	kgm <sup>2</sup>	l1 = 21 kgm²; l2 =	= 32 kgm²; I3 = 40
Principal moment of inertia (reference matrix based	kgm <sup>2</sup>	N	/Α
on center of gravity,standard IPU/G-Drive layout)	Kgin		
Mass moment of inertia - rotating components (excluding flywheel)	kgm <sup>2</sup>	N/A	
Mass moment of inertia - standard flywheel	kgm <sup>2</sup>	1,189	
Bending moment on the flywheel housing	Nm	N/A	
Flywheel housing SAE sizing		N/A	
Flywheel SAE sizing		N/A	
Max static mounting surface load	Ν	N	/A
Crankshaft thrust bearing pressure limit		N	/A
Intermittent load:	MPa	N	/A
Continuous load:	MPa	N	/Α
Rear main bearing load	MPa	N	/Α
Max bending moment available from front of the crankshaft:		N	/A
0 deg	Nm	10	00
90 deg	Nm	30	00
180 deg	Nm	30	00
Environmental operating conditions		N	/Α
Max altitude for declared performances	m	1000	
Max ambient temperaturefor declared performances	C°	4	0
Min guaranteed temperature for cold start w/o any aid (stand alone engine)	°C	- 15 (with glow plugs)	
Min guaranteed temperature for cold start with Air Heater (stand alone engine)	°C	- 23 (with glow plugs and fuel heater)	
Min guaranteed temperature for cold start with grid heater and block heater (stand alone engine)	°C	- 32 (with glow plugs, fuel heater and block heater	
Low idle continuous operation time (reccomended)	h	N/A	
Engine performance [*]		N/A	
Continuous power (gross) [mech]	kW	68	75,2
Prime power (gross) [mech]	kW	85	94
Stand-by power (gross) [mech]	kW	93,5	103,4
Fan consumption [mech]	kW	3,36	5,8
Continuous power (net) [mech]	kW	65,3	70,6
Prime power (net) [mech]	kW	81,6	88,2
Stand-by power (net) [mech]	kW	90,1	97,6
Typical generator output		0.91]	[typical generator efficiency 0.91]
Generator available power @ Prime power	kW	74,3 (generator efficiency 0,91)	80,3 (generator efficiency 0,91)
Generator available power @ Stand by	kW	82 (generator efficiency 0,91)	88,8 (generator efficiency 0,91)
Power limitation according to ambient conditions		N	/Α
Ambient temperature above xx°C	%/5°C (xx°C)	2	2
Altitude > 1000 < 3000m above sea level	%/500m	3	
Altitude > 3000m above sea level	%/500m	6	3
Power limitation due to safety protections		N	/A
Pre-Warning: first advice of high coolant temperature [**]. Switch-on of the amber lamp	°C	10	
Warning: second advice of high coolant temperature	°C		10

4



Start of derating	°C	108
Altitude level: gradual reduction of transient response by smoke map correction from	m	2000
Fuel temperature	°C	70
Intake manifold air temperature	°C	70
ATS Max gas inlet temperature	°C	600
Max allowed exhaust temperature	°C	740*C (760 peak)
Turbine overheating protection	°C	N/A
Turbine overspeed protection	rpm	N/A
Oil temperature protection	°C	125
Oil pressure protection (min engine rpm)	bar	N/A

Fuel System		
Fuel density	kg/l	0,84
Injection system type		electronic common rail
Injection pump manufacturer		BOSCH
Injection model type		common rail
Injection model pump		CP4N1
Injection pressure	bar	1600
Injector		CRI 2-160HW
Injector installation (sleeve, sealing flat or conical)		sealing flat
Injector nozzle		8 x 350
Engine fuel compatibility		See dedicated GOLD Book document on fluids
Feed pump on engine		integrated in high pressure pump
Max fuel flow supply line	l/h	N/A
Nominal feed pressure	bar	1
Fuel filter		single Cartridge on left side
Fuel filter clogging sensor		no
Max continuous allowable fuel temperature (without derating)	°C	70
Max relative pressure at gear pump inlet	bar	N/A
Min relative pressure at gear pump inlet	bar	N/A
Max back flow relative pressure	bar	N/A
Max back flow restriction	bar	N/A
Max heat rejection to return fuel	kW	N/A
Max fuel flow return line	kg/h	@1500: 18 kg/h @1800: 19,6 kg/h
Min fuel tank venting requirement	m³/h	N/A
Prefilter / Water separator micron size	μm	>99% @ 30

Air Intake System		@1500rpm	@1800rpm
Aftercooling system type		air to a	air
RoA (Temperature raise between ambient and inlet to engine	°C	10	
Filter air intake temperature (warm air ricirculatuion)	°C	40	
Max intake manifold temperature	°C	50	
Compressor inlet pressure (with new air filter)	hPa	> - 50	
Compressor inlet pressure (with dirty air filter)	hPa	hPa > - 65	
Air filter type	cartridge		
Loads on turbocharger on compressor intake	kg	kg 0	
Loads on turbocharger on compressor outlet	kg 0		
Charge air flow (max)	kg/h	350	414



Exhaust System		@1500rpm	@1800rpm
Max back pressure (after exhaust flap) @ rated power with clean system	hPa	220	D
Max mechanical load on turbine flange	kg	0	
Max mechanical load on tablic liange Max exhaust temperature After Treatment System	°C	740 °C cont.	/ 760 peak
Max exhaust flow rate	kg/h	366 (1500rpm) ;	
Energy to exhaust	kW	57	61,3
	KVV	51	01,0
After Treatment System			
After Treatment System		DOC + DPF	+ SCR-T
200		not inst	alled
DPF		yes	S
000		yes	S
SCR		yes	S
Urea Dosing System		yes	S
AdBlue mixer		yes	S
ATS sensors		DeltaP / 2x Temperature Temperature sensor Us/Ds Us/Ds S	s SCRT / 2x Nox Sensor
DPF regeneration strategy		active and	passive
Lubrication System			
Dil sump capacity, max level		8	
Dil sump capacity, min level	!	6,5	5
Dil system capacity including filter	 	9	·
Dil pump type	•	gear p	ump
Dil pump drive arrangement		driven b	
Vin oil pump flow	l/min	N//	
Max oil pump flow (@rated speed)	l/min	70	
Vin oil pressure @ low idle (engine oil temp at 120°C)	kPa (bar)	N/A	
Min oil pressure @ rated speed (engine oil temp at			
120°C) //	kPa (bar)	N/A	4
120°C)	kPa (bar)	N/#	4
Max oil temperature @ full load (in main gallery)	°C	12	
Max oil pressure peak on cold engine	bar	N//	4
Dil cooler type		water c	ooled
Transducer for indicating oil temperature and pressure		signal fro	m ECU
Max engine angularity - longitudinal / transversal (std pil pan)	deg	35	;
Allowed engine gradability during installation on vehicle	deg	± 4	1
Dil servicing intervals	h	600	0
Oil filter type		spin-on c	artridge
Dil filter capacity	l	0,5	5
Max oil content admitted in blow by gas (after filter)	g/h	< 0,	,5
Dil for cold condition mission (T° ambient < -25°C)	-	see dedicated GOLD Bo	ook document on fluids
Cooling system		@1500rpm	@1800rpm
Type (water to water or air to water)		air to v	
Recommended coolant		50% water and 50% coolar	
		50% water and 50% coolar	( I <b>0</b> ,

Min radiator cap pressurekPa100Warnnig setting first threshold°C106



Cooling system		@1500rpm	@1800rpm
Max additional restriction (cooling system)	Pa	N//	4
Air to boil (prime power, open genset configuration). For further information see GB document	°C	N//	4
Air flow (prime power, open genset configuration)	m³/s	N/A	
Air to boil (stand by, open genset configuration). For			
further information see GB document	°C	N//	4
Air flow (stand by, open genset configuration)	m³/s	N/A	
EGR Cooler water flow (for $\Delta T=6^{\circ}C$ )	l/s	N//	4
LP-CAC water flow (for ΔT=6°C)	l/s	N//	4
Fan		N//	
Diameter	mm	550	)
Number of blades		10	
Drive ratio		1,3	
Speed		@1500rpm:1950rpm;	
Air flow		@1500rpm:2,5 m3/s	
Power consumption		@1500rpm:3,36kW;	
Radiator		N//	
Core dimensions LxWxh	mm	625 x 267	
Dry weight	kg	44,	
Radiator coolant capacity		5,5	5
Optimum coolant temperature range @engine out (50% glycol)	°C	N/A	
Engine Water pump Type		centrifuga	
Engine water pump drive		driven by belt	
Coolant capacity (engine only)		5	
Coolant capacity (radiator & hoses)		7	
Thermostat type		wax t	
Thermostat position		on cylinder head	
Thermostat opening / fully open temperature	C	79 ± 2 / 94 ± 2	
Recommended coolant circuit pressurization range (relative)	hPa	N//	4
Coolant engine pressure outlet – inlet (delta pressure, open thermostat, high idle conditions)	hPa	@1500 rpm:125,8 hPa	a ; @1800 rpm:164,8
Coolant water pump inlet pressure (water temperature 60-100°C)	hPa	N/#	A
Coolant flow to radiator @rated speed	l/h	N//	4
Min coolant expansion space (% total cooling system capacity)	%	N//	Ą
Max coolant flow to accessories @ rated speed from cab heater	l/min	N//	
Engine out coolant to ambient @rated speed	delta °C	60,	
Engine out coolant to ambient @torque speed	delta °C	N//	A
Charge air cooler outlet to ambient @max rpm - CAC dT	delta °C	N/#	Ą
Pump water flow	l/min	102	117
Electrical, Electronic and Control Systems			
System voltage	V	12	
Engine control unit	•	MD1C	
ECU software		P1738 MD105	
ECU Vehicle connection		with CA	-
ECU operating range	°C	- 40 ÷ +	
Temperature of ECU case for <5' after power up	<u> </u>	- 40 * 85	

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Electrical, Electronic and Control Systems		
ECU rated continuous temperature	°C	80
ECU communication protocol		SAE J1939
Vin power supply for ECU operation	V	10
Max power supply for ECU operation	V	16
Battery wire connection resistance value @20°C (from battery to ECU)	mΩ	≤ 70
Diagnostic connector type		ISO 14229
Min cranking speed TDC @-30°C	rpm	70
Average cranking speed	rpm	110
N° tooth pinion/crown gear		10 / 126
Vin battery voltage	V	N/A
Mean battery voltage	V	N/A
Vin battery current	Ah	TBC
Vean battery current	Ah	101
Max starting circuit resistance ( to starter)	mΩ	< 70
Cold starting		
Without air preheating	°C	- 15
Emission assous and particulates		
Emission gaseus and particulales NOx (Oxides of nitrogen) [NRSC]	g/kWh	see homologation certificate
HC (Hydrocarbons) [NRSC]	g/kWh	see homologation certificate
	•	-
NOX+HC [NRSC]	g/kWh	see homologation certificate
CO (Carbon monoxide) [NRSC]	g/kWh	see homologation certificate
PM (Particlutes) [NRSC]	g/kWh	see homologation certificate
CO2 (Carbon Dioxide) [NRSC]	g/kWh	see homologation certificate
NOx (Oxides of nitrogen) [NRTC]	g/kWh	see homologation certificate
HC (Hydrocarbons) [NRTC]	g/kWh	see homologation certificate
NOX+HC [NRTC]	g/kWh	see homologation certificate
CO (Carbon monoxide) [NRTC]	g/kWh	see homologation certificate
PM (Particlutes) [NRTC]	g/kWh	see homologation certificate
CO2 (Carbon Dioxide) [NRTC]	g/kWh	see homologation certificate
Maintenance		
Oil drain interval		600h
Dil filter change		600 h
Oil refilling time		daily check to evaluate oil refill necessity
Approved engine oil specifications		N/A
CCV filter change		1800 h
Fuel filter change		600 h
Fuel pre-filter change		600 h
Belt replacement		3000 h
Valve lash check /adjustment		for life
AdBlue filter Change		see dedicated GOLD Book document on fluids
DPF filter service		600 h
Coolant change		3000 h
Engine Noise		
Overall sound pressure (engine only)	dBA	92,5
Overall sound pressure (with accessories only)	dBA	N/A



Engine Noise			
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
A-weight sound power level LW function of power (value calculated respecting standard ISO 3744 and 3746. For further information see GB document)			N/A
0% (no load)	dBA	N/A	
75% (partial load)	dBA	N/A	
100% (full load)	dBA	N/A	
110% (overload)	dBA	N/A	

Step Load (for further information see GB document)		@1500rpm	@1800rpm
G1 (% of PrP)	%	N/A	N/A
G2 (% of PrP)	%	N/A	N/A
G3 (% of PrP)	%	N/A	N/A
Removal load (G1)	%	N/A	N/A
Removal load (G2)	%	N/A	N/A
Removal load (G3)	%	N/A	N/A
Emergency (xxx)	%	N/A	N/A
Emergency (xxx)	%	N/A	N/A
Emergency (xxx)	%	N/A	N/A

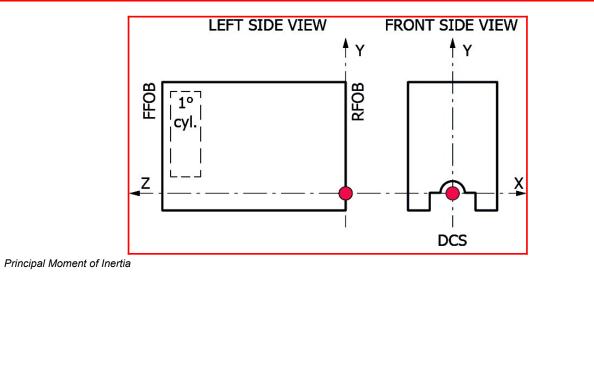
Maximum Rating Performance Data		@1500rpm	@1800rpm
Torque	Nm	541	500
Ambient Temperature	C°	25	25
EGR Rate	%	<10	<10
Fuel Flow	g/s	5	5,5
Fuel consumption (BSFC) (prime power)	(kg/h) [g/kWh]	[205]	[204]
Fuel consumption (BSFC) (stand by)	(kg/h) [g/kWh]	[208]	[207]
Fuel consumption (BSFC) (80% prime power)	(kg/h) [g/kWh]	[205]	[204]
Fuel consumption (BSFC) (50% prime power)	(kg/h) [g/kWh]	[210]	[218]
Fuel consumption (BSFC) (25% prime power)	(kg/h) [g/kWh]	[246]	[257]
AdBlue consumption (prime power)	% of fuel cons	4,2	4
AdBlue consumption (stand by)	% of fuel cons	4,2	4
AdBlue consumption (80% prime power)	% of fuel cons	5	5,4
AdBlue consumption (50% prime power)	% of fuel cons	6,7\	5,6
AdBlue consumption (25% prime power)	% of fuel cons	4,2	3
Exhaust Gas Flow	kg/h	366	432

Design air handling system data		@1500rpm	@1800rpm
EGR flow	kg/h	42,7	60,4
EGR pressure	kPa	257,2	289,1
Boost pressure (compressor outlet)	kPa	250,9	260,2
Pressure drop on charge air cooling system	kPa	7	6,4
Max temperature after HP-Compressor	°C	N/A	
Boost temperature (includes EGR effect)	°C	150	156,3
ATS back pressure	kPa	114,6	118,7
Exhaust Gas Temp between HP-TC	°C	N/A	
Max Exhaust Gas Temp (after TC)	°C	491,7	456,6
Max admitted back pressure after SCR	kPa	N/A	



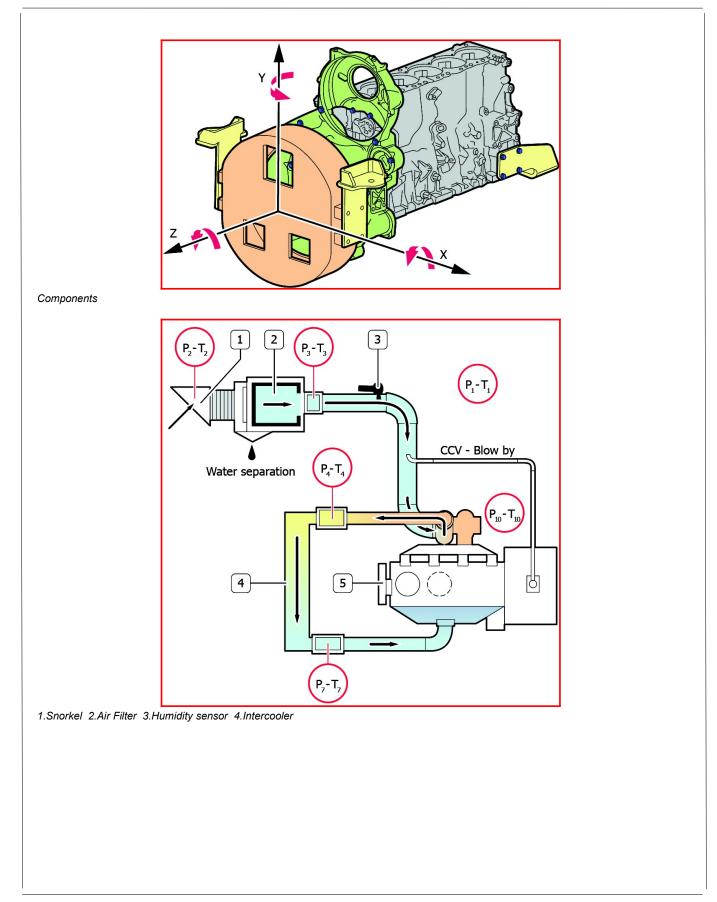
Design air handling system data		@1500rpm	@1800rpm
Max admitted back pressure after TC	kPa	114,6	118,7
Power engine coolant without EGR & CAC (prime power)	kW [kcal/kWh]	N/A	
Power engine coolant without EGR & CAC (stand by)	kW [kcal/kWh]	N/A	
Power high Temperature EGR Cooler (engine water) (prime power)	kW [kcal/kWh]	N/A	
Power high Temperature EGR Cooler (engine water) (stand by)	kW [kcal/kWh]	N/A	
Power to coolant due to EGR LP-Circuit (prime power)	kW [kcal/kWh]	N/A	
Power to coolant due to EGR LP-Circuit ( stand by)	kW [kcal/kWh]	N/A	
Total Power to coolant (prime power)	kW [kcal/kWh]	45	48,4
Total Power to coolant (stand by)	kW [kcal/kWh]	50,2	53,7
Total pump water flow	l/s	1,7	1,95
Radiator Coolant Flow (5% less if continuous deareating system, coolant according to FPT norms)	l/min	N/A	
EGR Cooler water flow (for $\Delta T=6^{\circ}C$ )	l/s	N/A	
LP-CAC water flow (for $\Delta T=6^{\circ}C$ )	l/s	N/A	
Power in CAC (air to air) (prime power)	kW [kcal/kWh]	9,6	11,2
Power in CAC (air to air) (stand by power)	kW [kcal/kWh]	15,1	10,3
Power Radiated	kW	11,7	12,9
Charge Air Flow	g/s	95,6	113,3
[*] Power at flywheel according dir. 97/68 EC (w/o fan), after 50 hours of run-in, tolerance ±5%, fuel EN 590; Test according ISO 3046/1, turbo air inlet temperature 25°C, atmospheric pressure 100 kPa, humidity 30 %		N/A	
[**] according to temperature sensor tolerance	N/A		

### Images



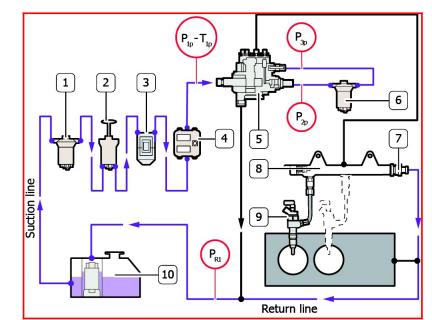




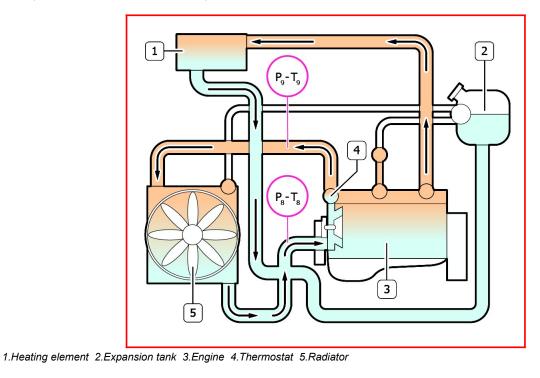


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1.Inspection glass with strainer 2.Prime pump 3.Pre-filter with water separator 4.ECU 5.High Pressure pump 6.Fuel Filter 7.Overpressure valve 8.Common Rail 9.Injectors 10.Fuel tank





#### ACRONYMS LIST

4

Acronyms	Description	Acronyms	Description	
-	Not Needed	iEGR	Internal EGR	
2stTC	Two Stage Turbo (sequential)	IPU	Industrial Power Unit	
Ag	Agricultural	ISC	Interstage Cooling	
ASC	Ammonia Slip Catalyst (same as CUC)	LD	Light Duty	
ATS	After Treatment System	LDCV	Light Duty Commercial Vehicles	
BSFC	Brake Specific Fuel Consumption	LH	Left Hand Side	
CAC	Charge Air Cooler	LWR	Laser Welded Rail	
CCDPF	Close Coupled DPF	MD	Medium Duty	
CCV	Crankcase Ventilation	n/a	Not Available	
CE	Construction Equipment	NA	Natural Aspirated	
CI	Cast Iron	NS	Non Structural	
CRS	Common Rail System	OHV	Over Head Valves	
CRSN	Common Rail System NKW (Commercial vehicles)	OPT	Option	
CUC	Clean Up Catalyst for ammonia (same as ASC)	PCP	Peak Cylinder Pressure	
DAVNT	Dual Axis Variable Nozzle Turbine	ΡΤΟ	Power Take Off	
DCS	Drawing Coordinate System	RFOB	Rear Face of Block	
DI	Direct Injection	RH	Right Hand Side	
DOC	Diesel Oxidation Catalyst	S	Structural	
DOHC	Double Over Head Camshaft	SAPS	Sulphated Ash, Phosphorus, Sulphur	
DPF	Diesel Particulate Filter	SCR	Selective Catalytic Reduction catalyst	
ECEGR	External Cooled EGR	SCRoF	SCRon filter	
ECU	Engine Control Unit	SOHC	Single Over Head Camshaft	
EEGR	External EGR	STD	Standard	
EGR	Exhaust Gas Recirculation	тс	Turbocharged	
epWG	Electro pneumatic WG	ТСА	Turbocharged, Charge Air Cooled	
eVGT	Electrical VGT	тнм	Thermal Management	
eWG	Electrical WG	UFDPF	Under Floor DPF	
FFOB	Front Face of Block	UQS	Urea Quality Sensor	
FGT	Fixed Geometry Turbocharger (no WG)	VE	Bosch Distributor Mechanical Pump	
FIE	Fuel Injection System	VFT	Variable Flow Turbine	
HD	Heavy Duty	VGT	Variable Geometry Turbocharger	
HLA	Hydraulic Lash Adjusters	WG	Waste Gate Turbocharger	
IDI	Indirect Injection	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
Revision 2.0_Mar 2022		March/2022
Revision 2.1_May 2022		June/2022
Revision 2.2_Jul 2022		July/2022
Revision 2.3_Sep 2022		October/2022





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