N45ENTZW69.00 BARE TIER 4

Brochure main description		@1500rpm	@1800rpm
Application & simbol		Power Generation	
Engine identication main		N45	
Engine identication rating	kW	-	126
Engine features		bare engine	
Emission feature		Tier 4	

Main characteristics		@1500rpm	@1800rpm
Emission certification		Tier 4	
Commercial code (for order)		N45ENTZW69.00	
Technical code (Pregnana productions, if needed)		N/A	
Technical code (original plant engine code, on engine block)		F4HFE415A*B003	
Stand-by power (gross) [mech]	kW	-	126
Specific power	kW/l	-	28.1
Electric commercial power (estimation alternator power output)	kWe [kVA]	-	N/A
Oil consumption on mission (average)	% fuel comsumption	0.30	
Cycle		Diesel 4 stroke	
Air charging system pattern		TCA	
Number of cylinder		4	
Configuration (cyliinder arrangement)		in line	
Bore	mm	104	
Stroke	mm	132	
Stroke / Bore		1.27	
Displacement	l	4.485	
Unit Displacement	l	1.121	
Bore pitch	mm	N/A	
Valves per cylinder		4	
Cooling system pattern		liquid	
Direction of rotation (looking flywheel)		anti-clockwise	
Compression ratio		17 : 1	
Firing order		1 - 3 - 4 - 2	
Injection type		direct - electronic common rail	
Engine brake configuration		-	
Be10	h	8000	
Cylinder Head			
Single / Multiple		single	
Material		cast iron	
Head air circulation		crossflow	
Intake valve dia.	mm	33	
Exhaust valve dia.	mm	33	
Camshaft			
Layout		OHV	
Cam carrier		no	
Material and Heat treatment		chilled cast iron	
Valve train		mechanical tappet & push rod	
Drivetrain (timing system)		gear tappet	
Valve actuation		tappet & push rod	

Main characteristics		@1500rpm	@1800rpm
Variable valve actuation system		no	
Cylinder block (crankcase)		no structrural	
Material of cylinder block		cast iron	
Type of liners		block liners	
Liners replaceable; (slip fit or interference fit)		no	
Bearing caps		machined cast iron	
Crankcase Ventilation		closed	
Oil separator		coalescent filter	
Crankshaft & counterweights			
Material		forged Steel	
Acceptable Inertia (clutch)	kgm^2	0.75	
Balancing		no	
Turbocharger & EGR system			
Turbocharger type		fix geometry, wastegate	
Turbocharger supplier		HTT (Honeywell)	
Turbocharger control		WG pneumatic control	
Max turbine inlet temperature	°C	700	
Max boost pressure	mbar	1550 (depending on rating)	
Method of cooling the turbocharger		oil lubricated	
Turbo protection devices		WG + Software strategy open loop	
Exhaust flap			
Exhaust flap supplier		Pierburg	
Actuation type		electronic actuator	
Exhaust flap cooling		yes	
Switchability (1500-1800 rpm)	yes/no		
Emission level 1500 rpm		-	
Emission level 1800 rpm		Tier 4	
Front power take off			
PTO type		-	
Max torque available from front of crankshaft (no side load)	Nm	-	
Power take off on gear train			
SAE A 9 teeth		-	
SAE A 11 teeth		-	
SAE B 13 teeth		-	
SAE B (DIN 5482)		-	
SAE 2B 15 teeth(ANSI B92,1)		-	
References values			
Engine dimension LxWxH (indicative values)	mm	816 x 687 x 1049	
Max permissible engine inclination	deg	35 all directions	
Engine Weight - Dry (no fluids, value purely indicative)	kg	402	
Engine Weight - Wet (with fluids, value purely indicative)	kg	415	
Center of gravity (FFOB or RFOB according to picture, standard engine layout)	mm	x = - 0.6 ; y = 145 ; z = - 200	
Principal moment of inertia (reference on center of gravity ,standard engine layout)	kgm^2	I1 = 32200 ; I2 = 26200 ; I3 = 17400	
Principal moment of inertia (reference matrix based on center of gravity,standard engine layout)	kgm^2	N/A	
Mass moment of inertia - rotating components (excluding flywheel)	kgm^2	0.2	

Main characteristics		@1500rpm	@1800rpm
Mass moment of inertia - standard flywheel	kgm^2	0.7 - 0.9	
Bending moment on the flywheel housing	Nm	Point 1 : within safety factor with mass 85kg @ max Z : 350mm ; Point 2 : within safety factor with mass 36kg @ max Z : 750mm ; Point 3 : within safety factor with mass 23,5kg @ max Z : 1050mm	
Max static mounting surface load	N	within safety factors, see guideline	
Crankshaft thrust bearing pressure limit			
Intermittent load:	MPa	-	
Continuous load:	MPa	15	
Rear main bearing load	MPa	-	
Max bending moment available from front of the crankshaft:			
0 deg	Nm	80	
90 deg	Nm	220	
180 deg	Nm	220	
Environmental operating conditions			
Max altitude for declared performances	m	1000	
Max ambient temperaturefor declared performances	°C	40	
Min guaranteed temperature for cold start w/o any aid (stand alone engine)	°C	- 10	
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 (reccomended)	h	3	
Engine performance			
Continuous power (gross) [mech]	kW		
Prime power (gross) [mech]	kW		
Stand-by power (gross) [mech]	kW		
Generator available power @ Prime power	kW	-	-
Generator available power @ Stand by	kW	-	-
Power limitation according to ambient conditions			
Ambient temperature above xx°C	%/5°C (xx°C)	2	
Altitude > 1000 < 3000m above sea level	%/500m	3	
Altitude > 3000m above sea level	%/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	102	
Max derating (50% derating) switch on of the high coolant temperature lamp (redcolor)	°C	N/A	
Altitude level: gradual reduction of transient response by smoke map correction from	m	2000	
Fuel temperature	°C	78 at 1900 rpm	
Intake manifold air temperature	°C	60	
ATS Max gas inlet temperature	°C	565 at DOC	
Max allowed exhaust temperature	°C	730	
Turbine overheating protection	°C	N/A	
Turbine overspeed protection	rpm	N/A	
Oil temperature protection	°C	125	
Oil pressure protection	bar	N/A	

Fuel System		
Fuel density	kg/l	0.835
Injection system type		common rail
Injection pump manufacturer		Bosch
Injection model type		CRSN2-16
Injection model pump		CP3.3
Injection pressure	bar	1600
Injector		Bosch CRIN2-16
Injector installation (sleeve, sealing flat or conical)		vertical, no sleeve, flat seal
Injector nozzle		8 x 550
Engine fuel compatibility		see dedicated GOLD Book document on fluids
Feed pump		on engine
Max flow	l/h	280
Nominal feed pressure	bar	0.5 - 1
Fuel filter		cartridge
Delta pressure on fuel filter	bar	2
Max continuous allowable fuel temperature (without derating)	°C	70
Max relative pressure at gear pump inlet	bar	0.15
Min relative pressure at gear pump inlet	bar	- 0.5
Max back flow relative pressure	bar	0.2
Max back flow restriction	bar	0.2
Max heat rejection to return fuel	kW	0.6
Max fuel flow	kg/h	323
Min fuel tank venting requirement	m^3/h	0.4
Prefilter / Water separator micron size	µm	30

Air Intake System		@1500rpm	@1800rpm
Aftercooling type (air to air or water to air)		air - air	
Interstage cooling type		-	
RoA (Temperature raise between ambient and inlet to engine	°C	≤ 25	
Filter air intake temperature (warm air ricirculatuion)	°C	≤ 5	
Max intake manifold temperature	°C	50	
Compressor inlet pressure (with new air filter)	bar	≥ - 0.05	
Compressor inlet pressure (with dirty air filter)	bar	≥ - 0.065	
Air filter type		-	
Loads on turbocharger on compressor intake	kg	2	
Loads on turbocharger on compressor outlet	kg	2	
Charge air flow (max)	kg/h	-	650

Exhaust System		
Max back pressure (after exhaust flap) @ rated power with clean system	bar	0.2
Max mechanical load on turbine flange	kg	-
Max ambient temperature for exhaust flap actuator	°C	105
Max exhaust temperature After Treatment System	°C	500
Max exhaust flow rate	kg/h	700
Energy to exhaust	kcal/kWh	N/A

After Treatment System		
After Treatment System		DOC + SCR + CUC
DOC		2.8 l
SCR		15.2 l
Urea Dosing System		Bosch DNOx-2.5
AdBlue mixer		yes
ATS sensors		pressure, temperature , NOx, NH3

Lubrication System		
Oil sump capacity	l	N/A
Max	l	14
Min	l	7
Oil system capacity including filter	l	17
Oil pump type		gear pump
Oil pump drive arrangement		gear pump forged of block
Min oil pump flow	l/min	~ 12
Max oil pump flow (@rated speed)	l/min	~ 50
Min oil pressure @ low idle (engine oil temp at 120°C)	kPa (bar)	60
Min oil pressure @ rated speed (engine oil temp at 120°C)	kPa (bar)	200
Max oil pressure @ rated speed (engine oil temp at 120°C)	kPa (bar)	350
Max oil temperature @ full load (in main gallery)	°C	< 120
Max oil pressure peak on cold engine	bar	15
Oil cooler type		water cooled
Transducer for indicating oil temperature and pressure		signal from ECU
Max engine angularity - longitudinal / transversal (std oil pan)	0/360°	< 35
ALLowed engine gradability during installation on vehicle	deg	± 4
Oil servicing intervals	h	see dedicated GOLD Book document on fluids
Oil filter type		cartrige
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

Cooling system		@1500rpm	@1800rpm
Type (water to water or air to water)		liquid	
Recommended coolant		see dedicated GOLD Book document on fluids	
Min radiator cap pressure	bar	0.7	
Warnnig setting first threshold	°C	-	
Max additional restriction	Pa	-	
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	-	
Optimum coolant temperature range @engine out (50% glycol)	°C	83 ÷ 99	
Engine Water pump Type		centrifuge	
Engine water pump drive		belt	
Coolant capacity (engine only)	l	7	

Cooling system		@1500rpm	@1800rpm
Thermostat type		wax	
Thermostat position		on cylinder head	
Thermostat opening / fully open temperature	°C	80° ÷ 90°	
Recommended coolant circuit pressurization range (relative)	bar	0.7 - 1.30	
Coolant engine pressure outlet – inlet (delta pressure, open thermostat, high idle conditions)	bar	< 0.2	
Coolant engine pressure outlet – inlet (only with remote thermostat, ex. retarder)	bar	-	
Min coolant pressure (no pressure cap and thermostat closed)	bar	1	
Coolant water pump inlet pressure (water temperature 60-100°C)	bar	0.5	
Coolant flow to radiator @rated speed	l/min	190	
Min coolant expansion space (% total cooling system capacity)	%	10	
Max coolant flow to accessories @ rated speed from cab heater	l/min	-	
Engine out coolant to ambient @rated speed	delta °C	-	
Engine out coolant to ambient @torque speed	delta °C	-	
Charge air cooler outlet to ambient @max rpm - CAC dT	delta °C	25	
Coolant engine flow	l/min	-	N/A

Electrical, Electronic and Control Systems		
System voltage	V	12 - 24
Engine control unit		Bosch EDC17 CV41
ECU software		P662
ECU Vehicle connection		Via body computer with CAN line
ECU operating range	°C	- 30 / + 95
Temperature of ECU case for <5' after power up	°C	+ 85
ECU rated continuous temperature	°C	+ 80
ECU communication protocol		SAE J1939
Min power supply for ECU operation	V	9
Max power supply for ECU operation	V	32
Battery wire connection resistance value @20°C (from battery to ECU)	mΩ	≤ 80
Diagnostic system		On board (engine)
Min cranking speed TDC @-30°C	rpm	75
Average cranking speed	rpm	115
N° tooth pinion/crown gear		10 / 125
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	130 (24V)
Mean battery current	Ah	500 (24V)
Max starting circuit resistance (to starter)	mΩ	< 70

Cold starting		
Without air preheating	°C	- 10
With air preheating	°C	- 25

Emission gaseus and particulales		
NOX (Oxides of nitrogen)	g/kWh	-

Emission gaseus and particulales		
HC (Hydrocarbons)	g/kWh	-
NOX+HC	g/kWh	-
CO (Carbon monoxide)	g/kWh	-
PT (Particlutes)	g/kWh	-
CO2 (Carbon Dioxide)	g/kWh	-

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

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

Step Load		@1500rpm	@1800rpm
G1 (% of PrP)	%	-	100
G2 (% of PrP)	%	-	88
G3 (% of PrP)	%	-	77
G1 (% of PrP) [open flap]	%	-	-
G2 (% of PrP)[open flap]	%	-	-
G3 (% of PrP)[open flap]	%	-	-
G1 (% of PrP) [closed flap]	%	-	-
G2 (% of PrP) [closed flap]	%	-	-
G3 (% of PrP) [closed flap]	%	-	-
Removal load (G1)	%	-	100
Removal load (G2)	%	-	100
Removal load (G3)	%	-	100
Emergency (xxx)	%	-	-
Emergency (xxx)	%	-	-
Emergency (xxx)	%	-	-

Maximum Rating Performance Data		@1500rpm	@1800rpm
Torque	Nm	-	641
Ambient Temperature	°C	-	25
Fuel Flow	g/s	-	7.3
Fuel consumption (BSFC) (prime power)	(kg/h) [g/kWh]	-	(23) [200]
Fuel consumption (BSFC) (stand by)	(kg/h) [g/kWh]	-	(25.7) [204]
Fuel consumption (BSFC) (80% prime power)	(kg/h) [g/kWh]	-	(19.1) [208]

Maximum Rating Performance Data		@1500rpm	@1800rpm
Fuel consumption (BSFC) (50% prime power)	(kg/h) [g/kWh]	-	(12.5) [217]
Fuel consumption (BSFC) (25% prime power)	(kg/h) [g/kWh]	-	(8.1) [283]
Exhaust Gas Flow	kg/h	-	N/A

Design air handling system data		@1500rpm	@1800rpm
Boost pressure (compressor outlet)	kPa	-	165
Pressure drop on charge air cooling system	kPa	-	10
Max temperature after HP-Compressor	°C	-	-
Boost temperature (includes EGR effect)	°C	-	-
Back pressure before DOC	kPa	-	160
Exhaust Gas Temp between HP-TC	°C	-	-
Max Exhaust Gas Temp (after TC)	°C	-	530
Max admitted back pressure after SCR	kPa	-	-
Max admitted back pressure after TC	kPa	-	250
Total water cooling power of engine (prime power)	kW [kcal/kWh]	-	64
Total water cooling power of engine (stand by)	kW [kcal/kWh]	-	64
Total pump water flow	l/s	-	3
Total CAC power (air to air) (prime power)	kW [kcal/kWh]	-	22
Total CAC power (air to air) (stand by power)	kW [kcal/kWh]	-	22

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
IPU	Industrial Power Unit
ISC	Interstage Cooling
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
Revision 2.0_Jun 2019		June/2019