Description:

Engine type	**SB 160 G5V TW 86 (dr.no. 1-080-733)**	
Fuel	Biogas	
Engine design	stationary	
Engine working cycle	four-stroke, spark ignited	
Design	in-line, vertical	
Number of cylinder	5	
Valve train	OHV	
Number of valves per cylinder	4	
Turbocharging	yes	
Intercooler	yes	
Mixture	lean	
Cooling	liquid	
Operation (looking at flywheel)	anticlockwise	
Displacement	9,3	[dm^3]
Bore	130	[mm]
Stroke	140	[mm]
Compression ratio	14:1	[-]
Firing order	1-2-4-5-3	[-]

Rated parameters at reference conditions:

Rated speed	1500	[rpm]
Mechanical power output (continuous)	157,5	[kW]
Mechanical power corrected according to ISO 3046-1	X	[kW]
Peak torque	1003	[Nm]

Engine heat output:

Load	100	80	60	[%]
Coolant heat output	71,8	67,4	61,4	[kW]
Exhaust gas heat output (cooled to 150 °C)	82,4	68,7	53,7	[kW]
Intercooler heat output	28,9(1)	18,2	9,8	[kW]
Radiation heat	10,6	10,2	9,7	[kW]

(1)…expected power distribution of the intercooler: HT 19,8 kW, LT 9,1 kW

Parameters under load:

Load	100	80	60	[%]
Fuel input power	381,0	314,6	247,6	[kW]
Fuel consumption	74,5	61,6	48,4	[$m^3.h^{-1}$]
Overall engine efficiency	41,3	40,0	37,8	[%]
Overall engine efficiency - corrected (1)	43,4	42,0	39,7	[%]

(1)…Tolerance according to ISO 3046-1 applicable

Tolerances of values in the specification are specified in regulation 61-0-0284

Engine parameters and settings:

Load	100	80	60	[%]
Coefficient of excess air λ	1,493	1,447	1,401	[-]
Exhaust gas temperature at the outlet from the cylinder heads	603	X	X	[°C]
Teplota spalin za turbodmychadlem	495	508	515	[°C]
Spotřeba vzduchu	700	561	428	[kg.h^{-1}]
Množství spalin	797	641	491	[kg.h^{-1}]
Teplota směsi za na výstupu z turbodmychadla	155,7	131,3	104,7	[°C]
Maximum temperature of the mixture after the intercooler for nominal parameters	45			[°C]

Engine ignition advance:

Load	100%	80%	60%	[%]
Cylinder No. 1$^{(3)}$	25	23,5	22,5	[°BTDC]
Cylinder No. 2$^{(3)}$	24	22,5	21,5	[°BTDC]
Cylinder No. 3$^{(3)}$	24	22,5	21,5	[°BTDC]
Cylinder No. 4$^{(3)}$	24	22,5	21,5	[°BTDC]
Cylinder No. 5$^{(3)}$	24	22,5	21,5	[°BTDC]

(3)... Cylinders marked from engine pulley

Technical and build-up parameters:

REGIME OF THE ENGINE REVOLUTION		
Overrun speed max. - gas cut-off	2100	[rpm]
Overrun speed max. - ignition deactivation	2100	[rpm]
ENGINE LUBRICATION		
Lubricating oil - total	31 - 36	[dm^3]
Lubricating oil - between max. and min.	5	[dm^3]
Oil consumption	< 0,2	[$g.kW^{-1}.h^{-1}$]
Operating lubrication pressure – rated speed	3-6	[bar]
Min. operating oil pressure - rated speed	0,7	[bar]
ENGINE COOLING		
Volume of coolant in engine and intercooler	15+10	[dm^3]
Coolant temperature at the outlet from the engine	89	[°C]
Max. coolant temperature short time (1 hour)	90	[°C]
Min. coolant temperature for 100 % load	70	[°C]
Maximum load for the coolant temperature below 70 °C	25	[%]
Minimum coolant temperature for start	10	[°C]
Recommended radiator (jacket water cooler) capacity	150	[kW]
Required engine coolant flow	300-365	[$dm^3.min^{-1}$]
Maximum cooling circuit pressure	250	[kPaa]
OPERATING LIMITATIONS		
Min. intake air temperature for start	10	[°C]
Intake air (mixture) temperature input before turbocharger for the nominal parameters	25	[°C]
Maximum temperature of the engine compartment during operation	50	[°C]
Allowed crankcase pressure range	-1/+0	[kPa]
Maximum exhaust back pressure for rated parameters (at the output of the engine)	0,6	[kPa]
Maximum permissible exhaust back pressure (at the output of the engine)	4	[kPa]
Maximum suction vacuum for nominal parameters (at the entrance to the mixer)	1,5	[kPa]
Maximum permissible suction vacuum (at the entrance to the mixer)	3	[kPa]
Recommended exhaust gas temperature upstream turbo for warning signal	623	[°C]
Recommended exhaust gas temperature upstream turbo for stop signal	643	[°C]
OPERATING CLEARANCE		
Cold valve clearance - exhaust valve	0,7	[mm]
Cold valve clearance - intake valve	0,45	[mm]

Emissions:

Nitrogen oxides - NO_x	< 500	[$mg.m_n^{-3}$]
Carbon monoxide - CO	< 500	[$mg.m_n^{-3}$]
Total hydrocarbons - HC	< 1300	[$mg.m_n^{-3}$]
Methan - CH4	< 1100	[$mg.m_n^{-3}$]
Formaldehyde - HCHO	<50	[$mg.m_n^{-3}$]

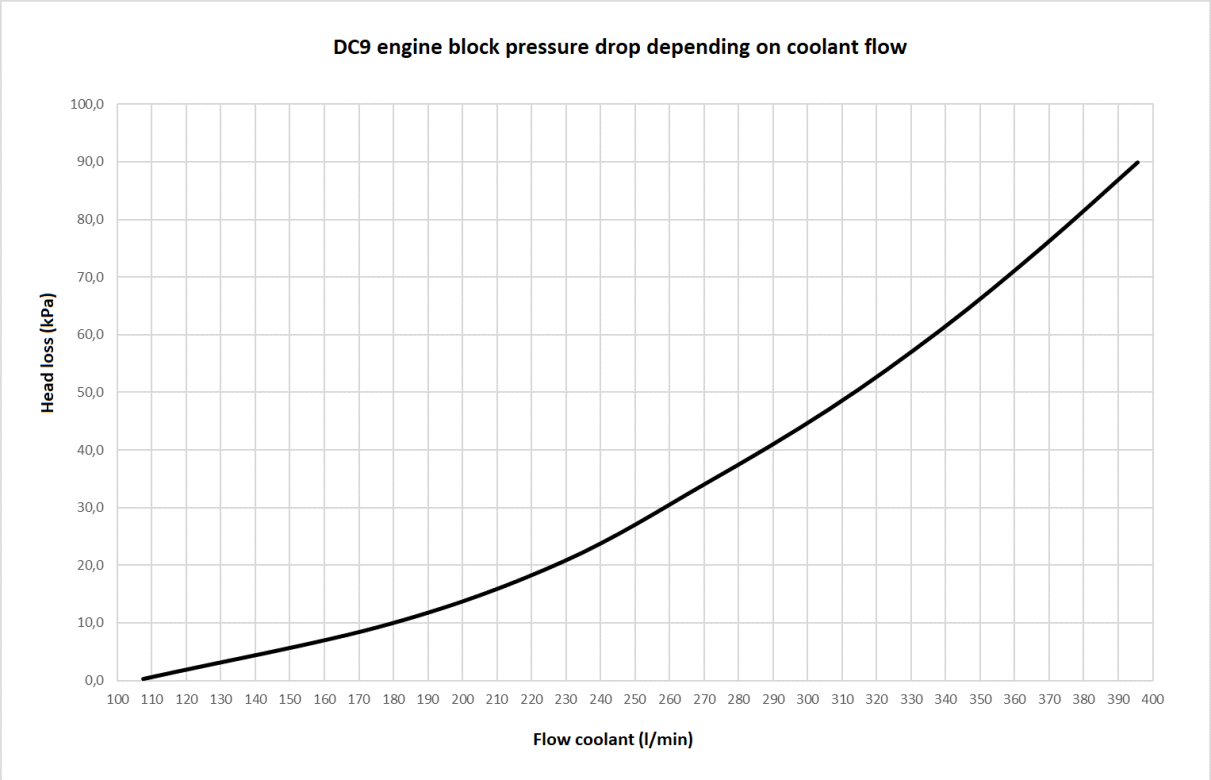
Engine noise [(4)]:

Sound power pressure of the engine	105	[dB(A)]
Sound power pressure of the exhaust line noise	115	[dB(A)]

Note:

[(4)]*... values taken from the diesel engine*

Head loss engine block:



Reference ambient conditions for engine performance data:

Barometric pressure	100	[kPa]
Ambient temperature	25	[°C]
Relative air humidity	30	[%]

Fuel reference conditions:

Fuel pressure - reference	101,325	[kPa]
Fuel temperature - reference	0	[°C]
Fuel relative humidity	0	[%]
LHV	18,4	[$MJ.m^{-3}$]
CH_4 concentration (biogas engines)	52	[%]
CO_2 concentration (biogas engines)	48	[%]

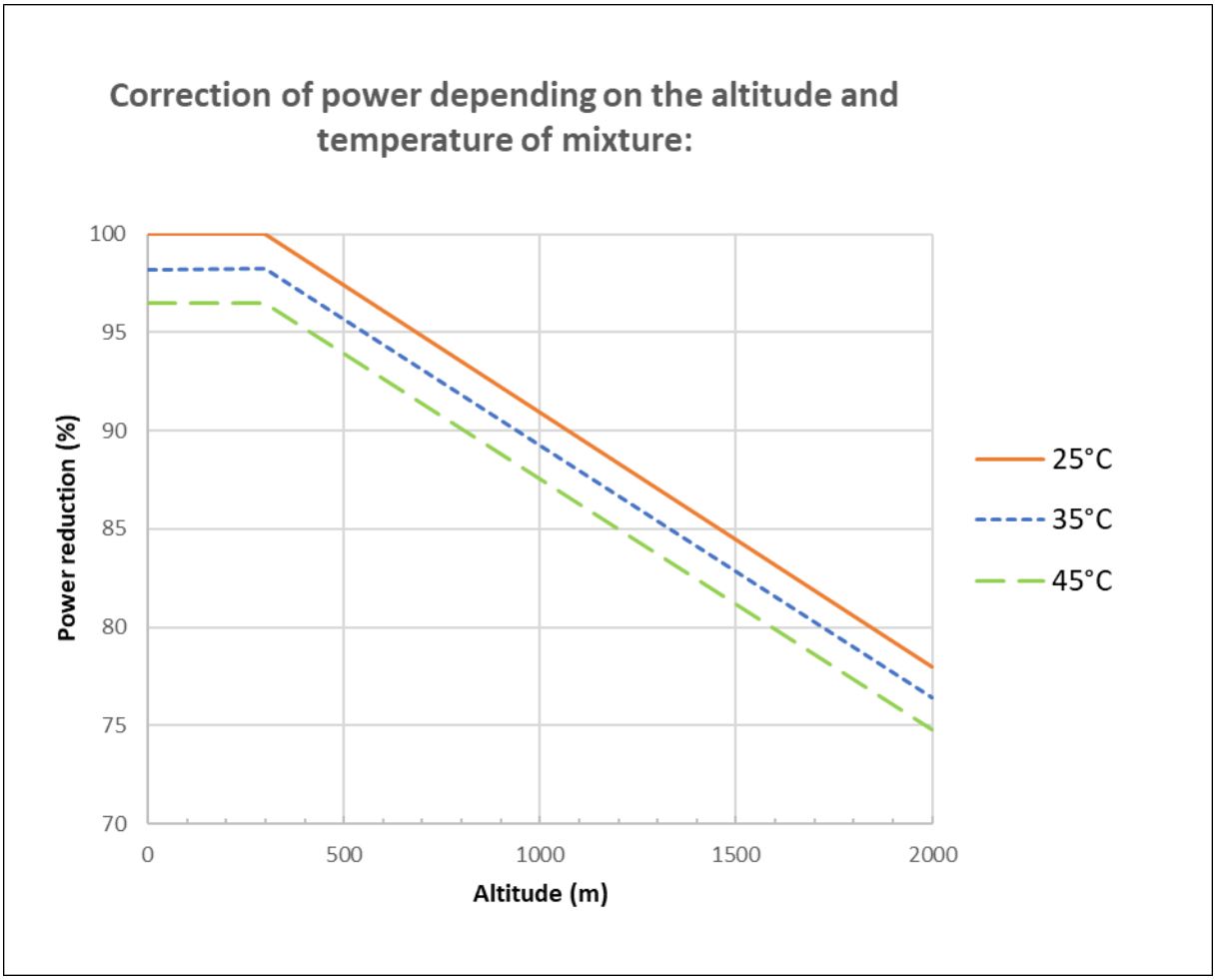
Allowed fuel parameters:

Minimum Methane Number for standard engine adjustment [5]	>129	[-]
Minimum Methane Number for standard engine adjustment [6]	> 123	[-]
RH at 10°C (condensation no permissible)	10/30	[%]

[5]... The minimum methane number for fuels with a methane content between 48 and 55 % vol. (without detonation detection)

[6]... The minimum methane number for fuels with a methane content between 55 and 65 % vol. (necessary detonation detection!)

Engine power correction depending on intake air temperature and altitude:



Time limits for low load operation:

The minimum power for continuous operation is 60 % of the rated value.

Engine power [%]	Runtime [min]
60 ÷ 100	Continuous [8,9]
30 ÷ 60	max. 500 h / year; max. 5 h continuous [7,8,9]
0 ÷ 30	5 min [8,9]

Note:

[7]*... After each part load operation <60 % the engine have to be run at least 1 hour at full load (100 %).*

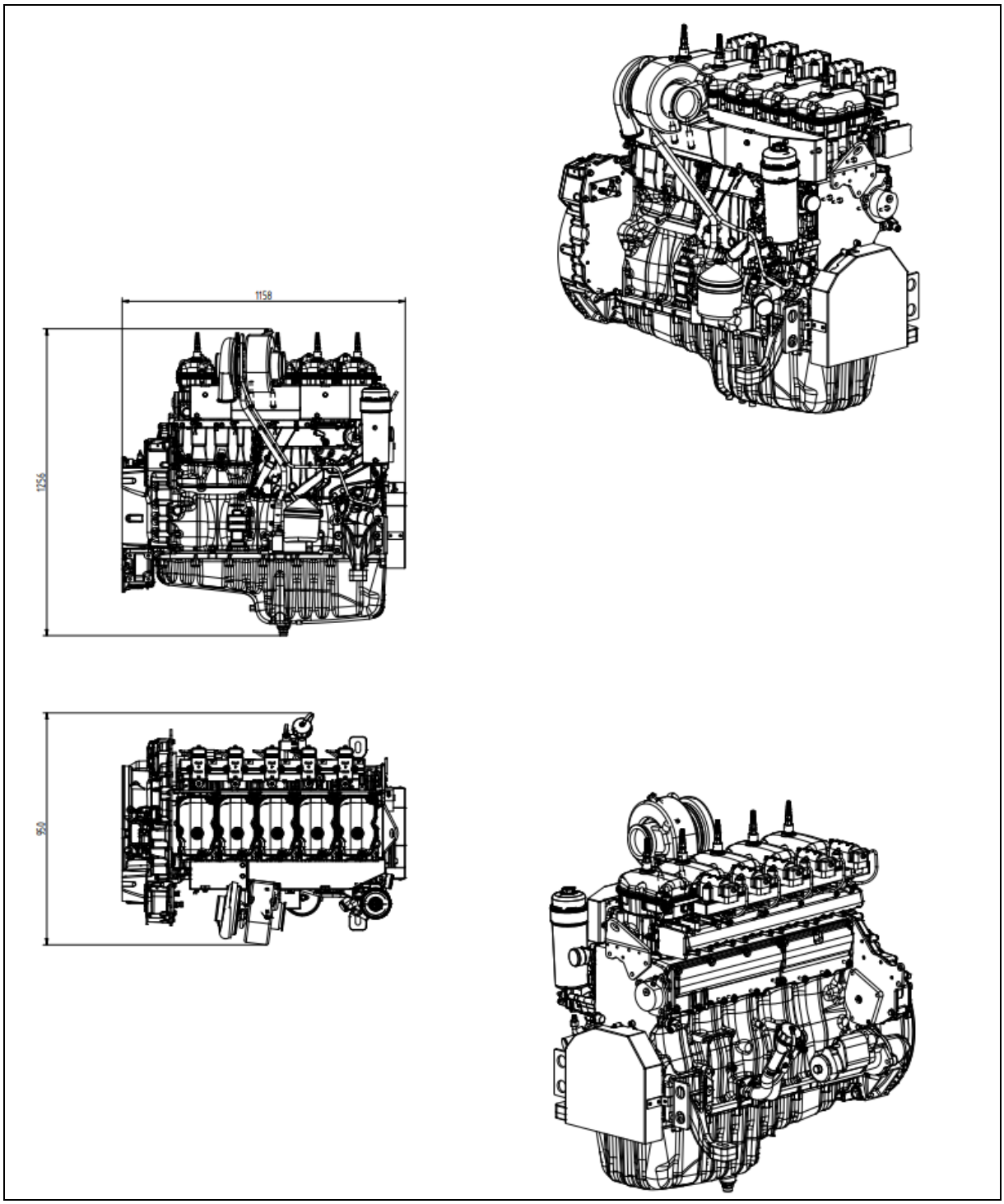
[8]*... the oil change interval must be determined by sampling according to regulation SCHNELL: 5424_220627_Technische__Anweisung_Schmierstoffe_019_de*

[9]*... use the prescribed oils Schnell (Longlife GE, Protect oil SAE40, Tectrol methaflexx ZS PLUS)*

Other operating restrictions:

Maximum number of starts per day	4	[-/dax]
Minimum run time after start	1	[hours]
In terms of wear, one start is equal to	0,5	[mth]

Engine dimensions:



Total engine weight:

Total engine weight	950	[kg]

Fitting dimensions of the engine:

Flywheel housing	SAE 1
Engine block/ flywheel housing	SAE 14

Recommended accessories to achieve the nominal parameters:

Ignition Motortech MIC-5 SE	1-064-369
Ignition coils Motortech 06.50.104	1-030-214
Spark plugs Schnell M14x1	1-064-239
Prechambers Schnell V41 (ocelové)	1-068-774
Electronic throttle Woodward F-series 68mm	1-066-165
Mixer Honeywell HON 983 200/100 + Zeppelin	1-060-063 + 1-025-454
Electronic fuel flap Woodward 8404-2022	1-067-964
Turbocharger Holset HE500FG Wastegate	1-067-770

Publication specification:

Date of specification:	Specification version:	Elaborated by:	Note:
14.07.2022	-	Hampl	Data Schnell 220223_DC9_SMP_V40_5Zyl_Interpolationsrechner.xlsx Interpolation to the required power of 150kWele