Technical Description

Cogeneration Unit

JMS 320 GS-B.L

2 G Kanada 320

Electrical output	**1058 kW el.**
Thermal output	**1213 kW**

Emission values

NOx < 500 mg/Nm³ (5% O2)

0.01 Technical Data (at module)

Data at:				Full load	Part Load	
Fuel gas LHV		kWh/Nm³		4,5		
				100%	75%	50%
Energy input		kW	[2]	2.716	2.110	1.503
Gas volume		Nm³/h	*)	604	469	334
Mechanical output		kW	[1]	1.095	821	548
Electrical output		kW el.	[4]	1.058	791	523
Recoverable thermal output						
~ Intercooler 1st stage		kW		154	80	17
~ Lube oil		kW		119	108	87
~ Jacket water		kW		329	281	233
~ Exhaust gas cooled to 180 °C		kW		611	510	387
Total recoverable thermal output		kW	[5]	1.213	979	724
Total output generated		kW total		2.271	1.770	1.247
Heat to be dissipated						
~ Intercooler 2nd stage		kW		56	24	11
~ Lube oil		kW		~	~	~
~ Surface heat	ca.	kW	[7]	90	90	88
~ Balance heat		kW		27	21	15
Spec. fuel consumption of engine		kWh/kWh	[2]	2,48	2,57	2,74
Lube oil consumption	ca.	kg/h	[3]	0,33	~	~
Electrical efficiency		%		38,9%	37,5%	34,8%
Thermal efficiency		%		44,7%	46,4%	48,2%
Total efficiency		%	[6]	83,6%	83,9%	83,0%
Hot water circuit:						
Forward temperature		°C		95,0	89,5	85,7
Return temperature		°C		75,0	75,0	75,0
Hot water flow rate		m³/h		58,0	58,0	58,0

*) approximate value for pipework dimensioning
[_] Explanations: see 0.10 - Technical parameters

All heat data is based on standard conditions according to attachment 0.10. Deviations from the standard conditions can result in a change of values within the heat balance, and must be taken into consideration in the layout of the cooling circuit/equipment (intercooler; emergency cooling; ...). In the specifications in addition to the general tolerance of +/- 8% on the thermal output a further reserve of 10% is recommended for the dimensioning of the cooling requirements.

Main dimensions and weights (at module)

Length	mm	~ 5.700
Width	mm	~ 1.900
Height	mm	~ 2.300
Weight empty	kg	~ 10.800
Weight filled	kg	~ 11.300

Connections

Hot water inlet and outlet	DN/PN	80/10
Exhaust gas outlet	DN/PN	250/10
Fuel gas (at gas train)	DN/PN	100/16
Fuel Gas (at module)	DN/PN	100/10
Water drain ISO 228	G	½''
Condensate drain	DN/PN	50/10
Safety valve - jacket water ISO 228	DN/PN	2x1½''/2,5
Safety valve - hot water	DN/PN	65/16
Lube oil replenishing (pipe)	mm	28
Lube oil drain (pipe)	mm	28
Jacket water - filling (flex pipe)	mm	13
Intercooler water-Inlet/Outlet 1st stage	DN/PN	80/10
Intercooler water-Inlet/Outlet 2nd stage	DN/PN	65/10

Output / fuel consumption

ISO standard fuel stop power ICFN	kW	1.095
Mean effe. press. at stand. power and nom. speed	bar	15,00
Fuel gas type		Biogas
Based on methane number|Min. methane number	MZ d)	135|100
Compression ratio	Epsilon	12,50
Min./Max. fuel gas pressure at inlet to gas train	mbar	80 - 200 c)
Allowed Fluctuation of fuel gas pressure	%	± 10
Max. rate of gas pressure fluctuation	mbar/sec	10
Maximum Intercooler 2nd stage inlet water temperature	°C	60
Spec. fuel consumption of engine	kWh/kWh	2,48
Specific lube oil consumption	g/kWh	0,30
Max. Oil temperature	°C	88
Jacket-water temperature max.	°C	95
Filling capacity lube oil (refill)	lit	~ 342

c) Lower gas pressures upon inquiry
d) based on methane number calculation software AVL 3.1

0.02 Technical data of engine

Manufacturer		GE Jenbacher
Engine type		J 320 GS-C81
Working principle		4-Stroke
Configuration		V 70°
No. of cylinders		20
Bore	mm	135
Stroke	mm	170
Piston displacement	lit	48,67
Nominal speed	rpm	1.800
Mean piston speed	m/s	10,20
Length	mm	3.320
Width	mm	1.358
Height	mm	2.065
Weight dry	kg	5.000
Weight filled	kg	5.500
Moment of inertia	kgm²	8,61
Direction of rotation (from flywheel view)		left
Flywheel connection		SAE 18"
Radio interference level to VDE 0875		N
Starter motor output	kW	7
Starter motor voltage	V	24

Thermal energy balance

Energy input	kW	2.716
Intercooler	kW	210
Lube oil	kW	119
Jacket water	kW	329
Exhaust gas total	kW	882
Exhaust gas cooled to 180 °C	kW	611
Exhaust gas cooled to 100 °C	kW	752
Surface heat	kW	53
Balance heat	kW	27

Exhaust gas data

Exhaust gas temperature at full load	°C [8]	509
Exhaust gas mass flow rate, wet	kg/h	5.867
Exhaust gas mass flow rate, dry	kg/h	5.428
Exhaust gas volume, wet	Nm³/h	4.562
Exhaust gas volume, dry	Nm³/h	4.036
Max.admissible exhaust back pressure after engine	mbar	60

Combustion air data

Combustion air mass flow rate	kg/h	5.382
Combustion air volume	Nm³/h	4.163
Max. admissible pressure drop in front of intake-air filter	mbar	10

Sound pressure level

Aggregate b)		dB(A) re 20µPa	96
31,5	Hz	dB	78
63	Hz	dB	90
125	Hz	dB	92
250	Hz	dB	89
500	Hz	dB	92
1000	Hz	dB	90
2000	Hz	dB	89
4000	Hz	dB	87
8000	Hz	dB	90
Exhaust gas a)		dB(A) re 20µPa	122
31,5	Hz	dB	97
63	Hz	dB	108
125	Hz	dB	118
250	Hz	dB	110
500	Hz	dB	113
1000	Hz	dB	114
2000	Hz	dB	117
4000	Hz	dB	115
8000	Hz	dB	114

Sound power level

Aggregate	dB(A) re 1pW	117
Measurement surface	m²	109
Exhaust gas	dB(A) re 1pW	130
Measurement surface	m²	6,28

a) average sound pressure level on measurement surface in a distance of 1m according to DIN 45635, precision class 2.
b) average sound pressure level on measurement surface in a distance of 1m (converted to free field) according to DIN 45635, precision class 3.
The spectra are valid for aggregates up to bmpe=18 bar. (add savety margin of 1dB to all values per increase of 1 bar pressure).
Operation with 1200 rpm see upper values, operation with 1800 rpm add 3 dB to upper values.
Engine tolerance ± 3 dB

0.03 Technical data of generator

Manufacturer		STAMFORD e)
Type		PE 734 B2 e)
Type rating	kVA	1.575
Driving power	kW	1.095
Ratings at p.f. = 1,0	kW	1.058
Ratings at p.f. = 0,8	kW	1.047
Rated output at p.f. = 0,8	kVA	1.309
Rated current at p.f. = 0,8	A	1.259
Frequency	Hz	60
Voltage	V	600
Speed	rpm	1.800
Permissible overspeed	rpm	2.160
Power factor lagging		0,8 - 1,0
Efficiency at p.f. = 1,0	%	96,6%
Efficiency at p.f. = 0,8	%	95,6%
Moment of inertia	kgm²	31,75
Mass	kg	2.710
Radio interference level to VDE 0875		N
Construction		B3/B14
Protection Class		IP 23
Insulation class		H
Temperature (rise at driving power)		F
Maximum ambient temperature	°C	40
Total harmonic distortion	%	1,5

Reactance and time constants

xd direct axis synchronous reactance	p.u.	2,38
xd' direct axis transient reactance	p.u.	0,15
xd'' direct axis sub transient reactance	p.u.	0,11
Td'' sub transient reactance time constant	ms	10
Ta Time constant direct-current	ms	20
Tdo' open circuit field time constant	s	2,14

e) GE Jenbacher reserves the right to change the generator supplier and the generator type. The contractual data of the generator may thereby change slightly. The contractual produced electrical power will not change.

0.04 Technical data of heat recovery

General data - Hot water circuit

Total recoverable thermal output	kW	1.213
Return temperature	°C	75,0
Forward temperature	°C	95,0
Hot water flow rate	m³/h	58,0
Nominal pressure of hot water	bar	10
Pressure drop hot water circuit	bar	1,00
Maximum Variation in return temperature	°C	+0/-20
Max. rate of return temperature fluctuation	°C/min	10

Mixture Intercooler (1st stage)

Type		gilled pipes
Nominal pressure of hot water	bar	10
Pressure drop hot water circuit	bar	0,40
Hot water connection	DN/PN	80/10

Mixture Intercooler (2nd stage) (Intercooler separate)

Type		gilled pipes
Nominal pressure of hot water	bar	10
Pressure drop hot water circuit	bar	0,20
Hot water connection	DN/PN	65/10

Heat exchanger lube oil

Type		shell-and-tube
Nominal pressure of hot water	bar	10
Pressure drop hot water circuit	bar	0,20
Hot water connection	DN/PN	80/10

Heat exchanger engine jacket water

Type		plate heat exchanger
Nominal pressure of hot water	bar	10
Pressure drop hot water circuit	bar	0,20
Hot water connection	DN/PN	80/10

Exhaust gas heat exchanger

Type		shell-and-tube
PRIMARY:		
Exhaust gas pressure drop approx	bar	0,02
Exhaust gas connection	DN/PN	250/10
SECONDARY:		
Nominal pressure of hot water	bar	6
Pressure drop hot water circuit	bar	0,20
Hot water connection	DN/PN	100/10

connection variant C

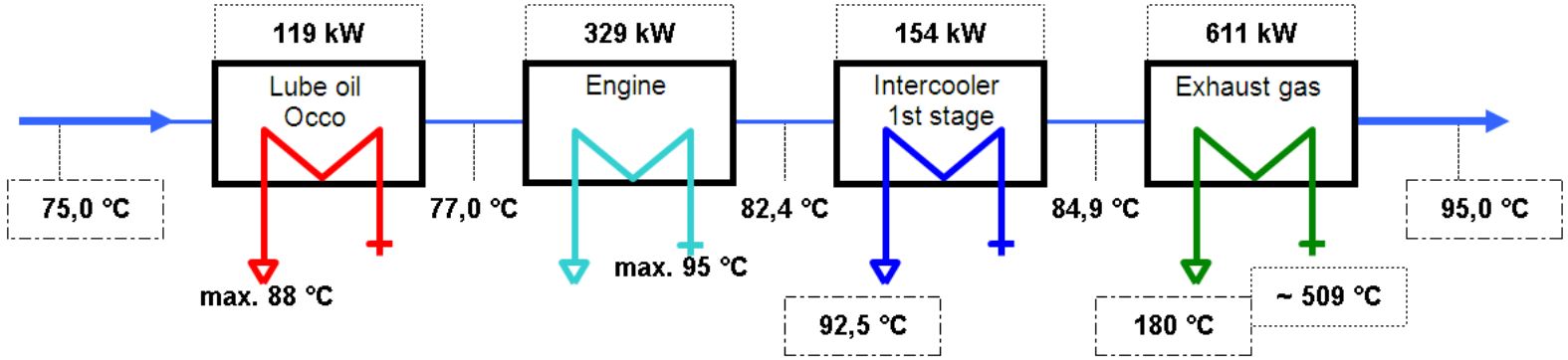
Hot water circuit (calculated with Glykol 35%)

2 G Kanada 320 **J 320 GS-C81**

Recoverable thermal output = 1.213 kW

(±8% tolerance +10% reserve for cooling requirements)

Hot water flow rate = 58,0 m³/h

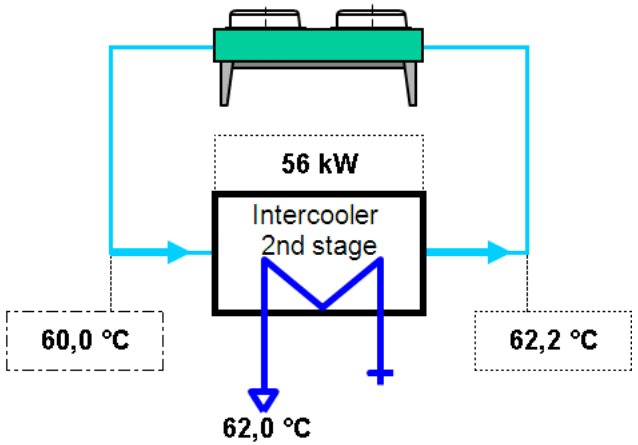


Low temperature circuit (calculated with Glykol 37%)

Heat to be dissipated = 56 kW

(±8% tolerance +10% reserve for cooling requirements)

Cooling water flow rate = 25,0 m³/h



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