



400 V / 50 Hz

Biogas

Electrical power	kW	999
Total thermal output	kW	1013
Energy input	kW	2384
Fuel consumption	Nm <sup>3</sup> /h	397,3
Electrical efficiency	%	41,9
Thermal efficiency with LT	%	45,3
Thermal efficiency without LT	%	42,5
<b>Overall efficiency with LT</b>	<b>%</b>	<b>87,2</b>

**Engine: MTU Type: 12V4000L32FB**

**Alternator: Stamford**

**Type:**

No. of cylinders / configuration	-	12V	Voltage / frequency	V/Hz	400/50
Engine speed	min <sup>-1</sup>	1500	PF	-	0,8L / 0,95C
Bore / stroke / displacement	mm / mm / dm <sup>3</sup>	170/210/57,2	Alternator efficiency at rated power	%	97,3
Compression ratio	-	12,8	Max. ambient temperature	°C	40
Engine power max.	kW	1200			
Spark plugs type	-	M18			
Lube oil consumption max.	dm <sup>3</sup> /h	0,27			
Lube oil filling quantity max.	dm <sup>3</sup>	220			

**Energy balance**

CHP unit performance parameters at rated load

Load	%	<b>100</b>	<b>75</b>	<b>50</b>	<b>85</b>
ISO standard engine power	kW	1200	902	605	<b>1027</b>
Electrical power	kW	1169	877	585	<b>999</b>
Engine cooling thermal output	kW	619	480	358	<b>538</b>
Exhaust gas thermal output (180 °C)	kW	536	430	327	<b>474</b>
Thermal output mixture cooling - LT	kW	90	52	28	<b>68</b>
Total thermal output	kW	1155	910	685	<b>1013</b>
Radiation heat max.	kW	68	0	10	<b>28</b>
Energy input 1)	kW	2755	2117	1515	<b>2384</b>
Fuel consumption	Nm <sup>3</sup> /h	459,2	352,8	252,5	<b>397,3</b>
Combustion air mass flow	kg/h	5701	4316	2987	<b>4895</b>
Exhaust gas mass flow, wet	kg/h	6259	4747	3296	<b>5379</b>
Exhaust temperature after turbocharger	°C	445	463	493	<b>455</b>
Alternator efficiency at PF=1	%	97,4	97,3	96,7	<b>97,3</b>
Electrical efficiency 1)	%	42,4	41,4	38,6	<b>41,9</b>
Thermal efficiency	%	41,9	43,0	45,2	<b>42,5</b>
<b>Overall efficiency without LT</b>	<b>%</b>	<b>84,3</b>	<b>84,4</b>	<b>83,8</b>	<b>84,4</b>

1) According to ISO 3046.

**Fuel: Biogas**

Min. methane number	-	115
Lower calorific value	MJ/Nm <sup>3</sup>	21,6
Biogas composition CH <sub>4</sub> /CO <sub>2</sub>	% vol./% vol.	60/40
Gas pressure at gas regulation line inlet 1)	kPa	17÷25
Max. gas temperature	°C	30

1) The gas regulation line for MAN engines is standardly dimensioned at 4 ÷ 5 kPa.

**Heating water circuit**

Thermal output	kW	1013
Temperature gradient	°C / °C	90 / 70
Min. cooling medium volume flow	m <sup>3</sup> /h	44,72
Max. allowable pressure loss 1)	kPa	50
Heat transfer medium	-	Treated water
Max. operating pressure	bar	6

1) Heating water circuit out of scope of supply of GENTEC CHP.

**LT mixture cooling circuit**

Thermal output	kW	68
Temperature gradient	°C / °C	55,5 / 53
Cooling medium volume flow	m <sup>3</sup> /h	33,20
Max. allowable pressure loss 1)	kPa	-
Heat transfer medium concentration - glycol / water	% vol./% vol.	40/60
Max. operating pressure	bar	6
Dry cooler acoustic sound pressure level at 10 m 2)	dB(A)	65
Max. ambient temperature	°C	35

1) Pipework between CHP unit and dry cooler.

2) The value of the sound pressure level is considered in free field.

**Emergency cooler**

Thermal output	kW	1013
Heat transfer medium	-	Ethylene glycol/Water-40/60
Max. allowable pressure loss 1)	kPa	-
Dry cooler acoustic sound pressure level at 10 m 2)	dB(A)	65
Max. ambient temperature	°C	35

1) Pipework between CHP unit and dry cooler.

2) The value of the sound pressure level is considered in free field

**Ventilation and combustion air**

Fan air volume flow 1)	m <sup>3</sup> /h	10800
Max. allowable pressure loss of air duct 2)	Pa	-
Max. inlet air temperature	°C	35

1) At temperature 35 °C and pressure 101,3 kPa.

2) Air ducts between CHP unit and air inlet/air outlet.

**Exhaust gas system**

Exhaust gas mass flow, wet	kg/h	5379
Exhaust gas temperature at CHP unit outlet	°C	180
Max. allowable pressure loss 1)	mbar	-
Silencer flanges 2)	-	-

1) Exhaust gas pipe between CHP unit and outlet excluding components at GENTEC CHP scope of supply.

2) According to EN 1092-1.

**Emissions**

CO	mg/Nm <sup>3</sup>	<650
NO <sub>x</sub>	mg/Nm <sup>3</sup>	<500

Correlation 5% O<sub>2</sub>.

**Noise level**

CHP unit design inside container 2)	dB(A)	70
Exhaust gas noise at 1 meter distance to silencer outlet 3)	dB(A)	80
Input/Output air ventilation 1)	dB(A)	80/80

All values of the sound pressure level is considered in free field.

1) Sound pressure level measured at 1 m distance from the CHP unit.

2) Sound pressure level measured at 10 m distance from the container.

3) On request, noise can be reduced by additional optimization of the standard silencer.

**Dimensions and weight**

Container dimensions L/W/H	mm	13100/2700/2900
Dry weight CHP unit design inside container	kg	27000

**Standard conditions and tolerances**

Atmospheric pressure	kPa	100
Air temperature	°C	25
Relative air humidity	%	30
Tolerance for the electrical power	%	±3
Tolerance for the usable thermal output	%	±8
Tolerance for the specific fuel consumption	%	+5

*The energy balance parameters listed in this data sheet are related to the standard conditions.*

*Detailed technical specifications of components on demand.*

*Change of technical parameters and printing errors reserved.*

**Minimum requirements for gas quality**

Parameter	Unit	Limit value	Unit	Comment
Methane number <sup>1)</sup>	MN	> 115	-	Consult GENTEC CHP in case of lower methane numbers
Lower calorific value	H <sub>u</sub>	> 4,5	kWh / Nm <sup>3</sup>	
Chlorine concentration*	Cl	< 40	mg / Nm <sup>3</sup> <sub>CH4</sub>	Chlorine exists as a volatile compound
Fluorine concentration*	F	< 20	mg / Nm <sup>3</sup> <sub>CH4</sub>	Fluorine exists as a volatile compound
Total Chlorine - Fluorine content*	Σ(Cl, F)	< 40	mg / Nm <sup>3</sup> <sub>CH4</sub>	
Dust content < 3 µm*		< 5	mg / Nm <sup>3</sup> <sub>CH4</sub>	
Oil vapour*		< 0,4	mg / Nm <sup>3</sup> <sub>CH4</sub>	Condensation must not occur in the mixture section
Volatile organic compounds*	VOC	-	mg / Nm <sup>3</sup> <sub>CH4</sub>	Without saturated hydrocarbon compounds
Silicion content <sup>2)*</sup>	Si	< 2	mg / Nm <sup>3</sup> <sub>CH4</sub>	In the case of high concentrations, please consult GENTEC CHP
Total sulphur content*	S	< 140	mg / Nm <sup>3</sup> <sub>CH4</sub>	Hydrogen sulfide is included in the total sulfur content
Hydrogen sulphide content <sup>3)*</sup>	H <sub>2</sub> S	< 150	ppm	Consult GENTEC CHP in case of higher concentrations
		< 228	mg / Nm <sup>3</sup> <sub>CH4</sub>	
Ammonia content*	NH <sub>3</sub>	< 70	ppm	
		< 53	mg / Nm <sup>3</sup> <sub>CH4</sub>	
Relative humidity	φ	< 80	%	Condensation must not occur in the mixture section
Temperature of the gas mixture after the gas mixer	T <sub>G</sub>	5 ÷ 45	°C	
Hydrogen <sup>4)*</sup>	H <sub>2</sub>	< 2	% <sub>vol</sub>	

*\* If these components are also part of the intake air, they need to be allocated to the fuel gas as components. The limit values mentioned above yield a limit value for the total of components contained from intake air and fuel gas.*

1) For all fuel gases, except natural gas, please contact GENTEC CHP

2) The engine oil may contain silicon due to additives (defoamers) being added. However, silicon may also have been diffused into the engine oil in form of dust due to insufficient air filtering or gas filtering. Therefore, the concentration of silicone in the gas shall always be evaluated together with the oil analyses. Depending on the occurrence in organic or inorganic form, high concentrations of silicone in the engine oil can result in increased component wear. The contents of wear elements such as iron, chromium and aluminum shall also be included in the evaluation in case of increased silicon content in the engine oil.

3) If catalyst is used, maximum allowed hydrogen sulphide is < 3 ppm (5 mg/ Nm<sup>3</sup>)

4) If hydrogen content exceeds 2 %vol please contact GENTEC CHP

Release date	Created	Revision	Project / Offer
28.08.2023	EB	1	