Technical datasheet of CHP unit

KE-MBG 450-AR

400 V / 50 Hz		Biogas
Electrical power	kW	435
Total thermal output	kW	486
Energy input	kW	1095
Fuel consumption	Nm^3/h	182,5
Electrical efficiency	%	39,7
Thermal efficiency with LT	%	47,1
Thermal efficiency without LT	%	44,4
Overall efficiency with LT	**%**	**86,8**

Engine: MAN Type: E3262 LE242

No. of cylinders / configuration	-	12V
Engine speed	min^{-1}	1500
Bore / stroke / displacement	mm / mm / dm^3	132/157/25,78
Compression ratio	-	12
Engine power max.	kW	450
Spark plugs type	-	M18
Lube oil consumption max.	kg/h	0,18
Lube oil filling quantity max.	dm^3	90

Alternator: Leroy-Somer Type: LSA 47.3 L9

Voltage / frequency	V/Hz	400/50
PF	-	0,8L / 0,8C
Alternator efficiency at rated power	%	96,6
Max. ambient temperature	°C	40

Energy balance

					CHP unit performance parameters at rated load
Load	%	**100**	**75**	**50**	**100**
ISO standard engine power	kW	450	337	225	**450**
Electrical power	kW	435	326	216	**435**
Engine cooling thermal output	kW	233	209	176	**233**
Exhaust gas thermal output (180 °C)	kW	212	172	127	**212**
Thermal output mixture cooling - HT	kW	41	16	0	**41**
Thermal output mixture cooling - LT	kW	30	20	13	**30**
Total thermal output	kW	486	397	303	**486**
Radiation heat max.	kW	21	11	7	**21**
Energy input 1)	kW	1095	845	608	**1095**
Fuel consumption	Nm^3/h	182,5	140,8	101,3	**182,5**
Combustion air mass flow	kg/h	2095	1593	1111	**2095**
Exhaust gas mass flow, wet	kg/h	2320	1767	1236	**2320**
Exhaust temperature after turbocharger	°C	455	-	-	**455**
Alternator efficiency at PF=1	%	96,6	96,6	95,9	**96,6**
Electrical efficiency 1)	%	39,7	38,5	35,5	**39,7**
Thermal efficiency	%	44,4	46,9	49,8	**44,4**
Overall efficiency without LT	**%**	**84,1**	**85,4**	**85,3**	**84,1**

1) According to ISO 3046.

Fuel: Biogas

Min. methane number	-	100
Lower calorific value	MJ/Nm^3	21,6
Biogas composition $CH_4/C0_2$	% vol./% vol.	60/40
Gas pressure at gas regulation line inlet 1)	kPa	4÷10
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	486
Temperature gradient	°C / °C	90 / 70
Min. cooling medium volume flow	m^3/h	21,45
Pressure loss of heating circuit 1)	bar	0,12
Heat transfer medium	-	Treated water
Max. operating pressure	bar	6

1) Pressure loss of all heating water circuit components at GENTEC CHP scope of supply.

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LT mixture cooling circuit

Thermal output	kW	30
Temperature gradient	°C / °C	46 / 42
Cooling medium volume flow	m^3/h	7,01
Max. allowable pressure loss 1)	kPa	20
Heat transfer medium concentration - glycol / water	% vol./% vol.	40/60
Max. operating pressure	bar	3
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	486
Heat transfer medium	-	Ethylene glycol/Water-40/60
Max. allowable pressure loss 1)	kPa	15
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^3/h	9500
Max. allowable pressure loss of air duct 2)	Pa	50
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	2320
Exhaust gas temperature at CHP unit outlet	°C	180
Max. allowable pressure loss 1)	mbar	6
Silencer flanges 2)	-	DN300-PN10

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^3	<750
NO_x	mg/Nm^3	<500

Correlation 5% O_2.

Noise level

CHP unit design without canopy 1)	dB(A)	91,4
CHP unit design with canopy 1)	dB(A)	74
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

Canopy dimensions L/W/H	mm	4600/2000/2050
Dry weight of CHP unit design with canopy	kg	6500

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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	%	±7
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[1)]	MN	> 100	-	Consult GENTEC CHP in case of lower methane numbers
Lower calorific value	H_u	> 5	kWh / Nm³	
Chlorine concentration*	Cl	< 180	mg / Nm^3_{CH4}	Chlorine exists as a volatile compound
Fluorine concentration*	F	< 50	mg / Nm^3_{CH4}	Fluorine exists as a volatile compound
Total Chlorine - Fluorine content*	Σ(Cl, F)	< 180	mg / Nm^3_{CH4}	
Dust content < 5 µm*		< 10	mg / Nm^3_{CH4}	
Oil vapour*		< 900	mg / Nm^3_{CH4}	Condensation must not occur in the mixture section
Volatile organic compounds*	VOC	< 70	mg / Nm^3_{CH4}	Without saturated hydrocarbon compounds
Silicion content[2)]*	Si	< 2	mg / Nm^3_{CH4}	In the case of high concentrations, please consult GENTEC CHP
Total sulphur content*	S	< 350	mg / Nm^3_{CH4}	Hydrogen sulfide is included in the total sulfur content
Hydrogen sulphide content[3)]*	H_2S	< 150	ppm	Consult GENTEC CHP in case of higher concentrations
		< 228	mg / Nm^3_{CH4}	
Ammonia content*	NH_3	< 40	ppm	
		< 30	mg / Nm^3_{CH4}	
Relative humidity	φ	< 60	%	Condensation must not occur in the mixture section
Temperature of the gas mixture after the gas mixer	T_G	10 ÷ 30	°C	
Hydrogen[4)]*	H_2	< 2	$\%_{vol}$	

** 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/ Nm3)

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

Release date	Created	Revision	Project / Offer
28.08.2023	EB	1	