



	400 V / 50 Hz	Natural gas
Electrical power	kW	2145
Total thermal output	kW	2373
Energy input	kW	4990
Fuel consumption	Nm <sup>3</sup> /h	528,4
Electrical efficiency	%	43,0
Thermal efficiency with LT	%	50,4
Thermal efficiency without LT	%	47,6
<b>Overall efficiency with LT</b>	<b>%</b>	<b>93,4</b>

**Engine: MTU Type: 20V4000L33FN**

**Alternator: Stamford**

**Type:**

No. of cylinders / configuration	-	20V	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>	170/210/95,3	Alternator efficiency at rated power	%	97,5
Compression ratio	-	12,8	Max. ambient temperature	°C	40
Engine power max.	kW	2200			
Spark plugs type	-	M18			
Lube oil consumption max.	dm <sup>3</sup> /h	0,75			
Lube oil filling quantity max.	dm <sup>3</sup>	350			

**Energy balance**

					CHP unit performance parameters at rated load
Load	%	<b>100</b>	<b>75</b>	<b>50</b>	<b>100</b>
ISO standard engine power	kW	2200	1650	1105	<b>2200</b>
Electrical power	kW	2145	1609	1073	<b>2145</b>
Engine cooling thermal output	kW	1161	873	622	<b>1161</b>
Exhaust gas thermal output (120 °C)	kW	1078	900	687	<b>1078</b>
Exhaust gas thermal output (80 °C)	kW	134	101	69	<b>134</b>
Thermal output mixture cooling - LT	kW	142	98	62	<b>142</b>
Total thermal output	kW	2373	1874	1378	<b>2373</b>
Radiation heat max.	kW	113	-	-	<b>113</b>
Energy input 1)	kW	4990	3837	2700	<b>4990</b>
Fuel consumption	Nm <sup>3</sup> /h	528,4	406,3	285,9	<b>528,4</b>
Combustion air mass flow	kg/h	10846	8210	5617	<b>10846</b>
Exhaust gas mass flow, wet	kg/h	11212	8493	5816	<b>11212</b>
Exhaust temperature after turbocharger	°C	441	470	502	<b>441</b>
Alternator efficiency at PF=1	%	97,5	97,5	97,1	<b>97,5</b>
Electrical efficiency 1)	%	43,0	41,9	39,7	<b>43,0</b>
Thermal efficiency	%	47,6	48,8	51,0	<b>47,6</b>
<b>Overall efficiency without LT</b>	<b>%</b>	<b>90,6</b>	<b>90,7</b>	<b>90,7</b>	<b>90,6</b>

1) According to ISO 3046.

**Fuel: Natural gas**

Min. methane number	-	80
Lower calorific value	MJ/Nm <sup>3</sup>	34
Gas pressure at gas regulation line inlet 1)	kPa	18+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	2373
Temperature gradient	°C / °C	90 / 70
Min. cooling medium volume flow	m <sup>3</sup> /h	104,80
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	142
Temperature gradient	°C / °C	43,8 / 40
Cooling medium volume flow	m <sup>3</sup> /h	35,30
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.

## Ventilation and combustion air

Fan air volume flow 1)	m <sup>3</sup> /h	35200
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	11212
Exhaust gas temperature at CHP unit outlet	°C	80
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	15400/3000/2900
Dry weight CHP unit design inside container	kg	45800

**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	> 80	-	Consult GENTEC CHP in case of lower methane numbers
Lower calorific value	H <sub>u</sub>	> 8	kWh / Nm <sup>3</sup>	
Chlorine concentration*	Cl	< 10	mg / Nm <sup>3</sup> <sub>CH4</sub>	Chlorine exists as a volatile compound
Fluorine concentration*	F	< 5	mg / Nm <sup>3</sup> <sub>CH4</sub>	Fluorine exists as a volatile compound
Total Chlorine - Fluorine content*	Σ(Cl, F)	< 10	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	< 1	mg / Nm <sup>3</sup> <sub>CH4</sub>	In the case of high concentrations, please consult GENTEC CHP
Total sulphur content*	S	< 30	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	< 3	ppm	Consult GENTEC CHP in case of higher concentrations
		< 5	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	