

## Technical Data Sheet

93800051561\_V01\_en\_PK

Voltage / Frequency

Cooling water temperature (in / out)

NOx emissions (dry, 5 % O<sub>2</sub>)

Mixture cooler 1st stage water temperature (in)

Mixture cooler 2nd stage water temperature (in)

Exhaust gas temperature

Catalytic converter

Special equipment

Elevation above sea level

Combustion air temperature

Relative combustion air humidity

Standard specifications and regulations

## MTU 16V4000 GS

GG16V4000A1



V / Hz	400	/	50
°C		78 / 90	
mg/m <sup>3</sup> i.N.		< 500	
°C			
°C		53	
°C		433	
		not included	
m / mbar	100	/	1000
°C		45	
%		35	

Energy balance	%	100	75	50
Electrical Power <sup>2) 3)</sup>	kW	1560	1170	780
Energy input <sup>4) 5)</sup>	kW	3677	2825	1992
Thermal output total <sup>6)</sup>	kW	898	674	481
Thermal output engine (block, lube oil, 1st stage mixture cooler) <sup>6)</sup>	kW	898	674	481
Thermal output mixture cooler 1st stage <sup>6)</sup>	kW			
Thermal output mixture cooler 2nd stage <sup>6)</sup>	kW	77	51	33
Exhaust heat ( 120 °C ) <sup>6)</sup>	kW	( 809 )	( 666 )	( 503 )
Engine power ISO 3046-1 <sup>2)</sup>	kW	1600	1201	803
Generator efficiency at power factor = 1	%	97.5	97.5	97.1
Electrical efficiency <sup>4)</sup>	%	42.4	41.4	39.2
Total efficiency	%	88.8	88.8	88.6
Power consumption <sup>7)</sup>	kW			

### Combustion air / Exhaust gas

Combustion air volume flow <sup>1)</sup>	m <sup>3</sup> i.N./h	6319	4724	3183
Combustion air mass flow	kg/h	8160	6100	4110
Exhaust gas volume flow, wet <sup>1)</sup>	m <sup>3</sup> i.N./h	6520	4881	3313
Exhaust gas volume flow, dry <sup>1)</sup>	m <sup>3</sup> i.N./h	6037	4509	3053
Exhaust gas mass flow, wet	kg/h	8429	6309	4284
Exhaust temperature after turbocharger	°C	433	462	500

### Reference fuel <sup>8)</sup>

Natural gas			CH <sub>4</sub> >95 Vol.%
Sewage gas			not applicable
Biogas			not applicable
Landfill gas			not applicable

### Fuel requirements <sup>9)</sup>

Minimum methane number	MN		80
Range of heating value: design / operation range without power derating	kWh/m <sup>3</sup> i.N.		10.0 - 10.5 / 8.0 - 11.0

### Exhaust gas emissions <sup>5) 8)</sup>

NOx, stated as NO <sub>2</sub> (dry, 5 % O <sub>2</sub> )	mg/m <sup>3</sup> i.N.	< 500	
CO (dry, 5 % O <sub>2</sub> )	mg/m <sup>3</sup> i.N.	< 1000	
HCHO (dry, 5 % O <sub>2</sub> )	mg/m <sup>3</sup> i.N.		
VOC (dry, 5 % O <sub>2</sub> )	mg/m <sup>3</sup> i.N.		

### Otto-gas engine, lean burn operation with turbocharging

Number of cylinders / configuration		16	/	V
Engine type			16V4000L32FN	
Engine speed	1/min		1500	
Bore	mm		170.0	
Stroke	mm		210.0	
Displacement	dm <sup>3</sup>		76.3	
Mean piston speed	m/s		10.5	
Compression ratio			12.1	
BMEP at nominal engine speed min-1	bar	16.8		
Lube oil consumption <sup>10)</sup>	dm <sup>3</sup> /h	0.36		
Exhaust back pressure min. - max. after module	mbar - mbar		30 - 60	

### Generator

Rating power (temperature rise class F) <sup>11)</sup>	kVA		2087
Insulation class / temperature rise class			H / F
Winding pitch			2/3
Protection			IP 23
Max. allowable p.f. inductive (overexcited) / capacitive (underexcited) <sup>12)</sup>			0.8 / 1
Voltage tolerance / frequency tolerance	%		± 5 / ± 5

### Engine cooling water system

Coolant temperature (in / out), design	°C		78 / 90
Coolant flow rate, constant <sup>13) 14)</sup>	m <sup>3</sup> /h		69.2
Pressure drop, design <sup>14)</sup>	Cv value <sup>13) 15)</sup>	bar / m <sup>3</sup> /h	2.67 / 43.0
Max. operation pressure (coolant before engine)	bar		6.0

### Exhaust gas heat exchanger (EGHE)

Exhaust gas temperature (out)	°C		
Coolant temperature (in / out), design	°C		
Coolant volumetric flow, constant <sup>13) 14)</sup>	m <sup>3</sup> /h		
Pressure drop, design <sup>14)</sup>	Cv value <sup>13) 15)</sup>	kPa / m <sup>3</sup> /h	/
Min. coolant flow rate / min. operation gauge pressure	m <sup>3</sup> /h / bar		/
Max. operation pressure (coolant water)	bar		

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<b>Mixture cooler 1st stage, external</b>				
Coolant temperature (in / out), design	°C			
Coolant volumetric flow, design, constant <sup>13) 14)</sup>	m³/h			
Pressure drop, design <sup>14)</sup>	Cv value <sup>13) 15)</sup>	bar / m³/h	/	
Min. coolant flow rate / min. operation gauge pressure	m³/h / bar		/	
Max. operation pressure before mixture cooler	bar			
<b>Mixture cooling 2nd stage, external</b>				
Coolant temperature (in / out), design	°C	53 / 55.5		
Coolant volumetric flow, design, constant <sup>13) 14)</sup>	m³/h	28.9		
Pressure drop, design <sup>14)</sup>	Cv value <sup>13) 15)</sup>	bar / m³/h	0.36	/ 49.3
Max. operation pressure before mixture cooler	bar		6	
<b>Heating circuit interface</b>				
Engine coolant temperature (in / out), design	°C			
Heating water temperature (in / out), design	°C			
Heating water flow rate, design <sup>14) 16)</sup>	m³/h			
Pressure drop, design <sup>14)</sup>	Cv value <sup>15) 16)</sup>	bar / m³/h	/	
Max. operation gauge pressure (heating water)	bar			
<b>Room ventilation</b>				
Genset ventilation heat <sup>17)</sup>	kW		85	
Inlet air temperature: (min./design/max.)	°C		30 / 35 / 40	
Min. engine room temperature <sup>18)</sup>	°C		15	
Max. temperature difference ventilation air (in / out)	K		20	
Min. supply air volume flow rate (combustion + ventilation) <sup>19)</sup>	m³ i.N./h		18500	
<b>Gearbox</b>	%	<b>100</b>	<b>75</b>	<b>50</b>
Efficiency	%	-	-	-
<b>Starter battery</b>				
Nominal voltage / power / capacity required	V / kW / Ah		24 / 2 x 9 / --	
<b>Filling quantities</b>				
Lube oil for engine	dm³		250	
Coolant in engine	dm³		270	
Coolant in mixture cooler	dm³		22	
Heating water for plate heat exchanger <sup>20)</sup>	dm³			
Lube oil for gearbox	dm³			
<b>Gas regulation line</b>				
Nominal size / gas pressure min. - max. (at gas regulation line inlet)	DN / mbar - mbar	80	/	180 - 250
<b>Engine sound level <sup>21)</sup> (1 meter distance, free field) +3 dB(A) for total A-weighted level tolerance</b>				
Frequency	Hz	<b>63</b>	<b>125</b>	<b>250</b>
Sound pressure level	dB	78.3	86.3	89.0
Frequency	Hz	<b>1000</b>	<b>2000</b>	<b>4000</b>
Sound pressure level	dB	92.1	90.8	99.4
	Lin dB	102.0		
Sum of pressure levels	dB(A)	101.8		
Sound power level	dB(A)	121.6		
<b>Undamped exhaust noise <sup>21)</sup> (1 meter distance to outlet within 90°, free field) +3 dB(A) for total A-weighted level tolerance</b>				
Frequency	Hz	<b>63</b>	<b>125</b>	<b>250</b>
Sound pressure level	dB	116.9	118.4	108.6
Frequency	Hz	<b>1000</b>	<b>2000</b>	<b>4000</b>
Sound pressure level	dB	97.3	96.1	91.9
	Lin dB	121.1		
Sum of pressure levels	dB(A)	106.5		
Sound power level	dB(A)	118.7		
<b>Dimensions (aggregate)</b>				
Length	mm		~ 5500	
Width	mm		~ 2000	
Height	mm		~ 2300	
Gross weight (dry weight)	kg		~ 15500 (~ 15000)	
<b>Power derating</b>				
Elevation			specific to the project	
Combustion air temperature			specific to the project	
Mixture cooler coolant temperature (in)			specific to the project	
Methane number			specific to the project	

**Boundary conditions and consumables**

Systems and consumables have to conform to the following actual company standards: A001067

- 1) Normal cubic meter at 1013 mbar and T = 273 K
- 2) Prime power operation will be designed specific to the project
- 3) Generator gross power at nominal voltage, power factor = 1 and nominal frequency
- 4) According to ISO 3046 (+ 5 % tolerance), using reference fuel used at nominal voltage, power factor = 1 and nominal frequency
- 5) Emission values during grid parallel operation
- 6) Thermal output at layout temperature; tolerance +/- 8 %
- 7) Power consumption of all electrical consumers which are mounted at the module / genset
- 8) Deviations from the layout parameters respectively the reference fuel can have influence on the obtained efficiency and exhaust emissions
- 9) Functional capability
- 10) Reference value at nominal load (without amount of oil exchange)
- 11) Genset max. 1000 m height of location and max. 40 °C intake air temperature; else power derating
- 12) Max. allowable cos phi at nominal power (view of producer)
- 13) Stated values for cooling fluid composition 65% water and 35% glycol, adaption for use of other cooling fluid composition necessary  
The system design must consider the tolerance.
- 14) Pressure loss at reference flow rate
- 15) The Cv value declares the volumetric flow in m³/h at a pressure drop of 1 bar. Min. and max. flow rate limits are defined.
- 16) Stated values for pure water, adaption for other cooling fluid composition necessary
- 17) Only generator- and surface losses
- 18) Frost-free conditions must be guaranteed
- 19) Amount of ventilation air must be adapted to the gas safety concept
- 20) Assemblies including pipe work
- 21) All sound pressure levels at nominal load
- 22) Max. admissible cos phi depending on voltage in accordance with the requirements of the BDEW Mittelspannungsrichtlinie (German Medium Voltage Directive)