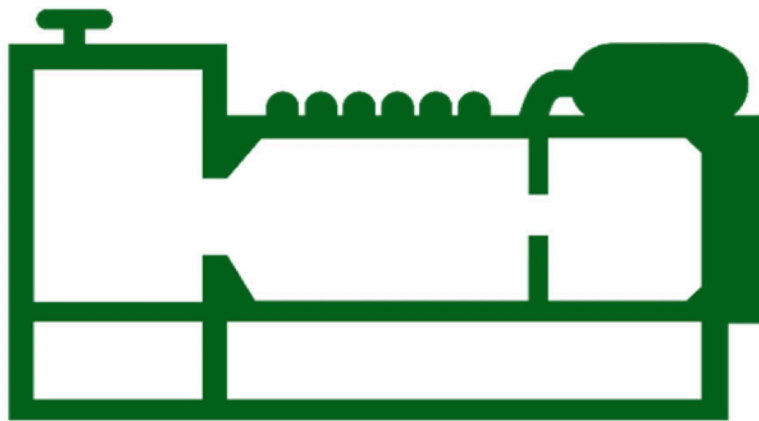


Technical Specification

avus 416plus NG | ct80-1
Provisional Technical data



Version

800 kW

50Hz / 400V

Natural Gas

Hi = 10,25 kWh/Nm³

NOx < 0,5 g/Nm³ (4)+(6)

Exhaust cooling system 120 °C



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1 Genset

1.1 Performance data	100 %	75 %	50 %	Load
Electrical output	800	600	400	kW
Useful thermal output	786	619	442	kW ⁽¹⁾
Energy Input	1.844	1.424	1.017	kW ⁽¹⁾
Electrical efficiency	43,4	42,1	39,3	%
Thermal efficiency	42,6	43,5	43,5	%
Total efficiency	86,0	85,6	82,8	%
Power-to-heat ratio	1,0	1,0	0,9	
min. approved power el. abs.****		200		kW

1.2 Exhaust gas* & sound emissions

NOx with catalytic converter	< 0,5		g/Nm ³ ^{(4)^(6)}
NOx without catalytic converter	< 0,5		g/Nm ³ ^{(4)^(6)}
CO with catalytic converter	< 0,25		g/Nm ³ ^{(4)^(6)}
CO without catalytic converter	< 1		g/Nm ³ ^{(4)^(6)}
HCHO with catalytic converter	20		mg/Nm ³ ^{(4)^(6)}
HCHO without catalytic converter	k.A		mg/Nm ³ ^{(4)^(6)}
Engine surface noise **	-		dB
Engine surface noise with soundproof encapsulation ***	-		dB(A)
Exhaust outlet noise **	-		dB

1.3 Engine

Engine manufacturer	2G	
Engine type	agenitor 416	
Model/cylinders	V / 16	
Mode of operation	4-stroke	
Combustion process	$\lambda > 1$	
Engine displacement	35.678	ccm
Bore / Stroke	130 / 168	mm
Rated speed	1.500	1/min
ISO coefficient of performance (mech.)	826	kW
Compression ratio	15:1	
Mean effective pressure	18,5	bar
Mean piston speed	8,4	m/s
Flywheel body	SAE 0	
Direction of flywheel rotation	left	
Number of crown gear teeth	60	
Unladen engine weight	-	kg
Mixture cooling system	50	°C

* With the appropriate catalyst configuration. When using an SCR system, see separate SCR data sheet

** Total sound power level at engine operation at full load according to DIN EN ISO 3746

*** Mean sound pressure level at a distance of 1 m under free field conditions according to DIN 45635. Increased noise exposure is to be expected with a fresh air intake from the installation room

**** Part-load operation specifications, see TA-008

1.4 Generator

Manufacturer	Leroy Somer	
Type	LSA 50.2 L8 / 4P	
Generator type	Synchronous, directly coupled	
Automatic voltage regulator (AVR)	D510 C	
Rated engine speed	1500	1/min
Frequency	50	Hz
Mechanical input power	826	kW
Effective electrical output	800	kVA
Apparent electrical output (Cos φ 1/0.9)	800 / 889	kVA
Rated generator current (Cos φ 1/0.9)	1155 / 1283	A
Rated generator voltage (+10%)	400	V
Subtransient reactance X"d	10,3	%
Short-circuit current Ik"3	0,15	kA
Power factor Cos φ (inductive/capacitive)	0,8 / 0,95	
generator protection relay circuit breaker	1600	A
Additional transfer switch (under VDE-AR-N 4105)	0	
Efficiency (full load at Cos φ 1)	96,8	%
Moment of inertia	23,7	kg · m ²
Max. ambient temperature	40	°C
Stator coupling	star	
Protection class	IP23	
Generator weight	3010	kg
Power factor correction	not available	
Engine startup	not available	

2 Mixture composition

2.1 Combustion air

Combustion air mass flow rate	4.199	kg/h
Combustion air volume flow rate (25°C/1013 mbar)	3.547	m ³ /h

2.2 Fuel

Fuel requirements according to "TA-004 Gas"

Reference methane number/minimum methane number	80 / 80	
Fuel mass flow rate	144,4	kg/h
Fuel volume flow rate	179,9	m ³ /h
Min. gas flow pressure at rated load*	80,000	mbar
Max. gas flow pressure at rated load*	250,000	mbar
Gas train safety pressure	500,000	mbar

* At gas train inlet

3 Integrated heat extraction

3.1 Heating circuit

Heating water requirements according to "TA-002 Heating circuit"

Heating water volume flow rate (delta T = 20K)	33,8	m ³ /h
Heating water return temperature(max.)*	70	°C
Heating water supply temperature (max.)**	90	°C
Safety valve	6,00	bar
Min. operating pressure	1,00	bar
Internal pressure drop in heating circuit *	300,0	mbar
Approx. pressure reserve*	500,0	mbar

3.2 Engine circuit:

Coolant requirements according to "TA-001 Coolant"

Jacket water heat (engine)	287,8	kW ⁽²⁾
Engine cooling water inlet temperature (min.)	80	°C
Engine cooling water outlet temperature (max.)	90	°C
Max. inlet/outlet difference	6	K
Recirculated engine cooling water volume (min.)	48,0	m ³ /h
Total recirculated cooling water volume	48,0	m ³ /h
Max. operating pressure	2,0	bar
Min. operating pressure	1,00	bar
Safety valve	3,00	bar
Approx. heat dump circuit pressure reserve (optional) *	250,00	mbar
Safety temperature limiter	110	°C
Mixture heat from high temperature circuit (HT)	130	kW ⁽²⁾
Mixture coolant inlet temperature HT (max.)	84	°C
Recirculated coolant volume HT mixture (min.)	48,0	m ³ /h

3.3 Low temperature mixture cooling circuit (LT)

Coolant requirements according to "TA-001 Coolant"

Mixture heat LT	46,0	kW ⁽²⁾
Mixture coolant inlet temperature LT	38 / 43	°C
Mixture coolant outlet temperature LT	41 / 46	°C
Recirculated coolant volume LT mixture (min.)	15,3	m ³ /h
Safety valve	3,0	bar
Min. operating pressure	1,0	bar
Approx. pressure reserve *	500,00	mbar

* From/to module interface

** Exhaust system

4 Exhaust system

Exhaust gas temperature after turbine	396	°C
Exhaust gas temperature after exhaust gas heat exchanger	120	°C
Exhaust gas heat	368	kW ⁽²⁾
Damp exhaust gas volume flow rate	3.414	m ³ /h
Dry exhaust gas volume flow rate	3.074	m ³ /h
Damp exhaust gas mass flow rate	4.344	kg/h
Dry exhaust gas mass flow rate	4.053	kg/h
Max. exhaust backpressure after turbocharger	-	mbar
Approx. pressure reserve (with catalytic converter) *	#WERT!	mbar

5 Ventilation

Radiant module heat (ca.)	123	kW ⁽²⁾
Min. supply air flow rate ($\Delta t = 15$ K)	28.354	m ³ /h

6 Operating materials

Lubricating oil approvals, see 'TA-003 Lubricating oil'		
Lubricating oil consumption (\emptyset /max.)	0,06 / 0,2	g/kWh
Engine oil capacity (max.)	140,00	l
Lubricating oil refill tank capacity (optional)	195,00	l
Lubricating oil system with auxiliary tank (optional)	195,00	l
Approx. engine circuit coolant capacity (Module)	220,00	l
Approx. LT mixture cooling circuit coolant capacity (Module)	26,00	l
Coolant approvals, see "TA-001 Coolant"		

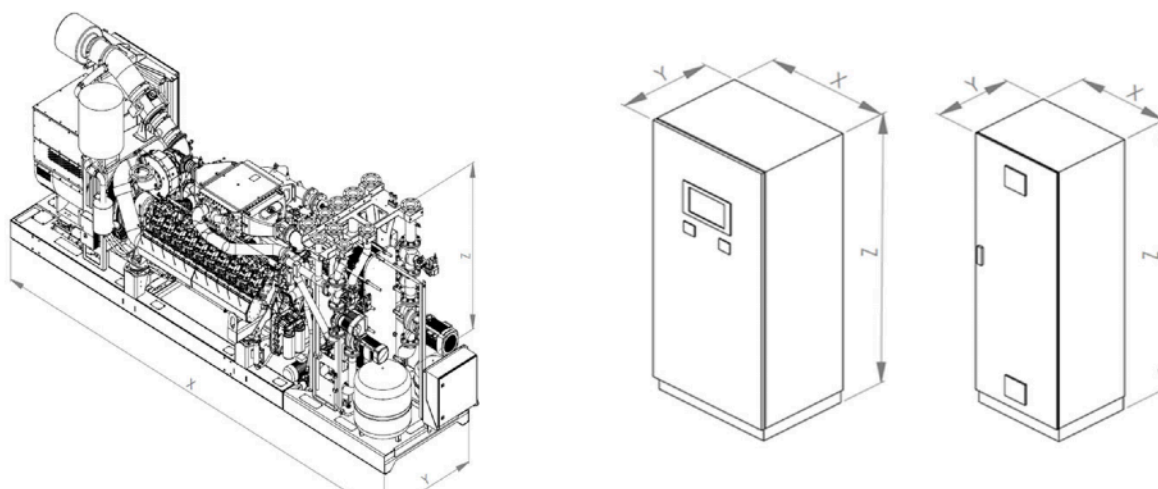
7 Electronics and software

Power system protection device	Bachmann GSP	
Power system protection software status	> 13466	
Touch screen	10	
Approval (depending on version)	VDE-AR-N 4105 / VDE-AR-N 4110	
Control cabinet protection class	IP 54	
Power distribution cabinet protection class	IP 54	
Ambient temperature of control cabinets	0 - 35	°C
Relative humidity of control cabinets (max.)	65	%

* From module interface (exhaust gas heat exchanger/catalytic converter as standard version and in new condition)

8 Interfaces

8.1 Dimensions and weights



Module Length *	5505,00	mm
Module Width *	1675,00	mm
Module Height *	2375,00	mm
Module Weight (without operating materials)	-	kg
Module Weight with soundproof encapsulation (optional)	-	kg
Powder-coated CHP frame	RAL 6002	
Control cabinet Width	800,00	mm
Control cabinet Depth	600,00	mm
Control cabinet Weight	2000,00	mm
Control cabinet Weight	200	kg
Powder-coated control cabinet	RAL 7035	
Power distribution cabinet Width	600,00	mm
Power distribution cabinet Depth	500,00	mm
Power distribution cabinet Height	2000,00	mm
Power distribution cabinet Weight	150	kg
Powder-coated power distribution cabinet	RAL 7035	

8.2 Water/gas interfaces

Gas interface	-
Exhaust gas interface	-
Heating circuit interface	80 / 16
Heat dump circuit interface	80 / 16
LT mixture cooling circuit interface	100 / 16

8.3 Electrical connections/interface for energy utilities

Grid connection with pre-fuse (provided by customer)	50 Hz / 400 V
Electricity network system	TN-S
Short-circuit current rating I _{cc} (max.)	50

* Deviating dimensions for version with soundproof encapsulation

8.4 Data interfaces

Remote maintenance access (optional) *

DSL / UMTS (SIM)

Interfaces/data interfaces (optional)

- Profibus DP
- Profinet IO
- Modbus RTU
- Modbus TCP
- Ethernet IP
- hardware signals

Virtual Power Plant access (optional)

Possible after technical clarification
(bus systems or hardware signals)

* The remote maintenance access must be provided by the customer

9 Technical framework

Unless otherwise indicated, all data refer to engine operation at full load at the respective media temperatures and apply subject to technical innovations.

The electrical output is based on the generator output measured at the generator terminals. Therefore, all output and efficiency specifications are gross values.

The fuel gas quality must meet the requirements of "TA-004 Gas". The equipment and peripheral systems must be configured according to the "Technical Manuals" by 2G.

- (1) Reference conditions according to DIN ISO 3046-1. At nominal output, the specific fuel consumption tolerance amounts to +5%. Efficiency data is based on an engine in new condition. The decrease in efficiency throughout the service life is reduced by adhering to the maintenance guidelines.
- (2) At nominal output, the useful thermal output tolerance amounts to $\pm 8\%$.
- (3) Specifications based on new condition. The exhaust gas temperature tolerance amounts to $\pm 8\%$
- (4) In reference to a residual oxygen content in the exhaust gas of 5%
- (5) Electrical output at the generator terminals at $\text{Cos } \varphi = 1$.
- (6) Volume specifications in standard condition:

Pressure	1013 mbar
Temperature	0 °C
- (7) Reproducibility standard deviation of 4 dB according to DIN EN ISO 3746
- (8) The heating water supply temperature tolerance amounts to ± 1 °C.

The performance data in this document are based on standard reference conditions.

Standard reference conditions according to DIN ISO 3046-1:

Air pressure	1000 mbar
Air temperature:	25 °C
Relative humidity	30 %

Derating

In case of installation at altitudes > 100 and/or intake air temperatures $> 25^{\circ}\text{C}$ the project-specific derating must be determined according to "TI-049 Derating".