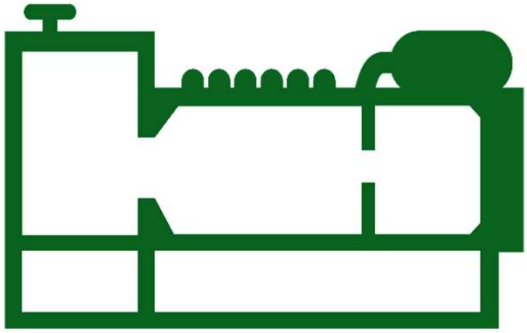
TECHNICAL SPECIFICATION

Avus 1000plus EG | ct80-1



DESIGN:

1000 kW el.
400 V / 50 Hz
natural gas
Hi = 10,25 kWh/Nm³
NOx < 250 mg/Nm³
Exhaust cooling to 120 °C

Subject to technical changes!

Note: Figure on cover page may differ

1 Genset

	50 %	75 %	100 %	Load	
Electrical power	500	750	1000	kW	(5)
Recoverable thermal output	598	820	1060	kW	(2)
Energy input	1325	1874	2429	kW	(1)
Efficiencies electrical	37,7	40,0	41,2	%	(1)
Efficiencies thermal	45,2	43,7	43,6	%	(1), (2)
Efficiencies total (el. + th.)	82,9	83,8	84,8	%	(1), (2)
CHP coefficient	0,84	0,92	0,94		(1), (2)

Exhaust emissions	with catalytic converter *	without exhaust aftertreatment		
NOx	< 250	< 250	mg/Nm³	(4), (6)
CO	< 100	< 1000	mg/Nm³	(4), (6)
HCHO	< 20	not specified	mg/Nm³	(4), (6)

1.1 Engine

Engine manufacturer	2G	
Engine type	avus 1000plus EG | ct80	
Type / No. of cylinders	V engine / 20	
Operating method	4-stroke	
Combustion process	λ > 1	
Engine displacement	44575	ccm
Bore / Stroke	130 / 168	mm
RPM	1500	1/min
ISO standard power (mech.)	1027	kW
compression ratio	14 : 1	
average effective pressure	18,4	bar
average piston speed	8,4	m/s
body of balance wheel	SAE 0	
Direction of rotation (based on balance wheel)	left	
tooth rim with number of teeth	60	
Engine dead weight	4315	kg
Mixture cooling to	50	°C
Engine surface noise **	-	dB(A) (7)
Engine surface noise with sound reducing encapsulation (not available) **	-	dB(A) (7)

* With appropriate catalyst configuration! Reduction of HCHO to < 20 mg/Nm³ available (optional)

** Total sound power level at full engine load in accordance with DIN EN ISO 3746

*** Average sound pressure level under open area conditions at distance of 1 m in accordance with DIN 45635
An increased noise load must be taken into account with fresh air intake from the installation room.

1.2 Generator (utility planning data)

Manufacturer	Leroy Somer	
Type	LSA 52.3 S5 /4p	
Generator type	Synchronous, directly coupled	
Voltage regualtor (AVR)	D510C	
Rated speed	1500	1/min
Frequency	50	Hz
mechanical fuel shutoff	1027	kW
Effective electrical power	1000	kW
Apparent electrical power (cos φ 1.0 / cos φ 0.9)	1000 / 1111	kVA
Rated generator current (cos φ 1.0 / cos φ 0.9)	1443 / 1604	A
Rated generator voltage (± 10 %)	400	V
Subtransient reactance X"d	11,8	%
Short-circuit current Ik"3	15,88	kA
Power factor cos φ (inductive / capacitive)	0,9 / 0,9	
Generator circuit breaker	2000	A
Additional section switch (VDE-AR-N 4105)	2000	A
Efficiency (full load) at Cos φ = 1	97,4	%
Mass moment of inertia	41,7	kg · m²
Ambient air temperature	40	°C
Stator circuit	star	
Protection class	IP 23	
Generator weight	3748	kg
Compensation	not available	
Engine startup	not available	

2 Mixture composition

2.1 Combustion air

Combustion air mass flow	5561	kg/h
Combustion air volume flow (25 °C, 1013 mbar)	4696	m³/h

2.2 Fuel

Fuel requirements in accordance with 'TA-004 Gas'

Reference methane number - minimum methane number	80 / 80	
Combustible mass flow	190,2	kg/h (1)
Combustible volume flow	237,0	Nm³/h (6), (1)
Gas pressure at rated load min. *	80	mbar
Gas flow pressure at rated load max. *	250	mbar
Gas regulation line safety pressure	500	mbar

* At the inlet to the gas regulation line

3 Integrated heat extraction

3.1 Heating circuit

Heating water requirements in accordance with 'TA-002 Heating circuit'		
Heating water volume flow (Δt = 20 K)	45,5	m³/h
Heating water return temperature (max)	70	°C
Heating water flow temperature (max) **	90	°C (8)
Safety valve	6	bar
Operating pressure (min.)	1	bar
Internal pressure loss in heating circuit (approx.) *	400	mbar
Pressure reserve ca. *	500	mbar

3.2 Engine circuit

Coolant requirements in accordance with 'TA-001 Coolant'		
Coolant heat	436	kW (2)
Engine inflow temperature (min.)	80	°C
Engine exit temperature (max.)	88	°C
Balance inflow / exit (max.)	5	K
Recirculated coolant quantity (min.)	87,2	m³/h
Total cooling water circulation volume	87,2	m³/h
Operating pressure (max.)	2	bar
Operating pressure (min.)	1	bar
Safety valve	3,0	bar
Emergency cooling circuit Pressure reserve ca. (optional) *	250	mbar
Safety temperature limiter	110	°C
Mixture heat high temperature circuit (HT)	136	kW (2)
Mixture coolant, inflow termperature high temperature circuit (max.)	80	°C
Mixture coolant recirculated quantity high temperature circuit (min.)	46,9	m³/h

3.3 Mixture cooling water circuit - low temperature (LT)

Coolant requirements in accordance with 'TA-001 Coolant'		
Mixture heat low temperature circuit (LT)	61	kW (2)
Mixture coolant, inflow temperature low temperature circuit	38	°C
Mixture cooling water outlet temperature LT	41	°C
Mixture coolant recirculated quantity low temperature circuit (min.)	20,3	m³/h
Safety valve	3	bar
Operating pressure (min.)	1	bar
Pressure reserve ca. *	500	mbar

* Up to / from module interface

** Heating water supply temperature max. in partial load operation < 90 °C

4. Exhaust system

Exhaust gas temperature downstream of turbine	396	°C (3)
Exhaust temperature after exhaust heat exchanger	120	°C (3)
Exhaust gas heat	488	kW (2)
exhaust gas volume flow wet	4520	Nm³/h (6)
exhaust gas volume flow dry	4071	Nm³/h (6)
exhaust gas mass flow wet	5751	kg/h
exhaust gas mass flow dry	5368	kg/h
Exhaust back pressure downstream of turbine max.	50	mbar
Pressure reserve approx. *	26	mbar
Exhaust outlet noise **	-	dB (7)

5 Ventilation

radiant heat of module (approx.)	126	kW
Supply air volume flow min. (at Δt = 15 K)	30047	m³/h

6 Operating fluids

Lubricating oil approvals, see 'TA-003 Lubricating oil'		
Lubrication oil consumption (Ø / max.)	0,06 / 0,2	g/kWh
Filling capacity lubricant (max.)	170	l
Lubricating oil filling tank fill capacity (optional)	195	l
Lubricating oil volume auxiliary tank (optional)	195	l
Motor circuit coolant fill quantity approx. (module)	250	l
Mixture cooling circuit LT coolant fill quantity approx. (module)	50	l
Coolant approvals, see 'TA-001 Coolant'		

7 Electronics and software

Grid protection device	Bachmann GSP	
Grid protection software status	> 13414	
Touchscreen display	10	"
Approval (depending on version)	VDE-AR-N 4105 / VDE-AR-N 4110	
Protection class Control cabinet	IP 54	
Protection class Power switch cabinet	IP 54	
Switch cabinet environmental temperature	0 - 35	°C
Switch cabinet relative air humidity (max.)	65	%

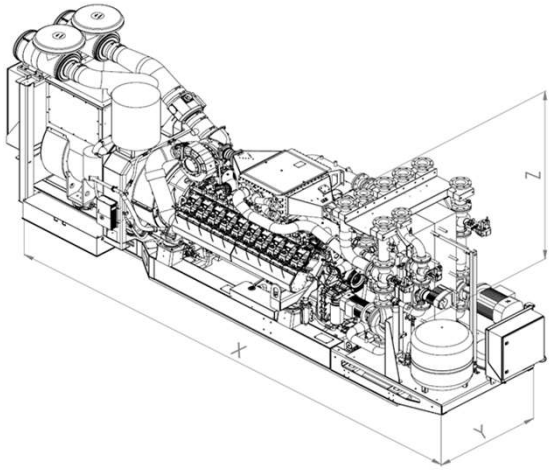
* From module interface (exhaust heat exchanger / catalytic converter in standard version and new condition)

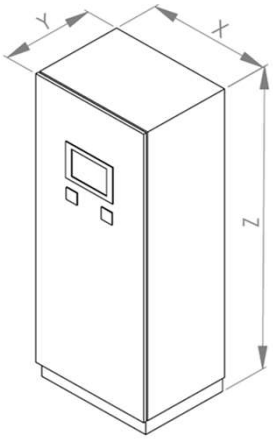
** Total sound power level at full engine load in accordance with DIN 45635-11 Annex A

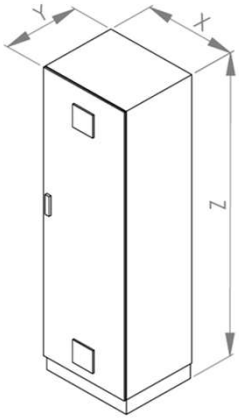
8 Interfaces

8.1 Dimensions and weights

(Figures may differ)







Length Module *	X	6071	mm
Width Module *	Y	1324	mm
Height Module *	Z	2350	mm
Weight Module (without operating fluids)		11500	kg
Weight Module with sound reducing encapsulation (not available)		-	kg
Powder-coated CHP frame		RAL 6002	
Width Control cabinet	X	1200	mm
Depth Control cabinet	Y	600	mm
Height Control cabinet	Z	2000	mm
Weight Control cabinet		270	kg
Control cabinet powder coated		RAL 7035	
Width Power switch cabinet	X	800	mm
Depth Power switch cabinet	Y	600	mm
Height Power switch cabinet	Z	2000	mm
Weight Power switch cabinet		190	kg
Power switch cabinet powder coated		RAL 7035	

*

8.2 Water / gas transfer points

Interfaces Gas	/	DN / PN
Interfaces Exhaust	/	DN / PN
Interfaces Heating circuit	100 / 16	DN / PN
Interfaces Emergency cooling circuit	100 / 16	DN / PN
Interfaces Mixture cooling circuit LT	80 / 16	DN / PN

8.3 Electrical connections / utility interface

Grid connection with pre-fuse (customer-provided)	400 V / 50 Hz	
Grid system	TN-S	
Short-circuit proof Icc (max.)	50	kA

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
Access virtual power plant (optional)	Possible after technical clarification (bus or hardware signals)	

* Access for remote maintenance must be provided by the customer

9 Technical boundary conditions

Unless otherwise specified, all data is based on full engine load with the respective indicated media temperatures and subject to technical improvements. The generator output measured at the generator terminals serves as the basis for the delivered electrical power. All power and efficiency specifications are gross specifications. The fuel gas quality must conform to the specifications of 'TA-004 Gas'. The operating fluids and plant system layout must conform to the 'Technical instructions' of 2G.

(1) Performance conditions in accordance with DIN ISO 3046. Tolerance for specific fuel use amounts to + 5% of nominal performance. Efficiency specifications are based on an engine in new condition. An abatement in efficiency over the service life is reduced with observance of the maintenance requirements.

(2) The tolerance for usable heat output is +/- 8 % under normal load.

(3) Data according to new condition.
The tolerance for the exhaust temperature is +/- 8 %.

(4) Corresponding to a residual oxygen concentration in the exhaust of 5 %

(5) Electrical generator terminal power at cos φ = 1.

(6) Volume specifications for normal status:

Pressure	1013 mbar
Temperature	0 °C

(7) Standard deviation of reproducibility 4 dB in accordance with DIN EN ISO 3746

(8) The tolerance for the Heating water flow temperature is +/- 1 °C.

Power specifications in this document relate to standard reference conditions.

Standard reference conditions in accordance with DIN ISO 3046-1:

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

Power reduction

Power reduction due to installation at altitude > 300 m a.s.l. and/or air suction temperature > 25 °C shall be determined specifically for each project according "TI-049 Load reduction".