White Harvest
ENERGY

TECHNICAL SPECIFICATION

aura 412 NG

btw70-0 | 420 kW Natural Gas CHP Module

AT A GLANCE

Application	**Combined Heat & Power (CHP)**
Electrical output	**420 kW**
Electrical service	**60 Hz / 480 V**
Fuel	**Natural gas, Hi = 990.37 BTU/ft³**
NOx	**< 0.2 g/BHP-h**
Exhaust cooling system	**221 °F**
Reference Conditions	**DIN ISO 3046-1**



Manufacturer technical data

Prepared and issued by White Harvest Energy, an authorized 2G Energy sales distributor and service provider. Performance figures are manufacturer data for the module in new condition at the stated reference conditions and are subject to project-specific derating and technical revision. Source document: 2G Energy AG Doc.-ID 5308920, Rev. P (24.08.26).

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1 Basic data

1.1 Performance data

Performance data	100 % Load	75 % Load	50 % Load	Unit
Electrical output ****	**420**	**315**	**210**	kW
Useful thermal output	**2,129**	**1,711**	**1,286**	MBTU/hr (2)
Energy input	**3,868**	**3,030**	**2,228**	MBTU/hr (1)
Electrical efficiency	**37.0**	**35.5**	**32.2**	%
Thermal efficiency	**55.1**	**56.5**	**57.7**	%
Total efficiency	**92.1**	**91.9**	**89.9**	%
Power-to-heat ratio	**0.67**	**0.63**	**0.56**	
Min. approved power el. abs. ****		**147**		kW

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

1.2 Exhaust gas* & sound emissions

Emission / sound parameter	Value	Unit
NOx with catalytic converter	**< 0.2**	g/BHP-h
NOx without catalytic converter	**< 14.3**	g/BHP-h
NOx (energy-specific, without cat)	**< 7.2**	g/kWh
CO with catalytic converter	**< 0.5**	g/BHP-h
CO without catalytic converter	**< 9.8**	g/BHP-h
HCHO with catalytic converter	**< 1.4**	ppm (4), (6)
HCHO without catalytic converter	**n.A.**	ppm (4), (6)
Engine surface noise **	**105**	dB(A) (7)
Engine surface noise with soundproof encapsulation ***	**70**	dB(A) (7)
Exhaust outlet noise **	**117**	dB (7)

* With the appropriate catalyst configuration.

** 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.

1.3 Engine

Engine	Value	Unit
Engine manufacturer	**2G**	
Engine type	**aura 412**	
Model / cylinders	**V / 12**	
Mode of operation	**4-stroke**	
Combustion process	**λ = 1**	
Engine displacement	**1,526**	in^3

Engine	Value	Unit
Bore / stroke	**5.12 / 6.18**	in
Rated speed	**1,800**	1/min
ISO coefficient of performance (mech.)	**584**	hp
Compression ratio	**12.5:1**	
Mean effective pressure	**168.5**	psi
Mean piston speed	**30.9**	ft/s
Flywheel body	**SAE 1**	
Direction of flywheel rotation	**left**	
Number of crown gear teeth	**137**	
Dry engine weight	**4,740**	lbs
Mixture cooling system	**183.2**	°F

1.4 Generator

Generator	Value	Unit
Manufacturer	**Leroy Somer**	
Type	**LSA 47.3 L9 / 4P**	
Generator type	**Synchronous, directly coupled**	
Automatic voltage regulator (AVR)	**D550**	
Rated engine speed	**1,800**	1/min
Frequency	**60**	Hz
Mechanical input power	**436**	kW
Effective electrical output	**420**	kW
Apparent electrical output (Cos φ 1 / 0.8)	**420 / 525**	kVA
Rated generator current (Cos φ 1 / 0.8)	**505 / 631**	A
Rated generator voltage (±10 %)	**480**	V
Subtransient reactance saturated X"ds / unsaturated X"d	**6.6 / 11.5**	
Short-circuit current Ik"3	**9.19**	kA
Power factor Cos φ (inductive / capacitive)	**0.8 / 0.95**	
Generator protection relay circuit breaker	**800**	A
Efficiency (full load at Cos φ 1)	**96.4**	%
Moment of inertia	**0.0**	lb · ft²
Max. ambient temperature	**104**	°F
Stator coupling	**star**	
Protection class	**IP23**	
Generator weight	**0**	lbs

Generator	Value	Unit
Power factor correction	**not available**	
Engine startup	**not available**	

2 Mixture composition

2.1 Combustion air

Combustion air	Value	Unit
Combustion air mass flow rate	**3,093**	lbs/hr
Combustion air volume flow rate (25 °C / 1013 mbar)	**697**	SCFM

2.2 Fuel

Fuel requirements according to "TA-004 Gas".

Fuel	Value	Unit
Reference methane number / minimum methane number	**80 / 70**	
Fuel mass flow rate	**195.7**	lbs/hr
Fuel volume flow rate	**65.1**	SCFM
Min. gas flow pressure at rated load *	**0.36**	psig
Max. gas flow pressure at rated load *	**1.02**	psig
Gas train safety pressure	**7.25**	psig

* At gas train inlet.

3 Integrated heat extraction

3.1 Heating circuit

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

Heating circuit	Value	Unit
Heating water volume flow rate (delta T = 20 K)	**121.3**	gpm
Heating water return temperature (max.) *	**158**	°F
Heating water supply temperature (max.) **	**194**	°F [8]
Safety valve	**87**	psi
Min. operating pressure	**15**	psi
Internal pressure drop in heating circuit *	**6**	psig
Approx. pressure reserve *	**7**	psig

* From / to module interface.

** Depending on the design of the heating circuit pump group; information applies to design by 2G. Heating water supply temperature max., in partial load operation < 90 °C.

3.2 Engine circuit

Coolant requirements according to "TA-001 Coolant".

Engine circuit	Value	Unit
Jacket water heat (engine)	**1,270**	MBTU/hr (2)
Engine cooling water inlet temperature (min.)	**165.2**	°F
Engine cooling water outlet temperature (max.)	**194**	°F
Max. inlet / outlet difference	**11**	K
Recirculated engine cooling water volume (min.)	**182.5**	gpm
Total recirculated cooling water volume	**182.5**	gpm
Maximum pressure at engine outlet	**44**	psi
Minimal pressure at engine outlet	**15**	psi
Safety valve	**43.5**	psi
Approx. heat dump circuit pressure reserve (optional) *	**4**	psig
Safety temperature limiter	**230**	°F
Mixture heat from high temperature circuit (HT)	**97**	MBTU/hr (2)
Mixture coolant inlet temperature HT (max.)	**181**	°F
Recirculated coolant volume HT mixture (min.)	**38.9**	gpm

* From / to module interface.

4 Exhaust system

Exhaust system	Value	Unit
Exhaust gas temperature after turbine	**1,040**	°F
Exhaust gas temperature after exhaust gas heat exchanger	**221**	°F (3)
Exhaust gas heat	**762**	MBTU/hr (2)
Damp exhaust gas volume flow rate	**699**	SCFM
Dry exhaust gas volume flow rate	**576**	SCFM
Damp exhaust gas mass flow rate	**3,289**	lbs/hr
Dry exhaust gas mass flow rate	**2,895**	lbs/hr
Max. exhaust backpressure after turbocharger	**1**	psig
Approx. pressure reserve (with catalytic converter) *	**0.7 (0.1)**	psig

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

5 Ventilation

Ventilation	Value	Unit
Radiant module heat (approx.)	**286.62**	MBTU/hr (2)
Min. supply air flow rate (Δt = 10 K)	**14,955**	SCFM

6 Operating materials

Lubricating oil approvals, see "TA-003 Lubricating oil". Coolant approvals, see "TA-001 Coolant".

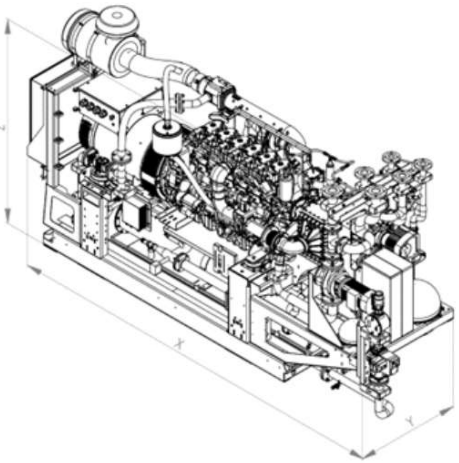
Operating materials	Value	Unit
Lubricating oil consumption (Ø / max.)	**0.06 / 0.2**	g/kWh
Engine oil capacity (max.)	**23.8**	gallons
Lubricating oil refill tank capacity (optional)	**50.2**	gallons
Lubricating oil system with auxiliary tank (optional)	**50.2**	gallons
Approx. engine circuit coolant capacity (module)	**—**	gallons
Approx. LT mixture cooling circuit coolant capacity (module)	**—**	gallons

7 Electronics and software

Electronics and software	Value	Unit
Power system protection device	**Bachmann GSP**	
Power system protection software status	**> 13495**	
Touch screen	**10**	
Approval (depending on version)	**0**	
Control cabinet protection class	**Type 12**	
Power distribution cabinet protection class	**Type 1**	
Ambient temperature of control cabinets	**32 – 95**	°F
Relative humidity of control cabinets (max.)	**65**	%

8 Interfaces

8.1 Dimensions and weights



Dimension / weight	Axis	Value	Unit
Module length *	X	**179**	in
Module width *	Y	**52**	in
Module height *	Z	**91**	in
Module weight (without operating materials)		**14,191**	lbs
Module weight with soundproof encapsulation (optional)		**17,278**	lbs
Powder-coated frame		**RAL 6002**	
Control cabinet width	X	**31**	in
Control cabinet depth	Y	**24**	in
Control cabinet height	Z	**79**	in
Control cabinet weight		**441**	lbs
Powder-coated control cabinet		**RAL 7035**	
Power distribution cabinet width	X	**24**	in
Power distribution cabinet depth	Y	**16**	in
Power distribution cabinet height	Z	**75**	in
Power distribution cabinet weight		**331**	lbs
Powder-coated power distribution cabinet		**RAL 7035**	

* Dimensions subject to change; refer to the interface drawing for exact values.

8.2 Water / gas interfaces

Water / gas interfaces	Value	Unit
Gas interface	**65 / 10**	DN / PN
Exhaust gas interface	**250 / 10**	DN
Heating circuit interface	**80 / 16**	DN / PN
Heat dump circuit interface	**80 / 16**	DN / PN

8.3 Electrical connections / interface for energy utilities

Electrical connections	Value	Unit
Grid connection with pre-fuse (provided by customer)	**60 Hz / 480 V**	
Electricity network system	**Y**	
Short-circuit current rating Icc (max.)	**50**	kA

8.4 Data interfaces

Data interfaces	Value
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.

Ref.	Note
(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 ± 8 %.
(3)	Specifications based on new condition. The exhaust gas temperature tolerance amounts to ± 8 %.
(4)	In reference to a residual oxygen content in the exhaust gas of 15 %.
(5)	Electrical output at the generator terminals at Cos φ = 1.
(6)	Volume specifications in standard condition: pressure 14.69 psi, temperature 32 °F.
(7)	Reproducibility standard deviation of 4 dB according to DIN EN ISO 3746.
(8)	The heating water supply temperature tolerance amounts to ± 2 °C.

Standard reference conditions according to DIN ISO 3046-1

Reference condition	Value	Unit
Air pressure	**14.5**	psi
Air temperature	**77**	°F
Relative humidity	**30**	%

Derating

Power reduction due to installation at altitude > 300 m a.s.l. and/or air suction temperature > 40 °C shall be determined specifically for each project according to "TI-049 Load reduction".