

# CG400S-BG

## Special Gas CHP Unit

### Main configuration and features:

- Highly efficient gas engine
- AC synchronous alternator
- Gas safety train and gas protection device against leakage
- Exhaust and jacket water heat exchanger
- Heating water and jacket water circulation system
- Expansion tank and water jacket heater
- Advanced engine control system, including: ignition system, detonation control system ,speed control system , air/fuel ratio control system and cylinder temp. protection system
- Strict shop test for all CHP unit
- Able to be used directly outdoors with durable and firm characteristics and design against rain and dust
- Ventilation fan
- Industrial silencer with silencing ability of 12-20dB(A)
- Unattached switch cabinet and electric control cabinet
- Multi-functional control system with simple operation
- Data communication interfaces integrated into control system
- Lighting and smoke alarm system
- Monitoring battery voltage and charging automatically
- Auto refilling oil system
- Bus interface for connecting to higher level control unit



### Power and efficiency @50Hz

Electric power -kW	400	Electric efficiency	38.1%
Heat power-kW	528	Heat efficiency	50.3%
Input power -kW	1050	Total efficiency	88.4%

### Soundproof canopy and control cabinet

Structure type	Soundproof canopy
Canopy painting	High-class powder coating
Electrical control cabinet	Integrated into canopy,IP54
Noise level@7m, dB(A)	67

### Dimension and weight

Dimension ( LxWxH ) , mm	5400x2050x2500
Weight, kg	7500

#### Special statement :

- 1、 The technical data are based on a gas mixture of 60% methane and 40% carbon dioxide with a calorific value of 6,0 kWh/Nm<sup>3</sup> and a methane no. > 100.
- 2、 The technical data is measured in standard conditions:  
Absolute atmospheric pressure: 100kPa  
Ambient temperature : 25°C  
Relative air humidity : 30%
- 3、 Rating adaptation at ambient conditions acc to DIN ISO 3046/1.  
The tolerance for the specific fuel consumption is + 5 % at rated output.
- 4、 Dimension and weight above are just for standard product ,and may be subject to change. As this document is used only for presale reference, take the specification supplied by PowerLink before ordering as final.

### Fuel and emission

Fuel type	Special gas
Fuel component	60%-CH <sub>4</sub> /40%-CO <sub>2</sub>
Methane number	MN > 100
Excess air factor ( Lambda )	1.45
NO <sub>x</sub> , mg/Nm <sup>3</sup>	≤500
CO , mg/Nm <sup>3</sup>	≤800
HCHO ( formaldehyde ) , mg/Nm <sup>3</sup>	≤60
NMHC , mg/Nm <sup>3</sup>	≤30
Fuel consumption @100% load, m <sup>3</sup> /h	163
Supply gas pressure range, kPa	10~20

### CHP Unit performance data and manufacturing technology

CHP unit model	CG400S-BG	Power and efficiency			
Electric output power ( kW )	400	Load	100%	75%	50%
Heat output power ( kW )	528	Electric power (kW)	400	300	200
CHP unit electric efficiency	38.1%	Heat power (kW)	528	443	324
CHP unit heat efficiency	50.3%	Energy input (kW)	1050	834	589
CHP unit total efficiency	88.4%	Electric efficiency	38.1%	36.0%	34.0%
Overload runtime at 1.1xSe(hour)	1	Heat efficiency	50.3%	53.1%	55.0%
Steady-state voltage deviation	≤±1%	Total efficiency	88.4%	89.1%	89.0%
Transient-state voltage deviation	-15%~20%	<b>Manufacturing technology</b> <ul style="list-style-type: none"> <li>● Special welded base frame, inner vibration isolators and design for whole lifting</li> <li>● With high-class paint, enduring brightness as well resistance against abrasion and defacing</li> <li>● Installation manual, operation and maintenance manual wiring program</li> </ul> <b>Standards and certificate</b> <ul style="list-style-type: none"> <li>● ISO3046 , ISO8528 , GB2820</li> <li>● BS5000PT99 , AS1359 , IEC34</li> <li>● ISO9001:2008 quality system certification</li> </ul>			
Voltage recovery time(s)	≤4				
Voltage unbalance	1%				
Steady-state frequency regulation	±0.5%				
Transient -state frequency regulation	±5%				
Frequency recovery time(s)	≤3				
Steady-state frequency band	0.5%				
Recovery time response(s)	0.5				
Telephone interference factor(TIF)	≤50				
Telephone harmonious factor(THF)	≤2% , as per BS4999				

### AC alternator performance data

Alternator brand	LEROR SOMER	Voltage	Power
Alternator model	LSA47.2M7	380V	400 kW
Rated output power (kW)	400	400V	400 kW
Power factor	0.8	415V	400 kW
Rated current @ 380V and 100% load (A)	760		
Excitation system	Brushless		
THF (BS EN60034- 1)	<2%		
Bearing number	2		
Winding material	100% copper		
Wiring connection	Series star		
Rotor insulation class	H		
Winding pitch	2/3		
A.V.R. model	R450		
Voltage fluctuation(no load to full load)	± 0.5%		
Housing protection	IP23		
TIF (NEMA MG 1-22)	<50		
Excitation method	PMG		
Rated ambient temperature(°C)	40		
Rated stator temperature rise(°C)	125		

### Efficient gas engine

#### General data

NO. of cylinders		12
Engine type		4-stroke, turbo charged and air to water cooled, lean burn
Cylinder arrangement		V-form
Bore x stroke	mm	128×142
Displacement	L	21.93
Compression ratio		12 : 1
Rated speed	rpm	1500
Rated output power	kW	420
Excess air factor		1.45
Rotation direction		Anti-clockwise viewed on flywheel
Ignition timing	°BTDC	17°

#### Cooling system

Coolant refilling capacity	L	23
Max. jacket water operating pressure	kPa	300
Min. jacket water circulation flow	L/min	701
Min. jacket water temperature	°C	80
Max. jacket water temperature	°C	88
Max. jacket water difference(inlet-outlet)	K	6
Min. circulation flow LT	L/min	80
Min. circulation flow HT	L/min	169
Coolant type	Mixture of 40% antifreeze and 60% clean fresh water. Lower ambient temperature, higher content of antifreeze.	

#### Induction/exhaust system

Exhaust flow(wet)	kg/h	2093
Combustion air flow	kg/h	1879
Exhaust temperature	°C	510
Max. exhaust back pressure	mbar	40
Max. suction restriction	mbar	15

#### Fuel control system

Gas train, Including:	ball valves
	filters
	gas pressure gauge
	safety solenoid valves
	constant pressure regulator etc
	gas pressure relief valve

#### Lubrication system

Max. refilling capacity	L	90
Min. refilling capacity	L	40
Max. consumption	kg/h	0.2
Lubrication oil pump	Gear driven	

#### Energy balance and gas flow

Load	100%	75%	50%
Mechanical power, kW	420	315	210
Coolant heat, kW	257	225	180
Mixture heat HT, kW	38	29	4
Mixture heat LT, kW	22	16	10
Exhaust heat up to 120°C, kW	233	189	140
Max. radiation heat, kW	44	23	15
Energy input, kW	1050	834	589
Combustion air flow, kg/h	1879	1482	1015
Fuel consumption, m <sup>3</sup> /h	163	128	88
Exhaust gas flow, kg/h	2093	1652	1135

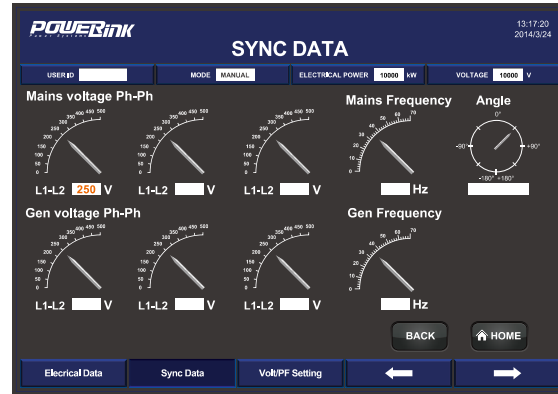
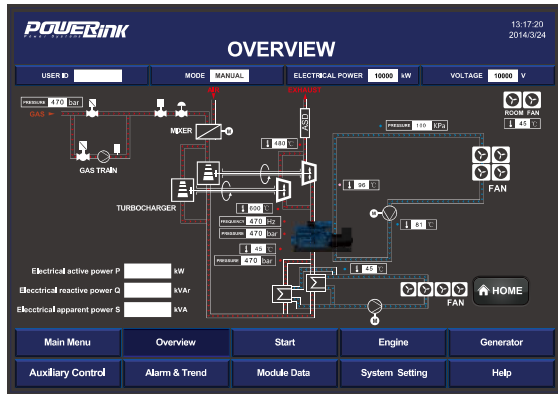
#### Ignition system

Ignition type	Electronic ignition system
Polarity	Negative earth
Spark plug	Separate for every cylinder

Fuel: Special Gas - LHV = 21.6 MJ/m<sup>3</sup>

### PCC-300 control system

Open control system is adopted with touch screen display , and various functions, including: engine protection and control, paralleling between gensets or gensets and mains, and CHP control functions, as well as communication functions, etc.



#### Main functions

- Engine monitor : coolant, lubrication, exhaust, battery
- Supply gas circuit monitor: pressure, temperature and CH4 content
- Auto paralleling and load share
- Voltage and PF control
- Alternator data : U, I, Hz, kW, kVA, kVar, PF, kWh, kVAh
- Mains data: U, I, Hz, kW, kVar, PF
- Modbus communication protocol based on RS232 and RS485 interfaces
- SMS message
- Internet connection and USB 2.0 interface
- 10-inch touch screen
- Internet monitor, auto orientation and cloud communication
- 1000 history events log

#### Advantages

- Accordant with consumer requirement
- Complete control project
- Convenient remote monitor and service
- Simplified engine start/stop control
- Enhanced stability and safety

#### Standard protection functions

- Alternator protection**
- 2xReverse power
  - 2xOverload
  - 4xOvercurrent
  - 1xOvervoltage
  - 1xUndervoltage
  - 1xOver/under frequency
  - 1xUnbalanced current
- Busbar/mains protection**
- 1xOvervoltage
  - 1xUndervoltage
  - 1xOver/under frequency
  - 1xPhase sequence
  - 1xROCOF alarm

#### Standard control functions

- Power control**
- RPM control(synchronization)
  - Power control(grid connection)
  - Load share(island )
- Lubrication control**
- Auto refilling
  - Warning and monitoring
- Fan control**
- Ventilation for engine room
  - Radiator fan
  - Emergency radiator fan
- Engine protection**
- Various routine and customized protection functions
  - Monitoring
- Voltage control**
- Voltage tracking (synchronization)
  - Voltage control(island)
  - PF control(grid connection)
  - Reactive power share (island)
- Pump control**
- Cooling system
  - Emergency radiator
- Valve control**
- Cooling system
  - Heating system
  - Emergency radiator

### Standard configuration

Engine	Alternator	Canopy and base	Electrical cabinet
Gas engine Ignition system Lambda controller Electronic governor actuator Electrical start motor Battery system Auto charging system Detonation control system Cylinder temp. protection system Coupling	PMG AC alternator H class insulation IP23 protection AVR voltage regulator PF control	Steel monocoque base frame Engine bracket Vibration isolators Alternator base Soundproof canopy	Air circuit breaker Paralleling control system 10-inch touch screen Communication interfaces Electrical switch cabinet Lighting system Smoke alarm system
Gas supply system	Lubrication system	Standard voltage	Induction/ exhaust system
Gas safety train Gas leakage protection Air/fuel mixer	Oil filter Daily auxiliary oil tank Auto refilling oil system	380/220V 400/230V 415/240V	Air filter Exhaust silencer Exhaust bellows Ventilation fan
Heat exchange system	Service and documents		
Exhaust heat exchanger Jacket water circulation pump Jacket water heat exchanger Mixture circulation pump Mixture radiator Jacket water heater Expansion tank, Shut-off valve Three-way auto proportional valve Emergency radiator	Tools package Installation and operation manual Maintenance manual Software manual Parts manual	Engine operation and maintenance manual Gas quality specification Control system manual After service guide Standard package	

### Optional configuration

Engine	Alternator	Service and documents	Lubrication system	Voltage
Heavy duty air filter Backfire safety control valve	Space heater, AVR Treatments against humidity and corrosion	Service tools Maintenance and service parts	Oil consumption gauge New and used oil tank	200V 220V 230V 240V
Canopy and base	Exhaust system	Electrical system	Gas supply system	
SECC base frame	Guard shield from touch Residential silencer Three-way catalytic converter	Lightning protection	Gas flow gauge Refrigerated gas drier Gas compressor	Emergency relief flare Free water separator Gas purification plant