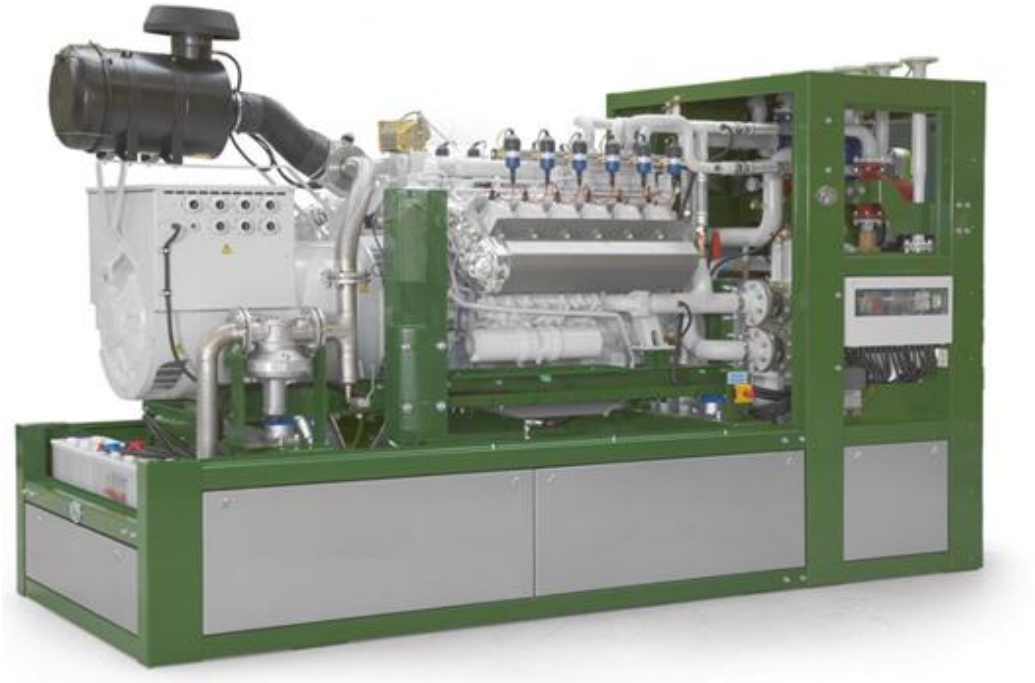


Picture: symbolic - may deviate from module described

Compact CHP module ready for connection, mainly consisting of

- Gas-Otto-engine from industriale series production
- air-cooled, self-excited, brushless synchronous generator
- exhaust gas heat exchanger integrated in primary cooling water circuit
- oxidising catalyst integrated in exhaust gas heat exchanger
- oil reservoir with automatic oil top-up device
- control cabinet with programmable logi control and operating panel
- gas pressure regulation and safety ramp

Integrated heat recovery system assembly, mainly consisting of

- expansion tank for engine and mixture cooling circuit
- safety valve in engine, mixture and heating circuit
- filling, drain and bleeding valves
- transfer plate heat exchanger
- pumps for engine, mixture and heating circuit
- 3-way mixing valve for return temperature increase

Water and gas connections are equipped with compensators. All water-side connections above the heat recovery assembly are directed upwards.

Engine and alternator are linked by a pluggable elastic metal-plastics coupling to compensate radial, axial and angular disalignment and mounted on vibration damping elements on the module baseframe.

Moreover the module baseframe is isolated from the installation surface by anti-oscillation elements.

The control cabinet is executed as a separate unit. All regulation and control functions as well as operational controls are integrated. The menu-navigated touch-screen allows to read and adjust all performance and status data.

The CHP module is driven by a water-cooled, supercharged Gas-Otto engine designed for stationary continuous operation. The microprocessor-controlled ignition system ensures the optimal adaption of ignition timing and energy to the gas quality (methane no.).

Lambda control is carried *without* lambda probe by using a calculation programme, which sets the optimal lambda value for every operational status based on actual power, charging pressure and mixture temperature.

The twin-stage mixture cooling with low and high temperature circuit ensures an exceptionally high electrical efficiency as well as an optimal utilization of thermal power of the mixture heat.

The oil level control is carried out by a sight glass connected to the oil pan with low oil level indication. A 35 litres oil reservoir ensures automatic oil topping-up between oil changing intervals.

Engine data	Hz	50
Mixture cooling to	°C	50
Nominal speed	1/min	1500
ISO standard power (mech.)	kW	415
Stoichiometric ratio (Lambda)	λ	1,6
Arrangement of cylinders		V
Number of Cylinders		12
Bore	mm	128
Stroke	mm	142
Swept volume	l	21,93
Sense of rotation (viewing on flywheel)		left
Housing of flywheel		SAE 1
tooth rim with number of teeth	Z	160
compression ratio	ε	12,0 : 1
mean effective pressure	bar	15,32
average piston speed	m/s	7,1

Power data	Hz	50
Load	%	100
Ignition timing BTDC	degrees	14
ISO standard power (mech.)	kW	415
Electrical Power	kW	400
Cooling water heat	kW	234
Mixture heat (high temperature circuit)	kW	53
Mixture heat (low temperature circuit)	kW	16
Exhaust gas heat down to 120 °C	kW	216
Useable thermal power at 120 °C exhaust gas	kW	504
Heat radiation of module (max.)	kW	70
Fuel power (consumption)	kW	1032
Specifici fuel consumption (mech.)	kWh/kWh	2,49
Specific fuel consumption (el.)	kWh/kWh	2,58

Temperatures and pressures		
Exhaust gas temperature after turbine	°C	440
Exhaust gas back pressure (max.)	mbar	40
Heating water return temperature (max)	°C	70
Heating water header temperature (max)	°C	90
Pressure loss heating circuit (max)	mbar	150
Underpressure at the air intake (max)	mbar	15

Emission values at 5% residual oxygen and dry exhaust gas		
NOx	mg/Nm³	< 500
CO	mg/Nm³	< 300

Engine utilities		
Specific lubricating oil consumption	g/kWh	0,5
Filling capacity lubricating oil min./max.	l	40/90
		0
Filling capacity cooling water	l	23
Operating pressure (max.)	bar	3
Cooling water flow	l/min	656
Cooling water temperature min.	°C	80
Cooling water temperature max.	°C	88
Difference (inlet/outlet max.)	K	6
Mixture inlet temperature after throttle valve max.	°C	50
Mixture cooling water inlet temperature.	°C	45
low temperature circuit (max.)		
Mixture cooling water flow	l/min	89
low temperature circuit (max.)		
Mixture cooling water inlet termperature	°C	85
high temperature circuit (max.)		
Mixture cooling water flow	l/min	306
high temperature circuit (max.)		

Efficiencies		
Electrical	%	38,8
Mechanical	%	40,2
Thermal	%	48,9
Total (el. + th.)	%	87,6
Electrical-thermal power ratio		0,79

Mass and volume flows		
Combustion air mass flow	kg/h	2.045
Combustion air volume flow	m³/h	1.727
Inlet air volume flow (max.)	m³/h	15.704
Fuel mass flow	kg/h	81
Fuel volume flow	m³/h	101
Exhaust gas mass flow, wet	kg/h	2.126
Exhaust gas mass flow, dry	kg/h	1.993
Exhaust gas volume flow, wet	m³/h	1.675
Exhaust gas volume flow, dry	m³/h	1.484
Heating water volume flow (max.)	m³/h	29

Technical basic conditions

Standard reference conditions acc. to DIN-ISO-3046/I
Air pressure: 1000 mbar
Air temperature: 25 °C or 295 K, rel. Humidity: 30%
Gas quality accorcing "2G TA 04 Gas Quality"
All data are referred to engine full load at the indicated media temperatures and are subject to technical progress. Operating media and balance of plant have to be carried in accordance with 2G's technical instructions. Power reduction due to installation at altitude <400m a.s.l. and/or air suction temperature <30°C shall be specifically determined for each project.

Alternator data

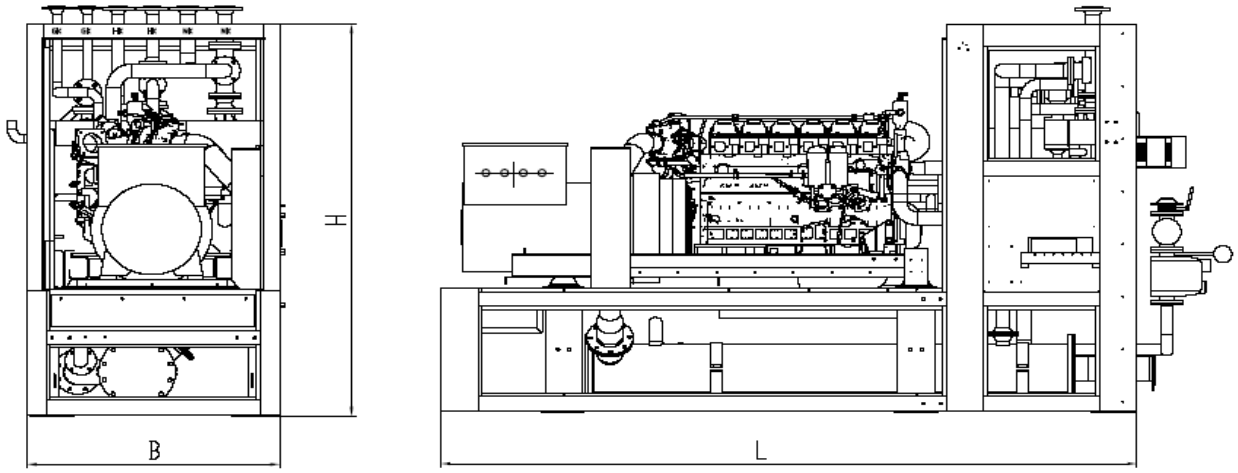
Manufacturer		Leroy Somer
Type		LSA 47.2 L9
Nominal power at cos φ = 0,8	kVA	500
Voltage	V	400
Frequency	Hz	50
Nominal speed	1/min	1500
Nominal current at Cos φ = 0,8	A	722
Cos φ		0,8 - 1
Efficiency (full load) at Cos φ = 1	%	96,50
Efficiency (full load) at Cos φ = 0,8	%	95,20
Reactance X"d	%	13,00
Reactance Xi = X2	%	16,00
Mass moment of inertia	kg m²	8,30
Stator circuit		star
Ambient air temperature	°C	40
Protection class		IP 23

Cos φ shall be between 0,8 and 1,0 over the entire power range.

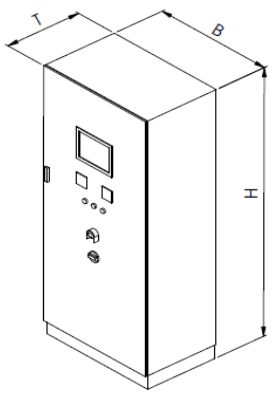
Main dimensions and weights

Module:		
Length (L):	mm	4.050
Height (H):	mm	2.320
Width (B):	mm	1.500
Weight (approx.)	kg	5.900
Control switchboard		
Height (H)	mm	2.000
Width (B)	mm	800
Depth (T)	mm	600
Weight (approx.)	kg	200
Power switchboard		
Height (H)	mm	2.000
Width (B)	mm	600
Depth (T)	mm	500
Weight (approx.)	kg	200

Module:



Control switchboard



Power switchboard