

Technical specification

agenitor[®] 406

Gas type: biogas (50% CH₄, 50% CO₂)



Picture: Symbolically, might differ from the described module

Compact CHP ready for connection, mainly consisting of

- serially manufactured Industrial-Gas-Otto-engine
- air-cooled synchronous generator
- waste-gas heat exchanger integrated in primary cooling circuit
- Oxikat integrated in waste-gas heat exchanger (optional)
- oil reservoir with automatic oil feeding
- control cabinet with programmable controller and operating unit
- gas train

Integrated heat exchanger basket, mainly consisting of

- expansion tank in motor circuit and mixture circuit
- relief valve in motor circuit, mixture circuit and heater circuit
- filling valves, cleanout valves and exhaust valves
- plate heat exchanger
- pumps for motor circuit, mixture circuit and heater circuit

Water and gas connections are executed with compensators. All water-side connections are directed upwards above the heat exchanger basket.

Engine and generator are connected through a pluggable elastic metal-plastic coupler to compensate radial offset, axial offset or angular offset. It is mounted on a framework vibration-cushionedly.

Furthermore the framework is uncoupled through oscillation decoupling elements.

The control cabinet is executed as a separate unit. All regulation and control functions as well as control elements are part of the control cabinet. Assisted by a menu-navigated touch-screen performance data and state data could be readed and adjusted easily.

The drive of the CHP is caused by a water-cooled, supercharged Otto-Gas-Engine. A microprocessor-controlled ignition ensures an optimal adaption of the ignition point and the ignition energy to the gas quality (methane number).

The lambda control is covered without a special probe. The value is calculated with the variables of the actual power, charge pressure and the gas mix temperature. The lambda value is calculated for the optimum of each operation status.

Besides an exceedingly high electrical efficiency, a double-staged mixture cooling, including a low temperature circuit and a high temperature circuit, leads to an ideal usage of thermal power from the mixture heat.

The oil level control is carried out by a sight glass with oil level deficit indication, which is connected with the oilpan.

Engine data			Engine utilities		
	Hz	50			
Mixture cooling to	°C	50	Lubricate consumption	g/kWh	0,2
RPM	1/min	1.500	Filling capacity lubricant (min./max.)	l	40,0
ISO standard power (mech.)	kW	261	Filling capacity cooling water	l	16
Air ration (Lambda)	λ	1,57	Operating pressure (max.)	bar	2
Configuration		row	Cooling water recirculated quantity (min.)	m³/h	30,8
No of cylinders		6	Cooling water temperature (min.)	°C	80
Bore	mm	130	Cooling water temperature (max.)	°C	88
Stroke	mm	150	Balance (inflow/exit, max.)	K	6
Swept volume	l	11,9			
Direction of rotation (look on balance wheel)		left	Mixture inflow temperature after damper (max.)	°C	50
body of balance wheel		SAE 1	Mixture cooling water, inflow temperature low	°C	45
tooth rim with number of teeth	Z	167	temperature circuit (max.)		
			Mixture cooling water recirculated quantity low	m³/h	8,1
compression ratio	ε	14,0 : 1	temperature circuit (max.)		
average effective pressure	bar	17,5	Mixture cooling water, inflow temperature high	°C	85
average piston speed	m/s	7,5	temperature circuit (max.)		
			Mixture cooling water recirculated quantity high	m³/h	11,1
			temperature circuit (max.)		
Power data			Efficiencies		
	Hz	50			
Load	%	100	Load	%	50 75 100
ISO standard power (mech.)	kW	261	Electrical	%	38,5 40,9 42,5
Electrical power	kW	250	Mechanical	%	40,6 42,7 44,3
Cooling water heat	kW	98	Thermal	%	46,9 43,1 42,5
Mixture heat (high temperature circuit)	kW	33	Total (el. + th.)	%	85,4 84,0 85,0
Mixture heat (low temperature circuit)	kW	24	Power classification number		0,82 0,95 1,00
Waste gas heat up to 180°C	kW	118			
			Mass flows and volume flows		
useable thermal power at 180°C	kW	250	Combustion air mass flow	kg/h	1.145
radiant heat of module (max.)	kW	33	Combustion air volume flow	m³/h	967
nominal power	kW	589	Supply air volume flow (min.)	m³/h	7.565
Fuel consumption (mech.)	kWh/kWh	2,26			
Fuel consumption (el.)	kWh/kWh	2,35	Combustible mass flow	kg/h	159
			Combustible volume flow	m³/h	118
Temperatures and pressures					
Waste gas temperatur after turbine	°C	469	Waste gas mass flow, wet	kg/h	1.304
			Waste gas mass flow, dry	kg/h	1.225
Heating water return temperature (max)	°C	70	Waste gas volume flow, wet	m³/h	996
Heating water flow temperature (max)	°C	90	Waste gas volume flow, dry	m³/h	885
Pressure decrease heating circuit internally	mbar	200	Heating water volume flow (max.)	m³/h	14,3
maximum backpressure at the air intake	mbar	15	Technical basic conditions		
			Power conditions acc. To DIN-ISO-3046		
			(The tolerance of the nominal energy input is +5% at nominal output. The tolerance for the usable thermal capacity is 7% at the nominal output.)		
			Norm conditions: air pressure: 1000 mbar, air temperature: 25°C, rel. Humidity: 30%. Gasquality according "2G TA 04 Gas". All data are related to full load engine running at denoted media temperatures and are subject to technical advancements. Equipment as well as installation systems have to meet all technical instructions of 2G. 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.		

Generator data

Manufacturer	Leroy Sommer	
Type	LSA 47.2 S4/4p	
Power at Cos $\varphi = 0,8$	kVA	313
Voltage	V	400
Frequency	Hz	50
Rated speed	1/min	1500
Nominal current at Cos $\varphi = 0,8$	A	451
Cos φ	0,8-1	
Efficiency (full load) at Cos $\varphi = 1$	%	95,9
Efficiency (full load) at Cos $\varphi = 0,8$	%	94,5
Reactance X"d	%	13,2
Reactance Xi = X2	%	15,5
Mass moment of inertia	kg m ²	6,7
Stator circuit	Stern	
Ambient air temperature	°C	40
Protection class	IP 23	
Cos φ has to be between 0,8 and 1,0 within		

Sound emissions engine

Engine surface noise (A-weighted)	dB(A)	110
Exhaust orifice noise according to DIN 45635-11 (linear weighted)	dB(A)	146

Emission value at 5% residual oxygen

NOx	mg/Nm ³	< 500
CO	mg/Nm ³	< 1000
CO(with catalyst)	mg/Nm ³	< 300

Piping connection

Gas		
Interfaces	-	DN 65
Gas pressure at rated load min.	mbar	30
Heating		
Interfaces	-	DN 50
Pressure reserve ca.	mbar	300
Exhaust		
Interfaces	-	DN 150
exhaust back pressure after turbine max.	mbar	40

Main dimensions and weights

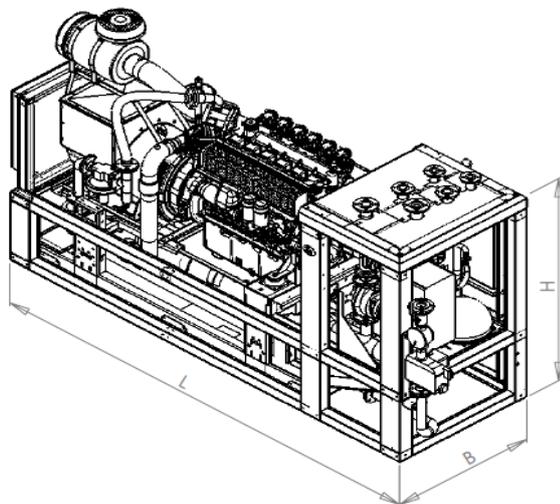
Module		
Length (L)	mm	3.990
Height (H)	mm	2.000
Width (B)	mm	1.300
Weight (approx.)	kg	5.260

Control cabinet

Height (H)	mm	2.000
Width (B)	mm	800
Depth (T)	mm	600
Weight (approx.)	kg	200

Power switch cabinet

Height (H)	mm	2.000
Width (B)	mm	600
Depth (T)	mm	500
Weight (approx.)	kg	150

Module

Control- and power cabinet
