



Illustration: may differ from specified 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
- 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
- 3-way mixing valve for return temperature increase

Water and gas connections are executed with compensators.

Motor and generator are connected through a pluggable elastic metal plastics 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 display performance data and state data could be read and adjusted easily.

The drive of the CHP is caused by a water-cooled, supercharged Otto-Gas-Engine. It is stationary engine designed for permanent operation. 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 carried out without lambda probe over the combustion chamber temperature, which is determined with the aid of a thermocouple in the cylinder. The combustion chamber temperature represents a proxy for the mixing ratio λ . Using the combustion chamber temperature, the optimum lambda value for each operating condition is set.

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.

Technical specification



Kraft-Wärme-Kopplung

avus1000c

Biogas 50% CH₄, 50% CO₂

Engine data			Engine utilities		
	Hz	400			
Mixture cooling to	°C	55	Lubricate consumption	kg/h	0,24
RPM	1/min	1.500	Filling capacity lubricant min./max.	l	205
ISO standard power (mech.)	kW	1.233			
Arrangement of cylinders		V	Filling capacity cooling water	l	111
Number of cylinders		12	Operating pressure (max.)	bar	2,5
Bore	mm	170	Cooling water recirculated quantity (min. / max.)	m ³ /h	36 / 56
Stroke	mm	195	Cooling water temperature (inflow)	°C	80
Swept volume	l	53	Cooling water temperature (exit)	°C	93
			Balance (inflow/exit, max.)	K	13
direction of rotation (look on balance wheel)		links			
			Mixture inflow temperature after damper (max.)	°C	55
compression ratio	ε	13,5 : 1	Mixture cooling water, inflow temperature low	°C	50
average effective pressure	bar	18,6	temperature circuit (max.)		
average piston speed	m/s	9,8	Mixture cooling water recirculated quantity low	m ³ /h	35
			temperature circuit (max.)		
Power data			Efficiencies		
	Hz	50			
Load	%	100		%	100 75 50
Ignition timing	grad	variabel	Electrical	%	41,5 40,6 38,5
ISO standard power (mech.)	kW	1.233	Mechanical	%	42,6 - -
Electrical power	kW el	1.200	Thermal	%	42,8 43,6 45,3
			Total (el. + th.)	%	84,3 84,2 83,8
Cooling water heat	kW	637			
Low temperature mixture heat	kW	94	Power number		0,97 0,93 0,85
High temperature mixture heat	kW	0			
Waste gas heat up to 180°C	kW	602	Mass flows and volume flows		
useable thermal power at 180°C	kW	1.239			
radiant heat of module (max.)	kW	135	Combustion air mass flow	kg/h	5.579
nominal power	kW	2.892	Combustion air volume flow	Nm ³ /h	5.132
Fuel consumption (mech.)	kWh/kWh	2,35	Supply air volume flow	m ³ /h	47.132
Fuel consumption (el.)	kWh/kWh el	2,41			
			Combustible mass flow	kg/h	783
			Combustible volume flow	m ³ /h	580
Temperatures and pressures					
Waste gas temperature after turbine	°C	484	Waste gas mass flow, wet	kg/h	6.360
exhaus back pressure (max.)	mbar	50	Waste gas mass flow, dry	kg/h	5.947
			Waste gas volume flow, wet	m ³ /h	4.844
Heating water return temperature (max.)	°C	70	Waste gas volume flow, dry	m ³ /h	4.296
Heating water flow temperature (max.)	°C	90			
Pressure decrease heating circuit (max.)	mbar	200	Heating water volume flow (max.)	m ³ /h	70,969
maximum backpressure at the air intake	mbar	5	Technical basic conditions		
			Power conditions acc. to DIN-ISO-3046		
			Norm conditions: air pressure: 1000mbar,		
			air temperature: 25°C or 295 K, rel. humidity: 30%		
			Gasquality according "TR 0199-99-3017"		
			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		
			MWM technical instructions.		
			When installed > 400 m and/or with intake air temperatures > 30 °C,		
			the power reduction must be determined on a project-specific basis.		
Emission value at 5% residual oxygen					
NOx	mg/Nm ³	< 500			
CO	mg/Nm ³	< 1.000			

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Biogas 50% CH₄, 50% CO₂

Generator data

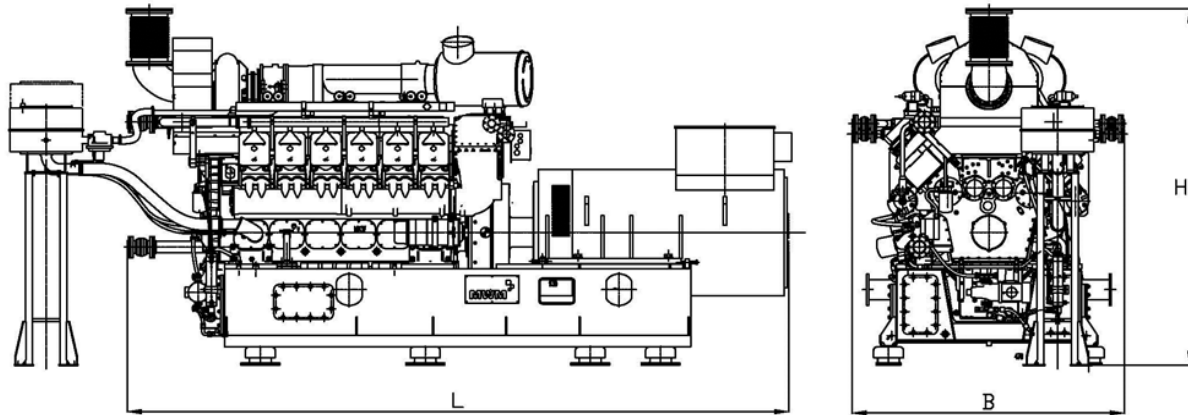
Manufacturer		Marelli
Type		MJB 500 MB 4
Power	kVA	1.487
Voltage	V	400
Frequency	Hz	50
Rated Speed	1/min	1500
Nominal current at Cos φ = 0,8	A	2.165
Cos φ		1
Efficiency (full load) at Cos φ = 1	%	97,26
Efficiency (full load) at Cos φ = 0,8	%	96,42
Reactance X _d	p.u.	209
Reactance X' _d	p.u.	19,8
Reactance X'' _d	p.u.	12
Mass moment of inertia	kgm ²	50
Stator circuit		Stern
Ambient air temperature	°C	40
Protection class		IP 23

The Cos Phi can be adjusted in between 0,8 inductive (lagging) and 0,95 capacitive (leading). The precise adjustment value however should be decided by the Utility company.

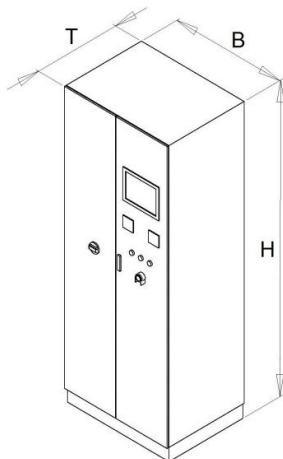
Main dimensions and weights

Module:		
Length (L)	mm	5.457
Height (H)	mm	2.474
Width (B)	mm	1.802
Weight dry (approx.)	kg	11.730
Control cabinet:		
Height (H)	mm	2.200
Width (B)	mm	1.400
Depth (T)	mm	600
Weight (approx.)	kg	250
Power switch cabinet:		
Height (H)	mm	2.100
Width (B)	mm	600
Depth (T)	mm	600
Weight (approx.)	kg	120

Modul:



Control cabinet:



Power switch cabinet:

