MAH 49.4 TI 211A

100% Wasserstoff

Principle:	4-stroke Otto gas engine
Number of cylinders:	4 in series
Engine cooling:	without internal coolant pump Cooling by external pump and temperature control
Lubricating oil supply:	Pressure lubrication by gear-driven pump, replaceable lubricating oil filter The lubricating oil cooler is integrated in the main flow. Cooling by engine coolant circuit.
Spark plugs:	Special spark plugs for industrial gas engines.
Starter:	Magnetic starter 24 V - 4.0 kW

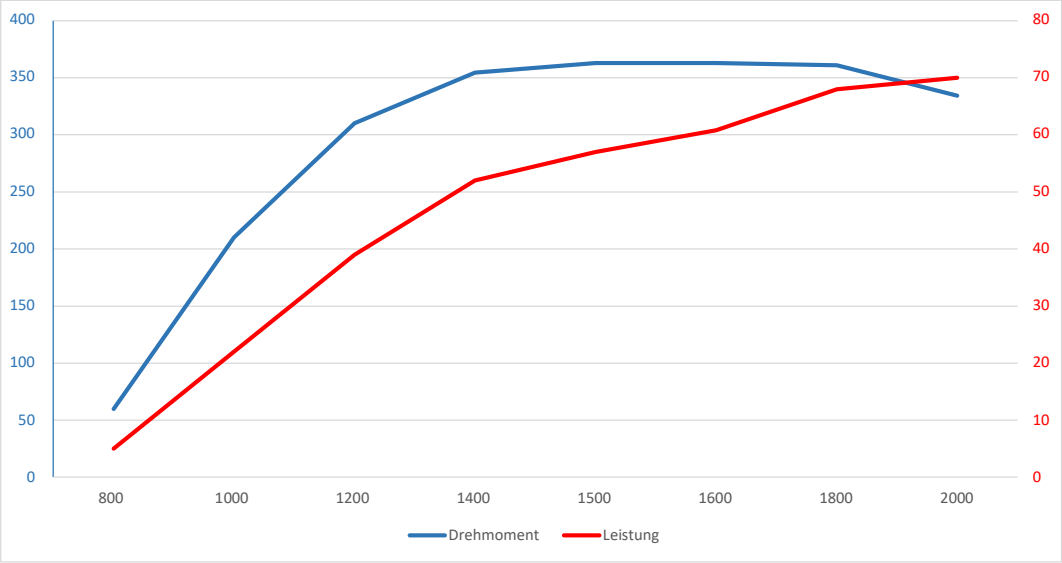
General data

Type		inline
Number of cylinders		4
Bore	mm	108
Stroke	mm	134
Displacement	l	4,91
Firing order		1-2-4-3
Direction of rotation with view of flywheel		counterclockwise
Flywheel housing		SAE 2
Number of teeth flywheel		141
Compression ratio ε		11:1
Lubricating oil consumption up to	g/kWh	0,3
Oil sump volume min./max.	l	10/11,5
Coolant filling quantity	l	12
min./max. operating pressure of coolant	bar	0,5/2,5
Minimum coolant temperature	°C	75
Maximum coolant temperature	°C	90
max. difference coolant inlet/outlet	K	6
Max. intake pressure before intake manifold	mbar	15
Max. exhaust back pressure	mbar	50
Engine width in mm		635
Engine length in mm		900
Engine height in mm		820
Engine weight, dry kg		410

Performance data mechanical at 1500 rpm

Rated speed	min-1	1500	1500	1500
Load rate	%	100	75	50
Lambda	λ	2,6	2,6	2,6
Ignition timing before top dead centre	grad	1	1	1
Average piston speed m/s	m/s	7	7	7
Max. Piston speed	m/s	11	11	11
Effective mean pressure	bar	9,29	6,60	4,40
Mechanical power	kW_{mech}	57	41	27

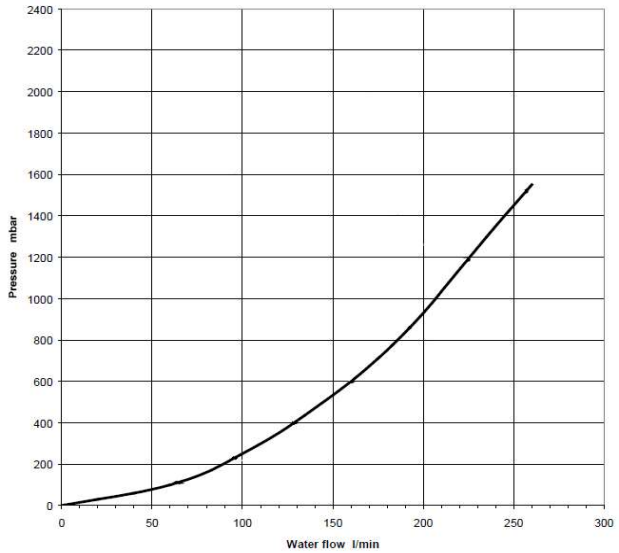
All-speed performance



Performance data thermal at 1500 rpm

Thermal output of the engine cooling water	kW	42,0	32,0	25,4
Heat output of the exhaust gas 100 °C	kW	34,9	23,6	14,7
Exhaust gas temperature	°C	390	366	330
Heat output of the charge air cooler	kW	5	3,1	1,5

Engine coolant resistance curve



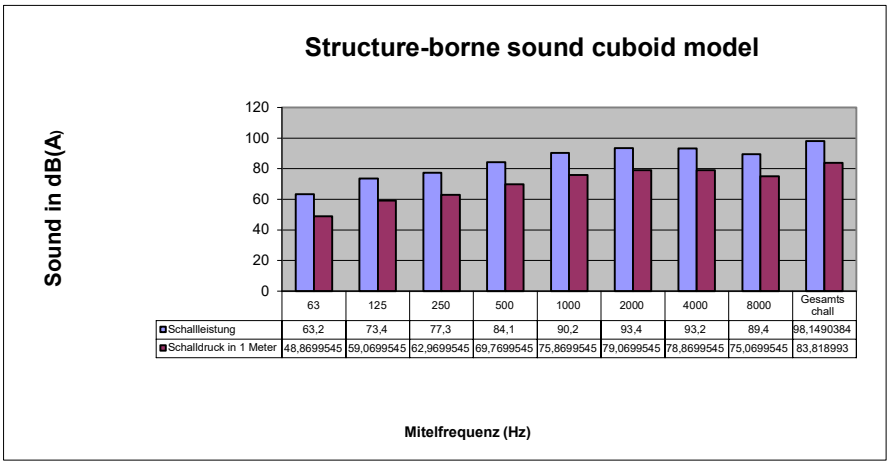
Power consumption				
Combustion power	kW	155	114	82

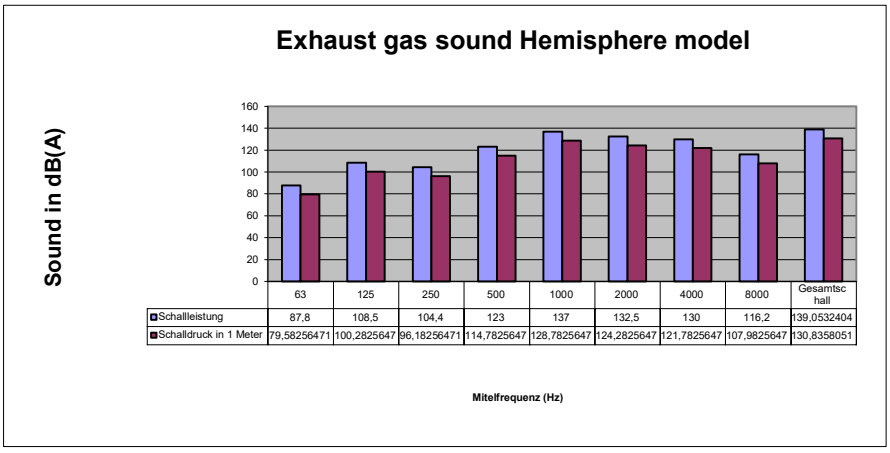
Efficiency				
ETA mechanical based on DIN ISO 3046-1 *	%	36,8	35,5	32,9
ETA thermal related to DIN ISO 3046-1 *	%	52,9	51,5	50,7
ETA total referred to DIN ISO 3046-1 *		89,6	87,0	83,6

Mass flows				
Air mass flow	kg/h	382,7	281,5	202,5
Gas mass flow	kg/h	4,7	3,4	2,5
Exhaust gas mass flow (wet)	kg/h	387,4	284,9	204,9

Exhaust emissions			
NOX	mg/Nm³	<60	at 5 % residual oxygen
CO	mg/Nm³	0	at 5 % residual oxygen
NMHC	mg/Nm³	<10	

Noise emissions





* DIN ISO 3046-1: The tolerance for specific fuel consumption is + 5 % at nominal power. The tolerance for the usable heat is 7 % at nominal power.
The technical data are based on standard conditions according to DIN ISO 3046-1.
All data in the data sheet are calculated values. These may deviate from the actual values.

Standard conditions:
Absolute air pressure: 1013 mBar
Air temperature: 25 °C
Relative humidity: 30 %.
Performance data for gas mixture with a calorific value of : 2,99 kWh N/m³ MZ 0
Performance adjustment in accordance with ambient conditions DIN ISO 3046-1
Cooling water data based on 40 % antifreeze content