

TECHNICAL SPECIFICATION INDOP 50M



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LIST OF TECHNICAL SPECIFICATIONS CHANGES

Nr.	DESCRIPTION	CHAPTER	DATE	PERFORMED BY	APPROVED BY
1	Flow data update in secondary circuit	/	24.1.2020	Andrić S.	Koradej M.
2	Maximum pressure in secondary circuit	/	18.2.2020	Andrić S.	Koradej M.
3	Edit: Electrical data of the CHP	Page 8	21.12.2022	Veternik S.	Koradej M.
4	Edit: Fresh oil tank volume data	Page 6	21.3.2023	Zdovc G.	Koradej M.
5	Total radiation heat added	Page 3	11.1.2024	Zdovc G.	Koradej M.

1 TECHNICAL DATA INDOP 50M

CHP type: Indoor version

Fuel type: Natural gas

Performance *	Load	without condensing system			With condensing system
		100%	75%	50%	Returning temp. 30°C
					100%
Mechanical power	kW	54	41	27	54
Electrical power	kW	50	38	24	50
Thermal power	kW	81	66	53	98
Energy input	kW	144	119	92	144
Efficiency LHV					
Electrical efficiency	%	34,7	31,9	26,1	34,7
Thermal efficiency	%	56,3	55,4	57,3	68,1
Total efficiency	%	91,0	87,3	83,4	102,8
Efficiency HHV					
Electrical efficiency	%	31,3	28,8	23,5	31,3
Thermal efficiency	%	50,8	50,0	51,7	61,4
Total efficiency	%	82,1	78,8	75,2	92,7
Thermal energy balance					
Exhaust gas	kW	35			52
Cooling liquid	kW	46			46
Power to heat ratio		0,62			0,51
Total radiation heat	kW	8			8
Fuel consumption					
Specific fuel consumption (mechanical)	kW _h /kW _{hmech}	2,67			2,67
Specific fuel consumption (electricity)	kW _h /kW _{helect}	2,88			2,88
Fuel gas					
Operating gas connection pressure	mbar	20-100			20-100
Gas volume flow	Nm ³ /h	14,4			14,4
Temperature regime					
Flow temperature	°C	85-90			85-90
Return temperature	°C	65-70			(30) 65-70
Standard temperature difference	K	20,0			20,0

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Secondary circuit			
Minimum flow volume 100% Water	m ³ /h	3,58	3,58
Minimum flow volume 40% Ethylene glycol - 60% Water	m ³ /h	3,86	3,86
Maximum pressure	bar	10,00	5,50
Minimum pressure	bar	2,50	2,50
Pressure drop Indop CHP unit	bar	0,30	0,30
Pressure drop condensation heat exchanger	bar	/	0,35

Air volume flow			
Volume flow of the inlet air into the unit (air temperature up to 20 °C)	m ³ /h	2699	2699
Volume flow of the outlet air from the unit (air temperature up to 20 °C)	m ³ /h	2547	2547
Volume flow of the inlet air into the unit (air temperature up to 25 °C)	m ³ /h	3577	3577
Volume flow of the outlet air from the unit (air temperature up to 25 °C)	m ³ /h	3425	3425
Volume flow of the inlet air into the unit (air temperature up to 30 °C)	m ³ /h	5380	5380
Volume flow of the outlet air from the unit (air temperature up to 30 °C)	m ³ /h	5228	5228
Max. pressure drop ventilation air duct (including silencer)	Pa	80	80
Ambient room temperature min/max	°C	(10/30)	(10/30)

Intercooler LT			
Max. permissible pressure drop for pipeline	bar	/	/
Max. returning temperature	°C	/	/
Max. pressure	bar	/	/
Min. pressure	bar	/	/
Min. flow rate (glycol/water mixture 40/60)	m ³ /h	/	/

Exhaust gases			
Temperature	°C	≈120	≈38
Volume flow	m ³ /h	222,5	176,1
Volume flow	Nm ³ /h	154,6	154,6
Mass flow, wet	kg/h	192	/

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Max. allowed backpressure after CHP	mbar	10,0	10,0
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Emissions (100% load @ 5% O₂)			
Carbon monoxide (CO)	mg/Nm ³	< 150	< 150
Nitrogen oxides (NO _x)	mg/Nm ³	< 125	< 125

Sound level			
Sound pressure level	dB(A)/1m (±2dB)	62,0	
Sound power level	dB(A) (±2dB)	70,0	

CHP dimensions, weight, connections		
Length (without handles, ventilation outlets)	mm	2600
Width (without handles, ventilation outlets)	mm	1150
Height (without handles, ventilation outlets)	mm	1750
Weight incl. Oil and coolant	kg	2000
Minimum length of the boiler room	mm	4600
Minimum width of the boiler room	mm	3150
Minimum height of the boiler room	mm	2950
Colour of CHP unit		RAL 5015

Dimensions of connections		
Heating circuit connections		DN40 PN16
Exhaust gas connection		DN80 PN6
Gas connection		DN25 PN16
Intercooler connection		/
Ventilating air duct connection	mm	Φ500

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Engine		
Manufacturer		MAN
Model		MAN E 0834 E 302
Engine type		L
Principle		Otto 4-Stroke
Number of cylinders		4
Bore	mm	108
Stroke	mm	125
Displacement	ccm ³	4580
Displacement	l	4,6
Rated speed	rpm	1500
Mean piston speed	m/s	6,3
Compression ratio	ϵ	13:1
Mean effective pressure	bar	9,43
ISO standard rating	kW	54
Lube oil consumption up to	kg/h	0,075
Lube oil filling quantity engine min/max	l	17/25
Engine weight	kg	430
Lube oil filling quantity fresh oil tank	l	60
Engine starter voltage - DC	V	24
Exhaust back pressure min./max.	mbar	5/40
Air-Fuel ratio control	λ	1
Ignition timing	°	18
Combustion air flow mass rate	kg/h	181
Exhaust gas outlet temperature a	°C	620
Noise level at distance 1m	dB(A)	98,3
Radiation heat	kW	12
Spark plug model		GK3-1
Spark plug gap		0,25-0,30

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Generator		
Manufacturer		Mecc Alte
Model		ECP34 1S4 C
Synchronous/Asynchronous		Synchronous
Synchronous/Asynchronous		Air cooled
Working power	kW	70
Apparent power	Kva	87,5
Voltage	V	400
Electric current (cos φ = 1)	A	101
Frequency	Hz	50
Insulation class		H
Nominal speed	rev./min	1500
Reactance		
Xd	%	324
Xd'	%	22,3
Xd''	%	7,4
Xq	%	170,2
Xq'	%	170,2
Xq''	%	29,5
X2	%	17,8
X0	%	3,59
Short circuit ratio	K _{cc}	0,36
Time constants:		
Td'	s	0,056
Td''	s	0,012
Tdo'	s	0,82
Ta	s	0,016
Excitation at no load	A	0,7
Excitation at full load	A	2,7
Protection		IP 21

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Electrical data of CHP unit		
max. Active power	kW	50
max. Apparent power S_{Amax} ($\cos \varphi$ 0.95):	kVA	52,6
$\cos \varphi$ (adjustable from 0.95 to 1)	ϕ	0,95
Nominal voltage UN	V	400
Current	A	75,9
Power supply		Three-phase
Possibility of island operation (option)		Option
Own electricity consumption (runing)	kW	2,1
Own electricity consumption (standby preheating ON)	kW	1,8
Own electricity consumption (standby preheating OFF)	kW	0,3
Max. Phase unbalance	%	8

Service interval	op. hours	1500
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Interface protection relay
CEI 0-21
VDE 0126-1-1
VDE-A-RN 4105
G99
G99 NI
G59/3, G83
IEC 60255
C10/11
IEn NR 055/2012

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Consumption of natural gas with H_u 10 kWh/m³ in standard atmospheric conditions. Basic technical data apply for standard conditions in accordance with specification. The recommended minimum continuous workload is 60 % of nominal power output. The defined technical data are based on standard conditions according to DIN ISO 3046-1. Any deviations from the standard conditions can cause changes in the value of the thermal data and should be considered when designing the thermal circuit equipment (intercooler, forced cooling). When defining dimensions for the thermal circuit equipment, it is recommended that next to the output thermal power tolerance of $\pm 7\%$, an additional 10% reserve should be considered. Electric power output $\pm 5\%$. Tolerance for special fuel consumption of rated output $\pm 5\%$.

Note:

All data provided in technical specifications are based on full load of the engine – unless otherwise defined – with planned temperatures, use of natural gas with a calorific value of 10 kWh/Nm³ and the gas methane number > 90, and considering technological development and changes. All pressure parameters should be measured with the stipulated pressure gauges (Pa, bar).

2. MAN NATURALLY ASPIRATED ENGINE POWER REDUCTION

