

ANNEX II to Purchase Order No.54261R6_Zorg Biogas

Technical data

2300 kWel; 400 V, 50 Hz; Bio gas

Design conditions

Inlet air temperature / rel. Humidity:	[°C] / [%]	25 / 60
Altitude:	[m]	100
Exhaust temp. after heat exchanger:	[°C]	180
NO _x Emission (tolerance - 8%):	[mg/Nm ³ @5%O ₂]	500
Datasheet specification considers the grid codes EU 631/2016 (NC-RfG)		

Genset:

Engine / Configuration code:	TCG 3020 V20	X
Speed / Mean piston speed:	[1/min] / [m/s]	1500 / 9.8
Configuration / number of cylinders:	[-]	V / 20
Bore / Stroke / Displacement:	[mm]/[mm]/[dm ³]	170 / 195 / 89
Compression ratio:	[-]	14
Mean effective pressure:	[bar]	21,3
Mean lube oil consumption at full load:	[g/kWh]	0,15
Generator:	Marelli MJB 630 LB4	
Voltage / voltage range / cos Phi:	[V] / [%] / [-]	400 / 10 / 1
Speed / frequency:	[1/min] / [Hz]	1500 / 50

Fuel gas data: 2)

Methane number:	[-]	141
Lower calorific value:	[kWh/Nm ³]	5,48
Gas density:	[kg/Nm ³]	1,25
Standard gas:	Bio gas	
Analysis: CO ₂	[Vol%]	40,00
N ₂	[Vol%]	4,70
O ₂	[Vol%]	0,30
H ₂	[Vol%]	0,00
CO	[Vol%]	0,00
CH ₄	[Vol%]	55,00
C ₂ H ₄	[Vol%]	0,00
C ₂ H ₆	[Vol%]	0,00
C ₃ H ₆	[Vol%]	0,00
C ₃ H ₈	[Vol%]	0,00
C ₄ H ₈	[Vol%]	0,00
C ₄ H ₁₀	[Vol%]	0,00
C ₅ H ₁₂	[Vol%]	0,00
C _x H _y	[Vol%]	0,00
H ₂ S	[Vol%]	0,00
H ₂ O	[Vol%]	0

Energy balance

Load:	[%]	100	75	50
Electrical power COP acc. ISO 8528-1:	[kW]	2300	1725	1150
Engine jacket water heat:	[kW ±8%]	1246	947	673
Intercooler LT heat:	[kW ±8%]	150	113	69
Lube oil heat:	[kW ±8%]			
Exhaust heat with temp. after heat exchanger:	[kW ±8%]	919	771	614
Exhaust temperature:	[°C ±25°C]	431	458	499
Exhaust mass flow wet / dry:	[kg/h]	11872 / 10857	8926 / 8145	6154 / 5602
Combustion mass air flow:	[kg/h]	10669	7997	5495
Radiation heat engine / generator:	[kW ±8%]	74 / 62	71 / 53	68 / 47
Fuel consumption:	[kW+5%]	5287	4083	2899
Electrical / thermal efficiency:	[%]	43,5 / 40,9	42,3 / 42,1	39,7 / 44,4
Total efficiency:	[%]	84,4	84,4	84,1

System parameters 1)

Ventilation air flow (comb. air incl.) with ΔT = 15K	[kg/h]	55100
Combustion air temperature minimum / design:	[°C]	5 / 25
Exhaust back pressure from / to:	[mbar]	30 / 50
Exhaust volume flow wet / dry:	[Nm ³ /h]	9089 / 8029
Maximum pressure loss in front of air cleaner:	[mbar]	5
Zero-pressure gas control unit selectable from / to: 2)	[mbar]	20 ³⁾ / 200
Pre-pressure gas control unit selectable from / to: 2)	[bar]	0,5 / 10
Starter battery 24V, capacity required:	[Ah]	430
Starter motor:	[kWel.] / [VDC]	18 / 24
Lube oil content engine / base frame*:	[dm ³]	300 / 685*
Dry weight engine / genset:	[kg]	8170 / 21590

Cooling system

Glycol content engine jacket water / intercooler:	[% Vol.]	33 / 33
Water volume engine jacket / intercooler:	[dm ³]	210 / 22
KVS / Cv value engine jacket water / intercooler:	[m ³ /h]	47 / 58
Jacket water coolant temperature in / out:	[°C]	78 / 93
Intercooler coolant temperature in / out:	[°C]	45 / 48
Engine jacket water flow rate from / to:	[m ³ /h]	60 / 85
Water flow rate engine jacket water / intercooler:	[m ³ /h]	76 / 40
Water pressure loss engine jacket water / intercooler:	[bar]	2,6 / 0,5



1) See also "Layout of power plants":

2) See also Techn. Circular 0199-99-3017

3) Minimum pressure may be higher, depending on project conditions.

*) optional

Frequency band f [Hz]	25	31,5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k	12.5k	16k	L _{WA} [dB(A)]	S [m ²]
	Air-borne noise 4) L _{W, Terz} [dB(lin)]	94,8	96,1	97,4	101,0	103,7	107,3	112,7	118,9	115,5	115,3	112,7	110,8	112,1	111,5	108,8	108,6	109,3	108,5	108,2	108,8	106,4	104,8	103,8	102,9	106,1	116,7	104,3			
Exhaust noise 5) L _{W, Terz} [dB(lin)]	117,7	117,3	120,0	124,0	125,4	126,5	130,7	142,5	127,4	126,7	131,0	125,5	125,2	125,6	126,4	125,1	124,5	123,8	124,3	124,0	122,7	122,3	119,8	118,5	116,8	115,4	115,2	113,1	110,7	135,6	15,5 ⁶⁾

4) DIN EN ISO 9614-2 (s=±4 dB)

5) Measured in exhaust pipe (f ≤ 250Hz: ±5dB; f > 250Hz: ±3dB)

L_W: Sound power level

S: Area of measurement surface (S_p=1m²)

6) DIN 45635-11, Appendix A