

GENSET - WITHOUT RADIATOR

ENGINE SPEED (rpm):	1500
COMPRESSION RATIO:	12.1
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER - STAGE 2 INLET (°F):	118
AFTERCOOLER - STAGE 1 INLET (°F):	192
JACKET WATER OUTLET (°F):	210
ASPIRATION:	TA
COOLING SYSTEM:	JW+OC+1AC, 2AC+GB
CONTROL SYSTEM:	ADEM4 W/ IM
EXHAUST MANIFOLD:	DRY
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	1.0
SET POINT TIMING:	22

RATING STRATEGY:
FUEL SYSTEM:

HIGH ALTITUDE/AMBIENT
CAT LOW PRESSURE
WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:

FUEL:	Nat Gas
FUEL PRESSURE RANGE(psig): (See note 1)	2.0-5.0
FUEL METHANE NUMBER:	84.7
FUEL LHV (Btu/scf):	905
ALTITUDE(ft):	4300
INLET AIR TEMPERATURE(°F):	85
STANDARD RATED POWER:	3457 bhp@1500rpm
POWER FACTOR:	1.0
VOLTAGE(V):	4160-13800

RATING	NOTES	LOAD	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE			
			100%	100%	75%	50%
GENSET POWER (WITH GEARBOX, WITHOUT FAN)	(2)(3)	ekW	2489	2489	1867	1245
GENSET POWER (WITH GEARBOX, WITHOUT FAN)	(2)(3)	kVA	2489	2489	1867	1244
ENGINE POWER (WITHOUT GEARBOX, WITHOUT FAN)	(3)	bhp	3453	3453	2601	1748
INLET AIR TEMPERATURE		°F	77	85	85	85
GENERATOR EFFICIENCY		%	97.5	97.5	97.0	96.2
GENSET EFFICIENCY (ISO 3046/1)	(4)(5)	%	44.2	44.2	43.2	40.9
THERMAL EFFICIENCY	(4)(6)	%	41.4	41.4	42.7	45.6
TOTAL EFFICIENCY	(4)(7)	%	85.6	85.6	85.9	86.5

ENGINE DATA

GENSET FUEL CONSUMPTION (ISO 3046/1)	(8)	Btu/ekW-hr	7712	7712	7905	8350
GENSET FUEL CONSUMPTION (NOMINAL)	(8)	Btu/ekW-hr	7978	7978	8178	8638
ENGINE FUEL CONSUMPTION (NOMINAL)	(8)	Btu/bhp-hr	5752	5752	5869	6148
AIR FLOW (@inlet air temp, 14.7 psia) (WET)	(9)	ft3/min	6362	6453	4806	3220
AIR FLOW (WET)	(9)	lb/hr	28198	28194	20996	14067
FUEL FLOW (60°F, 14.7 psia)		scfm	366	366	281	198
INLET MANIFOLD PRESSURE	(10)	in Hg(abs)	136.2	136.2	102.2	69.6
EXHAUST TEMPERATURE - ENGINE OUTLET	(11)	°F	730	730	791	896
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia) (WET)	(12)	ft3/min	15157	15155	11888	8660
EXHAUST GAS MASS FLOW (WET)	(12)	lb/hr	29200	29195	21766	14610
MAX INLET RESTRICTION	(13)	in H2O	14.49	14.49	10.15	7.36
MAX EXHAUST RESTRICTION	(13)	in H2O	20.14	20.13	11.45	5.48

EMISSIONS DATA - ENGINE OUT

NOx (as NO2)	(14)(15)	g/bhp-hr	1.00	1.00	1.00	1.00
CO	(14)(15)	g/bhp-hr	1.54	1.54	1.48	1.43
THC (mol. wt. of 15.84)	(14)(15)	g/bhp-hr	2.29	2.29	2.38	2.31
NMHC (mol. wt. of 15.84)	(14)(15)	g/bhp-hr	0.32	0.32	0.33	0.32
NMNEHC (VOCs) (mol. wt. of 15.84)	(14)(15)(16)	g/bhp-hr	0.25	0.25	0.26	0.25
HCHO (Formaldehyde)	(14)(15)	g/bhp-hr	0.21	0.21	0.22	0.22
CO2	(14)(15)	g/bhp-hr	401	401	408	418
EXHAUST OXYGEN	(14)(17)	% DRY	9.7	9.7	9.4	8.9

HEAT REJECTION

LHV INPUT	(18)	Btu/min	331023	330975	254436	179158
HEAT REJ. TO JACKET WATER (JW)	(19)	Btu/min	34234	34232	29376	24101
HEAT REJ. TO ATMOSPHERE (INCLUDES GENERATOR)	(19)	Btu/min	8023	8022	6910	5749
HEAT REJ. TO LUBE OIL (OC)	(19)	Btu/min	12587	12586	11310	9731
HEAT REJECTION TO EXHAUST (LHV TO 248°F)	(19)	Btu/min	62363	62358	52482	42385
HEAT REJ. TO A/C - STAGE 1 (1AC)	(19)(21)	Btu/min	27738	27729	15303	5406
HEAT REJ. TO A/C - STAGE 2 (2AC)	(19)(21)	Btu/min	16462	16459	11555	6466
HEAT REJECTION FROM GEARBOX (GB)	(19)	Btu/min	1157	1157	871	586
PUMP POWER	(20)	Btu/min	859	859	859	859

COOLING SYSTEM SIZING CRITERIA

TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)	(22)	Btu/min	86682	88188
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (2AC+GB)	(22)	Btu/min	19895	20333
HEAT REJECTION TO EXHAUST (LHV TO 248°F)	(22)	Btu/min	68600	68594

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

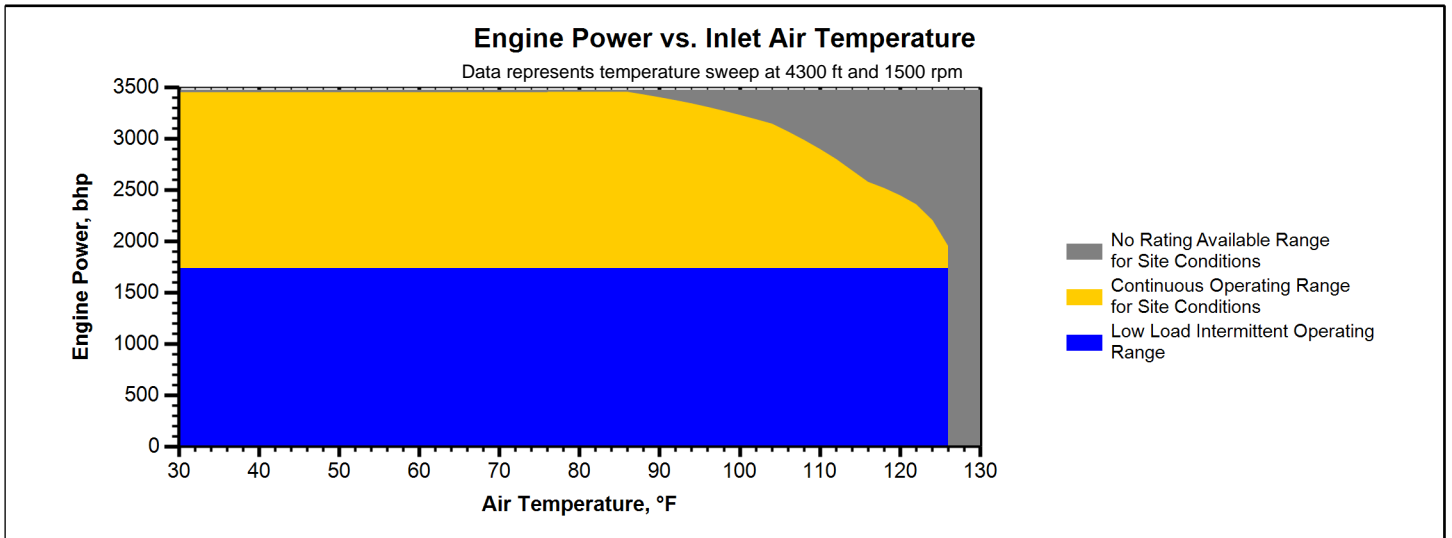
MINIMUM HEAT RECOVERY

TOTAL JACKET WATER CIRCUIT (JW+OC+1AC)	(23)	Btu/min	67231	67220
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (2AC+GB)	(23)	Btu/min	16738	16735
HEAT REJECTION TO EXHAUST (LHV TO 248°F)	(23)	Btu/min	50683	48953

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Refer to product O&M manual for details on additional lower load capability. No overload permitted at rating shown.

For notes information consult page three.



NOTES:

1. Fuel pressure range specified is to the engine fuel control valve. Additional fuel train components should be considered in pressure and flow calculations.
2. Generator efficiencies, power factor, and voltage are based on specified generator. [Genset Power (ekW) is calculated as: (Engine Power (bkW) - Gearbox Power (bkW)) x Generator Efficiency], [Genset Power (kVA) is calculated as: (Engine Power (bkW) - Gearbox Power (bkW)) x Generator Efficiency / Power Factor]
3. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load. All derates are applied without pumps, then pump power is subtracted to obtain final rating. Engine is equipped with a Humidity Management Strategy that will optimize SCAC inlet water temperature and limit available power during periods of high ambient humidity to protect the engine. When operating in high humidity conditions, please contact dealer / A&I team for details.
4. Efficiency represents a Closed Crankcase Ventilation (CCV) system installed on the engine.
5. Genset Efficiency published in accordance with ISO 3046/1.
6. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, 1st stage aftercooler, and exhaust to 248°F with engine operation at ISO 3046/1 Genset Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.
7. Total efficiency is calculated as: Genset Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.
8. ISO 3046/1 Genset fuel consumption tolerance is (+)5, (-)0% at the specified power factor. Nominal genset and engine fuel consumption tolerance is ± 1.5% of full load data at the specified power factor.
9. Air flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 5 %.
10. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
11. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.
12. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.
13. Inlet and Exhaust Restrictions are maximum allowed values at the corresponding loads. Increasing restrictions beyond what is specified will result in a significant engine derate.
14. Emissions data is at engine exhaust flange prior to any after treatment.
15. NOx tolerance's are ± 18% of specified value. All other emission values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes
16. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
17. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.
18. LHV rate tolerance is ± 1.5%.
19. Heat rejection values are representative of site conditions. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for atmosphere, ± 20% for lube oil circuit, ± 10% for exhaust, ± 5% for aftercooler circuit, and ± 5% for Gearbox.
20. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
21. Aftercooler heat rejection is nominal for site conditions and does not include an aftercooler heat rejection factor. Aftercooler heat rejection values at part load are for reference only.
22. Cooling system sizing criteria represent the expected maximum circuit heat rejection for the ratings at site, with applied plus tolerances. Total circuit heat rejection is calculated using formulas referenced in the notes on the standard tech data sheet with the following qualifications. Aftercooler heat rejection data (1AC & 2AC) is based on the standard rating. Jacket Water (JW), Oil Cooler (OC), and Gearbox (GB) heat rejection values are based on the respective site or maximum column. Aftercooler heat rejection factors (ACHRF) are specific for the site elevation and inlet air temperature specified in the site or maximum column, referenced from the table on the standard data sheet
23. Minimum heat recovery values represent the expected minimum heat recovery for the site, with applied minus tolerances. Do not use these values for cooling system sizing.

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	92.2700	92.2700
Ethane	C2H6	2.5000	2.5000
Propane	C3H8	0.5000	0.5000
Isobutane	iso-C4H10	0.0000	0.0000
Norbutane	nor-C4H10	0.2000	0.2000
Isopentane	iso-C5H12	0.0000	0.0000
Norpentane	nor-C5H12	0.1000	0.1000
Hexane	C6H14	0.0500	0.0500
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	3.4800	3.4800
Carbon Dioxide	CO2	0.9000	0.9000
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0000	100.0000

Fuel Makeup:
Unit of Measure:

Nat Gas
English

Calculated Fuel Properties

Caterpillar Methane Number:	84.7
Lower Heating Value (Btu/scf):	905
Higher Heating Value (Btu/scf):	1004
WOBBE Index (Btu/scf):	1168
THC: Free Inert Ratio:	21.83
Total % Inerts (% N2, CO2, He):	4.38%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.998
Stoich A/F Ratio (Vol/Vol):	9.45
Stoich A/F Ratio (Mass/Mass):	15.75
Specific Gravity (Relative to Air):	0.600
Fuel Specific Heat Ratio (K):	1.313

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.