G3412C
NON-CURRENT
PACKAGED GENSET - WITH RADIATOR

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
{Scratch Project}

CATERPILLAR®

ENGINE SPEED (rpm):	1800
COMPRESSION RATIO:	11.4
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER WATER INLET (°F):	130
JACKET WATER OUTLET (°F):	210
ASPIRATION:	TA
COOLING SYSTEM:	JW+OC, AC
CONTROL SYSTEM:	EIS
EXHAUST MANIFOLD:	WC
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	1.0
FAN POWER (bhp):	38
SET POINT TIMING:	27

RATING STRATEGY:	STANDARD
FUEL SYSTEM:	LPG IMPCO WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:

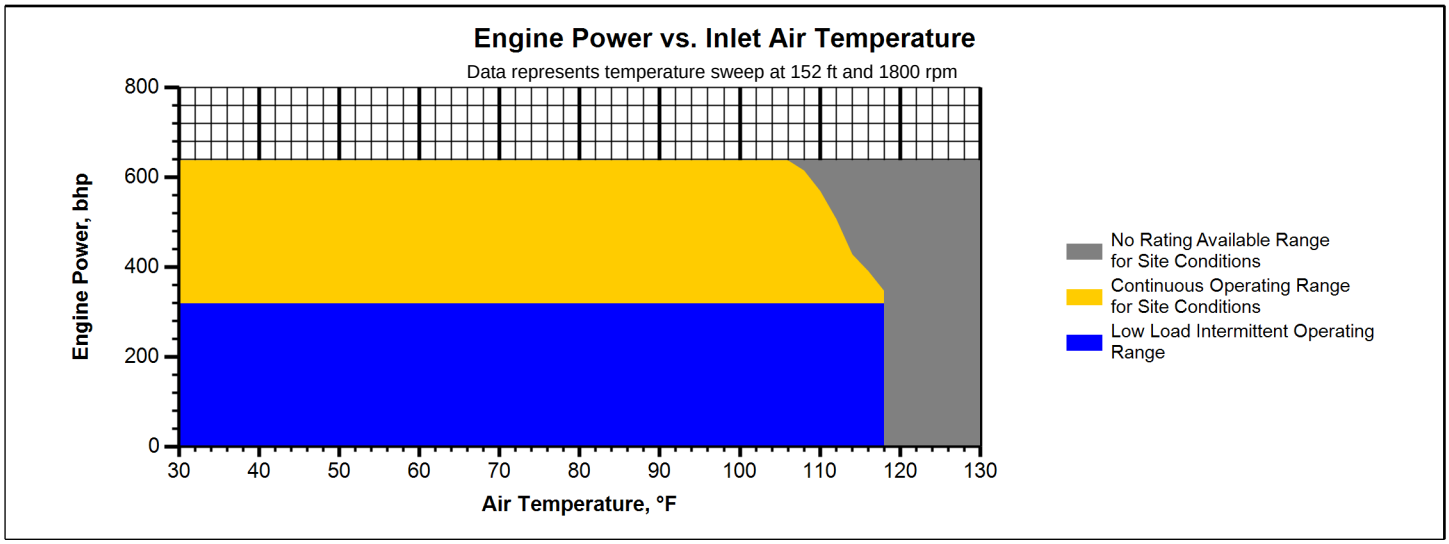
FUEL:	Nat Gas
FUEL PRESSURE RANGE(psig): (See note 1)	1.5-5.0
FUEL METHANE NUMBER:	84.7
FUEL LHV (Btu/scf):	905
ALTITUDE(ft):	152
INLET AIR TEMPERATURE(°F):	100
STANDARD RATED POWER:	637 bhp@1800rpm
POWER FACTOR:	0.8
VOLTAGE(V):	480-600

					MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**		**100%**	**100%**	**75%**	**50%**
PACKAGE POWER	(WITH FAN)	(2)(3)	ekW		423	423	317	212
PACKAGE POWER	(WITH FAN)	(2)(3)	kVA		529	529	396	265
ENGINE POWER	(WITHOUT FAN)	(3)	bhp		637	637	486	336
INLET AIR TEMPERATURE			°F		100	100	100	100
GENERATOR EFFICIENCY		(2)	%		94.7	94.7	94.9	95.1
PACKAGE EFFICIENCY	(ISO 3046/1)	(4)	%		31.1	31.1	29.5	26.6
THERMAL EFFICIENCY		(5)	%		45.9	45.9	48.5	52.7
TOTAL EFFICIENCY		(6)	%		77.0	77.0	78.0	79.3
ENGINE DATA								
PACKAGE FUEL CONSUMPTION	(ISO 3046/1)	(7)	Btu/ekW-hr		10968	10968	11585	12812
PACKAGE FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/ekW-hr		11181	11181	11810	13061
ENGINE FUEL CONSUMPTION	(NOMINAL)	(7)	Btu/bhp-hr		7428	7428	7709	8223
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(8)(9)	ft3/min		1455	1455	1138	822
AIR FLOW	(WET)	(8)(9)	lb/hr		6187	6187	4838	3494
FUEL FLOW (60ºF, 14.7 psia)			scfm		87	87	69	51
INLET MANIFOLD PRESSURE		(10)	in Hg(abs)		63.1	63.1	49.0	35.6
EXHAUST TEMPERATURE - ENGINE OUTLET		(11)	°F		696	696	679	667
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(12)(9)	ft3/min		3247	3247	2503	1791
EXHAUST GAS MASS FLOW	(WET)	(12)(9)	lb/hr		6426	6426	5027	3634
EMISSIONS DATA - ENGINE OUT								
NOx (as NO2)		(13)(14)	g/bkW-hr		1.34	1.34	1.34	1.34
CO		(13)(14)	g/bkW-hr		2.92	2.92	2.90	3.03
THC (mol. wt. of 15.84)		(13)(14)	g/bkW-hr		8.39	8.39	8.84	11.19
NMHC (mol. wt. of 15.84)		(13)(14)	g/bkW-hr		1.26	1.26	1.33	1.68
NMNEHC (VOCs) (mol. wt. of 15.84)		(13)(14)(15)	g/bkW-hr		0.84	0.84	0.88	1.12
HCHO (Formaldehyde)		(13)(14)	g/bkW-hr		0.37	0.37	0.37	0.37
CO2		(13)(14)	g/bkW-hr		641	641	664	706
EXHAUST OXYGEN		(13)(16)	% DRY		9.1	9.1	8.9	8.5
HEAT REJECTION								
LHV INPUT		(17)	Btu/min		78824	78824	62447	46041
HEAT REJ. TO JACKET WATER (JW)		(18)	Btu/min		21057	21057	18502	15327
HEAT REJ. TO ATMOSPHERE	(INCLUDES GENERATOR)	(18)	Btu/min		4499	4499	3467	2461
HEAT REJ. TO LUBE OIL (OC)		(18)	Btu/min		3330	3330	2926	2423
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(18)	Btu/min		9865	9865	7336	5110
HEAT REJ. TO AFTERCOOLER (AC)		(18)(19)	Btu/min		4517	4517	2772	1160
COOLING SYSTEM SIZING CRITERIA								
TOTAL JACKET WATER CIRCUIT (JW+OC)		(20)	Btu/min		27158	27158		
TOTAL AFTERCOOLER CIRCUIT (AC)		(20)	Btu/min		5568	5568		
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(20)	Btu/min		10851	10851		
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)		(21)	Btu/min		21615	21615		
TOTAL AFTERCOOLER CIRCUIT (AC)		(21)	Btu/min		4291	4291		
HEAT REJECTION TO EXHAUST (LHV TO 350°F)		(21)	Btu/min		8152	8152		

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. Lowest load point is the lowest continuous duty operating load allowed. No overload permitted at rating shown.

For notes information consult page three.


Engine Power vs. Inlet Air Temperature
Data represents temperature sweep at 152 ft and 1800 rpm
Engine Power, bhp
800
600
400
200
0
30
40
50
60
70
80
90
100
110
120
130
Air Temperature, °F
No Rating Available Range for Site Conditions
Continuous Operating Range for Site Conditions
Low Load Intermittent Operating Range

NOTES:

1. Fuel pressure range specified is to the engine fuel pressure regulator. Additional fuel train components should be considered in pressure and flow calculations.

2. Generator efficiencies, power factor, and voltage are based on specified generator. [Package Power (ekW) is calculated as: (Engine Power (bkW) - Fan Power (bkW)) x Generator Efficiency], [Package Power (kVA) is calculated as: (Engine Power (bkW) - Fan Power (bkW)) x Generator Efficiency / Power Factor]

3. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load. The rating shown assumes a specific air-to-core temperature rise and zero additional air flow restriction on the standard packaged radiator. Refer to TMI Systems Data for fan air flow and air-to-core temperature rise values. Increased fan airflow restriction or a different air-to-core rise value requires a Special Rating Request to determine actual engine power at your site.

4. Package Effieciency published in accordance with ISO 3046/1.

5. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, and exhaust to 350ºF with engine operation at ISO 3046/1 Package Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.

6. Total efficiency is calculated as: Package Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.

7. ISO 3046/1 Package fuel consumption tolerance is (+)5, (-)0% at the specified power factor. Nominal package and engine fuel consumption tolerance is ± 3.0% of full load data at the specified power factor.

8. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

9. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

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. Emissions data is at engine exhaust flange prior to any after treatment.

14. 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

15. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

16. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

17. LHV rate tolerance is ± 3.0%.

18. 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, and ± 5% for aftercooler circuit.

19. 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.

20. 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 (AC) is based on the standard rating. Jacket Water (JW) and Oil Cooler (OC) 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

21. 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.

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
{Scratch Project}

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:	Nat Gas
Unit of Measure:	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.