G3412C

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED:	1800	FUEL:	NAT GAS
COMPRESSION RATIO:	11.4:1	FUEL SYSTEM:	LPG IMPCO
AFTERCOOLER - MAX. INLET (°F):	130		
JACKET WATER - MAX. OUTLET (°F):	210	FUEL PRESS. RANGE (PSIG):	1.5 - 5.0
COOLING SYSTEM:	JW+OC, AC	MIN. METHANE NUMBER:	80
IGNITION SYSTEM:	EIS	RATED ALTITUDE (FT):	4922
EXHAUST MANIFOLD:	WC	AT AIR TO TURBO. TEMP. (°F):	77
COMBUSTION:	LOW EMISSION	NOx EMISSION LEVEL:	1.9 g/bhp-hr
		FUEL LHV (BTU/SCF):	905
		APPLICATION:	60 Hz GENSET

RATING AND EFFICIENCY		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(1)	BHP	637	478	318
GENERATOR POWER	(WITH MECH FAN)	(2)	EKW	375	259	154
ENGINE EFFICIENCY	**(ISO 3046/1)**	**(3)**	**%**	**37.0**	**35.4**	**32.8**
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	36.3	34.7	32.2
THERMAL EFFICIENCY	(NOMINAL)	(4)	%	42.4	44.6	50.9
TOTAL EFFICIENCY	(NOMINAL)	(5)	%	78.6	79.3	83.1

ENGINE DATA						
FUEL CONSUMPTION	**(ISO 3046/1)**	**(6)**	**BTU/bhp-hr**	**6887**	**7192**	**7753**
FUEL CONSUMPTION	(NOMINAL)	(6)	BTU/bhp-hr	7021	7332	7904
AIR FLOW (77 °F, 14.7 psi)		(7)	SCFM	1354	1047	673
AIR FLOW		(7)	lb/hr	6003	4641	2983.00
COMPRESSOR OUT PRESSURE			in. HG (abs)	66.3	63.2	47.4
COMPRESSOR OUT TEMPERATURE			°F	286	265	200
AFTERCOOLER AIR OUT TEMPERATURE			°F	148	145	140
INLET MAN. PRESSURE		(8)	in. HG (abs)	59.5	52.9	47.8
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(9)	°F	148	145	140
TIMING		(10)	°BTDC	27	27	27
EXHAUST STACK TEMPERATURE		(11)	°F	700	700	727
EXHAUST GAS FLOW (@ stack temp.)		(12)	CFM	3153	2440	1616
EXHAUST MASS FLOW		(12)	lb/hr	6229	4818	3110

EMISSIONS DATA					
NOx (as NO2)	(13)	g/bhp-hr	1.9	2	5.4
CO	(14)	g/bhp-hr	1.93	1.96	2.05
THC (molecular weight of 15.84)	(14)	g/bhp-hr	5.35	5.87	5.05
NMHC (molecular weight of 15.84)	(14)	g/bhp-hr	0.8	0.88	0.76
EXHAUST O2	(15)	% DRY	8.7	8.5	6.9
LAMBDA	(15)		1.68	1.66	1.48

HEAT BALANCE DATA					
LHV INPUT	(16)	BTU/min	74538	58378	41956
HEAT REJECTION TO JACKET (JW)	(17) (22)	BTU/min	18937	16021	13908
HEAT REJECTION TO ATMOSPHERE	(18)	BTU/min	2982	2335	1678
HEAT REJECTION TO LUBE OIL (OC)	(19) (22)	BTU/min	2994	2533	2199
HEAT REJECTION TO EXHAUST (LHV to 77°F)	(20)	BTU/min	18962	14775	9862
HEAT REJECTION TO EXHAUST (LHV to 350°F)	(20)	BTU/min	9647	7467	5236
HEAT REJECTION TO A/C (AC)	(21) (23)	BTU/min	3626	2436	790

CONDITIONS AND DEFINITIONS

ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1STD. REF. CONDITIONS OF 77°F, 29.6 IN HG BAROMETRIC PRESSURE, 500 FT ALTITUDE). NO OVERLOAD PERMITTED AT RATING SHOWN. CONSULT ALTITUDE CHARTS FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE.

EMISSION LEVELS ARE BASED ON THE ENGINE OPERATING AT STEADY STATE CONDITIONS AND ADJUSTED TO THE SPECIFIED NOx LEVEL AT 100% LOAD. EMISSION TOLERANCES SPECIFIED ARE DEPENDANT UPON FUEL QUALITY. METHANE NUMBER CANNOT VARY MORE THAN ± 3. PUBLISHED PART LOAD DATA MAY REQUIRE ENGINE ADJUSTMENT.

ENGINE RATING IS WITH 2 ENGINE DRIVEN WATER PUMPS.

FOR NOTES INFORMATION CONSULT PAGE THREE.

FUEL USAGE GUIDE

CAT METHANE NUMBER	30	35	40	45	50	55	60	65	70	75	80	85-100
IGNITION TIMING	-	-	-	-	-	-	-	-	23	25	27	27
DERATION FACTOR	0	0	0	0	0	0	0	0	1.00	1.00	1.00	1.00

ALTITUDE DERATION FACTORS

AIR TO TURBO (°F)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.77	0.74	0.71	0.68
120	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70
110	1.00	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71
100	1.00	1.00	1.00	1.00	0.99	0.96	0.92	0.88	0.85	0.82	0.78	0.75	0.72
90	1.00	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.86	0.83	0.80	0.76	0.73
80	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.92	0.88	0.85	0.81	0.78	0.75
70	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.90	0.86	0.83	0.79	0.76
60	1.00	1.00	1.00	1.00	1.00	1.00	0.99	0.95	0.91	0.88	0.84	0.81	0.78
50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.93	0.90	0.86	0.83	0.79

ALTITUDE (FEET ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

AIR TO TURBO (°F)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1.49	1.57	1.65	1.74	1.83	1.91	1.91	1.91	1.91	1.91	1.91	1.91	1.91
120	1.39	1.47	1.55	1.64	1.72	1.80	1.80	1.80	1.80	1.80	1.80	1.80	1.80
110	1.29	1.37	1.45	1.53	1.62	1.70	1.70	1.70	1.70	1.70	1.70	1.70	1.70
100	1.19	1.27	1.35	1.43	1.51	1.59	1.59	1.59	1.59	1.59	1.59	1.59	1.59
90	1.09	1.17	1.25	1.33	1.41	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
80	1.00	1.07	1.15	1.22	1.30	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
70	1.00	1.00	1.04	1.12	1.20	1.27	1.27	1.27	1.27	1.27	1.27	1.27	1.27
60	1.00	1.00	1.00	1.02	1.10	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
50	1.00	1.00	1.00	1.00	1.00	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06

ALTITUDE (FEET ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel. Note that deration occurs as the methane number decreases. Methane number is a scale to measure detonation characteristics of various fuels. The methane number of a fuel is determined by using the Caterpillar Methane Number Calculation program.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various air inlet temperatures and altitudes. Use this information along with the fuel usage guide chart to help determine actual engine power for your site.

ACTUAL ENGINE RATING:

It is important to note that the Altitude/Temperature deration and the Fuel Usage Guide deration are not cumulative. They are not to be added together. The same is true for the Low Energy Fuel deration (reference the Caterpillar Methane Number Program) and the Fuel Usage Guide deration. However, the Altitude/Temperature deration and Low Energy Fuel deration are cumulative; and they must be added together in the method shown below. To determine the actual power available, take the lowest rating between 1) and 2).

1) (Altitude/Temperature Deration) + (Low Energy Fuel Deration)
2) Fuel Usage Guide Deration

Note: For NA's always add the Low Energy Fuel deration to the Altitude/Temperature deration. For TA engines only add the Low Energy Fuel deration to the Altitude/Temperature deration whenever the Altitude/Temperature deration is less than 1.0 (100%). This will give the actual rating for the engine at the conditions specified.

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF):

Aftercooler heat rejection is given for standard conditions of 77°F and 500 ft altitude. To maintain a constant air inlet manifold temperature, as the air to turbo temperature goes up, so must the heat rejection. As altitude increases, the turbocharger must work harder to overcome the lower atmospheric pressure. This increases the amount of heat that must be removed from the inlet air by the aftercooler. Use the aftercooler heat rejection factor (ACHRF) to adjust for ambient and altitude conditions. Multiply this factor by the standard aftercooler heat rejection. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

NOTES

1 ENGINE RATING IS WITH 2 ENGINE DRIVEN WATER PUMPS. TOLERANCE IS ± 3% OF FULL LOAD.

2 GENERATOR POWER DETERMINED WITH AN ASSUMED GENERATOR EFFICIENCY OF 93% AND POWER FACTOR OF 0.8 [GENERATOR POWER = ENGINE POWER x GENERATOR EFFICIENCY].

3 ISO 3046/1 ENGINE EFFICIENCY TOLERANCE IS (+)0, (-)5% OF FULL LOAD % EFFICIENCY VALUE. NOMINAL ENGINE EFFICIENCY TOLERANCE IS ± 3% OF FULL LOAD % EFFICIENCY VALUE.

4 THERMAL EFFICIENCY: JACKET HEAT + LUBE OIL HEAT + EXH. HEAT TO 350°F.

5 TOTAL EFFICIENCY = ENGINE EFF. + THERMAL EFF. TOLERANCE IS ± 10% OF FULL LOAD DATA.

6 ISO 3046/1 FUEL CONSUMPTION TOLERANCE IS (+)5, (-)0% OF FULL LOAD DATA. NOMINAL FUEL CONSUMPTION TOLERANCE IS ± 3 % OF FULL LOAD DATA.

7 UNDRIED AIR. FLOW TOLERANCE IS ± 5 %

8 INLET MANIFOLD PRESSURE TOLERANCE IS ± 5 %

9 INLET MANIFOLD TEMPERATURE TOLERANCE IS ± 9°F.

10 TIMING INDICATED IS FOR USE WITH THE MINIMUM FUEL METHANE NUMBER SPECIFIED. CONSULT THE APPROPRIATE FUEL USAGE GUIDE FOR TIMING AT OTHER METHANE NUMBERS.

11 EXHAUST STACK TEMPERATURE TOLERANCE IS (+)63°F, (-)54°F.

12 WET EXHAUST. FLOW TOLERANCE IS ± 6 %

13 NOX VALUES ARE SET POINTS AND WILL VARY WITH OPERATING CONDITIONS.

14 CO, CO2, THC, and NMHC VALUES ARE "NOT TO EXCEED".

15 O2% TOLERANCE IS ± 0.5; LAMBDA TOLERANCE IS ± 0.05. LAMBDA AND O2 LEVEL ARE THE RESULT OF ADJUSTING THE ENGINE TO OPERATE AT THE SPECIFIED NOX LEVEL.

16 LHV INPUT TOLERANCE IS ± 3%.

17 HEAT REJECTION TO JACKET TOLERANCE IS ± 10 % OF FULL LOAD DATA, BASED ON TREATED WATER.

18 HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ± 50% OF FULL LOAD DATA, BASED ON TREATED WATER.

19 HEAT REJECTION OF LUBE OIL TOLERANCE IS ± 20% OF FULL LOAD DATA, BASED ON TREATED WATER.

20 HEAT REJECTION TO EXHAUST TOLERANCE IS ± 10% OF FULL LOAD DATA, BASED ON TREATED WATER.

21 HEAT REJECTION TO A/C TOLERANCE IS ± 5 % OF FULL LOAD DATA, BASED ON TREATED WATER.

SITE SPECIFIC COOLING SYSTEM SIZING EQUATIONS (WITH TOLERANCES)

22 TOTAL JACKET CIRCUIT (JW+OC) = (JW x 1.1) + (OC x 1.2).

23 TOTAL AFTERCOOLER CIRCUIT (AC) = AC x ACHRF x 1.05.