G3408 TA

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED:	1500	FUEL:	NAT GAS
COMPRESSION RATIO:	9.7:1	FUEL SYSTEM:	HPG IMPCO
AFTERCOOLER - MAX. INLET (°F):	130		WITH CUSTOMER SUPPLIED AIR FUEL RATIO
JACKET WATER - MAX. OUTLET (°F):	210	FUEL PRESS. RANGE (PSIG):	20.0 - 25.0
COOLING SYSTEM:	JW+OC, AC	MIN. METHANE NUMBER:	80
IGNITION SYSTEM:	CDIS	RATED ALTITUDE (FT):	4922
EXHAUST MANIFOLD:	WC	AT AIR TO TURBO. TEMP. (°F):	77
COMBUSTION:	CATALYST	EXHAUST O2 EMISSION LEVEL:	0.6 %O2
		FUEL LHV (BTU/SCF):	905
		APPLICATION:	INDUSTRIAL/PETROLEUM

RATING AND EFFICIENCY		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(1)	BHP	332	249	166
ENGINE EFFICIENCY	**(ISO 3046/1)**	**(2)**	**%**	**33.9**	**32.3**	**29.1**
ENGINE EFFICIENCY	(NOMINAL)	(2)	%	33.9	32.3	29.1
THERMAL EFFICIENCY	(NOMINAL)	(3)	%	53.1	55.4	59.0
TOTAL EFFICIENCY	(NOMINAL)	(4)	%	87.0	87.8	88.1

ENGINE DATA						
FUEL CONSUMPTION	**(ISO 3046/1)**	**(5)**	**BTU/bhp-hr**	**7507**	**7874**	**8746**
FUEL CONSUMPTION	(NOMINAL)	(5)	BTU/bhp-hr	7507	7874	8746
AIR FLOW (77 °F, 14.7 psi)		(6)	SCFM	458	362	267
AIR FLOW		(6)	lb/hr	2031	1604	1182
COMPRESSOR OUT PRESSURE			in. HG (abs)	42.2	38.8	35.1
COMPRESSOR OUT TEMPERATURE			°F	161	147	127
AFTERCOOLER AIR OUT TEMPERATURE			°F	135	133	125
INLET MAN. PRESSURE		(7)	in. HG (abs)	39.6	32.9	25.6
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(8)	°F	151	154	161
TIMING		(9)	°BTDC	20	20	20
EXHAUST STACK TEMPERATURE		(10)	°F	957	894	813
EXHAUST GAS FLOW (@ stack temp.)		(11)	CFM	1355	1022	709
EXHAUST MASS FLOW		(11)	lb/hr	2157	1703	1255

EMISSIONS DATA					
NOx (as NO2)	(12)	g/bhp-hr	14.11	13.95	11.74
CO	(13)	g/bhp-hr	14.1	13.64	11.28
THC (molecular weight of 15.84)	(13)	g/bhp-hr	4.33	3.54	3.71
NMHC (molecular weight of 15.84)	(13)	g/bhp-hr	0.65	0.54	0.56
CO2	(13)	g/bhp-hr	490	521	580
EXHAUST O2	(14)	% DRY	0.6	0.6	0.6
LAMBDA			1.01	1.02	1.01

HEAT BALANCE DATA					
LHV INPUT	(15)	BTU/min	41568	32698	24237
HEAT REJECTION TO JACKET	(16)	BTU/min	15992	11944	10037
HEAT REJECTION TO ATMOSPHERE	(17)	BTU/min	1663	1308	969
HEAT REJECTION TO LUBE OIL (OC)	(18)	BTU/min	2183	1889	1587
HEAT REJECTION TO EXHAUST (LHV to 77°F)	(19)	BTU/min	9576	6891	4578
HEAT REJECTION TO EXHAUST (LHV to 350°F)	(19)	BTU/min	6096	4296	2686
HEAT REJECTION TO A/C	(20)	BTU/min	248	99	13

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. EMISSION TOLERANCES SPECIFIED ARE DEPENDANT UPON FUEL QUALITY. METHANE NUMBER CANNOT VARY MORE THAN ± 3. PUBLISHED PART LOAD DATA REQUIRES CUSTOMER SUPPLIED AIR FUEL RATIO CONTROL.

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	-	-	-	-	-	-	-	-	18	19	20	20
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

AIR TO TURBO (°F)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	3.07	3.42	3.77	4.13	4.49	4.83	4.83	4.83	4.83	4.83	4.83	4.83	4.83
120	2.65	2.99	3.34	3.69	4.04	4.38	4.38	4.38	4.38	4.38	4.38	4.38	4.38
110	2.23	2.57	2.90	3.25	3.60	3.93	3.93	3.93	3.93	3.93	3.93	3.93	3.93
100	1.81	2.14	2.47	2.81	3.16	3.48	3.48	3.48	3.48	3.48	3.48	3.48	3.48
90	1.39	1.71	2.04	2.37	2.71	3.03	3.03	3.03	3.03	3.03	3.03	3.03	3.03
80	1.00	1.29	1.61	1.94	2.27	2.58	2.58	2.58	2.58	2.58	2.58	2.58	2.58
70	1.00	1.00	1.18	1.50	1.82	2.13	2.13	2.13	2.13	2.13	2.13	2.13	2.13
60	1.00	1.00	1.00	1.06	1.38	1.68	1.68	1.68	1.68	1.68	1.68	1.68	1.68
50	1.00	1.00	1.00	1.00	1.00	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23

ALTITUDE (FEET ABOVE SEA LEVEL)

MINIMUM SPEED CAPABILITY AT MAX SITE TORQUE (RPM)

AIR TO TURBO (°F)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
120	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
110	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
100	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
90	1420	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500	1500
80	1420	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500	1500
70	1300	1420	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500
60	1300	1420	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500	1500
50	1300	1300	1420	1440	1460	1480	1500	1500	1500	1500	1500	1500	1500

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:

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 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.

MINIMUM SPEED CAPABILITY AT MAX SITE TORQUE:

This table shows the minimum allowable engine operating speed for various air inlet temperatures and altitudes.

NOTES

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

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

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

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

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

6 UNDRIED AIR. FLOW TOLERANCE IS ± 5 %

7 INLET MANIFOLD PRESSURE TOLERANCE IS ± 5 %

8 INLET MANIFOLD TEMPERATURE TOLERANCE IS ± 9°F.

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

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

11 WET EXHAUST. FLOW TOLERANCE IS ± 6 %

12 NOX VALUES ARE "NOT TO EXCEED".

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

14 O2% TOLERANCE IS ± 0.2.

15 LHV RATE TOLERANCE IS ± 5%.

16 TOTAL JW HEAT (based on treated water) = JACKET HEAT + LUBE OIL HEAT. TOLERANCE IS ± 10 % OF FULL LOAD DATA.

17 RADIATION HEAT RATE BASED ON TREATED WATER. TOLERANCE IS ± 50% OF FULL LOAD DATA.

18 LUBE OIL HEAT RATE BASED ON TREATED WATER. TOLERANCE IS ± 20% OF FULL LOAD DATA.

19 EXHAUST HEAT RATE BASED ON TREATED WATER. TOLERANCE IS ± 10% OF FULL LOAD DATA.

20 A/C HEAT (based on treated water) = A/C HEAT x A/C HEAT REJ. FACTOR. TOLERANCE IS ± 5 % OF FULL LOAD DATA.