G3520C

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED:	1200	FUEL:	NAT GAS
COMPRESSION RATIO:	11.3:1	FUEL SYSTEM:	CAT LOW PRESSURE WITH AIR FUEL RATIO CONTROL
AFTERCOOLER - STAGE 1 MAX. INLET (°F):	198		
AFTERCOOLER - STAGE 2 MAX. INLET (°F):	130	FUEL PRESS. RANGE (PSIG):	0.50 - 5.0
JACKET WATER - MAX. OUTLET (°F):	210	MIN. METHANE NUMBER:	80
COOLING SYSTEM:	JW+OC+1AC , 2AC	RATED ALTITUDE (FT):	2595
IGNITION SYSTEM:	ADEM3	AT AIR TO TURBO. TEMP. (°F):	77
EXHAUST MANIFOLD:	DRY	NOx EMISSION LEVEL:	0.5 g/bhp-hr
COMBUSTION:	LOW EMISSION	FUEL LHV (BTU/SCF):	905
		APPLICATION:	GENSET

RATING AND EFFICIENCY		NOTES	LOAD	100%	75%	50%
ENGINE POWER	(WITHOUT FAN)	(1)	BHP	2248	1686	1124
GENERATOR POWER	(WITHOUT FAN)	(2)	EKW	1600	1201	800
ENGINE EFFICIENCY	**(ISO 3046/1)**	**(3)**	**%**	**40.3**	**38.8**	**36.3**
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	39.3	37.9	35.5
THERMAL EFFICIENCY	(NOMINAL)	(4)	%	38.9	40.4	42.4
TOTAL EFFICIENCY	(NOMINAL)	(5)	%	78.3	78.3	77.9

ENGINE DATA						
FUEL CONSUMPTION	**(ISO 3046/1)**	**(6)**	**BTU/bhp-hr**	**6313**	**6557**	**7007**
FUEL CONSUMPTION	(NOMINAL)	(6)	BTU/bhp-hr	6467	6716	7178
AIR FLOW (77 °F, 14.7 psi)		(7)	SCFM	5064	3821	2635
AIR FLOW		(7)	lb/hr	22452	16940	11683
COMPRESSOR OUT PRESSURE			in. HG (abs)	111	84.5	57.7
COMPRESSOR OUT TEMPERATURE			°F	395	323	231
AFTERCOOLER AIR OUT TEMPERATURE			°F	137	137	137
INLET MAN. PRESSURE		(8)	in. HG (abs)	100.7	75.7	51.9
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(9)	°F	137	137	137
TIMING		(10)	°BTDC	28	28	28
EXHAUST STACK TEMPERATURE		(11)	°F	758	827	890
EXHAUST GAS FLOW (@ stack temp.)		(12)	CFM	12296	9818	7116
EXHAUST MASS FLOW		(12)	lb/hr	23183	17510	12089

EMISSIONS DATA					
NOx (as NO2)	(13)	g/bhp-hr	0.50	0.50	0.50
CO	(14)	g/bhp-hr	2.24	2.31	2.33
THC (molecular weight of 15.84)	(14)	g/bhp-hr	7.07	7.83	9.22
NMHC (molecular weight of 15.84)	(14)	g/bhp-hr	1.07	1.18	1.39
CO2	(14)	g/bhp-hr	445	464	486
EXHAUST O2	(15)	% DRY	10.3	10.1	9.9
LAMBDA	(15)		1.92	1.86	1.80

HEAT BALANCE DATA					
LHV INPUT	(16)	BTU/min	242255	188706	134443
HEAT REJECTION TO JACKET	(17)	BTU/min	29313	25731	21952
HEAT REJECTION TO ATMOSPHERE	(18)	BTU/min	6372	5325	4278
HEAT REJECTION TO LUBE OIL	(19)	BTU/min	5778	5173	4431
HEAT REJECTION TO EXHAUST (LHV to 77°F)	(20)	BTU/min	78032	65224	49351
HEAT REJECTION TO EXHAUST (LHV to 350°F)	(20)	BTU/min	41670	37003	29095
HEAT REJECTION TO A/C - STAGE 1	(21)	BTU/min	17530	8350	1525
HEAT REJECTION TO A/C - STAGE 2	(22)	BTU/min	7926	5431	3266

CONDITIONS AND DEFINITIONS

ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1. DATA REPRESENTS CONDITIONS OF 77°F, 29.6 IN HG BAROMETRIC PRESSURE, 30% RELATIVE HUMIDITY, 10 IN H2O AIR FILTER RESTRICTION, AND 20 IN H2O EXHAUST STACK PRESSURE. ENGINE EFFICIENCY AND FUEL CONSUMPTION SPECIFICALLY NOTED AS ISO 3046/1 ARE REPRESENTED WITH 5 IN H2O AIR FILTER RESTRICTION AND 0 IN H2O EXHAUST STACK PRESSURE. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE. NO OVERLOAD PERMITTED AT RATING SHOWN.

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 IS WITH AIR FUEL RATIO CONTROL.

ENGINE RATING IS WITH 2 ENGINE DRIVEN WATER PUMPS. PUMP POWER IS NOT INCLUDED IN HEAT BALANCE DATA.

FOR NOTES INFORMATION CONSULT PAGE THREE.

FUEL USAGE GUIDE

CAT METHANE NUMBER	30	35	40	45	50	55	60	65	70	75	80	85 to 100
IGNITION TIMING	-	-	-	-	-	16	16	16	16	22	28	28
DERATION FACTOR	0	0	0	0	0	0.75	0.81	0.86	0.90	0.95	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	0.97	0.93	0.90	0.86	0.83	0.80	0.77	0.74	0.71	0.68	0.65	0.63
120	1.00	0.98	0.95	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.69	0.67	0.64
110	1.00	1.00	0.96	0.93	0.89	0.86	0.83	0.79	0.76	0.73	0.71	0.68	0.65
100	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.75	0.72	0.69	0.66
90	1.00	1.00	1.00	0.96	0.93	0.89	0.86	0.82	0.79	0.76	0.73	0.70	0.67
80	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.74	0.72	0.69
70	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.86	0.82	0.79	0.76	0.73	0.70
60	1.00	1.00	1.00	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.77	0.74	0.71
50	1.00	1.00	1.00	1.00	1.00	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73

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	1.30	1.35	1.39	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
120	1.24	1.29	1.33	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36	1.36
110	1.18	1.23	1.27	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
100	1.12	1.16	1.21	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23	1.23
90	1.06	1.10	1.14	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17	1.17
80	1.00	1.04	1.08	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11	1.11
70	1.00	1.00	1.02	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
60	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
50	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

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.

INLET AND EXHAUST RESTRICTION CORRECTIONS FOR ALTITUDE CAPABILITY:

To determine the appropriate altitude derate factor to be applied to this engine for inlet or exhaust restrictions differering from the standard conditions listed on page 1, a correction to the site altitude can be made to adjust for this difference. Add 000 feet to the site altitude for each additional inch of H2O of exhaust stack pressure greater than spec sheet conditions. Add 000 feet to the site altitude for each additional inch of H2O of inlet restriction greater than spec sheet conditions. If site inlet restriction or exhaust stack pressure are less than spec sheet conditions, the same trends apply to lower the site altitude.

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. For 2 Stage Aftercoolers with separate circuits, the 1st stage will collect 90% of the additional heat.

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 95.45% 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 ± 2.5% OF FULL LOAD % EFFICIENCY VALUE.

4 THERMAL EFFICIENCY: JACKET HEAT + LUBE OIL HEAT + STAGE 1 A/C 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 ± 2.5 % 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 TOLERANCES ARE ± 18 % OF SPECIFIED VALUE.

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 RATE TOLERANCE IS ± 2.5%.

17 TOTAL JW HEAT (based on treated water) = JACKET HEAT + LUBE OIL HEAT + STAGE 1 A/C HEAT + 0.90 x (STAGE 1 + STAGE 2) x (ACHRF-1). TOLERANCE IS ± 10 % OF FULL LOAD DATA.

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

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

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

21 STAGE 1 A/C HEAT (based on treated water) = STAGE 1 A/C HEAT + 0.90 x (STAGE 1 + STAGE 2) x (ACHRF-1). TOLERANCE IS ± 5 % OF FULL LOAD DATA.

22 STAGE 2 A/C HEAT (based on treated water) = STAGE 2 A/C HEAT + (STAGE 1 + STAGE 2) x 0.10 x (ACHRF - 1). TOLERANCE IS ± 5 % OF FULL LOAD DATA.