G3516 LE

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

ENGINE SPEED:	1200	FUEL:	NAT GAS
COMPRESSION RATIO:	11:1	FUEL SYSTEM:	LPG IMPCO
AFTERCOOLER - MAX. INLET (°F):	90		
JACKET WATER - MAX. OUTLET (°F):	261	FUEL PRESS. RANGE (PSIG):	1.5 - 5.0
COOLING SYSTEM:	JW, OC, AC	MIN. METHANE NUMBER:	80
IGNITION SYSTEM:	EIS	RATED ALTITUDE (FT):	2494
EXHAUST MANIFOLD:	ASWC	AT AIR TO TURBO. TEMP. (°F):	77
COMBUSTION:	LOW EMISSION	NOx EMISSION LEVEL:	2.0 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	1148	861	574
GENERATOR POWER	(WITHOUT FAN)	(2)	EKW	820	615	410
ENGINE EFFICIENCY	**(ISO 3046/1)**	**(3)**	**%**	**36.8**	**34.5**	**33.2**
ENGINE EFFICIENCY	(NOMINAL)	(3)	%	36.1	33.8	32.5
THERMAL EFFICIENCY	(NOMINAL)	(4)	%	39.8	45.1	47.4
TOTAL EFFICIENCY	(NOMINAL)	(5)	%	75.9	78.9	80.0

ENGINE DATA						
FUEL CONSUMPTION	**(ISO 3046/1)**	**(6)**	**BTU/bhp-hr**	**6912**	**7379**	**7669**
FUEL CONSUMPTION	(NOMINAL)	(6)	BTU/bhp-hr	7047	7523	7818
AIR FLOW (77 °F, 14.7 psi)		(7)	SCFM	2289	1632	1124
AIR FLOW		(7)	lb/hr	10148	7234	4981
COMPRESSOR OUT PRESSURE			in. HG (abs)	68.5	60.6	45.4
COMPRESSOR OUT TEMPERATURE			°F	313	270	190
AFTERCOOLER AIR OUT TEMPERATURE			°F	106	100	93
INLET MAN. PRESSURE		(8)	in. HG (abs)	63.2	46.6	32.7
INLET MAN. TEMPERATURE	(MEASURED IN PLENUM)	(9)	°F	120	118	117
TIMING		(10)	°BTDC	22	22	22
EXHAUST STACK TEMPERATURE		(11)	°F	801	824	829
EXHAUST GAS FLOW (@ stack temp.)		(12)	CFM	5826	4263	2949
EXHAUST MASS FLOW		(12)	lb/hr	10554	7559	5206

EMISSIONS DATA					
NOx (as NO2)	(13)	g/bhp-hr	2	5.6	6.9
CO	(14)	g/bhp-hr	2.23	2.3	2.44
THC (molecular weight of 15.84)	(14)	g/bhp-hr	5.26	4.26	4.47
NMHC (molecular weight of 15.84)	(14)	g/bhp-hr	0.79	0.64	0.68
EXHAUST O2	(15)	% DRY	8.5	7.3	6.4
LAMBDA	(15)		1.55	1.38	1.37

HEAT BALANCE DATA					
LHV INPUT	(16)	BTU/min	134808	107937	74786
HEAT REJECTION TO JACKET (JW)	(17)	BTU/min	25078	25173	18738
HEAT REJECTION TO ATMOSPHERE	(18)	BTU/min	6262	5219	4176
HEAT REJECTION TO LUBE OIL (OC)	(19)	BTU/min	7305	7333	5459
HEAT REJECTION TO EXHAUST (LHV to 77°F)	(20)	BTU/min	37254	27295	18959
HEAT REJECTION TO EXHAUST (LHV to 350°F)	(20)	BTU/min	21256	16155	11261
HEAT REJECTION TO A/C (AC)	(21) (22)	BTU/min	9252	5429	2137
HEAT REJECTION TO ENGINE PUMPS		BTU/min	977.2	977.2	977.2

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

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	83-100
IGNITION TIMING	-	-	-	-	-	-	-	15	18	20	22	22
DERATION FACTOR	0	0	0	0	0	0	0	1.00	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	0.96	0.93	0.89	0.86	0.83	0.79	0.76	0.73	0.70	0.68	0.65	0.62
120	1.00	0.98	0.94	0.91	0.87	0.84	0.81	0.78	0.75	0.72	0.69	0.66	0.63
110	1.00	1.00	0.96	0.92	0.89	0.86	0.82	0.79	0.76	0.73	0.70	0.67	0.64
100	1.00	1.00	0.98	0.94	0.90	0.87	0.84	0.80	0.77	0.74	0.71	0.68	0.66
90	1.00	1.00	0.99	0.96	0.92	0.89	0.85	0.82	0.79	0.76	0.73	0.70	0.67
80	1.00	1.00	1.00	0.98	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71	0.68
70	1.00	1.00	1.00	0.99	0.96	0.92	0.88	0.85	0.82	0.78	0.75	0.72	0.69
60	1.00	1.00	1.00	1.00	0.97	0.94	0.90	0.87	0.83	0.80	0.77	0.74	0.71
50	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

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	1.34	1.40	1.46	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49	1.49
120	1.27	1.33	1.39	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42	1.42
110	1.20	1.26	1.32	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
100	1.13	1.19	1.25	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28	1.28
90	1.06	1.12	1.18	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20	1.20
80	1.00	1.05	1.10	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13	1.13
70	1.00	1.00	1.03	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06	1.06
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)

FREE FIELD MECHANICAL & EXHAUST NOISE

100% Load Data			dB(A)	(dB)							
Free Field Mechanical	DISTANCE FROM THE ENGINE (FEET)	3.2	96.3	95.5	92.1	86.3	87.3	90.0	91.6	88.4	80.0
		22.9	86.7	85.9	82.5	76.7	77.7	80.4	82.0	78.8	70.4
		49.2	81.3	80.6	77.2	71.4	72.4	75.1	76.7	73.5	65.0
Free Field Exhaust	DISTANCE FROM THE ENGINE (FEET)	4.9	111.6	99.8	103.6	105.7	102.2	103.0	105.1	106.9	100.3
		22.9	98.3	89.5	91.8	93.2	89.6	92.0	91.8	92.2	85.2
		49.2	91.6	82.9	85.2	86.6	83.0	85.4	85.2	85.6	78.5
			Overal SPL	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 khz

Octave Band Center Frequency (OBCF)

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.

SOUND DATA:

Data determined by methods similar to ISO Standard DIS-8528-10. Accuracy Grade 3. SPL = Sound Pressure Level.

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 95.8% 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 AFTERCOOLER CIRCUIT (AC) = AC x ACHRF x 1.05.