G3616

GAS ENGINE TECHNICAL DATA

CATERPILLAR®

Genset **60 Hz** 07/07

ENGINE SPEED (rpm):	900	FUEL TYPE:	Nat Gas
COMPRESSION RATIO:	10.5:1	MIN. FUEL PRESSURE (PSIG):	43
AFTERCOOLER - STAGE 1 (°F)	199	MIN. RATED METHANE NUMBER:	80
AFTERCOOLER - STAGE 2 (°F)	129	RATED ALTITUDE @ 77°F (ft):	1640
JACKET WATER OUTLET (°F)	210	FUEL LHV (BTU/SCF):	905
IGNITION SYSTEM:	CIS/A3	ASSUMED GENERATOR EFFICIENCY (%)	97.0
EXHAUST MANIFOLD:	DRY	GENERATOR POWER FACTOR	0.8

RATING		NOTES	LOAD	100%	75%	50%
ENGINE POWER		(2)	bhp	4292	3219	2146
GENERATOR POWER		(2)	ekW	3105	2328	1552
ENGINE EFFICIENCY	**(ISO 3046/1)**	**(1)**	**%**	**41.4**	**40.4**	**38.8**
ENGINE EFFICIENCY	(NOMINAL)	(1)	%	40.4	39.4	37.9

ENGINE DATA						
FUEL CONSUMPTION	**(ISO 3046/1)**	**(1)**	**BTU/bhp-hr**	**6144**	**6306**	**6556**
FUEL CONSUMPTION	(NOMINAL)	(1)	BTU/bhp-hr	6293	6459	6715
AIR FLOW (@ 77°F, 14.7 psia)			scfm	10,977	8,194	5,529
AIR MASS FLOW			lb/hr	48,671	36,332	24,514
COMPRESSOR OUTLET PRESSURE			psi (abs)	35.4	27.6	19.9
COMPRESSOR OUTLET TEMPERATURE			°F	293	226	158
INLET MANIFOLD PRESSURE			psi (abs)	34.5	26.7	19
INLET MANIFOLD TEMPERATURE			°F	144	142	140
LAMBDA				2.22	2.15	2.09
TIMING			°BTDC	19.9	18.3	17.6
EXHAUST STACK TEMPERATURE			°F	731	781	811
EXHAUST GAS FLOW (@ stack temp, 14.5 psia)			ft3/min	26,411	20,534	14,197
EXHAUST GAS MASS FLOW			lb/hr	50,055	37,365	25,211

EMISSIONS						
NOx (as NO2)		(3)	g/bhp-hr	0.7	0.7	0.7
CO		(3)	g/bhp-hr	2.5	2.5	2.5
THC (molecular weight of 15.84)		(3)	g/bhp-hr	8.84	9.24	9.61
NMHC (molecular weight of 15.84)		(3)	g/bhp-hr	1.33	1.39	1.45
EXHAUST OXYGEN			%	12.3	12.2	11.9

ENERGY BALANCE DATA						
FUEL INPUT ENERGY (LHV)	(NOMINAL)	(1)	BTU/min	450,133	346,507	240,143
WORK ENERGY	(NOMINAL)	(2)	BTU/min	182,019	136,514	91,009
HEAT REJ. TO JACKET WATER	(NOMINAL)	(4)	BTU/min	37,444	32,606	26,097
HEAT REJ. TO ATMOSPHERE	(NOMINAL)	(5)	BTU/min	14,780	12,763	10,763
HEAT REJ. TO LUBE OIL	(NOMINAL)	(6)	BTU/min	22,846	20,920	17,754
HEAT REJ. TO EXH. (LHV to 77°F)	(NOMINAL)	(4)	BTU/min	162,787	130,836	92,216
HEAT REJ. TO EXH. (LHV to 350°F)	(NOMINAL)	(4)	BTU/min	83,403	70,643	51,206
HEAT REJ. TO AFTERCOOLER STAGE 1	(NOMINAL)	(7) (8)	BTU/min	15,640	3,366	(3,486)
HEAT REJ. TO AFTERCOOLER STAGE 2	(NOMINAL)	(6) (7)	BTU/min	14,617	9,502	5,789

CONDITIONS AND DEFINITIONS

ENGINE RATING OBTAINED AND PRESENTED IN ACCORDANCE WITH ISO 3046/1 (STD. REF. CONDITIONS OF 25°C, 100 KPA, 152 m). NO OVERLOAD PERMITTED AT RATING SHOWN. CONSULT ALTITUDE CURVES FOR APPLICATIONS ABOVE MAXIMUM RATED ALTITUDE AND/OR TEMPERATURE.

NOTES

1) FUEL CONSUMPTION TOLERANCE. ISO 3046/1 IS 0, + 5% OF FULL LOAD DATA. NOMINAL IS ± 2.5 % OF FULL LOAD DATA.
2) ENGINE POWER AND WORK ENERGY INCLUDE 1 ENGINE DRIVEN WATER PUMP.
3) EMISSION DATA SHOWN ARE DRY AND NOT TO EXCEED VALUES.
4) HEAT REJECTION TO JACKET AND EXHAUST TOLERANCE IS ± 10% OF FULL LOAD DATA. (heat rate based on treated water)
5) HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ± 50% OF FULL LOAD DATA. (heat rate based on treated water)
6) HEAT REJECTION TO LUBE OIL TOLERANCE IS ± 20% OF FULL LOAD DATA. (heat rate based on treated water)
7) HEAT REJECTION TO AFTERCOOLER TOLERANCE IS ± 5% OF FULL LOAD DATA. (heat rate based on treated water)
8) AFTERCOOLER HEAT STAGE 1 = (A/C HEAT STAGE 1 + 0.855 x (STAGE 1 + STAGE 2) x (ACHRF - 1)) : (heat rate based on treated water)
AFTERCOOLER HEAT STAGE 2 = (A/C HEAT STAGE 2 + 0.145 x (STAGE1 + STAGE 2) x (ACHRF - 1)) : (heat rate based on treated water)

FUEL USAGE GUIDE

DERATE FACTOR vs CATERPILLAR METHANE NUMBER

Methane Number	60	65	70	75	80	85	90	95	100
Rating Factor	0.00	0.87	0.91	0.95	1.00	1.00	1.00	1.00	1.00

Minimum Methane Number for Full Rating = 80.4

Fuel System Limit (minimum Wobbe Index) = 1038 BTU/SCF

TOTAL DERATION FACTORS - ALTITUDE & COOLING

AIR TO TURBO (°F)	0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10000	11000	12000
130	0.97	0.93	0.90	0.86	0.83	0.80	0.77	0.74	0.71	0.68	0.65	0.62	0.59
120	0.98	0.95	0.91	0.88	0.85	0.81	0.78	0.75	0.72	0.69	0.67	0.64	0.61
110	1.00	0.97	0.93	0.89	0.86	0.83	0.80	0.76	0.74	0.71	0.68	0.65	0.62
100	1.00	0.98	0.95	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.69	0.66	0.64
90	1.00	1.00	0.96	0.93	0.89	0.86	0.82	0.79	0.76	0.73	0.70	0.67	0.65
80	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
70	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
60	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
50	1.00	1.00	1.00	1.00	0.96	0.93	0.89	0.86	0.82	0.79	0.76	0.73	0.70

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	1.45	1.52	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56	1.56
120	1.36	1.42	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47	1.47
110	1.27	1.33	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
100	1.18	1.24	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29	1.29
90	1.09	1.15	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19	1.19
80	1.00	1.06	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
70	1.00	1.00	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
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)

ALLOWABLE INERTS IN THE FUEL:
The maximum amount of free inerts in the fuel is limited to 5%.

FUEL SYSTEM LIMIT:
Fuels with a Wobbe index lower than the limit, require a custom fuel system and engine control system mapping from the factory. The Wobbe index is determined using the Caterpillar Methane Number Calculation program.

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.

TOTAL 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. The total deration factor includes deration due to altitude and ambient temperature, and air inlet manifold temperature deration.

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
To determine the actual power available, take the lowest rating between the Altitude/Temperature Deration and the Fuel Usage Guide Deration.

GENERATOR EFFICIENCY:
Generator power determined with an assumed generator effeciency of 97% [generator power=engine power x 0.97]. If the actual generator efficiency is less than 97% [and greater than 95%], the generator power [ekW] listed in the technical data can still be achieved. The BSFC values must be increased by a factor.
The factor is a percentage = 97% - actual generator efficiency [%].

EXHAUST STACK TEMPERATURE:
The exhaust stack temperature listed in the technical data is a nominal value with a tolerance = +35°C, -30°C (+63°F, -54°F)

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 85.5% of the additional heat.