

G3516 LE**GAS ENGINE TECHNICAL DATA**

ENGINE SPEED:	1500	FUEL:	LANDFILL
COMPRESSION RATIO:	11:1	FUEL SYSTEM:	DELTEC
AFTERCOOLER (°C)	43/43	WITH AIR FUEL RATIO CONTROL	
JACKET WATER (°C)	110	MIN. FUEL PRESS. (KPAg):	10
COOLING SYSTEM:	2-CIRCUIT	MIN. METHANE NUMBER:	130
IGNITION SYSTEM:	EIS	RATED ALTITUDE (m):	350
EXHAUST MANIFOLD:	DRY	AT AMBIENT TEMP (°C):	25
COMBUSTION:	LEAN BURN	NOx EMISSION LEVEL:	500 mg/Nm3

RATING AND EFFICIENCY	NOTES	LOAD	100%	75%	50%
LHV OF FUEL		MJ/Nm3	18.2	18.2	18.2
ENGINE POWER		KW	1195	896	597
ENGINE EFFICIENCY	(1)	%	37.9	35.9	33.8
THERMAL EFFICIENCY	(6)	%	42.5	45.8	49.0
TOTAL EFFICIENCY	(7)	%	80.3	81.6	82.8

ENGINE DATA					
FUEL CONSUMPTION	(1)	MJ/bkW-hr	9.51	10.05	10.67
AIR FLOW (0 °C, 101.3 kPa)	(WET)	Nm3/bkW-hr	3.84	3.9	3.85
AIR FLOW	(WET)	kg/bkW-hr	4.97	5.04	4.97
COMPRESSOR OUT PRESS.		KPAa	245	192	144
COMPRESSOR OUT TEMP.		°C	140	106	69
INLET MAN. PRESS.		KPAa	228	172	116
INLET MAN. TEMP.	(11)	°C	61	61	61
TIMING	(12)	°BTDC	26	26	26
NOISE - MECH @ 1m		dB(A)	100	99	98
NOISE - EXH @ 1.5m		dB(A)	111	110	109
EXHAUST STACK TEMP.		°C	520	538	561
EXHAUST GAS FLOW (0 °C, 101.3 kPa)	(WET)	Nm3/bkW-hr	4.35	4.42	4.39
EXHAUST MASS	(WET)	kg/bkW hr	5.44	5.53	5.48

EMISSIONS DATA					
NOx (as NO2) (corr. 5% O2)	(10)	mg/Nm3	500	500	500
CO (corr. 5% O2)	(10)	mg/Nm3	1680	1581	1438
THC (corr. 5% O2)	(10)	mg/Nm3	1703	1839	1911
NMHC (corr. 5% O2)	(10)	mg/Nm3	256	276	287
EXHAUST O2	(10)	%	7.7	7.6	7.0
LAMBDA			1.85	1.83	1.72

HEAT BALANCE DATA					
LHV INPUT	(1)	KW	3154	2499	1770
HEAT REJ. TO JACKET	(2) (8)	KW	489	464	390
HEAT REJ. TO ATMOSPHERE	(4)	KW	118	98	79
HEAT REJ. TO LUBE OIL	(5)	KW	153	145	122
HEAT REJ. TO EXH. (LHV to 25°C)	(2)	KW	1057	834	574
HEAT REJ. TO EXH. (LHV to 120°C)	(2)	KW	854	651	430
HEAT REJ. TO A/C	(3) (9)	KW	142	62	8

CONDITIONS AND DEFINITIONS

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

NOTES

- 1) FUEL CONSUMPTION TOLERANCE ACCORDING TO ISO 3046/1. TOLERANCE IS + 5% OF FULL LOAD DATA.
- 2) HEAT REJECTION TO JACKET AND EXHAUST TOLERANCE IS ± 8% OF FULL LOAD DATA.
- 3) HEAT REJECTION TO A/C TOLERANCE IS ± 8% OF FULL LOAD DATA.
- 4) HEAT REJECTION TO ATMOSPHERE TOLERANCE IS ± 25% OF FULL LOAD DATA.
- 5) HEAT REJECTION TO LUBE OIL TOLERANCE IS ± 8% OF FULL LOAD DATA.
- 6) THERMAL EFFICIENCY: JACKET HEAT + EXH. HEAT TO 120°C.
- 7) TOTAL EFFICIENCY: ENGINE EFF. + THERMAL EFF. TOLERANCE IS ± 10% OF FULL LOAD DATA.
- 8) TOTAL JW HEAT: 2-CIRCUIT = JACKET HEAT (heat rate based on treated water)
- 9) TOTAL A/C HEAT: 2-CIRCUIT = (STAGE 1 A/C HEAT + STAGE 2 A/C HEAT) x A/C HEAT REJ. FACTOR + O/C HEAT. STAGE 1 AND STAGE 2 A/C PLUMBED IN SERIES.
- 10) EMISSION DATA SHOWN ARE DRY AND NOT TO EXCEED VALUES. PUBLISHED PART LOAD DATA REQUIRES LAMBDA CONTROL.
- 11) MEASURED BETWEEN AFTERCOOLER OUTLET AND PLENUM ENTRY.
- 12) TIMING INDICATED IS FOR USE WITH THE MINIMUM FUEL METHANE NUMBER SPECIFIED. CONSULT THE APPROPRIATE FUEL USAGE GUIDE FOR TIMING AT OTHER METHANE NUMBERS.

FUEL USAGE GUIDE											
DERATE FACTOR/ENGINE TIMING vs METHANE NUMBER											
<30	30	40	50	60	70	80	90	100	110	120	130 +
0	0	0	0	0	0	0	0	0	0	0	1.0/26*

* Denotes Air Fuel Ratio Control required for Rating(s) Shown.

ALTITUDE DERATION FACTORS														
A	50	0.96	0.93	0.91	0.88	0.85	0.83	0.80	0.78	0.75	0.73	0.71	0.69	0.67
M	45	0.98	0.95	0.92	0.89	0.87	0.84	0.82	0.79	0.77	0.74	0.72	0.70	0.68
B	40	0.99	0.96	0.94	0.91	0.88	0.85	0.83	0.80	0.78	0.75	0.73	0.71	0.69
I	35	1.00	0.98	0.95	0.92	0.89	0.87	0.84	0.82	0.79	0.77	0.74	0.72	0.70
E	30	1.00	1.00	0.97	0.94	0.91	0.88	0.86	0.83	0.80	0.78	0.76	0.73	0.71
N	25	1.00	1.00	0.98	0.95	0.92	0.90	0.87	0.84	0.82	0.79	0.77	0.74	0.72
T	20	1.00	1.00	1.00	0.97	0.94	0.91	0.88	0.86	0.83	0.81	0.78	0.76	0.73
	15	1.00	1.00	1.00	0.99	0.96	0.93	0.90	0.87	0.85	0.82	0.79	0.77	0.75
(°C)	10	1.00	1.00	1.00	1.00	0.97	0.94	0.92	0.89	0.86	0.83	0.81	0.78	0.76
		0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000

ALTITUDE (METERS ABOVE SEA LEVEL)

AFTERCOOLER HEAT REJECTION FACTORS														
A	50	1.31	1.37	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39	1.39
M	45	1.23	1.28	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31
B	40	1.15	1.20	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22	1.22
I	35	1.06	1.12	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14	1.14
E	30	1.00	1.03	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05	1.05
N	25	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
T	20	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
	15	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
(°C)	10	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
		0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000

ALTITUDE (METERS ABOVE SEA LEVEL)

FUEL USAGE GUIDE:

This table shows the derate factor required for a given fuel and what engine timing to use. Note that deration occurs as the methane number decreases. Methane number is a scale to measure ignition and burning characteristics of various fuels. Representative values are shown below.

Methane	100
Ethane	44
Propane	34
n-Butane	10
Hydrogen	0

Most dry pipeline natural gas has a methane number of 67 or above. The gas quality should be analyzed to determine the percentage of each constituent and then determine the methane number. Consult the dealer or factory for assistance.

ALTITUDE DERATION FACTORS:

This table shows the deration required for various ambient temperatures and altitudes. Use this information 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, i.e., 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 25°C and 150 m altitude. To maintain a constant inlet air manifold temperature, as the ambient air 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 shut down or fail.