

ENGINE SPEED (rpm):	1500	RATING STRATEGY:	STANDARD
COMPRESSION RATIO:	8	PACKAGE TYPE:	WITHOUT RADIATOR
AFTERCOOLER TYPE:	SCAC	RATING LEVEL:	CONTINUOUS
AFTERCOOLER WATER INLET (°C):	54	FUEL:	NATURAL GAS
JACKET WATER OUTLET (°C):	99	FUEL SYSTEM:	LPG IMPCO
ASPIRATION:	TA	FUEL PRESSURE RANGE(kPa): (See note 1)	10-35
COOLING SYSTEM:	JW+OC, AC	FUEL METHANE NUMBER:	80
CONTROL SYSTEM:	EIS	FUEL LHV (MJ/Nm3):	35.64
EXHAUST MANIFOLD:	ASWC	ALTITUDE CAPABILITY AT 25°C INLET AIR TEMP. (m):	1067
COMBUSTION:	LOW EMISSION	POWER FACTOR:	0.8
NOx EMISSION LEVEL (g/bhp-hr NOx):	2.0	VOLTAGE(V):	400

RATING	NOTES	LOAD	100%	75%	50%
GENSET POWER (WITHOUT FAN)	2,3	ekW	725	544	363
GENSET POWER (WITHOUT FAN)	2,3	kVA	906	680	453
ENGINE POWER (WITHOUT FAN)	3	bkW	758	569	382
GENERATOR EFFICIENCY	2	%	95.7	95.6	94.9
GENSET EFFICIENCY(@ 1.0 Power Factor) (ISO 3046/1)	4	%	33.0	32.4	30.0
THERMAL EFFICIENCY	5	%	49.5	51.1	54.9
TOTAL EFFICIENCY (@ 1.0 Power Factor)	6	%	82.5	83.5	84.9

ENGINE DATA						
GENSET FUEL CONSUMPTION (ISO 3046/1)	7	MJ/ekW-hr	11.03	11.23	12.06	
GENSET FUEL CONSUMPTION (NOMINAL)	7	MJ/ekW-hr	11.25	11.45	12.30	
ENGINE FUEL CONSUMPTION (NOMINAL)	7	MJ/bkW-hr	10.76	10.94	11.67	
AIR FLOW (0°C, 101.3 kPa) (WET)	8, 9	Nm3/bkW-hr	4.55	4.38	4.57	
AIR FLOW (WET)	8, 9	kg/bkW-hr	5.88	5.66	5.90	
FUEL FLOW (0°C, 101.3 kPa)		Nm3/hr	229	175	125	
COMPRESSOR OUT PRESSURE		kPa(abs)	266	233	170	
COMPRESSOR OUT TEMPERATURE		°C	163	145	100	
AFTERCOOLER AIR OUT TEMPERATURE		°C	55	55	54	
INLET MAN. PRESSURE	10	kPa(abs)	228	167	121	
INLET MAN. TEMPERATURE (MEASURED IN PLENUM)	11	°C	59	56	54	
TIMING	12	°BTDC	33	33	33	
EXHAUST TEMPERATURE - ENGINE OUTLET	13	°C	459	458	460	
EXHAUST GAS FLOW (0 °C, 101.3 kPa) (WET)	14, 9	Nm3/bkW-hr	4.86	4.70	4.90	
EXHAUST GAS MASS FLOW (WET)	14, 9	kg/bkW-hr	6.11	5.90	6.16	

EMISSIONS DATA - ENGINE OUT						
NOx (as NO2) (corr. to 5% O2)	15,16	mg/Nm3 DRY	776	1445	1434	
CO (corr. to 5% O2)	15,17	mg/Nm3 DRY	710	817	807	
THC (mol. wt. of 15.84) (corr. to 5% O2)	15,17	mg/Nm3 DRY	1081	865	908	
NMHC (mol. wt. of 15.84) (corr. to 5% O2)	15,17	mg/Nm3 DRY	162	130	136	
NMNEHC (VOCs) (mol. wt. of 15.84) (corr. to 5% O2)	15,17,18	mg/Nm3 DRY	108	87	91	
HCHO (Formaldehyde) (corr. to 5% O2)	15,17	mg/Nm3 DRY	104	104	97	
CO2 (corr. to 5% O2)	15,17	g/Nm3 DRY	205	203	204	
EXHAUST OXYGEN	15,19	% DRY	8.0	7.1	6.8	
LAMBDA	15,19		1.59	1.51	1.47	

ENERGY BALANCE DATA						
LHV INPUT	20	kW	2266	1730	1239	
HEAT REJECTION TO JACKET WATER (JW)	21,28	kW	533	452	367	
HEAT REJECTION TO ATMOSPHERE (INCLUDES GENERATOR)	22	kW	113	92	73	
HEAT REJECTION TO LUBE OIL (OC)	23,28	kW	79	67	55	
HEAT REJECTION TO EXHAUST (LHV TO 25°C)	24,25	kW	651	468	331	
HEAT REJECTION TO EXHAUST (LHV TO 120°C)	24	kW	492	356	252	
HEAT REJECTION TO AFTERCOOLER (AC)	26,29	kW	148	90	32	
PUMP POWER	27	kW	18	18	18	

CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1. (Standard reference conditions of 25°C, 100 kPa barometric pressure.) No overload permitted at rating shown. Consult the altitude deration factor chart for applications that exceed the rated altitude or temperature.

Emission levels are at engine exhaust flange prior to any after treatment. Values are based on engine operating at steady state conditions, adjusted to the specified NOx level at 100% load and corrected to 5 % exhaust oxygen. Tolerances specified are dependent upon fuel quality. Fuel methane number cannot vary more than ± 3. Part load data may require engine adjustment.

For notes information consult page three.

FUEL USAGE GUIDE

CAT METHANE NUMBER	14	20	30	35	40	45	50	55	60	65	70	75	80	100
SET POINT TIMING	19	19	19	21	22	23	24	26	27	28	30	31	33	33
DERATION FACTOR	0.50	0.65	0.90	0.90	0.90	1	1	1	1	1	1	1	1	1

ALTITUDE DERATION FACTORS AT RATED SPEED

INLET AIR TEMP °C	50	1	1	0.99	0.96	0.93	0.90	0.88	0.85	0.82	0.80	0.77	0.74	0.72
	45	1	1	1	0.98	0.95	0.92	0.89	0.86	0.84	0.81	0.78	0.75	0.73
	40	1	1	1	0.99	0.96	0.93	0.90	0.87	0.85	0.82	0.79	0.77	0.74
	35	1	1	1	1	0.98	0.95	0.92	0.89	0.86	0.83	0.81	0.78	0.75
	30	1	1	1	1	0.99	0.96	0.93	0.90	0.87	0.85	0.82	0.79	0.77
	25	1	1	1	1	1	0.98	0.95	0.92	0.89	0.86	0.83	0.81	0.78
	20	1	1	1	1	1	0.99	0.96	0.93	0.90	0.88	0.85	0.82	0.79
	15	1	1	1	1	1	1	0.98	0.95	0.92	0.89	0.86	0.83	0.81
	10	1	1	1	1	1	1	0.99	0.96	0.93	0.90	0.87	0.85	0.82
		0	250	500	750	1000	1250	1500	1750	2000	2250	2500	2750	3000
ALTITUDE (METERS ABOVE SEA LEVEL)														

AFTERCOOLER HEAT REJECTION FACTORS (ACHRF)

INLET AIR TEMP °C	50	1.31	1.36	1.41	1.46	1.51	1.52	1.52	1.52	1.52	1.52	1.52	1.52	1.52
	45	1.24	1.29	1.34	1.39	1.44	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
	40	1.17	1.22	1.27	1.32	1.37	1.38	1.38	1.38	1.38	1.38	1.38	1.38	1.38
	35	1.11	1.15	1.20	1.25	1.30	1.31	1.31	1.31	1.31	1.31	1.31	1.31	1.31
	30	1.04	1.09	1.13	1.18	1.23	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
	25	1	1.02	1.06	1.11	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16	1.16
	20	1	1	1	1.04	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09	1.09
	15	1	1	1	1	1.01	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
	10	1	1	1	1	1	1	1	1	1	1	1	1	1
		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 and full load set point timing required for a given fuel. Note that deration and set point timing adjustment may be required 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.

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. The derate factors shown do not take into account external cooling system capacity. The derate factors provided assume the external cooling system can maintain the specified cooling water temperatures at site conditions.

ACTUAL ENGINE RATING:

To determine the actual rating of the engine at site conditions, one must consider separately, limitations due to fuel characteristics and air system limitations. The Fuel Usage Guide deration establishes fuel limitations. The Altitude/Temperature deration factors and RPC (reference the Caterpillar Methane Program) establish air system limitations. RPC comes into play when the Altitude/Temperature deration is less than 1.0 (100%). Under this condition, add the two factors together. When the site conditions do not require an Altitude/Temperature derate (factor is 1.0), it is assumed the turbocharger has sufficient capability to overcome the low fuel relative power, and RPC is ignored. To determine the actual power available, take the lowest rating between 1) and 2).

- 1) Fuel Usage Guide Deration
- 2) $1 - ((1 - \text{Altitude/Temperature Deration}) + (1 - \text{RPC}))$

AFTERCOOLER HEAT REJECTION FACTORS(ACHRF):

To maintain a constant air inlet manifold temperature, as the inlet 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 (ACHRF) to adjust for inlet air temp and altitude conditions. See note 29 for application of this factor in calculating the heat exchanger sizing criteria. Failure to properly account for these factors could result in detonation and cause the engine to shutdown or fail.

NOTES:

1. Fuel pressure range specified is to the engine fuel pressure regulator. Additional fuel train components should be considered in pressure and flow calculations.
2. Generator efficiencies, power factor, and voltage are based on standard generator. [Genset Power (ekW) is calculated as: Engine Power (bkW) x Generator Efficiency], [Genset Power (kVA) is calculated as: Engine Power (bkW) x Generator Efficiency / Power Factor]
3. Rating is with two engine driven water pumps. Tolerance is (+)3, (-)0% of full load.
4. Genset Efficiency published in accordance with ISO 3046/1, based on a 1.0 power factor.
5. Thermal Efficiency is calculated based on energy recovery from the jacket water, lube oil, and exhaust to 120°C with engine operation at ISO 3046/1 Genset Efficiency, and assumes unburned fuel is converted in an oxidation catalyst.
6. Total efficiency is calculated as: Genset Efficiency + Thermal Efficiency. Tolerance is ±10% of full load data.
7. ISO 3046/1 Genset fuel consumption tolerance is (+)5, (-)0% at the specified power factor. Nominal genset and engine fuel consumption tolerance is ± 3.0% of full load data at the specified power factor.
8. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.
9. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.
10. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.
11. Inlet manifold temperature is a nominal value with a tolerance of ± 5°C.
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.
13. Exhaust temperature is a nominal value with a tolerance of (+)35°C, (-)30°C.
14. Exhaust flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 6 %.
15. Emissions data is at engine exhaust flange prior to any after treatment.
16. NOx values are set points and will vary with operating conditions.
17. CO, CO₂, THC, NMHC, NMNEHC, and HCHO values are "Not to Exceed" levels. THC, NMHC, and NMNEHC do not include aldehydes.
18. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ
19. Exhaust Oxygen tolerance is ± 0.5; Lambda tolerance is ± 0.05. Lambda and Exhaust Oxygen level are the result of adjusting the engine to operate at the specified NOx level.
20. LHV rate tolerance is ± 3.0%.
21. Heat rejection to jacket water value displayed includes heat to jacket water alone. Value is based on treated water. Tolerance is ± 10% of full load data.
22. Heat rejection to atmosphere based on treated water. Tolerance is ± 50% of full load data.
23. Lube oil heat rate based on treated water. Tolerance is ± 20% of full load data.
24. Exhaust heat rate based on treated water. Tolerance is ± 10% of full load data.
25. Heat rejection to exhaust (LHV to 25°C) value shown includes unburned fuel and is not intended to be used for sizing or recovery calculations.
26. Heat rejection to aftercooler based on treated water. Tolerance is ±5% of full load data.
27. Pump power includes engine driven jacket water and aftercooler water pumps. Engine brake power includes effects of pump power.
28. Total Jacket Water Circuit heat rejection is calculated as: (JW x 1.1) + (OC x 1.2). Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.
29. Total Aftercooler Circuit heat rejection is calculated as: AC x ACHRF x 1.05. Heat exchanger sizing criterion is maximum circuit heat rejection at site conditions, with applied tolerances. A cooling system safety factor may be multiplied by the total circuit heat rejection to provide additional margin.

FREE FIELD MECHANICAL & EXHAUST NOISE

SOUND PRESSURE LEVEL (dB)											
Octave Band Center Frequency (OBCF)											
100% Load Data			dB(A)	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
Mechanical Sound	Distance from the Engine (m)	1.0	95.3	94.5	91.1	85.3	86.3	89	90.6	87.4	79
		7.0	85.4	84.6	81.2	75.4	76.4	79.1	90.7	77.5	69.1
		15.0	79.6	78.8	75.4	69.6	70.6	73.3	74.9	71.7	63.3
Exhaust Sound	Distance from the Engine (m)	1.0	110.6	98.8	102.6	104.7	101.2	102	104.1	105.9	99.3
		7.0	97.3	88.5	90.8	92.2	88.6	91	90.8	91.2	84.2
		15.0	90.6	81.9	84.2	85.6	82	84.4	84.2	84.6	77.5

SOUND PARAMETER DEFINITION:

Data Variability Statement:
Sound data presented by Caterpillar has been measured in accordance with ISO 6798 in a Grade 3 test environment. Measurements made in accordance with ISO 6798 will result in some amount of uncertainty. The uncertainties depend not only on the accuracies with which sound pressure levels and measurement surface areas are determined, but also on the 'near-field error' which increases for smaller measurement distances and lower frequencies. The uncertainty for a Grade 3 test environment, that has a source that produces sounds that are uniformly distributed in frequency over the frequency range of interest, is equal to 4 dB (A-weighted). This uncertainty is expressed as the largest value of the standard deviation.