

Generator Set Data Sheet

2000kW Continuous



Model: C2000 N5CD
Frequency: 50 Hz
Fuel Type: Pipeline Natural Gas
Emissions NOx: 500 mg/Nm³
LT water inlet temp: 50°C (122°F)
HT water outlet temp: 90°C (194°F)
Ambient temp capability: ≤ 40 °C (104 °F)

Measured sound performance data sheet:	MSP-4005
Prototype test summary data:	
Remote radiator cooling outline:	

Fuel Consumption (ISO3046/1)	See Note	100% of Rated Load	90% of Rated Load	75% of Rated Load	50% of Rated Load
Fuel Consumption (LHV) ISO3046/1, kW (MMBTU/hr)	2,3,5,8	4530 (15.47)	4106 (14.02)	3492 (11.93)	2458 (8.39)
Electrical Efficiency ISO3046/1, percent	2,5,8,10	44.2%	43.8%	43.0%	40.7%
Thermal Efficiency ISO3046/1, percent	2,5,8,17	45.9%	46.0%	46.7%	48.5%

Engine

Engine Manufacturer	Cummins
Engine Model	HSK78G
Configuration	V12
Displacement, L (cu.in)	78 (4778)
Aspiration	Turbocharged and Charge Air Aftercooled
Gross Engine Power Output, kWm (hp)	2062 (2764)
BMEP, bar (psi)	22 (319)
Bore, mm (in)	190 (7.48)
Stroke, mm (in)	230 (9.06)
Rated Speed, rpm	1500
Piston Speed, m/s (ft/min)	11.5 (2264)
Compression Ratio	13.0:1
Lube Oil Capacity, L (qt)	617 (652)
Overspeed Limit, rpm	1725
Regenerative Power, kW	N/A
Full Load Lubricating oil consumption, g/kWe-hr (g/hp-hr)	0.2 (0.15)

Fuel

Gas supply pressure to FSOV inlet, bar (psi) ¹⁸	0.15 - 0.45 (2.2 - 6.5)
Minimum Methane Index	70

Starting System(s)

Electric Starter Voltage, volts	24
Minimum Battery Capacity @ 40°C (104°F), AH	358
Air Starter Pressure, barg (psig)	#N/A
Air Starter Flow Nm³/s (scfm)	#N/A

Genset dimensions (see Note 1)

Genset Length, m (ft)	6.9 (22)
Genset Width, m (ft)	2.2 (7)
Genset Height, m (ft)	2.8 (9)
Genset Weight (wet), kg (lbs)	23166 (51072)

Energy data

	See Notes	100% of Rated Load	90% of Rated Load	75% of Rated Load	50% of Rated Load
Continuous Generator Electrical Output kWe @ 1.0 pf	2,5,10	2000	1800	1500	1000
Heat Dissipated in Lube Oil Cooler, kW (MMBTU/h)	14	302 (1.03)	291 (0.99)	271 (0.93)	222 (0.76)
Heat Dissipated in Block, kW (MMBTU/h)	14	398 (1.36)	364 (1.24)	338 (1.15)	274 (0.94)
Total Heat Rejected in LT Circuit, kW (MMBTU/h)	14	127 (0.43)	119 (0.40)	111 (0.38)	94 (0.32)
Total Heat Rejected in HT Circuit, kW (MMBTU/h)	14	1180 (4.03)	1035 (3.53)	868 (2.96)	593 (2.02)
Unburnt, kW (MMBTU/h)	14	105 (0.36)	102 (0.35)	91 (0.31)	68 (0.23)
Heat Radiated to Ambient, kW (MMBTU/h)	14	214 (0.73)	193 (0.66)	163 (0.56)	113 (0.39)
Available Exhaust heat to 120°C, kW (MMBTU/h)	14	897 (3.06)	853 (2.91)	763 (2.60)	599 (2.04)

Intake air flow

Intake Air Flow Mass, kg/s (lb/hr)	14	3.12 (24762)	2.80 (22210)	2.35 (18654)	1.60 (12713)
Intake Air Flow Volume, m³/s @ 0°C (scfm)	14	2.41 (5380)	2.16 (4820)	1.82 (4070)	1.24 (2770)
Maximum Air Cleaner Restriction, mmHG (in H ₂ O)		18.7 (10.0)	18.7 (10.0)	18.7 (10.0)	18.7 (10.0)

Exhaust air flow

Exhaust Gas Flow Mass, kg/s (lb/hr)	14	3.22 (25563)	2.89 (22936)	2.43 (19272)	1.66 (13148)
Exhaust Gas Flow Volume, m³/s (cfm)	14	6.05 (12810)	5.55 (11750)	4.81 (10180)	3.51 (7430)
Exhaust Temperature After Turbine, °C (°F)	4	390 (734)	405 (760)	426 (800)	474 (886)
Max Exhaust System Back Pressure, mmHG (in H ₂ O)	12	36.8 (19.7)	36.8 (19.7)	36.8 (19.7)	36.8 (19.7)
Min Exhaust System Back Pressure, mmHG (in H ₂ O)	12	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)	0.0 (0.0)

HT cooling circuit

HT Circuit Engine Coolant Volume, L (gal)		284 (75)	284 (75)	284 (75)	284 (75)
HT Coolant Flow @ Max Ext Restriction, m³/h (gal/min)	13,15	99 (438)	99 (438)	99 (438)	99 (438)
Maximum HT Engine Coolant Inlet Temp, °C (°F)	6	78 (172)	79 (174)	81 (177)	84 (183)
HT Coolant Outlet Temp, °C (°F)	6	90 (194)	90 (194)	90 (194)	90 (194)
Max Pressure Drop in External HT Circuit, bar (psig)	15	1.3 (19)	1.3 (19)	1.3 (19)	1.3 (19)
HT Circuit Maximum Pressure, bar (psig)		6.0 (87)	6.0 (87)	6.0 (87)	6.0 (87)
Minimum Static Head - Pump Inlet, bar (psig)		0.5 (7)	0.5 (7)	0.5 (7)	0.5 (7)

LT Cooling Circuit	See Notes	100% of Rated Load	90% of Rated Load	75% of Rated Load	50% of Rated Load
LT Circuit Engine Coolant Volume, L (gal)		49 (13)	49 (13)	49 (13)	49 (13)
LT Coolant Flow @ Max Ext Restriction, m³/h (gal/min)	13,15	42 (187)	42 (187)	42 (187)	42 (187)
Maximum LT Engine Coolant Inlet Temp, °C (°F)	7	50 (122)	50 (122)	50 (122)	50 (122)
Nominal LT Coolant Outlet Temp, °C (°F)	7	53 (128)	53 (127)	53 (127)	52 (126)
Max Pressure Drop in External LT Circuit, bar (psig)	15	1.3 (19)	1.3 (19)	1.3 (19)	1.3 (19)
LT Circuit Maximum Pressure, bar (psig)		6.0 (87)	6.0 (87)	6.0 (87)	6.0 (87)
Minimum Static Head - Pump Inlet, bar (psig)		0.5 (7)	0.5 (7)	0.5 (7)	0.5 (7)

Emissions

NO _x Emissions dry, ppm		163	163	166	169
NO _x Emissions, mg/Nm³ @5% O ₂ (g/hp-h)		493 (0.94)	489 (0.94)	494 (0.97)	490 (1.01)
THC Emissions wet, ppm	11	1261	1313	1408	1587
THC Emissions, mg/Nm³ @5% O ₂ (g/hp-h)	11	1500 (2.87)	1549 (2.98)	1646 (3.22)	1817 (3.76)
CH ₄ Emissions wet, ppm	11	1002	1044	1114	1251
CH ₄ Emission, mg/Nm³ @5% O ₂ (g/hp-h)	11	1203 (2.30)	1243 (2.39)	1314 (2.57)	1447 (2.99)
NMHC Emissions wet, ppm	11	259	269	294	336
NMHC Exhaust Emissions, mg/Nm³ @5% O ₂ (g/hp-h)	11	207 (0.57)	214 (0.59)	235 (0.65)	267 (0.77)
Formaldehyde wet, ppm	11	42	43	45	49
Formaldehyde, mg/Nm³ @5% O ₂ (g/hp-h)	11	95 (0.18)	97 (0.35)	100 (0.39)	107 (0.46)
CO Emissions dry, ppm	14	467	477	489	502
CO Emissions, mg/Nm³ @5% O ₂ (g/hp-h)	14	980 (1.65)	992 (1.68)	1008 (1.73)	1014 (1.83)
CO ₂ Emissions dry, percent	14	6	6	6	6
CO ₂ Emissions, mg/Nm³ @5% O ₂ (g/hp-h)	14	197 (330)	197 (332)	197 (338)	198 (357)
O ₂ Emissions dry, percent	14	10	10	10	10
Particulates PM ₁₀ , g/hp-h	14	-	-	-	-
Particulates PM _{2.5} , g/hp-h	14	-	-	-	-

Genset De-rating

Altitude and Temperature Derate Multiplication Factor

Barometer		Altitude		Table A												
In Hg	mbar	Feet	Meters	Derate Multiplier												
18.2	616	13123	4000	0.72	0.71	0.71	0.71	0.71	0.71	0.67	0.62	0.57	0.21	0.17	0.15	
18.8	636	12303	3750	0.74	0.74	0.74	0.74	0.74	0.74	0.70	0.65	0.60	0.39	0.19	0.16	
19.5	657	11483	3500	0.77	0.77	0.77	0.77	0.77	0.77	0.73	0.68	0.63	0.43	0.20	0.17	
20.1	678	10663	3250	0.80	0.79	0.79	0.79	0.79	0.79	0.76	0.71	0.66	0.45	0.21	0.18	
20.7	701	9843	3000	0.83	0.82	0.82	0.82	0.82	0.82	0.79	0.74	0.69	0.48	0.22	0.19	
21.4	723	9022	2750	0.85	0.85	0.85	0.85	0.85	0.85	0.82	0.77	0.72	0.52	0.23	0.20	
22.1	747	8202	2500	0.88	0.88	0.88	0.88	0.88	0.88	0.85	0.80	0.75	0.57	0.24	0.21	
22.8	771	7382	2250	0.91	0.91	0.91	0.91	0.91	0.91	0.89	0.83	0.78	0.65	0.26	0.22	
23.5	795	6562	2000	0.94	0.94	0.94	0.94	0.94	0.94	0.92	0.87	0.81	0.69	0.27	0.24	
24.3	820	5741	1750	0.98	0.97	0.97	0.97	0.97	0.97	0.95	0.90	0.84	0.72	0.29	0.25	
25.0	846	4921	1500	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.93	0.88	0.76	0.30	0.26	
25.8	872	4101	1250	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.97	0.91	0.80	0.32	0.27	
26.6	899	3281	1000	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95	0.83	0.34	0.29	
27.4	926	2461	750	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.87	0.36	0.30	
28.3	954	1640	500	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.91	0.38	0.32	
29.1	983	820	250	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.94	0.40	0.33	
29.5	995	492	150	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.96	0.41	0.34	
30.0	1012	0	0	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.98	0.43	0.34	
				°C	0	5	10	15	20	25	30	35	40	45	50	55
				°F	32	41	50	59	68	77	86	95	104	113	122	131
Air Filter Inlet Temperature																

Temperature & altitude derate

1. Determine derate multiplier vs. temperature and altitude in Table A.
2. Assumes the LT return temperature is 10 °C above the air filter inlet with a maximum LT temperature of 50 °C.
3. If the LT temperature exceeds 50°C, consult factory for recommendations.
4. Altitude is based upon SAE standard ambient pressure vs. altitude. For low barometric conditions add 150 m (500 ft) to site altitude.

Genset De-rating

Heat Rejection Factor (altitude and ambient) for HT and LT Circuits

Barometer		Altitude		Table B												
In Hg	mbar	Feet	Meters	Multiplier for HT & LT (1/4) Heat Rejection vs Alt & Temp.												
18.2	616	13123	4000													
18.8	636	12303	3750													
19.5	657	11483	3500													
20.1	678	10663	3250													
20.7	701	9843	3000													
21.4	723	9022	2750													
22.1	747	8202	2500													
22.8	771	7382	2250													
23.5	795	6562	2000													
24.3	820	5741	1750													
25.0	846	4921	1500													
25.8	872	4101	1250													
26.6	899	3281	1000													
27.4	926	2461	750													
28.3	954	1640	500													
29.1	983	820	250													
29.5	995	492	150													
30.0	1012	0	0													
				°C	0	5	10	15	20	25	30	35	40	45	50	55
				°F	32	41	50	59	68	77	86	95	104	113	122	131
				Air Filter Inlet Temperature												

LT & HT Circuit Heat Rejection Calculation

- Determine derate multiplier vs. temperature and altitude in Table A.
- Using the multiplier from #1 above as the percent load factor determine the heat rejection from the previous page.
- From Table B find the LT circuit multiplier. *The HT circuit multiplier is 1/4 of the multiplier shown in the table e.g. if the table says 1.04, the actual factor for HT is 1.01.
- Multiply the result of step 2 by the result of step 3 to obtain the heat rejection at your altitude and temperature.

Methane Index Derate Multiplication Factor*

Table C

Derate Multiplier

MN	90	85	80	75	70	65	60	55	50	45	40	35
Derate Factor	1.00	1.00	1.00	1.00	1.00	0.95	0.90	0.85	0.75	0.65	0.55	

Methane Index Derate

- Determine derate multiplier vs. Methane Number in Table C based on MN given your gas analysis input into the Cummins Gas Analysis Tool.
- Using the multiplier from #1 above as the percent load factor determine the max load in kW using the nominal max rated load.

Alternator Data

Voltage Range	Connection Configuration	Temp Rise Degrees C	Duty ¹⁰ Cycle	Winding No.	Alternator Data Sheet
380	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
400	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
415	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
440	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
690	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
3300	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
6000	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
6300	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
6600	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
10000	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
10500	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
11000	Wye, 3 Phase	80 / 105	C	N/A	See Note 16
13200	Wye, 3 Phase	80 / 105	C	N/A	See Note 16

Continuous Rating Definition

Applicable for supplying power continuously to a constant load up to the full output rating for unlimited hours. No sustained overload capability is available for this rating. Consult authorized distributor for rating. (Equivalent to Continuous Power in accordance with ISO8528, ISO3046, AS2789, DIN6271, and BS5514).

Note:

- 1) Weights and set dimensions represent a generator set with its standard features, no FSOV installed, and HV P80T alternator. See outline drawing for other configurations.
- 2) At ISO3046 reference conditions, altitude 1013 mbar (30in Hg), air inlet temperature 25°C (77°F)
- 3) According to ISO 3046/I with fuel consumption tolerance of +5%, -0%
- 4) With air intake at 25°C (77°F). Tolerance $\pm 10^{\circ}\text{C}$.
- 5) Tested using pipeline natural gas with LHV of 35.64MJ/Nm³ (905BTU/scf).
- 6) Outlet temperature controlled by thermostat. Inlet temperature for reference only. Data taken with 50% Glycol and with outlet temperature at max allowance.
- 7) Inlet temperature controlled by thermostat, outlet temperature for reference only. Data taken with 50% Glycol.
- 8) Without engine driven coolant pumps
- 9) Standby (S), Prime (P), Continuous ©
- 10) At electrical output of 1.0 Power Factor, 97% Alternator Efficiency
- 11) Tolerance $\pm 15\%$. Values shown are measured using fuel with less than 1% NMHC by volume. Values can vary significantly depending on NMHC found in the fuel.
- 12) Exhaust system back pressure is at rated load and will decrease at lower loads. Minimum restriction/back pressure is 0 mm H₂O.
- 13) Flow including off engine thermostats.
- 14) Tolerance $\pm 10\%$
- 15) Pressure drop external to genset.
- 16) Alternator model and data sheet information available on www.powersuite.cummins.com
- 17) Exhaust gas cooled to 120 °C.
- 18) Fuel pressure capability will vary depending on fuel quality and site conditions.

**For more information contact your local Cummins distributor
or visit power.cummins.com**

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