

Performance Number: DM8117

Change Level: 03

SALES MODEL:	C9	COMBUSTION:	DIRECT INJECTION
BRAND:	CAT	ENGINE SPEED (RPM):	2,200
MACHINE SALES MODEL:		PEAK TORQUE SPEED (RPM):	1,400
ENGINE POWER (BKW):	224.0	TORQUE RISE (%):	37
PEAK TORQUE (NM):	1,338.6	ASPIRATION:	TA
COMPRESSION RATIO:	16.1	AFTERCOOLER TYPE:	ATAAC
RATING LEVEL:	INDUSTRIAL B	AFTERCOOLER CIRCUIT TYPE:	JW+OC, ATAAC
PUMP QUANTITY:	1	INLET MANIFOLD AIR TEMP (C):	49
FUEL TYPE:	DIESEL	JACKET WATER TEMP (C):	89
MANIFOLD TYPE:	DRY	TURBO CONFIGURATION:	SINGLE
GOVERNOR TYPE:	ELEC	TURBO QUANTITY:	1
CAMSHAFT TYPE:	STANDARD	TURBOCHARGER MODEL:	S310G-1.10
IGNITION TYPE:	CI	CERTIFICATION YEAR:	2005
INJECTOR TYPE:	EUI	PISTON SPD @ RATED ENG SPD (M/SEC):	10.9
REF EXH STACK DIAMETER (MM):	102		
MAX OPERATING ALTITUDE (M):	2,591		

INDUSTRY	SUBINDUSTRY	APPLICATION
INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL
INDUSTRIAL	MATERIAL HANDLING	INDUSTRIAL
INDUSTRIAL	CONSTRUCTION	INDUSTRIAL
INDUSTRIAL	AGRICULTURE	INDUSTRIAL
INDUSTRIAL	MINING	INDUSTRIAL
OIL AND GAS	WELL SERVICING	INDUSTRIAL
OIL AND GAS	LAND PRODUCTION	INDUSTRIAL
INDUSTRIAL	FORESTRY	INDUSTRIAL

General Performance Data

ENGINE SPEED	ENGINE POWER	ENGINE TORQUE	BRAKE MEAN EFF PRES (BMEP)	BRAKE SPEC FUEL CONSUMPTN (BSFC)	ISO BRAKE SPEC FUEL CONSUMPTN (BSFC)	VOL FUEL CONSUMPTN (VFC)	ISO VOL FUEL CONSUMPTN (VFC)
RPM	BKW	NM	KPA	G/BKW-HR	G/BKW-HR	L/HR	L/HR
2,200	224	972	1,387	224.1	219.9	59.1	57.9
2,100	224	1,019	1,453	221.4	217.1	58.3	57.2
2,000	224	1,070	1,526	218.6	214.4	57.6	56.5
1,900	224	1,126	1,606	216.0	211.9	56.9	55.8
1,800	224	1,188	1,695	214.0	209.9	56.4	55.3
1,700	219	1,229	1,754	214.1	210.0	55.1	54.1
1,600	212	1,265	1,805	214.5	210.4	53.5	52.5
1,500	204	1,301	1,856	215.4	211.3	51.8	50.8
1,400	196	1,340	1,912	216.7	212.6	50.1	49.1
1,300	182	1,339	1,911	219.4	215.3	47.1	46.2
1,200	168	1,339	1,911	222.7	218.5	44.1	43.3
1,100	154	1,340	1,911	226.7	222.3	41.1	40.4

ENGINE SPEED	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	EXH MFLD PRES	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
RPM	BKW	KPA	DEG C	DEG C	KPA	DEG C	KPA	DEG C
2,200	224	155.2	48.1	586.0	150.3	461.5	162	165.4
2,100	224	156.1	46.9	589.5	143.7	466.6	163	164.0
2,000	224	157.4	46.3	596.8	136.6	475.6	164	163.3
1,900	224	159.5	46.4	608.0	129.5	488.3	165	163.6
1,800	224	161.5	45.8	620.1	122.6	501.8	167	164.2
1,700	219	160.6	44.3	630.0	114.2	513.1	165	163.6
1,600	212	158.2	42.9	642.9	105.3	527.6	163	162.9
1,500	204	154.7	41.8	660.0	95.9	546.2	159	161.9
1,400	196	151.0	40.9	682.5	86.6	570.1	154	160.4
1,300	182	138.7	39.1	705.8	74.3	599.9	141	153.8
1,200	168	124.0	37.2	734.6	61.7	636.6	126	146.0
1,100	154	106.8	35.1	768.7	48.9	680.0	108	136.8

General Performance Data (Continued)

ENGINE SPEED	ENGINE POWER	WET INLET AIR VOL FLOW RATE	ENGINE OUTLET WET EXH GAS VOL FLOW RATE	WET INLET AIR MASS FLOW RATE	WET EXH GAS MASS FLOW RATE	ENGINE OUTLET WET EXH VOL FLOW RATE (0 DEG C AND 101 KPA)	ENGINE OUTLET DRY EXH VOL FLOW RATE (0 DEG C AND 101 KPA)
RPM	BKW	M3/MIN	M3/MIN	KG/HR	KG/HR	M3/MIN	M3/MIN
2,200	224	20.8	53.5	1,462.7	1,512.8	19.9	18.3
2,100	224	20.1	52.0	1,412.0	1,461.5	19.2	17.6
2,000	224	19.4	50.7	1,357.8	1,406.8	18.5	16.9
1,900	224	18.6	49.5	1,302.5	1,351.5	17.8	16.2
1,800	224	17.9	48.4	1,249.8	1,297.8	17.1	15.6
1,700	219	17.0	46.6	1,186.4	1,233.2	16.2	14.7
1,600	212	16.1	44.7	1,116.6	1,162.1	15.2	13.8
1,500	204	15.0	42.7	1,040.8	1,084.8	14.2	12.9
1,400	196	13.9	40.7	959.7	1,002.3	13.2	11.9
1,300	182	12.4	37.5	857.1	897.1	11.7	10.5
1,200	168	10.9	34.1	748.0	785.6	10.2	9.1
1,100	154	9.3	30.6	632.3	667.2	8.8	7.7

Heat Rejection Data

ENGINE SPEED	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXH RECOVERY TO 177C	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
RPM	BKW	KW	KW	KW	KW	KW	KW	KW	KW	KW
2,200	224	92.7	37.9	233	127	31.8	47.9	224	597	636
2,100	224	91.8	37.3	228	125	31.4	46.2	224	589	628
2,000	224	91.0	35.6	225	124	31.0	44.4	224	582	620
1,900	224	89.7	33.7	223	125	30.6	42.7	224	575	613
1,800	224	88.9	32.1	221	125	30.3	41.4	224	570	607
1,700	219	90.9	28.6	215	124	29.6	39.6	219	557	593
1,600	212	90.2	26.8	209	122	28.8	37.4	212	540	576
1,500	204	86.3	28.5	203	120	27.9	34.9	204	523	557
1,400	196	82.0	31.4	197	119	27.0	32.0	196	506	539
1,300	182	78.3	31.4	187	115	25.3	27.5	182	475	506
1,200	168	76.5	31.4	176	110	23.7	22.7	168	445	474
1,100	154	77.4	31.2	162	104	22.1	18.0	154	416	443

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 2200 RPM

ENGINE POWER	BKW	224	168	112	56.0	22.4
PERCENT LOAD	%	100	75	50	25	10
TOTAL NOX (AS NO2)	G/HR	840	474	282	177	125
TOTAL CO	G/HR	443	483	141	210	204
TOTAL HC	G/HR	49	67	74	102	102
TOTAL CO2	KG/HR	152	123	92	54	31
PART MATTER	G/HR	15.8	17.9	24.3	25.1	20.7
TOTAL NOX (AS NO2) (CORR 5% O2)	MG/NM3	1,240.1	864.1	697.7	762.1	905.0
TOTAL CO (CORR 5% O2)	MG/NM3	654.0	881.3	351.8	904.5	1,475.7
TOTAL HC (CORR 5% O2)	MG/NM3	63.2	106.7	158.2	380.4	637.5
PART MATTER (CORR 5% O2)	MG/NM3	19.7	28.1	52.5	96.7	137.5
TOTAL NOX (AS NO2) (CORR 5% O2)	PPM	604	421	340	371	441
TOTAL CO (CORR 5% O2)	PPM	523	705	281	724	1,181
TOTAL HC (CORR 5% O2)	PPM	118	199	295	710	1,190
TOTAL NOX (AS NO2)	G/HP-HR	2.82	2.12	1.89	2.37	4.19
TOTAL CO	G/HP-HR	1.49	2.16	0.94	2.81	6.81
TOTAL HC	G/HP-HR	0.17	0.30	0.49	1.36	3.41
PART MATTER	G/HP-HR	0.05	0.08	0.16	0.34	0.69
TOTAL NOX (AS NO2)	LB/HR	1.85	1.05	0.62	0.39	0.28
TOTAL CO	LB/HR	0.98	1.06	0.31	0.46	0.45

PERFORMANCE DATA[DM8117]

March 13, 2024

TOTAL HC	LB/HR	0.11	0.15	0.16	0.22	0.22
TOTAL CO2	LB/HR	336	272	203	118	69
PART MATTER	LB/HR	0.03	0.04	0.05	0.06	0.05
OXYGEN IN EXH	%	11.0	12.2	13.5	15.3	17.0
DRY SMOKE OPACITY	%	0.5	0.6	1.0	1.3	1.1
BOSCH SMOKE NUMBER		0.37	0.54	0.93	1.15	1.00

RATED SPEED POTENTIAL SITE VARIATION: 2200 RPM

ENGINE POWER	BKW	224	168	112	56.0	22.4
PERCENT LOAD	%	100	75	50	25	10
TOTAL NOX (AS NO2)	G/HR	907	512	305	192	135
TOTAL CO	G/HR	828	903	263	393	381
TOTAL HC	G/HR	93	127	139	193	192
PART MATTER	G/HR	30.7	34.9	47.3	49.0	40.3
TOTAL NOX (AS NO2) (CORR 5% O2)	MG/NM3	1,339.3	933.2	753.5	823.0	977.4
TOTAL CO (CORR 5% O2)	MG/NM3	1,223.0	1,648.0	657.8	1,691.4	2,759.6
TOTAL HC (CORR 5% O2)	MG/NM3	119.4	201.7	299.0	718.9	1,205.0
PART MATTER (CORR 5% O2)	MG/NM3	38.4	54.8	102.4	188.5	268.2
TOTAL NOX (AS NO2) (CORR 5% O2)	PPM	652	455	367	401	476
TOTAL CO (CORR 5% O2)	PPM	978	1,318	526	1,353	2,208
TOTAL HC (CORR 5% O2)	PPM	223	376	558	1,342	2,249
TOTAL NOX (AS NO2)	G/HP-HR	3.05	2.29	2.05	2.56	4.52
TOTAL CO	G/HP-HR	2.78	4.04	1.77	5.26	12.74
TOTAL HC	G/HP-HR	0.31	0.57	0.93	2.58	6.44
PART MATTER	G/HP-HR	0.10	0.16	0.32	0.66	1.35
TOTAL NOX (AS NO2)	LB/HR	2.00	1.13	0.67	0.42	0.30
TOTAL CO	LB/HR	1.83	1.99	0.58	0.87	0.84
TOTAL HC	LB/HR	0.21	0.28	0.31	0.42	0.42
PART MATTER	LB/HR	0.07	0.08	0.10	0.11	0.09

Regulatory Information

CHINA STAGE II		2010 - 2015		
THIS ENGINE HAS BEEN TESTED IN ACCORDANCE WITH THE PROVISIONS OF THE PEOPLE'S REPUBLIC OF CHINA NATIONAL STANDARD #GB 20891-2007, AND COMPLIES WITH THE STATED LIMITS OF CO, HC, NOX, AND PM FOR STAGE II				
Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
CHINA	CHINA	NON-ROAD	STAGE II	CO: 3.5 NOx: 6.0 HC: 1.0 PM: 0.20

EPA TIER 3		2005 - 2010		CYCLE :C1
GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 89 SUBPART D AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THE "MAX LIMITS" SHOWN BELOW ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.				
Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
U.S. (INCL CALIF)	EPA	NON-ROAD	TIER 3	CO: 3.5 NOx + HC: 4.0 PM: 0.20

EU STAGE IIIA		2006 - 2010		CYCLE :C1
GASEOUS EMISSION DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN EU 97/68/EC, ECE REGULATION NO. 96 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. GASEOUS EMISSION VALUES ARE WEIGHTED CYCLE AVERAGES AND ARE IN COMPLIANCE WITH THE NON-ROAD REGULATIONS.				
Locality	Agency	Regulation	Tier/Stage	Max Limits - G/BKW - HR
EUROPE	EU	NON-ROAD	STAGE IIIA	CO: 3.5 NOx + HC: 4.0 PM: 0.20

IMO II		2011 - ----		
GASEOUS EMISSIONS DATA MEASUREMENTS ARE CONSISTENT WITH THOSE DESCRIBED IN REGULATION 13 OF REVISED ANNEX VI OF MARPOL 73/78 AND ISO 8178 FOR MEASURING HC, CO, PM, AND NOX. THIS ENGINE CONFORMS TO INTERNATIONAL MARINE ORGANIZATION'S (IMO) MARINE COMPRESSION-IGNITION EMISSION REGULATIONS.				

Altitude Derate Data

STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BKW)

AMBIENT OPERATING TEMP (C)	0	5	10	15	20	25	30	35	40	45	50	55	60	NORMAL
ALTITUDE (M)														
0	224	224	224	224	224	224	224	224	224	224	224	224	224	224
250	224	224	224	224	224	224	224	224	224	224	224	224	224	224
500	224	224	224	224	224	224	224	224	224	224	224	224	224	224
750	224	224	224	224	224	224	224	224	224	224	224	224	224	224
1,000	224	224	224	224	224	224	224	224	224	224	224	224	224	224
1,250	224	224	224	224	224	224	224	224	224	224	224	224	224	224
1,500	224	224	224	224	224	224	224	224	224	224	224	224	224	224
1,750	224	224	224	224	224	224	224	224	224	224	224	224	224	224
2,000	224	224	224	224	224	224	224	224	224	224	223	220	217	224
2,250	224	224	224	224	224	224	224	224	223	220	216	213	210	224
2,500	224	224	224	224	224	224	223	219	216	212	209	206	203	224
2,750	224	224	224	224	223	219	216	212	209	206	202	199	196	224
3,000	224	224	223	219	216	212	209	205	202	199	196	193	190	224
3,250	224	220	216	212	209	205	202	198	195	192	189	186	184	220
3,500	216	212	209	205	202	198	195	192	189	186	183	180	177	214
3,750	209	205	202	198	195	192	188	185	182	179	177	174	171	208
4,000	202	198	195	191	188	185	182	179	176	173	171	168	166	202
4,250	195	192	188	185	182	179	176	173	170	167	165	162	160	196
4,500	188	185	182	179	175	173	170	167	164	162	159	157	154	191

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
0K4893	PP5337	2446783	E705	-	JSC00001	
0K4893	PP5337	2524430	E705	-	JSC00001	
0K4894	PP5372	2524430	E705	-	MBD00001	
0K4893	PP5337	3271007	E705	-	JSC00001	
0K4893	PP5337	3930595	E705	-	JSC00001	
0K4893	PP5337	3964949	E705	-	JSC00001	

Performance Parameter Reference

<p>Parameters Reference:DM9600-15</p> <p>PERFORMANCE DEFINITIONS</p>
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PERFORMANCE DEFINITIONS DM9600

APPLICATION:

Engine performance tolerance values below are representative of a typical production engine tested in a calibrated dynamometer test cell at SAE J1995 standard reference conditions. Caterpillar maintains ISO9001:2000 certified quality management systems for engine test Facilities to assure accurate calibration of test equipment. Engine test data is corrected in accordance with SAE J1995. Additional reference material SAE J1228, J1349, ISO 8665, 3046-1:2002E, 3046-3:1989, 1585, 2534, 2288, and 9249 may apply in part or are similar to SAE J1995. Special engine rating request (SERR) test data shall be noted.

PERFORMANCE PARAMETER TOLERANCE FACTORS:

- Power +/- 3%
- Torque +/- 3%
- Exhaust stack temperature +/- 8%
- Inlet airflow +/- 5%
- Intake manifold pressure-gage +/- 10%
- Exhaust flow +/- 6%
- Specific fuel consumption +/- 3%
- Specific fuel consumption (C7-C18) +/- 4%
- Fuel rate +/- 5%
- Specific DEF consumption +/- 3%
- DEF rate +/- 5%
- Heat rejection +/- 5%
- Heat rejection exhaust only +/- 10%
- Heat rejection CEM only +/- 10%
- Heat Rejection values based on using treated water.
- Torque is included for truck and industrial applications, do not use for Gen Set or steady state applications.
- On C7 - C18 engines, at speeds of 1100 RPM and under these values are provided for reference only, and may not meet the tolerance listed.
- On 3500 and C175 engines, at speeds below Peak Torque these values

PERFORMANCE DATA[DM8117]

are provided for reference only, and may not meet the tolerance listed.

These values do not apply to C280/3600. For these models, see the tolerances listed below.

C280/3600 HEAT REJECTION TOLERANCE FACTORS:

Heat rejection +/- 10%

Heat rejection to Atmosphere +/- 50%

Heat rejection to Lube Oil +/- 20%

Heat rejection to Aftercooler +/- 5%

TEST CELL TRANSDUCER TOLERANCE FACTORS:

Torque +/- 0.5%

Speed +/- 0.2%

Fuel flow +/- 1.0%

Temperature +/- 2.0 C degrees

Intake manifold pressure +/- 0.1 kPa

OBSERVED ENGINE PERFORMANCE IS CORRECTED TO SAE J1995 REFERENCE

AIR AND FUEL CONDITIONS.

REFERENCE ATMOSPHERIC INLET AIR

FOR 3500 ENGINES AND SMALLER

SAE J1228 AUG2002 for marine engines, and J1995 JAN2014 for other engines, reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity at the stated aftercooler water temp, or inlet manifold temp.

FOR 3600 ENGINES

Engine rating obtained and presented in accordance with ISO 3046/1 and SAE J1995 JANJAN2014 reference atmospheric pressure is 100 KPA (29.61 in hg), and standard temperature is 25deg C (77 deg F) at 30% relative humidity and 150M altitude at the stated aftercooler water temperature.

MEASUREMENT LOCATION FOR INLET AIR TEMPERATURE

Location for air temperature measurement air cleaner inlet at stabilized operating conditions.

REFERENCE EXHAUST STACK DIAMETER

The Reference Exhaust Stack Diameter published with this dataset is only used for the calculation of Smoke Opacity values displayed in this dataset. This value does not necessarily represent the actual stack diameter of the engine due to the variety of exhaust stack adapter options available. Consult the price list, engine order or general dimension drawings for the actual stack diameter size ordered or options available.

REFERENCE FUEL

DIESEL

Reference fuel is #2 distillate diesel with a 35API gravity;

A lower heating value is 42,780 KJ/KG (18,390 BTU/LB) when used at 15 deg C (59 deg F), where the density is 850 G/Liter (7.0936 Lbs/Gal).

GAS

Reference natural gas fuel has a lower heating value of 33.74 KJ/L (905 BTU/CU Ft). Low BTU ratings are based on 18.64 KJ/L (500 BTU/CU FT) lower heating value gas. Propane ratings are based on 87.56 KJ/L (2350 BTU/CU Ft) lower heating value gas.

ENGINE POWER (NET) IS THE CORRECTED FLYWHEEL POWER (GROSS) LESS

EXTERNAL AUXILIARY LOAD

Engine corrected gross output includes the power required to drive standard equipment; lube oil, scavenge lube oil, fuel transfer, common rail fuel, separate circuit aftercooler and jacket water pumps. Engine net power available for the external (flywheel) load is calculated by subtracting the sum of auxiliary load from the corrected gross flywheel out put power. Typical auxiliary loads are radiator cooling fans, hydraulic pumps, air compressors and battery charging alternators. For Tier 4 ratings additional Parasitic losses would also include Intake, and Exhaust Restrictions.

ALTITUDE CAPABILITY

Altitude capability is the maximum altitude above sea level at standard temperature and standard pressure at which the engine could develop full rated output power on the current performance data set.

Standard temperature values versus altitude could be seen on TM2001.

When viewing the altitude capability chart the ambient temperature is the inlet air temp at the compressor inlet.

Engines with ADEM MEUI and HEUI fuel systems operating at conditions above the defined altitude capability derate for atmospheric pressure and temperature conditions outside the values defined, see TM2001.

Mechanical governor controlled unit injector engines require a setting change for operation at conditions above the altitude defined on the engine performance sheet. See your Caterpillar technical representative for non standard ratings.

REGULATIONS AND PRODUCT COMPLIANCE

TMI Emissions information is presented at 'nominal' and 'Potential Site Variation' values for standard ratings. No tolerances are applied to the emissions data. These values are subject to change at any time. The controlling federal and local emission

PERFORMANCE DATA[DM8117]

March 13, 2024

requirements need to be verified by your Caterpillar technical representative.

Customer's may have special emission site requirements that need to be verified by the Caterpillar Product Group engineer.

EMISSION CYCLE LIMITS:

Cycle emissions Max Limits apply to cycle-weighted averages only. Emissions at individual load points may exceed the cycle-weighted limit.

WET & DRY EXHAUST/EMISSIONS DESCRIPTION:

Wet - Total exhaust flow or concentration of total exhaust flow

Dry - Total exhaust flow minus water vapor or concentration of exhaust flow with water vapor excluded

EMISSIONS DEFINITIONS:

Emissions : DM1176

EMISSION CYCLE DEFINITIONS

1. For constant-speed marine engines for ship main propulsion, including diesel-electric drive, test cycle E2 shall be applied, for controllable-pitch propeller sets test cycle E2 shall be applied.

2. For propeller-law-operated main and propeller-law-operated auxiliary engines the test cycle E3 shall be applied.

3. For constant-speed auxiliary engines test cycle D2 shall be applied.

4. For variable-speed, variable-load auxiliary engines, not included above, test cycle C1 shall be applied.

HEAT REJECTION DEFINITIONS:

Diesel Circuit Type and HHV Balance : DM9500

HIGH DISPLACEMENT (HD) DEFINITIONS:

3500: EM1500

RATING DEFINITIONS:

Agriculture : TM6008

Fire Pump : TM6009

Generator Set : TM6035

Generator (Gas) : TM6041

Industrial Diesel : TM6010

Industrial (Gas) : TM6040

Irrigation : TM5749

Locomotive : TM6037

Marine Auxiliary : TM6036

Marine Prop (Except 3600) : TM5747

Marine Prop (3600 only) : TM5748

MSHA : TM6042

Oil Field (Petroleum) : TM6011

Off-Highway Truck : TM6039

On-Highway Truck : TM6038

SOUND DEFINITIONS:

Sound Power : DM8702

Sound Pressure : TM7080

Date Released : 03/12/24