

Performance Number: DM7687

Change Level: 08

SALES MODEL:	C13	COMBUSTION:	DIRECT INJECTION
BRAND:	CAT	ENGINE SPEED (RPM):	2,100
MACHINE SALES MODEL:		PEAK TORQUE SPEED (RPM):	1,400
ENGINE POWER (BHP):	440	TORQUE RISE (%):	35
PEAK TORQUE (FT-LB):	1,482.5	ASPIRATION:	TA
COMPRESSION RATIO:	17.3	AFTERCOOLER TYPE:	ATAAC
RATING LEVEL:	INDUSTRIAL C - INTERMITTENT	AFTERCOOLER CIRCUIT TYPE:	JW+OC, ATAAC
PUMP QUANTITY:	1	INLET MANIFOLD AIR TEMP (F):	120
FUEL TYPE:	DIESEL	JACKET WATER TEMP (F):	192.2
MANIFOLD TYPE:	DRY	TURBO CONFIGURATION:	SINGLE
GOVERNOR TYPE:	ELEC	TURBO QUANTITY:	1
INJECTOR TYPE:	EUI	TURBOCHARGER MODEL:	GTA4502BS 1.33 A/R
REF EXH STACK DIAMETER (IN):	5	CERTIFICATION YEAR:	2005
MAX OPERATING ALTITUDE (FT):	2,349	PISTON SPD @ RATED ENG SPD (FT/MIN):	2,163.4

INDUSTRY	SubIndustry	APPLICATION
INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL
INDUSTRIAL	CONSTRUCTION	INDUSTRIAL
INDUSTRIAL	MINING	INDUSTRIAL
INDUSTRIAL	FORESTRY	INDUSTRIAL
OIL AND GAS	WELL SERVICING	INDUSTRIAL
OIL AND GAS	LAND PRODUCTION	INDUSTRIAL
INDUSTRIAL	AGRICULTURE	INDUSTRIAL
INDUSTRIAL	MATERIAL HANDLING	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	BHP	LB-FT	PSI	LB/BHP-HR	LB/BHP-HR	GAL/HR	GAL/HR
2,100	440	1,101	218	0.358	0.355	22.4	22.2
2,000	440	1,156	228	0.355	0.352	22.2	21.9
1,900	440	1,217	240	0.350	0.347	21.8	21.6
1,800	440	1,284	254	0.346	0.343	21.6	21.4

1,700	435	1,345	266	0.347	0.343	21.4	21.2
1,600	426	1,399	276	0.342	0.338	20.7	20.5
1,500	413	1,446	286	0.338	0.335	19.9	19.7
1,400	395	1,484	293	0.336	0.333	18.9	18.7
1,300	362	1,464	289	0.335	0.331	17.2	17.1
1,200	327	1,431	283	0.330	0.327	15.4	15.2
1,100	277	1,321	261	0.333	0.330	13.2	13.1
1,000	231	1,211	239	0.322	0.319	10.6	10.5
900	183	1,068	211	0.339	0.336	8.6	8.6
700	117	880	174	0.365	0.362	6.1	6.1

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	BHP	IN-HG	DEG F	DEG F	IN-HG	DEG F	IN-HG	DEG F
2,100	440	47.9	120.8	1,170.3	43.4	925.2	52	323.5
2,000	440	47.8	112.0	1,137.2	41.3	833.9	51	309.2
1,900	440	48.9	114.2	1,159.8	39.5	896.8	52	316.1
1,800	440	50.1	114.7	1,180.9	38.2	944.2	53	322.0
1,700	435	51.0	114.8	1,197.5	36.4	972.4	54	323.5
1,600	426	50.7	112.8	1,201.2	34.2	977.9	53	322.5
1,500	413	51.1	109.2	1,192.1	32.6	961.2	53	323.3
1,400	395	50.7	107.1	1,196.9	30.3	974.3	53	325.1
1,300	362	49.3	103.6	1,174.3	27.8	959.7	51	322.0
1,200	327	42.4	100.3	1,188.8	22.5	973.8	44	305.3
1,100	277	33.4	93.2	1,227.3	16.6	1,026.9	34	271.1
1,000	231	21.0	86.2	1,174.5	10.1	1,015.9	22	212.8
900	183	13.9	85.2	1,160.0	6.8	1,009.4	14	186.1
700	117	6.2	83.7	1,164.1	3.7	1,011.1	7	151.2

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	WET EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)	DRY EXH VOL FLOW RATE (32 DEG F AND 29.98 IN HG)
RPM	BHP	CFM	CFM	LB/HR	LB/HR	FT3/MIN	FT3/MIN
2,100	440	1,028.9	2,723.2	4,434.4	4,593.3	966.8	886.2
2,000	440	1,004.0	2,481.1	4,323.1	4,480.2	943.0	863.1
1,900	440	970.4	2,514.2	4,175.0	4,329.4	911.3	833.0

1,800	440	942.7	2,528.9	4,054.8	4,207.8	885.7	808.8
1,700	435	911.3	2,490.8	3,910.7	4,062.6	855.1	779.1
1,600	426	858.5	2,353.2	3,676.9	3,823.8	804.8	731.9
1,500	413	814.1	2,205.4	3,484.6	3,625.7	763.2	693.1
1,400	395	763.5	2,084.5	3,261.4	3,395.5	714.7	648.3
1,300	362	705.2	1,900.6	3,005.6	3,128.0	658.4	597.7
1,200	327	600.3	1,632.3	2,550.9	2,659.9	559.9	506.2
1,100	277	484.5	1,366.8	2,054.0	2,147.5	452.0	406.4
1,000	231	349.4	981.5	1,478.5	1,553.8	327.0	291.0
900	183	272.6	763.1	1,152.1	1,213.4	255.4	226.2
700	117	167.9	473.9	709.1	752.6	158.4	138.1

Heat Rejection Data

ENGINE SPEED	ENGINE POWER	REJECTION TO JACKET WATER	REJECTION TO ATMOSPHERE	REJECTION TO EXH	EXHAUST RECOVERY TO 350F	FROM OIL COOLER	FROM AFTERCOOLER	WORK ENERGY	LOW HEAT VALUE ENERGY	HIGH HEAT VALUE ENERGY
RPM	BHP	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN	BTU/MIN
2,100	440	7,091	2,411	19,708	11,214	2,574	3,599	18,664	48,321	51,474
2,000	440	6,933	4,553	17,449	9,150	2,551	3,414	18,664	47,888	51,012
1,900	440	6,806	3,342	18,141	10,041	2,516	3,375	18,664	47,245	50,328
1,800	440	6,713	2,396	18,580	10,647	2,486	3,366	18,664	46,674	49,720
1,700	435	6,884	2,121	18,561	10,801	2,465	3,268	18,465	46,279	49,299
1,600	426	6,566	2,149	17,648	10,270	2,376	3,089	18,067	44,608	47,519
1,500	413	6,312	2,264	16,492	9,474	2,279	2,988	17,516	42,781	45,572
1,400	395	5,989	2,052	15,699	9,077	2,168	2,846	16,771	40,700	43,356
1,300	362	5,517	1,869	14,229	8,154	1,981	2,629	15,372	37,189	39,615
1,200	327	5,120	1,749	12,383	7,116	1,760	2,094	13,865	33,053	35,210
1,100	277	4,781	1,451	10,639	6,274	1,503	1,463	11,732	28,225	30,066

Emissions Data

DIESEL

RATED SPEED NOMINAL DATA: 2100 RPM

ENGINE POWER	BHP	440	330	220	110	44.0
PERCENT LOAD	%	100	75	50	25	10
TOTAL NOX (AS NO2)	G/HR	1,246	756	404	193	135
TOTAL CO	G/HR	590	488	152	111	227

TOTAL HC		G/HR	20	23	48	51	41
TOTAL CO2		KG/HR	233	186	136	80	42
PART MATTER		G/HR	44.0	32.7	24.8	31.5	42.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,264.5	952.2	694.9	647.6	719.2
TOTAL CO	(CORR 5% O2)	MG/NM3	606.9	614.8	265.2	639.2	1,206.3
TOTAL HC	(CORR 5% O2)	MG/NM3	17.1	25.6	72.4	140.1	190.7
PART MATTER	(CORR 5% O2)	MG/NM3	37.8	35.5	38.1	120.3	207.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	616	464	338	315	350
TOTAL CO	(CORR 5% O2)	PPM	486	492	212	511	965
TOTAL HC	(CORR 5% O2)	PPM	32	48	135	262	356
TOTAL NOX (AS NO2)		G/HP-HR	2.86	2.31	1.85	1.77	3.07
TOTAL CO		G/HP-HR	1.35	1.49	0.70	1.02	5.17
TOTAL HC		G/HP-HR	0.04	0.07	0.22	0.46	0.93
PART MATTER		G/HP-HR	0.10	0.10	0.11	0.29	0.97
TOTAL NOX (AS NO2)		LB/HR	2.75	1.67	0.89	0.43	0.30
TOTAL CO		LB/HR	1.30	1.08	0.33	0.25	0.50
TOTAL HC		LB/HR	0.04	0.05	0.11	0.11	0.09
TOTAL CO2		LB/HR	513	411	300	175	93
PART MATTER		LB/HR	0.10	0.07	0.05	0.07	0.09
OXYGEN IN EXH		%	10.5	12.2	14.2	16.0	17.0
DRY SMOKE OPACITY		%	0.9	0.8	0.6	1.3	2.6
BOSCH SMOKE NUMBER			0.62	0.50	0.29	0.87	1.58

RATED SPEED POTENTIAL SITE VARIATION: 2100 RPM

ENGINE POWER		BHP	440	330	220	110	44.0
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	1,346	816	436	209	145
TOTAL CO		G/HR	1,103	913	284	208	424
TOTAL HC		G/HR	37	44	92	96	77
PART MATTER		G/HR	85.9	63.7	48.4	61.3	82.7
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,365.7	1,028.3	750.5	699.4	776.8
TOTAL CO	(CORR 5% O2)	MG/NM3	1,135.0	1,149.6	496.0	1,195.3	2,255.9
TOTAL HC	(CORR 5% O2)	MG/NM3	32.3	48.3	136.8	264.8	360.5
PART MATTER	(CORR 5% O2)	MG/NM3	73.7	69.3	74.3	234.5	404.4
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	665	501	366	341	378

TOTAL CO	(CORR 5% O2)	PPM	908	920	397	956	1,805
TOTAL HC	(CORR 5% O2)	PPM	60	90	255	494	673
TOTAL NOX (AS NO2)		G/HP-HR	3.08	2.49	2.00	1.91	3.32
TOTAL CO		G/HP-HR	2.53	2.79	1.30	1.90	9.67
TOTAL HC		G/HP-HR	0.08	0.13	0.42	0.87	1.76
PART MATTER		G/HP-HR	0.20	0.19	0.22	0.56	1.89
TOTAL NOX (AS NO2)		LB/HR	2.97	1.80	0.96	0.46	0.32
TOTAL CO		LB/HR	2.43	2.01	0.63	0.46	0.93
TOTAL HC		LB/HR	0.08	0.10	0.20	0.21	0.17
PART MATTER		LB/HR	0.19	0.14	0.11	0.14	0.18

Regulatory Information

EPA TIER 3		2005 - 2010			
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			
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 (BHP)

AMBIENT OPERATING TEMP (F)	50	60	70	80	90	100	110	120	130	NORMAL
ALTITUDE (FT)										
0	440	440	440	440	440	440	440	440	438	440
1,000	440	440	440	440	440	440	436	429	422	440
2,000	440	440	440	440	435	428	420	413	406	440
3,000	440	440	435	427	419	412	404	397	391	437
4,000	435	426	418	411	403	396	389	382	376	423
5,000	418	410	402	395	388	381	374	368	361	409
6,000	402	394	387	380	373	366	360	353	347	396
7,000	386	379	372	365	358	352	346	340	334	384
8,000	371	364	357	351	344	338	332	326	321	371
9,000	356	350	343	337	331	325	319	313	308	359
10,000	342	336	329	323	317	312	306	301	296	347
11,000	328	322	316	310	304	299	294	289	284	335
12,000	315	309	303	297	292	287	282	277	272	324
13,000	302	296	291	285	280	275	270	266	261	313
14,000	289	284	279	273	268	264	259	255	250	302
15,000	277	272	267	262	257	253	248	244	240	292

Cross Reference

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
0K5712	PP5378	2413804	E707	-	LGK21070	
0K5712	PP5378	3605981	E707	-	RRA00001	
0K5712	PP5378	3606744	E707	-	RRA00001	
4581416	PP7720	5099216	EE382	-	PK300001	

Performance Parameter Reference

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

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 output 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 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