PERFORMANCE DATA [BT400252]

(BT400252)-ENGINE (BBA146020A)-CEM

APRIL 03, 2022

For Help Desk Phone Numbers Click here

Perf No: EM1243 **Change Level:** 04

General Heat Rejection Emissions Regulatory Altitude Derate Cross Reference Supplementary Data Perf Param Ref

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SALES MODEL:	C32	**COMBUSTION:**	DIRECT INJECTION
BRAND:	CAT	**ENGINE SPEED (RPM):**	1,800
MACHINE SALES MODEL:		**PEAK TORQUE SPEED (RPM):**	1,200
ENGINE POWER (BHP):	1,000	**ASPIRATION:**	TA
PEAK TORQUE (FT-LB):	3,825.0	**AFTERCOOLER TYPE:**	ATAAC
COMPRESSION RATIO:	16	**AFTERCOOLER CIRCUIT TYPE:**	JW+OC, AC
RATING LEVEL:	B-RATING	**INLET MANIFOLD AIR TEMP (F):**	131
PUMP QUANTITY:	1	**JACKET WATER TEMP (F):**	210.2
FUEL TYPE:	DIESEL	**TURBO CONFIGURATION:**	PARALLEL
MANIFOLD TYPE:	DRY	**TURBO QUANTITY:**	2
ELECTRONICS TYPE:	ADEM4	**CERTIFICATION YEAR:**	2015
INJECTOR TYPE:	EUI	**PISTON SPD @ RATED ENG SPD (FT/MIN):**	1,913.4
REF EXH STACK DIAMETER (IN):	8		
MAX OPERATING ALTITUDE (FT):	8,399		

INDUSTRY	SUB INDUSTRY	APPLICATION
INDUSTRIAL	GENERAL INDUSTRIAL	INDUSTRIAL

General Performance Data Top

Note(s)

INLET MANIFOLD AIR TEMPERATURE ("INLET MFLD TEMP") FOR THIS CONFIGURATION IS MEASURED AT THE OUTLET OF THE AFTERCOOLER.

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
1,800	1,006	2,935	226	0.364	0.359	51.6	50.9
1,700	1,028	3,176	244	0.354	0.349	51.2	50.5
1,600	1,019	3,346	258	0.345	0.340	49.5	48.8
1,500	1,002	3,507	270	0.334	0.330	47.2	46.5
1,400	973	3,652	281	0.333	0.328	45.7	45.1
1,300	934	3,773	290	0.338	0.333	44.5	43.9
1,200	874	3,824	294	0.341	0.336	42.0	41.4
1,100	790	3,771	290	0.345	0.340	38.4	37.8
1,000	663	3,483	268	0.345	0.340	32.2	31.8
900	538	3,142	242	0.344	0.339	26.1	25.7
800	420	2,760	212	0.344	0.339	20.4	20.1
700	294	2,203	170	0.346	0.341	14.3	14.1

ENGINE SPEED	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP

ENGINE SPEED	ENGINE POWER	INLET MFLD PRES	INLET MFLD TEMP	EXH MFLD TEMP	ENGINE OUTLET TEMP	COMPRESSOR OUTLET PRES	COMPRESSOR OUTLET TEMP
RPM	BHP	IN-HG	DEG F	DEG F	DEG F	IN-HG	DEG F
1,800	1,006	66.3	132.9	1,096.5	741.0	72	388.9
1,700	1,028	67.1	130.4	1,085.1	740.1	72	387.2
1,600	1,019	65.8	130.8	1,089.8	735.4	70	379.3
1,500	1,002	63.5	132.7	1,111.5	730.4	68	367.6
1,400	973	62.3	131.5	1,128.2	751.7	66	365.0
1,300	934	61.3	132.1	1,168.2	780.7	65	365.0
1,200	874	58.1	132.7	1,191.3	802.0	61	357.1
1,100	790	52.8	130.4	1,211.1	819.9	55	341.8
1,000	663	43.3	132.0	1,214.4	837.1	45	309.3
900	538	32.1	127.1	1,196.1	826.2	33	266.7
800	420	21.3	139.0	1,171.5	821.2	22	218.0
700	294	12.0	120.1	1,027.4	719.8	13	163.2

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
1,800	1,006	2,074.4	4,822.0	9,015.2	9,381.6	1,974.6	1,793.1
1,700	1,028	2,099.1	4,868.9	9,120.6	9,484.3	1,995.4	1,815.5
1,600	1,019	2,008.2	4,623.6	8,686.8	9,037.9	1,902.3	1,728.4
1,500	1,002	1,841.4	4,194.5	7,887.1	8,221.8	1,732.9	1,568.5
1,400	973	1,747.3	4,035.7	7,459.0	7,783.3	1,638.0	1,480.7
1,300	934	1,655.8	3,900.9	7,044.2	7,357.3	1,546.2	1,393.6
1,200	874	1,531.8	3,663.0	6,483.6	6,781.2	1,427.5	1,283.6
1,100	790	1,379.2	3,327.1	5,798.9	6,070.8	1,278.5	1,146.0
1,000	663	1,152.8	2,799.2	4,812.1	5,040.5	1,061.3	952.5
900	538	914.0	2,198.0	3,807.9	3,992.9	840.5	751.3
800	420	704.3	1,660.1	2,917.0	3,061.7	637.2	570.0
700	294	489.1	1,073.7	2,025.1	2,126.7	447.6	399.1

Heat Rejection Data Top

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
1,800	1,006	27,112	7,535	33,357	15,447	5,980	9,291	42,652	112,282	119,609
1,700	1,028	25,014	7,477	33,455	15,562	5,934	9,402	43,590	111,408	118,677
1,600	1,019	23,743	7,224	32,026	14,658	5,733	8,700	43,220	107,646	114,670
1,500	1,002	23,597	6,892	29,177	13,185	5,470	7,478	42,475	102,693	109,394
1,400	973	22,687	6,671	28,426	13,213	5,295	7,017	41,281	99,407	105,893
1,300	934	21,435	6,441	28,354	13,438	5,112	6,562	39,604	95,978	102,241
1,200	874	20,030	6,123	28,254	13,028	4,859	5,860	37,050	91,234	97,187

Emissions Data Top

Units Filter All Units

DIESEL

RATED SPEED NOMINAL DATA: 1800 RPM

ENGINE POWER		BHP	1,000	750	500	250	100
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	2,487	1,340	737	383	292
TOTAL CO		G/HR	0	0	1	88	180
TOTAL HC		G/HR	14	12	14	35	56
TOTAL CO2		KG/HR	501	387	286	167	88
PART MATTER		G/HR	12.6	13.7	14.7	16.1	17.2
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,125.0	780.8	580.0	597.4	712.0
TOTAL CO	(CORR 5% O2)	MG/NM3	0.0	0.0	3.5	213.5	435.5
TOTAL HC	(CORR 5% O2)	MG/NM3	5.3	6.1	10.4	62.9	116.9
PART MATTER	(CORR 5% O2)	MG/NM3	4.7	6.7	10.1	24.3	37.9
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	548	380	282	291	347
TOTAL CO	(CORR 5% O2)	PPM	0	0	3	171	348
TOTAL HC	(CORR 5% O2)	PPM	10	11	19	117	218
TOTAL NOX (AS NO2)		G/HP-HR	2.51	1.80	1.48	1.54	2.93
TOTAL CO		G/HP-HR	0.00	0.00	0.00	0.35	1.80
TOTAL HC		G/HP-HR	0.01	0.02	0.03	0.14	0.56
PART MATTER		G/HP-HR	0.01	0.02	0.03	0.06	0.17
TOTAL NOX (AS NO2)		LB/HR	5.48	2.95	1.62	0.85	0.64
TOTAL CO		LB/HR	0.00	0.00	0.00	0.19	0.40
TOTAL HC		LB/HR	0.03	0.03	0.03	0.08	0.12
TOTAL CO2		LB/HR	1,103	854	630	368	194
PART MATTER		LB/HR	0.03	0.03	0.03	0.04	0.04
OXYGEN IN EXH		%	9.1	10.5	12.2	14.5	16.1
DRY SMOKE OPACITY		%	0.7	0.8	0.8	1.0	1.2
BOSCH SMOKE NUMBER			0.15	0.22	0.22	0.36	0.51

RATED SPEED POTENTIAL SITE VARIATION: 1800 RPM

ENGINE POWER		BHP	1,000	750	500	250	100
PERCENT LOAD		%	100	75	50	25	10
TOTAL NOX (AS NO2)		G/HR	3,009	1,621	892	464	353
TOTAL CO		G/HR	0	0	2	165	336
TOTAL HC		G/HR	26	23	27	66	105
PART MATTER		G/HR	24.6	26.7	28.7	31.5	33.5
TOTAL NOX (AS NO2)	(CORR 5% O2)	MG/NM3	1,361.2	944.8	701.7	722.8	861.5
TOTAL CO	(CORR 5% O2)	MG/NM3	0.0	0.0	6.5	399.3	814.4
TOTAL HC	(CORR 5% O2)	MG/NM3	10.0	11.5	19.6	118.8	221.0
PART MATTER	(CORR 5% O2)	MG/NM3	9.2	13.2	19.7	47.4	74.0
TOTAL NOX (AS NO2)	(CORR 5% O2)	PPM	663	460	342	352	420
TOTAL CO	(CORR 5% O2)	PPM	0	0	5	319	652
TOTAL HC	(CORR 5% O2)	PPM	19	22	37	222	413
TOTAL NOX (AS NO2)		G/HP-HR	3.04	2.18	1.79	1.86	3.54
TOTAL CO		G/HP-HR	0.00	0.00	0.00	0.66	3.37
TOTAL HC		G/HP-HR	0.03	0.03	0.05	0.26	1.06
PART MATTER		G/HP-HR	0.02	0.04	0.06	0.13	0.34
TOTAL NOX (AS NO2)		LB/HR	6.63	3.57	1.97	1.02	0.78
TOTAL CO		LB/HR	0.00	0.00	0.00	0.36	0.74
TOTAL HC		LB/HR	0.06	0.05	0.06	0.15	0.23
PART MATTER		LB/HR	0.05	0.06	0.06	0.07	0.07

Regulatory Information Top

EPA TIER 4 FINAL **2015 - ----**

GASEOUS EMISSIONS DATA MEASUREMENTS PROVIDED TO THE EPA ARE CONSISTENT WITH THOSE DESCRIBED IN EPA 40 CFR PART 1039 SUBPART F 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 NON-GENSET	TIER 4 FINAL	CO: 3.5 NOx: 3.5 HC: 0.19 PM: 0.04

EU STAGE V **2019 - ----**

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
EUROPE	EU	NON-ROAD	STAGE V	CO: 3.5 NOx: 3.5 HC: 0.19 PM: 0.045

EU STAGE V	**2019 - ----**

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STANDARD

ALTITUDE CORRECTED POWER CAPABILITY (BHP)

AMBIENT OPERATING TEMP (F)	50	60	70	80	90	100	110	120	130	140	NORMAL
ALTITUDE (FT)											
0	1,000	1,000	1,000	1,000	1,000	1,000	998	995	852	633	1,000
1,000	1,000	1,000	1,000	1,000	1,000	997	994	981	826	615	1,000
2,000	1,000	1,000	1,000	999	996	993	990	933	777	581	1,000
3,000	1,000	1,000	998	995	992	988	978	884	729	552	998
4,000	999	996	993	990	987	983	954	833	675	551	994
5,000	993	990	987	985	981	978	921	781	617	549	990
6,000	992	989	987	984	980	972	907	779	640	552	990
7,000	993	990	987	984	966	939	900	796	691	576	992
8,000	991	988	975	953	908	860	835	802	728	653	991
9,000	985	971	952	914	868	837	807	754	703	648	986
10,000	954	940	906	870	830	781	722	684	649	608	958
11,000	914	884	846	799	743	695	632	598	566	542	923
12,000	838	775	727	688	664	611	533	499	491	489	886
13,000	699	672	655	638	617	549	492	490	488	486	807
14,000	653	636	621	604	584	544	490	488	486	485	704
15,000	619	603	588	572	551	529	493	487	485	483	662

Cross Reference Top

Test Spec	Setting	Engine Arrangement	Engineering Model	Engineering Model Version	Start Effective Serial Number	End Effective Serial Number
4486145	GG1111	4439686	EE305	-	BT400001	
4486147	GG1113	4439686	EE305	-	BT400001	
4486144	GG1110	4439688	EE305	-	BT400001	
4486146	GG1112	4439688	EE305	-	BT400001	
4486140	GG1106	4572086	EE305	-	BT400001	
4486142	GG1108	4572086	EE305	-	BT400001	
4486141	GG1107	4572088	EE305	-	BT400001	
4486143	GG1109	4572088	EE305	-	BT400001	

Supplementary Data Top

Type	Classification	Performance Number
CHART	BSFC CONTOUR PLOT	EM5832

Performance Parameter Reference Top

Parameters Reference: DM9600 - 14

PERFORMANCE DEFINITIONS

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% 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.

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 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 : 10/27/21