# *PERFORMANCE DATA [DM5538]*

***JULY 09, 2020***

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**Perf No: DM5538** **Change Level:** 05

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

View PDF

| | | | |
|---|---|---|---|
| **SALES MODEL:** | 3616 | **COMBUSTION:** | DIRECT INJECTION |
| **BRAND:** | CAT | **ENGINE SPEED (RPM):** | 1,000 |
| **ENGINE POWER (BKW):** | 5,960.0 | **HERTZ:** | 50 |
| **GEN POWER W/O FAN (EKW):** | 5,720.0 | **ASPIRATION:** | TA |
| **COMPRESSION RATIO:** | 13 | **AFTERCOOLER TYPE:** | SCAC |
| **RATING LEVEL:** | STANDBY | **AFTERCOOLER CIRCUIT TYPE:** | JW, OC+AC |
| **PUMP QUANTITY:** | 2 | **AFTERCOOLER TEMP (C):** | 50 |
| **FUEL TYPE:** | DIESEL | **JACKET WATER TEMP (C):** | 90 |
| **MANIFOLD TYPE:** | DRY | **TURBO CONFIGURATION:** | PARALLEL |
| **GOVERNOR TYPE:** | WOODWARD | **TURBO QUANTITY:** | 2 |
| **CAMSHAFT TYPE:** | HSMOL | **TURBOCHARGER MODEL:** | NA297-4GS81B-143M |
| **IGNITION TYPE:** | CI | **COMBUSTION STRATEGY:** | LOW BSFC |
| **INJECTOR TYPE:** | MUI | **FUEL RATE (RATED RPM) NO LOAD (L/HR):** | 89.5 |
| **FUEL INJECTOR:** | 4188820 | **PISTON SPD @ RATED ENG SPD (M/SEC):** | 10.0 |
| **TIMING-STATIC ADVANCE (DEG):** | 16.5 | | |
| **REF EXH STACK DIAMETER (MM):** | 457 | | |

| INDUSTRY | SUB INDUSTRY | APPLICATION |
|---|---|---|
| ELECTRIC POWER | STANDARD | GENERATOR SET |

## General Performance Data Top

| GENSET POWER WITHOUT FAN | PERCENT LOAD | ENGINE POWER | BRAKE MEAN EFF PRES (BMEP) | BRAKE SPEC FUEL CONSUMPTN (BSFC) | VOL FUEL CONSUMPTN (VFC) | INLET MFLD PRES | INLET MFLD TEMP | EXH MFLD TEMP | EXH MFLD PRES | ENGINE OUTLET TEMP |
|---|---|---|---|---|---|---|---|---|---|---|
| EKW | % | BKW | KPA | G/BKW-HR | L/HR | KPA | DEG C | DEG C | KPA | DEG C |
| 5,720.0 | 100 | 5,960 | 2,420 | 196.6 | 1,378.7 | 301.5 | 60.2 | 552.4 | 175.4 | 395.6 |
| 5,148.0 | 90 | 5,364 | 2,178 | 196.6 | 1,240.5 | 256.7 | 59.2 | 548.9 | 145.3 | 407.2 |
| 4,576.0 | 80 | 4,768 | 1,936 | 198.2 | 1,111.7 | 211.1 | 58.2 | 552.4 | 116.5 | 427.7 |
| 4,290.0 | 75 | 4,470 | 1,815 | 199.5 | 1,049.1 | 189.3 | 57.9 | 555.7 | 103.1 | 439.8 |
| 4,004.0 | 70 | 4,172 | 1,694 | 201.1 | 986.9 | 168.2 | 57.6 | 559.6 | 90.3 | 452.3 |
| 3,432.0 | 60 | 3,576 | 1,452 | 205.2 | 863.4 | 127.8 | 57.5 | 567.2 | 67.2 | 476.6 |
| 2,860.0 | 50 | 2,980 | 1,210 | 211.4 | 741.0 | 90.5 | 57.7 | 571.8 | 47.8 | 495.6 |
| 2,288.0 | 40 | 2,384 | 968 | 219.7 | 616.3 | 57.7 | 57.9 | 571.3 | 32.2 | 505.5 |
| 1,716.0 | 30 | 1,788 | 726 | 231.3 | 486.4 | 32.8 | 57.8 | 530.7 | 20.8 | 479.8 |
| 1,430.0 | 25 | 1,490 | 605 | 239.6 | 420.0 | 22.8 | 57.7 | 500.4 | 16.6 | 457.4 |
| 1,144.0 | 20 | 1,192 | 484 | 251.5 | 352.7 | 14.4 | 57.6 | 463.5 | 13.5 | 428.7 |
| 572.0 | 10 | 596 | 242 | 309.8 | 217.2 | -1.1 | 57.3 | 385.4 | 7.9 | 367.1 |

| GENSET POWER WITHOUT FAN | PERCENT LOAD | ENGINE POWER | COMPRESSOR OUTLET PRES | COMPRESSOR OUTLET TEMP | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| EKW | % | BKW | KPA | DEG C | M3/MIN | M3/MIN | KG/HR | KG/HR | M3/MIN | M3/MIN |
| 5,720.0 | 100 | 5,960 | 304 | 201.6 | 531.4 | 1,229.6 | 38,549.2 | 39,720.7 | 502.2 | 461.5 |
| 5,148.0 | 90 | 5,364 | 259 | 183.4 | 472.4 | 1,115.2 | 34,273.8 | 35,327.9 | 447.7 | 411.3 |
| 4,576.0 | 80 | 4,768 | 213 | 163.8 | 413.2 | 1,003.7 | 29,926.6 | 30,871.2 | 391.2 | 358.9 |
| 4,290.0 | 75 | 4,470 | 191 | 153.7 | 385.2 | 949.3 | 27,814.7 | 28,705.8 | 363.7 | 333.4 |

| GENSET POWER WITHOUT FAN | PERCENT LOAD | ENGINE POWER | COMPRESSOR OUTLET PRES | COMPRESSOR OUTLET TEMP | 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) |
|---|---|---|---|---|---|---|---|---|---|---|
| 4,004.0 | 70 | 4,172 | 170 | 143.4 | 358.0 | 895.1 | 25,749.6 | 26,587.9 | 337.0 | 308.6 |
| 3,432.0 | 60 | 3,576 | 129 | 122.0 | 305.1 | 783.8 | 21,749.0 | 22,482.8 | 285.5 | 260.7 |
| 2,860.0 | 50 | 2,980 | 92 | 99.6 | 253.8 | 664.8 | 17,982.7 | 18,611.7 | 236.2 | 214.4 |
| 2,288.0 | 40 | 2,384 | 59 | 78.7 | 206.5 | 547.7 | 14,592.2 | 15,115.9 | 192.1 | 173.9 |
| 1,716.0 | 30 | 1,788 | 34 | 61.5 | 170.1 | 438.9 | 11,984.6 | 12,398.0 | 159.2 | 145.0 |
| 1,430.0 | 25 | 1,490 | 23 | 54.0 | 155.1 | 386.7 | 10,916.3 | 11,273.3 | 144.6 | 132.3 |
| 1,144.0 | 20 | 1,192 | 15 | 47.2 | 142.0 | 335.8 | 10,002.2 | 10,302.1 | 130.7 | 120.4 |
| 572.0 | 10 | 596 | -1 | 34.1 | 117.4 | 235.1 | 8,277.8 | 8,462.7 | 100.3 | 93.7 |

## Heat Rejection Data Top

| GENSET POWER WITHOUT FAN | PERCENT LOAD | 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| EKW | % | BKW | KW | KW | KW | KW | KW | KW | KW | KW | KW |
| 5,720.0 | 100 | 5,960 | 1,158 | 279 | 5,321 | 2,531 | 596 | 1,522 | 5,960 | 13,927 | 14,836 |
| 5,148.0 | 90 | 5,364 | 1,065 | 251 | 4,891 | 2,374 | 565 | 1,215 | 5,364 | 12,531 | 13,349 |
| 4,576.0 | 80 | 4,768 | 978 | 225 | 4,510 | 2,267 | 535 | 937 | 4,768 | 11,230 | 11,962 |
| 4,290.0 | 75 | 4,470 | 935 | 212 | 4,319 | 2,214 | 521 | 814 | 4,470 | 10,598 | 11,290 |
| 4,004.0 | 70 | 4,172 | 893 | 199 | 4,128 | 2,152 | 507 | 703 | 4,172 | 9,969 | 10,620 |
| 3,432.0 | 60 | 3,576 | 809 | 174 | 3,736 | 1,988 | 479 | 518 | 3,576 | 8,722 | 9,291 |
| 2,860.0 | 50 | 2,980 | 723 | 150 | 3,286 | 1,756 | 450 | 385 | 2,980 | 7,485 | 7,974 |
| 2,288.0 | 40 | 2,384 | 635 | 125 | 2,789 | 1,474 | 419 | 281 | 2,384 | 6,225 | 6,632 |
| 1,716.0 | 30 | 1,788 | 539 | 98.3 | 2,233 | 1,109 | 384 | 192 | 1,788 | 4,914 | 5,235 |
| 1,430.0 | 25 | 1,490 | 490 | 84.9 | 1,935 | 929 | 366 | 155 | 1,490 | 4,243 | 4,520 |
| 1,144.0 | 20 | 1,192 | 438 | 71.2 | 1,624 | 758 | 347 | 123 | 1,192 | 3,562 | 3,795 |
| 572.0 | 10 | 596 | 335 | 43.9 | 993 | 466 | 308 | 62.3 | 596 | 2,194 | 2,338 |

## Emissions Data Top

Units Filter All Units

### RATED SPEED POTENTIAL SITE VARIATION: 1000 RPM

| GENSET POWER WITHOUT FAN<br>ENGINE POWER<br>PERCENT LOAD | | EKW<br>BKW<br>% | 5,720.0<br>5,960<br>100 | 4,290.0<br>4,470<br>75 | 2,860.0<br>2,980<br>50 | 1,430.0<br>1,490<br>25 | 572.0<br>596<br>10 |
|---|---|---|---|---|---|---|---|
| TOTAL NOX (AS NO2) | | G/HR | 76,916 | 64,393 | 48,300 | 28,415 | 14,223 |
| TOTAL CO | | G/HR | 4,703 | 2,900 | 3,402 | 2,964 | 1,689 |
| TOTAL HC | | G/HR | 5,251 | 4,097 | 3,407 | 2,973 | 3,116 |
| TOTAL CO | (CORR 5% O2) | MG/NM3 | 253.1 | 200.3 | 338.2 | 515.7 | 592.6 |
| TOTAL NOX (AS NO2) | | G/HP-HR | 9.70 | 10.82 | 12.15 | 14.27 | 17.81 |
| TOTAL CO | | G/HP-HR | 0.59 | 0.49 | 0.86 | 1.49 | 2.12 |
| TOTAL HC | | G/HP-HR | 0.66 | 0.69 | 0.86 | 1.49 | 3.90 |
| TOTAL NOX (AS NO2) | | LB/HR | 169.57 | 141.96 | 106.48 | 62.64 | 31.36 |
| TOTAL CO | | LB/HR | 10.37 | 6.39 | 7.50 | 6.53 | 3.72 |
| TOTAL HC | | LB/HR | 11.58 | 9.03 | 7.51 | 6.55 | 6.87 |

### RATED SPEED NOMINAL DATA: 1000 RPM

| GENSET POWER WITHOUT FAN<br>ENGINE POWER<br>PERCENT LOAD | | EKW<br>BKW<br>% | 5,720.0<br>5,960<br>100 | 4,290.0<br>4,470<br>75 | 2,860.0<br>2,980<br>50 | 1,430.0<br>1,490<br>25 | 572.0<br>596<br>10 |
|---|---|---|---|---|---|---|---|
| TOTAL NOX (AS NO2) | | G/HR | 66,884 | 55,994 | 42,000 | 24,709 | 12,368 |
| TOTAL CO | | G/HR | 3,618 | 2,231 | 2,617 | 2,280 | 1,299 |
| TOTAL HC | | G/HR | 4,039 | 3,152 | 2,621 | 2,287 | 2,397 |
| TOTAL CO | (CORR 5% O2) | MG/NM3 | 194.7 | 154.1 | 260.2 | 396.7 | 455.8 |
| TOTAL NOX (AS NO2) | | G/HP-HR | 8.43 | 9.41 | 10.56 | 12.41 | 15.49 |
| TOTAL CO | | G/HP-HR | 0.46 | 0.37 | 0.66 | 1.15 | 1.63 |
| TOTAL HC | | G/HP-HR | 0.51 | 0.53 | 0.66 | 1.15 | 3.00 |
| TOTAL NOX (AS NO2) | | LB/HR | 147.45 | 123.44 | 92.59 | 54.47 | 27.27 |
| TOTAL CO | | LB/HR | 7.98 | 4.92 | 5.77 | 5.03 | 2.86 |
| TOTAL HC | | LB/HR | 8.90 | 6.95 | 5.78 | 5.04 | 5.28 |
| DRY SMOKE OPACITY | | % | 1.0 | 2.0 | 3.8 | 6.3 | 7.9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| **GENSET POWER WITHOUT FAN** | **EKW** | **5,720.0** | **4,290.0** | **2,860.0** | **1,430.0** | **572.0** |
| **ENGINE POWER** | **BKW** | **5,960** | **4,470** | **2,980** | **1,490** | **596** |
| **PERCENT LOAD** | **%** | **100** | **75** | **50** | **25** | **10** |
| BOSCH SMOKE NUMBER | | 0.36 | 0.38 | 0.87 | 1.35 | 1.59 |

# Regulatory Information Top

| | |
|---|---|
| **NON-CERTIFIED** | **1970 - 2100** |

THIS ENGINE RATING IS NOT EMISSIONS CERTIFIED BY ANY DOMESTIC OR FOREIGN AGENCY.

# Altitude Derate Data Top

### ALTITUDE CORRECTED POWER CAPABILITY (BKW)

| **AMBIENT OPERATING TEMP (C)** | **0** | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **40** | **45** | **NORMAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALTITUDE (M) | | | | | | | | | | | |
| 0 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 |
| 250 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 |
| 500 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,896 | 5,803 | 5,960 |
| 750 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,960 | 5,903 | 5,807 | 5,714 | 5,624 | 5,960 |
| 1,000 | 5,960 | 5,960 | 5,960 | 5,960 | 5,914 | 5,815 | 5,719 | 5,627 | 5,537 | 5,450 | 5,927 |
| 1,250 | 5,960 | 5,960 | 5,932 | 5,829 | 5,730 | 5,634 | 5,541 | 5,451 | 5,364 | 5,279 | 5,774 |
| 1,500 | 5,956 | 5,848 | 5,745 | 5,646 | 5,549 | 5,456 | 5,366 | 5,279 | 5,195 | 5,113 | 5,623 |
| 1,750 | 5,767 | 5,663 | 5,563 | 5,466 | 5,373 | 5,283 | 5,196 | 5,112 | 5,030 | 4,951 | 5,476 |
| 2,000 | 5,582 | 5,482 | 5,385 | 5,292 | 5,202 | 5,114 | 5,030 | 4,948 | 4,869 | 4,793 | 5,331 |
| 2,250 | 5,403 | 5,306 | 5,212 | 5,122 | 5,034 | 4,950 | 4,868 | 4,789 | 4,713 | 4,639 | 5,189 |
| 2,500 | 5,228 | 5,134 | 5,043 | 4,956 | 4,871 | 4,789 | 4,710 | 4,634 | 4,560 | 2,324 | 5,050 |
| 2,750 | 5,057 | 4,966 | 4,878 | 4,794 | 4,712 | 4,633 | 4,557 | 4,483 | 4,411 | 2,265 | 4,913 |
| 3,000 | 4,891 | 4,803 | 4,718 | 4,636 | 4,557 | 4,481 | 4,407 | 4,335 | 2,334 | 2,205 | 4,779 |

### AFTERCOOLER HEAT REJECTION FACTORS

| **AMBIENT OPERATING TEMP (C)** | **0** | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **40** | **45** | **NORMAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| ALTITUDE (M) | | | | | | | | | | | |
| 0 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.04 | 1.09 | 1.14 | 1.19 | 1.00 |
| 250 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.02 | 1.07 | 1.12 | 1.17 | 1.22 | 1.01 |
| 500 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.05 | 1.10 | 1.15 | 1.20 | 1.26 | 1.02 |
| 750 | 1.00 | 1.00 | 1.00 | 1.00 | 1.02 | 1.08 | 1.13 | 1.18 | 1.24 | 1.29 | 1.03 |
| 1,000 | 1.00 | 1.00 | 1.00 | 1.00 | 1.05 | 1.11 | 1.16 | 1.22 | 1.27 | 1.33 | 1.04 |
| 1,250 | 1.00 | 1.00 | 1.00 | 1.02 | 1.08 | 1.14 | 1.19 | 1.25 | 1.31 | 1.36 | 1.05 |
| 1,500 | 1.00 | 1.00 | 1.00 | 1.05 | 1.11 | 1.16 | 1.22 | 1.28 | 1.34 | 1.40 | 1.06 |
| 1,750 | 1.00 | 1.00 | 1.02 | 1.08 | 1.13 | 1.19 | 1.25 | 1.31 | 1.37 | 1.43 | 1.07 |
| 2,000 | 1.00 | 1.00 | 1.04 | 1.10 | 1.16 | 1.22 | 1.29 | 1.35 | 1.41 | 1.47 | 1.08 |
| 2,250 | 1.00 | 1.00 | 1.07 | 1.13 | 1.19 | 1.25 | 1.32 | 1.38 | 1.44 | 1.50 | 1.08 |
| 2,500 | 1.00 | 1.03 | 1.09 | 1.15 | 1.22 | 1.28 | 1.35 | 1.41 | 1.48 | 1.54 | 1.09 |
| 2,750 | 1.00 | 1.05 | 1.12 | 1.18 | 1.25 | 1.31 | 1.38 | 1.44 | 1.51 | 1.58 | 1.09 |
| 3,000 | 1.01 | 1.07 | 1.14 | 1.21 | 1.27 | 1.34 | 1.41 | 1.48 | 1.54 | 1.61 | 1.09 |

# Cross Reference Top

| **Test Spec** | **Setting** | **Engine Arrangement** | **Engineering Model** | **Engineering Model Version** | **Start Effective Serial Number** | **End Effective Serial Number** |
|---|---|---|---|---|---|---|
| 0K8496 | NAP | 1593616 | NAP | NAP | 1PD00001 | |
| 5526497 | LL2897 | 4657752 | EE379 | - | MG900001 | |
| 5526498 | LL2898 | 4657752 | EE379 | - | MG900001 | |
| 5526499 | LL2899 | 4657761 | EE390 | - | FTM00001 | |
| 3496361 | LL8521 | 7E7016 | E298 | - | 1PD00001 | |
| 3496361 | NAP | 7E7016 | E298 | - | 1PD00001 | |

# Performance Parameter Reference Top

**Parameters Reference: DM9600 - 12**

**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.
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.

**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 : 07/10/19**