# 2015 Mercedes B-Class Electric Drive

## Advanced Vehicle Testing – Baseline Vehicle Testing Results

### VEHICLE SPECIFICATIONS[1]

**Vehicle Features**
VIN: WDDVP9AB8FJ005042
EPA Class: Midsize
Seatbelt Positions: 5
Type: BEV
CARB[2]: Type II ZEV
EPA Fuel Economy:
85 MPGe (City)
82 MPGe (Highway)
84 MPGe (Combined)
EPA Range: 87 miles
On-Board Charger: 10 kW

**Motor**
Type: 3-Phase AC Synchronous
Max Power: 132 kW
Max Torque: 340 Nm
Max RPM: 14,500

**Transmission**
Type: Single Speed
Layout: Front Wheel Drive
Gear Ratio: 9.73:1

**Battery**
Manufacturer: Tesla
Type: Lithium-ion
Cathode Material: NCA (Nickel-Cobalt-Aluminum-Oxide)
Cells/Modules: 3,696 Cells, 12 Modules
Pack Configuration: 84 Cells in Series, 44 Cells Parallel
Nominal Pack Voltage: 300 V
Nominal Cell Voltage: 3.6 V
Useable Pack Capacity: 93 Ah
Tested Pack Capacity: 110 Ah
Useable Pack Energy: 28 kWh
Tested Pack Energy: 35 kWh
Pack Specific Density: 96 Wh/kg
Approx. Pack Energy Density: 98 Wh/L
Pack Location: Below Center of Vehicle
Pack Weight: 290 kg
Thermal Management: Active - Liquid

**Weights**
Design Curb Weight: 3,924 lb
Delivered Curb Weight: 3,916 lb
Distribution F/R: 58%/42%
GVWR: 4,784 lb
GAWR F/R: 2,579 lb/2,205 lb
Max. Payload: 860 lb

**Dimensions**
Wheelbase: 106.2 in
Track F/R: 60.8 in/59.5 in
Length/Width: 171.6 in/80.0 in
Height: 61.2 in

**Tires**
Manufacturer: Michelin
Model: Primacy MXM4
Size: 225/45R17
Pressure F/R: 44 psi/44 psi
Spare Installed[3]: NA

NOTES:
1. Vehicle specifications were supplied by the manufacturer, measured, or derived from a literature review.
2. The vehicle was classified as a Type II ZEV by the California Air Resources Board (CARB). The range on consecutive UDDS cycles is over 100 miles (and less than 200 miles), but the vehicle does not meet the charging requirements for the Type III classification.
3. Equipped with Extended Mobility tires; spare tire not provided.

## PERFORMANCE STATISTICS[1]

### TRACK TESTING[2]

**Acceleration 0-60 mph[3]**

Measured Time: 7.5 s

Performance Goal: ≤13.5 s

Peak DC Power from Battery: 156.4 kW

**Maximum Speed**

At ¼ Mile: 89.2 mph

Maximum Speed[4]: 100.7 mph

Performance Goal: ≥90 mph at 1-mile mark

**Braking from 60-0 mph at 100% SOC[5]**

Measured Time: 4.0 s

Distance: 137 ft

Peak DC Power into Battery: 43.6 kW

**Braking from 60-0 mph at 50% SOC[5]**

Measured Time: 3.7 s

Distance: 134 ft

Peak DC Power into Battery: 40.2 kW

**"D" Deceleration Mode 60-10 mph[6]**

Measured Time: 28.7 s

Distance: 1,454 ft

Peak DC Power into Battery: 28.3 kW

Total DC Energy into Battery: 136 Wh

**"D-" Deceleration Mode 60-10 mph[6]**

Measured Time: 20.4 s

Distance: 1,056 ft

Peak DC Power into Battery: 37.0 kW

Total DC Energy into Battery: 147 Wh

### DYNAMOMETER TESTING[7]

**Cycle Results[8]**

| | 72 °F | 20 °F | 0 °F | 95 °F + 850 W/m$^2$ |
|---|---|---|---|---|
| UDDS (Cold Start) | 288.2 Wh/mi | 878.8 Wh/mi | 1008.3 Wh/mi | 340.8 Wh/mi |
| UDDS | 275.5 Wh/mi | 544.2 Wh/mi | 827.0 Wh/mi | 316.9 Wh/mi |
| HWFET | 295.6 Wh/mi | 481.5 Wh/mi | 576.6 Wh/mi | 263.8 Wh/mi |
| US06 | 367.4 Wh/mi | 527.5 Wh/mi | 575.4 Wh/mi | 368.5 Wh/mi |
| SC03 | | | | 361.7 Wh/mi |

**Fuel Economy at Steady-State Speed, 0% Grade**

| | | | | |
|---|---|---|---|---|
| 10 mph | 200.1 Wh/mi | | 50 mph | 241.3 Wh/mi |
| 20 mph | 176.7 Wh/mi | | 60 mph | 291.6 Wh/mi |
| 30 mph | 198.2 Wh/mi | | 75 mph | 338.8 Wh/mi |
| 40 mph | 211.2 Wh/mi | | 80 mph | 401.0 Wh/mi |

**Duration of Passing Maneuver at Grade[9]**

| | 0% Grade | 3% Grade | 6% Grade |
|---|---|---|---|
| 35-55 mph | 3.2 s | 3.5 s | 3.9 s |
| 55-65 mph | 2.2 s | 2.5 s | 3.0 s |
| 35-70 mph | 6.6 s | 7.5 s | 8.7 s |
| 55-80 mph | 6.3 s | 7.6 s | 9.5 s |
| Maximum Speed at 25% Grade from Stop: 55 mph | | | |

NOTES:

1. Performance numbers based on "Normal" vehicle mode. Performance numbers are averages from multiple tests. Electricity values are AC values unless otherwise indicated.
2. Vehicle track testing occurs when the vehicle has achieved its "break-in mileage" of between 4,000 to 6,000 miles, and at the delivered curb weight plus 332 ± 10 lb (including driver and test equipment), for a test weight of 4,246 lb, distributed in a manner similar to the original curb loading of the vehicle. Track testing took place between October 27 and November 10, 2015 with the vehicle odometer reading 4,068 miles. The ambient temperatures ranged from 45 °F to 89 °F. No accessories were used except for headlights as required by track regulation. The results provided are from multiple runs unless otherwise indicated; if taken from a single run, the result is the maximum value over the set of runs.
3. The acceleration is measured from the point at which the vehicle begins to move. The peak power value was taken from a single run.
4. The maximum speed was reached before the one-mile mark.
5. Controlled braking on dry surface. The peak power into the battery value was taken from a single run.
6. Coasting in drive on dry surface. Test run data were cut off when the vehicle reached 10 mph, as vehicle creep speeds are typically below this threshold. The peak power into the battery value and total energy into the battery results were both taken from a single (but different) run.
7. Dynamometer testing occurs after the track testing is complete. Dynamometer testing began on December 3, 2015, with the vehicle odometer reading 5,193 miles. A comprehensive explanation of the dynamometer facility and methodology can be found at http://www.anl.gov/energy-systems/group/downloadable-dynamometer-database, titled "Chassis Dynamometer Testing Reference Document". The ABC coefficients derived from track coastdown testing and matched on the dynamometer were A: 27.33666 lb, B: 0.45993 lb/mph, and C: 0.012594 lb/mph2.

8. The Cycle Results table presents the fuel economy achieved by the vehicle on five EPA drive cycles at four different ambient temperatures: (1) 72 °F with vehicle climate-control off, (2) 20 °F with vehicle climate-control set to 72 °F Auto, (3) 0 °F with vehicle climate-control set to 72 °F Auto, and (3) 95 °F with vehicle climate-control set to 72 °F Auto and where the vehicle is also subjected to 850 $W/m^2$ of solar load at 95 °F to simulate direct sunlight. The drive cycles include a hot start unless otherwise indicated. The conversion for Wh/mi to miles-per-gallon-of-gasoline-equivalent (MPGe) is to divide 33,700 Wh/gallon-of-gasoline-equivalent by the Wh/mi value.
9. The passing maneuver value indicates the amount of time required for the vehicle to transition from the first to the second speed, at the specified grade.

Values in red indicate that the Performance Goal was not met.

## CONSTANT-SPEED RANGE AND CHARGE TESTING IN CHARGE-DEPLETING MODE[1]

| | 45 mph Test[2] | 60 mph Test[3] | 70 mph Test[4] |
|---|---|---|---|
| Average DC power out of battery at speed (kW): | 10.2 | 15.9 | 23.2 |
| **(A)** DC energy out of battery at set speed (kWh)[5,7,9]: | 28.7 | 29.0 | 27.8 |
| **(A+)** Total DC energy out of battery (kWh) [5,7,9]: | 29.3 | 29.7 | 28.6 |
| Battery capacity discharge at set speed (Ah): | 96.4 | 97.5 | 94.8 |
| **(B)** Range at set speed (mi)[6,8,10]: | 128.9 | 110.8 | 85.0 |
| **(C)** Post-test charge AC energy from EVSE @ 240 V to onboard charger (kWh): | 36.1 | 35.6 | 35.8 |
| **(D)** Post-test charge DC energy into battery from onboard charger (kWh): | N/A | 30.7 | 30.4 |
| Post-test charge duration (HH:MM)[11]: | 09:56 | 09:48 | 09:50 |
| AC electricity consumption rate (Wh/mi)[12]: | 274 | 314 | 409 |
| DC electricity consumption rate (Wh/mi)[13]: | 223 | 262 | 327 |
| **(A+/D)** Battery Roundtrip Efficiency[14]: | N/A | 97% | 94% |
| **(D/C)** On-Board Charger Efficiency[15]: | 80% | 86% | 85% |
| **(A+/C)** Overall Trip Efficiency[16]: | 81% | 83% | 80% |

NOTES:

1. See Note 3 and Note 4 on page 2. The vehicle is accelerated to the desired speed and then cruise control is used to maintain the speed. Range is considered reached when the vehicle is no longer capable of maintaining a speed that is 2 mph lower than the set speed. Battery temperature data were not captured for this vehicle.
2. During the 45 mph range test, the average ambient temperature was 12 °C. During the post-test charge, the average ambient temperature was 15 °C.
3. During the 60 mph range test, the average ambient temperature was 30 °C. During the post-test charge, the average ambient temperature was 19 °C.
4. During the 70 mph range test, the average ambient temperature was 20 °C. During the post-test charge, the average ambient temperature was 18 °C.
5. In addition to the energy discharged from the battery during the 45 mph test, energy was discharged during the drive from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 45 mph was completed, there is still ESS energy throughput during the drive to return the vehicle to the test prep area and the EVSE unit for the post-test charge. The pre-test drive required 0.53 kWh while the post-test drive returned 0.00 kWh, and these energy inputs can be added to the energy consumed during the range test **(A)** to obtain the total output from the battery (29.3 kWh, denoted as **(A+)**) that is used in the calculations discussed in Notes 13-15.
6. In addition to the range measured for the 45 mph test, the pre-test drive required 1.01 miles from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 45 mph was completed, the post-test drive required an additional drive of 0.78 miles to return to the test prep area and the EVSE unit for the post-test charge. These distances can be added to the distance traveled during the range test **(B)** to obtain the total distance traveled (130.7 miles). However, the energy consumption values consider only the distance traveled during the test itself, or value **(B)**.
7. In addition to the energy discharged from the battery during the 60 mph test, energy was discharged during the drive from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 60 mph was completed, there is still ESS energy throughput during the drive to return the vehicle to the test prep area and the EVSE unit for the post-test charge. The pre-test drive required 0.61 kWh while the post-test drive returned 0.00 kWh, and these energy inputs can be added to the energy consumed during the range test **(A)** to obtain the total output from the battery (29.7 kWh, denoted as **(A+)**) that is used in the calculations discussed in Notes 13-15.
8. In addition to the range measured for the 60 mph test, the pre-test drive required 1.17 miles from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 60 mph was completed, the post-test drive required an additional drive of 0.38 miles to return to the test prep area and the EVSE unit for the post-test charge. These distances can be added to the distance traveled during the range test **(B)** to obtain the total distance traveled (112.4 miles). However, the energy consumption values consider only the distance traveled during the test itself, or value **(B)**.
9. In addition to the energy discharged from the battery during the 70 mph test, energy was discharged during the drive from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 70 mph was completed, there is still ESS energy throughput during the drive to return the vehicle to the test prep area and the EVSE unit for the post-test charge. The pre-test drive required 0.75 kWh while the post-test drive required 0.02 kWh, and these energy inputs can be added to the energy consumed during the range test **(A)** to obtain the total output from the battery (28.6 kWh, denoted as **(A+)**) that is used in the calculations discussed in Notes 13-15.
10. In addition to the range measured for the 70 mph test, the pre-test drive required 1.42 miles from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 70 mph was completed, the post-test drive required an additional drive of 1.32 miles to return to the test prep area and the EVSE unit for the post-test charge. These distances can be added to the distance traveled during the range test **(B)** to obtain the total distance traveled (87.7 miles). However, the energy consumption values consider only the distance traveled during the test itself, or value **(B)**.
11. Vehicle was charged with an EVSE current setting of 16 A (AC) due to facility limitations, thus increasing charge times.
12. The AC electricity consumption rate is calculated by dividing the DC electricity consumption rate (in Wh/mi) by the Overall Trip Efficiency for that particular speed.
13. The DC electricity consumption rate is calculated by dividing the DC energy from the battery as the set speed **(A)** by the range at the set speed **(B)**.
14. Battery Roundtrip Efficiency is calculated by dividing the DC energy out of the battery **(A+)** by the DC energy from the on-board charger into the battery **(D).**
15. On-Board Charger Efficiency is calculated by dividing the DC energy from the on-board charger into the battery **(D)** by the AC energy from the EVSE **(C).**
16. Overall Vehicle Efficiency is calculated by dividing the DC energy out of the battery **(A+)** by the AC energy from the EVSE **(C)**.

## CONSTANT-SPEED RANGE AND CHARGE TESTING IN "RANGE PLUS[1]" CHARGE-DEPLETING MODE[2]

| | 45 mph Test[3] | 60 mph Test[4] | 70 mph Test[5] |
|---|---|---|---|
| Average DC power out of battery at speed (kW): | 10.2 | 17.3 | 23.0 |
| **(A)** DC energy out of battery at set speed (kWh)[6,8,10]: | 33.8 | 32.0 | 32.3 |
| **(A+)** Total DC energy out of battery (kWh)[6,8,10]: | 34.4 | 32.7 | 33.0 |
| Battery capacity discharge at set speed (Ah): | 111.6 | 107.0 | 108.3 |
| **(B)** Range at set speed (mi)[7,9,11]: | 151.8 | 112.5 | 99.4 |
| **(C)** Post-test charge AC energy from EVSE @ 240 V to onboard charger (kWh): | 40.3 | 40.4 | 40.2 |
| **(D)** Post-test charge DC energy into battery from onboard charger (kWh): | N/A | 32.8 | 33.5 |
| Post-test charge duration (HH:MM)[12]: | 11:06 | 09:51 | 11:00 |
| AC electricity consumption rate (Wh/mi)[13]: | 261 | 351 | 396 |
| DC electricity consumption rate (Wh/mi)[14]: | 223 | 284 | 325 |
| **(A+/D)** Battery Roundtrip Efficiency[15]: | N/A | 100% | 99% |
| **(D/C)** On-Board Charger Efficiency[16]: | 84% | 81% | 83% |
| **(A+/C)** Overall Trip Efficiency[17]: | 85% | 81% | 82% |

NOTES:

1. This vehicle is equipped with an option that the Manufacturer has designated as RANGE PLUS. If RANGE PLUS is activated, the operating window of the battery will be extended at the next charging event and an extended driving range will be available for the next journey. The Owner's Manual warns that using RANGE PLUS shortens the service life of the battery, i.e., the more often RANGE PLUS is used, the more the extended range is reduced.
2. See Note 3 and Note 4 on page 2. The vehicle is accelerated to the desired speed and then cruise control is used to maintain the speed. Range is considered reached when the vehicle is no longer capable of maintaining a speed that is 2 mph lower than the set speed. Battery temperature data were not captured for this vehicle.
3. During the 45 mph range test, the average ambient temperature was 12 °C. During the post-test charge, the average ambient temperature was 20 °C.
4. During the 60 mph range test, the average ambient temperature was 16 °C. During the post-test charge, the average ambient temperature was 15 °C.
5. During the 70 mph range test, the average ambient temperature was 27 °C. During the post-test charge, the average ambient temperature was 13 °C.
6. In addition to the energy discharged from the battery during the 45 mph test, energy was discharged during the drive from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 45 mph was completed, there is still ESS energy throughput during the drive to return the vehicle to the test prep area and the EVSE unit for the post-test charge. The pre-test drive required 0.54 kWh while the post-test drive returned 0.00 kWh, and these energy inputs can be added to the energy consumed during the range test **(A)** to obtain the total output from the battery (34.4 kWh, denoted as **(A+)**) that is used in the calculations discussed in Notes 13-15.
7. In addition to the range measured for the 45 mph test, the pre-test drive required 0.92 miles from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 45 mph was completed, the post-test drive required an additional drive of 0.48 miles to return to the test prep area and the EVSE unit for the post-test charge. These distances can be added to the distance traveled during the range test (**B**) to obtain the total distance traveled (153.2 miles). However, the energy consumption values consider only the distance traveled during the test itself, or value (**B**).
8. In addition to the energy discharged from the battery during the 60 mph test, energy was discharged during the drive from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 60 mph was completed, there is still ESS energy throughput during the drive to return the vehicle to the test prep area and the EVSE unit for the post-test charge. The pre-test drive required 0.62 kWh while the post-test drive returned 0.06 kWh, and these energy inputs can be added to the energy consumed during the range test **(A)** to obtain the total output from the battery (32.7 kWh, denoted as **(A+)**) that is used in the calculations discussed in Notes 13-15.
9. In addition to the range measured for the 60 mph test, the pre-test drive required 1.08 miles from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 60 mph was completed, the post-test drive required an additional drive of 0.63 miles to return to the test prep area and the EVSE unit for the post-test charge. These distances can be added to the distance traveled during the range test **(B)** to obtain the total distance traveled (114.2 miles). However, the energy consumption values consider only the distance traveled during the test itself, or value **(B)**.
10. In addition to the energy discharged from the battery during the 70 mph test, energy was discharged during the drive from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 70 mph was completed, there is still ESS energy throughput during the drive to return the vehicle to the test prep area and the EVSE unit for the post-test charge. The pre-test drive required 0.75 kWh while the post-test drive returned 0.01 kWh, and these energy inputs can be added to the energy consumed during the range test **(A)** to obtain the total output from the battery (33.0 kWh, denoted as **(A+)**) that is used in the calculations discussed in Notes 13-15.
11. In addition to the range measured for the 70 mph test, the pre-test drive required 1.48 miles from test prep area to point at which vehicle test speed is achieved and maintained. After the range at 70 mph was completed, the post-test drive required an additional drive of 0.88 miles to return to the test prep area and the EVSE unit for the post-test charge. These distances can be added to the distance traveled during the range test **(B)** to obtain the total distance traveled (101.8 miles). However, the energy consumption values consider only the distance traveled during the test itself, or value **(B)**.
12. Vehicle was charged with an EVSE current setting of 16 amperes due to facility limitations, thus increasing charge times.
13. The AC electricity consumption rate is calculated by dividing the DC electricity consumption rate (in Wh/mi) by the Overall Trip Efficiency for that particular speed.
14. The DC electricity consumption rate is calculated by dividing the DC energy from the battery as the set speed **(A)** by the range at the set speed **(B)**.
15. Battery Roundtrip Efficiency is calculated by dividing the DC energy out of the battery **(A+)** by the DC energy from the on-board charger into the battery **(D).**
16. On-Board Charger Efficiency is calculated by dividing the DC energy from the on-board charger into the battery **(D)** by the AC energy from the EVSE **(C).**
17. Overall Vehicle Efficiency is calculated by dividing the DC energy out of the battery **(A+)** by the AC energy from the EVSE **(C)**.

**As a production vehicle, this vehicle is assumed to meet all Federal Motor Vehicle Safety Standards (FMVSS) for Battery Electric Vehicles.**

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