



MIC Recommended Protocol “City” Riding Range Test Procedure for Electric Motorcycles

Adopted by the Motorcycle Industry Council Electric Vehicle Task Force
March 9, 2011

In order to provide consumers with consistent and representative values for the riding range of highway electric motorcycles used in urban areas, the MIC Electric Vehicle Task Force has adopted this procedure, which is to be used in advertising the range of vehicles offered for sale. The procedure is based on the Urban All-Electric Range test procedure used for electric cars under California and federal regulations. The procedure determines the range, expressed in miles or kilometers, for stop-and-go operation representative of riding in an urban area over a variety of roads and traffic conditions.

Starting with a fully-charged battery, the range is determined based on the total distance that can be travelled before the vehicle is no longer able to keep up with a specified speed-time profile. The basic driving cycle has a top speed of 56.7 mph and an average speed of 19.6 mph. A low speed driving cycle with a top speed of 36.5 mph and an average speed of 17.7 mph is used for vehicles with a top speed below 56.7 mph but not less than 20.0 mph. This test procedure is not intended for vehicles with a top speed below the minimum 20.0 mph top speed applicable to a “Low Speed Vehicle,” as defined by the National Highway Traffic Safety Administration.

1. **Test Equipment.** Electric motorcycles shall be tested using a chassis dynamometer meeting the requirements of either Title 40, Code of Federal Regulations, §86.508–78 (40CFR86.508-78) or 40CFR86.108-00(b) and the associated calibration procedures. Dynamometer settings for road load force and inertia weight shall be determined in accordance with 40CFR86.529–98.
2. **Battery preconditioning.** Prior to testing, batteries shall be charge-discharge cycled according to the recommendations of the vehicle manufacturer if such cycling is required to achieve maximum energy storage capacity. If the capacity of the vehicle’s battery changes by more than 10% following a series of 40 charge-discharge cycles, then the battery shall be subjected to at least 40 charge-discharge cycles prior to dynamometer testing.
3. **Cold soak.** The vehicle shall be stored at an ambient temperature not less than 68°F (20°C) and not more than 86°F (30°C) for 12 to 36 hours. During this time, the vehicle’s battery shall be charged to a full state-of-charge.
4. **Vehicle Operation.** At the end of the cold soak period, the vehicle shall be disconnected from the battery charging system and placed or pushed, onto the chassis

dynamometer and operated through successive Urban Dynamometer Driving Schedules (UDDS) as defined in 40CFR86, Appendix I. The driving schedule contained in Appendix I(b) (“EPA Urban Dynamometer Driving Schedule for Light-Duty Vehicles, Light-Duty Trucks, and Motorcycles with engine displacements equal to or greater than 170 cc”) shall be used for vehicles with a maximum speed of at least 56.7 mph. The driving schedule contained in Appendix I(c) (“EPA Urban Dynamometer Driving Schedule for motorcycles with engine displacements less than 170 cc”) shall be used for vehicles with a maximum speed of less than 56.7 mph. A 10-minute soak (period of non-operation with the vehicle switched off) may follow each UDDS, during which there shall be no recharging. (Manufacturers have the option of skipping the 10-minute soak period.)

The temperature of the air blowing over the motorcycle shall be not less than 68°F (20°C) and not more than 86°F (30°C) during dynamometer testing and the velocity of the air flowing over the motorcycle shall meet the requirements of 40CFR86.508-78(d).

To the extent feasible, vehicles shall be tested in accordance with the procedures specified in 40CFR86.528–78. References to “throttle” shall be interpreted as referring to the twist grip, pedal, or other device that regulates motor output. The manufacturer’s recommended procedures shall be used for the operation of any transmission or clutch in lieu of the procedures specified for motorcycles with internal combustion engines in 40CFR86.528–78.

For vehicles subject to the driving schedule in 40CFR86 Appendix I(b), the driving schedule shall be repeated until the vehicle is no longer able to reach a speed of at least 53.9 mph (86.7 km/hr) between second number 226 and second number 254 of the driving schedule or the illumination of a warning light informing the operator that operation should be terminated for safety reasons or to avoid permanent battery damage. Speed variations greater than the tolerances specified in Appendix I that occur during gear changes or braking spikes are acceptable, provided they occur for less than 2 seconds on any occasion and are clearly documented as to the time and speed at that point of the driving schedule.

For vehicles subject to the driving schedule in 40CFR86 Appendix I(c) that have a maximum speed of at least 36.5 mph, the vehicle shall be operated at maximum available power when the vehicle cannot achieve the speed trace within the speed and time tolerances specified in Appendix I. The test shall be terminated when the vehicle speed when operated at maximum available power falls below 34.5 mph (55.5 km/hr) between second number 226 and second number 256 of the driving schedule or the illumination of a warning light informing the operator that operation should be terminated for safety reasons or to avoid permanent battery damage. Speed variations greater than the tolerances specified in Appendix I that occur during gear changes or braking spikes are acceptable, provided they occur for less than 2 seconds on any occasion and are clearly documented as to the time and speed at that point of the driving schedule.

For vehicles subject to the driving schedule in 40CFR86 Appendix I(c) that have a maximum speed less than 36.5 mph, the vehicle shall be operated at maximum available power when the vehicle cannot achieve the speed trace within the speed and time tolerances specified in Appendix I. The test shall be repeated until illumination of a warning light informing the operator that operation should be terminated for safety reasons or to avoid permanent battery damage or the vehicle speed when operated at maximum available power falls to 2 mph (3.2 km/hr) below the maximum speed initially achieved between second number 226 and second number 256 of the driving schedule or 20 mph (32.2 km/hr), whichever is higher.

5. Range Calculation. The range value is determined by measuring the total number of revolutions of the dynamometer roller from the start of the test until the point at which the vehicle is no longer able to maintain the speed and time requirements specified. Based on the distance travelled per revolution of the dynamometer roller and the total number of revolutions, the distance travelled shall be reported in units of miles or kilometers, rounded to the nearest whole number. It is recommended that the calculated value be characterized as “city riding range, starting with a fully-charged battery.”