



天津内燃机研究所

TIANJIN INTERNAL COMBUSTION ENGINE RESEARCH INSTITUTE

Test Methods of Range and Energy Consumption for Electric Motorcycles in China Standards

Tianjin Motorcycle Technical Center

May ,2023



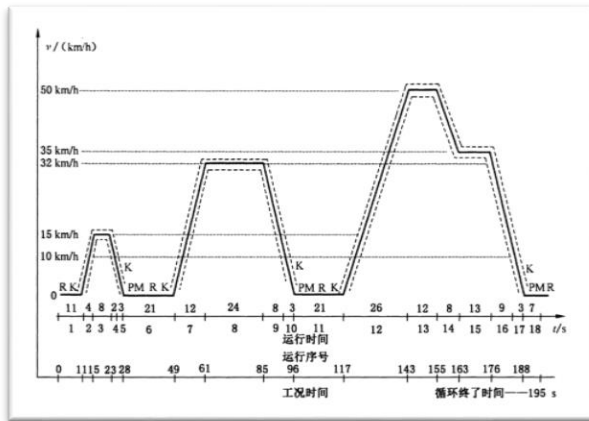
Publication Status of Standards

- **Standard name:** Test methods of range and indication for the state of charge for electric motorcycles and electric mopeds
- **Standard number:** GB/T 24157-2017
- **First edition publication date:** 25 Jun.,2009
- **Revised edition publication date:** 29 Dec.,2017
- **Test items:** electric range, electric energy consumption, indication for the state of charge
- **Test method:**
 - (a) Working condition method
 - (b) Constant speed method

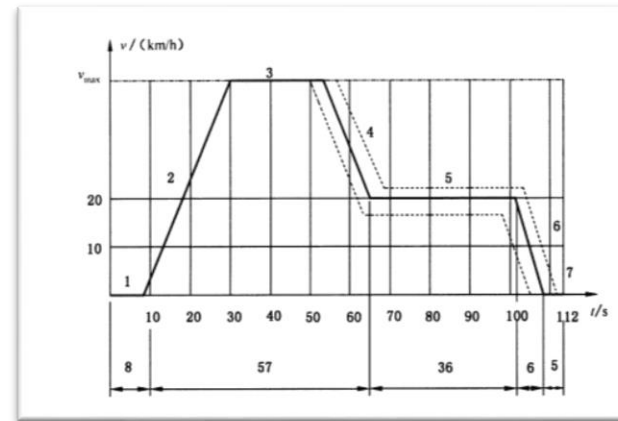


Test Method

(a) Working condition method (conducted on the chassis dynamometer)



Drive cycle of electric motorcycles



Drive cycle of electric mopeds

Notes: The V_{max} of the test is moped's maximum speed ($\leq 50\text{km/h}$).

(b) Constant speed method (conducted on the chassis dynamometer or on the test track) : Drive at 70% of the maximum speed.



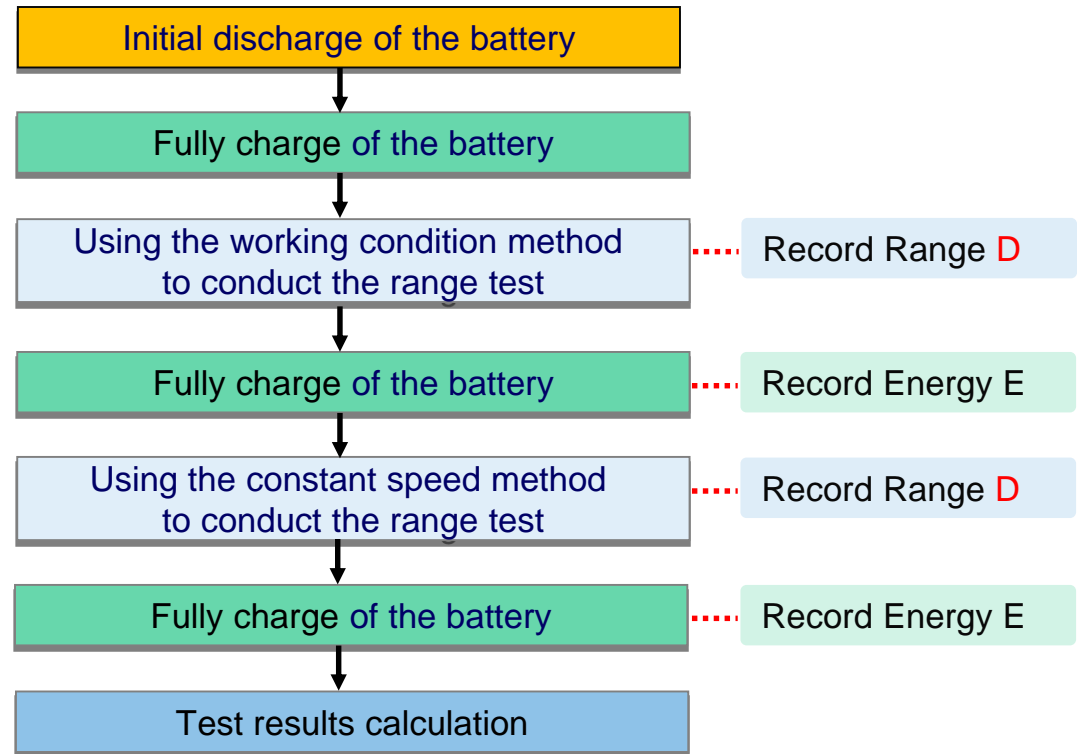
Conditions of the Sample Vehicle

- (a) The battery installed for the test vehicle is within one year of production, and charge-discharge cycles no mote than 50 times.
- (b) The vehicle shall have travelled at least 300 km before the test with the batteries installed for the test, or run in according to the manufacturer's recommended procedure until the vehicle reaches a stable state.
- (c) The lighting, signalling and auxiliary devices shall be off, except those required for the testing and usual daytime operation of the vehicle.



Test Procedure

- Conduct the test according to the flow chart.
- Measure the electric range, the electric energy consumption and the indication for the state of charge of the vehicle in one test.



Flow chart of test



Related Requirements

- Initial discharge of the battery: The battery is discharged while the vehicle is driven (on the test track or on a chassis dynamometer) at a steady speed of $70\% \pm 5\%$ of the maximum design vehicle speed , discharging shall stop:
 - (a) when the battery reaches the cutoff voltage or the management system cuts off the power,
 - or
 - (b) when the vehicle is unable to run at 65% of the maximum speed.
- Fully charge of the battery: The battery shall be fully charged according to the charging procedure provided by the manufacturer. If the manufacturer does not specify a charging procedure, it shall be carried out according to the method described in 5.1 in GB/T 18385-2005 (the same as the normal overnight charge of EU No.134) .Starting range test within four hours by the end of the charge
- Range test criteria:
 - (a) The battery reaches the cutoff voltage or the management system cuts off the power.
 - (b) The real-time vehicle speed exceeds the specified speed tolerance range ($\pm 2\text{km/h}$, use the lower deviation) for more than 4 seconds.



Test Conditions

(a) Dynamometer (working condition method/constant speed method):

The setting method of the chassis dynamometer is the same as GTR2

(b) Test track (constant speed method), requirements:

- The test track shall be flat, dry, and tidy.
- Air temperature: 288.2 K to 308.2 K
- Average wind speed: 3 m/s, maximum wind speed for gusts: 5 m/s



Determination of Test Results

- When conducting new type approval, the manufacturer shall submit the value on electric range, electric energy consumption, indication for the state of charge
- These value will be measured and confirmed by the technical service and approved by the approval authority.



Test Data

No.	battery type	battery capacity	maximum speed	Range (working condition)	Energy consumption (working condition)	Range (constant speed)	Energy consumption (constant speed)
1	Lead-acid	1.2kWh (5*20Ah)	38km/h	71.5km	23.3Wh/km	78.2km	22.1Wh/km
2	Lead-acid	0.8kWh (4*20Ah)	24km/h	33.6km	34.4Wh/km	28.5km	37.5Wh/km
3	Lead-acid	1.2kWh (5*20Ah)	51km/h	44.5km	38.3Wh/km	51.4km	32.7Wh/km
4	Li-ion	1kWh	65km/h	49.2km	33.4Wh/km	55.1km	30.7Wh/km
5	Li-ion	1.9kWh	70km/h	52.4km	37.0Wh/km	45.5km	44.5Wh/km
6	Li-ion	12.5kWh	129km/h	168.9km	79.5Wh/km	131.5km	101.0Wh/km



Possible Next Steps

- The Chinese standard GB/T 24157-2017 is about to be revised and is expected to be completed by 2025
- Referring to Regulation (EU) No 134/2014
- Test cycle maybe choose WMTC



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THANK YOU