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Electric road vehicles – Road operating characteristics

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Contents

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8715 was prepared by Technical Committee ISO/TC 22, *Road vehicles*, Subcommittee SC 21, *Electric road vehicles*.

Annex A forms a normative part of this International Standard.

Electric road vehicles — Road operating characteristics

1 Scope

This International Standard specifies the procedures for measuring the road performance of purely electrically propelled passenger cars and commercial vehicles of a maximum authorized total mass of 3 500 kg[1)].

The road performance comprises road operating characteristics such as speed, acceleration and hill climbing ability.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1176:1990, *Road vehicles — Masses — Vocabulary and codes*

ISO 8714:—[2)], *Electric road vehicles — Reference energy consumption and range — Test procedures for passenger cars and light commercial vehicles*

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
complete vehicle kerb mass
mass of the vehicle including batteries, without occupants but with fuel, cooling liquid, window washer fluid, lubricating oil, tools and spare wheel, on-board charger, portable charger or part of it, if provided as standard equipment by the vehicle manufacturer

Code: ISO-M06 (see ISO 1176)

3.2
maximum design total mass
maximum vehicle mass as specified by the vehicle manufacturer

Code: ISO-M07 (see ISO 1176)

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1) These vehicles comply with the vehicle categories M1 and N1 according to the Consolidated Resolution on the Construction of Vehicles (R.E.3) of UN/ECE, and according to 70/156/ EEC, and with three and four wheel motor vehicles as defined in the Directives 92/53/EEC and 92/62/EEC.

2) To be published.

3.3
test mass
sum of the complete vehicle kerb mass plus

— the maximum authorized pay mass (including driver) if it is equal or less than 180 kg;

— 180 kg, if the maximum authorized pay mass exceeds 180 kg but is less than or equal to 360 kg;

— half of the maximum authorized pay mass if this pay mass exceeds 360 kg

3.4
dynamic loaded radius (tyre)
effective radius of a tyre when it is deformed by the mass of the vehicle loaded to its test mass

3.5
maximum speed
highest average speed which the vehicle can maintain twice over a distance of 1 km

NOTE For the relevant test procedure, see 9.3.

3.6
maximum thirty minutes speed
v_{30}
highest average speed which the vehicle can maintain over 30 min

NOTE For the relevant test procedure, see 9.1.

3.7
acceleration ability (v_1 to v_2)
shortest time required to accelerate the vehicle from speed v_1 to speed v_2

NOTE For the relevant test procedures, see 9.5 and 9.6.

3.8
speed uphill
highest average speed which the vehicle can maintain on a given slope over a distance of 1 km

NOTE For the relevant test procedure, see 9.7.

3.9
hill starting ability
maximum slope on which the vehicle can start moving over a minimum distance of 10 m

NOTE For the relevant test procedure, see 9.8.

4 Principle

All road operating characteristics (3.5 to 3.9) shall be tested in the test sequence according to clause 8 with the charged states of the battery for each test resulting from the previous procedure.

However, if any test is conducted individually, start the test procedure for maximum speeds (9.1 and 9.3) with a battery state between 100 % and 90 % of fully charged. For acceleration (9.5 and 9.6), speed uphill (9.7) and hill starting ability (9.8), the test procedure shall be started with a battery state between 60 % and 50 % of fully charged.

5 Parameters, units and accuracy of measurements

Table 1 specifies parameters and their units, accuracy and resolution.

Table 1 — Parameters, units and accuracy of measurements

Parameter	Unit	Accuracy	Resolution
Time	s	± 0,1 s	0,1 s
Length (off-board measurements)	m	± 0,1 %	1 m
Temperature	°C	± 1 °C	1 °C
Air pressure	kPa	± 1 kPa	1 kPa
Speed, constant	km/h	± 1 % or ± 0,1 km/h, whichever is greater	0,2 km/h
Mass	kg	± 0,5 %	1 kg

6 Test conditions

6.1 Vehicle conditions

The vehicle shall be loaded according to the specification for each test.

The vehicle tyres shall be inflated to the pressure specified by the vehicle manufacturer when the tyres are at ambient temperature.

The viscosity of oils for the mechanical moving parts shall conform to the specification of the vehicle manufacturer.

The lighting, signalling and auxiliary devices shall be off, except those required for testing and usual day-time operation of the vehicle.

All energy storage systems available for other than traction purposes (electric, hydraulic, pneumatic, etc.) shall be charged up to their maximum level specified by the vehicle manufacturer.

The vehicle shall be clean, and the windows and air entries, not needed for the correct operation of the vehicle and the drive system, shall be closed by the normal operating controls.

If batteries are to be operated at temperatures above ambient temperature, the driver shall follow the procedure recommended by the vehicle manufacturer to keep the battery temperature within its operating range.

The vehicle shall be driven over at least 300 km seven days before the test(s) with those batteries that are installed in the test vehicle.

The traction battery shall be in the state of charge required for the test to be performed.

6.2 Atmospheric conditions

Outdoor test steps shall be performed at an ambient temperature between 5 °C and 32 °C. Indoor test steps shall be performed at a room temperature between 20 °C and 30 °C. The atmospheric pressure shall be between 91 kPa and 104 kPa. The average wind speed measured 0,7 m above the ground shall be less than 3 m/s, and the maximum speed of gusts shall be less than 5 m/s. The relative humidity shall be less than 95 %. The tests shall be performed in the absence of rain and fog.

6.3 Track conditions

6.3.1 General conditions

The measurements shall be taken on a dry track, which may be either a straight track (see 6.3.2) or a loop track (see 6.3.3). The surface of the track shall be hard, smooth, clean and give good adhesion.

6.3.2 Straight track

The length of the measuring zone shall be at least 1 000 m.

The length of the launching track shall be long enough to achieve a stable speed 200 m ahead of the measuring zone. The longitudinal slope on the measuring zone and on the last 200 m of the launching track shall not exceed 0,5 %. The longitudinal slope on the launching tracks shall not exceed 4 %.

The transverse slope in the measuring zone shall not exceed 3 %.

In order to reduce the influence of factors such as road slope and wind direction/speed, the acceleration and the speed tests shall be executed in both directions of the test track in direct sequence, taking care to use the same stretch of the track.

When conditions preclude performing the test in both directions, a single direction test shall be carried out as in 6.3.4.

6.3.3 Loop track

The length of the loop track shall be not less than 1 000 m. For calculating the speeds, the length of run shall be the distance actually covered by the vehicle while it is being timed.

The loop track may vary from a perfect circle to straight sections linked by approximately circular sections. The radius of the curves shall be not less than 200 m.

The longitudinal slope in the measuring zone shall not exceed 0,5 %. The effects of centrifugal forces may be compensated by the transverse profile of the curves in such a way that the vehicle holds a normal line without any action on the steering wheel.

6.3.4 Single direction test

Testing in one direction only shall be permitted if, because of the characteristics of the test track layout, it is not possible for the vehicle to reach its maximum speed in both directions.

The following conditions shall be fulfilled:

— the track shall conform to the requirements of 6.3.2;

— the variation in altitude shall not exceed 1 m between any two points;

— the run shall be repeated twice in immediate succession;

— the components of wind speed parallel to the track shall not exceed 2 m/s.