



SLOVENSKI STANDARD
SIST EN 1821-1:2000
01-december-2000

Electrically propelled road vehicles - Measurement of road operating ability - Part 1: Pure electric vehicles

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Elektrische angetriebene Straßenfahrzeuge - Meßverfahren für Fahreigenschaften - Teil 1: Reine Elektrofahrzeuge

Véhicules routiers a propulsion électrique - Mesurage des capacités routieres - Partie 1: Véhicules électriques purs

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Ta slovenski standard je istoveten z: EN 1821-1:1996

ICS:

43.120 Electric road vehicles

SIST EN 1821-1:2000 **en**

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EUROPEAN STANDARD

EN 1821-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 1996

ICS 43.120

Descriptors: road vehicles, electric vehicles, testing conditions, procedure tests, measurements, performance evaluation, speed, acceleration, starting tests

English version

**Electrically propelled road vehicles - Measurement
of road operating ability - Part 1: Pure electric
vehicles vehicles**

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<https://standards.iteh.ai/catalog/standards/sist/c18da529-0e80-4d9c-9a1a-23941-15470b4/sist-en-1821-1-2000>

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 301 "Electrically propelled road vehicles", the secretariat of which is held by AFNOR.

This standard results from works conducted in collaboration between experts from TC301 and from ISO/TC22/SC21 "Electric road vehicles".

The European Standard EN 1821 applies to measurement of road operating ability of electrically propelled road vehicles and comprises the following parts :

- Part 1 : Pure electric vehicles ;
- Part 2 : Thermal hybrid vehicles ;
- Part 3 : Other hybrid vehicles than those fitted with a thermal machine.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 1997, and conflicting national standards shall be withdrawn at the latest by February 1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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1 Scope

This standard specifies the principles, conditions and procedures of the test methods to measure the road performances of electrically propelled road vehicles (pure electric vehicles).

This standard is applicable to the concept of road performances which comprises the notions of speed, acceleration, hill climbing ability.

This standard applies to categories of vehicles M_1 , M_2 , N_1 ¹⁾, motor tricycles and quadricycles²⁾ from the motorcycles type.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 1176: 1990 Road vehicles - Masses - Vocabulary and codes

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3 Definitions

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For the purposes of this standard, the following definitions apply :

3.1 complete vehicle kerb mass VKM

The definition of ISO-M06 in accordance with ISO 1176 applies.

NOTE: The complete vehicle kerb mass VKM includes, in addition to the definition of ISO 1176, the traction battery, on board charger, portable charger or part of it if provided as standard by the manufacturer of the vehicle.

3.2 maximum design total mass MTM

The definition of ISO-M07 in accordance with ISO 1176 applies.

NOTE: The maximum design total mass MTM is defined by the vehicle manufacturer.

3.3 test mass

The test mass of the vehicle is the complete vehicle kerb mass plus :

- the total pay load if the pay load including driver is less than 180 kg ;
- 180 kg if the pay load including driver is greater than 180 kg but less than 360 kg ;
- half the pay load including driver if the pay load is greater than 360 kg.

1) Categories of vehicle M_1 , M_2 and N_1 , are defined in Directive 92/53 EEC.

2) Motor tricycles and quadricycles are defined in Directive 92/61/EEC.

3.4 dynamic loaded radius of a tyre

The effective radius of a tyre when it is deformed by the weight of the vehicle ballasted to its test mass ³⁾.

4 Principle

In accordance with the test conditions and procedures defined in this standard, the execution of the test sequence defined in clause 8 permits measurement of the following road performances :

- maximum thirty minute speed, V_{30} ;
- maximum speed ;
- acceleration 0 km/h to 50 km/h ;
- acceleration 50 km/h to 80 km/h ;
- speed uphill ;
- hill starting ability.

5 Parameters, units and tolerance of measurements

Table 1 defines parameters, units and tolerance of measurements.

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Table 1

Parameter	Units	Tolerance
Time	s	± 0,1 s
Distance (on board measurement)	m	± 0,5 %
Distance (off board measurement)	m	± 0,1 %
Temperature	°C	± 1 °C
Air pressure	kPa	± 1 kPa
Speed	km/h	± 1 % or ± 0,1 km/h, whichever is the greater
Mass	kg	± 0,5 %

³⁾ See the definition in Directive 92/23/EEC.

6 Test conditions

6.1 Vehicle conditions

- a) The vehicle shall be loaded according to the specifications for each test .
- b) The vehicle tyres shall be inflated to the pressure specified by the vehicle manufacturer when the tyres are at the ambient temperature .
- c) The viscosity of the oils for the mechanical moving parts shall conform to the specifications of the vehicle manufacturer .
- d) The lighting and light signalling and auxiliary devices shall be off, except those required for testing and usual day-time operation of the vehicle .
- e) 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 .
- f) 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.
- g) The vehicle shall have been driven at least 300 km in the seven days before the test with the traction battery that is installed in the test vehicle .
- h) The traction battery shall be in the state of charge required for the test to be performed .
- i) Preconditioning shall be as prescribed in each test or series of tests.

6.2 Atmospheric conditions

- a) For all the test steps which are carried out outside the ambient temperature shall be between 5 °C and 32 °C including.
- b) For those test steps which are carried out indoors, the ambient temperature shall be between 20 °C and 30 °C including.
- c) The atmospheric pressure shall be comprised between 94 kPa and 104 kPa including.
- d) The average wind speed measured at a height of 1 m above the ground shall be less than 3 m/s, gusts shall be less than 5 m/s .
- e) The relative humidity shall be less than 95 % .
- f) Rain and fog shall be absent.

6.3 Road conditions

The measurements shall be performed on a dry track, which is either a straight track in the conditions set out in 6.3.1 or a loop track in the conditions set out in 6.3.2.

The surface of the track shall be hard, smooth, clean and give good adhesion.

6.3.1 Straight track

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

The length of the launching tracks 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 tracks shall not exceed 0,5 %.

The longitudinal slope on the launching tracks shall not exceed 4 %.

The transverse slope on 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 speed performances shall be executed in both directions of travel, 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 in accordance with 6.3.3.

6.3.2 Loop track

The length of the loop shall not be less than 2 000 m. For calculating speeds, the length of run shall be the distance actually covered by the vehicle while it is being timed.

In plan, the loop track may vary from a perfect circle to straight sections linked by approximately circular sections.

The radius of curves shall not be less than 200 m.

The longitudinal slope, in the measuring zone shall not exceed 0,5 %. The effects of centrifugal force shall 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.

6.3.3 Single direction test

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

In this case, the track shall conform to the requirements of 6.3.1; additionally, the variation in altitude shall not exceed 1 m between any two points.

The component of wind speed parallel to the track shall not exceed 2 m/s.

The run shall be performed twice in immediate succession.

7 Preconditioning of the vehicle

7.1 Battery charge

The battery shall be charged according to the following procedure.

7.1.1 Normal charging procedure

The battery charge shall be carried out with the on board charger if fitted.

If not, the charge shall be carried out with an external charger recommended by the vehicle manufacturer.

The connection shall be carried out with the domestic plug as recommended by the vehicle manufacturer, in an ambient temperature comprised between 20 °C and 30 °C.

The procedure excludes all types of special charges, for instance, the equalization charges or the servicing charges.

The vehicle manufacturer shall be in a position to attest that during the test, a special charging procedure has not occurred.

7.1.2 End of charge criteria

The end of charge criterion corresponds to a charging time of 12 h unless a clear indication is given to the driver by the standard instrumentation that the battery is not yet fully charged.

In this case, the maximum time is:

$$\frac{3 \times \text{manufacturer's specified battery energy capacity}}{\text{mains power supply}}$$

where:

manufacturer's specified battery energy capacity is expressed in kilowatt hour ;

mains power supply is expressed in kilowatts.

7.1.3 Fully charged battery

A battery is fully charged when it is charged in accordance with normal charging procedure until the end of charge criteria.

7.2 Trip meter setting

The on board trip meter shall be set to zero, if not the mileage shall be recorded.

7.3 Warm-up

The vehicle shall be driven over a distance of about 5 000 m at 80 % of the vehicle manufacturer's estimated maximum thirty minute speed in order to preheat the motor and transmission gears.

8 Test sequence

The test sequence is arranged such that all the road performance tests can be performed within two days.

It shall be performed according to the following sequence:

a) first day:

- preconditioning of the vehicle (in accordance with clause 7),
- test: maximum thirty minute speed (in accordance with 9.1),
- complete battery discharge (in accordance with 9.2) ;

b) second day:

- preconditioning of the vehicle (in accordance with clause 7),
- test: maximum speed (in accordance with 9.3),
- 40 % battery discharge: reach 40 % of S_{tot} (in accordance with 9.4),
- test: acceleration 0 km/h to 50 km/h (in accordance with 9.5)
- test: acceleration 50 km/h to 80 km/h (in accordance with 9.6),
- test: speed uphill at a slope of 4 % (in accordance with 9.7),
- test: speed uphill at a slope of 12 % (in accordance with 9.7),
- test: hill starting ability (in accordance with 9.8).

If it is desired to measure separately one or more of these parameters except maximum speed and maximum thirty minute speed, the discharge shall be between 40 % and 50 %, before warm-up as described in 7.3.

9 Test procedure

9.1 Maximum thirty minute speed

The maximum thirty minute speed which shall be performed on a loop track or on a chassis dynamometer calibrated in accordance with annex A, is the highest average value which the vehicle can maintain for 30 min according to the following procedure.

The vehicle shall be loaded to the test mass.

The maximum thirty minute speed V_{30} is to be determined after the preconditioning phase, by driving the vehicle at the vehicle manufacturer's best estimate of such a speed $\pm 5\%$, for 30 min.

If the vehicle speed falls below the -5% level, the accelerator shall be fully depressed until the estimate $V_{30} - 5\%$ speed has been regained.