

44-1 Steering control system –The protection of the driver against the steering mechanism in the event of impact :Effective from 2011/1/1

Refer to: R12 04-S2

44-1.1 Effective Date and Scope:

44-1.1.1 Effective date from 2011/1/1, the new non-electric variants of M1 and the new non-electric variant N1 with a maximum permissible mass less than or equal 1,500 kg, the protection of the driver against the steering mechanism in the event of impact shall comply with this regulation.

44-1.1.1.1 Effective date from 2013/1/1, all non-electric variants of M1 with a maximum permissible mass more than or equal 1,500 kg, the protection of the driver against the steering mechanism in the event of impact shall comply with this regulation.

44-1.1.2 Effective date from 2012/1/1, the new electric variants of M1 and the new electric variant N1 with a maximum permissible mass less than or equal 1,500 kg, the protection of the driver against the steering mechanism in the event of impact shall comply with this regulation; and it shall be comply with either 44-1.5.3.2.1 or 44-1.5.3.2.2 of paragraph 44-1.5.3 Frontal- impact test against a barrier of this regulation.

44-1.1.2.1 Effective date from 2014/1/1, the new electric variants of M1 and the new electric variant N1 with a maximum permissible mass less than or equal 1,500 kg, it shall be comply with 44-1.5.3.2.2 of 44-1.5.3 Frontal- impact test against a barrier of this regulation.

44-1.1.3 Effective date from 2014/1/1, all electric vehicle variants of M1 and N1 with a maximum permissible mass less than or equal to 1,500 kg, the protection of the driver against the steering mechanism in the event of impact shall comply with this regulation; it shall be comply with 44-1.5.3.2.2 of 44-1.5.3 Frontal- impact test against a barrier of this regulation The electric variants of M1 and the electric variant N1 with a maximum permissible mass less than or equal 1,500 kg, which comply to “46-1 The protection of the occupants in the event of a frontal collision ” , it could be regard as conform to 44-1 5.3.2.2 of this regulation.

44-1.1.4 The applicants applying for low volume safety approval or vehicle-by-vehicle may be exempt from regulation of “the protection of

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the driver against the steering mechanism in the event of impact” except child-only vehicle.

#### 44-1.2 Definitions

44-1.2.1 "Mass of the vehicle in running order" means the mass of the vehicle unoccupied and unladen but complete with fuel, coolant, lubricant tools, spare wheel, if provided as standard equipment by the vehicle manufacturer, and REESS.

44-1.2.2 Passenger compartment :

44-1.2.2.1 Passenger compartment with regard to occupant protection : means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing and front bulkhead and the plane of the rear compartment bulkhead or the plane of the rear-seat back support.

44-1.2.2.2 Passenger compartment for electric safety assessment : means the space for occupant accommodation, bounded by the roof, floor, side walls, doors, outside glazing, front bulkhead and rear bulkhead, or rear gate, as well as by the electrical protection barriers and enclosures provided for protecting the occupants from direct contact with high voltage live parts.

44-1.2.3 "High Voltage" means the classification of an electric component or circuit, if its - working voltage is  $> 60$  V and  $\leq 1500$  V direct current (DC) or  $> 30$  V and  $\leq 1,000$  V alternating current (AC) root - mean- square (rms);

44-1.2.4 "Rechargeable energy storage system (REESS)" means rechargeable energy storage system which provides electrical energy for propulsion;

44-1.2.5 A "sharp edge" is an edge of a rigid material having a radius of curvature of less than 2.5 mm except in the case of projections of less than 3.2 mm, In this case, the minimum radius of curvature shall not apply provided the height of the projection is not more than half its width and its edges are blunted.

44-1.2.6 "Electrical Protection Barrier" the part providing protection against any direct contact to the high voltage live parts;

44-1.2.7 "Electrical power train" means the electrical circuit which includes the traction motor(s), and may also include the REESS, the electrical energy conversion system, the electronic converters, the associated wiring harness and connectors, and the coupling system for charging the REESS;

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- 44-1.2.8 "Live parts" means conductive part(s) intended to be electrically energized in normal use;
- 44-1.2.9 "Exposed conductive part" means the conductive part which can be touched under the provisions of the protection IPXXB, and which becomes electrically energized under isolation failure conditions. This includes parts under a cover that can be removed without using tools.
- 44-1.2.10 "Direct contact" means the contact of persons with high voltage live parts;
- 44-1.2.11 "Indirect contact" means the contact of persons with exposed conductive parts;
- 44-1.2.12 "Protection IPXXB" means protection from contact with high voltage live parts provided by either an electrical protection barrier or an enclosure and tested using a Jointed Test Finger (IPXXB) as described in paragraph 6.4;
- 44-1.2.13 "Working voltage" means the highest value of an electrical circuit voltage root-meansquare (rms), specified by the manufacturer, which may occur between any conductive parts in open circuit conditions or under normal operating conditions. If the electrical circuit is divided by galvanic isolation, the working voltage is defined for each divided circuit, respectively;
- 44-1.2.14 "Coupling system for charging the rechargeable energy storage system (REESS)" means the electrical circuit used for charging the REESS from an external electrical power supply including the vehicle inlet;
- 44-1.2.15 "Electrical chassis" means a set made of conductive parts electrically linked together, whose electrical potential is taken as reference;
- 44-1.2.16 "Electrical circuit" means an assembly of connected high voltage live parts which is designed to be electrically energized in normal operation;
- 44-1.2.17 "Electric Energy conversion system" means a system that generates and provides electrical energy for electrical propulsion;
- 44-1.2.18 "Electronic converter" means a device capable of controlling and/or converting electrical power for electrical propulsion;
- 44-1.2.19 "Enclosure" means the part enclosing the internal units and providing protection against any direct contact;
- 44-1.2.20 "High Voltage Bus" means the electrical circuit, including the coupling system for charging the REESS that operates on a high

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voltage;

44-1.2.21 "Solid insulator" means the insulating coating of wiring harnesses provided in order to cover and prevent the high voltage live parts from any direct contact. This includes covers for insulating the high voltage live parts of connectors; and varnish or paint for the purpose of insulation;

44-1.2.22 "Automatic disconnect" means a device that when triggered, galvanically separates the electrical energy sources from the rest of the high voltage circuit of the electrical power train;

44-1.2.23 "Open type traction battery" means a type of battery requiring liquid and generating hydrogen gas released to the atmosphere.

44-1.3 Steering control system -The protection of the driver against the steering mechanism in the event of impact shall according to suitable variants and range of principle are as below :

44-1.3.1 Vehicle powered by internal combustion engine:

44-1.3.1.1 The same vehicle category.

44-1.3.1.2 The same axle set variant.

44-1.3.1.3 The same brand and vehicle type.

44-1.3.1.4 The chassis vehicle have had same axle set variant.

44-1.3.1.5 The same chassis brand.

44-1.3.1.6 Chassis manufacturers announced that the same chassis vehicle type.

44-1.3.2 Vehicle powered by an electric motor:

44-1.3.2.1 The same vehicle category.

44-1.3.2.2 The same axle set variant.

44-1.3.2.3 The same brand and vehicle type.

44-1.3.2.4 The chassis vehicle have had same axle set variant.

44-1.3.2.5 The same chassis brand.

44-1.3.2.6 Chassis manufacturers announced that the same chassis vehicle type.

44-1.3.2.7 The same place of the components of the propulsion system.

44-1.3.2.8 The same place of the battery or of the parts of propulsion battery.

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#### 44-1.4 Test methods

##### 44-1.4.1 Dummy test (refer to Fig 1):

44-1.4.1.1 Chest impacting test: The body block shall strike the steering control at a speed of 24.1 km/h (+1.2/- 0 km/h). Any method of propulsion may be used, provided that when the body block strikes the steering control it is free from all connection with the propelling device. The body block shall strike this control after an approximately straight trajectory parallel to the longitudinal axis of the vehicle. If the steering control is fitted with a steering wheel airbag, specifications above are deemed to be met if the vehicle equipped with such a steering system complies with the thorax injury criterion of "The protection of the occupants in the event of a frontal collision" specified in this "Standards".

44-1.4.1.2 Head impacting test: The steering control is struck by an impactor (head form) released against this control at a relative speed of 24.1 km/h.

##### 44-1.4.2 Frontal- impact test against a barrier:

44-1.4.2.1 The unladen vehicle, in running order, without a manikin, is collision-tested against a barrier. The speed on impact shall be between 48.3 km/h and 53.1 km. This specification is deemed to be met if the vehicle equipped with such a steering system complies with the specifications of "The protection of the occupants in the event of a frontal collision" specified in this "Standards".

44-1.4.2.2 In the case of a vehicle powered by an electric motor, the impact test prescribed in paragraph 44-1.4.2.2. shall be carried out with the propulsion battery master switch in the "ON" position. In addition, the following requirements shall be satisfied paragraph 44-1.4.2.1 during and after the test.

44-1.4.3 It shall be allowed by agreement between manufacturer and Technical Service to modify the fuel system so that an appropriate amount of fuel can be used to run the engine or the electrical energy conversion system.

In such case, the fuel tank shall be filled to not less than 90 per cent of mass of a full load of fuel with a non-inflammable liquid of a density between 0.7 and 1.

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This requirement does not apply to Hydrogen fuel tanks.

#### 44-1.4.4 Electrical power train adjustment

44-1.4.4.1 The REESS shall be at any state of charge, which allows the normal operation of the power train as recommended by the manufacturer.

44-1.4.4.2 The electrical power train shall be energized with or without the operation of the original electrical energy sources (e.g. engine-generator, REESS or electric energy conversion system), however:

44-1.4.4.2.1 By the agreement between Technical Service and manufacturer it shall be permissible to perform the test with all or parts of the electrical power train not being energized in so far as there is no negative influence on the test result.

For parts of the electrical power train not energized, the protection against electrical shock shall be proved by either physical protection or isolation resistance and appropriate additional evidence.

44-1.4.4.2.2 In the case where an automatic disconnect is provided, at the request of the manufacturer it shall be permissible to perform the test with the automatic disconnect being triggered. In this case it shall be demonstrated that the automatic disconnect would have operated during the impact test. This includes the automatic activation signal as well as the galvanic separation considering the conditions as seen during the impact.

#### 44-1.5 Specifications

44-1.5.1 Before the impact test prescribed in paragraphs 44-1.4.1.1 and 44-1.4.1.2 above no part of the steering control surface, directed towards the driver, which can be contacted by a sphere of 165 mm in diameter shall present any roughness or sharp edges with a radius of curvature of less than 2.5 mm.

In the case of a steering control equipped with an airbag, this shall be deemed satisfactory if no part, which can be contacted by a sphere of 165 mm in diameter, contains any dangerous sharp edges, likely to increase the risk of serious injury to the occupants.

#### 44-1.5.2 Dummy test

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44-1.5.2.1 Chest impacting test: The force applied to the body block by the steering control shall not exceed 11,110 N.

44-1.5.2.2 Head impacting test: The deceleration of the impactor shall not exceed 80 g cumulative for more than 3 milliseconds. The deceleration shall always be lower than 120 g.

#### 44-1.5.3 Frontal- impact test against a barrier

44-1.5.3.1 The top of the steering column and its shaft shall not move backwards, horizontally and parallel to the longitudinal axis of the vehicle, by more than 12.7 cm and also not more than 12.7 cm vertically upwards, both dimensions considered in relation to a point of the vehicle not affected by the impact.

44-1.5.3.2 According to paragraphs 44-1.1.2 and 44-1.1.3 requirements , it shall comply with either paragraphs 44-1.5.3.2.1 or 44-1.5.3.2.2 as follows:

44-1.5.3.2.1 Vehicle powered by an electric motor shall comply with following paragraph else:

44-1.5.3.2.1.1 The monoblocs shall remain fixed in their places.

44-1.5.3.2.1.2 No liquid electrolyte shall leak into the passenger compartment; a limited leakage is permissible, however, only to outside the vehicle, provided that the leakage which occurs during the first hour after the test does not exceed 7 % of the total of the liquid electrolyte in the propulsion battery.

44-1.5.3.2.2 Additionally, vehicles equipped with electrical power train shall meet paragraph 46-1.6.5 of Regulation 「46-1 The protection of the occupants in the event of a frontal collision」. This could be demonstrated in a separate frontal impact test at the request of the manufacturer after validation by the Technical Service, given that the electric components do not influence the driver's protection performance of the vehicle type as defined in this regulation.

44-1.5.3.3 Specifications of paragraph 44-1.5.3.1. above are deemed to be met if the vehicle equipped with such a steering system complies with the specifications of paragraph 46-1.6.4.2. of Regulation 「46-1 The protection of the occupants in the event of a frontal collision」.

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44-1.5.4 The steering control shall be designed, constructed and fitted in such a way that, after the impacting test is performed:

44-1.5.4.1 The part of the steering control surface directed towards the driver shall not present any sharp or rough edges likely to increase the danger or severity of injuries to the driver. Small surface cracks and fissures shall be disregarded.

44-1.5.4.2 The steering control shall be so designed, constructed and fitted as not to embody components or accessories, including the horn control and assembly accessories, capable of catching in the driver's clothing or jewellery in normal driving movements.

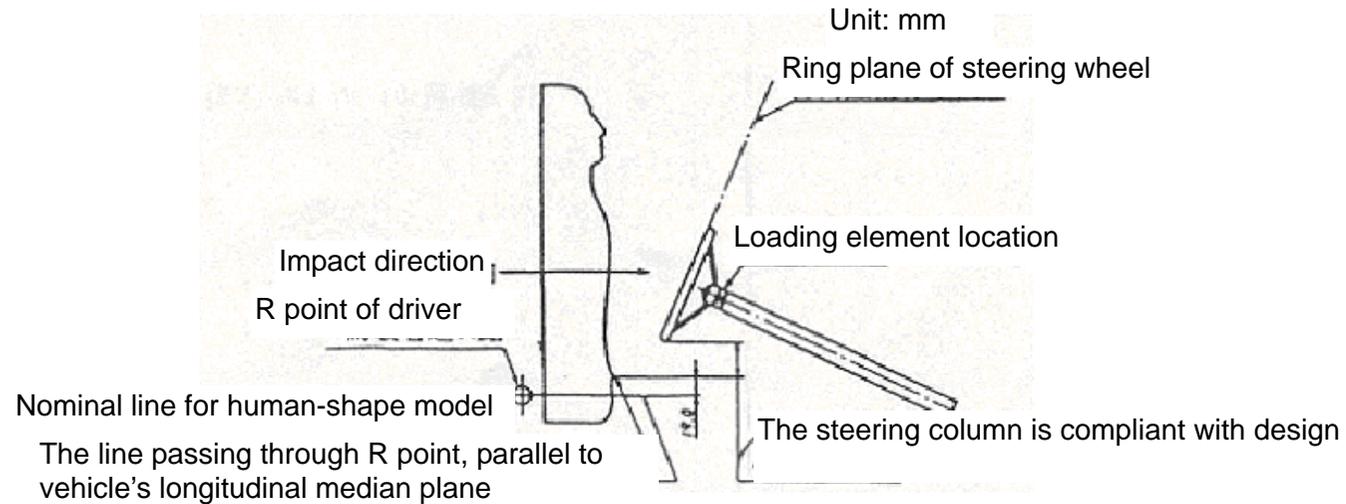


Fig 1. Dummy test-Location of which steering and dummy

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