EUROPEAN
COMMISSION

Brussels, XXX
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COMMISSION DELEGATED REGULATION (EU) No …/..

of XXX

supplementing Regulation (EU) No 167/2013 of the European Parliament and of the Council with regard to vehicle functional safety requirements for the approval of agricultural and forestry vehicles

(Text with EEA relevance)

DISCUSSION PAPER
DRAFT CONCEPT RVFSR v3

This document does not represent an official position of the European Commission. It is a tool to explore the views of interested parties. The suggestions contained in this document do not prejudge the form and content of any possible future proposal by the European Commission.

COMMISSION DELEGATED REGULATION (EU) No …/..

of XXX

supplementing Regulation (EU) No 167/2013 of the European Parliament and of the Council with regard to vehicle functional safety requirements for the approval of agricultural and forestry vehicles

(Text with EEA relevance)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, and in particular Article 290 thereof,

Having regard to Regulation (EU) No 167/2013 of the European Parliament and of the Council of 5 February 2013 on the approval and market surveillance of agricultural and forestry vehicles[1], and in particular Article 17(5),

Whereas:

(1) The internal market comprises an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured. To that end, a comprehensive EU type-approval system and a strengthened market surveillance system for agricultural and forestry vehicles and their systems, components and separate technical units as defined by Regulation (EU) No 167/2013 apply.

(2) The term 'agricultural and forestry vehicles' covers a wide range of different vehicle types with one or more axles and two, four or more wheels or track-laying vehicles, e.g. wheeled tractors, track-laying tractors, trailers and towed equipment, used for a wide variety of agricultural and forestry purposes, including special purpose works.

(3) By Council Decision 97/836/EC the Union acceded to the Agreement of the United Nations Economic Commission for Europe concerning the adoption of uniform technical prescriptions for wheeled vehicles, equipment and parts which can be fitted to and/or be used on wheeled vehicles and the conditions for reciprocal recognition of approvals granted on the basis of these prescriptions ('Revised 1958 Agreement')[2].

(4) By Council Decision 97/836/EC, the Union also acceded to UNECE regulations Nos 3, 4, 5, 6, 7, 19, 23, 31, 37, 38, 43, 71, 79, 98, 99.

(5) By Council Decision of 28 February 2000, the Union acceded to UNECE regulation No 110 on specific components of motor vehicles using compressed natural gas (CNG) in their propulsion system and on vehicles with regard to the installation of specific components of an approved type for the use of compressed natural gas (CNG) in their propulsion system.

(6) By Council Decision 2000/710/EC[3], the Union acceded to UNECE regulation No 67 on the approval of special equipment for motor vehicles fuelled by liquefied petroleum gas.

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1 OJ L 60, 2.3.2013, p. 1.
2 OJ L 346, 17.12.1997, p. 78.
3 OJ L 290, 17.11.2000, p. 29.

(7) In accordance with Regulation (EU) No 167/2013, vehicle manufacturers apply for approval for agricultural and forestry vehicles, their systems, components, or separate technical units. In the Union, some of the requirements under Regulations on vehicle parts are taken over from the corresponding UNECE regulations. As technology progresses, UNECE regulations are constantly amended and the relevant Union Regulations have to be regularly updated to keep them in line with the content of the respective UNECE regulations. In order to avoid this duplication, the CARS 21 High Level Group recommended the replacement of several Union legislative acts by the corresponding UNECE regulations.

(8) The possibility to apply UNECE regulations for the purpose of EU vehicle type-approval as a basis to the Union legislation is provided for in Regulation (EU) No 167/2013. According to this Regulation type-approval in accordance with UNECE regulations which apply on an equal basis to the Union legislation is to be considered as EU type-approval in accordance with that Regulation and its delegated and implementing acts.

(9) Using UNECE regulations on an equal basis to Union legislation helps to avoid duplication not only of technical requirements but also of certification and administrative procedures. In addition, type-approval that is directly based on internationally agreed standards should improve market access in third countries, in particular in those which are contracting parties to the Revised 1958 Agreement, thus enhancing the Union industry's competitiveness.

(10) It is appropriate to include UNECE regulations Nos 3, 4, 5, 6, 7, 19, 23, 31, 37, 38, 43, 71, 79, 98, 99, 106, 112, 113 into Annex I to this Regulation, which lists the UNECE regulations that apply on an equal basis to the Union legislation.

(11) The UNECE regulations listed in the Annex to this Regulation should apply following the application date set out in Article 78 of Regulation (EU) No 167/2013.

(12) Article 17 of, and Annexes I to, Regulation (EU) No 167/2013 lay down functional safety requirements. Requirements regarding steer-ability, glazing, dimensions and masses, tyres and mechanical couplings are deemed paramount for the functional safety of an agricultural and forestry vehicles. Requirements regarding the maximum design speed, speed governor and speed limitation devices to address specific characteristics of agricultural and forestry tractors that are designed for off-road use but that travel also on hard-paved public roads.

(13) This Regulation should apply as from date of application of Regulation (EU) No 167/2013.

HAS ADOPTED THIS REGULATION:

CHAPTER I

SUBJECT MATTER AND DEFINITIONS

Article 1

Subject matter

This Regulation establishes the detailed technical requirements and test procedures regarding functional safety for the approval and market surveillance of agricultural and forestry vehicles and the systems, components and separate technical units intended for such vehicles in accordance with Regulation (EU) No 167/2013.

Article 2

Definitions

The definitions of Regulation (EU) 167/2013 shall apply. In addition, the following definitions shall apply:

(1) 'Permissible towable mass' means the mass which a type of tractor may tow. It may, for example, consist of one or more trailers towed or agricultural or forestry implements. A distinction is drawn between the technically permissible towable mass stated by the manufacturer and the authorised towable mass as laid down in point 2.2 below.

(2) 'Towing device' means a component on the tractor designed to provide a mechanical link between a tractor and towed vehicle.

(3) **'Unladen mass of tractor in running order (mt)' means the mass of the unladen vehicle ready for normal use and including the standard equipment in accordance with the manufacturer's specifications (e.g. the roll-over protection structure), coolant, lubricants, fuel, tools and driver** (this being considered equal to 75 kg) **and excluding optional accessories.**

(4) 'Technically permissible towable mass(es)' means:

— unbraked towable mass,

~~— independently braked towable mass (as defined in point 1.12 of Annex II to Regulation (EU) …./…. (RVBR)~~

— inertia braked towable mass (as defined in point 1.14 of Annex II to Regulation (EU) …./…. (RVBR),

— towable mass fitted with hydraulic or pneumatic braking: such braking may be of the continuous, semi-continuous or independent power-operated type (as defined in points 1.9, 1.10 and 1.11, respectively, of Annex II to Regulation (EU) …./…. (RVBR).

(5) 'Steering control' means the part directly operated by the driver in order to steer the tractor.

(6) 'Steered wheels' means:

— the wheels the alignment of which may be altered directly or indirectly in relation to that of the tractor in order to obtain a change in the direction of movement of the tractor,

— all wheels of articulated tractors,

— wheels on the same axle, the speed of which may be varied in order to obtain a change in the direction of movement of the tractor.

~~Self-tracking castor wheels are not steered wheels.~~

(7) 'Steering effort' means the force exerted by the driver on the steering control in order to steer the tractor.

(8) 'Tyres << or tracks >> normally fitted' means the type or types of tyre << or tracks >> provided by the manufacturer on the vehicle type in question and specified in the information document annexed to Regulation << RAR >>~~; snow tyres shall not be regarded as tyres normally fitted~~.

(9) 'Rear-view mirror' means any device intended to give, within the field of vision geometrically defined in point 5 of Annex IX below, a clear view to the rear which, within reasonable limits, is not blocked by component parts of the tractor or by the occupants of the tractor itself. The additional mirrors and rear-view mirrors designed in order to monitor

Comment [v1]: Mostly taken from the 2003/37/EC. Amended with respect to v1.

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Comment [v2]: IT comment: ROPS to be included.
COM: support. It is as per current definition.
V3

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Comment [v3]: Term not used any more. ES. V3

Comment [v4]: Snow tyres not used on tractors. ES. V3

the implements while working in the fields are not necessarily open to component type-approval but must be located in accordance with the setting requirements contained in points 3.3 to 3.5 of Annex IX.

(10) 'Interior rear-view mirror' means a rear-view mirror which is fitted inside the cab or frame of a tractor.

(11) 'Exterior rear-view mirror' means a rear-view mirror which is mounted on any part of the external surface of a tractor.

(12) 'Class of rear-view mirror' means all rear-view mirrors having one or more common characteristics or functions. Interior rear-view mirrors are grouped in class I. Exterior rear-view mirrors are grouped in class II.

(13) 'Lamp' means a device designed to illuminate the road (headlamp) or to emit a light signal. Rear registration-plate lamps and retro-reflectors shall likewise be regarded as lamps;

(14) 'Roof' shall mean the upper part of the vehicle extending from the upper edge of the windscreen to the upper edge of the rear window, bounded at the sides by the upper framework of the side-walls.

(15) 'Type-approval mark' means the mark set out in Article 34 of Regulation (EU) 167/2013 which the manufacturer shall affix to each component or separate technical unit, whether or not it is part of a system, manufactured in conformity with the approved type in accordance with the provisions established in Chapter V of Regulation (EU) 167/2013.

(16) 'Tractor wheelbase' or 'Vehicle wheelbase' means the distance between the vertical planes perpendicular to the median longitudinal plane of the tractor or of the vehicle passing through the axles of the tractor or of the vehicle.

~~(16)~~(17) **'Differential steering' means a method of steering on wheels or on tracks, where the orientation of the tractor is done by creating a different rotational speed between the left and the right hand wheels or track assemblies. The speed difference is either realized by a combination of mechanical components, such as brakes and a differential, or by a separate transmission path to the left and the right hand side, such as separated hydrostatic transmissions.**

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CHAPTER II
OBLIGATIONS OF MANUFACTURERS

Article 3

Fitting and demonstration requirements related to functional safety

1. Manufacturers shall equip agriculutral and forestry vehicles with systems, components and separate technical units affecting its functional safety that are designed, constructed and assembled so as to enable the vehicle in normal use and maintained according to the prescriptions of the manufacturer to comply with the detailed technical requirements and testing procedures. In accordance with Articles 5 to 38, manufacturers shall demonstrate by means of physical demonstration testing to the approval authority that the agricultural and forestry vehicles made available on the market, registered or entering into service in the Union comply with the functional safety requirements of Article 17 and Annex I of Regulation (EU) No 167/2013 and comply with the detailed technical requirements and test procedures laid down in this Regulation.

2. Manufacturers shall demonstrate that replacement components requiring type approval that are made available on the market or are entering into service in the Union are approved in accordance with the requirements of Regulation (EU) No 167/2013, as specifed by the detailed technical requirements and test procedures referred to in this Regulation.

3. Manufacturers shall submit to the approval authority a description of the measures taken to prevent tampering with, and modification of, the powertrain management system, including the functional safety electronic control computers, if fitted.

Comment [v5]: To be checked whether such a computer is installed on tractors.

Article 4

Application of UNECE regulations

The UNECE regulations and amendments thereto set out in Annex I to this Regulation shall apply to type approval.

Article 5

Technical specifications on functional safety requirements and test procedures

1. The functional safety performance test procedures shall be performed in accordance with the test requirements laid down in this Regulation.

2. The tests shall be carried out or witnessed by the approval authority or, if authorised by the approval authority, by the technical service.

3. The measurement methods and test results shall be reported to the approval authority in the test report format set out in Article 68 (f) of Regulation (EU) No 167/2013.

Article 6

Requirements on vehicle structure integrity

The performance requirements applying to vehicle structure integrity referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex II to this Regulation.

Article 7

Requirements on the maximum design speed, speed governors and speed limitation devices

The test procedures and performance requirements applying to speed, speed governors and speed limitation devices referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex III to this Regulation.

Article 8

Requirements on steering for fast tractors

The test procedures and performance requirements applying to steering for fast tractors referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex IV to this Regulation.

Article 9

Requirements on steering

The test procedures and performance requirements applying to steering referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex V to this Regulation.

Article 10

Requirements on speedometers

The test procedures and performance requirements applying to speedometer referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex VI to this Regulation.

Article 11

Requirements on the field of vision and windscreen wipers

The test procedures and performance requirements applying to field of vision and windscreen wipers referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex VII to this Regulation.

Article 12

Requirements on glazing

The test procedures and requirements applying to glazing referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex VIII to this Regulation.

Article 13

Requirements on rear-view mirrors

The test procedures and performance requirements applying to rear view mirrors referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex IX to this Regulation.

Article 14

Requirements on driver information systems

The test procedures and requirements applying to driver information systems referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex X to this Regulation.

Article 15

Requirements on lighting, light signalling devices and their light sources

The test procedures and performance requirements applying to lighting, light signalling devices and their light sources referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XI to this Regulation.

Article 16

Requirements on lighting installations

The test procedures and requirements applying to lighting installations referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XII to this Regulation.

Article 17

Requirements on vehicle occupant protection, including interior fittings, head restraints, seat belts, vehicle doors

The test procedures and performance requirements applying to occupant protection, including interior fittings, head restraint, seat belts and vehicle doors referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XIII to this Regulation.

Article 18

Requirements on vehicle exterior and accessories

The test procedures and requirements applying to vehicle exterior and accessories referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XIV to this Regulation.

Article 19

Requirements on the electro-magnetic compatibility

The test procedures and performance requirements applying to electro-magnetic compatibility referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XV to this Regulation.

Article 20

Requirements on audible warning devices

The test procedures and performance requirements applying to audible warning devices referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XVI to this Regulation.

Article 21

Requirements on heating systems

The test procedures and performance requirements applying to heating systems referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XVII to this Regulation.

Article 22

Requirements on devices to prevent unauthorised use

The test procedures and performance requirements applying to unauthorised use referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XVIII to this Regulation.

Article 23

Requirements on registration plates

The test procedures and requirements applying to registration plates referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XIX to this Regulation.

Article 24

Requirements on statutory plates and markings

The requirements applying to statutory plates and marking referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XX to this Regulation.

Article 25

Requirements on dimensions and trailer masses

The test procedures and requirements applying to dimensions and trailer masses referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXI to this Regulation.

Article 26

Requirements on the maximum laden mass

The test procedures and requirements applying to the maximum laden mass referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXII to this Regulation.

Article 27

Requirements on ballast masses

The test procedures and requirements applying to ballast masses referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXIII to this Regulation.

Article 28

Requirements on the safety of electrical systems

The requirements applying to electrical systems referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXIV to this Regulation.

Article 29

Requirements on fuel tanks

The test procedures and performance requirements applying to fuel tanks referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXV to this Regulation.

Article 30

Requirements on rear protective structures

The test procedures and performance requirements applying to rear protective structures referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXVI to this Regulation.

Article 31

Requirements on lateral protection

The test procedures and requirements applying to lateral protection referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXVII to this Regulation.

Article 32

Requirements on load platforms

The test procedures and requirements applying to load platforms referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXVIII to this Regulation.

Article 33

Requirements on towing devices

The performance requirements applying to towing devices referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXIX to this Regulation.

Article 34

Requirements on tyres

The test procedures and performance requirements applying to tyres referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXX to this Regulation.

Article 35

Requirements on spray-suppression systems

The test procedures and performance requirements applying to spray suppression systems referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXXI to this Regulation.

Article 36

Requirements on the reverse gear

The requirements applying to the reverse gear referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXXII to this Regulation.

Article 37

Requirements on tracks

The test procedures and performance requirements applying to tracks referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXXIII to this Regulation.

Article 38

Requirements on mechanical couplings

The test procedures and performance requirements applying to mechanical couplings referred to in Annex I to Regulation (EU) No 167/2013 shall be conducted and verified in accordance with Annex XXXIV to this Regulation.

CHAPTER III
OBLIGATIONS OF THE MEMBER STATES

Article 39

Type-approval of vehicles, systems, components and separate technical units

In accordance with Article 17 of Regulation (EU) No 167/2013 and with effect from 1 January 2018 as laid down in its Article 73(3), national authorities shall, in the case of new vehicles that do not comply with Regulation (EU) No 167/2013 and the provisions of this Regulation, consider certificates of conformity to be no longer valid for the purposes of Article 38 (1) of Regulation (EU) No 167/2013 and shall, on grounds relating to functional safety, prohibit the making available on the market, registration, or entry into service of such vehicles.

CHAPTER IV
FINAL PROVISIONS

Article 40

Entry into force and application

This Regulation shall enter into force on the 20th day following that of its publication in the *Official Journal of the European Union*.

1. It shall apply as of 1 January 2016.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels,

For the Commission
The President

LIST OF ANNEXES

Comment [V6]: Based on 75/443 of MVs

Comment [V7]: Ref to UNECE Reg 43

Comment [V8]: 2009/59, ref to 2003/97

Comment [v9]: Study launched

XXIII	Requirements on ballast masses	X
XXIV	Requirements on the safety of electrical systems	X
XXV	Requirements on fuel tanks	X
XXVI	Requirements on rear protective structures	X
XXVII	Requirements on lateral protection	X
XXVIII	Requirements on load platforms	X
XXIX	Requirements on towing devices	X
XXX	Requirements on tyres	X
XXXI	Requirements on spray-suppression systems	X
XXXII	Requirements on the reverse gear	X
XXXIII	Requirements on tracks	
XXXIV	Requirements on mechanical couplings	X

Comment [v10]: Study launched.

ANNEX I
List of applicable UNECE regulations

Regulation Number	Subject	Series of amendments	OJ Reference	Applicability
1				

ANNEX II
Requirements on vehicle structure integrity

1. Vehicles shall be so designed and constructed as to be sufficiently robust to withstand their intended use over their normal lifetime, taking into account regular and scheduled maintenance and specific equipment adjustments clearly and unambiguously set out in the operator's manual provided with the vehicle. The vehicle manufacturer shall provide a signed statement to this effect.

2. Vehicle assembly and construction in the assembly plant(s), in particular the processes relating to the vehicle frame, chassis and/or body and the drivetrain, shall be covered by a quality assurance system to ensure that essential mechanical connections such as welds and threaded connections, as well as other relevant material characteristics, are checked and verified as appropriate.

3. The requirements of point 2. shall be covered by the vehicle manufacturers' obligations regarding the conformity of production arrangements referred to in Article 28 of Regulation (EU) No 167/2013.

4. The type-approval authority shall verify that in the event of a recall due to a serious safety risk, specific analysis of vehicle structures, components and/or parts by means of engineering calculations, virtual testing methods and/or structural testing can upon request be made available without delay to the approval authority and the European Commission.

5. Vehicle type-approval shall not be granted if there is reason to doubt that the vehicle manufacturer is able to make available the analysis referred to in paragraph 4. This doubt could relate either to the accessibility or the existence of such analysis (e.g. application for type-approval of a limited batch of vehicles from a nonestablished manufacturer represented by a party unlikely to have any meaningful access to such analysis).

>>

Vehicle type-approval shall not be granted if the vehicle manufacturer does not make available the analysis referred to in paragraph 4. This unavailability could relate either to the accessibility or the existence of such analysis (e.g. application for type-approval of a limited batch of vehicles from a nonestablished manufacturer represented by a party unlikely to have any meaningful access to such analysis).

Comment [v11]: These statements (maintenance, equipment adjustment) to be introduced as titles in the operator's manual. RVCR appropriate modification.

Comment [v12]: to confirm which drafting to keep

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Comment [v13]: Supported by ES. V3

ANNEX III

Requirements on the maximum design speed, speed governors and speed limitation devices

Definitions specific to this Annex

"Speed governor" means a device used to measure and regulate the speed of the engine and/or vehicle.

"Powertrain" means a group of components that generate power and deliver it to the road surface, including the engine, transmission, drive shafts, differentials and drive wheels or tracks.

"Tampering" means unauthorized modifications which may prejudice functional safety, in particular by increasing vehicle performance, and damage the environment.

"Diagnostic trouble code" means **a numeric or alphanumeric identifier which identifies or labels a malfunction**.

1. Maximum design speed

1.1. For the type-approval tests, the average speed shall be measured on a straight track, which the tractor shall traverse in both directions from a flying start. The soil of the track shall be stabilised; the track shall be flat and at least 100 metres long; however it may include slopes of not more than 1.5 %.

1.2. During the test, the tractor shall be unladen and in **running order** without ballast weights or special equipment and the tyre pressures shall be those specified for road use.

1.3. During the test the tractor shall be fitted with new pneumatic tyres having the greatest rolling radius intended by the manufacturer for the tractor.

1.4. The gear ratio used during the test shall be that producing the maximum vehicle speed and the throttle shall be fully open.

1.5. In order to take account of various unavoidable errors due, in particular, to the measuring technique and to the increase in running speed of the engine with a partial load, a measured speed exceeding the value for the maximum design speed by 3 km/h, shall be acceptable for the type-approval test. A 5% tolerance is permitted, **based on a measured speed not exceeding** the maximum design speed of the vehicle**, including the tolerance of 3 km/h**.

1.6. So that the authorities competent for the type-approval of tractors may calculate their maximum theoretical speed, the manufacturer shall specify as a guide the gear ratio, the actual forward movement of the powered wheels corresponding to one complete revolution, and the rpm at maximum power output with the throttle fully open and the speed governor, if fitted, adjusted as laid down by the manufacturer.

2. Speed governor

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2.1. If a **speed governor** is fitted as standard by the manufacturer, it must be installed and designed in such a way that the tractor complies with the above requirements on maximum design speed.

3. Requirements on **powertrain** and speed-limitation device **tampering** prevention measures (anti-tampering)

3.1. Purpose and scope

3.1.1. The powertrain tampering prevention measures are aimed at ensuring that a vehicle which meets the environmental and propulsion performance requirements, the vehicle construction requirements as well as the functional safety requirements at type approval remains compliant over its useful life and that adverse changes to the vehicle's powertrain which have negative impacts on functional safety and/or on the environment are discouraged.

3.2. General requirements

3.2.1. The manufacturer shall ensure that the approval authority and technical service are provided with the necessary information and, where appropriate, the necessary vehicles, propulsion systems, components and separate technical units to enable them to verify that the requirements of this Annex have been met.

3.2.2. The manufacturer shall declare in the application for the type-approval its commitment not to market the interchangeable components which could involve an increase in the propulsion performance above that applicable to the relevant (sub-) category.

3.3. The manufacturer shall ensure that the approved vehicle complies with the following provisions on electronic system security limiting the vehicle's performance.

3.3.1. For vehicles equipped with (an) electrical/electronic device(s) which limit its propulsion performance, the vehicle manufacturer shall provide data and evidence to the test authorities to demonstrate that modification or disconnection of the device or its wiring system will not increase the performance.

3.3.2. Any vehicle equipped with electronic control shall include features to prevent modification, except as permitted by the manufacturer. The manufacturer shall permit modifications if these modifications are necessary for the diagnosis, servicing, inspection, retrofitting or repair of the vehicle.

3.3.3. Any reprogrammable computer codes or operating parameter shall be resistant to tampering ~~and afford a level of protection at least as good as the provisions in ISO 15031-7:2001~~.

3.3.4. Computer-coded propulsion operating parameters shall not be changeable without the use of specialized tools and procedures, e.g. soldered or potted computer components, sealed or soldered computer enclosures.

3.3.5. Any removable calibration memory chips shall be potted, encased in a sealed container or protected by electronic algorithms and shall not be changeable without

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Comment [v17]: IT, CEMA comment. V3

the use of specialised tools and procedures.

3.3.6. Manufacturers using programmable computer code systems (e.g. electrical erasable programmable read-only memory, EEPROM) shall deter unauthorised reprogramming. Manufacturers shall include enhanced tamper-protection strategies and write-protect features requiring electronic access to an off-site computer maintained by the manufacturer, to which independent operators shall also have adequately protected access.

3.3.7. **Stored on-board diagnostic trouble codes (DTCs)** in the powertrain or engine control unit(s) shall not be erased by disconnection of the on board computer from the vehicle power supply or by disconnection or failure of the vehicle battery or ground.

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ANNEX IV
Requirements on steering for fast tractors

1. The requirements provided in sections 2, 5 and 6 and in the Annexes 4~~, 5~~ and 6 of the UNECE Regulation 79, Rev. 2, for the steering of motor vehicles apply to vehicles of categories T_b and C_b with maximum design speed exceeding 60 km/h..

1.1 The requirements of ISO 10998 **<< exact ref >>** apply to the steering of vehicles belonging to categories T_b and C_b with maximum design speed exceeding 40 km/h and not exceeding 60 km/h.

2. The steering effort requirements for the vehicles mentioned in point 1. shall be the ones corresponding to the vehicles of N2 category provided in section 6 of the UNECE Regulation 79, Rev. 2.

For a vehicle equipped with a straddle seat and handlebars, the same forces should apply at the middle of the grip.

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Comment [v19]: IT, CEMA support. V3

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ANNEX V

Requirements on steering << see comment

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CONSTRUCTION, FITTING AND INSPECTION REQUIREMENTS

Definitions ~~specific to this Annex~~

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For the purposes of this Annex,

'Steering equipment' means all the equipment the purpose of which is to alter the direction of movement of the tractor.

The steering equipment may be considered to include:

the steering control,

the steering gear,

the steered wheels,

where applicable, special equipment to produce additional or independent power.

'Steering gear' means all the components between the steering control and the steered wheels, with the exception of the special equipment defined in point 1.1.4. The steering gear may be mechanical, hydraulic, pneumatic, electric or a combination of any of these.

'Special equipment' means that part of the steering equipment by which additional or independent power is produced. Additional or independent power may be produced by any mechanical, hydraulic, pneumatic or electrical system, or by any combination of these (for example by an oil pump, air pump or battery, etc.).

Depending on the source of power which is necessary for the deflection of the steered wheels, the following types of steering equipment are identified:

'Assisted steering equipment', is the equipment in which the power for the deflection of the steered wheels is provided both by the muscular power of the driver and by the special equipment;

Steering equipment where the steering power is normally provided solely by the special equipment, but which in the event of failure of the special equipment enables the muscular power of the driver to be used for steering, shall be considered as 'assisted steering equipment'.

'Servo-steering equipment', is the equipment in which the power for the deflection of the steered wheels is provided solely by the special equipment.

'Differential steering' means a method of steering on wheels or on tracks, where the orientation of the tractor is done by creating a different rotational speed between the left and the right hand wheels or track assemblies. The speed difference is either realized by a combination of mechanical components, such as brakes and a differential, or by a separate transmission path to the left and the right hand side, such as separated hydrostatic transmissions.

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1.*General requirements*

1.1. The steering equipment must ensure easy and safe handling of the tractor and must comply with the detailed requirements set out in point 2.

1.2 **Requirements of point 2** of this Annex **are not applicable in case of steel track-laying tractors equipped with differential steering. For vehicles where the steering system is**

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combined with the braking system, the provisions of the Regulation XXX/XXXX (RVBR) with regard to requirements for braking apply.

Comment [v21]: IT, CEMA comment. V3

2.*Detailed requirements*

2.1.Steering control

2.1.1. The steering control must be easy to use and grip for the foreseeable range of adult operators in terms of variations in their size and strength. It must be designed in such a way as to permit gradual deflection. The direction of movement of the steering control must correspond to the desired change in the direction of the tractor.

2.1.2. The steering effort required to achieve a turning circle of 12 m radius, starting from the straight ahead position, must not exceed 25 daN. In the case of assisted steering equipment that is not connected to other equipment, if the auxiliary power supply fails the steering effort required must not exceed 60 daN.

Comment [v22]: Valid for C-cat too?

2.1.3. In order to check compliance with the requirement in point 2.1.2, the tractor shall describe a spiral movement at a speed of 10 kilometres per hour, starting from the straight ahead position, on a dry, flat road surface offering good tyre adhesion. The steering effort on the steering control shall be noted until it reaches the position corresponding to the tractor entering a turning circle of 12 m radius. The duration of the manoeuvre (time between the moment when the steering control is first operated and the moment when it reaches the position where the measurements are taken) must not exceed five seconds in normal cases and eight seconds if the special equipment fails. One manoeuvre must be made to the left and one to the right.

For the test, the tractor must be loaded to its technically permissible maximum weight; tyre pressures and weight distribution between the axles must conform to the manufacturer's instructions. The tracks pressure in particular must not exceed the value provided in the point 5(b) of Article 17 of Regulation (EU) No 167/2013.

Comment [v23]: Does this mean test with a trailed vehicle?

2.2.Steering gear

2.2.1. The steering equipment may not include either electrical or wholly pneumatic steering gear.

2.2.2. The steering gear must be so designed as to meet any operational requirements. It must be easily accessible for maintenance and inspection.

2.2.3. In the case of steering gear which is not wholly hydraulic, it must be possible to drive the tractor even in the event of failure of the hydraulic or pneumatic components of the steering gear.

2.2.4. Steering gear which is operated purely hydraulically and the special equipment must meet the following requirements:

2.2.4.1. One or more pressure limitation devices must protect the whole or part of the circuit against excess pressure;

2.2.4.2. The pressure limitation devices must be set so as not to exceed a pressure T equal to the maximum operating pressure stated by the manufacturer;

2.2.4.3. The characteristics and dimensions of the pipe work must be such that the pipes withstand four times the pressure T (permitted by the pressure limitation devices), and must be protected in places and arranged in such a way that the risks of damage by impact or interference are reduced to a minimum, and the risks of damage by rubbing can be considered negligible.

2.3.Steered wheels

2.3.1. All the wheels may be steered wheels.

2.4.Special equipment

2.4.1. The special equipment, used in the types of steering equipment, shall be acceptable in the following circumstances:

2.4.1.1. If the tractor is equipped with assisted steering equipment, it must be possible to drive it even in the event of failure of the special equipment. If the assisted steering equipment does not have its own source of power, it must be fitted with a power reservoir. This power reservoir may be replaced by a self-contained device providing power supply to the steering equipment with priority over the other systems which are linked to the common energy source. Without prejudice to the provisions of << Council Directive 76/432/EEC of 6 April 1976 on the approximation of the laws of the Member States relating to the braking devices of wheeled agricultural or forestry tractors[4] >>, if there is a hydraulic connection between the hydraulic steering equipment and the hydraulic braking equipment, and if both are supplied from the same energy source, the force required to activate the steering equipment shall not exceed 40 daN if either of the systems should fail. If the source of power is compressed air, the air reservoir must be protected by a non-return valve.

Where the steering power is provided solely by the special equipment, the assisted steering equipment must be fitted with a device such that if, in the event of failure of the special equipment, the steering effort exceeds 25 daN, a visual or acoustic signal must give warning of such failure.

2.4.1.2. If the tractor is fitted with servo-steering equipment and provided that such equipment has a wholly hydraulic steering gear, it must be possible, should the special device or motor fail, to carry out the two manoeuvres specified in point 2.1.3 using a special additional device. The special additional device may be a compressed air or gas reservoir. An oil pump or compressor may be used as the special additional device if that device is worked by the rotation of the tractor wheels and cannot be disconnected from them. In the event of failure of the special equipment, a visual or acoustic signal must give warning of such failure.

2.4.1.2.1. If the special device is pneumatic, it must be fitted with a compressed air reservoir protected by a non-return valve. The capacity of the compressed air reservoir must be calculated so that at least seven complete turns (from lock to lock) are possible before the reservoir pressure falls to half its operating pressure; the test must be carried out with the steered wheels off the ground.

Comment [v24]: Change to the correct RVBR ref

<< Ergonomics: only easiness of grip for tractors' steering. ~~usability of control systems, adaptation of the person/vehicle interface to the foreseeable characteristics of the driver, vibrations (TRL study)~~ >>

[4] OJ L 122, 8.5.1976, p. 1.

ANNEX VI
Requirements on speedometers

Definitions ~~specific to this Annex~~

'Normal running pressure' means the cold inflation pressure specified by the vehicle manufacturer increased by 0,~~,~~2 bar.

'Speedometer' means that part of the speedometer equipment which indicates to the driver the speed of his vehicle at any given moment.

1. All tractors with maximum design speed exceeding 30 km/h shall be equipped with a speedometer according to the requirements of this Annex.

1.1. Tractors of the category T4.1with a maximum design speed not exceeding 30 km/h, shall be equipped with a speedometer according to the requirements of this Annex.

1.2 The speedometer display shall be situated in the driver's direct field of vision and shall be clearly legible both by day and by night. The range of speeds indicated must be large enough to include the maximum speed given by the manufacturer for the type of vehicle.

2. Where the speedometer has a scale, as distinct from a digital display, it shall be clearly legible.

2.1. The graduations shall be of 1, 2, 5 or 10 km/h. The values of the speed shall be indicated on the dial as follows:

2.1.1. when the highest value on the dial does not exceed << 40 km/h >>, speed values shall be indicated at intervals not exceeding << 10 km/h and graduations not exceeding 5 km /h; >>

2.1.2. when the highest value on the dial exceeds << 40 km/h >>, then the speed values shall be indicated at intervals not exceeding << 20 km/h and graduations not exceeding 5 km /h. >>

2.2. Member States in which vehicle speed is, at the time of adoption of this Regulation, measured in miles per hour, shall be permitted to require speedometer equipment fitted to vehicles sold in their countries to be marked both in kilometres per hour and in miles per hour, until such time as their national legislation is amended to require only the use of metric (SI) units of measurement in accordance with the provisions of Council Directive No 71/354/EEC[5] of 18 October 1971 on the approximation of the laws of the Member States relating to units of measurement, as amended by the Treaty of Accession[6].

In the case of a speedometer manufactured for sale in any Member State where imperial units of measurement are used, and where transitional arrangements in accordance with Article 5 are in force, the speedometer shall also be marked in mph (miles per hour); the graduations shall be of 1, 2, 5 or 10 mph. The values of the speed shall be indicated on the dial at intervals not exceeding 20 mph.

2.3. The indicated speed value intervals need not be uniform.

3. The accuracy of the speedometer equipment shall be tested in accordance with the following procedure:

Comment [v25]: FR. V3

Comment [v26]: Division of the motor vehicles speed limits by a factor of 5 or 4 to get the values for tractors.

Comment [v27]: UK: support. V3

Comment [v28]: COM: action by MS to ask for speedometers with double measuring units.
V3

[5] OJ No L 243, 29. 10. 1971, p. 29.
[6] OJ No L 73, 27. 3. 1972, p. 14.

3.1. the vehicle is equipped with one of the types of tyre normally fitted; the test shall be repeated for each of the types of speedometer specified by the manufacturer;

3.2. the load on the axle driving the speedometer equipment must correspond to the part of mass in running order undertaken by that axle;

3.3. the reference temperature at the speedometer shall be 23 ± 5 °C;

3.4. during each test the pressure of the tyres shall be the normal running pressure;

3.5. the vehicle is tested at the following three speeds: << ~~12, 25~~20, 30 and 40 km/h >>, or 80 % of the maximum speed specified by the manufacturer, << for fast tractors >>;

3.6. the test instrumentation used for measuring the true vehicle speed shall be accurate to ± 1,0 %;

3.6.1. the surface of a test track when used be flat and dry, and shall provide sufficient adhesion.

4. The speed indicated must never be less than the true speed. At the speeds specified for the test in 3.5 above and between these speeds, there shall be the following relationship between the speed indicated on the dial of the speedometer (V_1) and the true speed (V_2): $0 \leq V_1 - V_2 \leq (V_2/10)+ 4$ km/h.

Comment [v29]: UK: new values proposed. V3

Comment [v30]: Values provided by dividing approximately by 3 the corresponding values in Dir. 75/443/EC, to cover the speed range up to 40 km/h.

Comment [v31]: Replaced the limit of 150 km/h by ref to the fast tractors.

ANNEX VII
Requirements on the field of vision and windscreen wipers

~~1.~~ Vehicles of categories T and C shall meet the requirements of: ~~the UNECE Regulation 71 on the field of vision and the windscreen wipers.~~

1. ISO 5721-1:2013 on the field of vision forward and the windscreen wipers;

2. ISO 5721: 1989 on the filed of vision to the rear and upwards of seated operators of tractors.

Comment [v32]: DE, CEMA support. V3.

Comment [v33]: Included in that ISO? V3

Comment [v34]: IT comment: Dir 2008/2/EC and alternative the ISO 5721.

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Comment [v35]: IT supports Dir. 2008/2/EC. V3.

ANNEX VIII
Requirements on glazing

Definitions ~~specific to this Annex~~

"Safety glazing material requisite for the driver's rearward vision" means all glazing situated behind a plane passing through the driver's R point perpendicular to the longitudinal median plane of the vehicle through which the driver can view the road when driving or manoeuvring the vehicle.

1. Vehicles of category T shall meet the requirements of the UNECE Regulation 43 Rev. 2, Amendment ~~5~~3, supplement ~~11~~12, except Annex 21.

2. Vehicles of category C shall meet the same requirements of the corresponding vehicles within T category.

3. Safety glazing installation on vehicles of category T and C with a maximum design speed exceeding 60 km/h shall meet the provisions for vehicles of category N in Annex 21 to UNECE R43, Rev. 2, Amendment 5, supplement 12.

4. Safety glazing installation on vehicles of category T and C with a maximum design speed not exceeding 60 km/h.

4.1 Safety glazing shall be installed in a way to ensure a high level of safety for the occupants and, in particular, to provide the driver with a high degree of visibility in all use conditions, not only forwards but also rearwards and laterally.

4.2 Safety glazing shall be fitted in such a way that, despite the stresses to which the vehicle is submitted under normal operating conditions, it remains in position and continues to afford visibility and safety to the occupants of the vehicle

4.3 Safety glazing shall bear the appropriate component type-approval mark specified in paragraph 5.4. of UNECE Regulation 43, followed when required, by one of the additional symbols provided for in paragraph 5.5 of UNECE Regulation 43.

4.4 Safety glazing for windscreens

4.4.1 The regular light transmittance shall not be less than 70 per cent.

4.4.2 The windscreen must be correctly fitted with reference to the vehicle driver's R point.

4.4.3 Vehicles of categories T and C, with maximum design speed not exceeding 40 km/h, shall be fitted with one of the types of safety glazing material defined in Annex 4, Annex 5, Annex 6, Annex 8 or Annex 10 of UNECE Regulation 43.

4.4.4 Vehicles of categories T and C, with maximum design speed exceeding 40 km/h, shall be fitted with one of the types of safety glazing material defined in 4.4.3 with the exception of Annex 5 to UNECE Regulation 43.

4.5 Safety glazing other than windscreens

Comment [v36]: Modifications according to IT and CEMA comments.

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Comment [v37]: Defined in Annex XIII. If it remains therein, then a general definition or a ref to Annex XIII to be done, otherwise it has to be defined in this Annex. V3

Comment [v38]: This is the supplement now accepted in the EU legislation.

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Comment [v39]: These should be suitable for tractors.

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Comment [v40]: Tractors are not intended only to traffic.

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4.5.1 The safety glazing must have a regular light transmittance of at least 70 per cent.

4.5.2 Plastic safety glazing material requisite for the driver's rearward vision shall bear a symbol A/L or B/L, as defined in paragraphs 5.5.5. and 5.5.7. of UNECE Regulation 43, in addition to the component type-approval mark specified in paragraph 4.3 of this Annex.

4.5.3 Safety glazing material not needed for the driver's rearward vision or driver's vision to the sides shall bear the symbol V specified in paragraph 5.5.2. of UNECE Regulation 43, in addition to the component type-approval mark specified in paragraph 4.3 of this Annex, if the light transmittance is below 70 per cent.

4.5.4 Plastic safety glazing material not needed for the driver's forward or rearward vision shall bear one of the symbols defined in paragraphs 5.5.5., 5.5.6. and 5.5.7. of UNECE Regulation 43, in addition to the component type-approval mark specified in paragraph 4.3 of this Annex.

4.5.5 In the case of plastic safety glazings, the provisions related to abrasion resistance as referred in paragraphs 4.5.2, do not apply for sunroofs and glazings located in the roof of a vehicle. No abrasion test/symbol is required.

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Comment [v41]: This is a requirement specific for the rearward vision glazing, distinguishing from the 4.5.4 requirements.

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Comment [v42]: According to provisions of UNECE R43 for glazing not necessary for forward or rearward vision, distinguished from the ones in 4.5.2 above.

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ANNEX IX
Requirements on rear-view mirrors

1. *Equipment requirements*

All tractors shall be equipped with at least one exterior rear-view mirror fitted to the left side of the tractor in Member States in which traffic drives on the right and to the right side of the tractor in Member States in which traffic drives on the left.

2. *General*

2.1. Tractors must be fitted with a rear-view mirror of class I or a rear-view mirror of class II, bearing the ~~EU~~ type-approval mark of the UNECE regulation 46, according to Article 34 of Regulation (EU) 167/2013 and Annex XX of this Regulation.

2.2 Tractors of category T4.2 and tractors for which the mirror is installed at a height exceeding two meters from ground when the vehicle is unladen shall also be fitted with a mirror of class << ?? >> on the other side from which the mirror of class II is installed.

<< In the RAR define the EU type-approval mark and an example for it being the one laid down in Directive 2003/97/EC of the European Parliament and of the Council of 10 November 2003 on the approximation of the laws of the Member States relating to the type-approval of devices for indirect vision and of vehicles equipped with these devices, amending Directive 70/156/EEC and repealing Directive 71/127/EEC. >>

2.~~2~~3. Rear-view mirrors must be fixed in such a way that they remain steady under normal driving conditions.

2.4. Vehicles equipped with a straddle seat and handlebars are deemed to comply with requirements of UNECE Regulation No 81.00 instead of the requirements in paragraphs 2.1, 2.2, 2.3 and points 3, 4, 5 and 6 of this Annex.

3. *Position*

3.1. The exterior rear-view mirror of class II must be so placed that the driver, when sitting on the driving seat in a normal driving position, has a clear view of that part of the road defined in point 5.

3.2 The exterior rear view mirror of class << ?? >> must be so placed that the driver, when sitting on the driving seat in a normal driving position, has a clear view of that part of the road defined in point 6.

3.~~2~~3. The exterior rear-view mirror must be visible through the portion of the windscreen that is swept by the windscreen wiper or through the side windows if the tractor is fitted with them.

3.~~3~~4. The rear-view mirror must not protrude beyond the external bodywork of the tractor or the tractor-trailer combination more than is necessary to obtain the fields of vision laid down in point 5.

3.~~4~~5. Where the bottom edge of an exterior rear-view mirror is less than 2 m above the ground when the tractor is laden, this rear-view mirror must not project more than 0,20 m beyond the overall width of the tractor or tractor-trailer combination measured without rear-view mirrors.

3.~~6~~5. Subject to the requirements of points 3.~~4~~3 and 3.~~5~~4, rear-view mirrors may project beyond the tractor's permissible maximum width.

4. *Adjustment*

4.1. Any interior rear-view mirror must be adjustable by the driver from his driving position.

Comment [v43]: In this Annex the text of the currently valid Directive 2009/59 on tractors' mirrors has been copied with suitable adaptations.

Comment [v44]: DE, FI, IT support. V3

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Comment [v45]: UK comment for mirrors that allow observing people near the vehicle and avoid fatalities.
COM: Class IV or V?
V3

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Comment [v46]: Drafting improvement, following UK comment. V3

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Comment [v47]: UK comment. V3

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4.2. The driver must be able to adjust the exterior rear-view mirror without leaving the driving position. The mirror may, however, be locked into position from the outside.

4.3. The requirements of point 4.2 do not apply to exterior rear-view mirrors which, after being displaced, are returned automatically to their original position or can be restored to their original position without the use of tools.

5. *Fields of vision for rear view mirror of class II*

5.1. Member States in which traffic drives on the right

The field of vision of the left hand exterior rear-view mirror must be such that the driver can see to the rear at least that level part of the road, as far as the horizon, which is to the left of the plane parallel to the vertical longitudinal median plane and which passes through the leftmost point of the overall width of the tractor or tractor-trailer combination.

5.2. Member States in which traffic drives on the left

The field of vision of the right hand exterior rear-view mirror must be such that the driver can see to the rear at least that level part of the road, as far as the horizon, which is to the right of the plane parallel to the vertical longitudinal median plane and which passes through the rightmost point of the overall width of the tractor or tractor-trailer combination.

6. *Fields of vision for rear view mirror of class << ?? >>*

6.1. Member States in which traffic drives on the right

The field of vision of the left hand exterior rear-view mirror must be such that the driver can see to **<< depending on the mirror class to be proposed >>.**

6.2. Member States in which traffic drives on the left

The field of vision of the right hand exterior rear-view mirror must be such that the driver can see to **<< depending on the mirror class to be proposed >>.**

Comment [v48]: UK comment. V3
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Comment [v49]: UK comment. V3
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Comment [v50]: UK comment. V3
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ANNEX X

Requirements on driver information systems

Definitions specific to this Annex

"Virtual terminals (VTs)" means electronic on-board information systems with display screens to provide an operator with visual information on the performance of the vehicle and its systems, and that allow the operator to monitor and control various functions via a touch screen or keypad.

1. Operator controls associated with **virtual terminals** shall comply with ISO 15077:2008 (Annex B)

2. **Driver Information Systems shall be designed so as to minimise distraction of the driver whilst conveying the necessary information.**

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Comment [v51]: ISO 15077:2008 specifies the preferred method of operation and requirements related to operator controls actuated by hand and foot, installed in agricultural tractors and self-propelled agricultural machinery and used by a seated operator as intended and under the conditions foreseen by the manufacturer. It also gives recommendations for the maximum control actuating forces, direction of motion and location of these controls.

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Comment [v52]: UK: compatible with the above mentioned ISO? V3

ANNEX XI

Requirements on lighting, light signalling devices and their light sources

1. **Lights and light signalling devices, if fitted to** ~~V~~vehicles of category T shall meet all the relevant requirements of the UNECE Regulations No**:**

3 Rev3 Am1 Sup11;

4 Rev4 Sup14;

5 Supplement 7 to the 02 series of amendments;

6 Rev4 Sup17;

7 Rev4 Sup15;

19 Rev5 Sup1;

23 Rev2 Sup15;

31 Supplement 7 to the 02 series of amendments;

37 Supplement 36 to the 03 series of amendments;

38 Rev2 Sup14;

69 Supplement 5 to the 01 series of amendments

87 << Revision?? Supplement ?? >> [[daytime lamps]]

98 Rev1 Sup11; - applicability to agricultural / forestry vehicles?

99 Supplement 6 to the original version of the Regulation;

112 01 series of amendments;

113 Supplement 9 to the original version of the Regulation~~.~~**;**

119 << Revision?? Supplement ?? >> [[cornering lamps]]

2. Vehicles of category C shall meet all the relevant requirements of the UNECE Regulations No:

99 Supplement 6 to the original version of the Regulation;

<< The rest of the above mentioned UNECE Regulations, which scope does not include C-category vehicles, are proposed to be used for C-category vehicles, due to the similarity in the categorisation of T- and C-category vehicles. To be discussed in the WGAT >>

3. Vehicles of category R shall meet all the relevant requirements of the UNECE

Comment [v53]: UK comment. V3

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Comment [v54]: CEMA comment. Introduced the last version of R69 accessed by COM. V3

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Regulation No 37 Supplement 36 to the 03 series of amendments, with regard to filament lamps.

3.1 In addition to the above, vehicles of categories R and S shall meet the following requirements << refs below from 2009/68/EC >> :

3.1.1 With regard to the direction indicators: the requirements for vehicles of category O in points 1 and 5 to 8 and Annexes 1 and 4 of the UNECE regulation 6.

Comment [v55]: V3

<< from the corresponding road trailers: 76/759/EEC, which refers to UNECE Regulation No 6 >>

3.1.2 With regard to the position lamps, stop lamps and end-outline marker lamps: the requirements for vehicles of category O of points 1 and 5 to 8 and Annexes 1, 4 and 5 in the UNECE regulation 7 and

with regard to the side marker lamps: the requirements for vehicles of category O in points 2 and 6 to 9 and Annexes 1, 4 and 5 of the UNECE regulation 91.

Comment [v56]: V3

<< from the corresponding road trailers: 76/758/EEC >>

3.1.3 With regard to the reversing lights: the requirements for vehicles of category O of points 1 and 5 to 8 and Annex 3 of the UNECE regulation 23.

Comment [v57]: V3

<< from the corresponding road trailers: 77/539/EEC, referring to UNECE Regulation No 23 >>

3.1.4 With regard to the illumination of rear registration plates: the requirements for vehicles of category O of points 1 and 5 to 9 and Annexes 3 to 5 of the UNECE regulation 4.

Comment [v58]: V3

<< from the corresponding road trailers: 76/760/EEC, referring to UNECE Regulation No 4 >>

3.1.5 With regard to the retro-reflecting devices: the requirements for vehicles of category O of points 2, 6 and 7 and Annexes 1 and 4 to 15 of the UNECE regulation 3.

Comment [v59]: V3

<< from the corresponding road trailers: 76/757/EEC, referring to UNECE Regulation No 3 >>

<< The above mentioned additional requirements for R-category vehicles to be extensively discussed in the WGAT >>

ANNEX XII
Requirements on lighting installations

Definitions and terms specific to this Annex

‘Transverse plane’ means a vertical plane perpendicular to the median longitudinal plane of the vehicle.

‘Lamp’ means a device designed to illuminate the road (headlamp) or to emit a light signal. Rear registration-plate lamps and retro-reflectors shall likewise be regarded as lamps;

‘Independent lamps’ means lamps having separate lenses, separate light sources, and separate lamp bodies;

‘Grouped lamps’ means lamps having separate lenses and separate light sources, but a common lamp body;

‘Combined lamps’ means lamps having separate lenses but a common light source and a common lamp body;

‘Reciprocally incorporated lamps’ means lamps having separate light sources (or a single light source operating under different conditions), totally or partially common lenses and a common lamp body;

‘Variable position lamps’ means lamps installed on the vehicle which can move in relation to the vehicle, without being detached;

‘Main-beam headlamp’ means the lamp used to illuminate the road over a long distance ahead of the tractor;

‘Dipped-beam headlamp’ means the lamp used to illuminate the road ahead of the tractor without causing undue dazzle or discomfort to oncoming drivers and other road-users;

‘Concealable illuminating lamp’ means a headlamp capable of being partly or completely hidden when not in use. This result may be achieved by means of a movable cover, by displacement of the headlamp or by any other suitable means. The term "retractable" is used more particularly to describe a concealable lamp the displacement of which enables it to be inserted within the bodywork;

‘Front fog-lamp’ means the lamp used to improve the illumination of the road in case of fog, snowfall, rainstorms or dust clouds;

‘Reversing lamp’ means the lamp used to illuminate the road to the rear of the vehicle and to warn other road-users that the vehicle is reversing or about to reverse;

‘Direction-indicator lamp’ means the lamp used to indicate to other road-users that the driver intends to change direction to the right or to the left;

‘Hazard-warning signal’ means the device permitting the simultaneous operation of all of a vehicle´s direction indicator lamps to draw attention to the fact that the vehicle temporarily constitutes a special danger to other road-users;

‘Stop lamp’ means the lamp used to indicate to other road-users to the rear of the vehicle that the longitudinal movement of the vehicle is intentionally

retarded;

‘Rear registration plate lamp’ means the device used to illuminate the space intended to accommodate the rear registration plate; it may consist of several optical components;

‘Front position (side) lamp’ means the lamp used to indicate the presence and the width of the vehicle when the latter is viewed from the front;

‘Rear position (side) lamp’ means the lamp used to indicate the presence and the width of the vehicle when the latter is viewed from the rear;

‘Rear fog-lamp’ means the lamp used to make the vehicle more easily visible from the rear in dense fog;

‘Parking lamp’ means the lamp used to draw attention to the presence of a stationary vehicle in a built-up area. In such circumstances it replaces the front and rear position (side) lamps;

‘End-outline marker lamp’ means the lamp fitted to the extreme outer edge as close as possible to the top of the vehicle and intended clearly to indicate the vehicle´s overall width. This signal is intended, for certain vehicles, to complement the vehicle´s front and rear position (side) lamps by drawing particular attention to its bulk;

‘Work lamp’ means a device for illuminating a working area or process;

‘Retro-reflector’ means a device used to indicate the presence of a vehicle by reflection of light emanating from a light source unconnected with the vehicle, the observer being situated near that source. For the purpose of this Regulation, the following are not considered as retro-reflectors:

— Retro-reflecting number plates;

— Other plates and retro-reflecting signals which must be used to comply with a Contracting Party's specifications for use as regards certain categories of vehicles or certain methods of operation.

‘Side marker lamp’ means a lamp used to indicate the presence of the vehicle when viewed from the side;

‘Daytime running lamp’ means a lamp facing in a forward direction used to make the vehicle more easily visible when driving during daytime;

‘Cornering lamp’ means a lamp used to provide supplementary illumination of that part of the road which is located near the forward corner of the vehicle at the side towards which the vehicle is going to turn;

‘Lane keeping lamp’ means a lamp that shows the driver the right and left rearmost end of the vehicle during darkness;

‘Exterior Courtesy lamp’ means a lamp used to provide supplementary illumination to assist the entry and exit of the vehicle driver and passenger or in loading operations.

‘Illuminating surface of a lamp’ (see Figure 2 of Appendix 1).

‘Exterior light-emitting surface’ means that part of the exterior surface of the transparent lens that encloses the lighting or light-signalling device and allows it to emit light.

‘Apparent surface’ for a defined direction of observation, means the orthogonal projection of the light-emitting surface in a plane perpendicular to the direction of observation (see Appendix 1).

‘Axis of reference’ means the characteristic axis of the light signal determined by the manufacturer of the lamp for use as the direction of reference (H = 0°, V = 0°) for photometric measurements and when fitting the lamp on the vehicle.

‘Angles of geometric visibility’ means the angles which determine the field of the minimum solid angle in which the apparent surface of the lamp must be visible. That field of the solid angle is determined by the segments of the sphere of which the center coincides with the center of reference of the lamp and the equator is parallel with the ground. These segments are determined in relation to the axis of reference. The horizontal angles β correspond to the longitude and the vertical angles α to the latitude. There must be no obstacle on the inside of the angles of geometric visibility to the propagation of light from any part of the apparent surface of the lamp observed from infinity. If measurements are taken closer to the lamp, the direction of observation must be shifted parallel to achieve the same accuracy.

On the inside of the angles of geometric visibility no account is taken of obstacles, if they were already presented when the lamp was type-approved.

If, when the lamp is installed, any part of the apparent surface of the lamp is hidden by any further parts of the vehicle, proof shall be furnished that the part of the lamp not hidden by obstacles still conforms to the photometric values prescribed for the approval of the device as an optical unit (see figures in Appendix 1 to Annex XII).

‘Extreme outer edge’ on either side of the vehicle means the plane parallel with the median longitudinal plane of the vehicle and coinciding with its lateral outer edge, disregarding the projection:

of tyres near their point of contact with the ground and connections for tyre-pressure gauges and tyre inflating/deflating devices/ducts;

of any anti-skid devices which may be mounted on the wheels;

of rear-view mirrors;

of side direction indicator lamps, end-outline marker lamps, front and rear position (side) lamps, parking lamps and lateral reflex reflectors;

of customs seals affixed to the vehicle and devices for securing and protecting such seals.

‘Overall width’ means the distance between the two extreme outer edges on either side of the vehicle.

‘A single lamp’ means:

(a) A device or part of a device having one lighting or light-signalling function, one or more light source(s) and one apparent surface in the direction of the reference axis, which may be a continuous surface or

composed of two or more distinct parts; or

(b) Any assembly of two independent lamps, whether identical or not, having the same function, both approved as type "D" lamp and installed so that:

(i) The projection of their apparent surfaces in the direction of the reference axis occupies not less than 60 per cent of the smallest quadrilateral circumscribing the projections of the said apparent surfaces in the direction of the reference axis; or

(ii) The distance between two adjacent/tangential distinct parts does not exceed 15 mm when measured perpendicularly to the reference axis; or

(c) Any assembly of two independent retro-reflectors, whether identical or not, that have been approved separately and are installed in such a way that:

(i) The projection of their apparent surfaces in the direction of the reference axis occupies not less 60 per cent of the smallest quadrilateral circumscribing the projections of the said apparent surfaces in the direction of the reference axis; or

(ii) The distance between two adjacent/tangential distinct parts does not exceed 15 mm when measured perpendiculary to the reference axis.

'Operational tell-tale' means a tell-tale showing whether a device that has been actuated is operating correctly or not.

'Circuit-closed tell-tale' means a tell-tale showing that a device has been switched on but not showing whether it is operating correctly or not.

'Signalling panel' means a device used to indicate to other road users the presence of a wide or long vehicle when viewed from the front, rear or side.

'Speed Identification Symbol' means a sign used to indicate when viewed from the rear to other road users the maximum specified ground speed for which a vehicle has been designed.

'SMV rear marking plate', a triangular plate with truncated corners with a characteristic pattern faced with retro-reflective and fluorescent material or devices (class 1); or with retro-reflective materials or devices only (class 2) (see e.g. UNECE Regulation No. 69).

Comment [v60]: To be reviewed

'Emergency stop signal' means a signal to indicate to other road users to the rear of the vehicle that a high retardation force has been applied to the vehicle relative to the prevailing road conditions.

1. Test procedure for EU type-approval

The application for EU type-approval shall be accompanied by the undermentioned documents in triplicate and the following particulars:

1.1. A description of the vehicle type with regard to the dimensions and exterior shape of the vehicle and the number and positioning of lighting and light-signalling devices; the vehicle type duly identified shall be specified;

1.2. A list of the devices intended by the manufacturer to form the lighting and signalling equipment; the list may include several types of device for each function, in addition, the list may include in respect of each function the additional annotation "or equivalent devices";

1.3. A diagram of the lighting and signalling installation as a whole, showing the position of the various devices on the vehicle;

1.4. A drawing or drawings of each lamp showing the illuminating surface of a lamp or a lighting device or signalling lamp other than a retro-reflector or a reflex-reflector;

1.5. An unladen vehicle fitted with a complete set of lighting and signalling equipment and representative of the vehicle type to be approved shall be submitted to the technical service conducting approval tests.

2. Approval

Templates of the above mentioned documents, to be submitted during the EU type-approval process, are provided in << RAR >>.

3. Approval number and markings

<< Each vehicle approved according to the requirements of the current Annex shall be assigned an approval number and marking, as determined in RAR. >>

4. General Specifications

4.1. The lighting and light-signalling devices must be so fitted that under normal conditions of use, and notwithstanding any vibration to which they may be subjected, they retain the characteristics laid down in this Regulation and enable the vehicle to comply with the requirements of this Regulation. In particular, it shall not be possible for the adjustment of the lamps to be inadvertently disturbed.

4.2. Vehicles must be fitted with the permanently connected socket outlet specified in ISO ~~standard~~ 1724 (1980) (Electrical connections for vehicles with 6 or 12 volt electrical systems applying more specifically to private motor cars and lightweight trailers or caravans), or ISO 1185 (1975) (Electrical connections between towing and towed vehicles having 24 volt electrical systems used for international commercial transport purposes) or both when they have a connection for attaching trailed vehicles or mounted machines. Also, vehicles may be fitted with **the supplementary 7-pin connector according to ISO 3732:199**.

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Comment [v61]: CEMA comment. V3

4.3. The illuminating main-beam headlamps, dipped-beam headlamps and front fog-lamps shall be so installed that correct adjustment of their orientation can easily be carried out.

4.4. For all light-signalling devices, the reference axis of the lamp when fitted to the vehicle must be parallel with the bearing plane of the vehicle on the road and with

the longitudinal plane of the vehicle. In each direction a tolerance of ±3° shall be allowed. In addition, any specific instructions as regards fitting laid down by the manufacturer must be complied with.

4.5. In the absence of specific instructions, the height and orientation of the lamps shall be verified with the vehicle unladen and placed on a flat horizontal surface.

4.6. In the absence of specific instructions, lamps constituting a pair shall:

4.6.1. Be mounted symmetrically in relation to the median longitudinal plane;

4.6.2. Be symmetrical to one another in relation to the median longitudinal plane;

4.6.3. Satisfy the same colorimetric requirements; and

4.6.4. Have substantially identical photometric characteristics.

4.7. On vehicles whose external shape is asymmetrical, the requirements of paragraphs 4.6.1. and 4.6.2. shall be satisfied as far as possible. These requirements shall be regarded as having been met if the distance of the two lamps from the median longitudinal plane and from the bearing plane on the ground is the same.

4.8. Lamps having different functions may be independent or be grouped, combined or reciprocally incorporated in one device, provided that each such lamp complies with the requirements applicable to it.

4.9. The maximum height above ground shall be measured from the highest point and the minimum height from the lowest point of the illuminating surface.

4.10. In the absence of specific instructions, no lamps other than direction-indicator lamps, the emergency stop signal and the hazard warning signal may emit a flashing light.

4.11. No red light shall be visible towards the front and no white light other than that from the reversing lamp or work lamps shall be visible towards the rear. This requirement is considered to have been met if:

4.11.1. For the visibility of a red light towards the front: there is no direct visibility of a red lamp if its light-emitting surface is viewed by an observer moving within zone 1 in a transverse plane situated 25 m in front of the vehicle (see Appendix 2, figure 1);

4.11.2. For the visibility of a white light towards the rear: there is no direct visibility of a white lamp if its light-emitting surface viewed by an observer moving within zone 2 in a transverse plane situated 25 m behind the vehicle (see Appendix 2, figure 2).

4.11.3. Zones 1 and 2, as seen by the observer, are limited in their respective planes as follows:

4.11.3.1. As regards height, by two horizontal planes which are 1 m and 2.2 m respectively above the ground;

4.11.3.2. As regards width, by two vertical planes which make an angle of 15° towards the front and rear respectively, and towards the outside by reference to the median plane of the vehicle, passing through the point (or points) of contact of vertical planes

which are parallel with the median longitudinal plane of the vehicle, and limiting the overall width of the vehicle when on wide track.

If there are several points of contact, the one furthest towards the front shall be selected for zone 1 and the one furthest towards the rear shall be selected for zone 2.

4.12. The electrical connections shall be such that the front and rear position lamps, the end-outline marker lamps, if they exist, the side-marker lamps, if they exist, and the rear registration plate lamp can only be switched ON and OFF simultaneously.

This condition does not apply:

4.12.1. When front and rear position lamps are switched ON, as well as side-marker lamps when combined or reciprocally incorporated with said lamps, as parking lamps;

4.12.2. When side-marker lamps are permitted to flash.

4.12.3. To front position lamps when their function is substituted under the provisions of paragraph 4.13.1. below.

4.13. The electrical connections shall be such that the main-beam and dipped-beam headlamps and the front fog lamps cannot be switched on unless the lamps referred to in paragraph 4.12. are also switched on. This requirement shall not apply, however, to main-beam or dipped-beam headlamps when their luminous warnings consist of the intermittent lighting up at short intervals of the main-beam headlamp or the intermittent lighting up at short intervals of the dipped-beam headlamp or the alternate lighting up at short intervals of the main-beam and dipped-beam headlamps.

4.13.1. The dipped-beam headlamps and/or the main-beam headlamps and/or the front fog lamps may substitute the function of the front position lamps, provided that:

4.13.1.1. Their electrical connections are such that in case of failure of any of these lighting devices the front position lamps are automatically re-activated; and

4.13.1.2. The substituting lamp/function meets, for the respective position lamp, the requirements concerning paragraphs 5.8.1. to 5.8.6. , and

4.13.1.3. appropriate evidence demonstrating compliance with the requirements indicated in paragraph 4.13.1.2. above is provided in the test reports of the substituting lamp.

4.14. The function of the circuit-closed tell-tales may be fulfilled by operational tell-tales.

4.15. The colors of the light emitted by the lamps[7] are the following:

Main-beam headlamp: White

Dipped-beam headlamp: White

Front fog lamp: White or selective yellow

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[7] Measurement of the chromaticity coordinates of the light emitted by the lamps is not part of this Annex.

Reversing lamp: White

Direction-indicator lamp: Amber

Hazard warning signal: Amber

Stop lamp: Red

Emergency stop signal: Amber or red

Rear registration plate lamp: White

Front position lamp: White

Rear position lamp: Red

Rear fog lamp: Red

Parking lamp: White in front, red at the rear, amber if reciprocally incorporated in the side direction indicator lamps or in the side-marker lamps.

Side-marker lamp: Amber; however the rearmost side-marker lamp can be red if it is grouped or combined or reciprocally incorporated with the rear position lamp, the rear end-outline marker lamp, the rear fog lamp, the stop lamp or is grouped or has part of the light emitting surface in common with the rear retro-reflector.

End-outline marker lamp: White in front, red at the rear

Daytime running lamp: White

Rear retro-reflector, non-triangular: Red

Rear retro-reflector, triangular: Red

Front retro-reflector, non-triangular: white or colorless

Side retro-reflector, non- triangular: Amber; however the rearmost side retro-reflector can be red if it is grouped or has part of the light emitting surface in common with the rear position lamp, the rear end outline marker lamp, the rear fog lamp, the stop-lamp, the red rearmost side-marker lamp or the rear retro-reflector, non- triangular.

Cornering lamp: White

Conspicuity marking: White or yellow to the side; Red or yellow to the rear[8].

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Lane keeping light: White

Exterior courtesy lamp: White

4.16. Concealable lamps

4.16.1. The concealment of lamps shall be prohibited, with the exception of main-beam headlamps, dipped-beam headlamps, and front fog-lamps.

4.16.2. An illuminating device in the position of use shall remain in that position if the malfunction referred to in paragraph 4.16.2.1. occurs alone or in conjunction with

[8] Nothing in this Annex shall preclude the Member States applying this Annex from allowing the use of white conspicuity markings to the rear in their territories.

one of the malfunctions described in paragraph 4.16.2.2.:

4.16.2.1. The absence of power for manipulating the lamp;

4.16.2.2. A break, impedance, or short-circuit to earth in the electrical circuit, defects in the hydraulic or pneumatic leads, Bowden cables, solenoids or other components controlling or transmitting the energy intended to activate the concealment device.

4.16.3. In the event of a defect in the concealment control a concealed lighting device shall be capable of being moved into the positions of use without the aid of tools.

4.16.4. Illuminating devices which are manipulated by power shall be brought into the position of use and switched on by means of a single control, without excluding the possibility of moving them into the position of use without switching them on. However, in the case of grouped- main-beam headlamps and dipped-beam headlamps, the control referred to above is required only to activate the dipped-beam headlamps.

4.16.5. It must not be possible deliberately, from the driver's seat, to stop the movement of switched-on headlamps before they reach the position of use. If there is a danger of dazzling other road users by the movement of headlamps, they may light up only when they have reached their final position.

4.16.6. At temperatures of -30 °C to +50 °C an illuminating device which is manipulated by power must be capable of reaching the position of use within three seconds of initial operation of the control.

4.17. Variable position lamps

4.17.1. The position of all lamps may be varied except main-beam headlamps, dipped-beam headlamps and at least one pair of rear reflectors:

4.17.1.1. These lamps remain attached to the vehicle when their position is altered;

4.17.1.2. These lamps shall be capable of being locked in the position required by traffic conditions. Locking shall be automatic.

4.18. Lighting and signalling devices for external projections of vehicles

The installation of lighting and signalling devices for external projections of vehicles shall comply with Appendix 5.

5. Individual specifications

5.1. Main-beam head lamps

5.1.1. Presence: Tractors may be equipped with main-beam head lamps. Prohibited on trailers and towed machines.

5.1.2. Number: Two or four.

5.1.3. Arrangement: No individual specifications.

5.1.4 Position in:

5.1.4.1. Width: The outer edges of the illuminating surface shall in no case be closer to the extreme outer edge of the vehicles than the outer edges of the illuminating surface of the dipped-beam headlamps.

5.1.4.2. Height: No individual specifications.

5.1.4.3. Length: As near to the front of the vehicle as possible; however, the light emitted must not in any circumstances cause discomfort to the driver either directly or indirectly through the rear-view mirrors and/or other reflecting surfaces of the vehicle.

5.1.5. Geometric visibility: The visibility of the illuminating surface, including its visibility in areas which do not appear to be illuminated in the direction of observation considered, shall be ensured within a divergent space defined by generating lines based on the perimeter of the illuminating surface and forming an angle of not less than 5° with the axis of reference of the headlamp.

5.1.6. Alignment: Towards the front.

Apart from the devices necessary to maintain correct adjustment and when there are two pairs of main-beam headlamps, one pair, consisting of headlamps functioning as main-beam headlamp only, may swivel, according to the angle of lock on the steering, about an approximately vertical axis.

5.1.7. May be grouped: With the dipped-beam headlamp and the other front lamps.

5.1.8. May not be combined: With any other lamp.

5.1.9. May be reciprocally incorporated:

5.1.9.1. With the dipped-beam headlamp, unless the main-beam headlamp swivels according to the angle of lock of the steering;

5.1.9.2. with the front position (side) lamp;

5.1.9.3. with the front fog-lamp;

5.1.9.4. with the parking lamp.

5.1.10. Electrical connections: The main-beam headlamp may be switched on either simultaneously or in pairs. For changing over from the dipped to the main-beam at least one pair of main beams must be switched on. For changing over from the main to the dipped-beam all main-beam headlamps must be switched off simultaneously.

The dipped beams may remain switched on at the same time as the main beams.

5.1.11. Circuit closed tell-tale: Vehicles must be equipped with a tell-tale showing circuit closed of the main-beam head lamps. Color: blue

5.1.12. Other requirements:

5.1.12.1. The aggregate maximum intensity of the main beams which can be switched on simultaneously shall not exceed 225,000 cd.

5.1.12.2. This maximum intensity shall be obtained by adding together the individual maximum intensities measured at the time of *component* type-approval and shown on the relevant approval reports.

5.2. Dipped beam headlamps

5.2.1. Presence: Tractors must be equipped with dipped beam headlamps. Dipped beam headlamps are prohibited on trailers and towed machines.

5.2.2. Number: Two (or four - see paragraph 5.2.4.2.1., below).

5.2.3. Arrangement: No individual specifications.

5.2.4. Position in:

5.2.4.1. Width: No individual specifications.

5.2.4.2. Height: If only two dipped-beam headlamps are fitted minimum 500 mm and maximum 1,500 mm above the ground.

For vehicles with a maximum width not exceeding 1,300 mm above the ground not less than 250 mm.

This distance may be increased to 2,500 mm, if the height of 1,500 mm cannot be observed due to the design, taking account of the conditions of use of the tractor and its working equipment;

5.2.4.2.1. In the case of tractors equipped for the fitting of portable devices at the front, two dipped-beam headlamps in addition to the lamps mentioned in paragraph 5.2.4.2. shall be allowed at a height not exceeding 4,000 mm if the electrical connections are such that two pairs of dipped-beam headlamps cannot be switched on at the same time.

5.2.4.3. Length: As near to the front of the tractor as possible; however, the light emitted must not in any circumstances cause discomfort to the driver either directly or indirectly through the rear-view mirrors and/or other reflecting surfaces of the tractor.

5.2.5. Geometric visibility: Defined by angles α and β as specified in paragraph 2.10.

α = 15° upwards and 10° downwards,

β = 45° outwards and 5° inwards.

Within this field, virtually the whole of the apparent surface of the lamp must be visible.

The presence of partitions or other items of equipment near the headlamp shall not give rise to secondary effects causing discomfort to other road users.

5.2.6. Alignment: Towards the front.

5.2.6.1. Horizontal alignment:

5.2.6.1.1. If the height of the dipped-beam headlamps is equal to or greater than 500 mm and equal to or less than 1,500 mm, it must be possible to lower the dipped beam by between 0.5 and 6 per cent;

5.2.6.1.2. The dipped-beam headlamps must be aligned in such a way that, measured at 15 m from the lamp, the horizontal line separating the lit zone from the unlit zone is situated at a height equivalent to only half the distance between the ground and the center of the lamp.

If the dipped-beam headlamps in a height above 2,500 mm are switched on, the maximum travel speed is limited to 40 km/h. Appropriate information must be given to the user.

5.2.6.2. Dipped beam headlamp levelling device (optional)

5.2.6.2.1. A headlamp levelling device may be automatic or manually adjustable.

5.2.6.2.2. Devices which are adjusted manually, either continuously or non-continuously, shall have a stop position at which the lamps can be returned to the initial inclination by means of the usual adjusting screws or similar means.

These manually adjustable devices shall be operable from the driver's seat.

Continually adjustable devices shall have reference marks indicating the loading conditions that require adjustment of the dipped-beam.

The number of positions on devices which are not continuously adjustable shall be such as to ensure compliance with the range of values prescribed in paragraph 5.2.6.1.1. or 5.2.6.1.2. in all the loading conditions defined in Annex 5 of UNECE Regulation No. 48.

5.2.6.2.3. The dipped-beam shall not assume a position in which the dip is less than it was at original adjustment.

5.2.7. May be grouped: With the main-beam headlamps and the other front lamps.

5.2.8. May not be combined: With any other lamp.

5.2.9. May be reciprocally incorporated: With the main-beam headlamp;
With the other front lamps.

5.2.10. May be reciprocally incorporated: With the main-beam headlamp;
With the other front lamps.

5.2.11. Circuit closed tell-tale: Vehicles may be equipped with a tell-tale showing closed circuit for dipped beam headlamps.

5.2.12. Other requirements The requirements of paragraph 5.5.2. shall not apply to the dipped-beam headlamps.

5.3. Front fog lamps

5.3.1. Presence: Tractors may be equipped with front fog lamps. Prohibited on trailers and towed machines.

5.3.2. Number: Two.

5.3.3. Arrangement: No individual specifications.

5.3.4. Position in:

5.3.4.1. Width: No individual specifications.

5.3.4.2. Height: No less than 250 mm above the ground. No point on the illuminating surface shall be higher than the highest point on the illuminating surface of the dipped-beam headlamp.

5.3.4.3. Length: As near to the front of the tractor as possible; however, the light emitted must not in any circumstances cause discomfort to the driver either directly or indirectly through the rear-view mirrors and/or other reflecting surfaces of the tractor.

5.3.5. Geometric visibility: Defined by angles α and β as specified in paragraph 2.10.

α = 5° upwards and downwards;

β = 45° outwards and 5° inwards.

5.3.6. Alignment: Towards the front.

They must be directed forwards without causing undue dazzle or discomfort to oncoming drivers and other road users.

5.3.7. May be grouped: With other front lamps.

5.3.8. May not be combined: With other front lamps.

5.3.9. May not be combined: With other front lamps.

5.3.10. Electrical connections: It shall be possible to switch the fog lamps on or off independently of the main-beam headlamp and dipped-beam headlamps and vice versa.

5.3.11. Circuit closed tell-tale: Vehicles may be equipped with a tell-tale showing closed circuit of front fog lamps.

5.4. Reversing lamps

5.4.1. Presence: Vehicles may be equipped with reversing lamps.

5.4.2. Number: One or two.

5.4.3. Arrangement: No individual specifications.

5.4.4. Position:

5.4.4.1. Width: No individual specifications.

5.4.4.2. Height: Not less than 250 mm and not more than 4,000 mm above the ground.

5.4.4.3. Length: At the back of the vehicle.

5.4.5. Geometric visibility: Defined by angles α and β as specified in paragraph 2.10.

α = 15° upwards and 5° downwards;

β = 45° to right and to left if there is only one lamp;

β = 45° outwards and 30° inwards if there are two lamps.

5.4.6. Alignment: Rearwards.

5.4.7. May be grouped: With any other rear lamp.

5.4.8. May not be combined: With any other lamps.

5.4.9. May not be reciprocally incorporated: With any other lamps.

5.4.10. Electrical connections: It can only be lit up or remain alight if the reverse gear is engaged and if:

Either the engine is running;

Or one of the devices controlling the starting and stopping of the engine is in such a position that operation of the engine is possible.

5.4.11. Tell-tale: Vehicles may be equipped with tell-tale for reversing lamps.

5.5. Direction-indicator lamps (see diagrams, Appendix 3).

5.5.1. Presence: Vehicles must be equipped with direction-indicator lamps. Types of indicators fall into categories (1, 2 and 5) the assembly of which on one tractor constitutes an arrangement (A to D).

Arrangement A shall be allowed only on tractors whose overall length does not exceed 4.60 m and in the case of which the distance between the outer edges of the illuminating surfaces is not more than 1.60 m.

Arrangements B, C and D shall apply to all tractors.

For trailers and towed machines category 2 lamps shall be used.

Vehicles may be equipped with additional direction-indicator lamps.

5.5.2. Number: The number of devices shall be such that they can emit signals which correspond to one of the arrangements referred to in paragraph 5.5.3.

5.5.3. Arrangement: The number, position and horizontal visibility of the indicator lamps shall be such that they can give indications corresponding to at least one of the arrangements defined below. The angles of visibility are hatched on the diagrams; the angles shown are minimum values which may be exceeded; all the angles of visibility are measured from the center of the illuminating surface.

5.5.3.1. For tractors: A Two front direction-indicator lamps (category 1),

Two rear direction-indicator lamps (category 2).

These lamps may be independent, grouped or combined.

B Two front direction-indicator lamps (category 1),

Two repeating side direction-indicator lamps (category 5),

Two rear direction-indicator lamps (category 2).

The front and repeating side lamps may be independent, grouped, or combined.

C Two front direction-indicator lamps (category 1),

Two rear direction-indicator lamps (category 2),

Two repeating side indicator lamps (category 5)

D Two front direction-indicator lamps (category 1),

Two rear direction-indicator lamps (category 2).

5.5.3.2. For trailers and towed machines:

Two rear direction-indicator lamps (category 2).

5.5.4. Position:

5.5.4.1. Width: Except in the case of category 1 direction indicator lamps of arrangement C and for additional direction indicator lamps, the edge of the illuminating surface furthest from the median longitudinal plane of the tractor must not be more than 400 mm from the extreme outer edge of the tractor. The distance between the inner edges of the two illuminating surfaces of a pair of lamps shall be not less than 500 mm.

Where the vertical distance between the rear direction-indicator lamp and the corresponding rear position (side) lamp is not more than 300 mm, the distance between the extreme outer edge of the vehicle and the outer edge of the rear direction-indicator lamp must not exceed by more than 50 mm the distance between the extreme outer edge of the vehicle and the outer edge of the corresponding rear position (side) lamp.

For front direction-indicator lamps the illuminating surface should be not less than 40 mm from the illuminating surface of the dipped-beam headlamps or front fog-lamps, if any.

A smaller distance is permitted if the luminous intensity in the reference axis of the direction-indicator lamp is equal to at least 400 cd.

5.5.4.2. Height: Above the ground not less than 400 mm and more than 2,500 mm and up to 4,000 mm for additional direction-indicator lamps the vehicle may be equipped with.

For vehicles with a maximum width not exceeding 1,300 mm above the ground not less than 250 mm.

5.5.4.3. Length: The distance between the center of reference of illuminating surface of the category 1 indicator (arrangement B), category 5 indicator (arrangement B and C) and the transverse plane which marks the forward boundary of the tractor's overall length normally shall not exceed 1,800 mm. If the structure of the tractor makes it impossible to keep to the minimum angles of visibility, this distance may be increased to 2,600 mm.

5.5.5. Geometric visibility: Horizontal angles: See Appendix 3.

Vertical angles: 15° above and below the horizontal.

The vertical angle below the horizontal may be reduced to 10° in the case of side repeating direction-indicator lamps of arrangements B and C if their height is less than 1,900 mm. The same applies in the case of direction-indicator lamps in category 1 of arrangements B and D.

5.5.6. Alignment: If individual specifications for installations are laid down by the manufacturer of the lamp they must be observed.

5.5.7. May be grouped: With one or more lamps, which may not be concealed.

5.5.8. May not be combined: With another lamp, save in accordance with the arrangements referred to in paragraph 5.5.3.

5.5.9. May be reciprocally incorporated: With a parking lamp only, but solely in the case of direction-indicator lamps in category 5.

5.5.10. Electrical connections: Direction-indicator lamps shall switch on independently of the other lamps. All direction-indicator lamps on one side of a tractor shall be switched on and off by means of one control and shall flash in phase.

5.5.11. Operational tell-tale: Tractors must be equipped with operational tell-tales for all direction-indicator lamps not directly visible to the driver. It may be optical or audible or both.

If it is optical, it shall be a green flashing light which, in the event of the malfunction of any of the direction-indicator lamps other than the repeating side direction-indicator lamps, is either extinguished, or remains alight without flashing, or shows a marked change of frequency.

If it is entirely auditory, it shall be clearly audible and shall show a marked change of frequency in the event of any malfunction.

If a tractor is equipped to tow a trailer, it must be equipped with a special optical operational tell-tale for the direction indicator lamps on the trailer unless the tell-tale of the drawing vehicle allows the failure of any one of the direction-indicator lamps on the tractor combination thus formed to be detected.

5.5.12. Other requirements: The lamps shall be a flashing lamp flashing 90 ± 30 times per minute. Operation of the light-signal control shall be followed within not more than one second by the appearance of the light and within not more than one and one-half seconds by the first extinction.

If a tractor is authorised to tow a trailer, the control of the

direction-indicators on the tractor shall also operate the indicators of the trailer.

In the event of failure, other than a short circuit, of one direction-indicator, the others must continue to flash but the frequency under this condition may be different from that specified.

5.6. Hazard warning signal

5.6.1. Presence: Vehicles must be equipped with a hazard warning signal.

5.6.2. Number

5.6.3. Arrangement

5.6.4. Position

5.6.4.1. Width

5.6.4.2. Height

5.6.4.3. Length

5.6.5. Geometric visibility

5.6.6. Alignment

5.6.7. May/may not be grouped

5.6.8. May/may not be combined

5.6.9. May/may not be reciprocally incorporated

As specified in the corresponding headings of paragraph 5.5.

5.6.10. Electrical connections: The signal shall be operated by means of a separate control enabling all the direction-indicator lamps to function in phase.

5.6.11. Circuit-closed tell-tale: Mandatory. Flashing warning light, which can operate in conjunction with tell-tale(s) specified in paragraph 5.5.11.

5.6.12. Other requirements: As specified in paragraph 5.5.12. If a tractor is equipped to tow a trailer the hazard-warning signal control must also be capable of activating the direction-indicator lamps on the trailer. The hazard-warning signal must be able to function even if the device which starts or stops the engine is in a position which makes it impossible to start the engine.

5.7. Stop lamps

5.7.1. Presence:

S1 or S2 of devices as described in UN Regulation No. 07: vehicles must be equipped with stop lamps.

S3 or S4 of devices as described in UN Regulation No. 07: vehicles

may be equipped with such stop lamps.

5.7.2. Number: Two S1 or S2 category devices and one S3 or S4 category device.

5.7.2.1. Vehicles may be equipped with two category S1 or S2 devices, except in the case where a category S3 or S4 device is installed.

5.7.2.2. Only, when the median longitudinal plane of the vehicle is not located on a fixed body panel but separates one or two movable parts of the vehicle (e.g. doors), and lacks sufficient space to be equipped with a single device of the S3 or S4 category on the median longitudinal plane above such movable parts, it may be equipped with either:

Two devices of the S3 or S4 category type D; or

One device of the S3 or S4 category offset to the left or to the right of the median longitudinal plane.

5.7.3. Arrangement: No individual specifications.

5.7.4. Position:

5.7.4.1. Width:

S1 or S2 categories: The distance in between the inner edges of the apparent surfaces in the direction of the reference axes shall be not less than 500 mm apart. This distance may be reduced to 400 mm if the overall width of the vehicle is less than 1,400 mm.

S3 or S4 categories: For S3 or S4 category devices: the center of reference shall be situated on the median longitudinal plane of the vehicle. However, in the case where the two devices of the S3 or S4 category are installed, according to paragraph 5.7.2., they shall be positioned as close as possible to the median longitudinal plane, one on each side of this plane.

In the case where one S3 or S4 category lamp offset from the median longitudinal plane is permitted according to paragraph 5.7.2., this offset shall not exceed 150 mm from the median longitudinal plane to the center of reference of the lamp.

5.7.4.2. Height:

S1 or S2 categories: Above the ground, not less than 400 mm and not more than 2,500 mm and up to 4,000 mm for stop lamps that vehicles may be equipped with.

S3 or S4 categories: Above the stop lamps and in the horizontal plane tangential to the lower edge of the apparent surface of a S3 or S4 category device shall be above the horizontal plane tangential to the upper edge of the apparent surface of S1 or S2 categories devices.

Vehicles may be equipped with two additional devices of category S1 or S2:

Above the ground, not less than 400 mm and not more than 4,000 mm

5.7.4.3. Length:

S1 or S2 categories: At the rear of the vehicle.

S3 or S4 categories: No individual specification.

5.7.5. Geometric visibility: Horizontal angle: 45° outwards and inwards.

Vertical angle: 15° above and below the horizontal.

The vertical angle below the horizontal may be reduced to 10° if the lamp is situated less than 1,900 mm above ground, to 5° in the case of lamps less than 750 mm above the ground.

5.7.6. Alignment: Towards the rear of the vehicle.

5.7.7. May be grouped: With one or more other rear lamps.

5.7.8. May not be combined: With any other lamp.

5.7.9. May be reciprocally incorporated: With the rear position (side) lamp and the parking lamp.

5.7.10. Electrical connections: Shall light up when the service brake is applied and/or when the vehicle speed is reduced intentionally.

5.7.11. Operational tell-tale: Vehicles may be equipped with tell-tale for stop lamps. If fitted, it shall be a non-flashing warning lamp which comes on in the event of the malfunctioning of the stop lamps.

5.7.12. Other requirements: The luminous intensity of the stop lamps shall be markedly greater than that of the rear position (side) lamps.

5.8. Front position (side) lamps

5.8.1. Presence: Tractors must be equipped with front position (side) lamps.

Trailers and towed machines over 2,550 mm width must be equipped with front position (side) lamps.

Trailers and towed machines of a width not exceeding 2,550 mm may be equipped with front position (side) lamps.

5.8.2. Number: Two or four (see paragraph 5.8.4.2.).

5.8.3. Arrangement: No individual specifications

5.8.4. Position:

5.8.4.1. Width: That point on the illuminating surface which is farthest from the vehicle´s median longitudinal plane shall be not more than 400 mm from the extreme outer edge of the vehicle. The clearance between the respective inner edges of the two illuminating surfaces shall be not less than 500 mm.

5.8.4.2. Height: Above the ground, not less than 400 mm and not more than 2,500 mm

In the case of vehicles equipped for the fitting of portable devices at the front, which may obscure the front position (side) lamps, two additional front

position (side) lamps may be fitted at a height not exceeding 4,000 mm.

5.8.4.3. Length: No specifications provided that the lamps are aligned forwards and the angles of geometrical visibility specified in paragraph 5.8.5. are complied with.

5.8.5. Geometric visibility: Horizontal angle: For the two front position (side) lamps: 10° inwards and 80° outwards. However, the angle of 10° inwards may be reduced to 5° if the shape of the bodywork makes it impossible to keep to 10°. For vehicles with any overall width not exceeding 1,400 mm this angle may be reduced to 3° if the shape of the bodywork makes it impossible to keep to 10°.

Vertical angle: 15° above and below the horizontal. The vertical angle below the horizontal may be reduced to 10° if the height of the lamp above the ground is less than 1,900 mm, and to 5° if this height is less than 750 mm.

5.8.6. Alignment: Towards the front.

5.8.7. May be grouped: With any other front lamp.

5.8.8. May not be combined: With other lamps.

5.8.9. May be reciprocally incorporated: With any other front lamps.

5.8.10. Electrical connections: No individual specifications (see paragraph 4.11).

5.8.11. Tell-tale: Tractors must be equipped with a tell-tale for front position (side) lamps. This tell-tale shall be non-flashing. It shall not be required if the instrument panel lighting can only be turned on simultaneously with the front position (side) lamps.

5.9. Rear position (side) lamps

5.9.1. Presence: Vehicles must be equipped with rear position (side) lamps.

5.9.2. Number: Two or more (see paragraphs 5.9.4.3 and 5.9.5.1).

5.9.3. Arrangement: No individual specifications. If four rear position (side) lamps according to paragraph 5.9.5.1 are fitted, at least one pair of rear position (side) lamps shall be fixed.

5.9.4. Position:

5.9.4.1. Width: Except as provided in paragraphs 5.9.5.1. that point on the illuminating surface which is farthest from the vehicle´s median longitudinal plane shall be not more than 400 mm from the extreme outer edge of the vehicle.

The distance between the inner edges of the two illuminating surfaces shall be not less than 500 mm. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1,400 mm.

5.9.4.2. Height: Except as provided in paragraph 6.9.5.1. above the ground not less than 400 mm and not more than 2,500 mm.

For vehicles with a maximum width not exceeding 1,300 mm above

the ground not less than 250 mm.

5.9.4.3. Length: At the rear of vehicle. Not more than 1,000 mm from the rearmost point of the vehicle.

Parts of the vehicle that extend the rearmost point of the illuminating surface of the rear position (side) lamps by more than 1000 mm shall be fitted with an additional rear position (side) lamp.

5.9.5. Geometric visibility: Horizontal angle: For the two rear position (side) lamps: either 45° inwards and 80° outwards, or 80° inwards and 45° outwards.

Vertical angle: 15° above and below the horizontal. The angle below the horizontal may be reduced to 10° if the height of the lamp above the ground is less than 1,900 mm, and to 5° if this height is less than 750 mm.

5.9.5.1. If it is impossible to observe the above position and visibility requirements, four rear position lamps may be fitted in accordance with the following installation specifications:

5.9.5.1.1. Two rear position lamps must keep within the maximum height of 2,500 mm above the ground.

A distance of at least 300 mm between the rear reflectors must be observed, and they must have a vertical angle of visibility above the horizontal of 15°.

5.9.5.1.2. The other two shall keep within a maximum height of 4,000 mm above the ground and shall be bound by the requirements of paragraph 5.9.4.1.

5.9.6. Alignment: Towards the rear.

5.9.7. May be grouped: With any other rear lamp.

5.9.8. May be combined: With the rear registration-plate lamp.

5.9.9. May be reciprocally incorporated: With the stop lamps, the rear fog-lamp or the parking lamp.

5.9.10. Electrical connections: No individual specifications.

5.9.11. Circuit closed tell-tale: Tractors must be equipped with a tell-tale showing circuit closed of rear position (side) lamps (see 4.11). It must be combined with that of the front position (side) lamps. Color: ~~amber or yellow~~green.

5.10. Rear fog lamps

5.10.1. Presence: Vehicles may be equipped with rear fog lamps.

5.10.2. Number: One or two.

5.10.3. Arrangement: This must satisfy the conditions of geometric visibility.

5.10.4. Position:

5.10.4.1. Width: If there is only one rear fog lamp, it must be on the opposite side of the median longitudinal plane of the vehicle ~~tractor~~ to the direction of traffic prescribed in the country of registration. In all cases the distance between the rear fog-lamp and the stop lamp shall be more than 100 mm.

5.10.4.2. Height: Above the ground, not less than 400 mm and not more than 2,500 mm.

5.10.4.3. Length: At the rear of vehicle

5.10.5. Geometric visibility: Horizontal angle: 25° inwards and outwards.

Vertical angle: 5° above and below the horizontal.

5.10.6. Alignment: Towards the rear.

5.10.7. May be grouped: With any other rear lamp.

5.10.8. May not be combined: With any other lamps.

5.10.9. May be reciprocally incorporated: With the rear position (side) lamps or the parking lamp.

5.10.10. Electrical connections: These must be such that the rear fog-lamp can light up only when the dipped-beam headlamps or the front fog-lamps in use.

If the front fog-lamps exist, the extinguishing of the rear fog-lamp must be possible independently from that of the front fog-lamps.

5.10.11. Circuit closed tell-tale: Tractors must be equipped with a tell-tale showing circuit closed of rear fog lamps. An independent, fixed-intensity warning light.

5.11. Parking lamps

5.11.1. Presence: Vehicles may be equipped with parking lamps.

5.11.2. Number: Dependent upon the arrangement.

5.11.3. Arrangement: Either two front lamps and two rear lamps, or one lamp on each side.

5.11.4. Position:

5.11.4.1. Width: That point on the illuminating surface which is farthest from the vehicles median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle. Furthermore, in the case of a pair of lamps, the lamps must be on the side of the vehicle.

5.11.4.2. Height: Above the ground, not less than 400 mm and not more than 2,500 mm.

5.11.4.3. Length: No individual specifications.

5.11.5. Geometric visibility: Horizontal angle: 45° outwards, towards the front and towards

the rear.

Vertical angle: 15° above and below the horizontal. The vertical angle below the horizontal may be reduced to 10° if the height of the lamp above the ground is less than 1,500 mm; and to 5° if this height is less than 750 mm.

5.11.6. Alignment: Such that the lamps meet the requirements concerning visibility towards the front and towards the rear.

5.11.7. May be grouped: With any other lamp.

5.11.8. May not be combined: With any other lamp.

5.11.9. May be reciprocally incorporated: At the front with the front position (side) lamps, the dipped-beam headlamps, the main-beam headlamps and the front fog-lamps.

At the rear, with the rear position (side) lamps, the stop lamps and the rear fog-lamps.

With the direction indicator lamps in category 5.

5.11.10. Electrical connections: The connections must allow the parking lamp(s) on the same side of the vehicle to be lit independently of any other lamps.

5.11.11. Tell-tale: Vehicles may be equipped with tell-tale for parking lamps. If there is one, it must not be possible to confuse it with the tell-tale for the position (side) lamps.

5.11.12. Other requirements: The function of this lamp may also be performed by the simultaneous switching on of the front and rear position (side) lamps on one side of the vehicle.

5.12. End-outline marker lamps

5.12.1. Presence: Vehicles exceeding 2.10 m in width may be equipped with end-outline marker lamps. Prohibited on all other vehicles.

5.12.2. Number: Two visible from the front and two visible from the rear.

5.12.3. Arrangement: No individual specifications.

5.12.4. Position:

5.12.4.1. Width: As close as possible to the extreme outer edge of the vehicle.

5.12.4.2. Height: At the greatest height compatible with the required position in width and with symmetry of the lamps.

5.12.4.3. Length: No individual specification.

5.12.5. Geometric visibility: Horizontal angle: 80° outwards.

Vertical angle: 5° above and 20° below the horizontal.

5.12.6. Alignment: Such that the lamps meet the requirements concerning visibility towards the front and towards the rear.

5.12.7. May not be grouped: With any other lamps, except for the case referred to in paragraph 5.8.4.2.

5.12.8. May not be combined: With any other lamps, except for the case referred to in paragraph 5.8.4.2.

5.12.9. May not be reciprocally incorporated: With any other lamps, except for the case referred to in paragraph 5.8.4.2.

5.12.10. Electrical connections: No individual specifications.

5.12.11. Tell-tale: Vehicles may be equipped with a tell-tale for end-outline marker lamps.

5.12.12. Other requirements: Subject to all the other conditions being met, the lamp visible from in front and the lamp visible from the rear, on the same side of the vehicle, may be included in one device. The position of an end-outline marker lamp in relation to the corresponding position (side) lamp shall be such that the distance between the projections on a transverse vertical plane of the points nearest to one another of the illuminating surfaces of the two lamps considered is not less than 200 mm.

5.13. Work lamp(s)

5.13.1. Presence: Vehicles may be equipped with work lamps.

There are no individual specifications for the following items 5.13.2. to 5.13.6.

5.13.2. Number

5.13.3. Arrangement

5.13.4. Position

5.13.5. Geometric visibility

5.13.6. Alignment

The following items 5.13.7. to 5.13.9. are meant valid with another lamp

5.13.7. May be grouped

5.13.8. May not be combined

5.13.9. May not be reciprocally incorporated

5.13.10. Electrical connections: This lamp shall be operated independently of all other lamps in view of the fact that it does not illuminate the road or act as a signalling device on the road.

5.13.11. Tell-tale: Tractors must be equipped with a tell-tale for work lamp(s).

5.14. Rear retro-reflectors, non-triangular

5.14.1. Presence: Tractors must be equipped with **non triangular rear-retro reflectors** ~~work lamp(s)~~.

Provided that they are grouped together with the other rear light-signalling devices, trailers and towed machines may be equipped with **non triangular rear-retro reflectors** ~~work lamps~~.

5.14.2. Number: Two or four (see paragraph 5.14.5.1.).

Class IA or IB retro-reflectors in Regulation No. 3. Additional retro-reflecting devices and materials (including two additional retro-reflectors not complying with paragraph 5.14.4. below), are permitted provided they do not impair the effectiveness of the mandatory lighting and light-signalling devices.

5.14.3. Arrangement: No individual specifications.

5.14.4. Position:

5.14.4.1. Width: Except as provided in paragraph 5.14.5.1. the point on the illuminating surface which is farthest from the vehicle´s median longitudinal plane shall be not more than 400 mm from the extreme outer edge of the vehicle. The inner edges of the reflex reflectors shall be not less than 600 mm apart. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1,300 mm.

5.14.4.2. Height: Except as provided in paragraph 5.9.5.1, not less than 400 mm and not more than ~~900~~ 1,200 mm above the ground.

For vehicles with a maximum width not exceeding 1,300 mm above the ground not less than 250 mm.

However, the upper limit may be increased to not more than 1,200 mm if it is impossible to keep within the height of 900 mm without having to use fixing devices liable to be easily damaged or bent.

5.14.4.3. Length: No individual specifications.

5.14.5. Geometric visibility: Horizontal angle: 30° inwards and outwards.

Vertical angle: 15° above and below the horizontal. The vertical angle below the horizontal may be reduced to 5° if the height of the reflector is less than 750 mm.

5.14.5.1. If it is impossible to observe the above position and visibility requirements, four retro-reflectors may be fitted in accordance with the following installation specifications:

5.14.5.1.1. Two retro-reflectors must keep within the maximum height of ~~900~~ 1,200 mm above the ground. However, this upper limit may be increased to not more than ~~1,200~~1,500 mm if it is impossible to keep within the height of ~~900~~ 1,200 mm without having to use fixing devices liable to be easily damaged or bent.

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A distance of at least 300 mm between the interior edges of the reflectors must be observed, and they must have a vertical angle of visibility above the horizontal of 15°.

5.14.5.1.2. The other two shall keep within a maximum height of 2,500 mm above the ground and shall be bound by the requirements of paragraph 5.14.4.1.

5.14.6. Alignment: Towards the rear.

5.14.7. May be grouped: With any other lamp.

5.14.8. Other requirements: The illuminating surface of the retro-reflector may have parts in common with that of any other rear lamp.

5.15. Non-triangular side retro-reflectors

5.15.1. Presence: Tractors the length of which exceeds 6 m and all trailers and towed machines must be equipped with non-triangular side retro-reflectors.

Tractors the length of which does not exceed 6 m may be equipped with non-triangular side retro-reflectors.

5.15.2. Number: Two or four.

5.15.3. Arrangement: One or two each side of tractor where over-all length of vehicle is ≤ 6 m. Two each side of tractor where over-all length of vehicle is > 6 m. The reflecting surface must be mounted in a vertical plane (maximum deviation 10°) parallel to the longitudinal axis of the vehicle.

5.15.4. Position:

5.15.4.1. Width: No individual specification.

5.14.5.2. Height:Not less than 400 mm and not more than 900 mm above the ground.

However, the upper limit may be increased to not more than 1,500 mm if it is impossible to keep within the height of 900 mm without having to use fixing devices liable to be easily damaged or bent.

5.14.5.3. Length: One reflector must be not more than 3 m from the foremost point of the tractor, and either the same reflector or a second reflector must be not more than 3 m from the rearmost point of the tractor. The distance between two reflectors on the same side of the tractor must not exceed 6 m.

5.15.5. Geometric visibility: Horizontal angle: 20° forwards and rearwards.

Vertical angle: 10° above and below the horizontal. The vertical angle below the horizontal may be reduced to 5° if the length of the reflector is less than 750 mm.

5.15.6. Alignment: Towards the side.

5.16. Rear registration plate lamp(s)

5.16.1. Presence: Vehicles may be equipped with rear registration plate lamp(s).

5.16.2. Number

5.16.3. Arrangement

5.16.4. Position

5.16.4.1. Width

5.16.4.2. Height

5.16.4.3. Length

5.16.5. Geometric visibility

5.16.6. Alignment

The values in (5.16.2. – 6.) must be such that the device is able to illuminate the site of the registration plate.

5.16.7. May be grouped: With one or more rear lamps.

5.16.8. May be combined: With the rear position (side) lamps.

5.16.9. May not be reciprocally incorporated: With any other lamp.

5.16.10. Tell-tale: Vehicles may be equipped with tell-tale for rear registration plate lamp(s). If provided, its function shall be performed by the tell-tale prescribed for the front and rear position (side) lamps.

5.16.11. Electrical connections: The device shall light up only at the same time as the rear position (side) lamps (see paragraph 4.12).

5.17. Rear retro-reflectors, triangular

5.17.1. Presence: Trailers and towed machines must be equipped with triangular rear retro-reflectors.

Prohibited on tractors.

5.17.2. Number: Two or four (see paragraph 5.17.5.1.).

5.17.3. Arrangement: The apex of the triangle shall be directed upwards.

5.17.4. Position:

5.17.4.1. Width: Except as provided in paragraph 6.17.5.1. the point on the illuminating surface which is farthest from the vehicle's median longitudinal plane shall be not more than 400 mm from the extreme outer edge of the vehicle. The inner edges of the reflex reflectors shall be not less than 600 mm apart. This distance may be

reduced to 400 mm where the overall width of the vehicle is less than 1,300 mm.

5.17.4.2. Height:Except as provided in paragraph 6.17.5.1., not less than 400 mm and not more than 1,500 mm above the ground.

For vehicles with a maximum width not exceeding 1,300 mm above the ground not less than 250 mm.

5.17.4.2.1. Rear retro reflectors for overlength parts or components may up to 4,000 mm above the ground.

5.17.4.3. Length: No individual specifications.

5.17.5. Geometric visibility: Horizontal angle: 30° inwards and outwards.

Vertical angle: 15° above and below the horizontal. The vertical angle below the horizontal may be reduced to 5° if the height of the reflector is less than 750 mm.

5.17.5.1. If it is impossible to observe the above position and visibility requirements, four retro-reflectors may be fitted in accordance with the following installation specifications:

5.17.5.1.1. Two retro-reflectors must keep within the maximum height of 900 mm above the ground. However, this upper limit may be increased to not more than 1,200 mm if it is impossible to keep within the height of 900 mm without having to use fixing devices liable to be easily damaged or bent.

A distance of at least 300 mm between the interior edges of the reflectors must be observed, and they must have a vertical angle of visibility above the horizontal of 15°.

5.17.5.1.2. The other two shall keep within a maximum height of 2,500 mm above the ground and shall be bound by the requirements of paragraph 5.14.4.1.

5.17.6. Alignment: Towards the rear.

5.17.7. May be grouped: With any other lamp.

5.17.8. Other requirements: The illuminating surface of the retro-reflector may have parts in common with that of any other rear lamp.

5.18. **~~Rear~~ Front retro-reflectors, non-triangular**

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5.18.1. Presence: Trailers and towed machines must be equipped with non-triangular ~~rear~~ front retro-reflectors.

Tractors having all forward facing lamps with reflectors concealable must be equipped with non-triangular ~~rear~~ front retro-reflectors.

All other vehicles may be equipped with non-triangular, ~~rear~~ front retro-reflectors.

Not necessary on vehicles fitted with signaling panels (paragraph 5.24) or conspicuity markings (paragraph 5.22).

5.18.2. Number: Two or four.

5.1.8.3. Arrangement: No special requirement.

5.18.4. Position

5.18.4.1. Width: That point on the illuminating surface which is farthest from the vehicle's median longitudinal plane shall not be more than 400 mm from the extreme outer edge of the vehicle.

The distance between the inner edges of the two apparent surfaces in the direction of the reference axes shall be not less than 600 mm. This distance may be reduced to 400 mm where the overall width of the vehicle is less than 1,300 mm.

5.18.4.2. Height:Above the ground, not less than 300 mm and not more than 1500 mm. If this is not possible due to the design the front reflectors shall be arranges as low as possible.

5.18.4.3. Length: At the front of the vehicle.

5.18.5. Geometric visibility:

Horizontal angle: 30° inwards and outwards. In the case of trailers or towed machines, the angle inwards may be reduced to 10°. If because of the construction of the trailers or towed machines, this angle cannot be met by the retro-reflectors, installed according to 5.18.1, then additional (supplementary) retro-reflectors shall be fitted, without the width limitation (paragraph 6.18.4.1.), which shall, in conjunction with the retro-reflectors, installed according to 5.18.1, give the necessary visibility angle.

Vertical angle: 10° above and below the horizontal. The vertical angle below the horizontal may be reduced to 5° in the case of a retro-reflector less than 750 mm above the ground.

5.18.5.1. If it is impossible to observe the above position and visibility requirements, four front retro reflectors may be fitted in accordance with the following installation specifications:

5.18.5.1.1. Two front retro reflectors must keep within the maximum height of 1,200 mm above the ground.

A distance of at least 300 mm between the rear reflectors must be observed, and they must have a vertical angle of visibility above the horizontal of 15°.

5.18.6. Alignment: Towards the front.

5.18.7. Other requirements: The illuminating surface of the retro-reflector may have parts in common with the apparent surface of any other lamp situated at the front.

5.19. Side marker lamps

5.19.1. Presence: Vehicles may be equipped with side marker lamps.

5.19.2. Minimum number per side: Such that the rules for longitudinal positioning are

complied with.

5.19.3. Arrangement: No individual specifications.

5.19.4. Position:

5.19.4.1. Width: No individual specifications.

5.19.4.2. Height:Above the ground, not less than 250 mm and not more than 2,500 mm.

5.19.4.3. Length: At least one side-marker lamp shall be fitted to the middle third of the vehicle, the foremost side-marker lamp being not further than 3 m from the front. The distance between two adjacent side-marker lamps shall not exceed 3 m. If the structure, design or the operational use of the vehicle makes it impossible to comply with such a requirement, this distance may be increased to 4 m.

The distance between the rearmost side-marker lamp and the rear of the vehicle shall not exceed 1 m.

However, for vehicles the length of which does not exceed 6 m and for chassis-cabs, it is sufficient to have one side-marker lamp fitted within the first third and/or within the last third of the vehicle length.

5.19.5. Geometric visibility

Horizontal angle: 45° to the front and to the rear; however, this value can be reduced to 30°.

Vertical angle: 10° above and below the horizontal. The vertical angle below the horizontal may be reduced to 5° in the case of a side-marker lamp less than 750 mm above the ground.

5.19.6. Alignment: Towards the side.

5.19.7. Electrical connections: No individual specifications (see paragraph 4.12).

5.19.8. Tell-tale: Vehicles may be equipped with tell-tale for side marker lamps. If it exists its function shall be carried out by the tell-tale required for the front and rear position lamps.

5.19.9. Other requirements: When the rearmost side-marker lamp is combined with the rear position lamp reciprocally incorporated with the rear fog-lamp or stop lamp, the photometric characteristics of the side-marker lamp may be modified during the illumination of the rear fog lamp or stop lamp.

Rearmost side-marker lamps shall be amber if they flash with the rear direction-indicator lamp.

5.20. Daytime running lamp

5.20.1. Presence: Tractors may be equipped with daytime running lamp. Prohibited on trailers and towed machines.

5.20.2. Number: Two or four (see paragraph 5.20.4.2).

5.20.3. Arrangement: No special requirement.

5.20.4. Position

5.20.4.1. Width: No individual specifications.

5.20.4.2. Height:Above the ground not less than 250 mm not more than 2,500 mm.

In the case of tractors equipped for the fitting of portable devices at the front, two Daytime Running Lamp (DRL) lamps in addition to the lamps mentioned in paragraph 6.20.4.2 shall be allowed at a height not exceeding 4,000 mm if the electrical connections are such that two pairs of DRL lamps cannot be switched on at the same time.

5.20.4.3. Length: At the front of the vehicle. This requirement shall be deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly, or indirectly through the devices for indirect vision and/or other reflecting surfaces of the vehicle.

5.20.5. Geometric visibility

Horizontal: outwards 20° and inwards 20°.

Vertical: upwards 10° and downwards 10°.

5.20.6. Alignment: Towards the front.

5.20.7. Electrical connections

5.20.7.1. The daytime running lamps shall be switched ON automatically when the device which starts and/or stops the engine is in a position which makes it possible for the engine to operate. However, daytime running lamps may remain OFF while the automatic transmission control is in the park or neutral position, while the parking brake is applied or after the propulsion system is activated but the vehicle was not set in motion for the first time.

The daytime running lamps shall switch OFF automatically when the front fog lamps or headlamps are switched ON, except when the latter are used to give intermittent luminous warnings at short intervals.

Furthermore, the lamps referred to in paragraph 5.11. are not switched ON when the daytime running lamps are switched ON.

5.20.7.2. If the distance between the front direction-indicator lamp and the daytime running lamp is equal or less than 40 mm, the electrical connections of the daytime running lamp on the relevant side of the vehicle may be such that either:

(a) It is switched OFF; or

(b) Its luminous intensity is reduced during the entire period (both ON and OFF cycle) of activation of a front direction-indicator lamp.

5.20.7.3. If a direction-indicator lamp is reciprocally incorporated with a daytime running lamp, the electrical connections of the daytime running lamp on the relevant side of the vehicle shall be such that the daytime running lamp is switched OFF during the

entire period (both ON and OFF cycle) of activation of the direction-indicator lamp.

5.20.8. Tell-tale: Vehicle may be equipped with tell-tale showing circuit closed for daytime running lamp.

5.21. Cornering lamp

5.21.1. Presence: Tractors may be equipped with cornering lamps. Prohibited on trailers and towed machines.

5.21.2. Number: Two or four.

5.21.3. Arrangement: No special requirement.

5.21.4. Position

5.21.4.1. Width: No individual specifications.

5.21.4.2. Length: Not further than 1,000 mm from the front.

5.21.4.3. Height:Above the ground not less than 250 mm and not more than 2,500 mm and up to 4,000 mm for two additional cornering lamps in the case of vehicles equipped for the fitting of portable devices at the front, which may obscure the cornering lamp.

However, no point on the apparent surface in the direction of the reference axis shall be higher than the highest point on the apparent surface in the direction of the reference axis of the dipped-beam headlamp.

5.21.5. Geometric visibility

Horizontal: 30° to 60° outwards.

Vertical: 10° upwards and downwards.

5.21.6. Alignment: Such that the lamps meet the requirements for geometric visibility.

5.21.7. Electrical connections

The cornering lamps shall be so connected that they cannot be activated unless the main-beam headlamps or the dipped-beam headlamps are switched ON at the same time.

5.21.7.1. The cornering lamp on one side of the vehicle may only be switched ON automatically when the direction-indicators on the same side of the vehicle are switched ON and/or when the steering angle is changed from the straight-ahead position towards the same side of the vehicle.

The cornering lamp shall be switched OFF automatically when the direction-indicator is switched OFF and/or the steering angle has returned in the straight-ahead position.

5.21.7.2. When the reversing lamp is switched ON, both cornering lamps may be switched on simultaneously, independently from the steering wheel or direction-indicator position. In this case, the cornering lamps shall be switched OFF when the reversing lamp is switched OFF.

5.21.8. Tell-tale: None.

5.21.9. Other requirements: The cornering lamps shall not be activated at vehicle speeds above 40 km/h.

5.22. Conspicuity markings

5.22.1. Presence: Vehicles may be equipped with conspicuity markings.

5.22.2. Number: According to the presence.

5.22.3. Arrangement: The conspicuity markings shall be as close as practicable to horizontal and vertical, compatible with the shape, structure, design and operational requirements of the vehicle.

5.22.4. Position: No individual specifications.

5.22.5. Geometric visibility: No individual specifications.

5.22.6. Alignment: No individual specifications.

5.23. Emergency stop signal

5.23.1. Presence: Vehicles may be equipped with emergency stop signal. The emergency stop signal shall be given by the simultaneous operation of all the stop or direction-indicator lamps fitted.

5.23.2. Number: As specified in paragraph 5.5.2. or 5.7.2.

5.23.3. Arrangement: As specified in paragraph 5.5.3. or 5.7.3.

5.23.4. Position: As specified in paragraph 5.5.4. or 5.7.4.

5.23.5. Geometric visibility: As specified in paragraph 5.5.5. or 5.7.5.

5.23.6. Orientation: As specified in paragraph 5.5.6. or 5.7.6.

5.23.7. Electrical connections:

5.23.7.1. All the lamps of the emergency stop signal shall flash in phase at a frequency of 4.0 ± 1.0 Hz.

5.23.7.1.1. However, if any of the lamps of the emergency stop signal to the rear of the vehicle use filament light sources the frequency shall be 4.0 +0.0/-1.0 Hz.

5.23.7.2. The emergency stop signal shall operate independently of other lamps.

5.23.7.3. The emergency stop signal shall be activated and deactivated automatically.

5.23.7.3.1. The emergency stop signal shall be activated only when the vehicle speed is above 20 km/h and the deceleration is at least 4 m/s^2.

5.23.7.3.2. The emergency stop signal shall be automatically deactivated when the deceleration

falls below 2.5 m/s².

5.23.8. Tell-tale: Vehicles may be equipped with tell-tale for emergency stop signal.

5.23.9. Other requirements

5.23.9.1. Except as provided in paragraph 6.23.9.2. below, if a tractor is equipped to tow a trailer or a towed machine, the control of the emergency stop signal on the tractor shall also be capable of operating the emergency stop signal on the trailer or towed machine.

When the tractor is electrically connected to a trailer or towed machine, the operating frequency of the emergency stop signal for the combination shall be limited to the frequency specified in paragraph 6.23.7.1.1. However, if the tractor can detect that filament light sources are not being used on the trailer or towed machine for the emergency stop signal, the frequency may be that specified in paragraph 6.23.7.1.

5.23.9.2. If a tractor is equipped to tow a trailer or towed machine fitted with a service braking system of either continuous or semi-continuous type, it shall be ensured that a constant power supply is provided via the electrical connector for the stop lamps to such trailers or towed machines while the service brake is applied.

The emergency stop signal on any such trailer or towed machine may operate independently of the towing vehicle and is not required to operate either at the same frequency as, or in phase with that on the towing vehicle.

5.24. Signalling panel

5.24.1. Presence: Tractors and trailers with a total width of more than 2.75 m (including tyres), on towed machines with a total width of more than 3.00 m (including tyres) or if external projections of the vehicle have to be marked must be equipped with a signaling panel. The latter should be determined in agreement with the manufacturer, the Technical Service and the responsible approval authority.

5.24.2. Number: Two or four (see Appendices 4 and 5).

5.24.3. Arrangement: The panels shall be arranged in a way that their stripes shall run under 45° outwards and downwards.

5.24.4. Position:

Width: That point on the illuminating surface which is farthest from the vehicle's median longitudinal plane shall not be more than 100 mm from the extreme outer edge of the vehicle. This value may be increased if the shape of the bodywork makes it impossible to keep within 100 mm.

Height: No individual specifications.

Length: No individual specifications.

5.24.5. Geometric visibility No individual specifications.

5.24.6. Alignment: Towards the front and the rear.

5.25. SMV rear marking plate

5.25.1. Presence: Vehicles with a maximum design speed of not more than 40 km/h may be equipped with SMV rear marking plate. Prohibited on all other vehicles.

5.25.2. Number: According to Annex 15 of UNECE Regulation No. 69.

5.25.3. Arrangement: According to Annex 15 of UNECE Regulation No. 69.

5.25.4. Position

Width: According to Annex 15 of UNECE Regulation No. 69.

Height:No individual specifications.

Length: According to Annex 15 of UNECE Regulation No. 69.

5.25.5. Geometric visibility According to Annex 15 of UNECE Regulation No. 69.

5.25.6. Alignment: According to Annex 15 of UNECE Regulation No. 69.

5.26. Lane keeping lamps (UN Regulation No. 7)

5.26.1. Presence: Vehicles may be equipped with lane keeping lamps .

5.26.2. Number: Two visible from the front.

5.26.3. Arrangement: Protruding at every side of the rear.

5.26.4. Position:

5.26.4.1. Width: No individual specification.

5.26.4.2. Height:As low as possible between 400 mm and 2,500 mm.

5.26.4.3. Length: At the rear of the vehicle.

5.26.5. Geometric visibility: From the front of the vehicle horizontal along both sides (for seeing in the rearview-mirror).

5.26.6. Alignment: Such that the lamps meet the requirements concerning visibility towards the front.

5.26.7. May not be grouped

5.26.8. May not be combined

5.26.9. May not be reciprocally incorporated: With any other lamps.

5.26.10. Electrical connections: No individual specifications (see paragraph 4.12).

5.26.11. Tell-tale: No individual specification.

5.26.12. Other requirements: The light emitted must not in any circumstances cause discomfort to the driver either directly or indirectly through the rear-view mirrors

nor to other road users.

6.27. Exterior courtesy lamp

6.27.1. Presence: Tractors may be equipped with exterior courtesy lamp.

6.27.2. Number: No individual specifications.

6.27.3. Arrangement: No individual specifications.

6.27.4. Position: No individual specifications.

6.27.5. Geometric visibility: No individual specifications.

6.27.6. Alignment: No individual specifications.

6.27.7. Electrical connections: No individual specifications.

6.27.8. Tell-tale: No individual specifications.

6.27.9. Other requirements: The exterior courtesy lamp shall not be activated unless the vehicle is stationary and one or more of the following conditions is satisfied:

(a) The engine is stopped; or

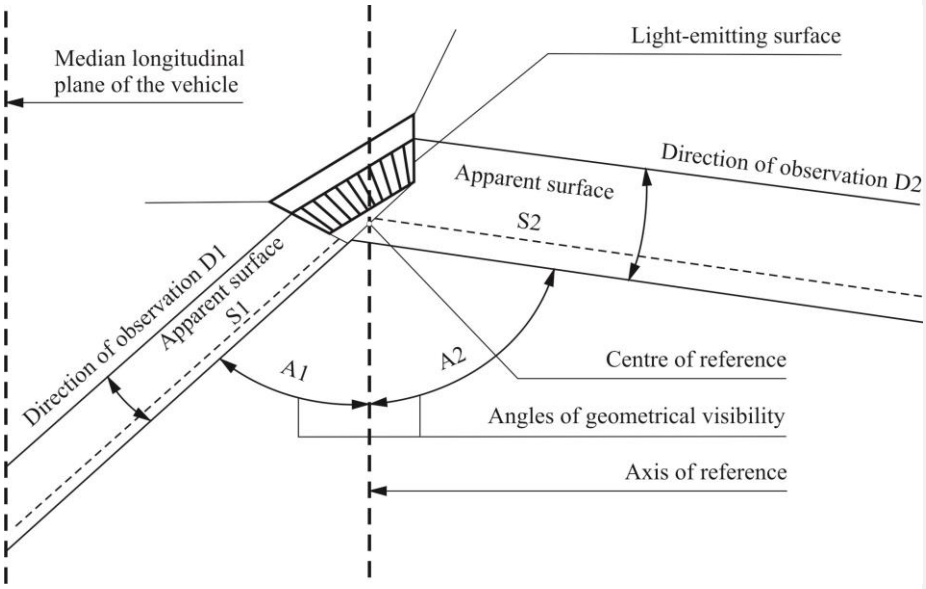
(b) A driver or passenger door is opened; or

(c) A load compartment door is opened.

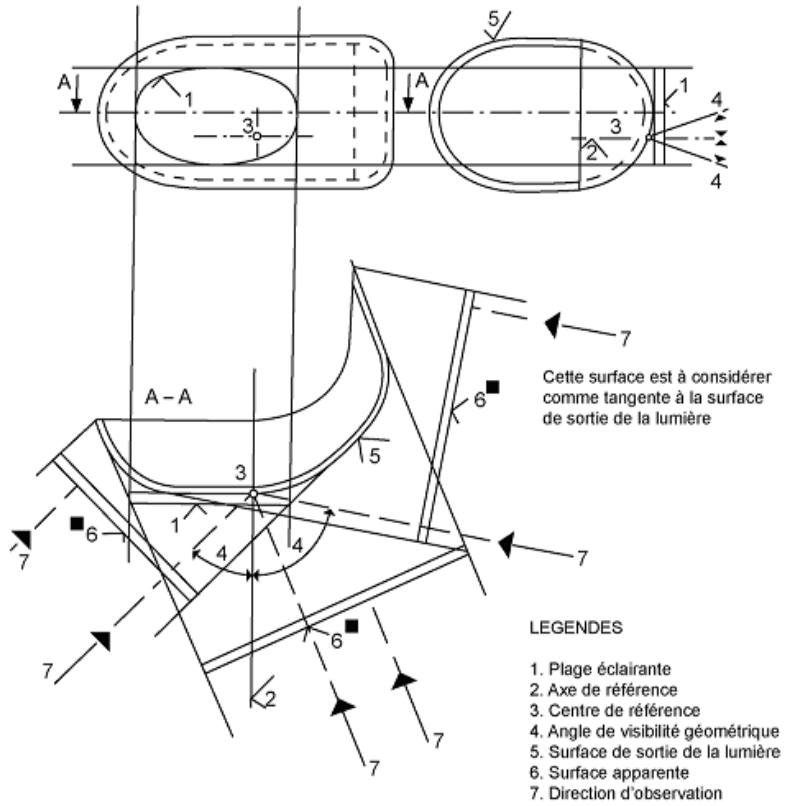
The provisions of paragraph 4.11. shall be met in all fixed positions of use.

Appendix 1

Explanatory figure 1



Explanatory figure 2



Appendix 2

Visibility of lamps

Figure 1

Visibility of a red lamp to the front

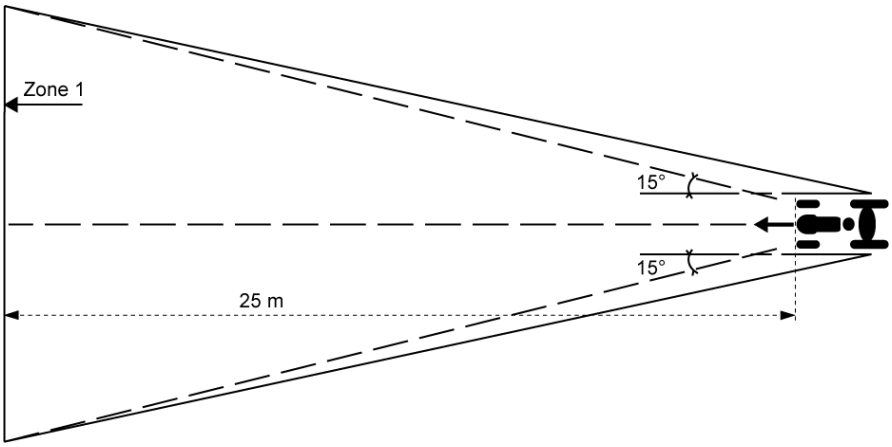
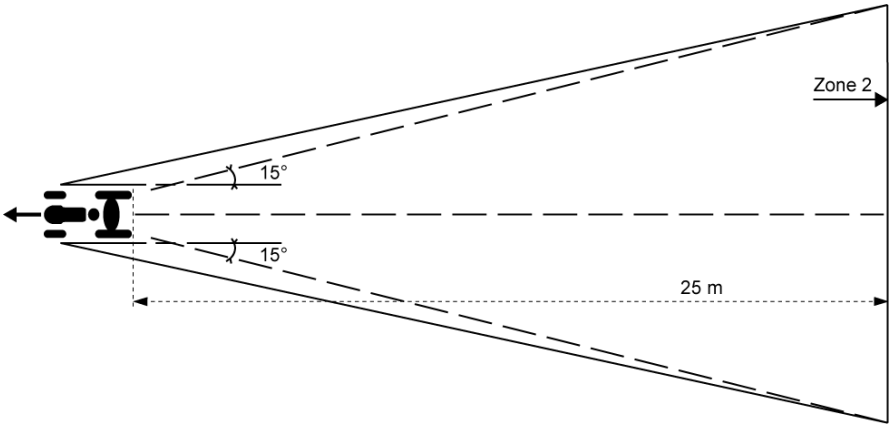


Figure 2

Visibility of a white lamp to the rear

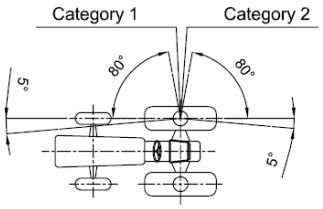


Appendix 3

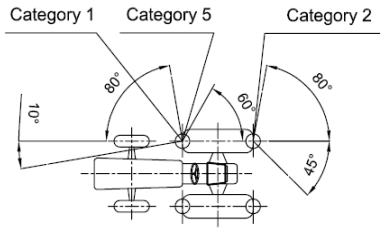
Direction indicator lamps

Geometric visibility (see paragraph 5.5.5.)

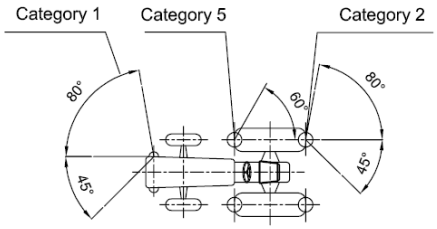
Arrangement A



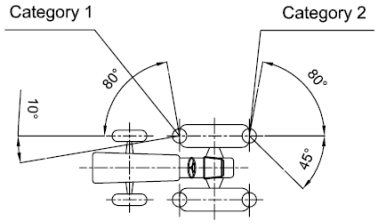
Arrangement B



Arrangement C



Arrangement D



Appendix 4

Signalling panels

1. This appendix applies to signalling panels and –foils which are used for the marking of agricultural vehicles to the front, the rear and to the side(s).

It describes the dimensions, a minimum size of the reflecting surface, the colour and photometric minimum requirements as well as the identification and marking.

The requirements concerning the arrangement and the position of the foils and panels on the agricultural vehicles are determined in paragraph 6.25 of this Regulation.

2. Warning panels and –foils shall have the dimensions provided in the following requirements:

Figure 1
Warning panel resp. –foil

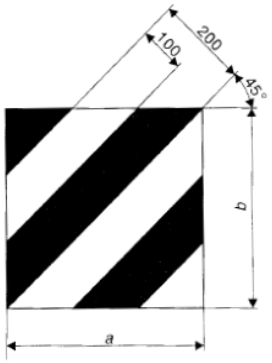


Figure 2
Basic square

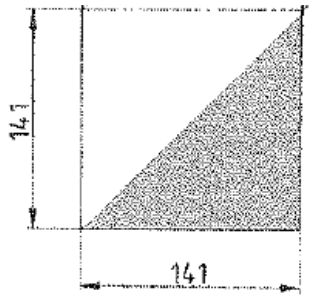


Table 1
Dimensions [mm]

Warning panel/–foil	*a [mm]*	*b [mm]*	*Surface [cm²]*
Form A	423	423	1790
Form B	282	282	795
Form R1 Form R2	282 423	423 282	1193

Form L1 Form L2	141 846	846 141	1193
Form K1 Form K2	141 423	423 141	596

Deviations from the specified formats are permitted, if the surface of the unspecified formats contains at least 3 basic squares. The number of panels/foils for each effective direction to the front, the rear and to both sides are specified in Table 2.

Table 2
Number of panels/foils for each effective direction

Warning panel/–foil	*Number for each effective direction*
Form A	2
Form B	2
Form R1 Form R2	2
Form L1 Form L2	2
Form K1 Form K2	4

Deviations from the number of panels/foils are permitted, if

(a) in the case of implements up to 1700 mm width for each effective direction to the front or the rear a minimum reflecting surface of 1000 cm² remains;

(b) in the case of implements above 1700 mm width for each effective direction to the front or the rear a minimum reflecting surface of 1500 [750] cm² for Class C (Regulation No. 104, Annex 7) resp. 2000 cm² (Regulation No. 69, Annex 7) remains;

(c) in the case of tractor-mounted implements up to 1000 mm length no panel/foil for each effective direction to the side is necessary;

(d) in the case of tractor-mounted implements above 1000 mm length for each effective direction to the side a minimum reflecting surface of 1000 cm²] remains;

(e) Warning boards of Form A may be combined with lamps, if the surface of the boards covered by the lamps does not exceed 150 cm².

3. Colouring and photometric minimum requirements

White according to 2.29.1 of UN Regulation No. 48.

Red according to 2.29.4 of UN Regulation No. 48.

The photometric requirements of Annex 7 of UN Regulation No. 69 or of Regulation No. 104 apply.

Panels/foils of Form B must comply with Annex 7 of UN Regulation No. 104, Class C.

4. Identification

Signalling Panels which comply with the requirements of this appendix are marked with the title of this regulation and the name of the manufacturer.

Appendix 5

Lighting and signalling devices for external projections of vehicles (see paragraph 4.18)

Vehicles with external projections which cannot practically be protected.

The front and the rear of vehicles with external projections must be equipped with a warning panel. Vehicles with external projections may be equipped with a warning panel to their side.

Any rear part of a vehicle exceeding 1.0 m from the illuminating surface of the rear position lamp shall be equipped with signaling additionally towards the rear. Signalling devices shall be affixed as close as possible to the rear external limit of that part of the vehicle.

- that rear part of the vehicle must be equipped with rear position lamp,

- that rear part of the vehicle must be equipped with rear reflector or warning panel.

Any front part of a vehicle part exceeding 1.0 m from the illuminating surface of the front position lamp shall be equipped with signaling towards the front. Signalling devices shall be affixed as close as possible to the front external limit of the part of the vehicle.

(a) that front part of the vehicle must be equipped with front position lamp,

(b) that front part of the vehicle must be equipped with front reflector or warning panel.

To the side with reflectors as specified in 5.15, but up to 4,000 mm height.

ANNEX XIII

Requirements on vehicle occupant protection, including interior fittings, head restraints, seat belts, vehicle doors

Definitions ~~**specific to this Annex**~~

Definitions of << RVCR >> Annex XVII are valid for this Annex.

'Interior fittings' are:

— interior parts of the passenger compartment other than the interior rear-view mirrors;

— the layout of the controls;

— the roof;

— power-operated windows, roof panel and partition systems.

'Level of the instrument panel' shall mean the line defined by the points of contact of vertical tangents to the instrument panel.

'Power-operated windows' means windows which are closed by power supply of the vehicle.

'Opening' is the maximum unobstructed aperture between the upper edge or the leading edge, depending on the closing direction, of a power-operated window or partition or roof panel and the vehicle structure which forms the boundary of the window, partition or roof panel, when viewed from the interior of the vehicle or, in the case of partition system, from the rear part of the passenger compartment.

To measure an opening, a cylindrical test rod shall (without exerting force) be placed through it normally perpendicular to the window from the interior of the vehicle or, as applicable, from the rear part of passenger compartment.

CHAPTER 1

Interior fittings << From motor vehicles: Dir 74/60/EEC, as amended by Commission Dir 78/632/EEC and the Dir 2000/4/EC of the EP and the Council and CEMA comments >>

1. SPECIFICATIONS

1.1. Interior parts of the passenger compartment excluding the side doors

1.1.1. The safety distance zone around the SIP determined in **<< RVCR Annex XVII >>** must not contain any dangerous roughness or sharp edges, likely to increase the risk of serious injury to the occupants. Those parts referred to in points 1.1.2 to 1.2 hereafter shall be deemed satisfactory if they comply with the requirements thereof.

1.1.2. In particular, for tractors with maximum design speed exceeding 40 km/h~~-~~, any metal support fittings shall have no protruding edges.

1.1.3. The lower edge of the instrument panel shall be rounded to a radius of curvature of not less than 19 mm.

1.1.4. Switches, pull-knobs, etc, made of rigid material, which, measured in accordance with the method described in Appendix 1 from 3.2 mm to 9.5 mm from the panel, shall have a cross-sectional area of not less than 2 cm^2, measured 2.5 mm from the point projecting furthest, and shall have rounded edges with a radius of curvature of not less than 2.5 mm.

Comment [v62]: Adapted according to IT and CEMA comments. V3

Comment [v63]: UK comment. V3

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Comment [v64]: IT, CEMA:
3.9.1 All metallic and plastic interior fittings with a hardness exceeding 60 Shore A, such as controls, switches, instrument panels, displays and interior mirrors installed within the zone defined by 3.1.1 and 3.2, shall have edges with a minimum radius of curvature not less than 2.5 mm.
3.9.2 This requirement shall not apply to parts which protrude less than 5 mm, such as small hardware, nor to components which are not rigidly installed

V3

Comment [v65]: RVCR requirements not to be repeated here. V3

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1.1.5. If these components project by more than 9.5 mm from the surface of the instrument panel, they shall be designed and constructed with a cross-section of not less than 6.50 cm^2 in area situated not more than 6.5 mm from the point of maximum projection.

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1.1.6. In the case of a projection consisting of a component made of non-rigid material of less than ~~5~~60 shore A hardness mounted on a rigid support, the requirements of points 1.1.4 and 1.1.5 shall apply only to the rigid support.

1.1.7. Shelves and other similar items, if fitted, shall be so designed and constructed that their supports in no case have protruding edges and, in particular for tractors with maximum design speed exceeding 40 km/h, they meet the following conditions:

1.1.7.1. the part facing into the vehicle shall present a surface not less than 25 mm high with edges rounded to a radius of curvature of not less than 3.2 mm;

1.1.7.2 under the effect of a forward-acting horizontal longitudinal force of 37.8 daN exerted by a cylinder of 110 mm diameter with its axis vertical, become detached, break up, presenting a deflection , measured from the initial point of contact with the test cylinder, must be a fold or with a deformation visible to the naked eye or retract without producing dangerous features on the rim of the shelf. The force must be directed at the part of the shelf shall be considered to be adjacent to a fixture or other similar items.

1.1.8. Window winders, if fitted, may project 35 mm from the surface of the panel.

1.1.9. Other items of equipment in the vehicle not covered by the preceding points such as seat slide rails, equipment for regulating the horizontal or vertical part of the seat, devices for retracting safety belts, etc. shall not be subject to any of these provisions if they are situated below a horizontal plane passing through the ~~H~~ seat index point of each seat, even though the occupant is likely to come into contact with such items.

1.1.10. Components mounted on the roof, if fitted, but which are not part of the roof structure, such as grab handles, lights and ventilation openings, etc., shall have a radius of curvature of not less than 3.2 mm and, in addition, the width of the projecting parts shall not be less than the amount of their downward projection.

1.1.11. If the items of 1.2.5 and 1.2.6 include a part made of material softer than ~~5~~60 shore A hardness mounted on a rigid support, the above requirements shall apply only to the rigid support.

1.2. Other non-specified fittings

The requirements of section “1. Specifications” above shall apply to such fittings not mentioned in previous paragraphs which, within the meaning of the various requirements in points 1.1 to 1.5 and according to their location in the vehicle, are capable of being contacted by the occupants. If such parts are made of a material softer than ~~5~~60 shore A hardness and mounted on (a) rigid support(s), the requirements in question shall apply only to the rigid support(s).

2. Test procedure for the EU type-approval

2.1.1. The application for EU component type-approval must be accompanied by the following samples that must be submitted to the technical service responsible for conducting the component type-approval tests:

2.1.2 at the manufacturer's discretion, either a vehicle representative of the vehicle type to be approved or the part(s) of the vehicle regarded as essential for the checks and tests prescribed by this Regulation; and

2.1.3. at the request of the aforesaid technical service, certain components and certain samples of the materials used.

Appendix 1

METHOD OF MEASURING PROJECTIONS

1. To determine the amount by which an item projects in relation to the panel on which it is mounted, a 165 mm sphere shall be moved along and be kept in contact with the component under consideration, starting from the initial position of contact with the component under consideration. The projection's value is the largest of all possible variations «y», the variation measured from the centre of the sphere perpendicular to the panel.

If the panels and components, etc., are covered with materials softer than 50 Shore A hardness, the procedure for the measuring of projections described above shall apply only after the removal of such materials.

2. The projection of switches, pull-knobs, etc., situated in the reference area shall be measured by using the test apparatus and procedure described below:

2.1. Apparatus

2.1.1. The measuring apparatus for projections shall consist of a hemispherical headform 165 mm in diameter, in which there is a sliding ram of 50 mm diameter.

2.1.2. Relative positions of the flat end of the ram and the edge of the headform shall be shown on a graduated scale, on which a mobile index shall register the maximum measurement achieved when the apparatus is moved away from the item tested. A minimum distance of 30 mm shall be measurable; the measuring scale shall be graduated in half-millimeters to make possible an indication of the extent of the projections in question.

2.1.3. Gauging procedure:

2.1.3.1. The apparatus shall be placed on a flat surface so that its axis is perpendicular to that surface. When the flat end of the ram contacts the surface, the scale shall be set at zero.

2.1.3.2. A 10 mm strut shall be inserted between the flat end of the ram and the retaining surface; a check shall be made to ensure that the mobile index records this measurement.

2.1.4. The apparatus for measuring projections is illustrated in figure 1.

2.2. Test procedure

2.2.1. A cavity shall be formed in the headform by pulling back the ram and the mobile index shall be placed against the ram.

2.2.2. The apparatus shall be applied to the projection to be measured so that the headform contacts the maximum surrounding surface area, with a force not exceeding 2 daN.

2.2.3. The ram shall be pushed forward until it makes contact with the projection to be measured and the amount of the projection shall be observed on the scale.

2.2.4. The headform shall be adjusted to obtain maximum projection. The amount of the projection shall be recorded.

2.2.5. If two or more controls are situated sufficiently close for the ram or the headform to contact them simultaneously, they shall be treated as follows:

2.2.5.1. Multiple controls, all of which can be contained in the headform cavity, shall be regarded as forming a single projection.

2.2.5.2. If other controls prevent normal testing by contacting the headform, they shall be removed and the test shall be conducted without them. They may subsequently be re-installed and tested in their turn with other controls that have been removed to facilitate the procedure.

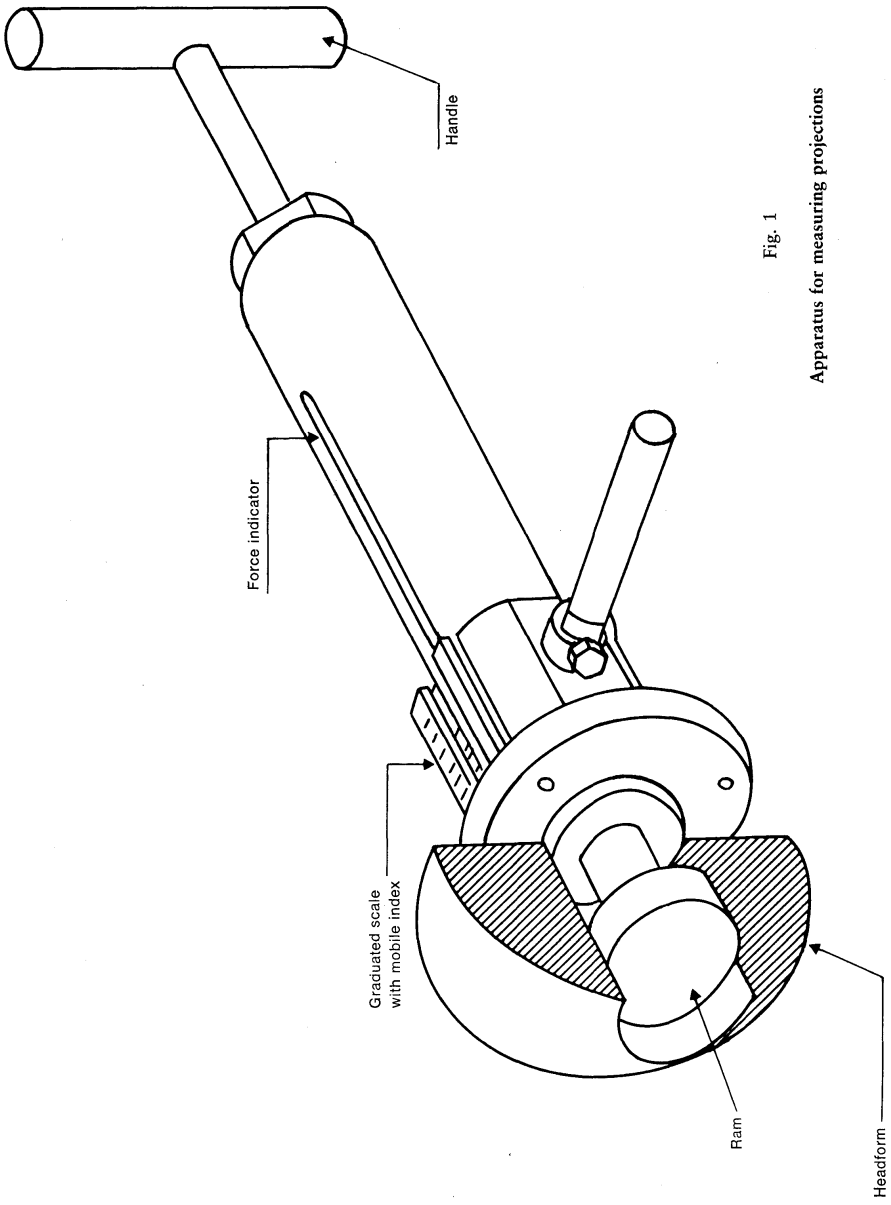


Fig. 1

Apparatus for measuring projections

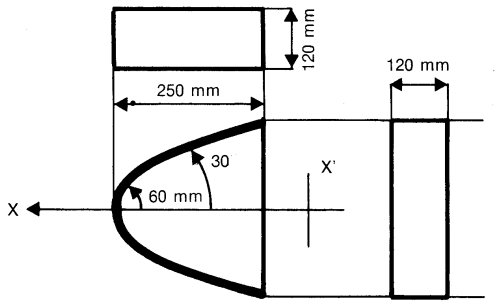
Appendix 2

APPARATUS AND PROCEDURE FOR APPLICATION OF ITEM 1.1.1 OF THIS CHAPTER

Those parts (switches, pull-knobs etc.) which can be contacted by using the apparatus and procedure described below shall be considered as being likely to be contacted by the knees of an occupant:

1. Apparatus

Diagram of apparatus



2. Procedure

The apparatus may be placed in any position below the instrument panel so that:

– the plane XX' remains parallel to the median longitudinal plane of the vehicle

– the axis X can be rotated above and below the horizontal through angles up to 30°.

In carrying out the above test, all materials of less than ~~5~~60 shore A hardness shall be removed.

CHAPTER 2

Head restraints, if fitted

Head restraints, if fitted shall comply with the provisions of UNECE regulation 25, 04 series of amendments.

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CHAPTER 3

Seat belts

The requirements for the seat belts fall under the point 48 of Annex I to the Regulation (EU) 167/2013 and therefore will be the ones within the corresponding delegated act.

CHAPTER 4

Vehicle doors, if fitted

Vehicle doors, with powered windows and/or powered roof hatches, if fitted, shall comply with the provisions of points 2 and 5 and Annex 3 of the UNECE regulation 26, supplement 1 to 03 series of amendments.

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ANNEX XIV
Requirements on vehicle exterior and accessories

1. Requirements

1.1. Dir. 76/757/EEC as starting point: rear reflex reflectors → Stakeholders input ??

New study to be launched

ANNEX XV
Requirements on the electro-magnetic compatibility

This Annex applies to the electromagnetic compatibility of vehicles covered by Article 2 of the Regulation (EU) 167/2013. It also applies to electrical or electronic separate technical units intended to be fitted to the vehicles.

Definitions specific to this Annex

'Electromagnetic compatibility' means the ability of a vehicle or component(s) or separate technical unit(s) to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

'Electromagnetic disturbance' means any electromagnetic phenomenon which may degrade the performance of a vehicle or component(s) or separate technical unit(s). An electromagnetic disturbance may be electromagnetic noise, an unwanted signal or a change in the propagation medium itself.

'Electromagnetic immunity' means the ability of a vehicle or component(s) or separate technical unit(s) to perform without degradation of performance in the presence of specified electromagnetic disturbances.

'Electromagnetic environment' means the totality of electromagnetic phenomena existing at a given location.

'Reference limit' means the nominal level to which type-approval and conformity of production limit values are referenced.

'Reference antenna' for the frequency range 20 to 80 MHz: means a shortened balanced dipole being a half wave resonant dipole at 80 MHz, and for the frequency range above 80 MHz: means a balanced half wave resonant dipole tuned to the measurement frequency.

'Broadband electromagnetic emission' means an emission which has a bandwidth greater than that of a particular measuring apparatus or receiver.

'Narrowband electromagnetic emission' means an emission which has a bandwidth less than that of a particular measuring apparatus or receiver.

'Electrical/electronic system' means (an) electrical and/or electronic device(s) or set(s) of devices together with any associated electrical connections which form part of a vehicle but which are not intended to be type approved separately from the vehicle.

'Electrical/electronic sub-assembly' (ESA) means an electrical and/or electronic device or set(s) of devices intended to be part of a vehicle, together with any associated electrical connections and wiring, which performs one or more specialised functions. An ESA may be approved at the request of a manufacturer as either a 'component' or a 'separate technical unit (STU)'.

'Type of ESA' in relation to electromagnetic compatibility means ESAs which do not differ in such essential respects as:

— the function performed by the ESA;

— the general arrangement of the electrical and/or electronic components, if applicable.

CHAPTER 1 << ANNEX I of 2009/64 >>

REQUIREMENTS TO BE MET BY VEHICLES AND ELECTRICAL/ELECTRONIC SUB-ASSEMBLIES FITTED TO A VEHICLE

1. APPLICATION FOR EC TYPE-APPROVAL

1.1. Approval of a vehicle type

1.1.1. The application for approval of a vehicle type, with regard to its electromagnetic compatibility pursuant to Articles 22, 24 and 26 of Regulation (EU) 167/2013 shall be submitted by the vehicle manufacturer.

1.1.2. A model for the information document is set out in Annex << [[appropriate number]] of RAR >> .

1.1.3. The vehicle manufacturer shall draw up a schedule describing all projected combinations of relevant vehicle electrical/electronic systems or ESAs, body styles[9], variations in body material[10], general wiring arrangements, engine variations, left-hand/right-hand drive versions and wheelbase versions. Relevant vehicle electrical/electronic systems or ESAs are those which may emit significant broadband or narrowband radiation and/or those which are involved in the driver's direct control (see point 3.4.2.3) of the vehicle.

1.1.4. A representative vehicle shall be selected from this schedule for the purpose of being tested, in mutual agreement between the manufacturer and the competent authority. This vehicle shall represent the vehicle type (see << Appendix [[appropriate number]] of Annex [[appropriate number]] RAR >>). The choice of vehicle shall be based on the electrical/electronic systems offered by the manufacturer. One more vehicle may be selected from this schedule for the purpose of being tested if it is considered by mutual agreement between the manufacturer and the competent authority that different electrical/electronic systems are included which are likely to have a significant effect on the vehicle's electromagnetic compatibility compared with the first representative vehicle.

Comment [v66]: The Annex is the information doc that the manufacturer submits for TA and Appendix 1 is the vehicle representative type description. See Annex II to 2009/64.

1.1.5. The choice of the vehicle(s) in conformity with point 1.1.4 is limited to vehicle/electrical/electronic system combinations intended for actual production.

1.1.6. The manufacturer may supplement the application with a report from tests which have been carried out. Any such data provided may be used by the approval authority for the purpose of drawing up the EC type-approval certificate.

1.1.7. << A vehicle representative of the type to be approved, according to point 1.1.4 shall be provided to the technical service that carries out the test itself. >>

Comment [v67]: Corresponds to Tech. Svc of Cat A. To verify.

1.2. Approval of a type of ESA

1.2.1. The application for approval of a type of ESA with regard to its electromagnetic compatibility pursuant to Articles 22, 24 and 26 of Regulation (EU) 167/2013 shall be submitted by the vehicle manufacturer or by the manufacturer of the ESA.

1.2.2. A model for the information document is set out in Annex << [[appropriate number]] RAR >>.

[9] If applicable.
[10] If applicable.

1.2.3. The manufacturer may supplement the application with a report from tests which have been carried out. Any such data provided may be used by the approval authority for the purpose of drawing up the EC type-approval certificate.

1.2.4.<< A sample of the ESA representative of the type to be approved shall be provided to the technical service that carries out the test itself,>> if necessary, after discussion with the manufacturer on, for example, possible variations in the layout, the number of components and the number of sensors. If the technical service deems it necessary, it may select a further sample.

1.2.5. The sample(s) must be clearly and indelibly marked with the manufacturer's trade name or mark and the type designation.

1.2.6. Where applicable, any restrictions on use shall be identified. Any such restrictions shall be included in the information document set out in << Annex [[appropriate number]] RAR >>and/or in the EC type-approval certificate set out in << Annex [[appropriate number]] RAR >>.

Comment [v68]: Corresponds to Tech. Svc of Cat A. To verify with JR.

Comment [v69]: Annex II corresponds to the Information Document.

Comment [v70]: Annex V: TA Certificate.

2. MARKING

2.1. Every ESA conforming to a type approved pursuant to this Regulation shall bear an EU type-approval mark according to Article 34 of Regulation (EU) 167/2013 and Annex XX of this Regulation.

2.2. No marking is required for electrical/electronic systems included in vehicle types approved by this Regulation.

2.3. Markings on ESAs in compliance with points 2.1 and 2.2 need not be visible when the ESA is installed in a vehicle.

3. SPECIFICATIONS

3.1. General specification

3.1.1. A vehicle (and its electrical/electronic system(s) or ESAs) shall be so designed, constructed and fitted as to enable the vehicle, in normal conditions of use, to comply with the requirements of this Regulation.

3.2. Specifications concerning broadband electromagnetic radiation from vehicles fitted with spark ignition

3.2.1. Method of measurement

The electromagnetic radiation generated by the vehicle representative of its type shall be measured using the method described in Chapter 2 at either of the defined antenna distances. The choice shall be made by the vehicle manufacturer.

3.2.2. Vehicle broadband reference limits

3.2.2.1. If measurements are made using the method described in Chapter 2 using a vehicle-to-antenna spacing of 10,0 ± 0,2 m, the radiation reference limits shall be 34 dB microvolts/m (50 microvolts/m) in the 30 to 75 MHz frequency band and 34 to 45 dB microvolts/m (50 to 180 microvolts/m) in the 75 to 400 MHz frequency band, this limit increasing logarithmically (linearly) with frequencies above 75 MHz as shown in Appendix 1 of this Chapter. In the 400 to 1000 MHz frequency band the limit remains constant at 45 dB microvolts/m (180 microvolts/m).

3.2.2.2. If measurements are made using the method described in Chapter 2 using a vehicle-to-antenna spacing of 3,0 ± 0,05 m, the radiation reference limits shall be 44 dB microvolts/m (160 microvolts/m) in the 30 to 75 MHz frequency band and 44 to 55 dB microvolts/m (160 to 562 microvolts/m) in the 75 to 400 MHz frequency band, this limit increasing logarithmically (linearly) with frequencies above 75 MHz as shown in Appendix 2 of this Chapter. In the 400 to 1000 MHz frequency band the limit remains constant at 55 dB microvolts/m (562 microvolts/m).

3.2.2.3. On the vehicle representative of its type, the measured values, expressed in dB microvolts/m (microvolts/m), shall be at least 2,0 dB (20 %) below the reference limits.

3.3. Specifications concerning narrowband electromagnetic radiation from vehicles

3.3.1. Method of measurement

The electromagnetic radiation generated by the vehicle representative of its type shall be measured using the method described in Chapter 3 at either of the defined antenna distances. The choice shall be made by the vehicle manufacturer.

3.3.2. Vehicle narrowband reference limits

3.3.2.1. If measurements are made using the method described in Chapter 3 using a vehicle-to-antenna spacing of 10,0 ± 0,2 m, the radiation-reference limits shall be 24 dB microvolts/m (16 microvolts/m) in the 30 to 75 MHz frequency band and 24 to 35 dB microvolts/m (16 to 56 microvolts/m) in the 75 to 400 MHz frequency band, this limit increasing logarithmically (linearly) with frequencies above 75 MHz as shown in Appendix 3 to this Chapter. In the 400 to 1000 MHz frequency band the limit remains constant at 35 dB microvolts/m (56 microvolts/m).

3.3.2.2. If measurements are made using the method described in Chapter 3 using a vehicle-to-antenna spacing of 3,0 ± 0,05 m, the radiation reference limit shall be 34 dB microvolts/m (50 microvolts/m) in the 30 to 75 MHz frequency band and 34 to 45 dB microvolts/m (50 to 180 microvolts/m) in the 75 to 400 MHz frequency band, this limit increasing logarithmically (linearly) with frequencies above 75 MHz as shown in Appendix 4 of this Chapter. In the 400 to 1000 MHz frequency band the limit remains constant at 45 dB microvolts/m (180 microvolts/m).

3.3.2.3. On the vehicle representative of its type, the measured values, expressed in dB microvolts/m (microvolts/m), shall be at least 2,0 dB (20 %) below the reference limit.

3.3.2.4. Notwithstanding the limits defined in points 5.3.2.1, 5.3.2.2 and 5.3.2.3 of this Chapter, if, during the initial step described in point 1.3 of Chapter 3, the signal strength measured at the vehicle broadcast radio antenna is less than 20 dB microvolts/m (10 microvolts/m) over the frequency range 88 to 108 MHz, then the vehicle shall be deemed to comply with the limits for narrowband emissions and no further testing will be required.

3.4. Specifications concerning immunity of vehicles to electromagnetic radiation

3.4.1. Method of testing

The immunity to electromagnetic radiation of the vehicle representative of its type shall be tested by the method described in Chapter 4.

3.4.2. Vehicle immunity reference limits

3.4.2.1. If tests are made using the method described in Chapter 4, the field strength reference level shall be 24 volts/m rms in over 90 % of the 20 to 1000 MHz frequency band and 20 volts/m rms over the whole 20 to 1000 MHz frequency band.

3.4.2.2. The vehicle representative of its type shall be considered as complying with immunity requirements if, during the tests performed in accordance with Chapter 4, and subjected to a field strength, expressed in volts/m, of 25 % above the reference level, there shall be no abnormal change in the speed of the driven wheels of the vehicle, no degradation of performance which would cause confusion to other road users, and no degradation in the driver's direct control of the vehicle which could be observed by the driver or other road user.

3.4.2.3. The driver's direct control of the vehicle is exercised by means of, for example, steering, braking, or engine speed control.

3.5. Specification concerning broadband electromagnetic interference generated by ESAs

3.5.1. Method of measurement

The electromagnetic radiation generated by the ESA representative of its type shall be measured by the method described in Chapter 5.

3.5.2. ESA broadband reference limits

3.5.2.1. If measurements are made using the method described in Chapter 5, the radiation reference limits shall be 64 to 54 dB microvolts/m(1600 to 500 microvolts/m) in the 30 to 75 MHz frequency band, this limit decreasing logarithmically (linearly) with frequencies above 30 MHz, and 54 to 65 dB microvolts/m (500 to 1 800 microvolts/m) in the 75 to 400 MHz band, this limit increasing logarithmically (linearly) with frequencies above 75 MHz as shown in Appendix 5 of this Chapter. In the 400 to 1000 MHz frequency band the limit remains constant at 65 dB microvolts/m (1800 microvolts/m).

3.5.2.2. On the ESA representative of its type, the measured values, expressed in dB microvolts/m, (microvolts/m) shall be at least 2,0 dB (20 %) below the reference limits.

3.6. Specifications concerning narrowband electromagnetic interference generated by ESAs

3.6.1. Method of measurement

The electromagnetic radiation generated by the ESA representative of its type shall be measured by the method described in Chapter 6.

3.6.2. ESA narrowband reference limits

3.6.2.1. If measures are made using the method described in Chapter 6, the radiation reference limits shall be 54 to 44 dB microvolts/m (500 to 160 microvolts/m) in the 30 to 75 MHz frequency band, this limit decreasing logarithmically (linearly) with frequencies above 30 MHz, and 44 to 55 dB microvolts/m (160 to 560 microvolts/m) in the 75 to 400 MHz band, this limit increasing logarithmically (linearly) with frequencies above 75 MHz as shown in Appendix 6 of this Chapter. In the 400 to 1000 MHz frequency band the limit remains constant at 55 dB microvolts/m (560 microvolts/m).

3.6.2.2. On the ESA representative of its type, the measured value, expressed in dB microvolts/m (microvolts/m) shall be at least 2,0 dB (20 %) below the reference limits.

3.7. Specifications concerning immunity of ESAs to electromagnetic radiation

3.7.1. Method(s) of testing

The immunity to electromagnetic radiation of the ESA representative of its type shall be tested by the method(s) chosen from those described in Chapter 7.

3.7.2. ESA immunity reference limits

3.7.2.1. If tests are made using the methods described in Chapter 7, the immunity test reference levels shall be 48 volts/m for the 150 mm stripline testing method, 12 volts/m for the 800 mm stripline testing method, 60 volts/m for the transverse electromagnetic mode (TEM) cell testing method, 48 mA for the bulk current injection (BCI) testing method and 24 volts/m for the free field testing method.

3.7.2.2. On the ESA representative of its type at a field strength or current expressed in appropriate linear units 25 % above the reference limit, the ESA shall not exhibit any malfunction which would cause any degradation of performance which could cause confusion to other road users or any degradation in the driver's direct control of a vehicle fitted with the system which could be observed by the driver or other road user.

4. EXCEPTIONS

4.1. Where a vehicle or electrical/electronic system or ESA does not include an electronic oscillator with an operating frequency greater than 9 kHz, it shall be deemed to comply with point 3.3.2 or 3.6.2 of this Chapter and with Chapters 3 and 6.

4.2. Vehicles which do not have electrical/electronic systems or ESAs involved in the direct control of the vehicle need not be tested for immunity and shall be deemed to comply with point 3.4 of this Chapter and with Chapter 4.

4.3. ESAs whose functions are not involved in the direct control of the vehicle need not be tested for immunity and shall be deemed to comply with point 3.7 of this Chapter and with Chapter 7.

4.4. Electrostatic discharge

For vehicles fitted with tyres, the vehicle body/chassis can be considered to be an electrically isolated structure. Significant electrostatic forces in relation to the vehicle's external environment only occur at the moment of occupant entry into or exit from the vehicle. As the vehicle is stationary at these moments, no type-approval test for electrostatic discharge is deemed necessary.

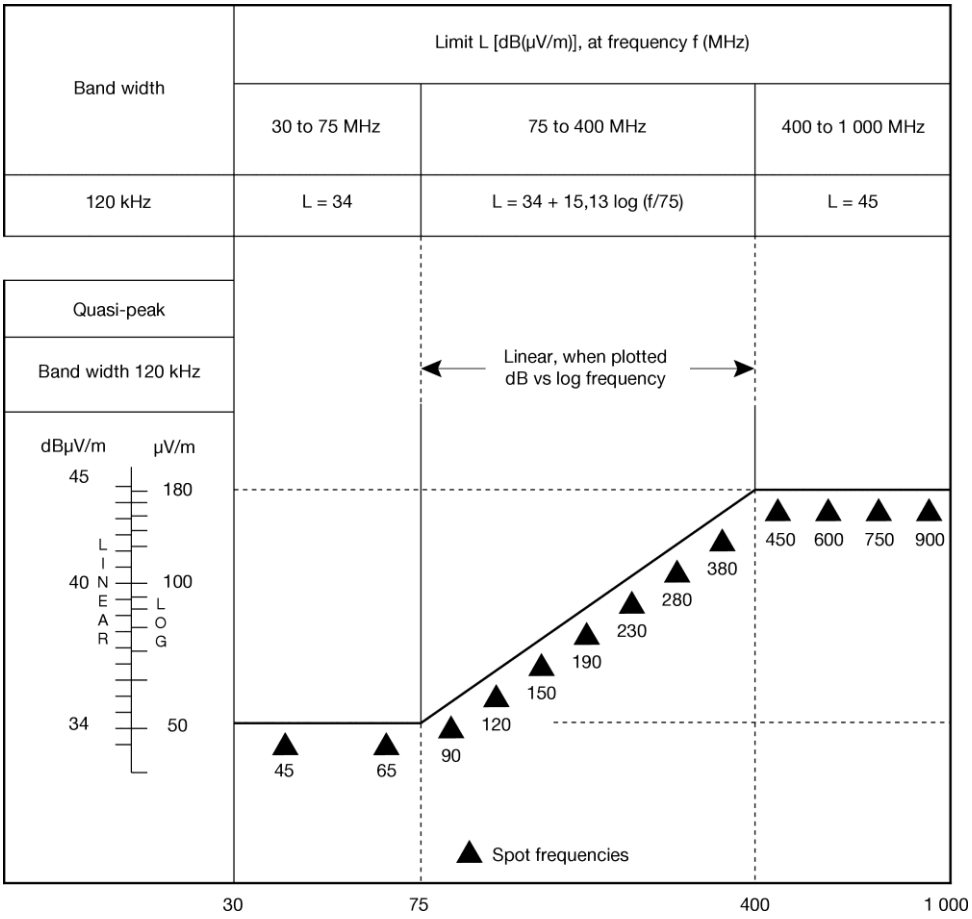
4.5. Conducted transients

Since during normal driving, no external electrical connections are made to vehicles, no conducted transients are generated in relation to the external environment. The responsibility of ensuring that equipment can tolerate the conducted transients within a vehicle, for example due to load switching and interaction between systems, lies with the manufacturer. No type-approval test for conducted transients is deemed necessary.

Appendix 1

VEHICLE BROADBAND REFERENCE LIMITS

Antenna-vehicle separation: 10 m



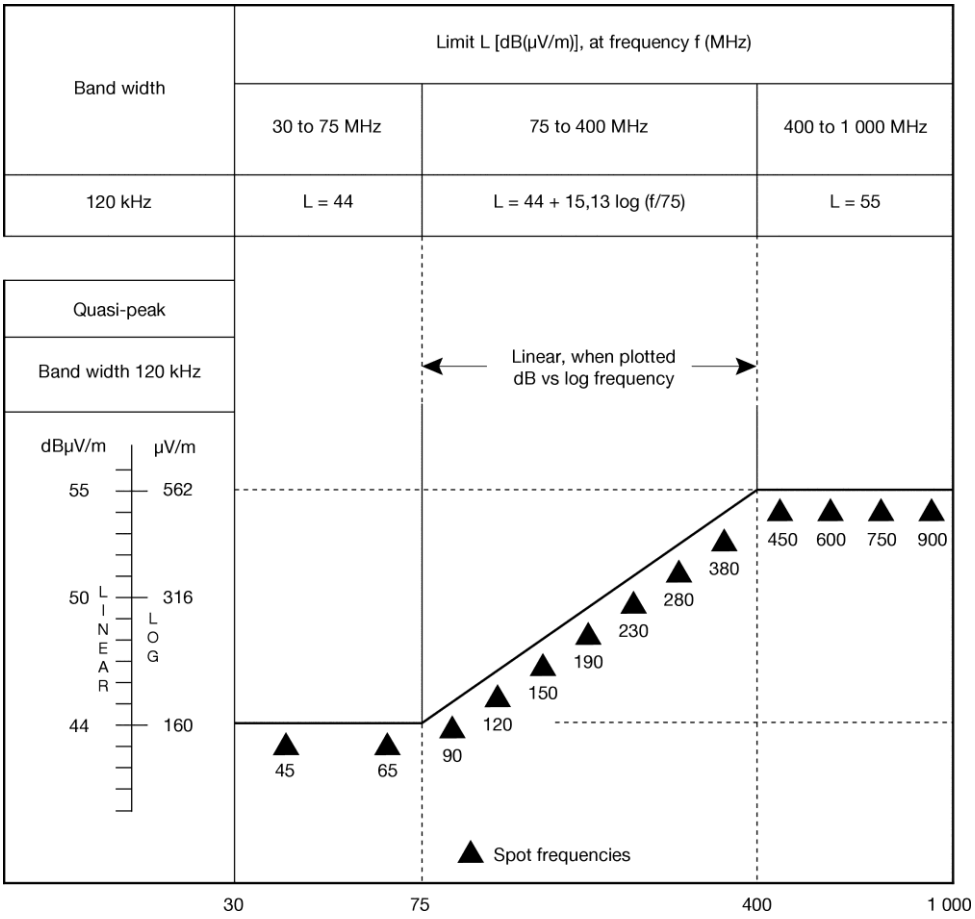
Frequency — megahertz — logarithmic

See point 3.2.2.1 of Chapter 1

Appendix 2

VEHICLE BROADBAND REFERENCE LIMITS

Antenna-vehicle separation: 3 m



Frequency — megahertz — logarithmic

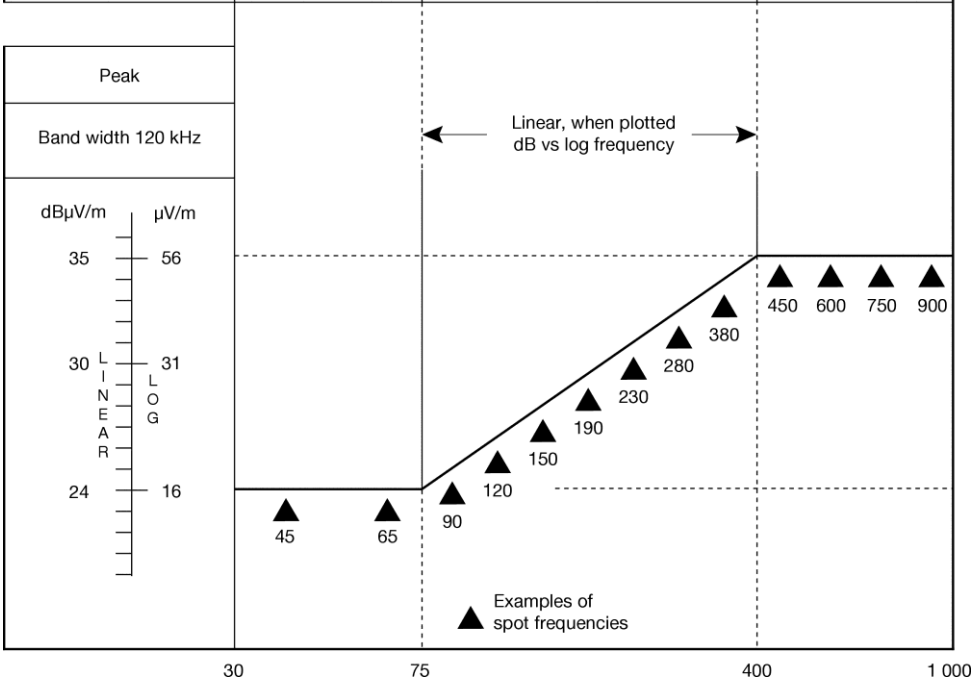
See point 3.2.2.2 of Chapter 1

Appendix 3

VEHICLE NARROWBAND REFERENCE LIMITS

Antenna-vehicle separation: 10 m

Band width	Limit L [dB(µV/m)], at frequency f (MHz)		
	30 to 75 MHz	75 to 400 MHz	400 to 1 000 MHz
120 kHz	L = 24	L = 24 + 15,13 log (f/75)	L = 35



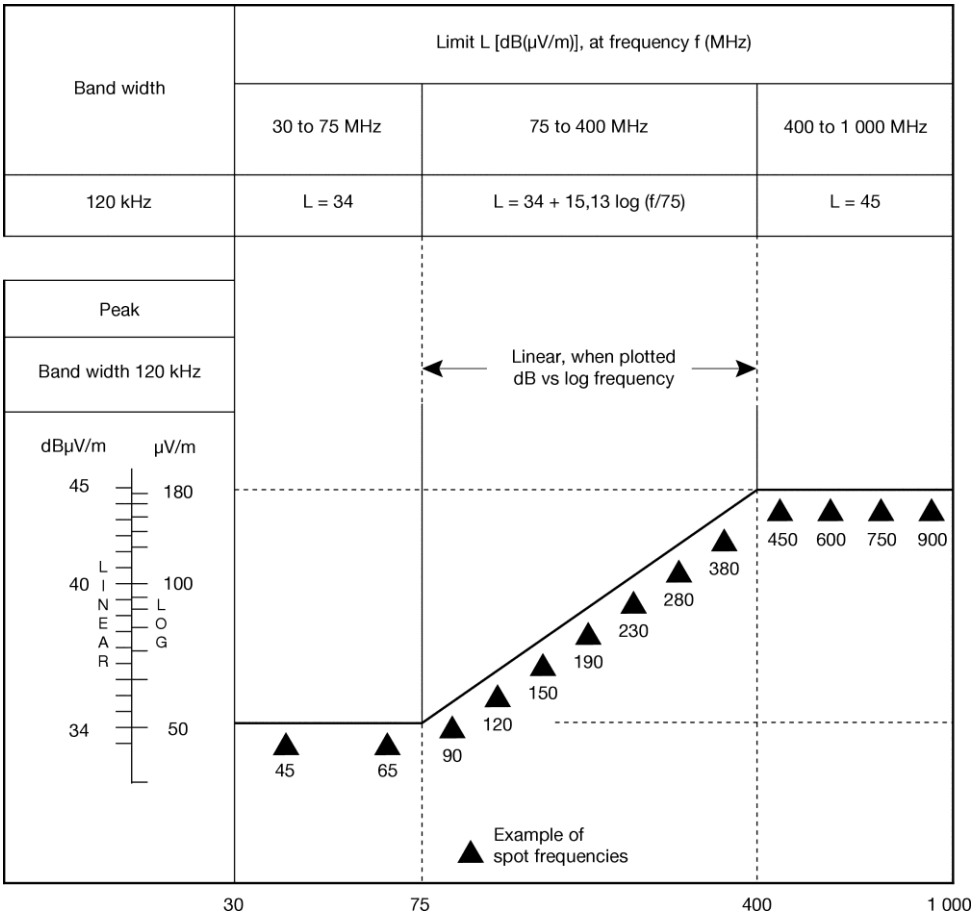
Frequency — megahertz — logarithmic

See point 3.3.2.1 of Chapter 1

Appendix 4

VEHICLE NARROWBAND REFERENCE LIMITS

Antenna-vehicle separation: 3 m

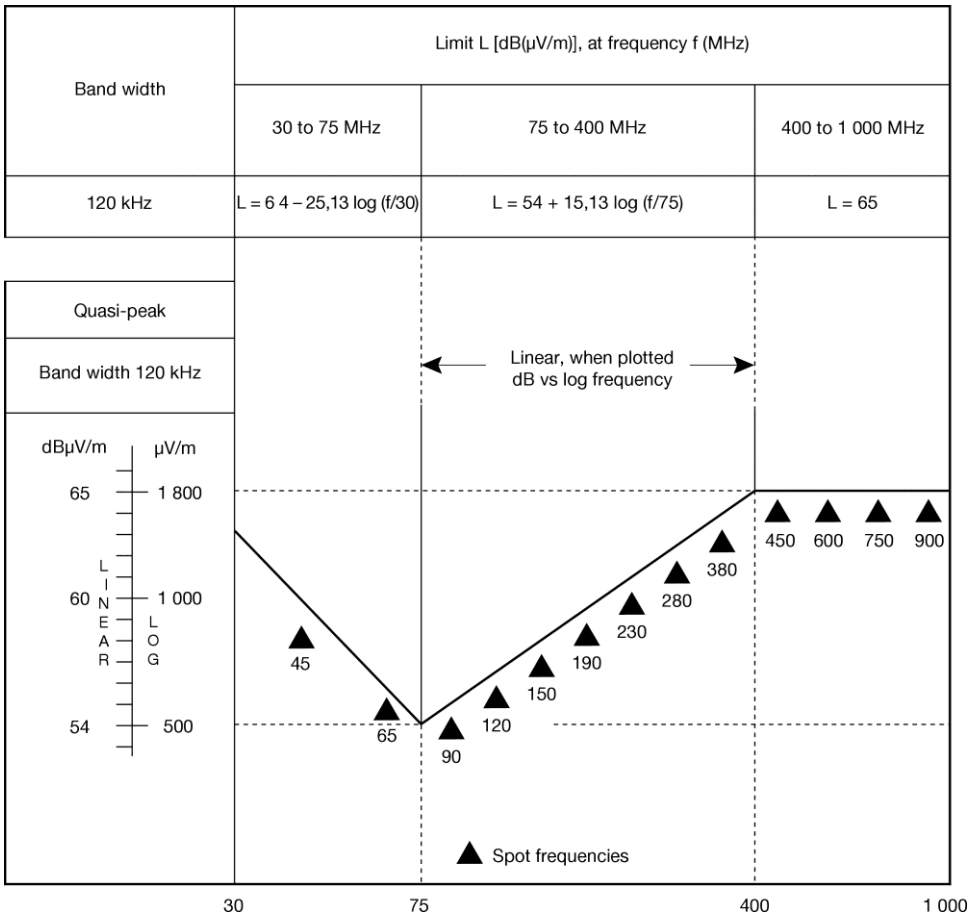


Frequency — megahertz — logarithmic

See point 3.3.2.2 of Chapter 1

Appendix 5

BROADBAND REFERENCE LIMITS OF ELECTRICAL/ELECTRONIC SUB-ASSEMBLY

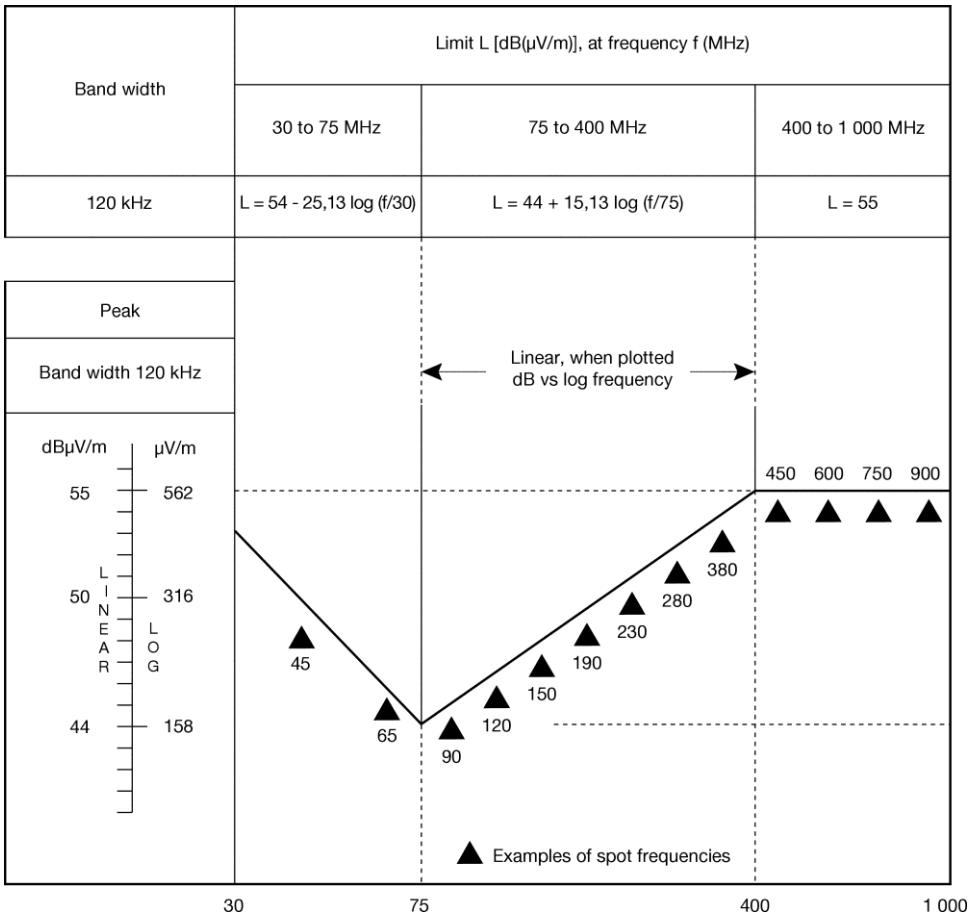


Frequency — megahertz — logarithmic

See point 3.5.2.1 of Chapter 1

Appendix 6

NARROWBAND REFERENCE LIMITS OF ELECTRICAL/ELECTRONIC SUB-ASSEMBLY



Frequency — megahertz — logarithmic

See point 3.6.2.1 of Chapter 1

CHAPTER 2 << ANNEX VI of 2009/64 >>

METHOD OF MEASUREMENT OF RADIATED BROADBAND ELECTROMAGNETIC EMISSIONS FROM VEHICLES

1. GENERAL

1.1. The test method described in this Chapter shall only be applied to vehicles.

1.2. Measuring apparatus

The measuring equipment shall comply with the requirements of << publication No 16-1 (93) >> of the International Special Committee on Radio Interference (CISPR).

Comment [v71]: Verify the validity of this ref

A quasi-peak detector shall be used for the measurement of broadband electromagnetic emissions in this Chapter, or if a peak detector is used an appropriate correction factor shall be used depending on the spark pulse rate.

1.3. Test method

This test is intended to measure the broadband electromagnetic emissions generated by spark-ignition systems and by electric motors (electric traction motors, engines for heating or de-icing systems, fuel pumps, water pumps, etc.) permanently fitted to the vehicle.

Two alternative reference antenna distances are permissible: 10 or 3 m from the vehicle. In either case the requirements of point 3 shall be complied with.

2. EXPRESSION OF RESULTS

The results of measurements shall be expressed in dB microvolts/m (microvolt/m) for 120 kHz band width. If the actual band width B (expressed in kHz) of the measuring apparatus differs from 120 kHz, the readings taken in microvolts/m shall be converted to 120 kHz band width through multiplication by a factor 120/B.

3. MEASURING LOCATION

3.1. The test site shall be a level, clear area free from electromagnetic reflecting surfaces within a circle of minimum radius 30 m measured from a point midway between the vehicle and the antenna (see Figure 1 in Appendix 1).

3.2. The measuring set, test hut, or vehicle in which the measurement set is located may be within the test site, but only in the permitted region shown in Figure 1 in Appendix 1.

Other measuring antennae are allowed within the test area, at a minimum distance of 10 m both from receiving antenna and the vehicle under test, provided that it can be shown that the test results will not be affected.

3.3. Enclosed test facilities may be used if correlation can be shown between the enclosed test facility and an outdoor site. Enclosed test facilities do not need to meet the dimensional requirements of Figure 1 in Appendix 1 other than the distance from the antenna to the vehicle and the height of the antenna. Neither do they need to have ambient emissions checked before or after the test as indicated in point 3.4.

3.4. Ambient

To ensure that there is no extraneous noise or signal of a magnitude sufficient to affect materially the measurement, measurements shall be taken before and after the main test. If the vehicle is present when ambient measurements are taken, it will be necessary to ensure that any emissions from the vehicle do not affect significantly the ambient measurements, for example by removing the vehicle from the test area, removing the ignition key, or disconnecting the battery. In both of the measurements, the extraneous noise or signal shall be at least 10 dB below the limits of interference given in point 5.2.2.1 or 5.2.2.2 (as appropriate) of Chapter 1, except for intentional narrowband ambient transmissions.

4. VEHICLE STATE DURING TESTS

4.1. Engine

The engine shall be running at its normal operating temperature and the transmission shall be in neutral. If for practical reasons this cannot be achieved, alternative arrangements mutually agreed between the manufacturer and the test authorities may be made.

Care shall be taken to ensure that the speed setting mechanism does not influence electromagnetic radiations. During each measurement, the engine shall be operated as follows:

Engine type	Method of measurements	
	Quasi peak	Peak
Spark ignition	Engine speed	Engine speed
One cylinder	2500 rpm ± 10 %	2500 rpm ± 10 %
More than one cylinder	1500 rpm ± 10 %	1500 rpm ± 10 %

4.2. Testing shall not be conducted while rain or other precipitation is falling on the vehicle or within 10 minutes after such precipitation has stopped.

5. ANTENNA TYPE, POSITION AND ORIENTATION

5.1. Antenna type

Any antenna may be used provided it can be normalised to the reference antenna. The method described in CISPR << publication No 12, Edition 3, Appendix A, >> may be used to calibrate the antenna.

Comment [v72]: Verify the validity of the ref

5.2. Height and distance of measurement

5.2.1. Height

5.2.1.1. 10 m test

The phase centre of the antenna shall be 3,00 ± 0,05 m above the plane on which the vehicle rests.

5.2.1.2. 3 m test

The phase centre of the antenna shall be 1,80 ± 0,05 m above the plane on which the vehicle rests.

5.2.1.3. No part of any antenna's receiving elements shall be closer than 0,25 m to the plane on which the vehicle rests.

5.2.2. Distance of measurement

5.2.2.1. 10 m test

The horizontal distance from the tip or other appropriate point of the antenna defined during the normalisation procedure described in point 5.1 to the outer body surface of the vehicle shall be 10,0 ± 0,2 m.

5.2.2.2. 3 m test

The horizontal distance from the tip or other appropriate point of the antenna defined during the normalisation procedure described in point 5.1 to the outer body surface of the vehicle shall be 3,00 ± 0,05 m.

5.2.2.3. If the test is carried out in a facility enclosed for radio frequency electromagnetic screening purposes, the antenna's receiving elements shall be no closer than 1,0 m to any radio absorbent material and no closer than 1,5 m to the wall of the enclosed facility. There must be no absorbent material between the receiving antenna and vehicle under test.

5.3. Antenna location relative to vehicle

The antenna shall be located successively on the left and right-hand sides of the vehicle, with the antenna parallel to the plane of longitudinal symmetry of the vehicle, in line with the engine mid-point (see Figure 1 in Appendix 1) and in line with the vehicle mid-point defined as the point on the principal axis of the vehicle midway between the centres of the front and rear axles of the vehicle.

5.4. Antenna position

At each of the measuring points, readings shall be taken both with the antenna in a horizontal and in a vertical polarisation (see Figure 2 in Appendix 1).

5.5. Readings

The maximum of the four readings taken in accordance with points 5.3 and 5.4 at each spot frequency shall be taken as the characteristic reading at the frequency at which the measurements were made.

6. FREQUENCIES

6.1. Measurements

Measurements shall be made throughout the 30 to 1000 MHz frequency range. To confirm that the vehicle meets the requirements of this Chapter, the Testing Authority shall test at up to 13 frequencies in the range, for example 45, 65, 90, 120, 150, 190, 230, 280, 380, 450, 600, 750, 900 MHz. In the event that the limit is exceeded during the test, investigations shall be made to ensure that this is due to the vehicle and not to background radiation.

6.1.1. The limits apply throughout the frequency range 30 to 1000 MHz.

6.1.2. Measurements can be performed with either quasi-peak or peak detectors. The limits given in points 5.2 and 5.5 of Chapter 1 are for quasi-peak. If peak is used, add 38 dB for 1 MHz band width or subtract 22 dB for 1 kHz band width.

6.2. Tolerances

Spot frequency (MHz)	Tolerance (MHz)
45, 65, 90, 120, 150, 190 and 230	±5
280, 380, 450, 600, 750 and 900	±20

The tolerances apply to frequencies quoted and are intended to avoid interference from transmissions operating on or near the nominal spot frequencies during the time of measurement.

Appendix 1

FIGURE 1

TRACTOR TEST AREA

(Level area free from reflecting electromagnetic surfaces)

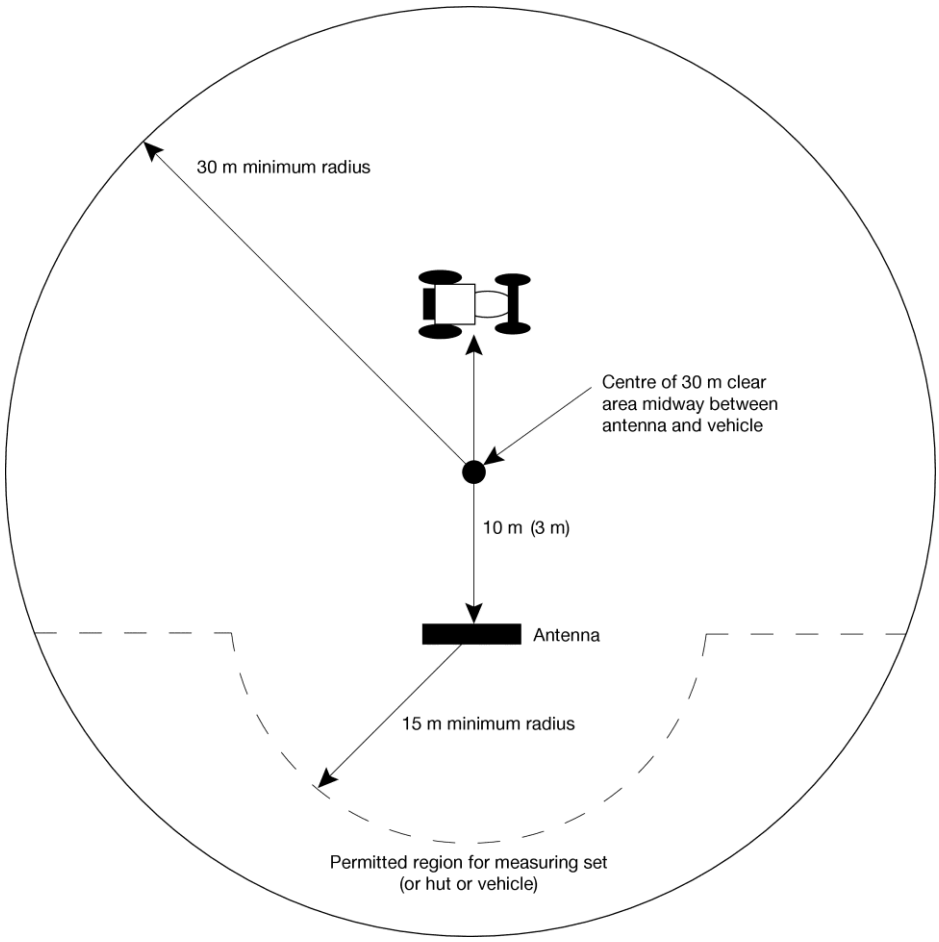
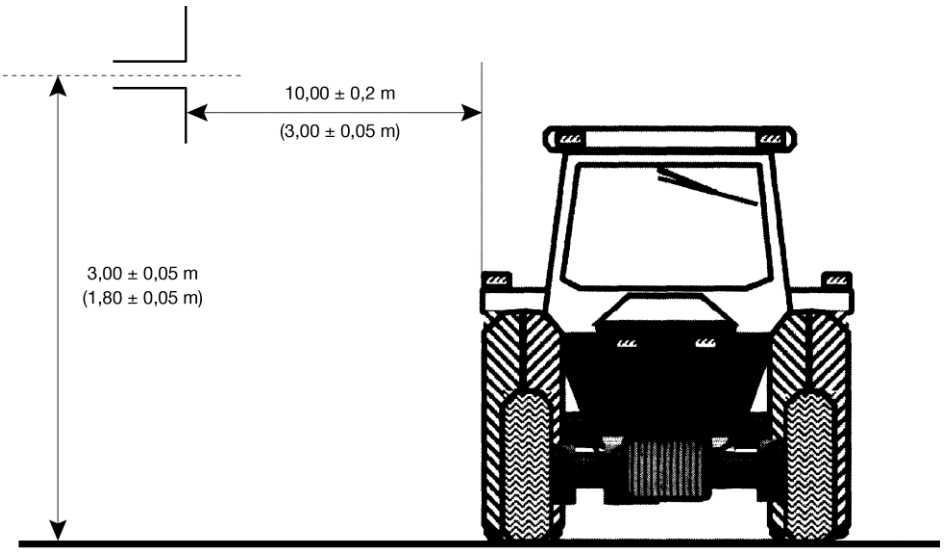


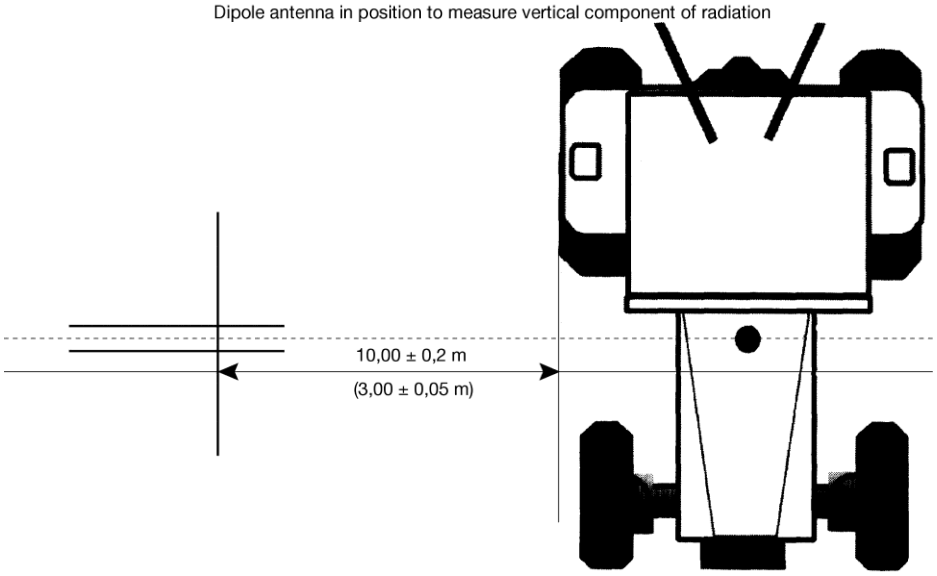
FIGURE 2

POSITION OF ANTENNA RELATIVE TO TRACTOR



Elevation

Dipole antenna in position to measure vertical component of radiation



Plan

Dipole antenna in position to measure horizontal component of radiation*

CHAPTER 3 << ANNEX VII of 2009/64 >>

METHOD OF MEASUREMENT OF RADIATED NARROWBAND ELECTROMAGNETIC EMISSIONS FROM VEHICLES

1. GENERAL

1.1. The test method described in this Chapter shall only be applied to vehicles.

1.2. Measuring apparatus

The measuring equipment shall comply with the requirements of publication << No 16-1 (93) >> of the International Special Committee on Radio Interference (CISPR).

Comment [v73]: Verify the validity of the reference

An average detector or a peak detector shall be used for the measurement of radiated narrowband electromagnetic emissions in this Chapter.

1.3. Test method

1.3.1. This test is intended to measure narrowband electromagnetic emissions such as might emanate from a microprocessor-based system or other narrowband source.

1.3.2. As an initial step the levels of emissions in the FM frequency band (88 to 108 MHz) shall be measured at the vehicle broadcast radio antenna with equipment as specified in point 1.2. If the level specified in point 5.3.2.4 of Chapter 1 is not exceeded, then the vehicle shall be deemed to comply with the requirements of this Chapter in respect of that frequency band and the full test shall not be carried out.

1.3.3. In the full test procedure two alternative antenna distances are permissible: 10 or 3 m from the vehicle. In either case the requirements of point 3 of this Chapter shall be complied with.

2. EXPRESSION OF RESULTS

The results of measurements shall be expressed in dB microvolts/m (microvolts/m).

3. MEASURING LOCATION

3.1. The test site shall be a level, clear area free from electromagnetic reflecting surfaces within a circle of minimum radius 30 m measured from a point midway between the vehicle and the antenna (see Figure 1 in Appendix 1 of Chapter 3).

3.2. The measuring set, test hut, or vehicle in which the measurement set is located may be within the test site, but only in the permitted region shown in Figure 1 in Appendix 1 of Chapter 3.

Other measuring antennae are allowed within the test area, at a minimum distance of 10 m both from receiving antenna and the vehicle under test, provided that it can be shown that the test results will not be affected.

3.3. Enclosed test facilities may be used if correlation can be shown between the enclosed test facility and an outdoor site. Enclosed test facilities do not need to meet the dimensional requirements of Figure 1 in Appendix 1 of Chapter 2 other than the distance from the antenna to the vehicle and the height of the antenna. Neither do they need to have ambient emissions checked before or after the test as indicated in point 3.4 of this Chapter.

3.4. Ambient

To ensure that there is no extraneous noise or signal of a magnitude sufficient to affect materially the measurement, ambient measurements shall be taken before and after the main test. It will be necessary to ensure that any emissions from the vehicle do not affect significantly the ambient measurements, for example by removing the vehicle from the test area, removing the ignition key, or disconnecting the battery(ies). In both of the measurements, the extraneous noise or signal shall be at least 10 dB below the limits of interference given in point 5.3.2.1 or 5.3.2.2 (as appropriate) of Chapter 1, except for intentional narrowband ambient transmissions.

4. VEHICLE STATE DURING TESTS

4.1. The vehicle's electronic systems shall all be in normal operating mode with the vehicle stationary.

4.2. The ignition shall be switched on. The engine shall not be operating.

4.3. Measurements shall not be made while rain or other precipitation is falling on the vehicle or within 10 minutes after such precipitation has stopped.

5. ANTENNA TYPE, POSITION AND ORIENTATION

5.1. Antenna type

Any antenna may be used provided that it can be normalised to the reference antenna. The method described in the CISPR publication << No 12, Edition 3, Appendix A, >> may be used to calibrate the antenna.

Comment [v74]: Verify validity of the ref

5.2. Height and distance of measurement

5.2.1. Height

5.2.1.1. 10 m test

The phase centre of the antenna shall be 3,00 ± 0,05 m above the plane on which the vehicle rests.

5.2.1.2. 3 m test

The phase centre of the antenna shall be 1,80 ± 0,05 m above the plane on which the vehicle rests.

5.2.1.3. No part of any antenna's receiving elements shall be closer than 0,25 m to the plane on which the vehicle rests.

5.2.2. Distance of measurement

5.2.2.1. 10 m test

The horizontal distance from the tip or other appropriate point of the antenna defined during the normalisation procedure described in point 5.1 to the outer body surface of the vehicle shall be 10,0 ± 0,2 m.

5.2.2.2. 3 m test

The horizontal distance from the tip or other appropriate point of the antenna defined during the normalisation procedure described in point 5.1 to the outer body surface of the vehicle shall be 3,00 ± 0,05 m.

5.2.2.3. If the test is carried out in a facility enclosed for radio frequency electromagnetic screening purposes, the antenna's receiving elements shall be no closer than 1,0 m to any radio absorbent material and no closer than 1,5 m to the wall of the enclosed facility. There must be no absorbent material between the receiving antenna and vehicle under test.

5.3. Antenna location relative to vehicle

The antenna shall be located successively on the left and right-hand sides of the vehicle with the antenna parallel to the plane of longitudinal symmetry of the vehicle and in line with the engine mid-point (see Figure 2 in Appendix 1 of Chapter 2).

5.4. Antenna position

At each of the measuring points, readings shall be taken both with the antenna in a horizontal and in a vertical polarisation (see Figure 2 in Appendix 1 of Chapter 2).

5.5. Readings

The maximum of the four readings taken in accordance with points 5.3 and 5.4 at each spot frequency shall be taken as the characteristic reading at the frequency at which the measurements are made.

6. FREQUENCIES

6.1. Measurements

Measurements shall be made throughout the 30 to 1000 MHz frequency range. This range shall be divided into 13 bands. In each band one spot frequency may be tested to demonstrate that the required limits are satisfied. To confirm that the vehicle meets the requirements of this Chapter, the testing authority shall test at one such point in each of the following 13 frequency bands:

30 to 50, 50 to 75, 75 to 100, 100 to 130, 130 to 165, 165 to 200, 200 to 250, 250 to 320, 320 to 400, 400 to 520, 520 to 660, 660 to 820, 820 to 1000 MHz.

In the event that the limit is exceeded during the test, investigations shall be made to ensure that this is due to the vehicle and not to background radiation.

CHAPTER 4 << ANNEX VIII of 2009/64 >>

METHOD OF TESTING FOR IMMUNITY OF VEHICLES TO ELECTROMAGNETIC RADIATION

1. GENERAL

1.1. The test method described in this Chapter shall only be applied to vehicles.

1.2. Test method

This test is intended to demonstrate the immunity to degradation in the direct control of the vehicle. The vehicle shall be subject to electromagnetic fields as described in this Chapter. The vehicle shall be monitored during the tests.

2. EXPRESSION OF RESULTS

For the test described in this Chapter, field strengths shall be expressed in volts/m.

3. MEASURING LOCATION

The test facility shall be capable of generating the field strengths over the frequency ranges defined in this Chapter. The test facility shall comply with (national) legal requirements regarding the emission of electromagnetic signals.

Care shall be taken so that the control and monitoring equipment shall not be affected by radiated fields in such a way as to invalidate the tests.

4. VEHICLE STATE DURING TESTS

4.1. The vehicle shall be in an unladen condition except for necessary test equipment.

4.1.1. The engine shall turn the driving wheels normally at a constant speed corresponding to three quarters of the maximum speed of the vehicle if there is no technical reason for the manufacturer to prefer another speed. The vehicle's engine must be loaded with an appropriate torque. If need be, the transmission shafts may be disengaged (for example, in the case of vehicles with more than two axles), provided they do not drive a component-emitting interference.

4.1.2. Headlamps shall be on dipped beam.

4.1.3. Left or right-direction indicator shall be operating.

4.1.4. All other systems which affect the driver's control of the vehicle shall be (on) as in normal operation of the vehicle.

4.1.5. The vehicle shall not be electrically connected to the test area and no connections shall be made to the vehicle from any equipment, except as required by point 4.1.1 or 4.2. Tyre contact with the test area floor shall not be considered to be an electrical connection.

4.2. If there are vehicle electrical/electronic systems which form an integral part of the direct control of the vehicle, which will not operate under the conditions described in point 4.1, it will be permissible for the manufacturer to provide a report or additional evidence to the testing authority that the vehicle electrical/electronic system meets the requirements of this Regulation. Such evidence shall be retained in the type-approval documentation.

4.3. Only non-perturbing equipment shall be used while monitoring the vehicle. The vehicle exterior and the passenger compartment shall be monitored to determine whether the requirements of this Chapter are met (for example by using (a) video camera(s)).

4.4. The vehicle shall normally face a fixed antenna. However, where the electronic control units and the associated wiring harness are predominantly in the rear of the vehicle, the test shall normally be carried out with the vehicle facing away from the antenna. In the case of long vehicles (namely excluding cars and light vans), which have electronic control units and associated wiring harness predominantly towards the middle of the vehicle, a reference point (see point 5.4) may be established based on either the right-side surface or the left-side surface of the vehicle. This reference point shall be at the midpoint of the vehicle's length or at one point along the side of the vehicle chosen by the manufacturer in conjunction with the competent authority after considering the distribution of electronic systems and the layout of any wiring harness.

Such testing may only take place if the physical construction of the chamber permits. The antenna location must be noted in the test report.

5. FIELD GENERATING DEVICE TYPE, POSITION AND ORIENTATION

5.1. Field generating device type

5.1.1. The field generating device type(s) shall be chosen such that the desired field strength is achieved at the reference point (see point 5.4) at the appropriate frequencies.

5.1.2. The field generating device(s) may be an antenna or antennas or a transmission line system (TLS).

5.1.3. The construction and orientation of any field generating device shall be such that the generated field is polarised: from 20 to 1000 MHz horizontally or vertically.

5.2. Height and distance of measurement

5.2.1. Height

5.2.1.1. The phase centre of any antenna shall not be less than 1,5 m above the plane on which the vehicle rests or not less than 2,0 m above the plane on which the vehicle rests if the vehicle roof exceeds 3 m in height.

5.2.1.2. No part of any antenna's radiating elements shall be closer than 0,25 m to the plane on which the vehicle rests.

5.2.2. Distance of measurement

5.2.2.1. In-service conditions may be best approximated by placing the field generating device as far from the vehicle as practical. This distance will typically lie within the range 1 to 5 m.

5.2.2.2. If the test is carried out in an enclosed facility, the field generating device's radiating elements shall be no closer than 1,0 m to any radio absorbent material and no closer than 1,5 m to the wall of the enclosed facility. There shall be no absorbent material between the transmitting antenna and the vehicle under test.

5.3. Antenna location relative to vehicle

5.3.1. The field generating device's radiating elements shall not be closer than 0,5 m to the outer body surface of the vehicle.

5.3.2. The field generating device shall be positioned on the vehicle's centre line (plane of longitudinal symmetry).

5.3.3. No part of a TLS, with the exception of the plane on which the vehicle rests, shall be closer than 0,5 m to any part of the vehicle.

5.3.4. Any field generating device which is placed over the vehicle shall extend centrally over at least 75 % of the length of the vehicle.

5.4. Reference point

5.4.1. For the purposes of this Chapter the reference point is the point at which the field strength shall be established and shall be defined as follows:

5.4.1.1. at least 2 m horizontally from the antenna phase centre or at least 1 m vertically from the radiating elements of a TLS,

5.4.1.2. on the vehicle's centre line (plane of longitudinal symmetry),

5.4.1.3. at a height of 1,0 ± 0,05 m above the plane on which the vehicle rests or 2,0 ± 0,05 m if the minimum height of the roof of any vehicle in the model range exceeds 3,0 m,

5.4.1.4. for front illumination, either:

– 1,0 ± 0,2 m inside the vehicle, measured from the point of intersection of the windscreen and bonnet (point C in Appendix 1), or

– 0,2 ± 0,2 m from the centre line of the front axle of the tractor, measured towards the centre of the tractor (point D in Appendix 2),

whichever results in a reference point closer to the antenna,

5.4.1.5. for rear illumination, either:

– 1,0 ± 0,2 m inside the vehicle, measured from the point of intersection of the windscreen and bonnet (point C in Appendix 1), or

– 0,2 ± 0,2 m from the centre line of the rear axle of the tractor, measured towards the centre of the tractor (point D in Appendix 2),

whichever results in a reference point closer to the antenna.

5.5. If it is decided to radiate the rear of the vehicle, the reference point shall be established as in point 5.4. The vehicle shall then be installed facing away from the antenna and positioned as if it had been horizontally rotated 180° around its centre point, namely in such a way that the distance from the antenna to the nearest part of the outer body of the vehicle remains the same. This is illustrated in Appendix 3.

6. TEST REQUIREMENTS

6.1. Frequency range, dwell times, polarisation

The vehicle shall be exposed to electromagnetic radiation in the 20 to 1000 MHz frequency range.

6.1.1. To confirm that the vehicle meets the requirements of this Chapter, the vehicle shall be tested at up to 14 spot frequencies in the range, for example:

27, 45, 65, 90, 120, 150, 190, 230, 280, 380, 450, 600, 750 and 900 MHz.

The response time of the equipment under test shall be considered and the dwell time shall be sufficient to allow the equipment under test to react under normal conditions. In any case, it shall not be less than two seconds.

6.1.2. One mode of polarisation shall be used at each frequency — see point 5.1.3.

6.1.3. All other test parameters shall be as defined in this Chapter.

6.1.4. If a vehicle fails the test defined in point 6.1.1, it must be verified as having failed under the relevant test conditions and not as a result of the generation of uncontrolled fields.

7. GENERATION OF REQUIRED FIELD STRENGTH

7.1. Test methodology

7.1.1. The 'substitution method' shall be used to establish the test field conditions.

7.1.2. Calibration phase

At each test frequency, a level of power shall be fed into the field generating device to produce the required field strength at the reference point (as defined in point 5) in the test area with the vehicle absent, the level of forward power, or another parameter directly related to the forward power required to define the field, shall be measured and the results recorded. Test frequencies shall lie in the range 20 to 1000 MHz. Calibration shall be made, starting at 20, in steps not greater than two per cent of the previous frequency finishing at 1000 MHz. These results shall be used for type-approval tests unless changes occur in the facilities or equipment which necessitate this procedure being repeated.

7.1.3. Test phase

The vehicle shall then be introduced into the test facility and positioned in accordance with the requirements of point 5. The required forward power defined in point 7.1.2 at each frequency as defined in point 6.1.1 shall then be applied to the field generating device.

7.1.4. Whatever parameter was chosen in point 7.1.2 to define the field, the same parameter shall be used to establish the field strength during the test.

7.1.5. The field generating equipment and its layout employed during the test shall be to the same specification as that used during the operations performed in point 7.1.2.

7.1.6. Field strength measuring device

A suitable compact field strength measuring device shall be used to determine the field strength during the calibration phase of the substitution method.

7.1.7. During the calibration phase of the substitution method, the phase centre of the field strength measuring device shall be positioned at the reference point.

7.1.8. If a calibrated receiving antenna is used as the field strength measuring device, readings shall be obtained in three mutually orthogonal directions and the isotropic equivalent value of the readings shall be taken as the field strength.

7.1.9. To take account of different vehicle geometries, a number of antennae positions or reference points may need to be established for a given test facility.

7.2. Field strength contour

7.2.1. During the calibration phase of the substitution method (prior to a vehicle being introduced into the test area), the field strength in at least 80 % of the calibration steps shall not be less than 50 % of the nominal field strength, at the following locations:

(a) for all field generating devices, 0,5 ± 0,05 m either side of the reference point on a line passing through the reference point and at the same height as the reference point, and perpendicular to the vehicle plane of longitudinal symmetry;

(b) in the case of a TLS, 1,50 ± 0,05 m on a line passing through the reference point at the same height as the reference point and along the line of longitudinal symmetry.

7.3. Chamber resonance

Notwithstanding the condition set out in point 7.2.1, tests shall not be performed at chamber resonant frequencies.

7.4. Characteristics of the test signal to be generated

7.4.1. Maximum envelope excursion

The maximum envelope excursion of the test signal shall equal the maximum envelope excursion of an unmodulated sine wave whose rms value in volts/m is defined in point 5.4.2 of Chapter 1 (see Appendix 3 of this Chapter).

7.4.2. Test signal wave form

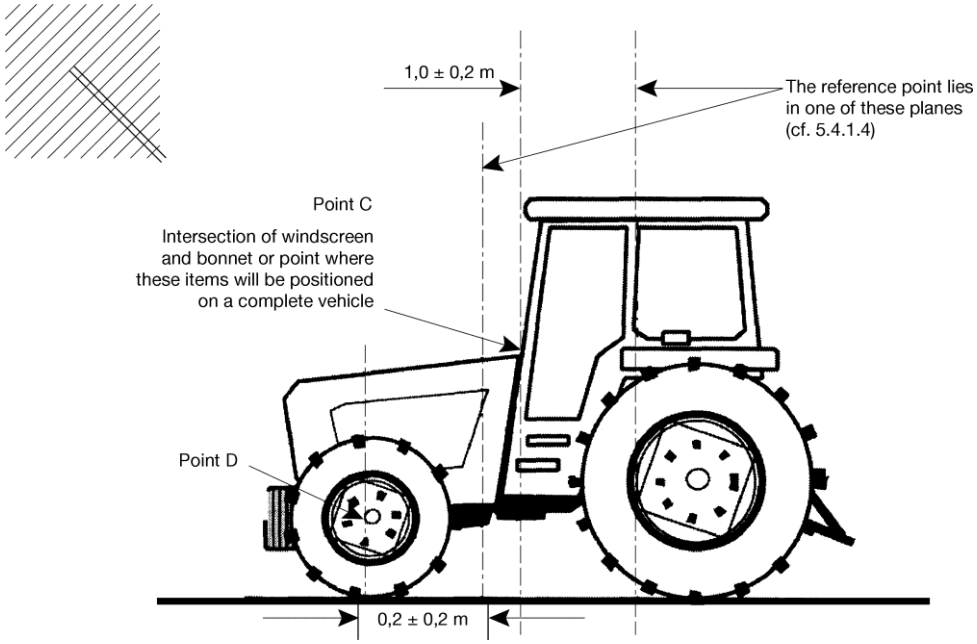
The test signal shall be a radio frequency sine wave, amplitude modulated by a 1 kHz sine wave at a modulation depth m of 0,8 ± 0,04.

7.4.3. Modulation depth

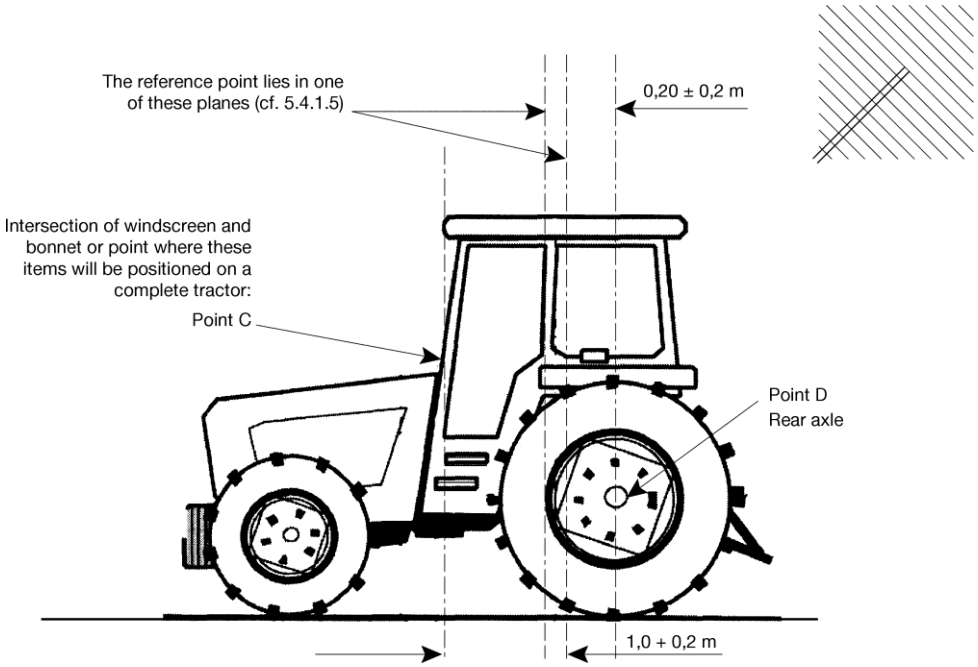
The modulation depth m is defined as:

m	=	(maximum envelope excursion – minimum envelope excursion)/(maximum envelope excursion + minimum envelope excursion).

Appendix 1

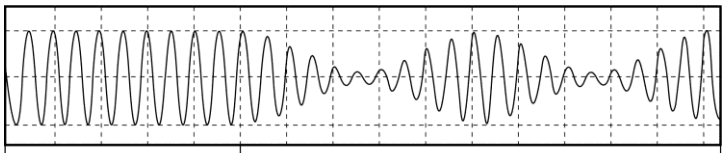

1,0 ± 0,2 m
The reference point lies in one of these planes (cf. 5.4.1.4)
Point C
Intersection of windscreen and bonnet or point where these items will be positioned on a complete vehicle
Point D
0,2 ± 0,2 m

Appendix 2


The reference point lies in one of these planes (cf. 5.4.1.5)
0,20 ± 0,2 m
Intersection of windscreen and bonnet or point where these items will be positioned on a complete tractor:
Point C
Point D
Rear axle
1,0 + 0,2 m

Appendix 3

CHARACTERISTICS OF TEST SIGNAL TO BE GENERATED



Unmodulated sine wave whose rms value is as defined in point 6.4.2 of Annex I	Test signal 80 %, sine wave, amplitude modulated: maximum envelope excursion equal to maximum envelope excursion of an unmodulated sine wave whose rms value is as defined in point 6.4.2 of Annex I

CHAPTER 5 << ANNEX IX of 2009/64 >>

METHOD OF MEASUREMENT OF RADIATED BROADBAND ELECTROMAGNETIC EMISSIONS FROM ELECTRICAL/ELECTRONIC SUB-ASSEMBLIES

1. GENERAL

1.1. The test method described in this Chapter may be applied to ESAs which may be subsequently fitted to vehicles which comply with Chapter 2.

1.2. Measuring apparatus

The measuring equipment shall comply with the requirements of publication << No 16-1 (93) >> of the International Special Committee on Radio Interference (CISPR).

Comment [v75]: Verify validity of ref

A quasi-peak detector shall be used for the measurement of broadband electromagnetic emissions in this Chapter, or if a peak detector is used an appropriate correction factor shall be used depending on the interference pulse rate.

1.3. Test method

This test is intended to measure broadband electromagnetic emissions from ESAs.

2. EXPRESSION OF RESULTS

The results of measurements shall be expressed in dB microvolts/m (microvolts/m), for 120 kHz band width. If the actual band width B (expressed in kHz) of the measuring apparatus differs from 120 kHz, the readings taken in microvolts/m shall be converted to 120 kHz band width through multiplication by a factor 120/B.

3. MEASURING LOCATION

3.1. The test site shall comply with the requirements of CISPR publication << No 16-1 (93) >> (see Appendix 1).

Comment [v76]: Verify the validity of the ref

3.2. The measuring set, test hut or vehicle in which the measurement set is located shall be outside the boundary shown in Appendix 1.

3.3. Enclosed test facilities may be used if correlation can be shown between the enclosed test facility and an approved outdoor site. Enclosed test facilities do not need to meet the dimensional requirements of Appendix 1 other than the distance from the antenna to the ESA under test and the height of the antenna (see Figures 1 and 2 in Appendix 2).

3.4. Ambient

To ensure that there is no extraneous noise or signal of a magnitude sufficient to affect materially the measurement, measurements shall be taken before and after the main test. In both of these measurements, the extraneous noise or signal shall be at least 10 dB below the limits of interference given in point 5.5.2.1 of Chapter 1, except for intentional narrowband ambient transmissions.

4. ESA STATE DURING TESTS

4.1. The ESA under test shall be in normal operation mode.

4.2. Measurements shall not be made while rain or other precipitation is falling on the ESA under test or within 10 minutes after such rain or other precipitation has stopped.

4.3. Test arrangements

4.3.1. The ESA under test and its wiring harnesses shall be supported 50 ± 5 mm above a wooden or equivalent non-conducting table. However, if any part of the ESA under test is intended to be electrically bonded to a vehicle's metal bodywork, that part shall be placed on a ground plane and shall be electrically bonded to the ground plane. The ground plane shall be a metallic sheet with a minimum thickness of 0,5 mm. The minimum size of the ground plane depends on the size of the ESA under test but shall allow for the distribution of the ESA's wiring harness and components. The ground plane shall be connected to the protective conductor of the earthing system. The ground plane shall be situated at a height of 1,0 ± 0,1 m above the test facility floor and shall be parallel to it.

4.3.2. The ESA under test shall be arranged and connected according to its requirements. The power supply harness shall be positioned along, and within 100 mm of, the edge of the ground plane/table closest to the antenna.

4.3.3. The ESA under test shall be connected to the grounding system according to the manufacturer's installation specification, no additional grounding connections shall be permitted.

4.3.4. The minimum distance between the ESA under test and all other conductive structures, such as walls of a shielded area (with the exception of the ground plane/table underneath the test object) must be 1,0 m.

4.4. Power shall be applied to the ESA under test via a 5 μH/50 Ω artificial network (AN) which shall be electrically bonded to the ground plane. The electrical supply voltage shall be maintained to ±10 % of its nominal system operating voltage. Any ripple voltage shall be less than 1,5 % of the nominal system operating voltage measured at the AN monitoring port.

4.5. If the ESA under test consists of more than one unit, the interconnecting cables shall ideally be the wiring harness as intended for use in the vehicle. If these are not available, the length between the electronic control unit and the AN shall be 1500 ± 75 mm.

All cables in the loom shall be terminated as realistically as possible and preferably with real loads and actuators.

If extraneous equipment is required for the correct operation of the ESA under test, compensation shall be made for the contribution it makes to the emissions measured.

5. ANTENNA TYPE, POSITION AND ORIENTATION

5.1. Antenna type

Any linearly polarised antenna may be used provided it can be normalised to the reference antenna.

5.2. Height and distance of measurement

5.2.1. Height

The phase centre of the antenna shall be 150 ± 10 mm above ground plane.

5.2.2. Distance of measurement

The horizontal distance from the phase centre, or tip of the antenna as appropriate, to the edge of the ground plane shall be 1,00 ± 0,05 m. No part of the antenna shall be closer than 0,5 m to the ground plane.

The antenna shall be placed parallel to a plane which is perpendicular to the ground plane and coincident with the edge of the ground plane along which the principal portion of the harness runs.

5.2.3. If the test is carried out in a facility enclosed for radio frequency electromagnetic screening purposes, the antenna's receiving elements shall be no closer than 0,5 m to any radio absorbent material and no closer than 1,5 m to the wall of the enclosed facility. There must be no absorbent material between the receiving antenna and the ESA under test.

5.3. Antenna orientation and polarisation

At the measuring point, readings shall be taken both with the antenna in a vertical and in a horizontal polarisation.

5.4. Readings

The maximum of the two readings taken (in accordance with point 5.3) at each spot frequency shall be taken as the characteristic reading at the frequency at which the measurements were made.

6. FREQUENCIES

6.1. Measurements

Measurements shall be made throughout the 30 to 1000 MHz frequency range. An ESA is considered as very likely to satisfy the required limits over the whole frequency range if it satisfies them at the following 13 frequencies in the range: 45, 65, 90, 120, 150, 190, 230, 280, 380, 450, 600, 750 and 900 MHz

In the event that the limit is exceeded during the test, investigations shall be made to ensure that this is due to the ESA and not to background radiation.

6.1.1. The limits apply throughout the frequency range 30 to 1000 MHz.

6.1.2. Measurements can be performed with either quasi-peak or peak detectors. The limits given in points 5.2 and 5.5 of Chapter 1 are for quasi-peak. If peak is used, add 38 dB for 1 MHz band width or subtract 22 dB for 1 kHz band width.

6.2. Tolerances

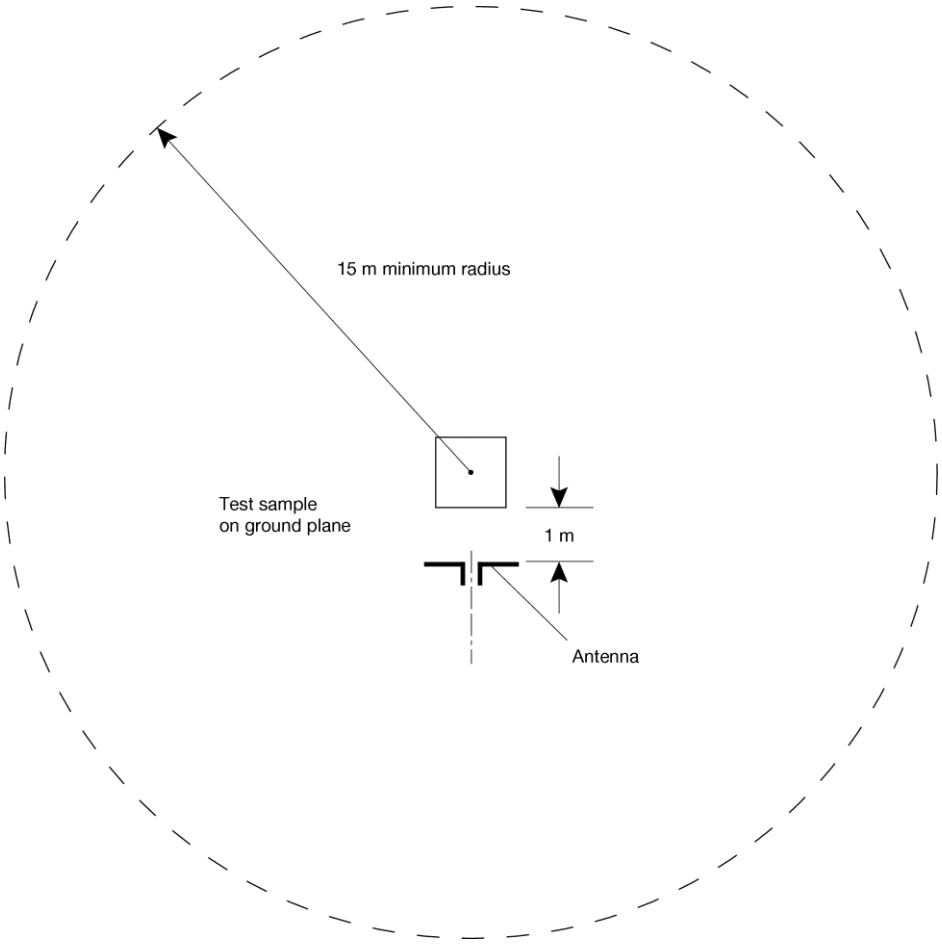
Spot frequency (MHz)	Tolerance (MHz)
45, 65, 90, 120, 150, 190 and 230	±5
280, 380, 450, 600, 750 and 900	±20

The tolerances apply to frequencies quoted and are intended to avoid interference from transmissions operating on or near the nominal spot frequencies during the time of measurement.

Appendix 1

ELECTRICAL/ELECTRONIC SUB-ASSEMBLY TEST AREA BOUNDARY

Level clear area free from electromagnetic reflecting surfaces



Appendix 2

FIGURE 1

Radiated electromagnetic emissions from an ESA test layout (General plan view)

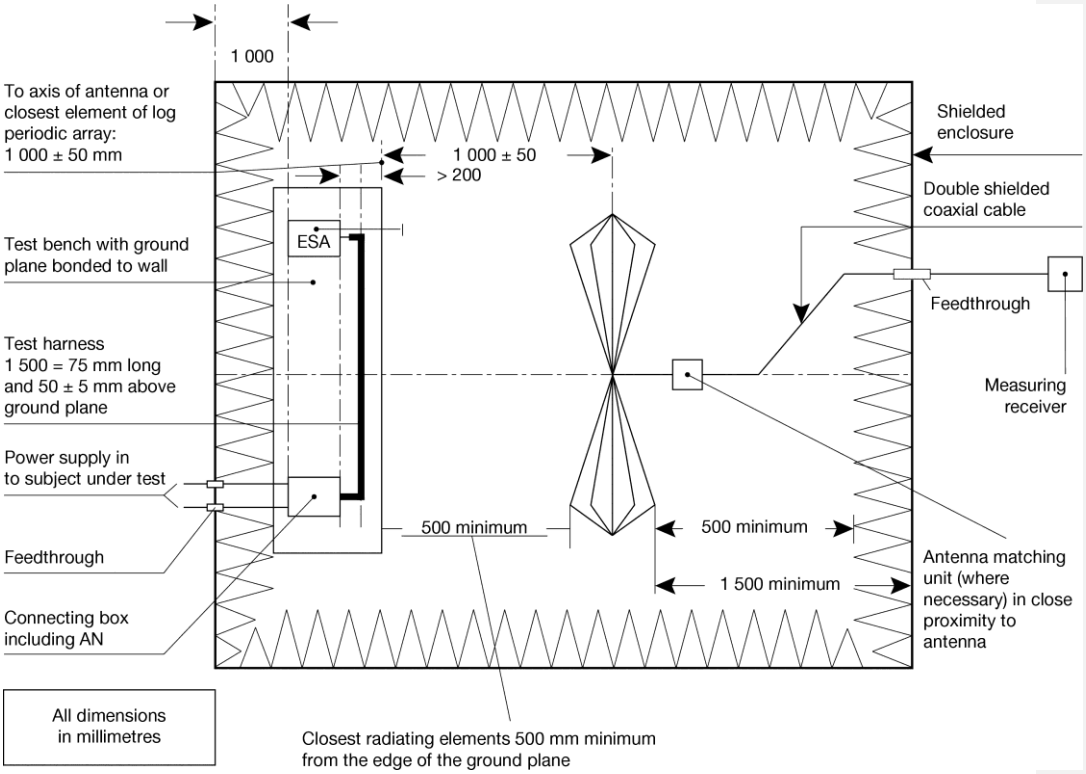
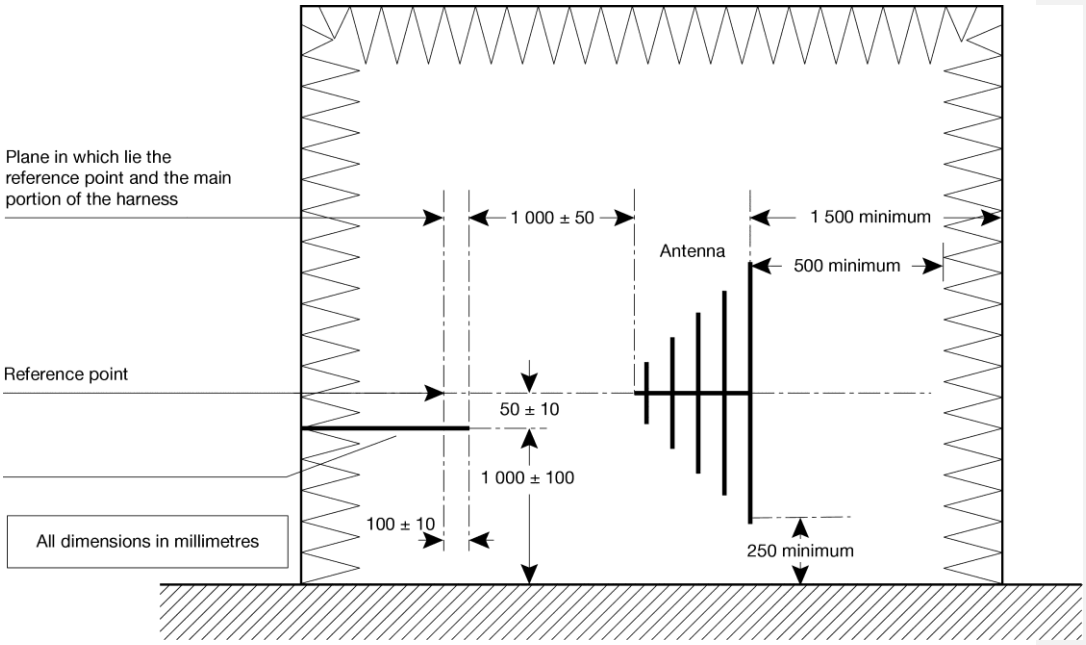


FIGURE 2

Radiated electromagnetic emissions from an ESA view of test bench plane of longitudinal symmetry



CHAPTER 6 << ANNEX X of 2009/64 >>

METHOD OF MEASUREMENT OF RADIATED NARROWBAND ELECTROMAGNETIC EMISSIONS FROM ELECTRICAL/ELECTRONIC SUB-ASSEMBLIES

1. GENERAL

1.1. The test method described in this Chapter may be applied to ESAs.

1.2. Measuring apparatus

The measuring equipment shall comply with the requirements of publication << No 16-1 (93) >> of the International Special Committee on Radio Interference (CISPR).

Comment [v77]: Verify the validity of the ref

An average detector or a peak detector shall be used for the measurement of radiated narrowband electromagnetic emissions in this Chapter.

1.3. Test method

1.3.1. This test is intended to measure the narrowband electromagnetic radiation such as might emanate from a microprocessor-based system.

1.3.2. As a short (2 to 3 minutes) initial step, choosing one antenna polarisation, it is permitted to make sweeps of the frequency range identified in point 6.1 using a spectrum analyser to indicate the existence and/or whereabouts of peak emissions. This may assist in the choice of frequencies to be tested (see point 6).

2. EXPRESSION OF RESULTS

The results of measurements shall be expressed in dB microvolts/m (microvolts/m).

3. MEASURING LOCATION

3.1. The test site shall comply with the requirements of CISPR publication **No 16-1 (93) (see Appendix 1 of Chapter 5).**

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3.2. The measuring set, test hut or vehicle in which the measurement set is located shall be outside the boundary shown in Appendix 1 of Chapter 5.

3.3. Enclosed test facilities may be used if correlation can be shown between the enclosed test facility and an outdoor site. Enclosed test facilities do not need to meet the dimensional requirements of Appendix 1 of Chapter 5 other than the distance from the antenna to the ESA under test and the height of the antenna (see Figures 1 and 2 in Appendix 2 of Chapter 5).

3.4. Ambient

To ensure that there is no extraneous noise or signal of a magnitude sufficient to affect materially the measurement, measurements shall be taken before and after the main test. In both of these measurements, the extraneous noise or signal shall be at least 10 dB below the limits of interference given in point 5.6.2.1 of Chapter 1, except for intentional narrowband ambient transmissions.

4. ESA STATE DURING TESTS

4.1. The ESA under test shall be in normal operation mode.

4.2. Measurements shall not be made while rain or other precipitation is falling on the ESA under test or within 10 minutes after rain or other precipitation has stopped.

4.3. Test arrangements

4.3.1. The ESA under test and its wiring harnesses shall be supported 50 ± 5 mm above a wooden or equivalent non-conducting table. However, if any part of the ESA under test is intended to be electrically bonded to a vehicle's metal bodywork, that part shall be placed on a ground plane and shall be electrically bonded to the ground plane.

The ground plane shall be a metallic sheet with a minimum thickness of 0,5 mm. The minimum size of the ground plane depends on the size of the ESA under test but shall allow for the distribution of the ESA's wiring harness and components. The ground plane shall be connected to the protective conductor of the earthing system. The ground plane shall be situated at a height of 1,0 ± 0,1 m above the test facility floor and shall be parallel to it.

4.3.2. The ESA under test shall be arranged and connected according to its requirements. The power supply harness shall be positioned along, and within 100 mm of, the edge of the ground plane/table closest to the antenna.

4.3.3. The ESA under test shall be connected to the grounding system according to the manufacturer's installation specification, no additional grounding connections shall be permitted.

4.3.4. The minimum distance between the ESA under test and all other conductive structures, such as walls of a shielded area (with the exception of the ground plane/table underneath the test object) must be 1,0 m.

4.4. Power shall be applied to the ESA under test via a 5 μH/50 Ω resistance artificial network (AN) which shall be electrically bonded to the ground plane. The electrical supply voltage shall be maintained to ±10 % of its nominal system operating voltage. Any ripple voltage shall be less than 1,5 % of the nominal system operating voltage measured at the AN monitoring port.

4.5. If the ESA under test consists of more than one unit, the interconnecting cables shall ideally be the wiring harness as intended for use in the vehicle. If these are not available, the length between the electronic control unit and the AN shall be 1500 ± 75 mm. All cables in the loom shall be terminated as realistically as possible and preferably with real loads and actuators. If extraneous equipment is required for the correct operation of the ESA under test, compensation shall be made for the contribution it makes to the emissions measured.

5. ANTENNA TYPE, POSITION AND ORIENTATION

5.1. Antenna type

Any linearly polarised antenna may be used provided it can be normalised to the reference antenna.

5.2. Height and distance of measurement

5.2.1. Height

The phase centre of the antenna shall be 150 ± 10 mm above ground plane.

5.2.2. Distance of measurement

The horizontal distance from the phase centre, or tip of the antenna as appropriate, to the edge of the ground plane shall be 1,00 ± 0,05 m. No part of the antenna shall be closer than 0,5 m to the ground plane.

The antenna shall be placed parallel to a plane which is perpendicular to the ground plane and coincident with the edge of the ground plane along which the principal portion of the harness runs.

5.2.3. If the test is carried out in a facility enclosed for radio frequency electromagnetic screening purposes, the antenna's receiving elements shall be no closer than 0,5 m to any radio absorbent material and no closer than 1,5 m to the wall of the enclosed facility. There must be no absorbent material between the receiving antenna and the ESA under test.

5.3. Antenna orientation and polarisation

At the measuring point, readings shall be taken both with the antenna in a vertical and in a horizontal polarisation.

5.4. Readings

The maximum of the two readings taken (in accordance with point 5.3) at each spot frequency shall be taken as the characteristic reading at the frequency at which the measurements were made.

6. FREQUENCIES

6.1. Measurements

Measurements shall be made throughout the 30 to 1000 MHz frequency range. This range shall be divided into 13 bands. In each band one spot frequency may be tested to demonstrate that the required limits are satisfied. To confirm that the ESA under test meets the requirements of this Chapter, the testing authority shall test one such point in each of the following 13 frequency bands:

30 to 50, 50 to 75, 75 to 100, 100 to 130, 130 to 165, 165 to 200, 200 to 250, 250 to 320, 320 to 400, 400 to 520, 520 to 660, 660 to 820, 820 to 1000 MHz.

In the event that the limit is exceeded during the test, investigations shall be made to ensure that this is due to the ESA under test and not to background radiation.

6.2. If during the initial step which may have been carried out as described in point 1.3, the radiated narrowband emissions for any of the bands identified in point 6.1 are at least 10 dB below the reference limit, then the ESA shall be deemed to comply with the requirements of this Chapter in respect of that frequency band.

CHAPTER 7 << ANNEX XI of 2009/64 >>

METHOD(S) OF TESTING FOR IMMUNITY OF ELECTRICAL/ELECTRONIC SUB-ASSEMBLIES TO ELECTROMAGNETIC RADIATION

1. GENERAL

1.1. The test method(s) described in this Chapter may be applied to ESAs.

1.2. Test methods

1.2.1. ESAs may comply with the requirements of any combination of the following test methods at the manufacturer's discretion provided that this results in the full frequency range specified in point 5.1 being covered.

– Stripline testing: see Appendix 1

– Bulk current injection testing: see Appendix 2

– TEM cell testing: see Appendix 3

– Free field test: see Appendix 4

1.2.2. Due to radiation of electromagnetic fields during these tests, all testing shall be conducted in a shielded area (the TEM cell is a shielded area).

2. EXPRESSION OF RESULTS

For the tests described in this Chapter, field strengths shall be expressed in volts/m and injected current shall be expressed in milliamps.

3. MEASURING LOCATION

3.1. The test facility shall be capable of generating the required test signal over the frequency ranges defined in this Chapter. The test facility shall comply with (national) legal requirements regarding the emission of electromagnetic signals.

3.2. The measuring equipment shall be located outside the chamber.

4. STATE OF ESA DURING TESTS

4.1. The ESA under test shall be in normal operation mode. It shall be arranged as defined in this Chapter unless individual test methods dictate otherwise.

4.2. Power shall be applied to the ESA under test via an (5 µ H/50 Ω) artificial network (AN), which shall be electrically grounded. The electrical supply voltage shall be maintained to ±10 % of its nominal system operating voltage. Any ripple voltage shall be less than 1,5 % of the nominal system operating voltage measured at the AN monitoring port.

4.3. Any extraneous equipment required to operate the ESA under test shall be in place during the calibration phase. No extraneous equipment shall be closer than 1 m from the reference point during calibration.

4.4. To ensure reproducible measurement results are obtained when tests and measurements are repeated, the test signal generating equipment and its layout shall be to the same

specification as that used during each appropriate calibration phase (points 7.2, 7.3.2.3, 8.4, 9.2 and 10.2).

4.5. If the ESA under test consists of more than one unit, the interconnecting cables shall ideally be the wiring harness as intended for use in the vehicle. If these are not available, the length between the electronic control unit and the AN shall be 1500 ± 75 mm. All cables in the loom shall be terminated as realistically as possible and preferably with real loads and actuators.

5. FREQUENCY RANGE, DWELL TIMES

5.1. Measurements shall be made in the 20 to 1000 MHz frequency range.

5.2. To confirm that the ESA(s) meet(s) the requirements of this Chapter, the tests shall be performed at up to 14 spot frequencies in the range, for example:

27, 45, 65, 90, 120, 150, 190, 230, 280, 380, 450, 600, 750 and 900 MHz

The response time of the equipment under test shall be considered and the dwell time shall be sufficient to allow the equipment under test to react under normal conditions. In any case, it shall not be less than two seconds.

6. CHARACTERISTICS OF TEST SIGNAL TO BE GENERATED

6.1. Maximum envelope excursion

The maximum envelope excursion of the test signal shall equal the maximum envelope excursion of an unmodulated sine wave whose rms value is defined in point 5.4.2 of Chapter 1 (see Appendix 3 of Chapter 4).

6.2. Test signal wave form

The test signal shall be a radio frequency sine wave, amplitude modulated by a 1 kHz sine wave at a modulation depth m of 0,8 ± 0,04.

6.3. Modulation depth

The modulation depth m is defined as:

m	=	(maximum envelope excursion — minimum envelope excursion)/(maximum envelope excursion + minimum envelope excursion)

7. STRIPLINE TESTING

7.1. Test method

This test method consists of subjecting the wiring harness connecting the components in an ESA to specified field strengths.

7.2. Field strength measurement in the stripline

At each desired test frequency a level of power shall be fed into the stripline to produce the required field strength in the test area with the ESA under test absent, this level of forward power, or another parameter directly related to the forward power required to define the field, shall be measured and the results recorded. These results shall be used for type-approval tests unless changes occur in the facilities or equipment which necessitate this procedure being

repeated. During this process, the position of the field probe head shall be under the active conductor, centred in longitudinal, vertical and transversal directions. The housing of the probe's electronics shall be as far away from the longitudinal stripline axis as possible.

7.3. Installation of the ESA under test

7.3.1. 150 mm stripline testing

The test method allows the generation of homogeneous fields between an active conductor (the stripline 50 Ω impedance), and a ground plane (the conducting surface of the mounting table), between which part of the wiring harness may be inserted. The electronic controller(s) of the ESA under test shall be installed on the ground plane but outside the stripline with one of its edges parallel to the active conductor of the stripline. It shall be 200 ± 10 mm from a line on the ground plane directly under the edge of the active conductor.

The distance between any edge of the active conductor and any peripheral device used for measurement shall be at least 200 mm.

The wiring harness section of the ESA under test shall be placed in a horizontal attitude between the active conductor and the ground plane (see Figures 1 and 2 in Appendix 1).

7.3.1.1. The minimum length of the wiring harness, which shall include the power harness to the electronic control unit and shall be placed under the stripline, shall be 1,5 m unless the wiring harness in the vehicle is less than 1,5 m. In this case, the length of the wiring harness shall be that of the longest length of harness used in the vehicle installation. Any line branches occurring in this length shall be routed perpendicularly to the longitudinal axis of the line.

7.3.1.2. Alternatively, the fully extended length of the wiring harness, including the length of the longest of any branches, shall be 1,5 m.

7.3.2. 800 mm stripline testing

7.3.2.1. Test method

The stripline consists of two parallel metallic plates separated by 800 mm. Equipment under test is positioned centrally between the plates and subjected to an electromagnetic field (see Figures 3 and 4 in Appendix 1).

This method can test complete electronic systems including sensors and actuators as well as the controller and wiring loom. It is suitable for apparatus whose largest dimension is less than one-third of the plate separation.

7.3.2.2. Positioning of stripline

The stripline shall be housed in a screened room (to prevent external emissions) and positioned 2 m away from walls and any metallic enclosure to prevent electromagnetic reflections. RF absorber material may be used to damp these reflections. The stripline shall be placed on non-conducting supports at least 0,4 m above the floor.

7.3.2.3. Calibration of the stripline

A field measuring probe shall be positioned within the central one-third of the longitudinal, vertical and transverse dimensions of the space between the parallel plates with the system under test absent. The associated measuring equipment shall be sited outside the screen room.

At each desired test frequency, a level of power shall be fed into the stripline to produce the required field strength at the antenna. This level of forward power, or another parameter directly related to the forward power required to define the field, shall be used for type-

approval tests unless changes occur in the facilities or equipment which necessitate this procedure being repeated.

7.3.2.4. Installation of the ESA under test

The main control unit shall be positioned within the central one-third of the longitudinal, vertical and transverse dimensions of the space between the parallel plates. It shall be supported on a stand made from non-conducting material.

7.3.2.5. Main wiring loom and sensor/actuator cables

The main wiring loom and any sensor/actuator cables shall rise vertically from the control unit to the top ground plate (this helps to maximise coupling with the electromagnetic field). Then they shall follow the underside of the plate to one of its free edges where they shall loop over and follow the top of the ground plate as far as the connections to the stripline feed. The cables shall then be routed to the associated equipment which shall be sited in an area outside the influence of the electromagnetic field, for example: on the floor of the screened room 1 m longitudinally away from the stripline.

8. FREE FIELD ESA IMMUNITY TEST

8.1. Test method

This test method allows the testing of vehicle electrical/electronic systems by exposing an ESA to electromagnetic radiation generated by an antenna.

8.2. Test bench description

The test shall be performed inside a semi-anechoic chamber on a bench top.

8.2.1. Ground plane

8.2.1.1. For free field immunity testing, the ESA under test and its wiring harnesses shall be supported 50 ± 5 mm above a wooden or equivalent non-conducting table. However, if any part of the ESA under test is intended to be electrically bonded to a vehicle's metal bodywork, that part shall be placed on a ground plane and shall be electrically bonded to the ground plane. The ground plane shall be a metallic sheet with a minimum thickness of 0,5 mm. The minimum size of the ground plane depends on the size of the ESA under test but shall allow for the distribution of the ESA's wiring harness and components. The ground plane shall be connected to the protective conductor of the earthing system. The ground plane shall be situated at a height of 1,0 ± 0,1 m above the test facility floor and shall be parallel to it.

8.2.1.2. The ESA under test shall be arranged and connected according to its requirements. The power supply harness shall be positioned along, and within 100 mm of, the edge of the ground plane/table closest to the antenna.

8.2.1.3. The ESA under test shall be connected to the grounding system according to the manufacturer's installation specification, no additional grounding connections shall be permitted.

8.2.1.4. The minimum distance between the ESA under test and all other conductive structures, such as walls of a shielded area (with the exception of the ground plane/table underneath the test object) must be 1,0 m.

8.2.1.5. The dimension of any ground plane shall be 2,25 square metres or larger in area with the smaller side no less than 750 mm. The ground plane shall be bonded to the chamber with bonding straps such that the DC bonding resistance shall not exceed 2,5 milliohms.

8.2.2. Installation of ESA under test

For large equipment mounted on a metal test stand, the test stand shall be considered a part of the ground plane for testing purposes and shall be bonded accordingly. The faces of the test sample shall be located at a minimum of 200 mm from the edge of the ground plane. All leads and cables shall be a minimum of 100 mm from the edge of the ground plane and the distance to the ground plane (from the lowest point of the harness) shall be 50 ± 5 mm above the ground plane. Power shall be applied to the ESA under test via an (5 μ H/50 Ω) artificial network (AN).

8.3. Field generating device type, position and orientation

8.3.1. Field generating device type

8.3.1.1. The field generating device type(s) shall be chosen such that the desired field strength is achieved at the reference point (see point 8.3.4) at the appropriate frequencies.

8.3.1.2. The field generating device(s) may be (an) antenna(s) or a plate antenna.

8.3.1.3. The construction and orientation of any field generating device shall be such that the generated field is polarised: from 20 to 1000 MHz horizontally or vertically.

8.3.2. Height and distance of measurement

8.3.2.1. Height

The phase centre of any antenna shall be 150 ± 10 mm above the ground plane on which the ESA under test rests. No parts of any antenna's radiating elements shall be closer than 250 mm to the floor of the facility.

8.3.2.2. Distance of measurement

8.3.2.2.1. In-service conditions may best be approximated by placing the field generating device as far from the ESA as practical. This distance will typically lie within the range 1 to 5 m.

8.3.2.2.2. If the test is carried out in an enclosed facility, the field generating device's radiating elements shall be no closer than 0,5 m to any radio absorbent material and no closer than 1,5 m to the wall of the facility. There shall be no absorbent material interposed between the transmitting antenna and the ESA under test.

8.3.3. Antenna location relative to ESA under test

8.3.3.1. The field generating device's radiating elements shall not be closer than 0,5 m to the edge of the ground plane.

8.3.3.2. The phase centre of the field generating device shall be on a plane which:

(a) is perpendicular to the ground plane;

(b) bisects the edge of the ground plane and the midpoint of the principal portion of the wiring harness; and

(c) is perpendicular to the edge of the ground plane and the principal portion of the wiring harness.

The field generating device shall be placed parallel to this plane (see Figures 1 and 2 in Appendix 4).

8.3.3.3. Any field generating device which is placed over the ground plane or ESA under test shall extend over the ESA under test.

8.3.4. Reference point

For the purpose of this Chapter the reference point is the point at which the field strength shall be established and shall be defined as follows:

8.3.4.1. at least 1 m horizontally from the antenna phase centre or at least 1 m vertically from the radiating elements of a plate antenna;

8.3.4.2. on a plane which:

(a) is perpendicular to the ground plane;

(b) is perpendicular to the edge of the ground plane along which the principal portion of the wiring harness runs;

(c) bisects the edge of the ground plane and the midpoint of the principal portion of the wiring harness; and

(d) is coincident with the midpoint of the principal portion of the harness which runs along the edge of the ground plane closest to the antenna;

8.3.4.3. 150 ± 10 mm above the ground plane.

8.4. Generation of required field strength: test methodology

8.4.1. The 'substitution method' shall be used to establish the test field conditions.

8.4.2. Substitution method

At each desired test frequency, a level of power shall be fed into the field generating device to produce the required field strength at the reference point (as defined in point 8.3.4 in the test area with the ESA under test absent), this level of forward power, or another parameter directly related to the forward power required to define the field, shall be measured and the results recorded. These results shall be used for type-approval tests unless changes occur in the facilities or equipment which necessitates this procedure being repeated.

8.4.3. Extraneous equipment must be a minimum of 1 m from the reference point during calibration.

8.4.4. Field strength measuring device

A suitable compact field strength measuring device shall be used to determine the field strength during the calibration phase of the substitution method.

8.4.5. The phase centre of the field strength measuring device shall be positioned at the reference point.

8.4.6. The ESA under test which may include an additional ground plane shall then be introduced into the test facility and positioned in accordance with the requirements of point 8.3. If a second ground plane is used, then it shall be within 5 mm of the bench ground plane and electrically bounded to it. The required forward power defined in point 8.4.2 at each frequency as defined in point 5 shall then be applied to the field generating device.

8.4.7. Whatever parameter was chosen in point 8.4.2 to define the field, the same parameter shall be used to determine the field strength during the test.

8.5. Field strength contour

8.5.1. During the calibration phase of the substitution method (prior to an ESA under test being introduced into the test area), the field strength shall not be less than 50 % of the nominal field strength 0,5 ± 0,05 m either side of the reference point on a line parallel to the edge of the ground plane nearest to the antenna and passing through the reference point.

9. TEM CELL TESTING

9.1. Test method

The transverse electromagnetic mode (TEM) cell generates homogeneous fields between the internal conductor (septum) and housing (ground plane). It is used for testing ESAs (see Figure 1 in Appendix 3).

9.2. Field strength measurement in a TEM cell

9.2.1. The electric field in the TEM cell shall be determined by using the equation:

$|E| = (\sqrt{(P \times Z)})/d$

E	=	Electric field (volts/metre)
P	=	Power flowing into cell (W)
Z	=	Impedance of cell (50 Ω)
d	=	Separation distance (metres) between the upper wall and the plate (septum).

9.2.2. Alternatively an appropriate field strength sensor shall be placed in the upper half of the TEM cell. In this part of the TEM cell the electronic control unit(s) has only a small influence on the test field. The output of this sensor shall determine the field strength.

9.3. Dimensions of TEM cell

In order to maintain a homogeneous field in the TEM cell and to obtain repeatable measurement results, the test object shall not be larger than one-third of the cell inside height.

Recommended TEM cell dimensions are given in Appendix 3, Figures 2 and 3.

9.4. Power, signal and control wires

The TEM cell shall be attached to a co-axial socket panel and connected as closely as possible to a plug connector with an adequate number of pins. The supply and signal leads from the plug connector in the cell wall shall be directly connected to the test object.

The external components such as sensors, power supply and control elements can be connected:

(a) to a screened peripheral;

(b) to a vehicle next to the TEM cell; or

(c) directly to the screened patchboard.

Screened cables must be used in connecting the TEM cell to the peripheral or the vehicle if the vehicle or peripheral is not in the same or adjacent screened room.

10. BULK CURRENT INJECTION TESTING

10.1. Test method

This is a method of carrying out immunity tests by inducing currents directly into a wiring harness using a current injection probe. The injection probe consists of a coupling clamp

through which the cables of the ESA under test are passed. Immunity tests can then be carried out by varying the frequency of the induced signals.

The ESA under test may be installed on a ground plane as in point 8.2.1 or in a vehicle in accordance with the vehicle design specification.

10.2. Calibration of bulk current injection probe prior to commencing tests

The injection probe shall be mounted in a calibration jig. Whilst sweeping the test frequency range, the power required to achieve the current specified in point 5.7.2.1 of Chapter 1 shall be monitored. This method calibrates the bulk current injection system forward power versus current prior to testing, and it is this forward power which shall be applied to the injection probe when connected to the ESA under test via the cables used during calibration. It should be noted that the monitored power applied to the injection probe is the forward power.

10.3. Installation of the ESA under test

For an ESA mounted on a ground plane as in point 8.2.1 all cables in the wiring harness shall be terminated as realistically as possible and preferably with real loads and actuators. For both vehicle mounted and ground plane mounted ESAs the current injection probe shall be mounted in turn around all the wires in the wiring harness to each connector and 150 ± 10mm from each connector of the ESA under test electronic control units (ECU), instrument modules or active sensors as illustrated in Appendix 2.

10.4. Power, signal and control wires

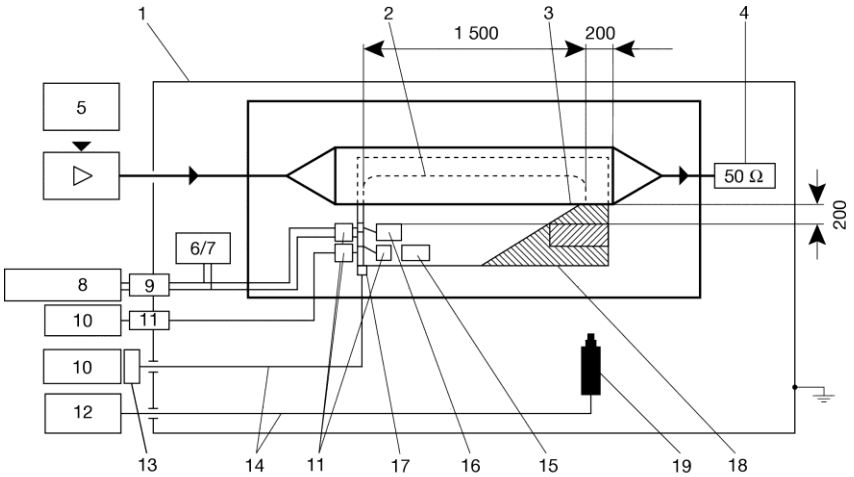
For an ESA under test mounted on a ground plane as in point 8.2.1, a wiring harness shall be connected between an artificial network (AN) and the principal electronic control unit (ECU). This harness shall run parallel to the edge of the ground plane and 200 mm minimum from its edge. This harness shall contain the power feed wire which is used to connect the vehicle battery to this ECU and the power return wire if used on the vehicle.

The distance from the ECU to the AN shall be 1,0 ± 0,1 m or shall be the harness length between the ECU and the battery as used on the vehicle, if known, whichever is the shorter. If a vehicle harness is used then any line branches which occur in this length shall be routed along the ground plane but perpendicular away from the edge of the ground plane. Otherwise the ESA under test wires which are in this length shall break out at the AN.

Appendix 1

FIGURE 1

150 mm stripline testing



1 = Shielded room
2 = Cable harness
3 = Test object
4 = Terminating resistance
5 = Frequency generator
6/7 = Alternative battery
8 = Power supply
9 = Filter
10 = Peripheral
11 = Filter
12 = Video peripheral
13 = Opto-electrical converter
14 = Optical lines
15 = Non irradiation-proof peripheral
16 = Linear or radiation-proof peripheral
17 = Opto-electrical converter
18 = Insulating base
19 = Video camera

All dimensions in millimetres

FIGURE 2

150 mm stripline testing

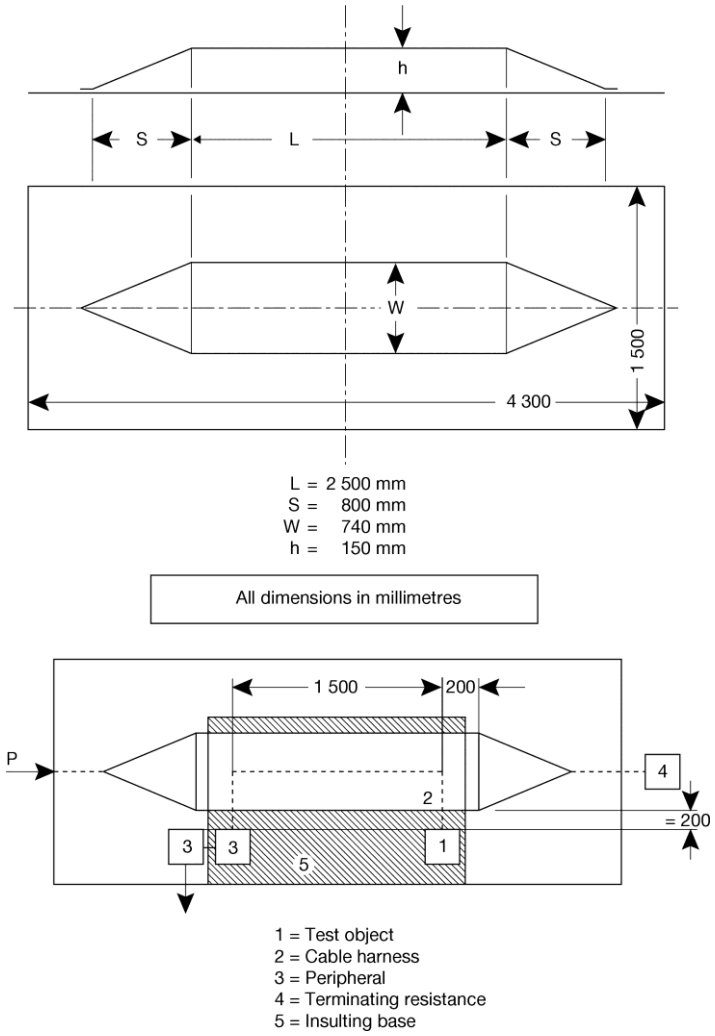
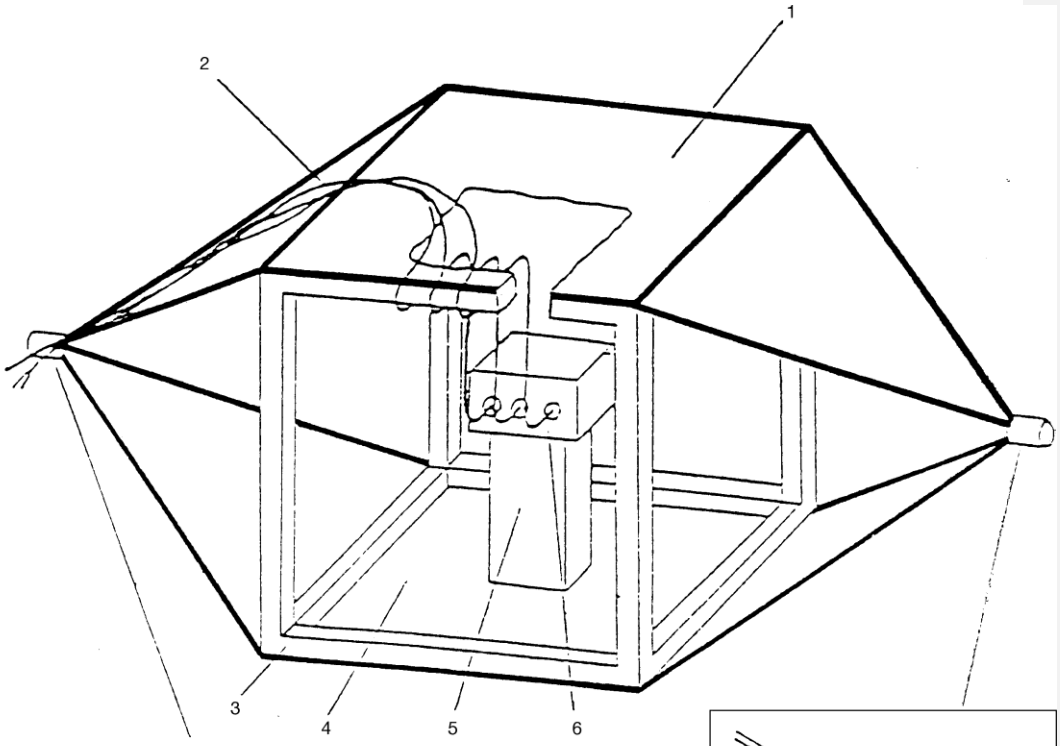
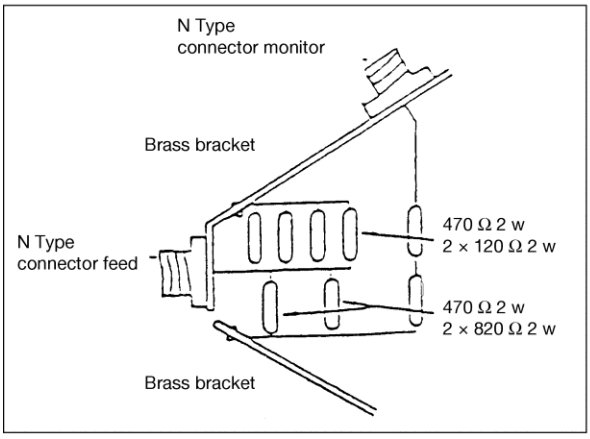


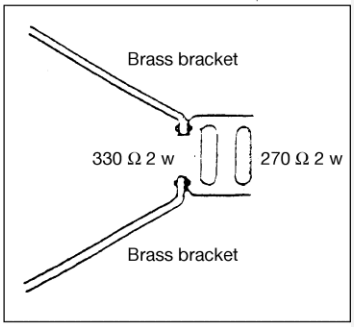
FIGURE 3

800 mm stripline testing





Details of stripline feed



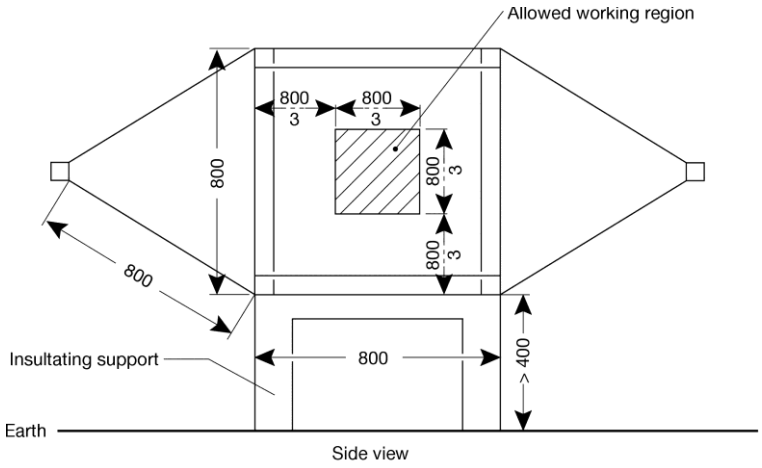
Details of stripline termination

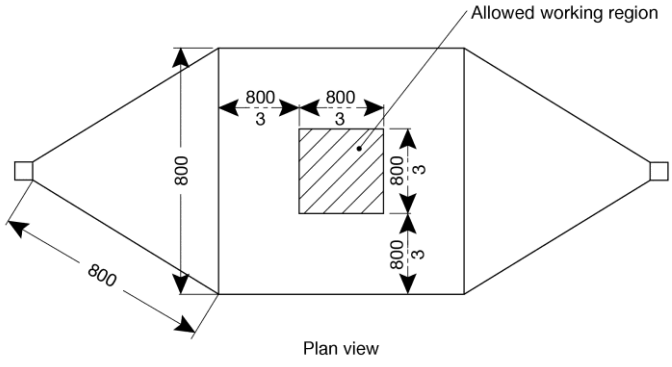
1	=	Ground plate
2	=	Main loom and sensor/actuator cables
3	=	Wooden frame
4	=	Driven plate

5	=	Insulator
6	=	Test object

FIGURE 4

800 mm stripline dimensions

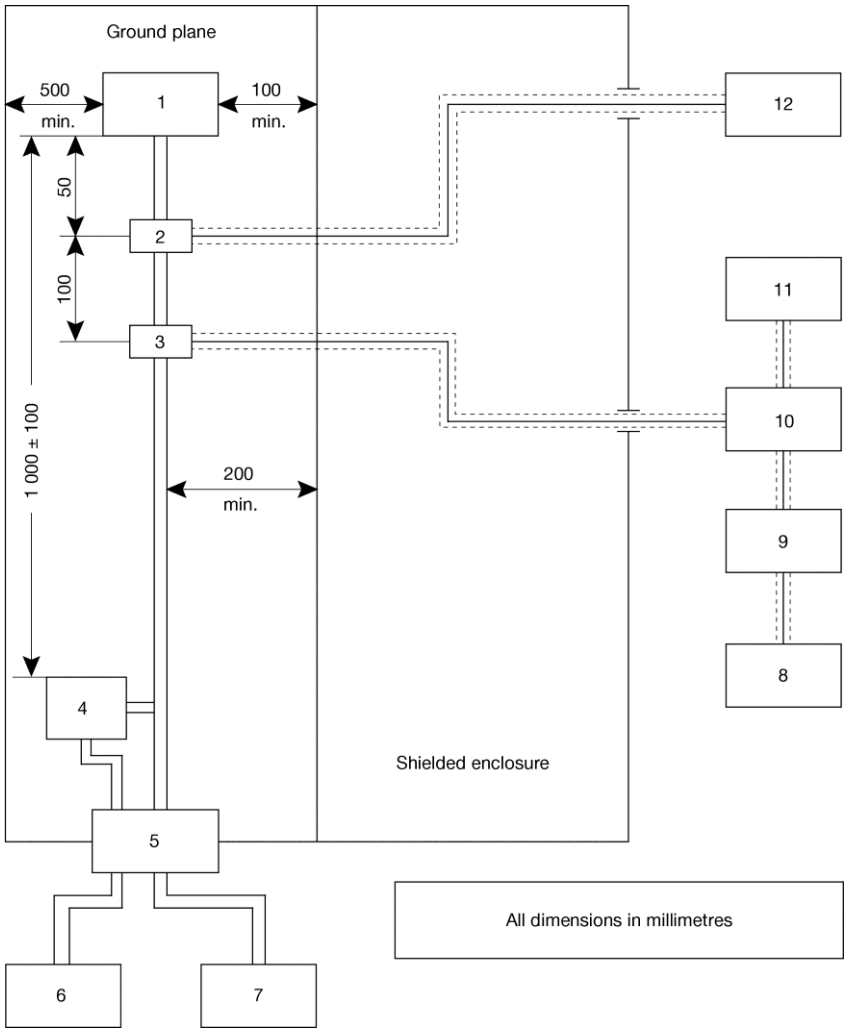




All dimensions in millimetres

Appendix 2

EXAMPLE OF BCI TEST CONFIGURATION



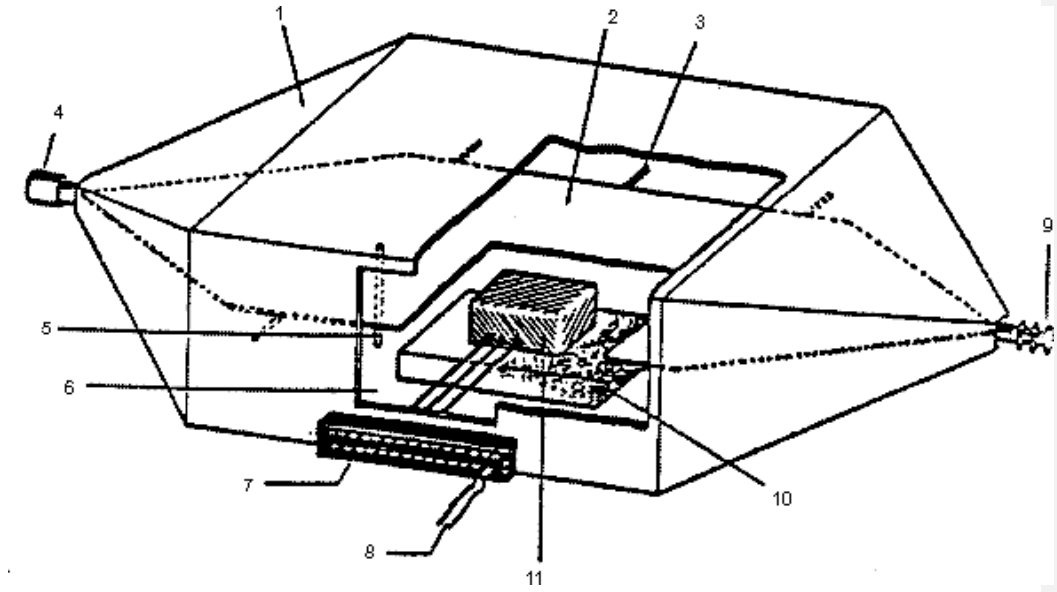
1	=	DUT
2	=	RF measuring probe (optional)
3	=	RF injection probe
4	=	Artificial network
5	=	Shielded room filter network
6	=	Power source

7	=	DUT interface: stimulation and monitoring equipment
8	=	Signal generator
9	=	Broadband amplifier
10	=	RF 50 Ω directional complex
11	=	RF power level measuring device or equivalent
12	=	Spectrum analyser or equivalent (optional)

Appendix 3

FIGURE 1

TEM cell testing



1	=	Outer conductor, shield
2	=	Inner conductor (septum)
3	=	Insulator
4	=	Input
5	=	Insulator
6	=	Door
7	=	Socket panel
8	=	Test object power supply
9	=	Terminating resistance 50 Ω
10	=	Insulation
11	=	Test object (maximum height one third of distance between cell floor and septum)

FIGURE 2

Design of rectangular TEM cell

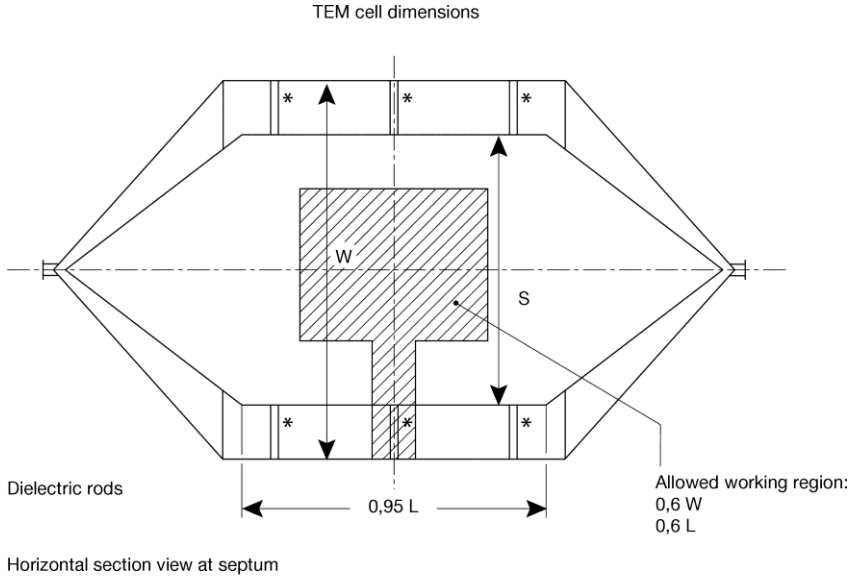


FIGURE 3

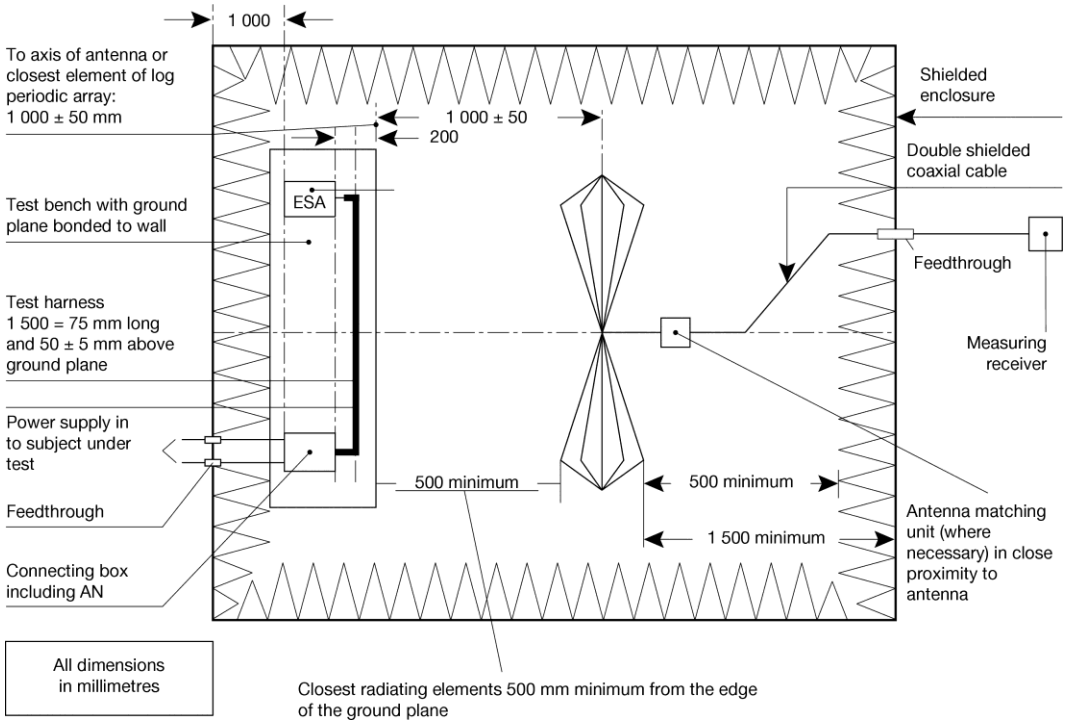
The following table shows the dimensions for constructing a cell with specified upper frequency limits:

Upper frequency (MHz)	Cell form factor W: b	Cell form factor L/W	Plate separation b (cm)	Septum S (cm)
200	1,69	0,66	56	70
200	1,00	1,00	60	50

Typical TEM cell dimensions

Appendix 4

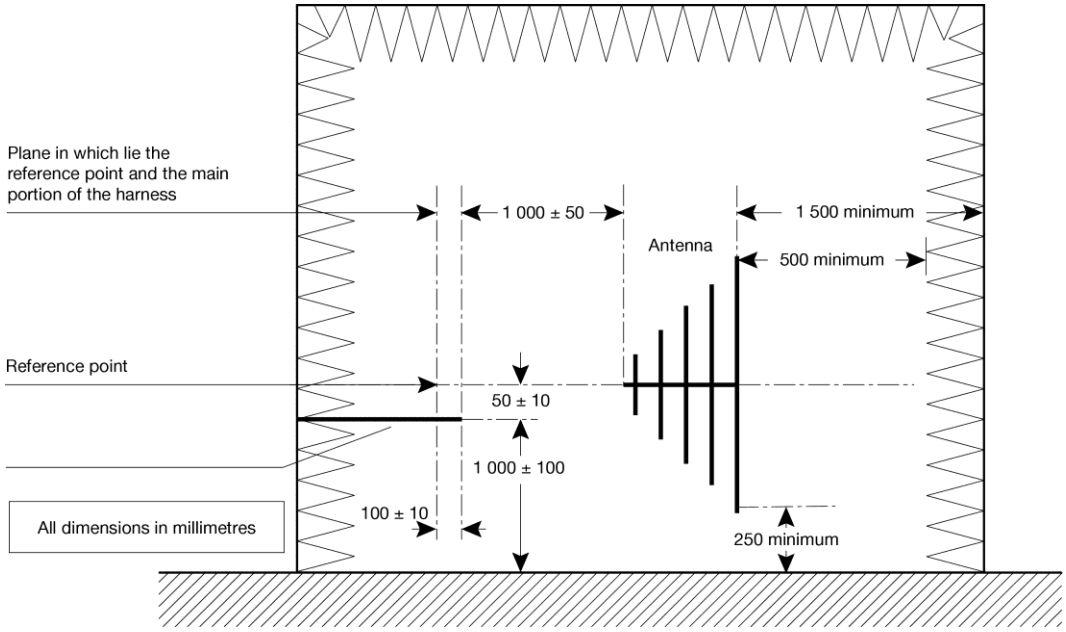
FIGURE 1



Free field ESA immunity test

Test layout (general plan view)

FIGURE 2



Free field ESA immunity test

View of test bench plane of longitudinal symmetry

CHAPTER 8

Alternatively to the requirements of Chapters 1 to 7 in this Annex the requirements of either the UNECE regulation 10 or of the ISO 14982 : 2009 can be used.

Alternative requirements

Comment [v78]: IT, CEMA comment. V3

Comment [v79]: 1) UNECE Regulation 10

2) ISO 14982 (2009)
Rem: this ISO is since 1998.

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ANNEX XVI
Requirements on audible warning devices

1. The audible warning device can be granted component type-approval according to the requirements for N-category vehicles in the UNECE Regulation 28 supplement 3.

Comment [v80]: UK comment. COM: support. Audible warning devices will be regulated according to R28 after the repeal of Dir. 70/388/EEC by the Reg (EC) 661/2009. V3.

2.*Characteristics of the audible warning device when fitted to the tractor*

2.1. Acoustic tests

When a tractor is type approved, the characteristics of the warning device fitted to that type of tractor shall be tested as follows:

2.1.1. The sound pressure level of the device when fitted to the tractor shall be measured at a point 7 metres in front of the tractor, at a site which is open and as level as possible. The engine of the tractor shall be stopped. The effective voltage shall be that laid down in point 1.2.1. of Annex I to Directive 70/388/EEC.

2.1.2. Measurements shall be made on the 'A' weighting scale of the IEC (International Electrotechnical Commission) standard.

2.1.3. The maximum sound pressure level shall be determined at a height between 0,5 and 1,5 metres above ground level.

2.1.4. The maximum value for the sound-pressure level must be at least 93 dB(A) and at the most 112 dB(A).

ANNEX XVII
Requirements on heating systems

1. Requirements for all T- and C-category vehicles, where such system is fitted.

1.1. Heating and~~,~~ cooling ~~and ventilation systems~~, where fitted, shall be tested in accordance with the~~, and comply with the performance requirements of,~~ ISO 14269-2:1997, sections 8 and 9, respectively. **Test reports shall be included into the technical information document.**

1.2. Heating systems may **alternatively** comply with the requirements for motor vehicles contained in Directive 2001/56/EC or with the requirements for N-category vehicles contained in the UNECE regulation 122.

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Comment [v81]: IT, CEMA comment. COM: To clarify the correspondence of test requirements sections (8 and 9) for heating and cooling. V3

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Comment [v82]: UK comment. COM: T-cat vehicles not in scope of R122. V3.

ANNEX XVIII
Requirements on devices to prevent unauthorised use

Comment [v83]: Alternative ISO 26322 and UNECE, as below. V3

1. Requirements for all T- and C-category vehicles until 31 December 2017:

1.1. Starting and stopping the engine

1.1.1. A means shall be provided to enable prevention of inadvertent and/or unauthorized starting of the engine. Examples of such means include but are not limited to:

– an ignition or start switch with a removable key;

– a lockable cab;

– a lockable cover over the ignition or start switch;

– a security ignition or starting lock (e.g. key card activated);

– a lockable battery disconnect switch.

2. Requirements for all T- and C-category vehicles applying from 1 January 2018

2.1. **Vehicles which are fitted with handlebars shall meet all the relevant requirements of UNECE regulation No. 62. The explanatory notes in paragraphs 3. to 3.1.6. below shall be taken into account.**

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2.2. **Vehicles which are not fitted with handlebars shall meet all the relevant requirements of UNECE regulation No. 18,** points 2, 5, 6.2 and 6.3, **as prescribed for vehicle category N2. The explanatory notes in paragraphs 4. to 4.1.4. shall be taken into account.**

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3. Explanatory notes to UNECE regulation No. 62

3.1. The technical service shall ensure that compliance with paragraph 5.3. of UNECE regulation No. 62 is checked as follows.

3.1.1. Compliance to the requirements shall be demonstrated by a person with similar physical characteristics as a 95th percentile anthropomorphic dummy and the physical force which such a person can reasonably extend to the vehicle and tools.

3.1.2. Low-cost and easily concealable tools include slim crow bars with straight, curved, narrow and wide tips, up to a length of 350 mm along with a hammer with a length up to 350 mm and a weight of 0.5 kg which may be used together in order to demonstrate resistance to rendering the protective device inoperable. It also includes similarly dimensioned bolt or wire cutters as well as battery operated cutting and grinding devices.

3.1.3. It shall not be considered as attracting attention if rendering the protective device inoperable can be achieved within a total timeframe of 30 seconds of which a 5 seconds timeframe may display high peak noise due to hammering and/or jamming actions onto the vehicle. The technical service shall assess multiple scenarios and thus different attempts of rendering the protective device inoperable, each time on an undamaged vehicle.

3.1.4. If vehicle structures such as body panels can be disassembled simply by means of loosening standard fasteners or clips in order to access the protective device, they shall first be removed in order to facilitate the assessment of the protective device in accordance with paragraphs 3.1.1. to 3.1.3.

3.1.5. In accordance with the requirements as set out in paragraph 5.9. of UNECE regulation No. 62 the protective device shall be able to withstand an application of a torque of 200 Nm about the axis of the steering shaft without damage to the steering mechanism likely to compromise safety. However, this torque value may be exceeded for the purpose of checking compliance with paragraph 5.3. of UNECE regulation No. 62, as permanent damage (e.g. opening, rendering ineffective, destruction) may occur to the protective device as a result of this assessment. Furthermore, the relevant torque shall be applied by means of repeated peak application of physical force, at least twice per second, by the person as described in paragraph 3.1.1., if appropriate onto just one end of the handlebars by both hands at the same time. The duration of this handlebar jamming test shall not exceed 5 seconds.

3.1.6. So-called “security torx”, “tamper-resistant torx” or “pin-in torx” as well as any other commercially available variants of bolts or nuts are all considered to be standard fasteners and are thus deemed not to be in compliance with paragraph 5.3. of UNECE regulation No. 62 with respect to the offered level of protection.

4. Explanatory notes to UNECE regulation No. 18

4.1 The technical service shall ensure that compliance with paragraph 5.4. of UNECE regulation No. 18 is checked as follows.

4.1.1. Compliance to the requirements shall be demonstrated by a person with similar physical characteristics as a 95th percentile anthropomorphic dummy and the physical force which such a person can reasonably extend to the vehicle and tools.

4.1.2. Low-cost and easily concealable tools include slim crow bars with straight, curved, narrow and wide tips, up to a length of 350 mm along with a hammer with a length up to 350 mm and a weight of 0.5 kg which may be used together in order to demonstrate resistance to rendering the protective device inoperable. It also includes similarly dimensioned bolt or wire cutters as well as battery operated cutting and grinding devices.

4.1.3. It shall not be considered as attracting attention if rendering the protective device inoperable can be achieved within a total timeframe of 30 seconds of which a 5 seconds timeframe may display high peak noise due to hammering and/or jamming actions onto the vehicle. The technical service shall assess multiple scenarios and thus different attempts of rendering the protective device inoperable, each time on an undamaged vehicle.

4.1.4. So-called “security torx”, “tamper-resistant torx” or “pin-in torx” as well as any other commercially available variants of bolts or nuts are all considered to be standard fasteners and are thus deemed not to be in compliance with paragraph 5.4. of UNECE regulation No. 18 with respect to the offered level of protection.

5. Requirements for all R- and S-category vehicles

A means shall be provided to enable prevention of inadvertent and/or unauthorized use of the machinery on such vehicles, if this is fitted. Examples of such means include but are not limited to:

– a lockable cover of power transmission to the machinery;

– a lockable cover over other activating or control switch(es);

– a lockable disconnect switch for independent power source(s), if fitted, of the machinery;

– information warning and markings on the vehicle, according to the requirements of Annex XXVI to << **RVCR** >>.

Comment [v84]: Following to ES comment. V3

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ANNEX XIX

Requirements on registration plates

1. SHAPE AND DIMENSIONS OF THE SPACE FOR MOUNTING REAR REGISTRATION PLATES

The space for mounting shall comprise ~~an even~~a flat or virtually ~~even~~ flat rectangular surface with the following minimum dimensions:

~~length: 255 or 520 mm,~~

~~width: 165 or 120 mm,~~

~~The choice must take account of the dimensions in force in the Member States of destination.~~**either**

width: 520 mm

height: 120 mm

or

width: 255 mm

height: 165 mm.

[[according to Reg (EU) 1003/2010.]]

The surface for mounting the registration plate on light agricultural and forestry vehicles will comply with the following minimum dimensions:

width: 100 mm

height: 175 mm

or

width: 145 mm

height: 125 mm

For vehicles of categories L3e, L4e, L5e and L7e:

width: 280 mm

height: 200 mm

[[according to L-category RVCR]]

2. LOCATION OF THE SPACE FOR MOUNTING AND THE FIXING OF THE PLATES

The space for mounting shall be such that, after correct fixing, the plates shall have the following characteristics:

2.1. Lateral position of the plate

The centre of the plate may not be further to the right than the plane of symmetry of the tractor. The left lateral edge of the plate may not be further to the left than the vertical plane parallel to the plane of symmetry of the tractor and tangent to the point where the cross section of the tractor is at its widest.

2.2. Position of the plate in relation to the longitudinal plane of symmetry of the tractor

The plate shall be perpendicular or practically perpendicular to the plane of symmetry of the tractor.

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Comment [v85]: V3

Comment [v86]: This drafting part according to UK comment. V3

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Comment [v87]: V3

2.3. Position of the plate in relation to the vertical plane

The plate shall be vertical within a tolerance of 5°. However, where the shape of the tractor so requires, it may be inclined to the vertical:

2.3.1. at not more than 30° when the surface bearing the registration number is inclined upwards, provided that the height of the upper edge of the plate is not more than 1,2 metres from the ground.

2.3.2. at not more than 15° when the surface bearing the registration number is inclined downwards, provided that the height of the upper edge of the plate is more than 1,2 metres from the ground.

2.4. Height of the plate from the ground

The height of the lower edge of the plate above ground may not be less than 0,3 metres; the height of the upper edge of the plate above ground must not exceed 4 metres.

2.5. Determination of the height of the plate from the ground

The heights given in points 2.3 and 2.4 shall be measured with the tractor unladen.

ANNEX XX

Requirements on statutory plates and markings

Definitions specific to this Annex

'Statutory plate' means the plate that the manufacturer shall affix to each vehicle manufactured in conformity with the approved type as set out in Article 34 of Regulation (EU) 167/2013 and it will have the appropriate marking in accordance with the provisions established in this Annex.

'Statutory markings' means any mandatory markings ~~additional to~~together with the type-approval mark set out in Article 34 of Regulation (EU) No 167/2013 which, in accordance with the provisions established in this Annex, shall be affixed to vehicles, components or separate technical units when they are manufactured in conformity with the approved type or for its identification during the type approval processes.

1. GENERAL

1.1. All agricultural or forestry vehicles must be provided with the plate and inscriptions described in the following points. The plate and inscriptions are attached either by the manufacturer or by his authorised representative.

1.2. All components or separate technical units conforming to a type approved pursuant to the Regulation (EU) 167/2013 shall bear an EU type-approval mark described in point 5.1 or a mark according to Article 34 (2) of the Regulation (EU) 167/2013.

2. MANUFACTURER'S PLATE

2.1. A manufacturer's plate, modelled on that shown in the Appendix 1 hereto, must be firmly attached in a conspicuous and readily accessible position on a part normally not subject to replacement in use. It must show clearly and indelibly the following information in the order listed.

2.1.1. Name of manufacturer.

2.1.2. Type of ~~tractor~~ vehicle ~~(and version if necessary)~~ (and variant and version if necessary).

2.1.3. EU type-approval number:

The EU type-approval number consists of the lower-case letter 'e' followed by the distinguishing code (letter(s) or number) of the Member State which has granted the EC type-approval:

1 for Germany; 2 for France; 3 for Italy; 4 for the Netherlands; 5 for Sweden; 6 for Belgium; 7 for Hungary; 8 for the Czech Republic; 9 for Spain; 11 for the United Kingdom; 12 for Austria; 13 for Luxembourg; 17 for Finland; 18 for Denmark; 19 for Romania; 20 for Poland; 21 for Portugal; 23 for Greece; 24 for Ireland; [25 for Croatia]; 26 for Slovenia; 27 for Slovakia; 29 for Estonia; 32 for Latvia; 34 for Bulgaria; 36 for Lithuania; 49 for Cyprus and 50 for Malta, and the type-approval number which corresponds to the number of the type-approval certificate issued for the type of vehicle.

Comment [v88]: COM: double-check that the split between RAR and this act is in line with the empowerment in the codecision act.
V3

Comment [v89]: UK comment.V3

Comment [v90]: "if necessary": as per current legislation. The text in parenthesis: NL supports, FI, CEMA to delete it. V3

Comment [v91]: UK comment: To be transferred to RAR. V3.

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An asterisk is placed between the letter 'e' followed by the distinguishing code of the country granting EC type-approval and the type-approval number.

2.1.4. ~~Tractor~~ Vehicle identification number.

2.1.5. Minimum and maximum values for the maximum permitted laden mass of the ~~tractor~~vehicle, depending on the possible types of tyre which may be fitted.

2.1.6. Maximum permitted vehicle mass bearing on each ~~tractor~~ vehicle axle, according to the possible types of tyre which may be fitted; this information must be listed in order from front to rear.

2.1.7. Technically permissible towable mass(es):

– unbraked towable mass,

– ~~independently braked towable mass~~,

– inertia braked towable mass,

– towable mass fitted with hydraulic or pneumatic braking.

2.1.8. Member States may require, for ~~tractors~~ vehicles placed on their markets, that the country of final assembly also be indicated in addition to the name of the manufacturer where the final assembly was carried out elsewhere than in the manufacturer's country, but not in a Member State of the Community.

2.2. The manufacturer may give additional information below or to the side of the prescribed inscriptions, outside a clearly marked rectangle enclosing only the information prescribed in points 2.1.1 to 2.1.7 (see example of manufacturer's plate).

3. ~~TRACTOR~~ VEHICLE IDENTIFICATION NUMBER

The ~~tractor~~ vehicle identification number is a fixed combination of characters assigned to each ~~tractor~~ vehicle by the manufacturer. Its purpose is to ensure that every ~~tractor~~vehicle, and in particular its type, can be clearly identified over a period of 30 years through the intermediary of the manufacturer, without a need for further reference.

The identification number shall comply with the following requirements:

3.1. It must be marked on the manufacturer's plate, and also on the chassis, or other similar structure.

3.1.1. It must wherever possible be entered on a single line.

3.1.2. It must be marked on the chassis or other similar structure, on the front right-hand side of the vehicle.

3.1.3. It must be placed in a clearly visible and accessible position by a method such as hammering or stamping, in such a way that it cannot be obliterated or deteriorate.

4. CHARACTERS

4.1. Roman letters and arabic numerals must be used for all of the markings provided for in points 2 and 3. However, the roman letters used in the markings provided for in points 2.1.1 and 3 must be capital letters.

4.2. For the ~~tractor~~ vehicle identification number:

4.2.1. use of the letters 'I' 'O' and 'Q' and dashes, asterisks and other special signs is not permitted;

4.2.2. the minimum height of the letters and figures should be as follows:

4.2.2.1. 7 mm for characters marked directly on the chassis, frame or other similar structure of the ~~tractor~~vehicle,

4.2.2.2. 4 mm for characters marked on the manufacturer's plate.

4.2.2.3. 4 mm for characters marked on a surface radius small than 28 mm.

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5. MARKING REQUIREMENTS FOR COMPONENTS AND SEPARATE TECHNICAL UNITS

5.1 Every separate technical unit or component, conforming to a type in respect of which EU separate technical unit or component type-approval has been granted in accordance with Chapter V of Regulation (EU) 167/2013, shall bear an EU separate technical unit or component type-approval mark, pursuant to Article 34 (2) of Regulation (EU) 167/2013, as set out in paragraph 5.2. below. In addition, the make, trade name or trade mark shall be marked in the vicinity of the EU type-approval mark. The markings shall be visible when installed on the vehicle without the need to remove any parts with the use of tools and shall be durably affixed (e.g. stamped, etched, laser inscribed, self destructing adhesive label).

5.2. The EU type-approval mark of a component or separate technical unit shall consist of a rectangle surrounding the letter 'e' followed by the distinguishing number of the Member State which has granted EU type-approval, as these are mentioned at the point 2.1.3 above.

It must also include in the vicinity of the rectangle the four-digit sequential number (with leading zeros as applicable) — hereinafter referred to as the 'base approval number' — contained in << Section [[appropriate number]] >> of the type-approval number shown on the EU type-approval certificate issued for the type of component or separate technical unit in question (see << Annex [[appropriate number RAR]]>>), preceded by the two figures indicating the sequence number assigned to the most recent major technical amendment to Regulation, on the date EU component type-approval was granted.

Comment [v92]: To determine which one

5.3. A general example of the EU type-approval mark is set out in Appendix 2.

Appendix 1

EXAMPLE OF A VEHICLE MANUFACTURER'S PLATE

The following example in no way prejudices the data which may actually be entered on the manufacturer's plate: it is given solely for information purposes.

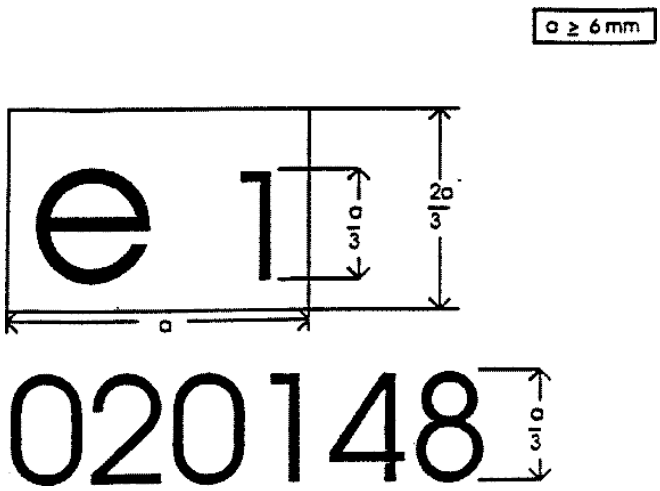
STELLA TRAKTOR WERKE
Type: 846 E
EC number: e * 1* 1 792
Identification number: GBS18041947
Total permissible mass(*): 4 820 to 6 310 kg Permissible front axle load(*): 2 390 to 3 200 kg Permissible rear axle road(*): 3 130 to 4 260 kg (*) Depending on the tyres
Permissible towable mass: — unbraked towable mass: 3 000 kg — independently-braked towable mass: 6 000 kg — inertia-braked towable mass: 3 000 kg — towable mass fitted with an assisted braking system (hydraulic or pneumatic): 12 000 kg

Comment [v93]: UK comment: to be deleted.
COM: in 2.1.7 above it is specified like as currently drafted.
V3

Appendix 2

EXAMPLE OF EU TYPE-APPROVAL MARKING FOR A COMPONENT OR SEPARATE TECHNICAL UNIT

Comment [v94]: UK comment: add sequential number of RVFSR version.
COM: RAR-question
V3



<< Example taken for EMC approval. Another one will be used, with the suitable explanation below of the various symbols – markings >>

ANNEX XXI
Requirements on dimensions and trailer masses

Defiitions specific to this Annex

‘Length of the tractor’ means:

— the length of the tractor measured between the vertical planes at right angles to the longitudinal axis of the tractor and passing the outermost points thereof, but excluding:

— all mirrors,

— all starting handles,

— all front or lateral position (side) lamps.

‘Width of the tractor’ means:

— the width of the tractor measured between the vertical planes parallel to the longitudinal axis of the tractor and passing through the outermost points thereof, but excluding:

— any mirrors,

— any direction indicators,

— any front, lateral or rear position (side) lamps; any parking lamps,

— any distortion of the tyres caused by the weight of the tractor,

— any folding components such as lift-up footrests and flexible mud-flaps.

‘Height of the tractor’ means the vertical distance between the ground and the point on the tractor the greatest distance from the ground, excluding the aerial. When this height is determined, the tractor must be fitted with new tyres having the greatest rolling radius specified by their manufacturer.

1. Dimensions

A. The maximum dimensions of a tractor are as follows:

1.1. length: 12 m;

1.2. width: 2,55 m (ignoring any bulging of the part of the tyres that is in contact with the ground);

1.3. height: 4 m.

1.4. The measurements intended to check these dimensions are carried out as follows:

— with the tractor unladen and in running order as indicated in the definition ‘Unladen mass of tractor in running order (mt)’ in Article 2, above,

— on a flat horizontal surface,

— with the tractor stationary and the engine switched off,

— with the new tyres at the normal pressure recommended by the manufacturer,

— with doors and windows closed,

— with the steering wheel in the straight-ahead position,

— without any agricultural or forestry implement attached to the tractor.

B. The maximum dimensions of a trailer are as follows:

1.1. length: ;

1.2. width: 2,55 m (ignoring any bulging of the part of the tyres that is in contact with the ground);

1.3. height: 4 m.

C. The maximum dimensions of an interchangeable towed equipment are as follows:

1.1. length: ;

1.2. width: 2,55 m (ignoring any bulging of the part of the tyres that is in contact with the ground);

1.3. height: 4 m.

2. Permissible towable (trailer) mass

2.1. The permissible towable mass must not exceed:

2.1.1. the technically permissible towable mass, recommended by the tractor manufacturer;

2.1.2. the towable mass laid down for the towing device pursuant to the EC component type-approval.

Comment [v95]: DK: introduce the ones of corresponding motor vehicles category O (cf Dir. 2007/46, Reg 1230/2013)
COM: where no limits from agri / forestry vehicles, this can be considered.
V3.

Comment [v96]: COM: Proposals by participants in WGAT.
V3

Comment [v97]: DK: introduce the ones of corresponding motor vehicles category O (cf Dir. 2007/46, Reg 1230/2013)
COM: where no limits from agri / forestry vehicles, this can be considered.
V3.

Comment [v98]: Proposals by participants in WGAT. V3

Comment [v99]: B. and C. for R and S category vehicles, respectively, introduced following to a comment by ES. To be further discussed in WGAT. V3

ANNEX XXII
Requirements on the maximum laden mass

1. The technically permissible maximum laden mass as stated by the manufacturer shall be accepted by the competent administration as the maximum permissible laden mass provided that:

   1.1. the results of any tests which that administration makes, in particular those in respect of braking and steering, are satisfactory;

   1.2. the maximum permissible laden mass and the maximum permissible mass per axle depending on the vehicle category does not exceed the values given in Table 1.

Table 1

Maximum Permissible Laden Mass and Maximum Permissible Mass per Axle Depending on the Vehicle Category

Vehicle category	Number of axles	Maximum permissible mass (t)	Maximum permissible mass per axle	
			Driven axle (t)	Non-driven axle (t)
T1, T2, T4.1	2	18 (laden)	11,5	10
	3	24 (laden)	11,5	10
T3	2 or 3	0,6 (unladen)	(a)	(a)
T4.3	2, 3 or 4	10 (laden)	(a)	(a)
T4.2	tbd	tbd	tbd	tbd
C	N/A	32	N/A	N/A
R	tbd	tbd	tbd	tbd
S	tbd	tbd	tbd	tbd

(a) It is not necessary to establish an axle limit for vehicle categories T3 and T4,3, as they have by definition limitations on the maximum permissible laden and/or unladen mass.

2. Whatever the state of loading of the tractor, the mass transmitted to the road by the wheels on the steering ~~forward~~ axle must not be less than 20 % of the unladen mass of that tractor.

Comment [v100]: CEMA comment. COM: meaning of "to be decided?" Propose: According to masses mentioned in Art. 4 of the co-decision act. Feedback from MS / stakeholders. V3

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Comment [v101]: CEMA comment. V3

Comment [v102]: DK support. V3

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Comment [v103]: CEMA comment. COM: meaning of "to be decided?" Propose: According to masses mentioned in Art. 4 of the co-decision act. Feedback from MS / stakeholders. V3

Comment [v104]: DK: introduce the ones of corresponding motor vehicles category O (cf Dir. 2007/46, Reg 1230/2013) COM: if these are suitbale limits for agri / forestry vehicles, this can be considered. V3.

Comment [v105]: UK comment. Refer to national requirements until limits accepted at EU level are set. COM: support. V3

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Comment [v106]: CEMA comment. COM: meaning of "to be decided?" Propose: According to masses mentioned in Art. 4 of the co-decision act. Feedback from MS / stakeholders. V3

Comment [v107]: COM: follow the national requirements, as in R, proposed by UK. V3

Comment [v108]: DK: introduce the ones of corresponding motor vehicles ...

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ANNEX XXIII
Requirements on ballast masses

If the tractor is to be fitted with ballast weights in order to meet the other requirements of EU approval, those ballast weights must be supplied by the manufacturer of the tractor, be intended for fitting, and bear the manufacturer's mark and a statement of their mass in kilograms to an accuracy of ± 5 %. Front ballast weights that have been designed for frequent removal/fitting must leave a safety clearance of at least 25 mm for the grab handles. The method of locating the ballast weights must be such that any inadvertent separation is avoided (e.g. in the event of tractor rollover).

ANNEX XXIV
Requirements on the safety of electrical systems

1. Requirements for all T, C, R and S vehicles equipped with electrical systems

1.1. Electrical equipment

1.1.1. Electrical cables shall be protected if located in potentially abrasive contact with surfaces and shall be resistant to, or protected against, contact with lubricant or fuel. Electrical cables shall be located so that no portion is in contact with the exhaust system, moving parts or sharp edges.

1.1.2. Fuses or other overload protection devices shall be installed in all electrical circuits except for high amperage circuits such as the starter-motor circuit and high-tension spark ignition system. Electrical distribution of these devices between circuits shall prevent the possibility of cutting off all operator alert systems simultaneously.

2. Requirements on static electricity safety

Such requirements are related to the safety of the fuel tank, in order to avoid spark-ignition risks, as provided in the paragraph 3 of Annex XXV to this Regulation.

3. All-electric vehicles in categories T2, T3, C2 or C3 should comply, as far as is practicable, with the technical provisions of Annex IV << L-category RVFSR >>.

Comment [v109]: To cover the case of light electrical vehicles, corresponding to utility ATVs / SbS, until the ISO norm, currently developed on the subject with CEMA, is ready. V3

ANNEX XXV
Requirements on fuel tanks

1. **This annex applies to tanks designed to contain the liquid fuel used primarily for the propulsion of the vehicle.**

Fuel tanks must be made so as to be corrosion resistant. They must satisfy the leakage tests carried out by the manufacturer at a pressure equal to double the working pressure but in any event not less than 0,3 bar. Any excess pressure or any pressure exceeding the working pressure must be automatically compensated by suitable devices (vents, safety valves etc.). The vents must be designed in such a way as to prevent any fire risk. The fuel must not escape through the fuel-tank cap or through the devices provided to compensate excess pressure even if the tank is completely overturned: a drip shall be tolerated.

2. Fuel tanks must be installed in such a way as to be protected from the consequences of an impact to the front or to the rear of the tractor; there shall be no protruding parts, sharp edges etc. near the tanks.

The fuel supply pipework and the filler orifice must be installed outside the cab.

3. Requirements related to static electricity safety of the fuel tank

The fuel tank and its accessory parts shall be designed and installed in the vehicle in such a way that any ignition hazard due to static electricity shall be avoided.

If necessary, measure(s) for charge dissipation shall be provided.

The manufacturer shall demonstrate to the Technical Service the measure(s) which guarantee the fulfilling of these requirements.

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Comment [v110]: According to the last version of UNECE R34, published in the OJ of EU. V3

ANNEX XXVI
Requirements on rear protective structures

1. GENERAL

Vehicles of category R covered by this Regulation must be designed so as to provide effective protection against underrunning from the rear by vehicles of categories M_1 and N_1[11]. They shall comply with the requirements of Section 5 to this Annex, will be granted a type-approval certificate according to the Annexes << ref to appropriate annexes of RAR >> and the EU type-approval mark will be affixed to them as described in Annex << ref to appropriate annexes of RAR >>.

2. REQUIREMENTS

2.1. Vehicles of categories R_a and R_b must be so constructed and/or equipped as to offer effective protection over their whole width against underrunning from the rear by a vehicle of categories M_1 and N_1[12].

Comment [v111]: To be confirmed by WGAT

2.1a. The vehicle shall be tested under the following conditions:

- it must be at rest on a level, flat, rigid and smooth surface,
- the front wheels must be in the straight-ahead position,
- tyres must be inflated to the pressure recommended by the vehicle manufacturer,
- the vehicle may, if necessary to achieve the test forces required, be restrained by any method specified by the vehicle manufacturer,
- if the vehicle is equipped with hydropneumatic, hydraulic or pneumatic suspension or a device for automatic levelling according to load, it must be tested with the suspension or device in the normal running condition specified by the manufacturer.

2.2. Any vehicle in one of the categories R_{1a}, R_{1b}, R_{2a} or R_{2b} will be deemed to satisfy the condition set out in 2.1:

- if it satisfies the conditions set out in 2.3, or
- if the ground clearance of the rear part of the unladen vehicle does not exceed 55 cm over a width which is not shorter than that of the rear axle by more than 10 cm on either side (excluding any tyre bulging close to the ground).

Comment [v112]: Confirm this figure within WGAT, if suitable for the agri / forestry trailers

Where there is more than one rear axle, the width to be considered is that of the widest.

This requirement must be satisfied at least on a line at a distance of not more than 45 cm from the rear extremity of the vehicle.

2.3. Any vehicle in one of the categories R_{3a}, R_{3b}, R_{4a} or R_{4b} will be deemed to satisfy the condition set out in 2.1 provided that:

- the vehicle is equipped with a special rear protective structure in accordance with the requirements of 2.4, or
- the vehicle is so designed and/or equipped at the rear that, by virtue of their shape and characteristics, its component parts can be regarded as replacing the rear protective

[11] As defined in Annex II Section A to Directive 70/156/EEC.
[12] As defined in Annex II Part A to Directive 2007/46/EC.

structure. Components whose combined function satisfies the requirements set out in 2.4 are considered to form a rear protective structure.

2.4. A device for protection against underrunning from the rear, hereinafter referred to as «device», generally consists of a cross-member and linking components connected to the chassis side-members or to whatever replaces them.

2.4a. For vehicles fitted with a platform lift the fitting of the rear protective structure may be interrupted for the purposes of the mechanism. In such cases, the following must apply:

2.4a.1. the lateral distance between the fitting elements of the rear protective structure and the elements of the platform lift, which make the interruption necessary, may amount to no more than 2,5 cm;

2.4a.2. the individual elements of the rear protective structure must, in each case, have an effective surface area of at least 350 cm^2;

2.4a.3. the individual elements of the rear protective structure must be of sufficient dimensions to comply with the requirements of paragraph 2.4.5.1, whereby the relative positions of the test points are determined. If the points P1 are located within the interruption area mentioned in 2.4a, the points P1 to be used will be located in the middle of any lateral section of the rear protective structure;

2.4a.4. for the area of interruption of the rear protective structure and for the purposes of the platform lift, point 2.4.1. need not apply.

It must have the following characteristics:

2.4.1. the device must be fitted as close to the rear of the vehicle as possible. When the vehicle is unladen[13] the lower edge of the device must at no point be more than 55 cm above the ground;

2.4.2. the width of the device must at no point exceed the width of the rear axle measured at the outermost points of the wheels, excluding the bulging of the tyres close to the ground, nor must it be more than 10 cm shorter on either side. Where there is more than one rear axle, the width to be considered is that of the widest;

2.4.3. the section height of the cross-member must be not less than 10 cm. The lateral extremities of the cross-member must not bend to the rear or have a sharp outer edge; this condition is fulfilled when the lateral extremities of the cross-member are rounded on the outside and have a radius of curvature of not less than 2,5 mm;

2.4.4. the device may be so designed that its position at the rear of the vehicle can be varied. In this event, there must be a guaranteed method of securing it in the service position so that any unintentional change of position is precluded. It must be possible for the operator to vary the position of the device by applying a force not exceeding 40 daN;

2.4.5. the device must offer adequate resistance to forces applied parallel to the longitudinal axis of the vehicle, and be connected, when in the service position, with the chassis side-members or whatever replaces them.

This requirement will be satisfied if it is shown that both during and after the application the horizontal distance between the rear of the device and the rear extremity of the vehicle does not exceed 40 cm at any of the points P1, P2 and P3. In measuring this distance, any part of the vehicle which is more than 3 m above the ground when the vehicle is unladen must be excluded;

[13] As defined in item 2.6 of Appendix 1.

2.4.5.1. points P1 are located 30 cm from the longitudinal planes tangential to the outer edges of the wheels on the rear axle; points P2, which are located on the line joining points P1, are symmetrical to the median longitudinal plane of the vehicle at a distance from each other of 70 to 100 cm inclusive, the exact position being specified by the manufacturer. The height above the ground of points P1 and P2 must be defined by the vehicle manufacturer within the lines that bound the device horizontally. The height must not, however, exceed 60 cm when the vehicle is unladen. P3 is the centre-point of the straight line joining points P2;

2.4.5.2. a horizontal force corresponding to 25 % of the maximum technically permissible mass of the vehicle but not exceeding 5×10^4N must be applied successively to both points P1 and to point P3;

2.4.5.3. a horizontal force corresponding to 50 % of the maximum technically permissible mass of the vehicle but not exceeding 10×10^4 N must be applied successively to both points P2;

2.4.5.4. the forces specified in 2.4.5.2 and 2.4.5.3 above must be applied separately. The order in which the forces are applied may be specified by the manufacturer;

2.4.5.5. whenever a practical test is performed to verify compliance with the abovementioned requirements, the following conditions must be fulfilled:

2.4.5.5.1. the device must be connected to the chassis side-members of the vehicle or to whatever replaces them;

2.4.5.5.2. the specified forces must be applied by rams which are suitably articulated (e.g. by means of universal joints) and must be parallel to the median longitudinal plane of the vehicle via a surface not more than 25 cm in height (the exact height must be indicated by the manufacturer) and 20 cm wide, with a radius of curvature of 5 ± 1 mm at the vertical edges; the centre of the surface is placed successively at points P1, P2 and P3.

2.5. By way of derogation from the abovementioned requirements, vehicles of the following categories need not comply with the requirements of this Annex as regards rear underrun protection:

– «slung» trailers and other similar trailers for the transport of logs or other very long items,

– vehicles for which rear underrun protection is incompatible with their use.

3. EXEMPTIONS

– If the vehicle is fitted with operational devices at the rear that would be compromised by fitting a rear protective structure, then the vehicle shall be exempted from the requirement.

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ANNEX XXVII
Requirements on lateral protection

1.*GENERAL PRESCRIPTIONS AND DEFINITIONS*

1.1. Every vehicle of categories R_{3b} and R_{4b} shall be so constructed and /or equipped as to offer, when a complete entity, effective protection to unprotected road users (pedestrians, cyclists, motorcyclists) against the risk of falling under the sides of the vehicle and being caught under the wheels[14].

This Annex does not apply to:

– trailers specially designed and constructed for the carriage of very long loads of indivisible length, such as timber,

– vehicles designed and constructed for special purposes where it is not possible, for practical reasons, to fit such lateral protection.

1.2. A vehicle shall be deemed to satisfy the requirement set out in point 1.1 if its side parts provide protection conforming to the provisions of the paragraphs below.

1.3. *Positioning of the vehicle for testing its compliance to lateral protection*

When tested for compliance with the technical specifications set out in point 2, the position of the vehicle shall be as follows:

– on a horizontal and flat surface,

– the steered wheels shall be in a straight-ahead position,

– the vehicle shall be unladen,

– semi-trailers shall be positioned on their supports with the loading survace horizontal.

2.*LATERAL PROTECTION PROVIDED BY A SPECIFIC DEVICE (SIDE GUARD)*

2.1. The device shall not increase the overall width of the vehicle and the main part of its outer surface shall not be more than 120 mm inboard from the outermost plane (maximum width) of the vehicle. Its forward end may be turned inwards on some vehicles in accordance with points 2.4.2 and 2.4.3. Its rearward end shall not be more than 30 mm inboard from the outermost edge of the rear tyres (excluding any bulging of the tyres close to the ground) over at least the rearmost 250 mm.

2.2. The outer surface of the device shall be smooth, substantially flat or horizontally corrugated and so far as possible continuous from front to rear; adjacent parts may however overlap, provided that the overlapping edge faces rearwards or downwards, or a gap of not more than 25 mm measured longitudinally may be left, provided that the rearward part does not protrude outboard of the forward part; domed heads of bolts or rivets may protrude beyond the surface to a distance not exceeding 10 mm and other parts may protrude to the same extent provided that they are smooth and similarly rounded; all external edges and corners shall be rounded with a radius not less than 2,5 mm (tested as prescribed in Appendix 1, below << from Directive 74/483/EEC >>).

[14] This Regulation does not prevent any country from having additional requirements for the vehicle parts forward of the front wheels and rearward of the rear wheels.

2.3. The device may consist of a continuous flat surface, or of one or more horizontal rails, or a combination of surface and rails; when rails are used, they shall be not more than 300 mm apart and not less than:

– 50 mm high in the case of category R_{3b} vehicles,

– 100 mm high and essentially flat in the case of R_{4b} vehicles. Combinations of surfaces and rails shall form a continuous side guard subject, however, to the provisions of point 2.2.

2.4. The *forward edge* of the side guard shall be constructed as follows:

2.4.1. Its position shall be:

2.4.1.1. on a drawbar trailer: not more than 500 mm to the rear of the transverse vertical plane tangential to the rearmost part of the tyre on the wheel immediately forward of the guard;

2.4.1.2. on a semi-trailer: not more than 250 mm to the rear of the transverse median plane of the support legs, if support legs are fitted, but in any case the distance of the front edge to the transverse plane passing through the centre of the kingpin in its rearmost position may not exceed 2,7 m.

2.4.2. Where the forward edge lies in otherwise open space, the edge shall consist of a continuous vertical member extending over the whole height of the guard; the outer and forward faces of this member shall measure at least 50 mm rearward and be turned 100 mm inwards in the case of R_{3b} and at least 100 mm rearwards and be turned 100 mm inwards in the case of R_{4b}.

2.5. The rearward edge of the side guard shall not be more than 300 mm forward of the transverse vertical plane tangential to the foremost part of the tyre on the wheel immediately to the rear; a continuous vertical member is not required on the rear edge.

2.6. The *lower edge* of the side guard shall at no point be more than 550 mm above the ground.

2.7. The *upper edge* of the guard shall not be more than 350 mm below that part of the structure of the vehicle, cut or contacted by a vertical plane tangential to the outer surface of the tyres, excluding any bulging close to the ground, except in the following cases:

2.7.1. where the plane in point 2.7 does not cut the structure of the vehicle, the upper edge shall be level with the surface of the load-carrying platform, of 950 mm from the ground, whichever is the less;

2.7.2. where the plane in point 2.7 cuts the structure of the vehicle at a level more than 1.3 m above the ground, then the upper edge of the side guard shall not be less than 950 mm above the ground;

2.8. Side guards shall be essentially rigid, securely mounted (they shall not be liable to loosening due to vibration in normal use of the vehicle) and made of metal or any other suitable material.

The side guard shall be considered suitable if it is capable of withstanding a horizontal static force of 1 kN applied perpendicularly to any part of its external surface by the centre of a ram the face of which is circular and flat, with a diameter of 220 mm ± 10 mm, and if the deflection of the guard under load is then not more than:

– 30 mm over the rearmost 250 mm of the guard, and

– 150 mm over the remainder of the guard.

2.8.1. The above requirement may be checked by means of calculations.

2.9. The side guard may not be used for the attachment of brake, air or hydraulic pipes.

3. *By derogation* from the above provisions, vehicles of the following types need comply only as indicated in each case:

3.1.*An extendible trailer* shall comply with all of the requirements of point 2, when closed to its minimum length; when the trailer is extended, the side guards shall comply with points 2.6, 2.7 and 2.8, and with either 2.4 or 2.5 but not necessarily both; extension of the trailer shall not produce gaps in the length of the side guards;

3.2. a *tank-vehicle* that is a vehicle designed solely for the carriage of fluid substance in a closed tank permanently fitted to the vehicle and provided with hose or pipe connections for loading or unloading, shall be fitted with side guards which comply so far as is practicable with all the requirements of point 2; strict compliance may be waived only where operational requirements make this necessary;

3.3. On a vehicle fitted with *extendible legs* to provide additional stability during loading, unloading or other operations for which the vehicle is designed, the side guard may be arranged with additional gaps where these are necessary to permit extension of the legs.

4. If the sides of the vehicle are so designed and/or equipped that by their shape and characteristics their component parts together meet the requirements of point 2, they may be regarded as replacing the side guards.

5. Alternative requirements

Alternatively to the requirements set in points 1.3 to 2.9 and 4 of this Annex, a vehicle of categories R_{3b} and R_{4b} shall be deemed to satisfy the requirement set out in point 1.1 if its side parts provide protection conforming instead to the provisions of the points 2 and 3, points 12 and 13 in Part I, point 14 in Part II, points 15 and 16 in Part III and Annex 3 of the UNCECE regulation 73 – Revision 1.

Comment [v113]: Verify in WGAT which of the following vehicles (in p. 3.1, 3.2 and 3.3) are agri / forestry trailers.

Comment [v114]: FI support. V3

Appendix 1

METHOD FOR DETERMINING THE HEIGHT OF EXTERNAL SURFACE PROJECTIONS

1. The height H of a projection is determined graphically by reference to the circumference of a 165 mm diameter circle, internally tangential to the external outline of the external surface at the section to be checked.

2. H is the maximum value of the distance, measured along a straight line passing through the centre of the 165 mm diameter circle, between the circumference of the aforesaid circle and the external contour of the projection (see Fig. 1).

3. In cases where it is not possible for a 100 mm diameter circle to contact externally part of the external outline of the external surface at the section under consideration, the surface outline in this area will be assumed to be that formed by the circumference of the 100 mm diameter circle between its tangent points with the external outline (see Fig. 2).

4. Drawings of the necessary sections through the external surface shall be provided by the manufacturer to allow the height of the projections referred to above to be measured.

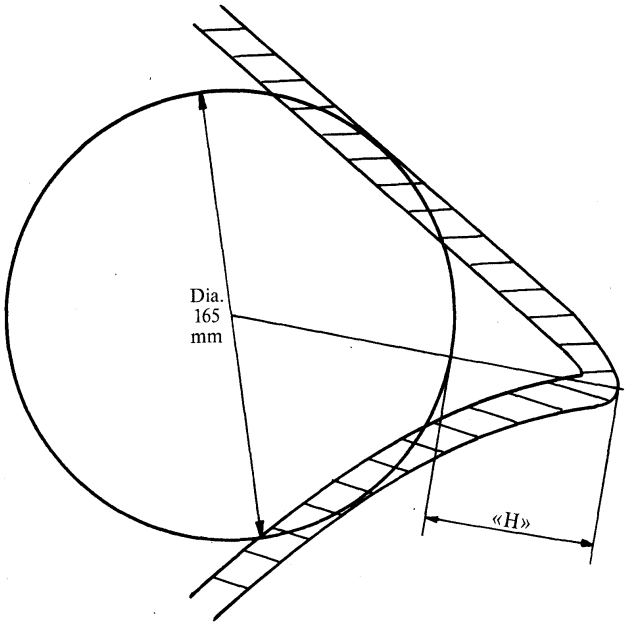

Figure 1

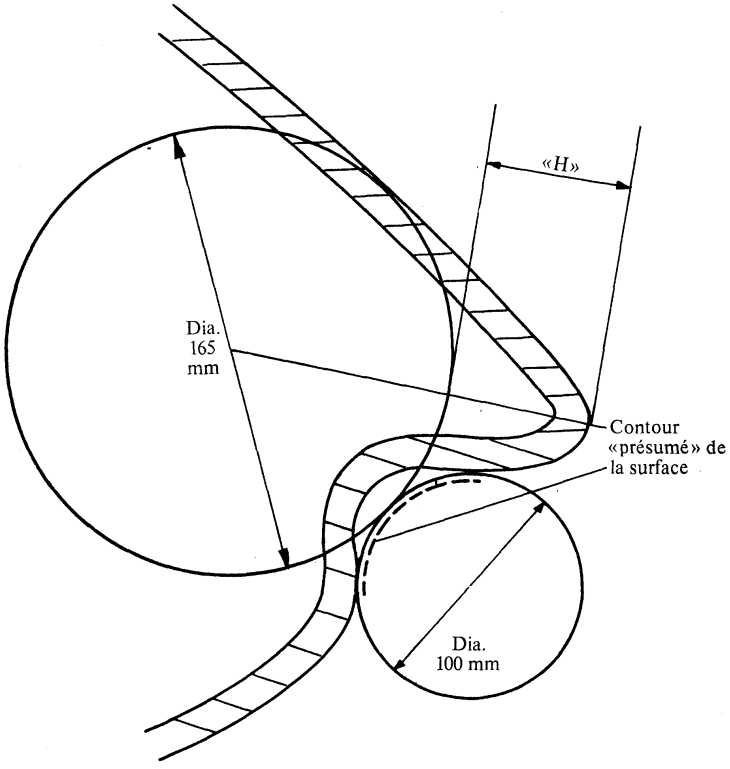

Figure 2

ANNEX XXVIII
Requirements on load platforms

1. The centre of gravity of the platform shall be situated between the axles.

2. The dimensions of the platform shall be such that:

— the length does not exceed 1,4 times the front or rear track of the tractor, whichever is the larger,

— the width does not exceed the maximum overall width of the tractor without equipment.

3. The platform shall be laid out symmetrically in relation to the longitudinal median plane of the tractor.

4. The height of the load platform above the ground shall be not more than 150 cm.

5. The type of platform and the way it is fitted shall be such that, with a normal load, the driver's field of vision remains adequate and the various compulsory lighting and light-signalling devices may continue to fulfil their proper function.

6. The load platform shall be detachable; it shall be attached to the tractor in such a way as to avoid any risk of accidental detachment.

7. In the case of tractors of category T4.3, the length of the platform shall not exceed 2.5 times the maximum front or rear track of the tractor, whichever is the larger.

8. **In the case of vehicles with multiple load platforms, the centre of gravity of the vehicle with loaded platform(s) and without driver shall be situated between the front-most and the rearmost axle in all loading conditions. Any load should be evenly distributed on the load platform(s).**

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ANNEX XXIX
Requirements on towing devices

COUPLING DEVICE

1.*Number*

Every tractor must have a special device to which it must be possible to attach a connection such as a tow-bar or a tow-rope for towing purposes.

2.*Position*

The device must be fitted to the front of the tractor, which must be equipped with a coupling pin or hook.

3.*Design*

The device shall be of the slotted-jaw type or a winch suitable for its application. The opening at the centre of the locking pin shall be 60 mm + 0,5/- 1,5 mm and the depth of the jaw measured from the centre of the pin shall be 62 mm ± 0,5 mm.

The coupling pin must have a diameter of 30 + 1,5 mm and be fitted with a device preventing it from leaving its seating during use. The securing device must be non-detachable.

The tolerance of + 1,5 mm referred to above should not be regarded as a manufacturing tolerance but as a permissible variation in nominal dimensions for pins of different designs.

4. Large tractors

The dimensions of paragraph 3 can be exceeded if the manufacturer deems that they are not adequate for the size or mass of the vehicle.

5. Instructions:

The correct use of the towing device shall be explained in the Operator's manual, according to the requirements on the latter in << RVCR >>.

Comment [v115]: ATVEA comment. V3

Comment [v116]: ATVEA comment. V3

Comment [v117]: UK comment: use probably requirements of Reg 1005/2010. COM: necessary, provided the ATVEA comments above? V3

Comment [v118]: COM: CEMA to precise the tractors category(ies). T4.2? V3

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Comment [v119]: Points 4 and 5: CEMA comemnts. V3

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ANNEX XXX
Requirements on tyres

Comment [v120]: New drafting to account for stakeholders' feedback. Further verification is needed. V3

Definitions specific to this Annex

"Cyclic service" means the condition that applies when the load on the tyre cycles between the fully loaded and the unloaded condition; unloading must occur before road transport.

"Low torque" means the condition that applies when the primary torque involved is that to propel the vehicle. Vehicles towing trailers are considered to be operating in a low torque mode when operating on slopes up to 11^{o} (20%).

"High and sustained torque" means the condition that occurs due to a load on the drawbar or hitch. Vehicles equipped with injectors, or any other ground engaging attachment (e.g. ploughs) or dragging objects are considered to be operating in a high torque mode. Vehicles towing trailers are also considered to be operating in a high torque mode when operating on slopes greater than 11^{o} (20%).

"Applicable tyre inflation pressure" means the internal pressure of the tyre, with the tyre at ambient temperature (i.e. cold tyre pressure), recommended in conformity to the load, speed and service conditions of the vehicle. It does not include any pressure built up due to tyre usage and is expressed in kPa.

1. Requirements applying to the component type-approval of tyres

1.1 Provisions for pneumatic tyres designed primarily for agricultural vehicles with diagonal or bias-ply and bias-belted construction with a reference speed not exceeding 40 km/h.

1.1.1. All tyres conforming to the relevant type shall be marked in conformity with points 1.1.2. to 1.1.2.4.

1.1.2. Specific requirements for markings.

1.1.2.1. Tyres shall bear the following markings, in conformity with ISO 4223-1:2002, including:

Comment [v121]: Year to be mentioned, because otherwise this same ISO is under development. V3

- the tyre size designation;
- the load capacity index (i.e. a numerical code which indicates the load the tyre can carry at the speed corresponding to the associated speed category, as defined in paragraph 2.28. of UNECE Regulation No 106);
- the speed category symbol (i.e. a symbol which indicates the maximum speed at which the tyre can carry the load corresponding to its load index, as defined in paragraph 2.29. of UNECE Regulation No 106); and
- the word "TUBELESS" if the tyre is designed for use without an inner tube.

1.1.2.2. Tyres shall bear the following additional markings:

- the manufacturer's trade name or mark;
- the inflation pressure that shall not be exceeded for the purpose of bead seating during tyre mounting;
- in case of implement tyres the service description (i.e. load index and speed

symbol, as defined in paragraph 2.26. of UNECE Regulation No 106) shall be supplemented with the indication whether it applies to "drive wheel" or to "free rolling wheel" or to both; and

– the date of manufacture in the form of a group of four digits, the first two showing the week and the last two the year of manufacture.

1.1.2.3. All markings mentioned in points 1.1.2.1. to 1.1.2.2. shall be legibly and permanently moulded into or onto the sidewall and produced as part of the process during manufacture. The use of branding or other methods of marking after completion of the original manufacturing process is not permitted.

1.1.2.4. In line with the provisions of Article 34(2) of Regulation 167/2013, no type-approval mark is required for pneumatic tyres designed primarily for agricultural vehicles with diagonal or bias-ply and bias-belted construction approved according to this Regulation.

1.2. New pneumatic tyres conforming to the type complying with the requirements set out in points 1.1. to 1.1.2.4 may continue to be placed on the market or enter into service until 31 December 2018.

1.3. Requirements for pneumatic tyres designed primarily for agricultural vehicles other than those set out in points 1.1. to 1.1.2.4.

1.3.1. Tyres not covered by the provisions of points 1. to 1.2.4. shall conform to the types approved under the relevant UNECE Regulations.

2. Requirements for the approval of a type of vehicle with regard to the installation of tyres

2.1. Specific requirements for the installation of tyres on vehicles with a maximum design speed not exceeding 65 km/h.

2.1.1. Subject to the provisions of point 2.1.2. all tyres fitted to vehicles, including any spare tyre, shall be type-approved according to UNECE regulation No 106.

2.1.1.1. For the purpose of vehicle type-approval in accordance with Regulation 167/2013, tyres designed primarily for agricultural vehicles with diagonal or bias-ply, bias-belted and radial-ply construction with a reference speed not exceeding 40 km/h may until 31 December 2016 be type-approved according to this Regulation instead.

2.1.2. Where a vehicle is designed for conditions of use which are incompatible with the characteristics of tyres type-approved according to UNECE regulation No 106 or this Regulation and it is therefore necessary to fit tyres with different characteristics, the requirements of point 2.1.1. do not apply, provided that the following conditions are met:

– the tyres are in accordance with Regulation (EC) No 661/2009[15] (i.e. type-approved according to UNECE regulation Nos 30, 54 and 117) or type-approved according to UNECE regulation No 75; and

– the approval authority and technical service are satisfied that the tyres fitted are suitable for the operating conditions of the vehicle. The nature of the exemption and reasons for acceptance shall be clearly stated in the test report.

2.2. Specific requirements for the installation of tyres on vehicles with a maximum design speed exceeding 65 km/h.

2.2.1. Subject to the provisions of point 2.2.2., all tyres fitted to vehicles, including any spare tyre, shall be in accordance with Regulation (EC) No 661/2009 (i.e. type-approved according to UNECE regulation Nos 30, 54 and 117).

2.2.2. Where a vehicle is designed for conditions of use which are incompatible with the characteristics of tyres type-approved according to Regulation (EC) No 661/2009 and it is therefore necessary to fit tyres with different characteristics, the requirements of point 2.2.1. do not apply, provided that the following conditions are met:

– the tyres are type-approved according to UNECE regulation No 75; and

– the approval authority and technical service are satisfied that the tyres fitted are suitable for the operating conditions of the vehicle. The nature of the exemption and reasons for acceptance shall be clearly stated in the test report.

2.3. General requirements for the installation of tyres

2.3.1 All tyres normally fitted to one axle shall be of the same type.

2.3.2 The space in which the wheel revolves shall be such as to allow unrestricted movement when using the maximum permissible size of tyres and rim widths, taking into account the minimum and maximum wheel off-sets if applicable, within the minimum and maximum suspension and steering constraints as declared by the vehicle manufacturer. This shall be verified by performing the checks with the largest and the widest tyres in each space, taking into account the applicable rim size and the maximum allowed section width and outer diameter of the tyre, in relation to the tyre size designation as specified in the relevant UNECE Regulation. The checks shall be performed by rotating a representation of the tyre's maximum envelope, not just the actual tyre, in the space for the wheel in question.

2.3.3 The technical service may agree to an alternative test procedure (e.g. virtual testing) to verify that the requirements of point 2.3.2 are met, provided that the clearance between the tyre's maximum envelope and vehicle structure exceeds 10 mm at all points.

2.4. Load capacity

[15] OJ L 200, 31.7.2009, p. 1.

2.4.1 The maximum load rating of each tyre fitted on the vehicle, taking into due account the maximum design speed of the vehicle and the most demanding service conditions, as well as the special cases of points 2.6. to 2.6.9.1. if applicable, shall be at least equal to the following:

– the maximum permissible axle mass where the axle is equipped with one tyre only;

– half of the maximum permissible axle mass where the axle is equipped with two tyres in single formation;

– 0.285 times the maximum permissible axle mass where the axle is equipped with two sets of tyres in dual (twin) formation;

– 0.20 times the maximum permissible axle mass where the axle is equipped with two sets of tyres in triple formation;

The maximum permissible axle mass is the one declared by the vehicle manufacturer.

2.4.2 The maximum load rating of a tyre is determined as follows:

2.4.2.1 In the case of tyres identified by speed symbol D (i.e. 65 km/h) or lower, type-approved according to the UNECE Regulation No 106, the 'table load-capacity variation with speed' as referred to in paragraph 2.30 of that Regulation for its specific category of use is taken into account. The table shows, as a function of the load-capacity indices and nominal-speed-category symbols, the load variations which a pneumatic tyre can withstand taking into account the maximum design speed of the vehicle.

2.4.2.2 In the case of tyres identified by speed symbol F (80 km/h) or higher, type-approved according to UNECE Regulation No 54, the 'table load-capacity variation with speed' as referred to in paragraph 2.29 of that Regulation is taken into account. The table shows, as a function of the load-capacity indices and nominal-speed-category symbols, the load variations which a pneumatic tyre can withstand taking into account the maximum design speed of the vehicle.

2.4.2.3 In the case of tyres type-approved according to UNECE Regulation No 75, the 'table load-capacity variation with speed' as referred to in paragraph 2.27 of that Regulation is taken into account. The table shows, as a function of the load-capacity indices and nominal-speed-category symbols, the load variations which a pneumatic tyre can withstand taking into account the maximum design speed of the vehicle.

2.4.3 The applicable tyre inflation pressures shall be stated on the vehicle (e.g. on one or more labels). The information shall be clearly legible without the need to remove any parts with the use of tools and shall be affixed in a way that it is not easily removed. The relevant information concerning load and speed indices as well as the applicable tyre inflation pressures shall be stated clearly in the instruction manual of the vehicle in order to ensure that suitable replacement tyres with an appropriate load capacity shall be fitted when necessary, once the vehicle has been put into service.

Comment [v122]: Insert template to RVCR: operator's manual V3

2.5. Speed capacity

2.5.1 Every tyre fitted normally on the vehicle shall bear a speed category symbol.

2.5.1.1 The speed category symbol shall be compatible with the maximum design speed.

2.5.1.2 The adjusted load rating as referred to in points 2.4.2.1. to 2.4.2.3. shall be taken into

account.

2.5.2 The relevant information and the applicable tyre inflation pressure shall be stated clearly in the vehicle owner's handbook in order to ensure that suitable replacement tyres with an appropriate speed capacity shall be fitted when necessary, once the vehicle has been put into service.

2.6. Specific requirements for vehicles fitted with tyres identified by speed symbols corresponding to a maximum design speed not exceeding 65 km/h (i.e. up to symbol D).

2.6.1 Cyclic service [needs to be verified if the VEHICLE load rating may exceed the TYRE rating – this is what it is understood from the initial drafted text]

2.6.1.2 In case tyres classified in category of use 'Tractor - Steering wheel' and marked 'FRONT' or 'F-1' or 'F-2' or 'F-3' operated at speeds up to a maximum speed of 10 km/h on a tractor equipped with a 'Front end loader' the applicable maximum load rating of a tyre shall not exceed 2.0 times the load rating corresponding to the load index marked on the tyre.

Comment [b123]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.1.3 In case tyres classified in category of use 'Tractor - Drive wheel' operating in field applications with 'high and sustained torque' (e.g. ploughing) the applicable maximum load rating of a tyre shall not exceed the load rating corresponding to the load index marked on the tyre multiplied by 1.07 for tyres with speed symbol A8 or 1.15 for tyres with speed symbol D.

Comment [b124]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3?

2.6.1.4 In case tyres classified in category of use 'Tractor - Drive wheel' operating in field applications without 'high and sustained torque' and up to a maximum speed of 10 km/h (excluding hillside operations over 20% slope) the applicable maximum load rating of a tyre shall not exceed the load rating corresponding to the load index marked on the tyre multiplied by 1.70.

Comment [b125]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.1.5 In case tyres classified in category of use 'Tractor. Drive wheel' operating in field applications without 'high and sustained torque' and a maximum speed not exceeding 15 km/h (excluding hillside operations over 20% slope) the applicable maximum load rating of a tyre shall not exceed the load rating corresponding to the load index marked on the tyre multiplied by 1.55.

Comment [b126]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.1.6 In case tyres classified in category of use 'Implement', identified by speed symbols A6 or A8 with a Nominal rim diameter code lower than 24, operating in 'cyclic high load variation' (i.e. when one way the vehicle is empty and on the other way the technically permissible maximum laden mass of the vehicle exceeds two times the mass of the empty vehicle inclusive of the driver) the variation in load capacity with speed identified in point 2.4.2.1. may be increased by up to 20% for Free Rolling wheels or by up to 43% in case of Drive wheels.

Comment [b127]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.1.7 The minimum tyre inflation pressure to be adopted for the cases of the above paragraphs 2.6.1.2 to 2.6.1.6 shall be provided by the tyre manufacturer

2.6.2 In case of "Improved Flexion Tyre" or "Very High Flexion Tyre" classified in category of use 'Tractor – Drive wheel' (marked with prefix IF or VF) operated at speeds up to a maximum speed of 10 km/h fitted to a vehicle equipped with a 'Front end loader', the applicable maximum load rating of a tyre shall not exceed 1.40 times the load rating corresponding to the load index marked on the tyre and the relevant reference pressure

Comment [b128]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

shall be increased by 40 kPa.

2.6.3 In case of "Improved Flexion Tyre" or "Very High Flexion Tyre" classified in category of use 'Tractor-- Drive wheel' marked with prefix IF or VF and with suffix 'CFO' operating in field applications without 'high and sustained torque' (excluding hillside operations over 20% slope), the applicable maximum load rating of a tyre shall be the load rating corresponding to the load index marked on the tyre multiplied by 1.55 for operations at a maximum speed not exceeding 15 km/h or by 1.30 for operations at a maximum speed not exceeding 30 km/h.

Comment [b129]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.4 In case of tyres classified in category of use 'Tractor - Drive wheel' marked with suffix 'CHO' operating in field applications without 'high and sustained torque' (excluding hillside operations over 20% slope), the applicable maximum load rating of a tyre shall be the load rating corresponding to the load index marked on the tyre multiplied by 1.80 for operations at a maximum speed not exceeding 10 km/h or by 1.65 for operations at a maximum speed not exceeding 15 km/h.

Comment [b130]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.5 In case of tyres classified in category of use 'Tractor – Drive wheel' marked with speed symbols A6 or A8 fitted to agricultural trailers operating at speeds between 25 km/h and 40 km/h, the applicable maximum load rating of a tyre does not exceed 1.20 times the load rating corresponding to the load index marked on the tyre.

Comment [b131]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.6 In case of tyres classified in category of use 'Forestry machines' fitted to vehicles with high and sustained torque applications (e.g. skidders) in forestry service at speeds up to 10 km/h, the maximum load rating of a tyre shall not exceed the load rating corresponding to the load index marked on the tyre.

Comment [b132]: COM: the applicable maximum load rating of…? Clarification needed.
Suggestions from WGAT experts?
V3

2.6.7 In case of tyres classified in category of use 'Implement', identified by speed symbols A6 or A8, fitted to free rolling steering wheels of self-propelled agricultural equipment, the variation in load capacity with speed identified in point 2.4.2.1. specified for tyres not subjected to sustained high torque service (i.e. in Part C of UNECE Regulation No 106) shall be multiplied by up 0.80.

2.6.8 The relevant information and the applicable tyre inflation pressure shall be stated clearly in the instruction manual of the vehicle in order to ensure that suitable replacement tyres with an appropriate load capacity shall be fitted when necessary, once the vehicle has been put into service.

Comment [v133]: Requirements for RVCR.
V3

2.6.9 In case the applicable tyre inflation pressure for tyres fitted to agricultural or forestry vehicles exceeds 500 kPa, the tyre ground pressure exerted on a flat surface shall not exceed 0.8 MPa.

2.6.9.1. The tyre ground pressure is the average load transmitted by the correctly inflated tyre, through its contact area, onto a flat surface. The vertical force is taken under static conditions on the axis of the wheel taking into account the maximum permissible axle mass as declared by the manufacturer. The tyre contact area consists of the flat surface contained within the convex polygonal curve circumscribing the smallest area containing all points of contact between the tyre and the ground.

ANNEX XXXI
Requirements on spray-suppression systems

Comment [v134]: CEMA comment, due to deviating requirements for off-road vehicles in Dir. 91/226/EC. V3

1. Requirements for all vehicles in category Tb and Rb

1.1. Tb category tractors shall be equipped with wheel guards (parts of the bodywork, mudguards, etc.).

1.2. The wheel guards shall be designed so that they protect other road users as far as possible from dispersed stones, dirt, ice, snow and water.

1.3. The wheels must have a guard at the top, which covers at least 2/3 of the total width of the tyre. The front and rear edge of the guard shall cover an angle of at least 90 degrees.~~The front and rear edge of the guard shall be dragged down as far as possible.~~

~~2. Requirements for all trailers in category Rb~~

~~2.1. Rb category trailers shall be equipped with spray suppression systems meeting the technical requirements of Directive 91/226/EEC. The provisions of Directive 91/226/EEC for O2 vehicles shall apply to R1 and R2 trailers. The provisions for O3 trailers shall apply to R3 and R4 trailers.~~

ANNEX XXXII
Requirements on the reverse gear

All tractors must be equipped with a device for reversing which can be operated from the driving position.

ANNEX XXXIII
Requirements on tracks

Comment [v135]: IT input.
COM: to be accounted for through on-going TRL study.
V3

1. Requirements

1.1. Machinery directive and new study to be launched

ANNEX XXXIV
Requirements on mechanical couplings

Comment [v136]: UK comment: any other type of coupling than the ones mentioned in this Annex? E.g. couplings used on trucks, suitable also for tractors? V3

Definitions specific to this Annex

'Mechanical coupling between tractor and towed vehicle' means the components installed on the tractor and on the towed vehicle in order to provide the mechanical coupling between those vehicles.

'Type of mechanical coupling between tractor and towed vehicle' means parts which do not differ from one another in such essential respects as:

— nature of mechanical coupling component,

— drawbar rings (40 mm and/or 50 mm diameter),

— external shape, dimensions or mode of operation (e.g. automatic or non-automatic),

— material,

— value of D as defined in Appendix 2 to Annex XXXIV for the test performed using the dynamic method or the trailer mass as defined in Appendix 3 to Annex XXXIV for tests performed using the static method, and also the vertical load on the coupling point S.

'Reference centre of mechanical coupling' means the point on the pin axis which is equidistant from the wings in the case of a fork and the point resulting from the intersection of the plane of symmetry of the hook with the generatrix of the concave part of the hook at the level of contact with the ring when this is in the traction position.

'Height above ground of mechanical coupling' means the distance between the horizontal plane through the reference centre of the mechanical coupling and the horizontal plane on which the wheels of the tractor are resting.

'Vertical load on the coupling point' means the load transmitted, under static conditions on the reference centre of the mechanical coupling.

'Automatic mechanical coupling' means a mechanical coupling component which closes and secures itself when the sliding mechanism for the drawbar rings is actuated, without further action.

'Weight on the front axle of the unladen tractor' means that part of the weight of the tractor which, under static conditions, is transmitted on the ground by the front axle of the tractor.

1. General requirements

1.1. The mechanical coupling components may be designed to function automatically or non-automatically.

1.2. The mechanical coupling components on the tractor must conform to the dimensional and strength requirements in point 2.1 and point 2.2 and the requirements for the vertical load on the coupling point in point 2.3.

1.3. The mechanical coupling components must be so designed and made that in normal use they will continue to function satisfactorily and retain the characteristics prescribed by this Annex.

1.4. All parts of mechanical coupling components must be made of materials of a quality sufficient to withstand the tests referred to in point 2.2. and must have durable strength characteristics.

1.5. All the couplings and their locks must be easy to engage and release and must be so designed that under normal operating conditions no accidental de-coupling is possible.

In automatic coupling components the locked position must be secured in a form-locking manner by two independently functioning safety devices. However, the latter may be released using the same control device.

1.6. The drawbar ring must be capable of tilting horizontally at least 60° on both sides of the longitudinal axis of a non-built-in coupling device. In addition, vertical mobility of 20° upwards and downwards is required at all times. (See also Appendix 1.)

The angles of articulation must not be attained at the same time.

1.7. The jaw must permit the drawbar rings to swivel axially at least 90° to the right or left around the longitudinal axis of the coupling with a fixed braking momentum of between 30 and 150 Nm.

The towing hook, no-swivel clevis coupling, ball type coupling and pin type coupling must allow the drawbar ring to swivel axially at least 20° to the right or left around the longitudinal axis of the coupling.

1.8. In order to prevent unintentional uncoupling from the hitch ring, the distance between the towing hook tip and the keeper (clamping device) shall not exceed 10 mm at the maximum design load.

2. Special requirements

2.1. Dimensions

The dimensions of the mechanical coupling components on the tractor must comply with Appendix 1, Figures 1 to 5 and Table 1.

2.2. Strength

2.2.1. For the purposes of checking their strength, the mechanical coupling components must undergo:

i) a dynamic test under the conditions set out in Appendix 2 or a static test under the conditions set out in Appendix 3, if they are used on vehicles with maximum design speed not exceeding 40 km/h;

ii) a dynamic test under the conditions set out in Appendix 2, if they are used on

Comment [v137]: IT , CEMA comment.
V3

vehicles with maximum design speed exceeding 40 km/h.

Alternatively, in both cases i) and ii), the dynamic test may be performed according to the requirements of the UNECE regulation 55 Revision 02.

In addition, for vehicles with maximum design speed exceeding 40 km/h, a virtual dynamic test must be performed with the numerically simulated structure of coupling attached to the entire vehicle chassis.

2.2.2. The test must not cause any permanent deformation, breaks or tears.

2.3. Vertical load on the coupling point (S)

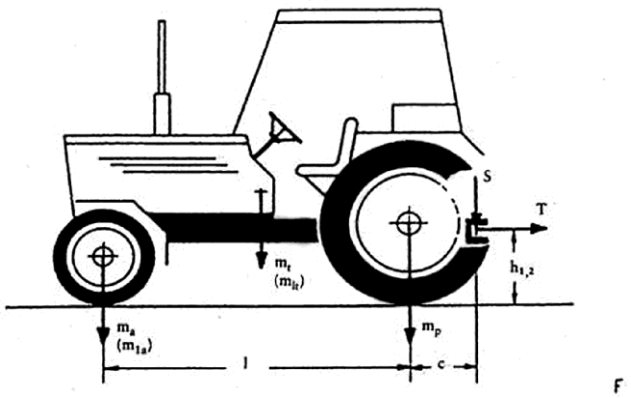
2.3.1. The maximum static vertical load is laid down by the manufacturer. However, it must not exceed 3000 kg, except for the ball type coupling, where the maximum value shall not exceed 4000 kg.

2.3.2. Conditions of acceptance:

2.3.2.1. The permissible static vertical load must not exceed the technically permissible static vertical load recommended by the manufacturer of the tractor nor the static vertical load laid down for the towing device pursuant to EC component type-approval.

2.3.2.2. Whatever the state of loading of the tractor, the mass transmitted to the road by the wheels on the forward (steering) axle must not be less than 20 % of the unladen mass of that tractor~~**The requirements of point 2 of Annex I to Directive 2009/63/EC[16] must be complied with,**~~ **but the maximum load on the rear** (other) **axle must not be exceeded.**

2.4. Height above the ground of the coupling device (h)



2.4.1. All tractors with a loaded mass exceeding 2,5 tonnes must be fitted with a trailer coupling having a ground clearance satisfying one of the following relations:

$h_1 \leq (((m_a - 0{,}2.m_t).l - (S.c))/(0{,}6.(0{,}8.m_t + S)))$or

~~[16] Directive 2009/63/EC of the European Parliament and of the Council of 13 July 2009 on certain parts and characteristics of wheeled agricultural or forestry tractors (Codified version) (OJ L 214, 19.8.2009, p. 23).~~

Comment [v138]: IT comment. V3

Comment [v139]: CEMA comment. V3

Comment [v140]: This suggested text added to enhance assessment of vehicle structural integrity, in line with study report. Virtual test proposed by CEMA during the 11/9/2013 WGAT. V3

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Comment [v141]: According to Dir 2009/144/EC and 2009/63/EC. V3

$h_2 \leq (((m_{la} – 0{,}2.m_t).l – (S.c))/(0{,}6.(0{,}8.m_{lt} – 0{,}2.m_t + S)))$where:

m_t	:	mass of the tractor,
m_{lt}	:	mass of the tractor with ballast weight on the front axle,
m_a	:	weight on the front axle of the unladen tractor,
m_{la}	:	weight on the front axle of the tractor with ballast weight on the front axle,
l	:	tractor wheelbase,
S	:	vertical load on the coupling point,
c	:	distance between the reference centre of the mechanical coupling and the vertical plane passing through the axle of the rear wheels of the tractor.

Masses m_t, m_{lt}, m_a and m_{la} are expressed in kg.

3. Conditions for granting EU type approval

Comment [v142]: This section contains the requirements of sections 4 and 6 of Annex IV to 2009/144 and Appendix 6 to Annex IV.

3.1. A tractor representative of the tractor type to be approved, on which a coupling device, duly approved, is mounted is submitted to the technical services responsible for conducting the type-approval tests.

3.2. The technical service responsible for conducting the type-approval tests checks whether the approved type of coupling device is suitable for mounting on the type of tractor for which type-approval is requested. In particular, it ascertains that the attachment of the coupling device corresponds to that which was tested when the EU component type-approval was granted.

3.3. For each type of mechanical coupling component the application must be accompanied by the following documents and particulars:

- scale drawings of the coupling device (three copies). These drawings must in particular show the required dimensions in detail as well as the measurements for mounting the device,
- a short technical description of the coupling device specifying the type of construction and the material used,
- a statement of the value of D as referred to in Appendix 2 for the dynamic test or the value of T (towable mass in tonnes), corresponding to 1,5 times the technically permissible maximum laden trailer mass, as referred to in Appendix 3 for the static test, and also the vertical maximum load on the coupling point S (expressed in kg),
- one or more sample devices as required by the technical service.

3.4. The holder of the EU type-approval may ask for its extension for other types of

coupling device.

3.5. The competent authorities grant such extension on the following conditions:

3.5.1. the new type of coupling device has received EU component type-approval;

3.5.2. it is suitable for mounting on the type of tractor for which the extension of the EU type-approval is requested;

3.5.3. the attachment of the coupling device on the tractor corresponds to that which was presented when EU component type-approval was granted.

3.6. A certificate, of which a model is shown in << RAR >>, is annexed to the EU type-approval certificate for each type-approval or type-approval extension which has been granted or refused.

3.7. If the application for EU type-approval for a type of tractor is made at the same time as the request for EU component type-approval for a type of coupling device on a tractor for which EU type-approval is requested, then points 3.1 and 3.2 are unnecessary.

3.8. All mechanical couplings must be accompanied by the manufacturer's instructions for use. These instructions must include the EU component type-approved number and also the values of D (kN) or T (tonnes) depending on which test was performed on the coupling.

4. Markings

4.1. Every mechanical coupling component conforming to the type for which EU component type-approval has been granted must bear a marking with the following inscriptions:

4.1.1. trade name or mark;

4.1.2. EU component type-approval mark conforming to the model in << RAR >>;

Comment [v143]: Model in RAR according to Appendix 4 to Annex IV of 2009/144

4.1.3. where the strength is checked in accordance with Appendix 2 (dynamic test):

permissible value of D (kN),

static vertical load value of S (kg);

4.1.4. where the strength is checked in accordance with Appendix 3 (static test):

towable mass T (tonnes), and vertical load on the coupling point S (kg).

4.1.5. The data must be clearly visible, easily legible and durable.

Appendix 1

Mechanical coupling types

‘Clevis type mechanical coupling’: see Figures 1 and 2.

‘No-swivel clevis mechanical coupling’: see Figure 1d.

‘Towing hook’: see Figure 1 – “Hitch-hook dimensions” in ISO 6489-1:2001.

‘Tractor drawbar’: see Figure 3.

‘Ball type mechanical coupling’: see Figure 4.

‘Pin (piton) type mechanical coupling’: see Figure 5.

Drawings of mechanical couplings components

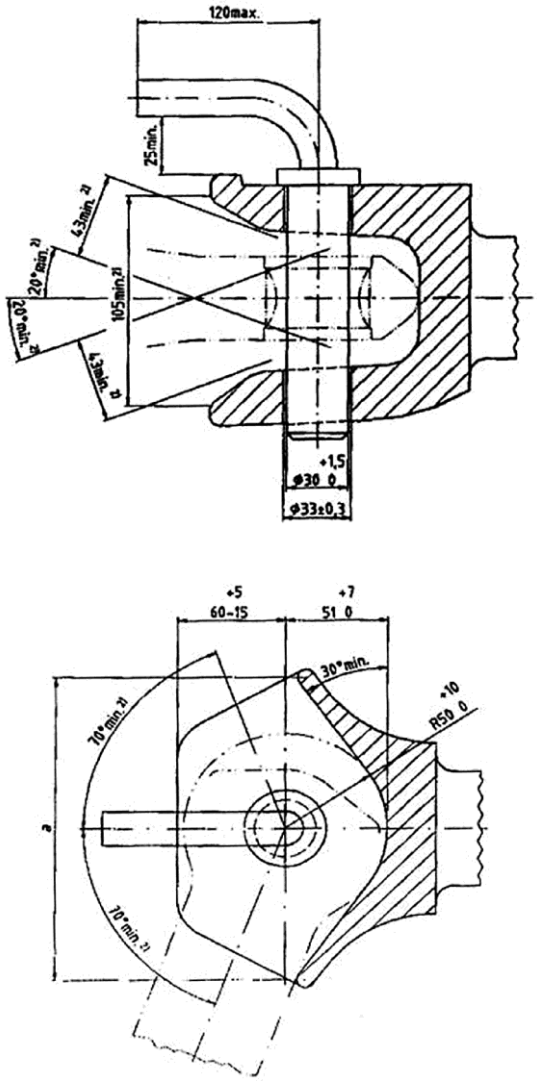


Figure 1a — Non-automatic trailer coupling, with cylindrical locking pin

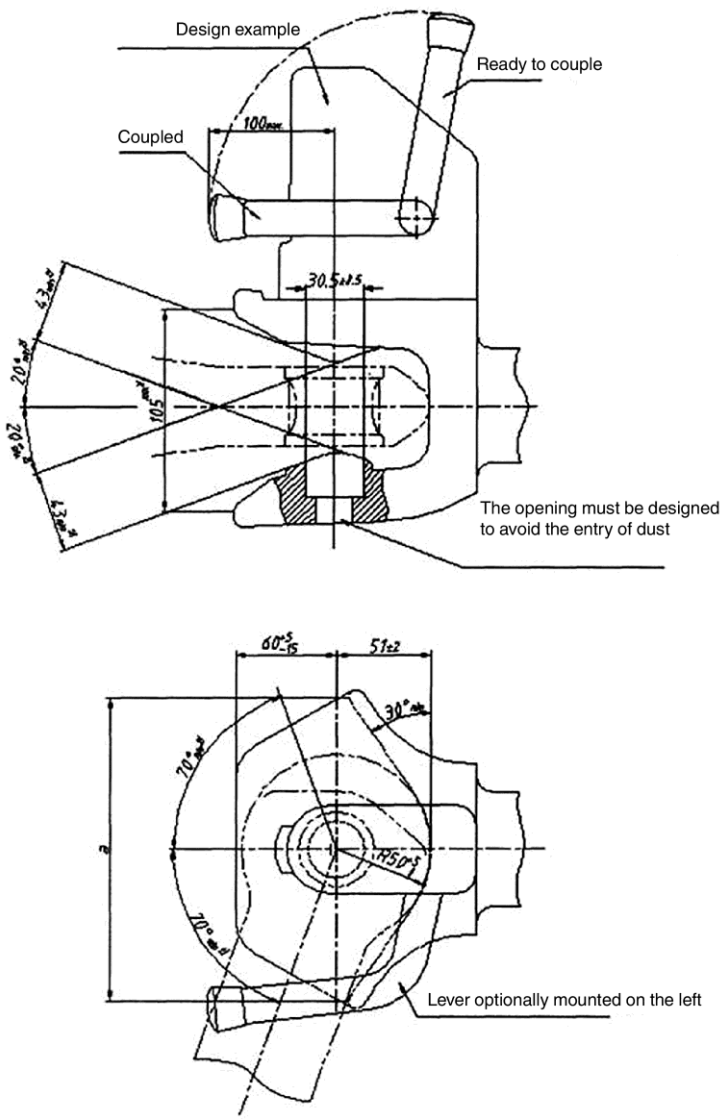


Figure 1b — Automatic trailer coupling, with cylindrical locking pin

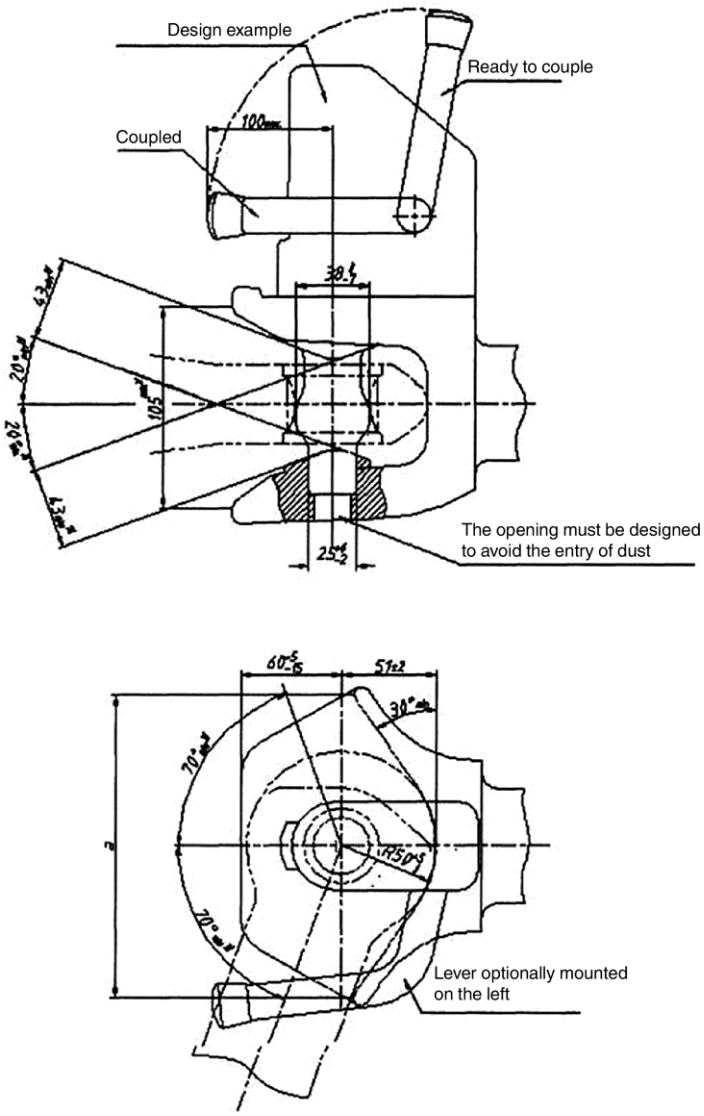


Figure 1c — Automatic trailer coupling, with cambered locking pin

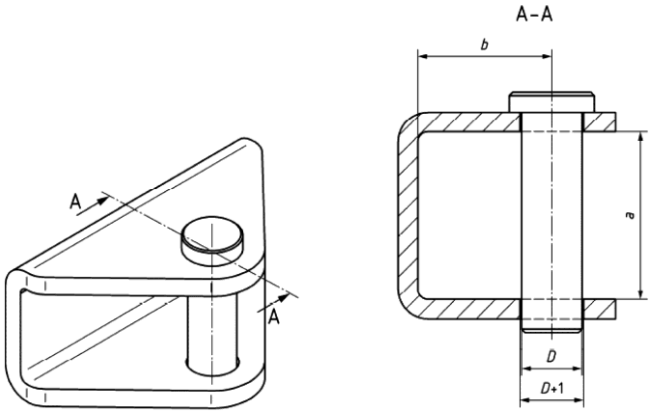


Table 1					
Shapes and dimensions of trailer or implement clevis couplings					
Vertical load S kg	*D value* D kN	*Shape*	*Dimension* mm		
			D ± 0,5	a min.	b min.
≤ 1000	≤ 35	w	18	50	40
≤ 2000	≤ 90	x	28	70	55
≤ 3000	≤ 120	y	43	100	80
≤ 3000	≤ 120	z	50	110	95

Figure 1d – No-swivel clevis coupling (corresponding to ISO 6489-5:2011)

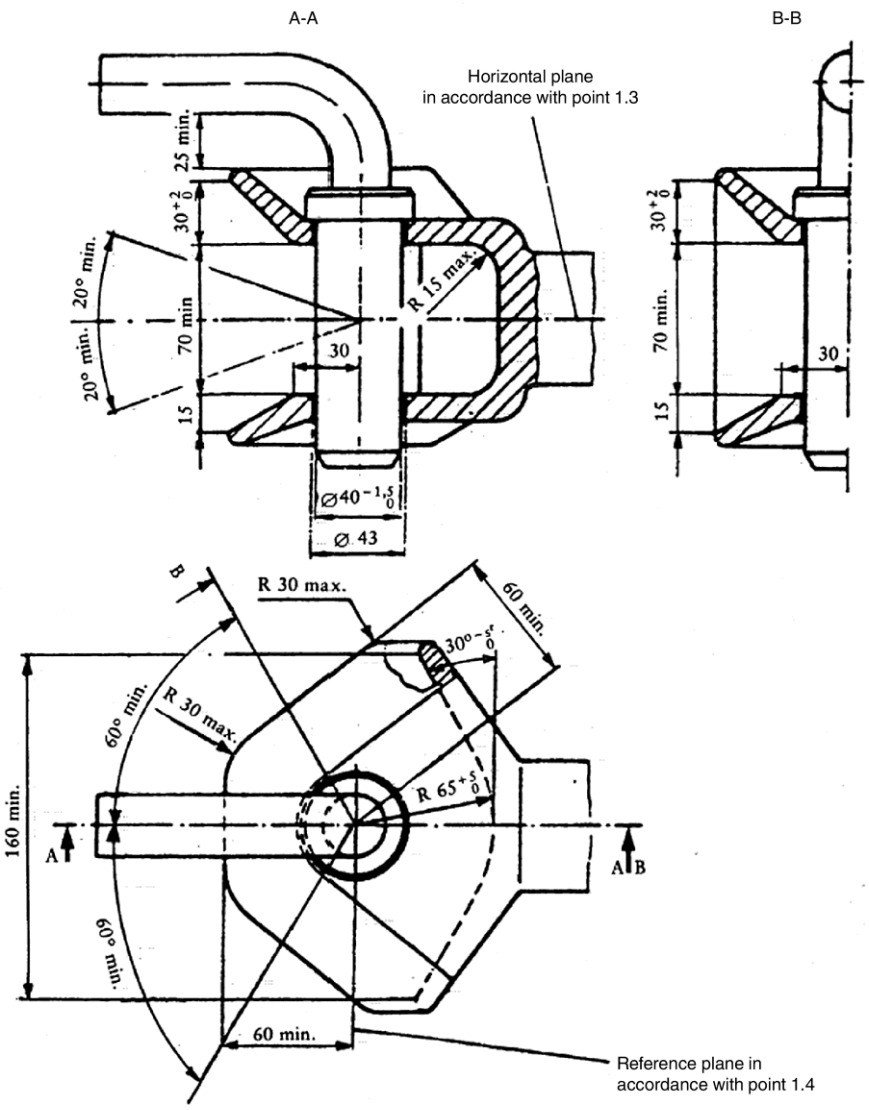


Figure 2 — Non-automatic trailer coupling

corresponds to ISO 6489 Part 2 of July 2002

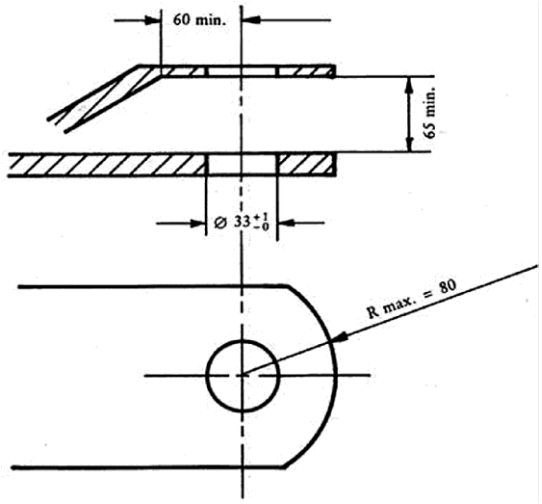
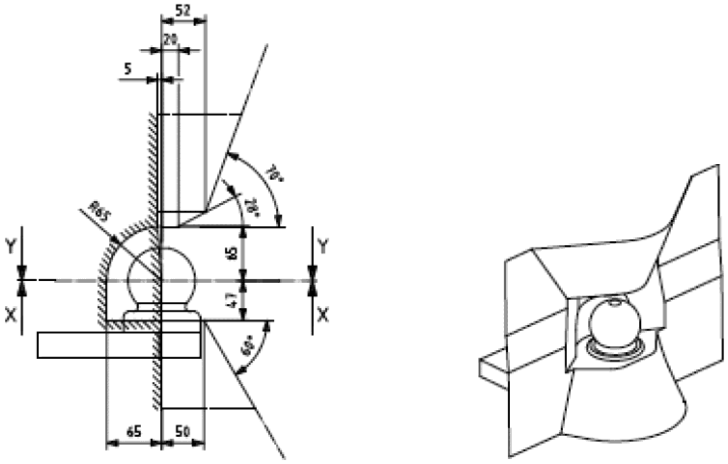


Figure 3 — Tractor drawbar
corresponds ISO Standard 6489 Part 3 of June 2004



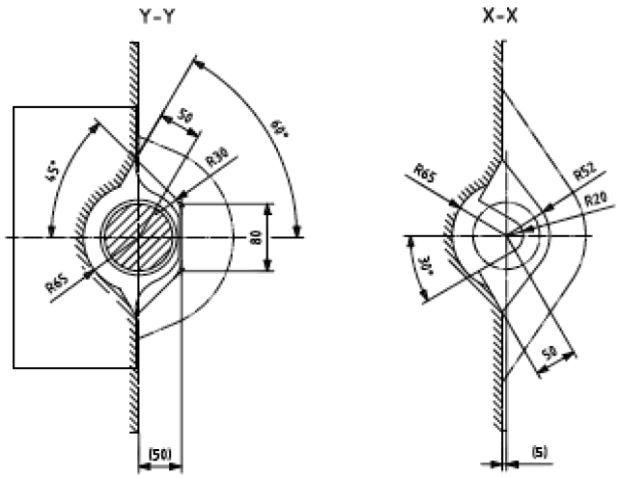
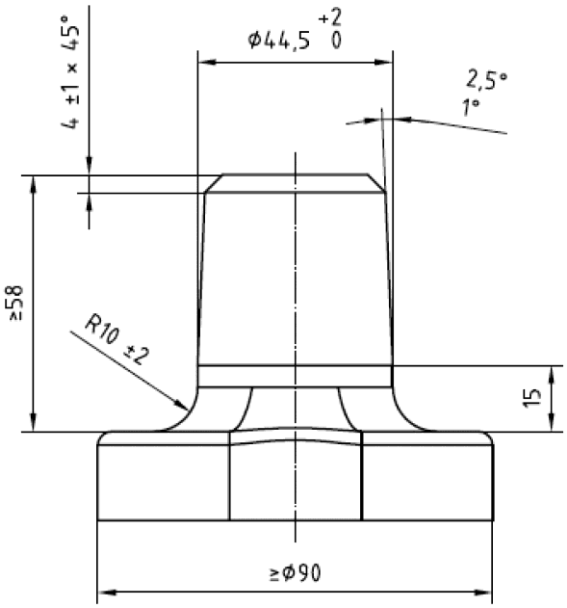


Figure 4 – Ball type coupling (corresponding to ISO 24347:2005)



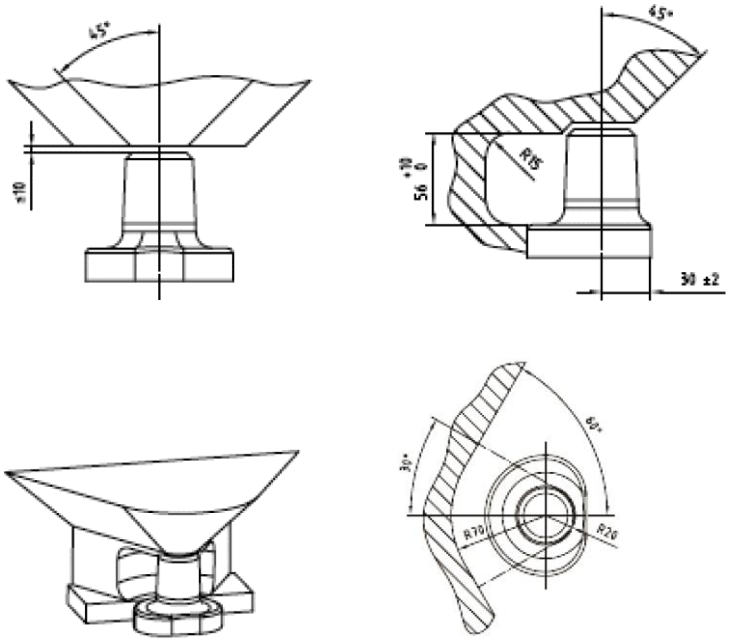


Figure 5 – Pin type coupling (corresponding to ISO 6489-4:2004)

Appendix 2

DYNAMIC TEST METHOD

1. TEST PROCEDURE

The strength of the mechanical coupling is to be established by alternating traction on a test bed.

This method describes the fatigue test to be used on the complete mechanical coupling device, i.e. when fitted with all the parts needed for its installation the mechanical coupling is mounted and tested on a test bed.

The alternating forces are applied as far as possible sinusoidally (alternating and/or rising) with a load cycle depending on the material involved. No tears or breaks may occur during the test.

2. TEST CRITERIA

The horizontal force components in the longitudinal axis of the vehicle together with the vertical force components form the basis of the test loads.

In so far as they are of secondary importance, horizontal force components at right

angles to the longitudinal axis of the vehicle and also moments are not to be taken into consideration.

The horizontal force components in the longitudinal axis of the vehicle are represented by a mathematically established representative force, the value D.

The following equation is applied to the mechanical coupling:

$D = g \cdot (M_T \cdot M_R)/(M_T + M_R)$

Where:

M_T	=	the technically permissible total mass of the tractor,
M_R	=	the technically permissible total mass of the towed vehicles,
g	=	9,81 m/s^2.

The vertical force components at right angles to the track are expressed by the static vertical load S.

The technically permissible loads are given by the manufacturer.

3. TEST PROCEDURE

3.1. General requirements

The test force is applied to the mechanical coupling device being tested by means of an appropriate standard drawbar ring beneath an angle formed by the position of the vertical test load F_v *vis-à-vis* the horizontal test load F_h in the direction of the median longitudinal plane passing from top front to bottom rear.

The test force is applied at the usual point of contact between the mechanical coupling device and the drawbar ring.

The play between the coupling device and the ring must be kept to a minimum.

In principle the test force is applied in an alternating manner around the zero point. With an alternating test force the resulting load is equal to zero.

Should the design of the coupling device (e.g. excessive play, towing hook) make it impossible to carry out the test with an alternating test load, the test load may also be applied on a rising basis in the direction of traction or pressure, whichever is the greater.

Where the test is carried out with a rising force curve, the test load is equal to the upper (highest) load, and the lower (smallest) load should not exceed 5 % of the upper load.

Care should be taken in the alternating force test to ensure that by suitable mounting of the test apparatus and choice of power conduction system no additional moments or forces arising at right angles to the test force are introduced; the angular error for the direction of force in the alternating force test should not exceed ±1,5°; and for the rising force test the angle is set in the upper load position.

The test frequency must not exceed 30 Hz.

For components made of steel or steel casting the load cycle amounts to $2 \cdot 10^6$. The subsequent tear test is carried out using the colour penetration method or similar method.

If springs and/or dampers are incorporated into the coupling parts, they are not to be removed during the test but may be replaced if, during the test, they are subject to strain under conditions which would not obtain during normal operation (e.g. heat action) and become damaged. Their behaviour before, during and after the test must be described in the test report.

3.2. Test forces

The test force consists in geometrical terms of the horizontal and vertical test components as follows:

$F = \sqrt{(Fh2 + Fv2)}$ where:

$Fh = \pm 0{,}6 \cdot D$ (kN) in the case of alternating force,

or

$Fh = 1{,}0 \cdot D$ (kN) in the case of rising force (traction or pressure),

$Fv = g \cdot 1{,}5 \cdot S/1000$ (value expressed in kN)

S	=	static drawbar load (load on the track, expressed in kg).';»

Appendix 3

COUPLING DEVICE

STATIC TEST METHOD

1. TEST SPECIFICATIONS

1.1. General

1.1.1. Subject to a check on its construction characteristics, the towing device must undergo static tests in accordance with the requirements of points 1.2, 1.3 and 1.4.

1.2. Test preparation

The tests must be carried out on a special machine, with the towing device and any structure coupling it to the body of the tractor attached to a rigid structure by means of the same components used to mount it on the tractor.

1.3. Test instruments

– The instruments used to record loads applied and movements must have the following degree of accuracy:

loads applied ±50 daN,

– movements ±0,01 mm.

1.4. Test procedure

1.4.1. The coupling device must first be subjected to a pre-traction load which does not exceed 15 % of the traction test load defined in point 1.4.2.

1.4.1.1. The operation described in point 1.4.1 must be repeated at least twice, starting with a zero load, which is gradually increased until the value prescribed in point 1.4.1 is reached, and then decreased to 500 daN; the settling load must be maintained for at least 60 seconds.

1.4.2. The data recorded for plotting the load/deformation curve under traction, or the graph of that curve provided by the printer linked to the traction machine, must be based on the application of increasing loads only, starting from 500 daN, in relation to the reference centre of the coupling device.

There must be no breaks for values up to and including the traction test load which is established as 1,5 times the technically permissible trailer mass; in addition, the load/deformation curve must show a smooth progression, without irregularities, in the interval between 500 daN and 1/3 of the maximum traction load.

1.4.2.1. Permanent deformation is recorded on the load/deformation curve in relation to the load of 500 daN after the test load has been brought back to that value.

1.4.2.2. The permanent deformation value recorded must not exceed 25 % of the maximum elastic deformation occurring.

1.5. The test referred to in point 1.4.2 must be preceded by a test in which an initial load of three times the maximum permissible vertical force (in daN, equal to $g \cdot S/10$) recommended by the manufacturer is applied in a gradually increasing manner, starting from an initial load of 500 daN, to the reference centre of the coupling device.

During the test, deformation of the coupling device must not exceed 10 % of the maximum elastic deformation occurring.

The check is carried out after removing the vertical force (in daN, equal to $g \cdot S/10$) and returning to the initial load of 500 daN.