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Working Party on the Construction of Vehicles

Meeting of Experts on Passive Safety

(Twenty-third session, 4-8 May 1998,
agenda item 3.)

PROPOSAL FOR A DRAFT REGULATION:

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF:

- AN AIRBAG MODULE FOR A REPLACEMENT AIRBAG SYSTEM
- A REPLACEMENT STEERING WHEEL EQUIPPED WITH AN AIRBAG MODULE OF AN APPROVED TYPE OR WITHOUT AN AIRBAG
- REPLACEMENT AIRBAG DEVICE(S) OTHER THAN THOSE INSTALLED IN A STEERING WHEEL

Transmitted by the Expert from Germany

Note: The text reproduced below was prepared by the expert from Germany following the instructions provided by the Meeting of Experts during its twenty-first session (TRANS/WP.29/GRSP/21, paras. 37 and 38). It is based on the text distributed without a symbol (informal document No. 6) during the twenty-second session and it had been prepared as a revision of document TRANS/WP.29/GRSP/R.148 (TRANS/WP.29/GRSP/21, para. 39).

Note: This document is distributed to the Experts on Passive Safety only.

CONTENTS

REGULATION

1. SCOPE
2. DEFINITIONS
3. APPLICATION FOR APPROVAL
 - 3.1. Application for approval of an airbag module for a replacement airbag system
 - 3.2. Application for approval of a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
 - 3.3. Application for approval of a replacement airbag device other than those installed in a steering wheel
4. APPROVAL
 - 4.1. Approval of a replacement airbag module
 - 4.2. Approval of a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
 - 4.3. Approval of a replacement airbag system other than those installed in a steering wheel
5. REQUIREMENTS
 - 5.1. General requirements for the approval of modules for replacement airbag system, replacement steering wheels equipped with an airbag module or replacement airbag system other than those installed in a steering wheel
 - 5.2. Requirements for the approval of an airbag module for a replacement airbag system
 - 5.3. Requirements for replacement steering wheels equipped with an airbag module of an approved type or without an airbag
 - 5.4. Requirements for replacement airbag device(s) other than those installed in a steering wheel
6. TESTS
 - 6.1. Tests of an airbag module for a replacement airbag system
 - 6.2. Tests for a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
 - 6.2.1. Strength tests:
 - 6.2.1.1. Heat test
 - 6.2.1.2. Bending test
 - 6.2.1.3. Torque test
 - 6.2.1.4. Fatigue test
 - 6.2.2. Installation requirement tests and driver's view to the instrument panel
 - 6.2.3. Frontal impact test(s) with vehicle(s) for steering wheel(s) equipped with an airbag module of an approved type
 - 6.3. Tests for replacement airbag system other than those installed in a steering wheel

- 6.3.1. Tests of airbag modules for replacement airbag system
- 6.3.2. Impact test(s) with vehicle(s) for airbag system(s) other than those installed in steering wheels
- 7. INSTRUCTIONS FOR USERS
- 8. CONFORMITY OF PRODUCTION
- 9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 10. MODIFICATIONS OF THE TYPE OF AN AIRBAG MODULE OR A VEHICLE WITH REGARD TO AN AIRBAG SYSTEM OR A REPLACEMENT STEERING WHEEL WITH OR WITHOUT AN AIRBAG OR OF REPLACEMENT AIRBAG SYSTEM OTHER THAN THOSE INSTALLED IN A STEERING WHEEL
- 11. PRODUCTION DEFINITELY DISCONTINUED
- 12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

ANNEXES

- Annex 1: Communication document for a type of a replacement airbag module
- Annex 2: Communication document for a type of a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
- Annex 3: Communication document for a type of a replacement airbag system other than those installed in a replacement steering wheel
- Annex 4: Example of an approval mark for a replacement airbag module
- Annex 5: Example of an approval mark for a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
- Annex 6: Example of an approval mark for replacement airbag system other than those installed in a steering wheel
- Annex 7: Body block test
- Annex 7 - Appendix 1: Body block
- Annex 8: Head form test
- Annex 9: Fatigue test device
- Annex 10: Procedure for determining the "H"-point and the actual torso angle for seating positions in motor vehicles

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1. SCOPE

This Regulation applies:

- 1.1. to airbag modules for a replacement airbag system intended to be installed on motor vehicles;
- 1.2. to replacement steering wheels for vehicles of categories M₁ and N₁ equipped with an airbag module of an approved type intended to be installed as an additional restraint system beside safety-belts and other restraint systems in power-driven vehicles, i.e. a system which, in the event of a severe impact, automatically deploys a flexible structure intended to reduce the severity of injuries of the occupants and to replacement steering wheels without an airbag system;
- 1.3. to other replacement airbag devices than those installed in a steering wheel and equipped with airbag modules of an approved type as an additional restraint system beside safety-belts and other restraint systems in power-driven vehicles of categories M₁ and N₁, i.e. a system which, in the event of a severe impact, automatically deploys a flexible structure intended to reduce the severity of injuries of the occupants.

2. DEFINITIONS

- 2.1. Airbag system means a group of components which, once installed in vehicle(s), perform all functions provided for the manufacturer. This system comprises as a minimum a release unit activating one or more airbag modules and the electrical wiring harness, if present.
- 2.2. Airbag means a flexible material, forming an enclosed volume that receives the gas from the inflator and restrains the occupant.
- 2.3. Airbag module for replacement steering system means the smallest sub-assembly comprising at least a flexible structure, the energy source for its deployment and the bag involved in the deployment.
- 2.4. Airbag device means a category of an airbag system or airbag subsystem intended to protect the occupants according to paragraph 2.5. below.
- 2.5. Categories of airbag modules for replacement airbag system:
 - 2.5.1. Category A: Device intended to protect the driver of a vehicle in the event of a frontal collision.
 - 2.5.2. Category B: Device intended to protect front seat passenger(s) other than the driver in the event of a frontal collision.

- 2.5.3. Category C: Device intended to protect the passenger(s) in seats other than the front seats in the event of a frontal collision.
- 2.5.4. Category D: Device intended to protect the occupants in the event of a lateral collision.
- 2.6. Instant of release means the moment at which, in the event of an impact causing deployment, the components producing that deployment are irreversibly actuated.
- 2.7. Full deployment means the state of the flexible structure when its volume reaches the stabilized size needed to ensure its full protective function.
- 2.8. Control unit or release unit means the sub-assembly comprising all components permitting the collision to be detected and producing release.
- 2.9. Wiring harness means all the electrical conductors and connections linking the various parts of the complete airbag assembly to each other and possibly to the vehicle.
- 2.10. Unladen kerb weight means the mass of the vehicle in running order, unoccupied and unladen but complete with fuel, coolant, lubricant, tools and spare wheel (if these are provided as a standard equipment by the vehicle manufacturer).
- 2.11. Type of an airbag module for a replacement airbag system comprises airbag modules which do not differ in such aspects as:
- (a) the category of an airbag module,
 - (b) the geometry of the flexible structure when fully deployed,
 - (c) the material of the flexible structure,
 - (d) the vents or equivalent devices,
 - (e) the gas generator,
 - (f) the envelope principle,
 - (g) the material, structure and dimension of the cover,
 - (h) the composition of the propellant,
 - (i) the method of fixation of the module.
- 2.12. Type of a replacement steering wheel, equipped with an airbag module of an approved type or without an airbag, is an aftermarket steering wheel differing substantially from one another; the differences may relate in particular to:
- (a) the dimension and diameter of the steering wheel,
 - (b) the form, in so far as the safety performance and the strength performance is influenced,
 - (c) the material,
 - (d) the type definition of an airbag module for a replacement

airbag system according to paragraph 2.11. above.

2.13. Type of a replacement airbag system other than those installed in a steering wheel is a type which does not differ in such essential aspects as:

- (a) the category of airbag module,
- (b) the geometry of the flexible structure when fully deployed,
- (c) the material of the flexible structure,
- (d) the vents or equivalent devices,
- (e) the gas generator,
- (f) the envelope principle,
- (g) the material, structure and dimension of the cover,
- (h) the composition of the propellant,
- (i) the method of fixation of the module.

2.14. Replacement steering wheel means an aftermarket steering wheel which is supplied to modify a motor vehicle and which may vary in its functional dimensions, form and/or material from the original steering wheel provided by the vehicle manufacturer.

2.15. Vehicle type means a category of power-driven vehicles which do not essentially differ in such aspects in so far as they have an effect on the results of the impact tests prescribed in this Regulation:

- (a) the structure, dimension, body version and materials of the vehicle,
- (b) the unladen kerb weight, as defined in paragraph 2.10. above,
- (c) the steering control, the seat and the safety belt system and other restraint systems,
- (d) the siting and orientation of the engine,
- (e) the parts and optional arrangements or fittings of the vehicle which influence the performance of the airbag.

3. APPLICATION FOR APPROVAL

3.1. Application for approval of an airbag module for a replacement airbag system

3.1.1. The application for approval of an airbag module shall be submitted by the holder of the trade mark of the airbag module manufacturer, the vehicle component manufacturer or the vehicle manufacturer or by their duly accredited representatives.

3.1.2. For each category of an airbag module for a replacement airbag system, the application shall be accompanied by the following documents in triplicate and the following particulars:

3.1.2.1. a technical description, including mounting instructions and

specifying the type(s) of vehicle for which the airbag module is intended,

3.1.2.2. sufficiently detailed drawings to permit the verification of the positions intended for the approval number as required under paragraph 4.1.4. below.

3.1.2.3. A sufficient number of modules shall be submitted to the technical service responsible for the tests and verification of the conformity with the relevant paragraphs 5 and 6 of this Regulation.

3.2. Application for approval of a replacement steering wheel equipped with an airbag module of an approved type or without an airbag

3.2.1. The application for approval of a replacement steering wheel equipped with or without an airbag or a replacement airbag device shall be submitted by the holder of the trademark of the replacement steering wheel or by the manufacturer or by their duly accredited representative.

3.2.2. For each type of a replacement steering wheel, the application shall be accompanied by the following documents in triplicate and the following particulars:

3.2.2.1. a technical description, including mounting instructions,

3.2.2.2. sufficiently detailed drawings,

3.2.2.3. drawings showing the position of the airbag module(s) and its (their) attachment(s) on the steering wheel,

3.2.2.4. the position intended for the approval number and required under paragraph 4.2.4. below to be verified.

3.2.2.5. a sufficient number of replacement steering wheel and vehicles representative of the type to be approved shall be submitted to the technical service responsible for conducting the approval tests so as to verify conformity with the relevant paragraphs 5 and 6 of this Regulation.

3.3. Application for approval of a replacement airbag device other than those installed in a steering wheel

3.3.1. The application for approval of a replacement airbag system other than those installed in a steering wheel shall be submitted by the holder of the trade mark of the replacement airbag system or by the manufacturer or by their duly accredited representatives.

3.3.2. For each type of a replacement airbag system, the application

shall be accompanied by the following documents in triplicate and the following particulars:

- 3.3.2.1. a technical description, including mounting instructions,
 - 3.3.2.2. sufficiently detailed drawings,
 - 3.3.2.3. drawings showing the position of the airbag device(s) and its (their) attachment(s) on the vehicle,
 - 3.3.2.4. the position intended for the approval number and required under paragraph 4.3.4. below to be verified,
 - 3.3.2.5. a sufficient number of replacement airbag systems and vehicles representative of the types where the replacement system shall be approved for, shall be submitted to the technical service responsible for conducting the approval tests so as to verify conformity with the relevant paragraphs 5 and 6 of this Regulation.
4. APPROVAL
- 4.1. Approval of a replacement airbag module
- 4.1.1. If the samples submitted for approval meet the requirements of the relevant paragraphs 5 and 6 below, approval for this type of a replacement airbag module for a replacement airbag system shall be granted.
 - 4.1.2. An approval number shall be assigned to each type approved. Its first two digits (00 at present) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of airbag module.
 - 4.1.3. Notice of approval or of refusal or extension or withdrawal of approval or of definite discontinuation of production of a type of replacement airbag module, pursuant to this Regulation, shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in annex 1 to this Regulation.
 - 4.1.4. The samples of replacement airbag modules shall be clearly and indelibly marked with the manufacturer's trade name or mark and an approval mark consisting of:
 - 4.1.4.1. a circle surrounding the letter "E" followed by the distinguishing

number of the country which has granted approval, 1/

- 4.1.4.2. an approval number,
- 4.1.4.3. an additional symbol, indicating the airbag module category (see para. 2.5. above).
- 4.1.5. The approval mark and the additional symbol shall be clearly legible and indelible.
- 4.1.6. Annex 4 to this Regulation gives an example of the approval mark and the additional symbol mentioned above.
- 4.2. Approval of a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
- 4.2.1. If a replacement steering wheel submitted for approval meets the requirements of the relevant paragraphs 5 and 6, approval of one or more replacement steering wheel types shall be granted.
- 4.2.2. An approval number shall be assigned to each type approved. Its first two digits (00 at present) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of airbag system(s) with regard to the installation on vehicle(s).
- 4.2.3. Notice of approval or of refusal or extension or withdrawal of approval or of definite discontinuation of production of an airbag system pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in annex 2 to this Regulation.
- 4.2.4. The samples of the replacement airbag steering wheel and the hub

1/ 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, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 (vacant), 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 (Bosnia and Herzegovina), 32-36 (vacant) and 37 for Turkey. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

(adapters) shall be clearly and indelibly marked with the manufacturer's trade name or mark and an approval mark consisting of:

- 4.2.4.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval, 2/
- 4.2.4.2. an approval number,
- 4.2.4.3. an additional symbol, indicating the airbag module category (see para. 2.5. above).
- 4.2.5. The approval mark and the additional symbol shall be clearly legible and indelible.
- 4.2.6. The approval mark shall be placed on the replacement steering wheel and on the hub (adapter). If the replacement steering wheel and hub are in one piece, one approval mark and one mark with the manufacturer's trade name or mark is sufficient.
- 4.2.7. Annex 5 to this Regulation gives an example of the approval mark and the additional symbol mentioned above.
- 4.3. Approval of a replacement airbag system other than those installed in a steering wheel
- 4.3.1. If a replacement airbag system submitted for approval meets the requirements of the relevant paragraphs 5 and 6, approval of one or more replacement airbag systems shall be granted.
- 4.3.2. An approval number shall be assigned to each type approved. Its first two digits (00 at present) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of airbag system(s) with regard to the installation on vehicle(s).
- 4.3.3. Notice of approval or of refusal or extension or withdrawal of approval or of definite discontinuation of production of an airbag system pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in annex 3 to this Regulation.
- 4.3.4. There shall be affixed to every replacement airbag system conforming to a replacement airbag type approved under this Regulation, conspicuously and in a readily accessible place, an

2/ See footnote No. 1/

international approval mark consisting of:

- 4.3.4.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval, 3/
- 4.3.4.2. an approval number,
- 4.3.4.3. an additional symbol, indicating the airbag module category (see para. 2.5. above).
- 4.3.5. The samples of the replacement airbag system shall be clearly and indelibly marked with the manufacturer's trade name or mark.
- 4.3.6. Annex 6 to this Regulation gives an example of the approval mark and the additional symbol mentioned above.

3/ See footnote No. 1/

5. REQUIREMENTS

5.1. General requirements for the approval of modules for replacement airbag system, replacement steering wheels equipped with an airbag module or replacement airbag system other than those installed in an steering wheel.

5.1.1. Before type approval according to paragraphs 4.1., 4.2 and/or 4.3. is granted, the competent authority shall verify the existence of satisfactory arrangements for ensuring:

5.1.1.2. installation, maintenance, repair and dismantling of the system by trained technicians only according to a manual, which shall be prepared by the applicant of the approval.

5.1.1.3. substitution of a part or the complete system after guaranteed lifetime or in case of an inevitable recall campaign,

5.1.1.4. scrapping of the airbag system in a not detrimental way for humans and the environment,

5.1.1.5. labelling and notices for rescue persons, labelling and information for the use of child restraint systems.

5.1.2. Interference from magnetic fields shall not disrupt the operation of the airbag system.

5.1.3. A complete system shall comprise a system alerting the user that the airbag device or the airbag devices are in a perfect working order.

5.1.4. Airbag modules for replacement airbag system of categories A shall be so designed that, when they are submitted to a test in accordance with the requirements of paragraph 5.2.2.7., static deployment test, the flexible structure may be pushed aside manually after full deployment.

5.1.5. Toxicity and burns
A certificate shall be prepared stating that the nature, concentration and temperature of the gases released on deployment of an airbag module are not such as to be liable to harm the occupants of the vehicle. The authorities responsible for issuing the approval shall reserve the right to verify the accuracy of the statement.

5.2. Requirements for the approval of an airbag module for a replacement airbag system

5.2.1. Each airbag module shall comply with the requirements of the "International Standard ISO 12097-2 ROAD VEHICLES-AIRBAG COMPONENT

TESTING-PART 2: Testing of Airbag Modules" version:1996-08-00, to guarantee the operating safety of the airbag modules.

- 5.2.2. Instead of paragraph 5.2.1., a reduced test program is permitted which shows as a minimum the following test elements:
 - 5.2.2.1. Drop test
 - 5.2.2.2. Mechanical impact test
 - 5.2.2.3. Dust test
 - 5.2.2.4. Simultaneous vibration temperature test
 - 5.2.2.5. Thermal humidity cycling test
 - 5.2.2.6. Solar radiation simulation test
 - 5.2.2.7. Static deployment test
 - 5.2.2.8. Temperature shock test
- 5.3. Requirements for replacement steering wheels equipped with an airbag module of an approved type or without an airbag
 - 5.3.1. Before type approval according to paragraph 4.2. is granted, the competent authority shall verify the existence of satisfactory arrangements for ensuring:
 - 5.3.1.1. a heat test of the steering wheel (all parts except the airbag module) to guarantee a cohesion of all materials. This test must leave no permanent deformation exceeding the design tolerances, or any cracks or fractures which might affect the operational safety of the steering wheel.
 - 5.3.1.2. a bending test to guarantee a minimum deformation of the steering wheel rim. This test may not leave any permanent deformation on the rim that is greater than 8 per cent of the steering wheel diameter. There must be no signs of any cracks or fractures which will affect the operational safety of the steering wheel.
 - 5.3.1.3. a torque test to guarantee a sufficient stiffness when the steering wheel is loaded tangentially to the steering wheel rim. The permanent deformation shall not exceed 1 degree in the direction of rotation after applying a load of 70 kg. The steering wheel is then subjected to a load of 22 mdaN. This must not affect the steering wheel's operational safety even if the permanent deformation is greater than 1 degree in the direction of rotation.

- 5.3.1.4. a fatigue test to guarantee a sufficient lifetime. The replacement steering wheel must withstand at least 1×10^5 load cycles with a torque of 14 mdaN without showing any signs of cracks or fractures which might affect its operational safety.

5.3.2. When the steering wheel is struck by a body block released against this steering wheel, in accordance with the procedure prescribed in annex 7, at a relative speed of 24.1 km/h the force applied to the body block by the steering wheel shall not exceed 1111 daN. The test shall not be carried out with steering wheels which incorporate a steering wheel airbag system.

5.3.3. When the steering wheel is struck by an headform impactor released against this steering wheel at a relative speed of 24.1 km/h, in accordance with the procedure of annex 8, the deceleration of the impactor shall not exceed 80 g cumulative for more than 3 milliseconds. The deceleration shall always be lower than 120 g with C.F.C. 600 Hz.

If the impactor strikes a test component, which covers an uninflated airbag, the test shall be carried out at a speed of at least 19.3 km/h.

These velocities shall be achieved either by the mere energy of propulsion or by using an additional propelling device.

5.3.4. The steering control shall be designed, constructed and fitted in such a way that:

5.3.4.1. Before the impact test prescribed in paragraphs 5.3.2. and 5.3.3. above no part of the steering wheel surface, directed towards the driver, which can be contacted by a sphere of 165 mm in diameter shall present any roughness or sharp edges with a radius of curvature of less than 2.5 mm.

5.3.4.2. After any impact test prescribed in paragraphs 5.3.2 and 5.3.3 the part of the steering control surface directed towards the driver shall not present any sharp or rough edges likely to increase the danger of severity of injuries to the driver. Small surface cracks and fissures shall be disregarded.

5.3.4.2.1. In case of a projection consisting of a component made of non rigid material of less than 50 Shore A hardness mounted on rigid support, the requirement of paragraph 5.3.4.1 and 5.3.4.2 shall only apply to the rigid support.

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

5.3.6. In the case of "general replacement steering wheels" the requirements shall be met over:

5.3.6.1. the full range of steering column angles, it being understood that

the tests shall be performed at least for the maximum and minimum column angles for the range of vehicle types for which the replacement steering wheels are intended,

- 5.3.6.2. the full range of possible headform impactor and body block positions in relation to the steering control, it being understood that the test shall be performed at least for the mean position for the range of vehicle types for which the replacement steering wheels are intended,
- 5.3.6.3. the full range of possible headform impactor and body block positions in relation to the steering control, it being understood that the test shall be performed at least for the mean position for the range of vehicle types for which the replacement steering wheel are intended. Where a steering column is used, it shall be of a type corresponding to the "worst case" conditions.
- 5.3.7. Where adapters are used to adapt a single type of replacement steering wheel to a range of steering columns, and it can be demonstrated that with such adaptors the energy-absorbing characteristics of the system are the same, all the tests may be performed with one type of adaptor:
- 5.3.8. For the replacement steering wheel, it must be guaranteed that the effective diameter is not substantially smaller than the effective diameter of the steering wheel installed by the manufacturer of the vehicle. This requirement is deemed fulfilled when the effective diameter of the replacement steering wheel is not less than 0.9 times the effective diameter of the steering wheel used by the vehicle manufacturer.
- If the replacement steering wheel is less than 0.9 of the smallest diameter used by the vehicle manufacturer, the applicant of the replacement steering wheel must have obtained the consent of the vehicle manufacturer beforehand. Provided the vehicle manufacturer makes no technically justified objections, detailed and thorough road trails will be carried out to determine whether the vehicle can be steered safely and easily under all traffic and operating conditions including the failure of the steering power device according to ECE Regulation No. 79, if there is any.
- 5.3.9. The size and fitting of the replacement steering wheel to the steering column must be within the dimensions and tolerances specified by the vehicle manufacturer. Otherwise the replacement manufacturer shall demonstrate to the Technical Service the proper function of any other chosen fixing method.
- 5.3.10. The replacement steering wheel shall allow the drivers a direct view to all important instruments and indicators such as

- (a) the speedometer and
- (b) the tell tales for:
 - direction indicator
 - main beam
 - rear fog lamp
 - hazard warning signal
 - automatic antilock system
 - brake system malfunctions
 - airbag function indicator

The tests shall be carried out according to the prescription laid down in paragraph 6.2.3.1.

- 5.3.11. Replacement airbag steering wheels installed in a vehicle shall fulfil sufficient tests according to paragraph 6.2.4. to demonstrate the function of the airbag device or devices in a frontal impact test according to Regulation No. 94, 01 series of amendments.
- 5.4. Requirements for replacement airbag device(s) other than those installed in a steering wheel
- 5.4.1. Replacement airbag devices shall be equipped with an approved airbag module or it shall be demonstrated to the satisfaction of the technical service, responsible for this test, that the system used complies with the requirements prescribed in paragraphs 5.1. and 5.2. above.
- 5.4.2. Additionally, after installation of the airbag device(s) in the vehicle, sufficient tests according to paragraph 6.3.2. shall be carried out to demonstrate the function of the airbag device in a frontal impact test according to Regulation No. 94, 01 series of amendments and/ or in a side impact test according to Regulation No. 95, 01 series of amendments, depending on the category and location of the replacement airbag device or devices. In case of airbag devices of categories C and D, additional dummies shall be used for the verification of the performance of each airbag device.
- 6. TESTS
- 6.1. Tests of an airbag module for replacement airbag system

The tests shall be carried out according to ISO/DIS 12097-Part 2, version 1996-08-00.
- 6.2. Tests for a replacement steering wheel equipped with an airbag module of an approved type or without an airbag
- 6.2.1. Strength tests:

6.2.1.1. Heat test

The replacement steering wheel (except the airbag module) is exposed to the following temperature cycle with immediate repetition:

- | | | |
|---|---------------|--------------|
| - | 16 hours at | - 15°C ± 2°C |
| - | 30 minutes at | + 22°C ± 2°C |
| - | 3 hours at | + 80°C ± 2°C |
| - | 30 minutes at | - 22°C ± 2°C |

This test must leave no permanent deformation over and above the design tolerances, or any cracks or fractures.

6.2.1.2. Bending test

The replacement steering wheel is exposed to a temperature of at least -15°C ± 2°C for 16 hours. The replacement steering wheel is then mounted with its hub on a rigid shaft and the steering wheel rim is subjected to a static loading of 70 daN ± 0.5 kg acting perpendicular to the plane of the rim. The test loading must be applied on the rim and between two spokes that confine the greatest angle.

This test may not leave any permanent deformation on the rim of the replacement steering wheel that would be greater than 8 per cent of the steering wheel diameter. There must be no signs of any cracks or fractures which will affect the operational safety of the steering wheel.

6.2.1.3. Torque test

The replacement steering wheel is mounted with its hub on a rigid shaft and subjected statically to a test load of 70 daN ± 0.5 daN applied tangentially to the steering wheel rim. The permanent deformation resulting from this test may not exceed 1 degree in the direction of rotation. The test may not leave any signs of cracks or fractures which might affect the operational safety of the steering wheel. The steering wheel rim is then subjected to a tangential load corresponding to a torque of 22 mdaN ± 0.5 mdaN. This must not affect the steering wheel's operational safety even if the permanent deformation is greater than 1 degree in the direction of rotation.

6.2.1.4. Fatigue test

The replacement steering wheel is mounted with its rim in a test jig, as shown in annex 9, figure of an example of a fatigue test device, and subjected to a approximate sinusoidal endurance load cycle test with a torque of 14 mdaN ± 0.5 mdaN at a frequency of 1.5 Hz ± 0,25 Hz.

The replacement steering wheel must withstand at least 1×10^5 load cycles without showing any signs of cracks or fractures which might affect its operational safety.

6.2.2. Installation requirement tests and driver's view to the instrument panel

6.2.2.1. The driver's view to:

- (a) the speedometer
- (b) the tell tales for:
 - direction indicator
 - main beam
 - rear fog lamp
 - hazard warning signal
 - automatic antilock system
 - brake system malfunctions
 - airbag function indicator

shall be guaranteed. The visibility is assessed by means of a comparative evaluation of photographs taken of the instrument panel of the vehicle under test equipped with a replacement steering wheel. The H points are measured after the vehicle has been aligned on the three dimensional measuring device. The relation between vehicle and coordinate system is established through reference points of the body.

If the coordinates of the R point are not known, the H point is determined using a 50 percentile manikin. The driver's seat is adjusted as follows:

- (a) seat in rearmost position of the device for longitudinal adjustment;
- (b) backrest inclined corresponding to 25° back angle of the manikin;
- (c) other adjusting devices in central position.

A 35 mm camera inclined by 15° towards the horizontal plane is used to simulate binocular viewing and photos are taken from each of the eye points.

Position of the eye points related to the R or H point in the coordinate system in accordance with ISO 4130 (dimensions in mm):

x	y	z	x	y	z
0	-32.5	+635.0	0	+32.5	+635.0

For the camera the eye points are determined 35 mm in front of the plane of representation (normally the film plane) and on the

centre axis of the optical system.

6.2.2.2. Operation of control elements

An examination is made to find out whether the minimum and maximum distances indicated below between the control elements for instance for direction indicator and headlamp flasher and the steering wheel rim are maintained. Thus, satisfactory operation of the control elements and satisfactory handling of the replacement steering wheel are to be ensured:

- (a) the measure "a" with a limitation of a minimum 30 mm refers to the control element with the smallest distance to the replacement steering wheel. It denotes the shortest

distance between the control element and the rearplane of the steering wheel rim facing the instrument panel.

- (b) The measure "b" with a limitation of a maximum value of 130 mm denotes the distance from the centre of the direction indicator control element and the front plane of the steering wheel rim facing the driver.

6.2.2.3. Testing of installation

The conditions of installation, the diameter of the replacement steering wheel as compared with the original version of the vehicle manufacturer, the resetting of direction indicator, the function of the audible warning device and the function of the airbag tell tale are considered in the examination. Also the function of sensors monitoring the driver's seat or the passenger seat(s) and providing a deployment status to the airbag controller shall be examined, if available.

6.2.2.4. Testing of adapters

The fitting dimensions (e.g. tothing of the steering shaft) are compared with the dimensions as provided by the manufacturer using a profile projector.

The strength of the replacement adapters is checked by tightening the fixing nut/screw applying twice the tightening torque specified by the vehicle manufacturer but not more than 85 Nm.

Adequate examinations are made to verify that the adapters for vehicle types with anti-theft systems integrated into the steering wheel conform to the corresponding features of the steering wheel produced by the vehicle manufacture in terms of strength, dimensions and the materials and function, or tests of the anti-theft system in accordance with Regulation No. 18 shall be carried out to demonstrate that the replacement steering wheel system fulfils the above mentioned Regulation.

6.2.3. Frontal impact test(s) with vehicle(s) for steering wheel(s) equipped with an airbag module of an approved type

Replacement airbag steering wheels installed in a vehicle shall fulfil sufficient number of tests to demonstrate the function of the airbag device or devices in a frontal impact test according to Regulation No. 94, 01 series of amendments.

6.3. Tests for replacement airbag system other than those installed in a steering wheel

6.3.1. Testing of airbag modules for replacement airbag system

The replacement airbag system shall be equipped with an approved airbag module or the manufacturer of the replacement airbag device shall demonstrate to the satisfaction of the technical service, responsible for this test, that the system fulfils the requirements as prescribed in paragraphs 5.1 and 5.2. above.

- 6.3.2. Impact test(s) with vehicle(s) for airbag system(s) other than those installed in steering wheels

Additionally, after installation of the airbag device(s) in the vehicle, sufficient number of tests shall be carried out to demonstrate the function of the airbag device in a frontal impact test according to Regulation No. 94, 01 series of amendments, and/or in a side impact test according to Regulation No. 95, 01 series of amendments, depending on the category and location of the replacement airbag device.

In case of airbag devices of categories C and D, additional instrumented dummies shall be used for the verification of the performance of each airbag device.

7. INSTRUCTIONS FOR USERS

- 7.1. The manufacturer of the replacement airbag devices shall include in the operating instructions any recommendations or precautions to be taken during the use, maintenance or destruction of the system or of any of its components.

- 7.1.1. In particular:

- 7.1.1.1. If the system is fitted with a monitoring device intended to inform the user of its operating condition, it shall be clearly indicated how messages delivered by the system, of whatever kind, are to be interpreted. An indication shall be given of measures to be taken in the event of a message warning of malfunctioning, together with a description of any risk involved in using the vehicle in such a condition;

- 7.1.1.2. It shall be indicated whether maintenance or repair work is or is not to be performed exclusively by specially trained personnel, and whether any risks are involved in disassembling the system;

- 7.1.1.3. The procedure to be followed in the event of deployment shall be explained. In particular, details shall be given of any precautions to be taken as regards products generated by deployment, in the form of gases, liquids or solids. Similarly, if there is any danger from the components of the system as a result of deployment, such as dangerous roughness or sharp edges, temperature, corrosion, etc., these dangers shall be described, as well as the ways of avoiding them;

7.1.1.4. If the scrapping of the replacement airbag system(s) can lead to situations which are dangerous either directly to humans or to the environment, an appropriate procedure for avoiding them shall be indicated. This may consist in a method for deliberately releasing the airbag if its released state does not lead to a dangerous situation, in an obligation to return the system or part of it to the constructor or manufacturer, or in any other appropriate measure.

7.2. The replacement airbag system shall carry information as prescribed below:

7.2.1. for a vehicle fitted with an replacement airbag device of category A, B, C or D this information shall consist of the inscription "AIRBAG" located in the interior of the circumference of the steering wheel or the cover of the airbag module; this inscription shall be durably affixed and easily visible.

7.2.2. for a vehicle fitted with an replacement airbag device of category B, C or D, this information shall consist of warning label described in paragraph 7.3. below.

7.3. A vehicle fitted with one or more replacement passenger airbags shall carry information about the extreme hazard associated with the use of rearward-facing child restraints on seats equipped with airbag devices.

7.3.1. As a minimum, this information shall consist of a pictogram label as indicated below.

7.3.2. This warning label shall be durable, affixed and located such that it is easily visible in front of the person about to install a rearward-facing child restraint on the seat in question. A permanent reference should be visible at all times, in case the warning is not visible when the door is closed.

This requirement does not apply to those seats equipped with a device which automatically deactivates the airbag devices when a rearward-facing child restraint is installed.

7.3.3. Detailed information, making reference to the label shall be prepared and distributed by the manufacturer of the replacement airbag system to each part as an owners' manual; as a minimum the following text in an official ECE language, supplemented by the corresponding text in the language of the country where the vehicle is to be registered must be included:

"Extreme Hazard! Do not use a rearward-facing child restraint on a seat protected by an airbag in front of it."

The text shall be accompanied by the pictogram mounted on the vehicle.



Diameter: at least 60 mm

Colours:

- the pictogram is red
- seat, child seat and contour line of the airbag are black
- the word airbag as well as the airbag are white

8. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the Agreement, appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2) with the following requirements:

8.1. The authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every two years. Where negative results are recorded during one of these verifications, their frequency may be increased.

8.2. Conformity of production of an airbag module

Airbag modules approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 5.1. and 5.2. above.

8.3. Conformity of production of replacement steering wheel equipped with an airbag module of an approved type or without an airbag Replacement airbag steering wheels approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 5.1. and 5.3. above.

8.4. Conformity of production of replacement airbag system other than those installed in a steering wheel steering

Replacement airbag systems other than those installed in a

steering wheel approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 5.1. and 5.4. above.

9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

The approval granted in respect of a type of an airbag module, a vehicle with regard to the airbag system, a replacement steering wheel with or without an airbag or a replacement airbag system pursuant to this Regulation, may be withdrawn if the requirements laid down in paragraph 8 above are not complied with.

10. MODIFICATIONS OF THE TYPE OF AN AIRBAG MODULE OR A VEHICLE WITH REGARD TO AN AIRBAG SYSTEM OR A REPLACEMENT STEERING WHEEL WITH OR WITHOUT AN AIRBAG OR OF REPLACEMENT AIRBAG SYSTEM OTHER THAN THOSE INSTALLED IN A STEERING WHEEL

10.1. Every modification of the type of the above-mentioned system shall be notified to the administrative department which approved the type. The department may then either:

10.1.1. decide that the modifications made are unlikely to have an appreciable adverse effect and that in any case the module or the system or the replacement steering wheel still meets the requirements,

10.1.2. require a further test report from the technical service responsible for conducting the tests.

10.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraphs 4.1. to 4.3. above to the other Parties to the Agreement applying this Regulation.

10.3. The competent authority which has issued the extension of approval shall assign a series number to that extension and so inform the other Parties to the 1958 Agreement applying this Regulation, by means of a communication form conforming to the models in annexes 1, 2 and 3 to this Regulation.

11. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval ceases completely to manufacture a type of airbag module or a vehicle type with regard to the airbag system or a replacement steering wheel with or without an airbag system or a replacement airbag device other than those installed in a vehicle under this Regulation, he shall inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation, by means

of a communication form conforming to the models in annexes 1, 2 and 3 to this Regulation.

12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

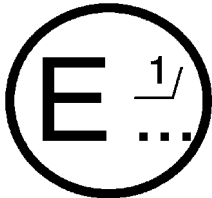
The Parties to the 1958 Agreement applying this Regulation shall communicate to the United Nations secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or extension, or refusal or withdrawal of approval, issued in other countries, are to be sent.

Annex 1

COMMUNICATION

(maximum format: A4 (210 x 297 mm))

issued by: Name of administration:
.....
.....
.....



concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a type of a replacement airbag module pursuant to Regulation No. ...

Approval No: Extension No.:

1. Replacement airbag module of categories A, B, C, D:
2. Trade name or mark:
3. Description of the type of airbag module given by the manufacturer: . .
.
4. Manufacturer's name:
5. If applicable, name of manufacturer's representative:
6. Address:
7. Replacement airbag system submitted for approval:
8. Technical service responsible for conducting approval tests:
9. Date of test report issued by this service:
10. Number of test report issued by this service:
11. Approval granted/refused/extended/withdrawn for general use/for use in a

specific vehicle or in specific types of vehicles 2/

12. Position and type of mark:
13. Place:
14. Date:
15. Signature:
16. The list of documents deposited with the administrative service which has granted approval is annexed to this communication and may be obtained on request.

1/ Distinguishing number of the country which has granted/extended/withdrawn approval (see approval provisions in the Regulation).

2/ Strike out what does not apply.

Annex 2

COMMUNICATION

(maximum format: A4 (210 x 297 mm))

issued by: Name of administration:
.....
.....
.....



concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a replacement steering wheel equipped with an airbag module of an approved type or without an airbag pursuant to Regulation No.: ...

Approval No.: Extension No.:

1. Trade name or mark of the replacement steering wheel:
2. Manufacturer's name and address:
3. If applicable, name and address of manufacturer's representative: ..
.....
4. Trade name and mark of the type of the airbag module and approval No.:
.....
5. Extension of approval of replacement steering wheel:
6. List of vehicles, where the replacement steering wheel can be installed
(name of vehicle manufacturer/commercial name/vehicle code/replacement
steering wheel type/adapter type and number):
7. Technical service responsible for conducting approval tests:
8. Date of test report issued by this service:

9. Number of test report issued by this service:

10. Approval granted/refused/extended/withdrawn for general use/for use in a specific vehicle or in specific types of vehicles 2/

11. If applicable, reasons for extension of approval:
.

12. Place:

13. Date:

14. Signature:

15. The list of documents deposited with the administrative service which has granted approval is annexed to this communication and may be obtained on request.

- 1/ Distinguishing number of the country which has granted/extended/withdrawn approval (see approval provisions in the Regulation).

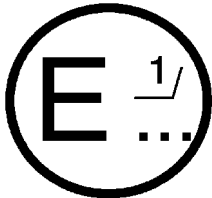
- 2/ Strike out what does not apply.

Annex 3

COMMUNICATION

(maximum format: A4 (210 x 297 mm))

issued by: Name of administration:
.....
.....
.....



concerning: 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a replacement airbag system other than those installed in a replacement steering wheel pursuant to Regulation No.:....

Approval No.: Extension No.:

1. Trade name or mark of the replacement airbag system:
2. Trade name and mark of the replacement airbag system, category of the airbag device and approval No. of the airbag module:
.
3. Manufacturer's name and address:
.
4. If applicable, name and address of manufacturer's representative: . . .
.
5. Replacement airbag system and vehicles submitted for approval on: . . .
6. Extension of approval of replacement airbag system:
7. List of vehicles, where the replacement airbag system can be installed:
.
8. Technical service responsible for conducting approval tests:

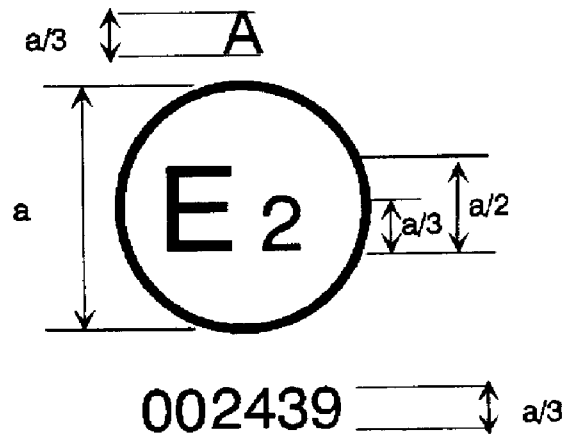
- 9. Date of test report issued by this service:
- 10. Number of test report issued by this service:
- 11. Approval granted/refused/extended/withdrawn for general use/for use in a specific vehicle or in specific types of vehicles 2/
- 12. If applicable, reasons for extension of approval:
- 13. Place:
- 14. Date:
- 15. Signature:
- 16. The list of documents deposited with the administrative service which has granted approval is annexed to this communication and may be obtained on request.

1/ Distinguishing number of the country which has granted/extended/withdrawn approval (see approval provisions in the Regulation).

2/ Strike out what does not apply.

Annex 4

EXAMPLE OF AN APPROVAL MARK FOR A REPLACEMENT AIRBAG MODULE



$a = 8 \text{ mm min}$

The airbag module bearing the above approval mark is a category A airbag approved in France (E2) under the number 002439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of the Regulation in its original form.

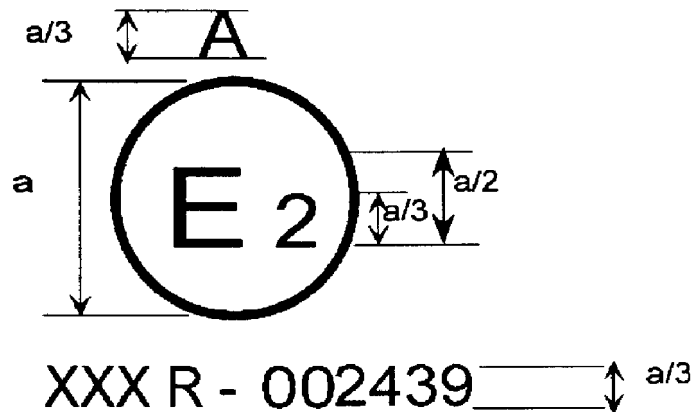
Note:

The approval number and additional symbol(s) must be placed close to the circle and either above or below the "E" or to the left or right of that letter.

The digits of the approval number must be on the same side of the "E" and oriented in the same direction. The additional symbol(s) must be diametrically opposite the approval number. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with the other symbols.

Annex 5

EXAMPLE OF AN APPROVAL MARK
FOR A REPLACEMENT STEERING WHEEL EQUIPPED WITH AN AIRBAG MODULE
OF AN APPROVED TYPE OR WITHOUT AN AIRBAG



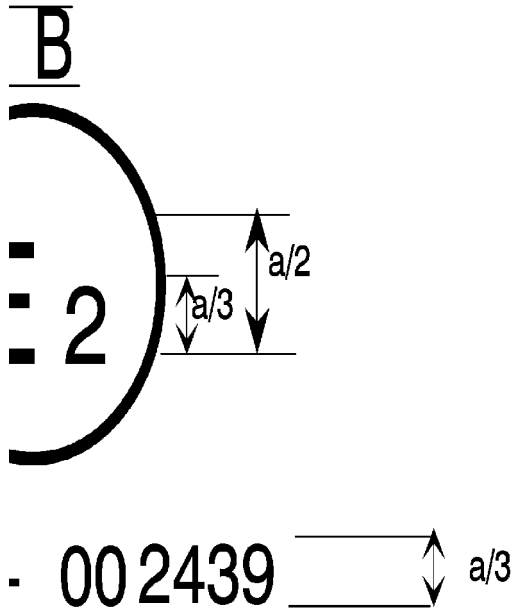
$a = 8 \text{ mm min}$

The replacement steering wheel bearing the above approval mark is a steering wheel with an airbag of category A and approved in France (E2) under the number 002439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of the Regulation in its original form.

Note:

The approval number and additional symbol(s) must be placed close to the circle and either above or below the "E" or to the left or right of that letter.

The digits of the approval number must be on the same side of the "E" and oriented in the same direction. The additional symbol(s) must be diametrically opposite the approval number. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with the other symbols.

Annex 6EXAMPLE OF AN APPROVAL MARK FOR A REPLACEMENT AIRBAG SYSTEM
OTHER THAN THOSE INSTALLED IN A STEERING WHEEL

$a = 8 \text{ mm min}$

The replacement airbag system bearing the above approval mark is a category B airbag device approved in France (E2) under the number 002439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of the Regulation in its original form.

Note:

The approval number and additional symbol(s) must be placed close to the circle and either above or below the "E" or to the left or right of that letter.

The digits of the approval number must be on the same side of the "E" and oriented in the same direction. The additional symbol(s) must be diametrically opposite the approval number. The use of Roman numerals as approval numbers should be avoided so as to prevent any confusion with the other symbols.

Annex 7

BODY BLOCK TEST

1. Purpose

The purpose of this test is to verify whether the vehicle meets the requirements set out in paragraph 5.3.2. or this Regulation

2. Installation, procedures and measuring instruments

2.1. Mounting of the steering wheel or steering control

2.1.1. The control shall be mounted on the front section of the vehicle obtained by cutting the body transversely at the level of the front seats, and possibly eliminating the roof, windscreen and doors. This section shall be fixed rigidly to the test bench, so that it does not move under the impact of the body block.

The tolerance on the control mounting angle shall be ± 2 degrees of the design angle.

2.1.2. However, at the request of the manufacturer and with the agreement of the technical service, the replacement steering wheel may be mounted on a framework simulating the mounting of the steering mechanism, provided that, as compared with the real "front body section/steering mechanism" assembly, the "framework/steering mechanism" assembly has:

2.1.2.1. the same geometrical layout,

2.1.2.2. greater rigidity.

2.1.3. The replacement steering wheel shall be tested complete with trim. The replacement steering wheel shall have a minimum collapsing space of 100 mm between the replacement steering wheel and the test bench, if the steering wheel shall be tested without original instrument panel and column-cover. The steering shaft shall be firmly attached to the test bench.

2.2. Setting of the steering mechanism for the tests

2.2.1. During the first test, the replacement steering wheel shall be turned so that its most rigid spoke is perpendicular to the point of contact with the body block; if the replacement steering control is a steering wheel, the test shall be repeated with the most flexible part of the steering wheel perpendicular to that point of contact. In the case of an adjustable replacement steering wheel, both tests shall be made with the wheel adjusted

to the middle position.

2.2.2. If the vehicle is equipped with a device to adjust the slope and position of the steering wheel, the test shall be performed with the latter in the normal position of use indicated by the manufacturer and regarded by the laboratory as representative from the standpoint of energy absorption.

2.2.3. If the replacement steering wheel is fitted with a steering wheel airbag, the test shall be carried out with the airbag inflated. At the request of the manufacturer and with the consent of the technical service, the test may be carried out without the airbag inflated.

2.3. Body block

The body block shall have the shape, dimensions, mass and characteristics shown in the appendix to this annex.

2.4. Measurements of forces

Measurements shall be made of the maximum force, acting horizontally and parallel to the longitudinal axis of the vehicle, applied to the body block as a result of impact against the replacement steering wheel.

2.4.2. This force may be measured directly or indirectly or may be calculated from values recorded during the test.

2.5. Propulsion of the body block

2.5.1. Any method of propulsion may be used, provided that, when the body block strikes the replacement steering wheel, it is free from all connection with the propelling device. The body block shall strike this control after an approximately straight trajectory parallel to the longitudinal axis of the vehicle.

2.5.2. The H point of the body block, indicated by a special mark, shall be so adjusted that before the impact, it is in the horizontal plane passing through the R point as indicated by the manufacturer of the vehicle.

2.6. Speed

The body block shall strike the replacement steering wheel at a speed of 24.1 km/h \pm 1.2/-0.0 km/h . However, if the test has been carried out at a higher impact speed and the control has met the requirements laid down, the test shall be considered satisfactory.

2.7. Measuring instruments, accuracy and conditions

2.7.1. The instrumentation used to record the parameters referred to in paragraph 5.2. of this Regulation shall enable the measurements to be made with the following accuracy:

2.7.1.1. Speed of body block: within 2 per cent;

2.7.1.2. Time recording: within 1/1000 second.

2.7.1.3. The beginning of the impact (zero point) at the moment of first contact of the body block with the replacement steering wheel shall be identified on the recordings and films used for analyzing the results of the test.

2.7.1.4 Measurement of force

The instrumentation used shall comply with ISO 6487:1987 unless otherwise specified in this Regulation.

2.7.1.4.1. With load transducers inserted on the steering system:

The channel amplitude class shall be 1,960 daN and the channel frequency class 600.

2.7.1.4.2. With accelerometers or load transducers inserted on the body block:

Two unidirectional accelerometers shall be placed symmetrically in the transverse plane of the centre of gravity of the body block. The channel amplitude class shall be 60 g and the channel frequency class 180. Other methods with regard to the number and positioning of the measuring accelerometers shall be allowed, such as by dividing the test apparatus in separate parts at the centre of gravity of which accelerometers are placed to measure the acceleration horizontally and parallel to the longitudinal axis of the vehicle.

The resultant force shall be the force corresponding to the maximum of the sum of forces calculated or measured directly for each part of the body block.

2.8. Ambient temperature: stabilized at 20°C ± 5°C.

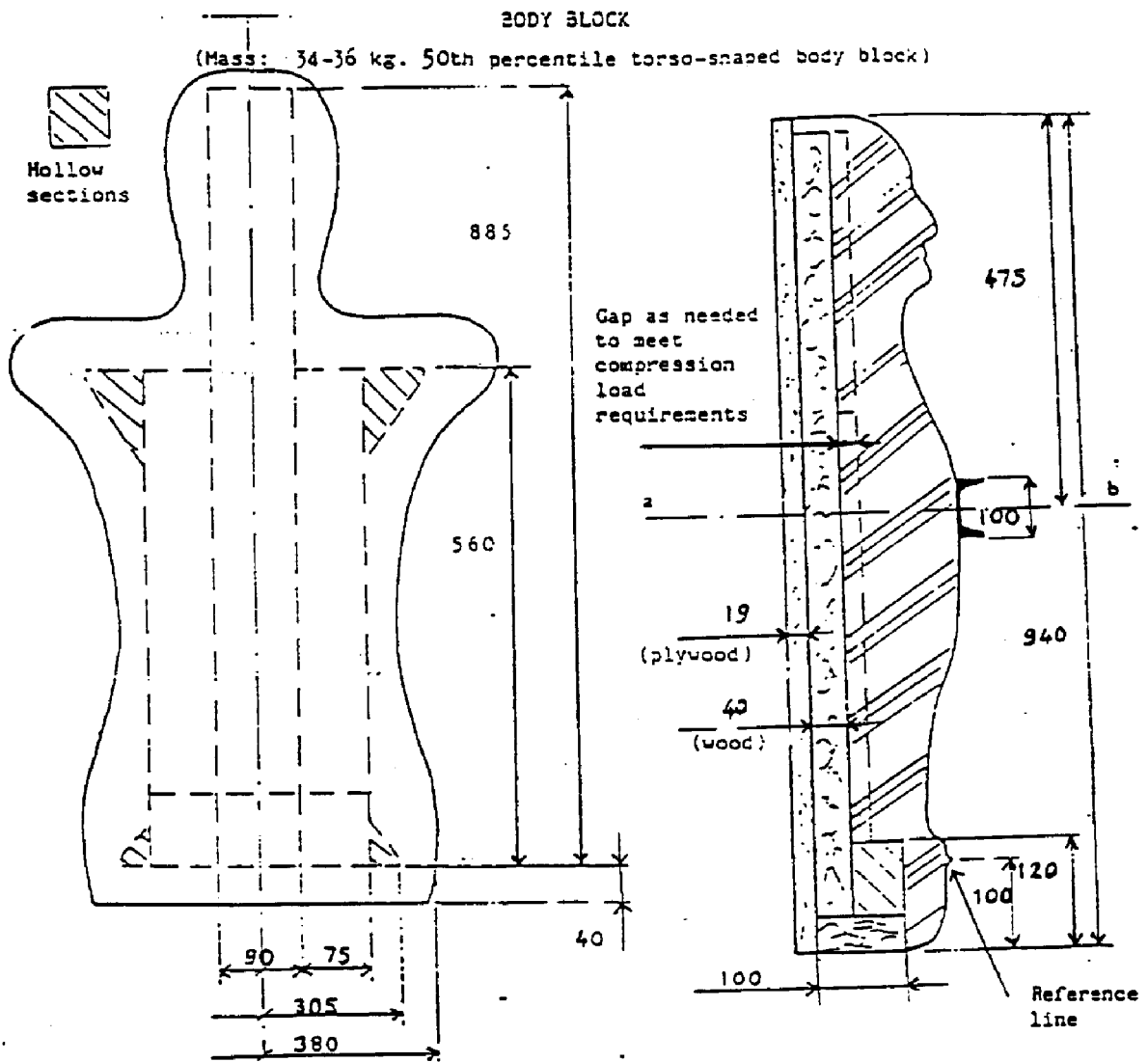
3. Results

3.1. After the test, the damage sustained by the steering mechanism shall be ascertained and described in a written report; at least one side-view and one front-view photograph of the "replacement steering wheel/steering column/instrument panel" area shall be taken.

- 3.2. The maximum value of the force shall be measured or calculated as indicated in paragraph 2.7.1.4. above.

4. Equivalent test procedures
 - 4.1. Alternative tests may be permitted at the discretion of the approval authority provided that equivalence can be demonstrated. A report shall be attached to the approval documentation describing the method used and the results obtained.
 - 4.2. Responsibility for demonstrating the equivalence of the alternative method shall rest with the manufacturer or his agent wishing to use such a method.

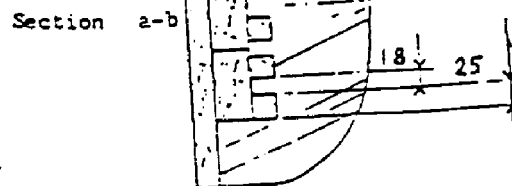
Annex 7 - Appendix 1



Spring rate: 107 - 143 kgf/cm

The chest is loaded with a 100 mm beam as shown, 90° to the longitudinal axis of the block and parallel to the backing plate. The load is measured when the beam has moved 12.7 mm into the body block.

Rubber-like material strapped and taped to backing plate



Dimensions in mm

Annex 8

HEAD FORM TEST

1. Purpose

The purpose of this text is to verify if the replacement steering wheel meets the requirements set out in paragraph 5.3.3. of this Regulation.

2. Installation, procedures and measuring instruments

2.1. General

2.1.1. The replacement steering wheel shall be tested complete with trim.

2.1.2. If the replacement steering wheel is fitted with a steering wheel airbag, the test shall be carried out with the uninflated airbag. If the head form strikes the test components which cover an uninflated airbag, the test speed may be carried out with a speed of not less than [19,3] km/ h.

2.2. Mounting of the replacement steering wheel

2.2.1. The replacement steering wheel shall be mounted on the front section of the vehicle obtained by cutting the body transversely at the level of the front seats and possibly eliminating the roof, windscreen and doors.

This section shall be fixed rigidly to the test bench so that it does not move under the impact of the head form.

The tolerance on the control mounting angle shall be ± 2 degrees of the design angle.

2.2.2. However, at the request of the manufacturer of the replacement steering wheel and with the agreement of the technical service, the replacement steering wheel may be mounted on a framework simulating the mounting of the steering mechanism, provided that, as compared with the real "front body section/steering mechanism" assembly, the "framework/steering mechanism" assembly has:

2.2.2.1. the same geometric layout,

2.2.2.2. greater rigidity.

2.3. If the test shall be carried out with the replacement steering wheel fixed to a stiff test bench, the steering wheel shall be tested complete with trim. The replacement steering wheel shall

have a minimum collapsing space of 100 mm between the replacement steering wheel and the test bench. The steering shaft shall be firmly attached to the test bench.

- 2.3.1. However, at the request of the manufacturer the test may be carried out under conditions specified in paragraph 2.2 above. In such case the approval will only be valid for the specified type(s) of vehicle(s).
3. Test apparatus
 - 3.3.1. This apparatus consists of a fully guided linear impactor, rigid, with a mass of 6.8 kg. Its impact surface is hemispherical with a diameter of 165 mm.
 - 3.3.2. The headform shall be fitted with two accelerometers and a speed-measuring device, all capable of measuring the values in the impact direction.
 - 3.3. Measuring instruments, accuracy and conditions
 - 3.3.1. The measuring instruments used shall comply with ISO 6487:1987. In addition, they shall have the following characteristics:
 - 3.3.2. Acceleration:

Channel amplitude class 150 g CAC
Channel frequency class 600 Hz CFC
 - 3.3.3. Speed:

Accuracy to within ± 1 per cent
 - 3.3.4. Time recording:

The instrumentation shall enable the action to be recorded throughout its duration and the readings to be made with the accuracy to one-thousandth of a second. The beginning of the impact at the moment of first contact between the impactor and the replacement steering wheel shall be noted on the recordings used for analyzing the test.
4. Test procedure
 - 4.1. The plane of the replacement steering wheel shall be set up perpendicular to the direction of impact.
 - 4.2. A maximum of four and a minimum of three positions on each replacement steering wheel type shall be impacted. A new

replacement steering wheel shall be used for each impact.
On successive impacts the axial axis of the impactor shall be in line with one of the following points:

- 4.2.1. The centre of the replacement steering wheel boss;

- 4.2.2. The joint of the stiffest or most supported spoke to the inner edge of the replacement steering wheel rim;
 - 4.2.3. The mid-point of the shortest unsupported area of the replacement steering wheel rim that does not include a spoke when hit by the head form;
 - 4.2.4. At the discretion of the type approving authority, the "worst case" position on the replacement steering wheel.
 - 4.3. The impactor shall strike the replacement steering wheel at a velocity of 24.1 km/h; if the impactor strike a test component, which covers an uninflated airbag, the test shall be carried out at a speed of at least 19.3 km/h. These velocities shall be achieved either by the mere energy of propulsion or by using an additional propelling device.
 5. Results

In the tests carried out according to the above procedures, the deceleration rate of the impactor shall be taken as the simultaneous average of the readings of the two decelerometers.
 6. Equivalent test procedures
 - 6.1. Alternative tests may be permitted at the discretion of the approval authority provided that equivalence can be demonstrated. A report shall be attached to the approval documentation describing the method used and the results obtained.
 - 6.2. Responsibility for demonstrating the equivalence of the alternative method shall rest with the manufacturer or his representative wishing to use such a method.
-

Annex 9

FATIGUE TEST DEVICE

(FIGURE - OFFSET)

Example of a Fatigue Test Device

Annex 10

PROCEDURE FOR DETERMINING THE "H"-POINT AND ACTUAL TORSO ANGLE
FOR SEATING POSITIONS IN MOTOR VEHICLES

Note: Takeover of the standard text (TRANS/SC1/WP29/178 and Corr.1) or reference to existing Regulation (e.g. Regulation No. 12, annex 6 and appendices 1-3).
