

Agreement

Concerning the Adoption of Harmonized Technical United Nations Regulations for Wheeled Vehicles, Equipment and Parts which can be Fitted and/or be Used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these United Nations Regulations

Addendum 160 - UN Regulation No. 161

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UN Regulation on uniform provisions concerning the protection of motor vehicles against unauthorized use and the approval of the device against unauthorized use (by mean of a locking system)

UN Regulation No. 161

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1. Scope

This Regulation applies to:

- 1.1. Approval of a vehicle of category M₁ and N₁¹ with regard to its devices to prevent unauthorized use.
- 1.2. The fitting of devices to vehicles of other categories is optional but any such device fitted is required to comply with all relevant provisions of this Regulation.
- 1.3. At the request of the manufacturer, Contracting Parties may grant approvals according to this Regulation to vehicles of other categories and devices for fitment to such vehicles.
- 1.4. This Regulation does not apply to radio transmission frequencies, whether or not related to the protection of vehicles against unauthorized use.

2. Definitions

- 2.1. "*Component*" means a device subject to the requirements of this Regulation and intended to be part of a vehicle, which may be type-approved independently of a vehicle where this Regulation makes express provisions for so doing.
- 2.2. "*Separate technical unit*" means a device subject to the requirements of this Regulation and intended to be part of a vehicle, which may be type-approved separately, but only in relation to one or more specified types of vehicle where this Regulation makes express provisions for so doing.
- 2.3. "*Manufacturer*" means the person or body who is responsible to the approval authority for all aspects of the type approval process and for ensuring conformity of production. It is not essential that the person or body is directly involved in all stage of the construction of the vehicle, system, component or separate technical unit which is the subject of the approval process.
- 2.4. "*Vehicle type*" means a category of motor vehicles which do not differ in such essential respects as:
 - 2.4.1. The manufacturer's type designation,
 - 2.4.2. The arrangement and design of the vehicle component or components on which the device to prevent unauthorized use acts,
 - 2.4.3. The type of device to prevent unauthorized use.
- 2.5. "*Device to prevent unauthorized use*" means a locking system designed to prevent unauthorized normal activation of the engine or other source of main engine power of the vehicle in combination with at least one system which:
 - (a) locks the steering; or
 - (b) locks the transmission; or
 - (c) locks the gearshift control; or
 - (d) locks brakes.

In the case of a system which locks brakes, deactivation of the device shall not automatically release the brakes contrary to the driver's intention.
- 2.6. "*Steering*" means the steering control, the steering column and its accessory cladding, the steering shaft, the steering gearbox and all other components which directly affect the effectiveness of the device to prevent unauthorized use.

¹ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev.6. (www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html).

- 2.7. "*Combination*" means one of the specifically developed and constructed variations of a locking system which, when properly activated, permits operation of the locking system.
- 2.8. "*Key*" means any mechanical and/or electronic solution designed and constructed to provide a method of operating a locking system which is designed and constructed to be operated by that mechanical and/or electronic solution.
- 2.9. "*Rolling code*" means an electronic code consisting of several elements the combination of which changes at random after each operation of the transmitting unit.
- 2.10. "*Primary user*" is a user who is able to authorize digital keys. There can be more than one primary users.
- 2.11. "*Digital key*" means a key designed to be transferred to multiple devices by the primary user(s) through dedicated processes.
- 2.12. "*Close proximity*" means a distance of less than 6 m.

3. Application for approval

- 3.1. The application for approval of a vehicle or component type with regard to this Regulation shall be submitted by the manufacturer.
- 3.2. It shall be accompanied by an information document established in accordance with the model shown in Annex 1, and giving a description of the technical characteristics of the device to prevent unauthorized use and the method(s) of installation for each make and type of vehicle on which the protective device is intended to be installed.
- 3.3. Vehicle(s) / component(s) representative of the type(s) to be approved shall be submitted to the technical service responsible for conducting the approval tests.

4. Approval

- 4.1. If the type submitted for approval to this Regulation meets the requirements of this Regulation, approval of that type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00, corresponding to the Regulation in its original form) shall indicate the series of amendments incorporating the most recent major technical amendment made to the Regulation at the time of issue of the approval. The same Contracting Party shall not assign the same number to another type of vehicle or component as defined in this Regulation.
- 4.3. Notice of approval or of extension of approval of a type pursuant to this Regulation shall be communicated to the Contracting Parties to the Agreement applying this Regulation by means of a form conforming to the model in Annex 2 to this Regulation.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle or component conforming to a type approved under this Regulation, an international approval mark consisting of:
 - 4.4.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval,² and

² As defined in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3) document ECE/TRANS/WP.29/78/Rev.6 (www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html).

- 4.4.2. the number of this Regulation, followed by the letter "R", a dash and the approval number, to the right of the circle prescribed in paragraph 4.4.1.
- 4.5. If a type conforms to a type approved, under one or more other UN Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1. need not be repeated; in such a case, the Regulation under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. In the case of a vehicle, the approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.9. Annex 3 to this Regulation gives examples of arrangements of approval marks.

5. Approval of a vehicle of category M1 and N1 with regard to its devices to prevent unauthorized use

- 5.1. General specifications
- 5.1.1. The device to prevent unauthorized use shall be so designed that it is necessary to put it out of action in order to enable:
- 5.1.1.1. the engine to be started by means of the normal control, and
- 5.1.1.2. the vehicle to be steered, driven or moved forward under its own power.
- 5.1.1.3. The requirement of paragraph 5.1.1. can be achieved at the same time as or before to the actions described at paragraphs 5.1.1.1. and 5.1.1.2.
- 5.1.2. The requirements of paragraph 5.1.1. shall be met by the application of a single key.
- 5.1.3. Except in the case provided for in paragraph 5.2.1.5., a system operated with a key inserted in a lock shall not permit removal of the key before the device referred to in paragraph 5.1.1. has come into action or has been set to act.
- 5.1.4. The device to prevent unauthorized use referred to in paragraph 5.1.1. above, and the vehicle components on which it operates, shall be so designed that it cannot rapidly and without attracting attention be opened, rendered ineffective or destroyed by, for example, the use of low-cost, easily concealed tools, equipment or fabrications readily available to the public at large.
- 5.1.5. The device to prevent unauthorized use shall be fitted to the vehicle as an item of original equipment (i.e. equipment installed by the vehicle manufacturer prior to first retail sale). It shall be fitted in such a way that even after removal of its housing it cannot, when in the blocked condition, be dismantled other than with special tools. If it is possible to render the device to prevent unauthorized use ineffective by the removal of screws, those screws shall, unless they are of the non-removable type, be covered by parts of the blocked protective device.
- 5.1.6. Mechanical locking systems shall provide at least 1,000 different key combinations or a number equal to the total number of vehicles manufactured annually if less than 1,000. In vehicles of one type the frequency of occurrence of each combination shall be roughly one per 1,000.
- 5.1.7. Electrical/electronic locking systems, e.g. remote control, shall have at least 50,000 variants and shall incorporate a rolling code and/or have a minimum scan time of ten days, e.g. a maximum of 5,000 variants per 24 hours for 50,000 variants minimum.
- 5.1.8. Regarding the nature of the device to prevent the unauthorized use, paragraph 5.1.6. or 5.1.7., shall be applied.

- 5.1.9. The key and lock shall not be visibly coded.
- 5.1.10. The lock shall be so designed, constructed and fitted that turning of the lock cylinder, when in the locked position, with a torque of less than 2.45 Nm is not possible with any key other than the mating key, and
- 5.1.10.1. For lock cylinders with pin tumblers no more than two identical tumblers operating in the same direction shall be positioned adjacent to each other, and in a lock there shall not be more than 60 per cent identical tumblers;
- 5.1.10.2. For lock cylinders with disc tumblers no more than two identical tumblers operating in the same direction shall be positioned adjacent to each other, and in a lock there shall not be more than 50 per cent identical tumblers.
- 5.1.11. Devices to prevent unauthorized use shall be such as to exclude any risk of accidental operating failure while the engine is running, particularly in the case of blockage likely to compromise safety.
- 5.1.11.1. It shall not be possible to activate devices to prevent unauthorized use without first setting the engine controls to a stop condition and then performing an action which is not an uninterrupted continuation of stopping the engine or without first setting the engine controls to a stop condition and when the vehicle is stationary with the parking brake applied or the speed of the vehicle does not exceed 4 km/h.
- 5.1.11.2. In the case of devices to prevent unauthorized use, if the action of key withdrawal activates the device it shall either necessitate a minimum movement of 2 mm before activation of the device or incorporate an override facility to prevent accidental removal or partial withdrawal of the key.
- 5.1.11.3. Paragraphs 5.1.10., 5.1.10.1. or 5.1.10.2., and 5.1.11.2. are only applicable to devices which include mechanical keys.
- 5.1.12. Power assistance may be used only to activate the locking and/or unlocking action of the device to prevent unauthorized use. The device shall be kept in its operating position by any suitable means which does not need a power supply.
- 5.1.13. It shall not be possible to activate the motive power of the vehicle by normal means until the device to prevent unauthorized use has been deactivated.
- 5.1.14. Devices to prevent unauthorized use by preventing release of the brakes of the vehicle shall only be permitted when the working parts of the brakes are held in a locked position by a purely mechanical device. In this case the prescriptions of paragraph 5.1.13. do not apply.
- 5.1.15. If the device to prevent unauthorized use is equipped with a driver warning feature it shall be activated when the operator opens the driver's side door, unless the device has been activated and the key removed by the operator.
- 5.1.16. In addition, digital keys shall comply with the provisions of Annex 9.

5.2. Particular specifications

In addition to the general specifications prescribed in paragraph 5.1., the device to prevent unauthorized use shall meet the particular conditions prescribed below:

- 5.2.1. Devices to prevent unauthorized use acting on the steering
- 5.2.1.1. A device to prevent unauthorized use acting on the steering shall render the steering inoperative. Before the engine as a motive power can be started, the normal steering operation must be restored.
- 5.2.1.2. When the device to prevent unauthorized use is set to act, it shall not be possible to prevent the device from functioning.

- 5.2.1.3. The device to prevent unauthorized use shall continue to meet the requirements of paragraphs 5.1.11., 5.2.1.1., 5.2.1.2. and 5.2.1.4. after it has undergone 2,500 locking cycles in each direction of the wear producing test specified in Part 1 of Annex 4 to this Regulation.
- 5.2.1.4. The device to prevent unauthorized use shall, in its activated position, satisfy one of the following criteria:
- 5.2.1.4.1. It shall be strong enough to withstand, without damage to the steering mechanism likely to compromise safety, the application of a torque of 300 Nm about the axis of the steering spindle in both directions under static conditions.
- 5.2.1.4.2. It shall incorporate a mechanism designed to yield or slip, such that the system will withstand, either continuously or intermittently, the application of a torque of at least 100 Nm. The locking system shall still withstand the application of this torque after the test specified in Part 2 of Annex 4 to this Regulation.
- 5.2.1.4.3. It shall incorporate a mechanism designed to permit the steering wheel to rotate freely on the blocked steering spindle. The blocking mechanism shall be strong enough to withstand the application of a torque of 200 Nm about the axis of the steering spindle in both directions under static conditions.
- 5.2.1.5. If the device to prevent unauthorized use is such that the key can be removed in a position other than the position in which the steering is inoperative, it shall be so designed that the manoeuvre required to reach that position and remove the key cannot be effected inadvertently.
- 5.2.1.6. If a component fails such that the torque requirements specified in paragraphs 5.2.1.4.1., 5.2.1.4.2. and 5.2.1.4.3. cannot be easily applied, yet the steering system remains blocked, the system shall satisfy the requirements.
- 5.2.2. Devices to prevent unauthorized use acting on the transmission or on brakes
- 5.2.2.1. A device to prevent unauthorized use acting on the transmission shall prevent the rotation of the vehicle's driving wheels.
- 5.2.2.2. A device to prevent unauthorized use by acting on brakes shall brake at least one wheel on each side of at least one axle.
- 5.2.2.3. When the device to prevent unauthorized use is set to act, it shall not be possible to prevent the device from functioning.
- 5.2.2.4. It shall not be possible for the transmission or brakes to be blocked inadvertently when the key is in the lock of the device to prevent unauthorized use, even if the device preventing starting of the engine has come into action or been set to act. This does not apply wherever the requirements of paragraph 5.2.2. of this Regulation are met by devices used for another purpose in addition and the lock under the conditions above is necessary for this additional function (e.g. electrical parking brake).
- 5.2.2.5. The device to prevent unauthorized use shall be so designed and constructed that it remains fully effective even after some degree of wear as a result of 2,500 locking cycles in each direction. In the case of a protective device acting on brakes, each mechanical or electrical sub-part of the device is concerned.
- 5.2.2.6. If the device to prevent unauthorized use is such that the key can be removed in a position other than the position in which the transmission or brakes are locked, it shall be so designed that the manoeuvre required to reach that position and remove the key cannot be effected inadvertently.
- 5.2.2.7. In the case when the protective device acting on the transmission is used, it shall be strong enough to withstand, without damage likely to compromise safety, the application in both directions and in static conditions of a torque 50 per cent greater than the maximum torque that can normally be applied to the transmission. In determining the level of this testing torque account shall be

- taken not of the maximum engine torque, but of the maximum torque that can be transmitted by the clutch or by the automatic transmission.
- 5.2.2.8. In the case of a vehicle equipped with a protective device acting on brakes, the device shall be capable of holding the laden vehicle stationary on a 20 per cent up- or down-gradient.
- 5.2.2.9. In the case of a vehicle equipped with a protective device acting on brakes, the requirements of this Regulation shall not be construed as a departure from the requirements of UN Regulation No. 13 or 13-H even in the case of a failure.
- 5.2.3. Devices to prevent unauthorized use acting on the gearshift control
- 5.2.3.1. A device to prevent unauthorized use acting on the gearshift control shall be capable of preventing any change of gear.
- 5.2.3.2. In the case of manual gearboxes, it shall be possible to lock the gearshift lever in reverse only; in addition locking in neutral shall be permitted.
- 5.2.3.3. In the case of automatic gearboxes provided with a "parking" position it shall be possible to lock the mechanism in the parking position only; in addition, locking in neutral and/or reverse shall be permitted.
- 5.2.3.4. In the case of automatic gearboxes not provided with a "parking" position it shall be possible to lock the mechanism in the following positions only: neutral and/or reverse.
- 5.2.3.5. The device to prevent unauthorized use shall be so designed and constructed that it remains fully effective even after some degree of wear as a result of 2,500 locking cycles in each direction.
- 5.3. Electromechanical and electronic devices to prevent unauthorized use shall comply with the requirements of paragraphs 5.1. and 5.2. and shall be submitted to the tests described in Annex 6, mutatis mutandi.
- Components that are not embedded in the vehicle (e.g. keys, which are used for activation/deactivation) need not to comply with the requirements described in Annex 6.
- If the technology of the device is such that Paragraph 5. and Annex 6 are not applicable it shall be verified that care has been taken to preserve safety of the vehicle. The functioning process of these devices shall incorporate secure means to prevent any risk of blocking or accidental malfunctioning which could compromise the safety of the vehicle.

6. Modification of the type and extension of approval

- 6.1. Every modification of a vehicle or component type with regard to this Regulation shall be notified to the administrative department which approved the vehicle or component type. The department may then either:
- 6.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the component or the vehicle still complies with the requirements, or
- 6.1.2. require a further report from the technical service responsible for conducting the tests.
- 6.2. Confirmation or refusal of approval, specifying the alteration, shall be communicated by the procedure specified in paragraph 4.3. above to the Contracting Parties to the Agreement applying this Regulation.
- 6.3. The Type Approval Authority shall inform the other Contracting Parties of the extension by means of the communication form which appears in Annex 1 to this

Regulation. It shall assign a serial number to each extension, to be known as the extension number.

7. Conformity of production procedures

The conformity of production procedures shall comply with those set out in the Agreement, Schedule 1 (E/ECE/TRANS/505/Rev.3), with the following requirements:

- 7.1. Vehicles/components under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements of the relevant part(s) of this Regulation.
- 7.2. For each type of vehicle or component the tests prescribed in the relevant part(s) of this Regulation shall be carried out on a statistically controlled and random basis, in accordance with one of the regular quality assurance procedures.
- 7.3. The authority which has granted approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be one every two years.

8. Penalties for non-conformity of production

- 8.1. The approval granted in respect of a vehicle/component type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 7. above are not complied with.
- 8.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of a form conforming to the model in Annex 2.

9. Production definitively discontinued

- 9.1. If the holder of the approval completely ceases to manufacture a vehicle/component type approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication, that authority shall inform thereof the other Contracting Parties to the Agreement applying this Regulation by means of a form conforming to the model in Annex 2.

10. Names and addresses of Technical Services responsible for conducting approval tests, and of the Type Approval Authorities

- 10.1. The Contracting Parties to the 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 Type Approval Authorities 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**Annex 1**

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

Information document

In accordance with UN Regulation No. [xxx] on uniform provisions concerning the protection of motor vehicles against unauthorized use and the approval of the device against unauthorized use (by mean of a locking system)

1. General
 - 1.1. Make (trade name of manufacturer):.....
 - 1.2. Type:
 - 1.3. Means of identification of type, if marked on the device:¹
 - 1.3.1. Location of that marking:.....
 - 1.4. Category of vehicle:²
 - 1.5. Name and address of the manufacturer:
 - 1.6. Location of the ECE approval mark:.....
 - 1.7. Address(es) of assembly plant(s):
2. General construction characteristics of the vehicle
 - 2.1. Photographs and/or drawings of a representative vehicle:
 - 2.2. Hand of drive: left / right³
3. Miscellaneous
 - 3.1. Devices to prevent unauthorized use of the vehicle
 - 3.1.1. Protective device:
 - 3.1.1.1. A detailed description of the vehicle type with regard to the arrangement and design of the control or of the unit on which the protective device acts:
 - 3.1.1.2. Drawings of the protective device and of its mounting on the vehicle:.....
 - 3.1.1.3. A technical description of the device:
 - 3.1.1.4. Details of the lock combinations use:.....

¹ If the means of identification of type contains characters not relevant to describe the vehicle, component or separate technical unit types covered in this information document, such characters shall be represented in the documentation by the symbol "?" (e.g. ABC??123??).

² As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3.), document ECE/TRANS/WP.29/78/Rev.6 (www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html).

³ Strike out what does not apply.

Annex 2

Communication

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



issued by:

Name of administration:

.....
.....
.....

- ¹concerning:²
- approval granted
 - approval extended
 - approval refused
 - approval withdrawn
 - production definitely discontinued

of a vehicle type with regard to its devices to prevent unauthorized use pursuant to UN Regulation No. [xxx]

Approval No..... Extension No.....

Reason for extension:

Section I

1. General
- 1.1. Make (trade name of manufacturer):
- 1.2. Type:
- 1.3. Means of identification of type, if marked on the vehicle/component/separate technical unit ² ³:
- 1.3.1. Location of that marking:.....
- 1.4. Category of vehicle⁴:
- 1.5. Name and address of manufacturer:.....
- 1.6. Location of the ECE approval mark:
- 1.7. Address(es) of assembly plant(s):

Section II

1. Additional information (where applicable): see addendum
2. Technical service responsible for carrying out the tests:

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

² Strike out what does not apply (there are cases where nothing needs to be deleted, when more than one entry is applicable).

³ If the means of identification of type contains characters not relevant to describe the vehicle, component or separate technical unit types covered in this information document, such characters shall be represented in the documentation by the symbol "?" (e.g. ABC??123??).

⁴ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3) document ECE/TRANS/WP.29/78/Rev.6 (www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html).

3. Date of test report:
4. Number of test report:
5. Remarks (if any): see addendum
6. Place:
7. Date:
8. Signature:
9. The index to the information package lodged with the approval authority, which may be obtained on request, is attached.

Addendum

to UN type approval certificate No. ...

concerning the type approval of a vehicle with regard to UN Regulation No. [xxx]

1. Additional information:
- 1.1. Brief description of the device(s) against unauthorized use and the vehicle parts on which it (they) act(s):
2. Remarks:

Annex 3**Arrangements of approval marks**

(see paragraphs 4.4. to 4.4.2. of this Regulation)

 $a = 8 \text{ mm min.}$

The above approval mark affixed to a vehicle shows that the type concerned was approved in the Netherlands (E 4) pursuant to UN Regulation No. XXX under approval No. 001234. The first two digits (00) of the approval number indicate that the approval was granted in accordance with the requirements of UN Regulation No. XXX in its original form.

Annex 4 - Part 1

Wear producing test procedure for devices to prevent unauthorized use acting on the steering

1. Test equipment

The test equipment shall consist of:

1.1. A fixture suitable for mounting the sample steering complete with the device to prevent unauthorized use attached, as defined in paragraph 2.5. of this Regulation.

1.2. A means for activating and deactivating the device to prevent unauthorized use which shall include the use of the key.

1.3. A means for rotating the steering shaft relative to the device to prevent unauthorized use.

2. Test method

2.1. A sample of the steering complete with the device to prevent unauthorized use is attached to the fixture referred to in paragraph 1.1. above.

2.2. One cycle of the test procedure shall consist of the following operations:

2.2.1. Start position. The device to prevent unauthorized use shall be deactivated and the steering shaft shall be rotated to a position which prevents engagement of the device to prevent unauthorized use, unless it is of the type which permits locking in any position of the steering.

2.2.2. Set to activate. The device to prevent unauthorized use shall be moved from the deactivated to the activated position, using the key.

2.2.3.¹ Activated. The steering spindle shall be rotated such that the torque on it, at the instant of engagement of the device to prevent unauthorized use, shall be $40 \text{ Nm} \pm 2 \text{ Nm}$.

2.2.4. Deactivated. The device to prevent unauthorized use shall be deactivated by the normal means, the torque being reduced to zero to facilitate disengagement.

2.2.5.¹ Return. The steering spindle shall be rotated to a position which prevents engagement of the device to prevent unauthorized use.

2.2.6. Opposite rotation. Repeat procedures described in paragraphs 2.2.2., 2.2.3., 2.2.4. and 2.2.5, but in the opposite direction of rotation of the steering spindle.

2.2.7. The time interval between two successive engagements of the device shall be at least 10 seconds.

2.3. The wear-producing cycle shall be repeated the number of times specified in paragraph 5.2.1.3. of this Regulation.

¹ If the device to prevent unauthorized use permits locking in any position of the steering, the procedures described in paragraphs 2.2.3. and 2.2.5. shall be omitted.

Annex 4 - Part 2**Test procedure for devices to prevent unauthorized use
acting on the steering using a torque limiting device**

1. Test equipment

The test equipment shall consist of:

- 1.1. A fixture suitable for holding the relevant parts of a steering system or, if the test is carried out on a complete vehicle, a jacking system capable of lifting all the steered wheels clear of the ground, and
- 1.2. A device or devices capable of producing, and measuring, a torque applied to the steering control as prescribed in paragraph 2.3. The measurement precision shall be less than or equal to 2 per cent.

2. Test procedure description

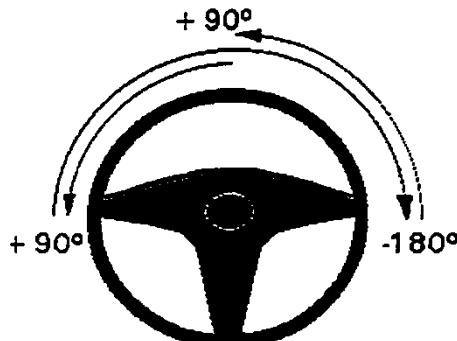
2.1. If the test is carried out on a complete vehicle, the test shall be carried out with all the steered wheels of the vehicle held clear of the ground.

2.2. The steering lock shall be activated such that the steering is blocked.

2.3. A torque shall be applied to the steering control such that it rotates.

2.4. The test cycle includes a rotation of the steering control of 90° followed by a rotation in the opposite direction of 180° , and a new rotation of 90° in the original direction (see figure);

1 cycle = $+90^\circ / -180^\circ / +90^\circ$ with a tolerance of ± 10 per cent.



- 2.5. A cycle duration is equal to $20\text{ s} \pm 2\text{ s}$.
- 2.6. Five test cycles shall be carried out.
- 2.7. During each of the test cycles the minimum recorded value of the torque shall be higher than that given in paragraph 5.2.1.4.2. of this Regulation.

Annex 5

Annex 5

(reserved)

Annex 6

Operation parameters and test conditions for devices to prevent unauthorized used (by mean of a locking system)

1. Operation parameters

The requirements below do not apply to:

- (a) Those components that are fitted and tested as part of the vehicle, whether or not a locking system is fitted (e.g. lamps, alarm system, immobilizer); or
- (b) Those components that have previously been tested as part of the vehicle and documentary evidence has been provided; or
- (c) Components that are not embedded in the vehicle, e.g. keys.

All components of the locking system shall operate without any failure under the following conditions

1.1. Climatic conditions

Two classes of environmental temperature are defined as follows:

- (a) -40°C to +85°C for parts to be fitted in the passenger or luggage compartment,
- (b) -40°C to +125°C for parts to be fitted in the engine compartment unless otherwise specified.

1.2. Degree of protection for installation

The following degrees of protection in accordance with IEC Publication 529 1989 shall be provided:

- (a) IP 40 for parts to be fitted in the passenger compartment,
- (b) IP 42 for parts to be fitted in the passenger compartment of roadsters/convertibles and cars with moveable roof-panels if the installation location requires a higher degree of protection than IP 40,
- (c) IP 54 for all other parts.

The locking system manufacturer shall specify in the installation instructions any restrictions on the positioning of any part of the installation with respect to dust, water and temperature.

1.3. Weatherability

Seven days according to IEC 68-2-30-1980.

1.4. Electrical conditions

Rated supply voltage: 12 V

Operation supply voltage range: from 9 V to 15 V in the temperature range according to paragraph 1.1.1

Time allowance for excess voltages at 23°C:

U = 18 V, max. 1 h

U = 24 V, max. 1 min.

2. Test conditions

All the tests shall be carried out in sequence on a single locking system. However, at the discretion of the test authority, other samples may be used if this is not considered to affect the results of the other tests.

2.1. Normal test conditions

Voltage $U = (12 \pm 0.2)$ V

Temperature $T = (23 \pm 5)^\circ\text{C}$

3. Operation test

All components of the locking system shall comply with prescriptions given in paragraphs 3.2. to 3.9.

3.1 Upon completion of all the tests specified below, the locking system shall be tested under the normal test conditions specified in paragraph 2.1. to check that it continues to function normally. Where necessary, fuses may be replaced prior to the test.

If some of the tests required in each of these paragraphs prior to the operation tests are performed in series on a single locking system, the operation test may be carried out one time only after the chosen tests are completed instead of performing the operation tests required in the paragraphs after each of the chosen tests. Vehicle manufacturers and suppliers have to guarantee satisfactory results only on non-accumulated procedures.

3.2. Resistance to temperature and voltage changes

Compliance with the specifications defined under paragraph 3.1. shall also be checked under the following conditions:

3.2.1. Test temperature $T = (-40 \pm 2)^\circ\text{C}$
 Test voltage $U = (9 \pm 0.2)$ V
 Storage duration 4 hours

3.2.2. For parts to be fitted in the passenger or luggage compartment:

Test temperature $T = (+85 \pm 2)^\circ\text{C}$
 Test voltage $U = (15 \pm 0.2)$ V
 Storage duration 4 hours

3.2.3. For parts to be fitted in the engine compartment unless otherwise specified:

Test temperature $T = (+125 \pm 2)^\circ\text{C}$
 Test voltage $U = (15 \pm 0.2)$ V
 Storage duration 4 hours

3.2.4. The locking system, in both set and unset state, shall be submitted to an excess voltage equal to (18 ± 0.2) V for 1 hour.

3.2.5. The locking system, in both set and unset state, shall be submitted to an excess voltage equal to (24 ± 0.2) V for 1 min.

3.3. Safe operation after foreign body and water-tightness testing

After the test for tightness to foreign body and water according to IEC 529-1989, for degrees of protection as in paragraph 1.1.2., the operation tests according to paragraph 3.1. shall be repeated.

With the agreement of the Technical Service this requirement need not apply in the following circumstances:

(a) Type Approval of a locking system which is to be type approved as a separate technical unit

In this case, the manufacturer of the locking system shall:

(i) Specify in item 4.5. of the information document (Annex 1, Part 2), that the requirement of this paragraph was not applied to the

- locking system (in accordance with paragraph 7. of this Regulation), and
- (ii) Specify in item 4.1. of the information document, the list of vehicles to which the locking system is intended to be fitted and the relevant installation conditions in item 4.2.
- (b) Type approval of a vehicle in respect of a locking system
- In this case, the manufacturer shall specify in item 3.1.3.1.1. of the information document (Annex 1a), that the requirement of this paragraph does not apply to the locking system due to the nature of installation conditions and the vehicle manufacturer shall prove it by submitting related documents.
- (c) Type approval of a vehicle in respect of the installation of a locking system which is type approved as a separate technical unit.
- In this case, the vehicle manufacturer shall specify in item 3.1.3.1.1. of the information document (Annex 1a), that the requirement of this paragraph does not apply to the installation of the locking system where the relevant installation conditions are met.
- This requirement does not apply in cases where the information required in item 3.1.3.1.1. of Annex 1a has already been submitted for the approval of the separate technical unit.
- 3.4. Safe operation after condensed water test
- After a resistance-to-humidity test to be carried out according to IEC 68 2 30 (1980) the operation tests according to paragraph 3.1. shall be repeated.
- 3.5. Test for safety against reversed polarity
- The locking system and components thereof shall not be destroyed by reversed polarity up to 13 V during 2 min. After this test the operation tests according to paragraph 3.1. shall be repeated with fuses changed, if necessary.
- 3.6. Test for safety against short-circuits
- All electrical connections of the locking system must be short-circuit proof against earth, max. 13 V and/or fused. After this test the operation tests according to paragraph 3.1. shall be repeated, with fuses changed if necessary.
- 3.7. Energy consumption in the set condition
- The energy consumption in set condition under the conditions given in paragraph 2.1. shall not exceed 20 mA on average for the complete locking system including status display.
- With the agreement of the Technical Service this requirement need not apply in the following circumstances:
- (a) Type Approval of a locking system which is to be type approved as a separate technical unit
- In this case, the manufacturer of the locking system shall:
- (i) Specify in item 4.5. of the information document (Annex 1, Part 2), that the requirement of this paragraph was not applied to the locking system (in accordance with paragraph 7. of this regulation), and
 - (ii) Specify in item 4.1. of the information document, the list of vehicles to which the locking system is intended to be fitted and the relevant installation conditions in item 4.2.
- (b) Type approval of a vehicle in respect of a locking system

In this case, the manufacturer shall specify in item 3.1.3.1.1. of the information document (Annex 1a), that the requirement of this paragraph does not apply to the locking system due to the nature of installation conditions and the vehicle manufacturer shall prove it by submitting related documents.

- (c) Type approval of a vehicle in respect of the installation of a locking system which is type approved as a separate technical unit.

In this case, the vehicle manufacturer shall specify in item 3.1.3.1.1. of the information document (Annex 1a), that the requirement of this paragraph does not apply to the installation of the locking system where the relevant installation conditions are met.

This requirement does not apply in cases where the information required in item 3.1.3.1.1. of Annex 1a has already been submitted for the approval of the separate technical unit.

3.8. Safe operation after vibration test

3.8.1. For this test, the components are subdivided into two types:

Type 1: components normally mounted on the vehicle,

Type 2: components intended for attachment to the engine.

3.8.2. The components/ locking system shall be submitted to a sinusoidal vibration mode whose characteristics are as follows:

3.8.2.1. For Type 1

The frequency shall be variable from 10 Hz to 500 Hz with a maximum amplitude of ± 5 mm and maximum acceleration of 3 g (0-peak).

3.8.2.2. For Type 2

The frequency shall be variable from 20 Hz to 300 Hz with a maximum amplitude of ± 2 mm and maximum acceleration of 15 g (0-peak).

3.8.2.3. For both type 1 and type 2

The frequency variation is 1 octave/min.

The number of cycles is 10, the test shall be performed along each of the 3 axes.

The vibrations are applied at low frequencies at a maximum constant amplitude and at a maximum constant acceleration at high frequencies.

3.8.3. During the test the locking system shall be electrically connected and the cable shall be supported after 200 mm.

3.8.4. After the vibration test the operation tests according to paragraph 3.1. shall be repeated.

3.9. Electromagnetic compatibility

The locking system shall be submitted to the tests described in Annex 7"

Annex 7

Electromagnetic compatibility

1. Immunity against disturbances conducted along supply lines

Tests shall be performed according to the technical prescriptions and transitional provisions of UN Regulation No. 10, 06 series of amendments and according to the test methods described in Annex 10 for an Electrical/Electronic Sub-Assembly (ESA).

The locking system shall be tested in unset state and in set state.

2. Immunity against radiated high frequency disturbances

Testing of the immunity of a locking system in a vehicle may be performed according to the technical prescriptions and transitional provisions of UN Regulation No. 10, 06 series of amendments and test methods described in Annex 6 for the vehicles or Annex 9 for an Electrical/Electronic Sub-Assembly (ESA).

The locking system shall be tested with operating conditions and failure criteria as defined in table 1

**Table 1
Operating conditions and failure criteria for the locking system**

<i>Test type</i>	<i>Locking system operating conditions</i>	<i>Failure criteria</i>
Vehicle test	Locking system in unset state	Unexpected activation of the locking system
	Key ON or Vehicle at 50 km/h ⁽¹⁾	
	Locking system in set state	Unexpected deactivation of the locking system
	Key OFF	
	Locking system in set state	Unexpected deactivation of the locking system
ESA Test	Vehicle in charging mode (if applicable)	
	Locking system in unset state	Unexpected activation of the locking system
	Locking system in set state	Unexpected deactivation of the locking system

(1) This test can be covered by the UN Regulation No. 10, 50 km/h mode

3. Electrical disturbance from electrostatic discharges

Immunity against electrical disturbances shall be tested in accordance with ISO 10605-2008 + corrigendum:2010 + AMD1:2014 using the test severity levels from table 2.

ESD tests shall be performed either at vehicle level or at Electrical/Electronic Sub-Assembly (ESA) level.

**Table 2
ESD Test levels**

<i>Discharge type</i>	<i>Discharge points</i>	<i>Locking system state</i>	<i>Discharge network</i>	<i>Test Level</i>	<i>Failure criteria</i>
Air discharge	Points that can easily be accessed only from the inside of the vehicle	Locking system in unset state (if test performed on vehicle then vehicle shall be Key ON or Vehicle at 50 km/h or engine in idle mode)	330 pF, 2 kΩ	± 6 kV	Unexpected activation of the locking system
	Points that can easily be touched only from the outside of the vehicle	Locking system in set state (if test performed on vehicle then vehicle shall be locked and Key OFF)	150 pF, 2 kΩ	± 15 kV	Unexpected deactivation of the locking system without reactivation, within 1s, after each discharge
Contact discharge	Points that can easily be accessed only from the inside of the vehicle	Locking system in unset state (if test performed on vehicle then vehicle shall be Key ON or Vehicle at 50 km/h or engine in idle mode)	330 pF, 2 kΩ	± 4 kV	Unexpected activation of the locking system
	Points that can easily be touched only from the outside of the vehicle	Locking system in set state (if test performed on vehicle then vehicle shall be locked and Key OFF)	150 pF, 2 kΩ	± 8 kV	Unexpected deactivation of the locking system without reactivation, within 1s, after each discharge

Each test shall be performed with 3 discharges with a minimum of 5 s interval between each discharge

4. Radiated emissions

Tests shall be performed according to the technical prescriptions and transitional provisions of UN Regulation No. 10, 06 series of amendments prescriptions and according to the test methods described in Annexes 4 and 5 for vehicles or Annexes 7 and 8, for an Electrical/Electronic Sub-Assembly (ESA).

The locking system shall be in set state.

Annex 8 (reserved)

Annex 9

Safety provisions for digital keys

1. General

The purpose of this annex is to specify the requirements for documentation and verification for digital keys used to operate the ‘device to prevent unauthorized use’ of the vehicle.

2. Definitions

"Authorization process" means any method to provide the digital key which can operate the ‘device to prevent unauthorized use’ of the vehicle.

"Revocation process" means any method to prevent the digital key to operate the ‘device to prevent unauthorized use’ of the vehicle.

"Boundary of functional operation" defines the boundaries of the external physical limits (e.g. distance) within which the digital key is able to operate the ‘device to prevent unauthorized use’ of the vehicle.

3. Documentation

The vehicle manufacturer shall provide the following documentation for type approval:

3.1. A description of the authorization process.

3.2. A description of the revocation process.

3.3. A description of the boundary of functional operation.

3.4. A description of the safety measures designed within the digital key revocation process to ensure safe operation of the vehicle.

4. Requirements for Safe Operation

4.1. A digital key shall only be transferred to a device via the authorization process.

4.2. There shall be a revocation process.

4.2.1. Revocation of a digital key shall not result in an unsafe condition.

A risk reduction analysis using functional safety standard such as ISO 26262 and safety of the intended functionality standard such as ISO/PAS 21448, which documents the risk to vehicle occupants caused by revocation of a digital key and documents the reduction of risk resulting from implementation of the identified risk mitigation functions or characteristics.

4.2.2. It shall be possible for the primary user(s) to identify the number of authorized registered digital keys.

4.3. Boundary of functional operation for the device to prevent unauthorized use:

4.3.1. Unlocking of the device to prevent unauthorized use shall require that an authorized registered digital key is detected in the interior of the vehicle, or in close proximity of the vehicle.

4.3.2. The requirements in paragraph 4.3.1. shall not apply during a remote control manoeuvring and remote control parking as defined in UN Regulation No. 79.

4.4. Detailed information shall be contained in the owner's manual of the vehicle, or by any other communication means in the vehicle; as a minimum, this information shall include:

(a) The method(s) for authorization of the digital key;

(b) The method(s) for revocation of the digital key.

5. The effectiveness of the system shall not be adversely affected by cyber-attacks, cyber threats and vulnerabilities. The effectiveness of the security measures shall be demonstrated by compliance with UN Regulation No. 155."

6. Verification

Verification of the functionality of the digital key shall be conducted with support of manufacturer's documentation as specified in paragraph 3.

7. Competence of the auditors/assessors

The assessments under this Annex shall only be conducted by auditors/assessors with the technical and administrative knowledge necessary for such purposes. They shall in particular be competent as auditor/assessor for ISO 26262-2018 (Functional Safety - Road Vehicles), and ISO/PAS 21448 (Safety of the Intended Functionality of road vehicles); and shall be able to make the necessary link with cybersecurity aspects in accordance with UN Regulation No 155. and ISO/SAE 21434). This competence should be demonstrated by appropriate qualifications or other equivalent training records."
