

UN Regulation No. xxx

Uniform provisions concerning the approval of motor vehicles with regard to the Acceleration Control for Pedal Error (ACPE) systems

Note: Bold and strikethrough show changes of 01 series over 00 series. Transitional provisions of 2 years need to be added for the 01 series.

Industry overall comment ; In the first phase we would like to discuss based on existing technology and results of actual results. New test methods, new requirements will discuss at later phase.

Commented [A1]: Industry: .
Need to reconsider the number of Transitional provisions years.
Because test procedures and performance requirements is not clear at this moment.
Also Technical feasibility is not clear when including child pedestrian operation.

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0. Introduction (not legally binding)

Talk about secondary collision, 02 series in the future, moving vehicle, interaction with AEBS systems

Commented [A2]: Industry:
There is not enough discussion, and further discussion is needed regarding what will be covered in the 02 series. So SB (square bracket) should be attached.

1. Scope

This UN Regulation applies to the type approval of vehicles of Categories M1 **and N1** equipped with automatic transmission with regard to their Acceleration Control for Pedal Error systems (APCE).

At the request of a manufacturer, vehicles of ~~category N1~~ **other categories** may be approved under this Regulation.

Commented [A3]: Industry:
The results of the previous meeting said "guidance will be received at GRVA in January," so SB (square bracket) should be added.

2. Definitions

For the purposes of this Regulation:

- 2.1 "Acceleration Control for Pedal Error (ACPE)" means a system to detect misapplication of the accelerator control by the driver and to control unintended acceleration.
- 2.1.1 "Vehicle Type with Regard to its ACPE" means a category of vehicles which do not differ in such essential aspects as:
- (a) Vehicle features which significantly influence the performances of ACPE;
 - (b) The type and design of ACPE.
- 2.3 "Common space" means an area on which two or more information functions (e.g. symbol) may be displayed but not simultaneously.
- 2.4 "Moving off" means starting from stationary and moving forward or rearward after releasing the brakes.
- 2.5 "Dry road affording good adhesion" means a road with a sufficient nominal Peak Braking Coefficient (PBC) that would permit:
- (a) A mean fully developed deceleration of at least 9 m/s²; or
 - (b) The design maximum deceleration of the relevant vehicle;
- whichever is lower.
- 2.6 "Sufficient nominal Peak Braking Coefficient (PBC)" means a road surface friction coefficient of:
- (a) 0.9, when measured using the American Society for Testing and Materials (ASTM) of E1136-19 standard reference test tyre in accordance with ASTM Method E1337-19 at a speed of 40 mph;
 - (b) 1.017, when measured using either:
 - (i) The American Society for Testing and Materials (ASTM) of F2493-20 standard reference test tyre in accordance with ASTM Method E1337-19 at a speed of 40 mph; or
 - (ii) The k-test method specified in Appendix 2 to Annex 6 of UN Regulation No. 13-H.

2.7. "Self-Check" means an integrated function that checks for a system failure on a continuous basis at least while the system is active.

2.8. "Obstacle" means a vehicle, wall-like structure with a width of at least 2 m and a height of at least ~~0.5~~ 1.5m, and/or **adult standing pedestrian**.

2.9. "Automatic Transmission" means any transmission which does not require the use of a clutch control by the driver in order to shift gears (automatic transmissions include e.g. single gear transmissions, continuously-variable transmissions, transmissions with an automated clutch).

Commented [A4]: Industry:
The minimum wall height of 0.5m is too low. 1.5m is proposed as the height of the object with the large degree of damage.

Commented [A5]: Industry:
Propose to change "Adult" pedestrian based on traffic accidents. (ACPE-04-09) And also standing pedestrian.

3. Application for approval

3.1. The application for approval of a vehicle type with regard to the ACPE shall be submitted by the vehicle manufacturer or by his authorized representative

3.2. It shall be accompanied by the documents mentioned below in triplicate:

3.3. A description of the vehicle type with regard to the items mentioned in paragraph 2.5., together with a documentation package which gives access to the basic design of the ACPE and the means by which it is linked to other vehicle systems or by which it directly controls output variables. The numbers and/or symbols identifying the vehicle type shall be specified.

3.4. A vehicle representative of the vehicle type to be approved shall be submitted to the Technical Service conducting the approval tests.

4. Approval

4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraph 5. below, approval of that vehicle type shall be granted.

4.2. An approval number shall be assigned to each vehicle type approved; its first two digits (00 for the Regulation in its initial form) 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 shall not assign the same number to the same vehicle type equipped with another type of ACPE, or to another vehicle type.

4.3. Notice of approval or of refusal or withdrawal of approval 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 and photographs and/or plans supplied by the applicant being in a format not exceeding A4 (210 x 297 mm), or folded to that format, and on an appropriate scale.

4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark conforming to the model described in Annex2, consisting of:

4.4.1. A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval¹;

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. above.

4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1. above need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1. above.

4.6. The approval mark shall be clearly legible and be indelible.

¹ The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev.6, Annex 3 - www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html

4.7. The approval mark shall be placed close to or on the vehicle data plate.

5. Specifications

5.1 Performance Requirements

5.1.1. The ACPE shall be able to limit unintended acceleration of a vehicle when a pedal misapplication by driver has been detected at least when an obstacle exists in front of the vehicle when intending to forward or when an obstacle exists behind the vehicle when intending to go backward.

[Vehicles where installation of means of rear visibility or detection is incompatible with their on-road use may be partly or fully exempted from this Regulation, subject to the decision of the Type Approval Authority.]

In case of pedestrian targets, the ACPE shall be designed so as to intervene when the pedestrian target is placed the lateral offset between the centreline of the target and the center line of the vehicle shall be between 0 and 0.2m. between the two vertical longitudinal side planes of the vehicle.

The ACPE shall control acceleration at least when the vehicle is stationary or moving off.

The system shall limit vehicle acceleration in order to prevent or mitigate a collision with an obstacle located between 1 m and 1.5 m in front of or behind the vehicle, in the vehicle path, at the time the accelerator control is applied., provided:

Homework for Industry (boundary conditions):

Vehicle external influences allow for the required deceleration, i.e.:

- (i) The road is flat, horizontal and dry affording good adhesion;
- (ii) The weather conditions do not affect the dynamic performance of the vehicle (e.g. no storm, not below 0°C);
- (b) The vehicle state itself allows for the required deceleration, e.g.:
 - (i) The tyres are in an appropriate state and properly inflated;
 - (ii) The brakes are properly operational (brake temperature, pads condition etc.);
 - (iii) There is no severe uneven load distribution;
 - (iv) No trailer is coupled to the motor vehicle and the mass of the motor vehicle is between maximum mass and mass in running order conditions;
- (c) There are no external influences affecting the physical sensing capabilities, i.e.:
 - (i) The ambient illumination conditions are at least 1000 Lux and there is no extreme blinding of the sensors (e.g. direct blinding sunlight, highly RADAR-reflective environment);
 - (ii) The target vehicle is not extreme with regard to the Radar Cross Section (RCS) or the shape/silhouette (e.g. below fifth percentile of RCS of all M₁ vehicles)
 - (iii) There are no significant weather conditions affecting the sensing capabilities of the vehicle (e.g. heavy rain, dense fog, snow, dirt);

Commented [A6]: Industry

Based on R158.

Vehicles that are mounted on a loading platform cannot be fitted with sensors at the rear, so we would like to exempt them from this regulation.

Commented [A7]: Industry:

There are no current ACPE systems that detects and operates on pedestrians present at the edge of the vehicle. It should be limited to pedestrians within $\pm 0.2\text{m}$ from the vehicle center.

Commented [A8]: Industry

These items are essential for defining the road surface and test environment and basically can be left as is.

- (iv) There are no overhead obstructions close to the vehicle;
- (d) The situation is unambiguous, i.e.:
 - (i) The object preceding of the stationary vehicle belongs to Category M1, is unobstructed, clearly separated from other objects in the driving lane and constantly travelling or stationary;
 - (ii) The vehicle longitudinal centre planes are displaced by not more than 0.2 m;
 - (iii) The direction of travel is straight with no curve, and the vehicle is not turning at an intersection and following its lane.
 - (iv) The pedal application has a velocity of at least 400 %/s over a travel distance of at least 70% of the total travel distance of the accelerator control, and the maximum value of the accelerator control is depressed by at least 90%.

Commented [A9]: Industry
Small amendment. This regulation is using stationary target.

When conditions deviate from those listed above, the system shall not deactivate or unreasonably switch the control strategy. This shall be demonstrated in accordance with paragraph 6 and Annex 3 of this Regulation.

Commented [A10]: Industry
Due to actual accidents and concerns about false positive operation, the depression value at least 90% .

In the case that a collision is not prevented, the collision speed shall be no greater than 8 km/h higher than the vehicle speed at the point the accelerator control was applied with a speed of at least 400 %/s.

Following any intervention, the vehicle acceleration shall continue to be limited by the ACPE for at least 5 m or 2 s, whatever is lower. The intervention can may be ended when if the obstacle is detected to no longer detected be present, or the driver has interrupted the function. **Manufacturer shall declare ACPE continuation conditions to the technical services**

Commented [A11]: Industry:
We understand this requirement as meaning that it must be detected that no longer an object is there. A maybe impossible requirement.
We suggest a phrase that describes that the system does not detect an object:

5.1.2 The effectiveness of ACPE shall not be adversely affected by magnetic or electrical fields. This shall be demonstrated by fulfilling the technical requirements and respecting the transitional provisions of the 06 series or later series of amendments to UN Regulation No. 10.

Commented [A12]: Industry
To add driver's interruption.
In order to have freedom in design, we would like to make the control continuation conditions as declared by the OEM

5.1.3 Conformity with the safety aspects of electronic control systems shall be shown by meeting the requirements of Annex 3.

5.1.4 The ACPE shall inform the driver of its intervention in accordance with paragraph 5.4.2.

5.1.5 Interruption of Acceleration Control by driver

5.1.5.1 ACPE shall provide a means for the driver to interrupt its intervention. This interruption shall be started by intentional action which indicates that driver has recognised the situation.

5.1.5.2 In the case of interruption by maintaining the accelerator control application, there shall be no rapid increase of acceleration.

5.1.5.3 The fulfilment of these requirements shall be documented and demonstrated by the manufacturer to the Approval Authority during the inspection of the safety concept as part of the assessment to Annex CEL.

5.1.6 The performance requirements shall be verified using the test procedure as described in section 6.

5.2. ~~Manual~~ Deactivation

Commented [A13]: Industry:
Delete "Manual" wording. To add "Automatic deactivation" in to 5.2.3

5.2.1. Short term deactivation

When a vehicle is equipped with a means to manually deactivate the ACPE function, the ACPE function shall be automatically reinstated at the initiation of any new engine start (or run cycle, as relevant).

This requirement does not apply when a new engine start (or run cycle, as relevant) is performed automatically, e.g., the operation of a stop/start system.

5.2.2. Long term deactivation

Notwithstanding paragraph 5.2.1, when a vehicle is equipped with a means to manually deactivate the ACPE function, and the function is not reinstated at the initiation of each engine start (or run cycle, as relevant), either:

(a) A constant optical warning signal shall inform the driver that the ACPE function has been deactivated.; or

(b) The driver shall be informed that the ACPE function has been deactivated. In this case this information shall be given for a minimum of [10] second} **or until driver confirmation** at least every [10] engine start (or run cycle, as relevant).

This requirement does not apply when a new engine start (or run cycle, as relevant) is performed automatically, e.g. the operation of a stop/start system.

The long-term deactivation warning signal shall be distinct from the failure warning signal specified in paragraph 5.4.3. **This shall not apply to the case if other methods can be used to distinguish between them.**

The long-term deactivation process shall be designed in such a way that deactivation shall not be possible with less than two deliberate actions.

5.2.3 Automatic deactivation

5.2.3.1. When the vehicle is equipped with a means to automatically deactivate the ACPE function, for instance in situations such as off-road use, being towed, being operated on a dynamometer, being operated in a washing plant, the following conditions shall apply as appropriate:

5.2.3.1.1. The vehicle manufacturer shall provide a list of situations and corresponding criteria where the ACPE function is automatically deactivated to the technical service at the time of type approval and it shall be annexed to the test report.

5.2.3.1.2. The ACPE function shall be automatically reactivated as soon as the conditions that led to the automatic deactivation are not present anymore.

5.2.3.1.3. While automated driving functions or Advanced Driver-Assistance Systems are in control of the vehicle (e.g. ALKS or ACSF category A is active) the ACPE function may be suspended or its control strategies (i.e. acceleration suppression demand, warning timing) adapted without indication to the driver, as long as it remains ensured that the vehicle provides at least the same acceleration suppression capabilities as the ACPE function during manual operation.

5.3 Failure detection / self-check

5.3.1 A failure warning shall be given to the driver when there is a failure in the ACPE that prevents the requirements of this Regulation of being met. The warning shall be as specified in paragraph 5.4.3.

Commented [A14]: Industry:

If the driver confirms, it does not have to last for [10] seconds to avoid annoyance.

Commented [A15]: Industry

To clarify the situation

Commented [A16]: Industry:

Amend to clarify conformance with current specifications

Commented [A17]: Industry:

Refer R152 "Automatic deactivation", and select necessary items and amend wording for ACPE. (5.2.3 ~ 5.2.3.1.3)

- 5.3.1.1 It is not required to provide the driver with a failure warning signal to indicate that the ACPE is temporarily not available, for example due to inclement weather conditions.
- 5.3.2 There shall not be an appreciable time interval between each ACPE self-check.
- 5.3.3 A failure warning shall also be given to the driver in the case of a detected non-electrical failure condition (e.g. sensor blindness or sensor misalignment).
- 5.3.4 If the vehicle speed is greater than 10 km/h at the time a failure is detected, the warning signal shall be given not later than the next time the vehicle speed is below 10 km/h.
- 5.4. Warning signals
- 5.4.1. General
- 5.4.1.1 The optical warning signals shall be visible even by daylight; the satisfactory condition of the signals must be easily verifiable by the driver from the driver's seat.
- 5.4.1.2 Each ACPE optical warning signal shall be activated either when the engine start (or run, as relevant) switch is turned to the "on" (run) position or when the engine start (or run, as relevant) switch is in a position between the "on" (run) and "start" position that is designated by the manufacturer as a check position (initial system (power-on)). This requirement does not apply to warning signals shown in a common space.
- 5.4.2. Intervention warning signal
- The intervention warning shall be given by an optical signal. In addition, a haptic or acoustic signal shall be provided to the driver, unless such a signal is already being provided by another vehicle system comprising an object detection capability (e.g. parking distance warning).
- The optical warning signal may be the flashing of the failure warning signal.
- A description of the warning indication presented to the driver shall be provided by the vehicle manufacturer at the time of type-approval and recorded in the test report.
- 5.4.3. Failure warning signal
- The failure warning shall be given by a constant yellow optical signal.
- 5.5. Provisions for the Periodic Technical Inspection
- 5.5.1. At a Periodic Technical Inspection, it shall be possible to confirm the correct operational status of the ACPE by a visible observation of the failure warning signal status. Following a "power-ON" and any bulb check, the failure warning signal shall remain illuminated if any failure was present at the end of the previous engine start (or run, as relevant) cycle, unless this failure is detected to be no longer present.
- In the case of the failure warning signal being in a common space. The common space must be observed to be functional prior to the failure warning signal status check.
- 5.5.2. At the time of type approval, the means to protect against simple unauthorised modification of the operation of the failure warning signal chosen by the manufacturer shall be confidentially outlined.
- Alternatively, this protection requirement is fulfilled when a secondary means of checking the correct operational status of the ACPE available.

6. Test procedure

6.1 Test surface and environment conditions

6.1.1 The test shall be performed on a flat, dry, concrete or asphalt road affording good adhesion.

6.1.2 The test surface has a consistent slope between level and 1 per cent.

6.1.3 The ambient temperature shall be between 0°C and 45°C.

6.1.4 The horizontal visibility range shall allow the target to be observed throughout the test.

6.1.5 The tests shall be performed when there is no wind liable to affect the results.

6.1.6 Natural ambient illumination must be homogeneous in the test area and in excess of 1000 lux. It should be ensured that testing is not performed whilst driving towards, or away from the sun at a low angle.

6.1.7 At the request of the manufacturer and with the agreement of the Technical Service tests may be conducted under deviating test conditions (suboptimal conditions, e.g. on a not dry surface; below the specified minimum ambient temperature; against a non-articulated pedestrian target), whilst the performance requirements are still to be met.

6.2 Test Vehicle

6.2.1 Pre-Test Conditioning

If requested by the vehicle manufacturer:

(a) The vehicle can be driven a maximum of 100 km on a mixture of urban and rural roads with other traffic and roadside furniture to initialise the sensor system.

(b) The vehicle can undergo a sequence of brake activations in order to ensure the service brake system is bedded in prior to the test.

(c) The average temperature of the service brakes on the hottest axle of the vehicle, measured inside the brake linings or on the braking path of the disc or drum, is between 65 and 100°C prior to each test run.

Details of the pre-test condition strategy requested by the vehicle manufacturer shall be identified and recorded in the vehicle type approval documentation.

6.2.2 Prior to any testing, it shall be ensured that the ACPE is switched on and ready to function.

6.2.3 Test mass

The vehicle shall be tested:

(a) At the minimum mass (mass in running order with an additional mass of maximum 125 kg);

(b) If this is deemed justified, the technical service may test at any other mass up to the technically permissible maximum laden mass as defined by the manufacturer. No alteration shall be made once the test procedure has begun.

6.3 Test Targets

6.3.1 The target used for the vehicle detection tests shall be a regular high-volume series production passenger car of Category M1 or alternatively a "soft target" representative of a passenger vehicle

in terms of its identification characteristics applicable to the sensor system of the ACPE under test according to ISO 19206-01 or ISO 19206-3:2021. The reference point for the location of the vehicle shall be the most rearward point on the centreline of the vehicle.

6.3.2 The target used for the pedestrian detection tests shall be a ~~child~~ [Adult] "non-articulated (standing) soft target" and be representative of the human attributes applicable to the sensor system of the ACPE under test according to ISO 19206-2:2018.

6.4. Pedal misapplication test

The subject vehicle shall be placed in a situation where it is stationary; a forward or respectively a reverse gear shall be engaged, and the vehicle maintained in a stationary condition using the service brake control.

The test target shall be positioned so that an unintended acceleration would lead to a collision with the target within 1.0 +0.1m ~~1.5 m~~ after the application of the accelerator control. at the start of accelerator pedal input.

The lateral offset between the centreline of the target and the centreline of the vehicle shall be between 0 and 0.2 m.

The service brake control shall be released, and after a period of between 1 and 5 seconds, as soon as the accelerator control shall be applied so as to reach 100 % within 0,25 seconds. In case of ACPE systems using the application force as a triggering criterion, a sufficient force at a sufficient rate shall be applied, as specified by the manufacturer.

The vehicle shall be tested in forward and rearward directions and for pedestrian and vehicle obstacles.

6.5. At the request of the manufacturer and with the agreement of the Technical Service, tests may be conducted under deviating test conditions (suboptimal conditions, e.g. on a not dry surface; below the specified minimum ambient temperature), whilst the performance requirements are still to be met.

6.6. If this is deemed justified, the Technical Service may test in any test condition within the conditions specified in paragraph 5.1 during the tests as described in paragraph 6.4.

7. Modification of vehicle type and extension of approval

7.1. Every modification of the vehicle type as defined in paragraph 2.4. above shall be notified to the Type Approval Authority which approved the vehicle type. The Type Approval Authority may then either:

7.1.1. Consider that the modifications made do not have an adverse effect on the conditions of the granting of the approval and grant an extension of approval;

7.1.2. Consider that the modifications made affect the conditions of the granting of the approval and require further tests or additional checks before granting an extension of approval.

7.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.3. above to the Contracting Parties to the Agreement which apply this Regulation.

7.3. 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

Commented [A18]: Industry:
There is no ACPE systems suitable for children. We believe it is appropriate to start with the "Adult" target.
And to clarify that target is non-articulated (standing) target.

Commented [A19]: Industry:
We believe that sufficient discussion is necessary regarding the details of the test procedures, so SB (Square Bracket) should be added.
There is no actual tests results other than the JNCAP test procedures. Therefore, we propose JNCAP test procedures as a introduction faze.
Review of the test procedures will be considered at a later stage.

Commented [A20]: Industry
Test should be conducted fix value plus torelance.

Commented [A21]: Industry:
To clarify the distance measurement point, define it by the point at the time of pedal input.

Commented [A22]: Industry:
Similar to JNCAP, immediately applies the accelerator pedal input after releasing the brake.

Commented [A23]: Industry:
To add SB (Square Bracket)

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

8. Conformity of production

- 8.1. Procedures concerning conformity of production shall comply with those set out in the 1958 Agreement, Schedule 1 (E/ECE/TRANS/505/Rev.3) and meet the following requirements:
- 8.2. A vehicle approved pursuant to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements of paragraph 5. above;
- 8.3. The Type Approval Authority which has granted approval may at any time verify the conformity of control methods applicable to each production unit. The normal frequency of such inspections shall be once every two years.

9. Penalties for non-conformity of production

- 9.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 8, above are not complied with.
- 9.2. If a Contracting Party withdraws an approval it had previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation by sending them a communication form conforming to the model in Annex 1 to this Regulation.

10. Names and Addresses of Technical Series Responsible for Conducting Approval Tests and of Type Approval Authorities

If the holder of the approval completely ceases to manufacture a type of vehicle approved in accordance with this Regulation, he shall so inform the Type Approval Authority which granted the approval, which in turn shall forthwith inform the other Contracting Parties to the Agreement applying this Regulation by means of a communication form conforming to the model in Annex 1 to this Regulation.

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

The Contracting Parties to the Agreement applying this Regulation shall communicate to the United Nations Secretariat² the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval are to be sent.

12. Transitional provisions

- 12.1. As from the official date of entry into force of the 01 series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept type approvals under this Regulation as amended by the 01 series of amendments.
- 12.2. As from 1 September 2027, Contracting Parties applying this Regulation shall not be obliged to accept type approvals to the original version of this Regulation, first issued after 1 September 2027.
- 12.3. Until 1 September 2029, Contracting Parties applying this Regulation shall accept type approvals to the original version of this Regulation, first issued before 1 September 2027.
- 12.4. As from 1 September 2029, Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued to the original version of this Regulation.
- 12.5. [Notwithstanding paragraph 12.4., Contracting Parties applying this Regulation shall continue to accept type approvals issued according to the original version of this Regulation, for vehicles which are not affected by the changes introduced by the 01 Series of amendments.]
- 12.6. Contracting Parties applying this Regulation may grant type approvals according to any preceding series of amendments to this Regulation.
- 12.7. Contracting Parties applying this Regulation shall continue to grant extensions of existing approvals to any preceding series of amendments to this Regulation.]

Commented [A24]: Industry:

At present, the "test procedures", "performance requirements", "objects (ex. whether children are included in pedestrians or not)", and "vehicle category (include N1 or not)" have not been determined, and we believe we can't have a position to determine "transitional provisions." We believe it should be discussed after the contents is decided.

So SB (Square Bracket) should be added.

Commented [A25]: Industry:

To add SB (Square Bracket)

² The UNECE secretariats provides the online platform ("343 Application") for exchange of such information with the secretariat: <https://www.unece.org/trans/main/wp29/datasharing.html>

Annex 1

Communication

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



issued by : (Name of administration)

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

³Concerning: ⁴

- Approval granted
- Approval extended
- Approval refused
- Approval withdrawn
- Production definitively discontinued

of a type of vehicle with regard to the acceleration control for pedal error pursuant to UN Regulation No. XXX

Approval No.:

1. Trademark:
2. Type and trade name(s):
3. Name and address of manufacturer:
4. If applicable, name and address of manufacturer's representative:
5. Brief description of vehicle:
6. Date of submission of vehicle for approval:
7. Technical Service performing the approval tests:
8. Date of report issued by that Service:
9. Number of reports issued by that Service:
10. Approval granted/refused/extended/withdrawn:²
11. Place:
12. Date:
13. Signature:
14. Annexed to this communication are the following documents, bearing the approval number indicated above:
15. Any remarks:

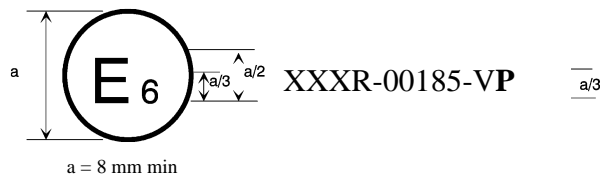
³ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

⁴ Strike out what does not apply.

Annex 2

Arrangements of approval marks

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



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in Belgium (E 6) with regard to the Acceleration Control for Pedal Error (ACPE) pursuant to UN Regulation No. XXX (marked with V for Vehicle-to-Vehicle/Wall, with P for Vehicle-to-Pedestrian). The first two digits 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 3

Special requirements to be applied to the safety aspects of electronic control systems

1. General

This annex defines the special requirements for documentation, fault strategy and verification with respect to the safety aspects of Complex Electronic Vehicle Control Systems (paragraph 2.4. below) as far as this Regulation is concerned.

This annex shall also apply to safety related functions identified in this Regulation which are controlled by electronic system(s) (paragraph 2.3.) as far as this Regulation is concerned.

This annex does not specify the performance criteria for "The System" but covers the methodology applied to the design process and the information which must be disclosed to the Technical Service, for type approval purposes.

This information shall show that "The System" respects, under non-fault and fault conditions, all the appropriate performance requirements specified elsewhere in this Regulation and that it is designed to operate in such a way that it does not induce safety critical risks.

2. Definitions

For the purposes of this annex,

- 2.1. *The System*" means an electronic control system or complex electronic control system that provides or forms part of the control transmission of a function to which this Regulation applies. This also includes any other system covered in the scope of this Regulation, as well as transmission links to or from other systems that are outside the scope of this Regulation, that acts on a function to which this Regulation applies."
- 2.2. *Safety Concept*" is a description of the measures designed into the system, for example within the electronic units, so as to address system integrity and thereby ensure safe operation under fault and non-fault conditions, including in the event of an electrical failure. The possibility of a fall-back to partial operation or even to a back-up system for vital vehicle functions may be a part of the safety concept.
- 2.3. *Electronic Control System*" means a combination of units, designed to co-operate in the production of the stated vehicle control function by electronic data processing. Such systems, often controlled by software, are built from discrete functional components such as sensors, electronic control units and actuators and connected by transmission links. They may include mechanical, electro-pneumatic or electro-hydraulic elements.
- 2.4. *Complex Electronic Vehicle Control Systems*" are those electronic control systems in which a function controlled by an electronic system or the driver may be over-ridden by a higher level electronic control system/function. A function which is over-ridden becomes part of the complex system, as well as any overriding system/function within the scope of this Regulation. The transmission links to and from overriding systems/function outside of the scope of this Regulation shall also be included.

- 2.5. "*Higher-Level Electronic Control*" systems/functions are those which employ additional processing and/or sensing provisions to modify vehicle behaviour by commanding variations in the function(s) of the vehicle control system. This allows complex systems to automatically change their objectives with a priority which depends on the sensed circumstances.
- 2.6. "*Units*" are the smallest divisions of system components which will be considered in this annex, since these combinations of components will be treated as single entities for purposes of identification, analysis or replacement.
- 2.7. "*Transmission links*" are the means used for inter-connecting distributed units for the purpose of conveying signals, operating data or an energy supply. This equipment is generally electrical but may, in some part, be mechanical, pneumatic or hydraulic.
- 2.8. "*Range of control*" refers to an output variable and defines the range over which the system is likely to exercise control.
- 2.9. "*Boundary of functional operation*" defines the boundaries of the external physical limits within which the system is able to maintain control.
- 2.10. "*Safety Related Function*" means a function of "The System" that is capable of changing the dynamic behaviour of the vehicle. "The System" may be capable of performing more than one safety related function.

3. Documentation

3.1. Requirements

The manufacturer shall provide a documentation package which gives access to the basic design of "The System" and the means by which it is linked to other vehicle systems or by which it directly controls output variables. The function(s) of "The System" and the safety concept, as laid down by the manufacturer, shall be explained. Documentation shall be brief, yet provide evidence that the design and development has had the benefit of expertise from all the system fields which are involved. For periodic technical inspections, the documentation shall describe how the current operational status of "The System" can be checked.

The Technical Service shall assess the documentation package to show that "The System":

- (a) Is designed to operate, under non-fault and fault conditions, in such a way that it does not induce safety critical risks;
- (b) Respects, under non-fault and fault conditions, all the appropriate performance requirements specified elsewhere in this Regulation; and,
- (c) Was developed according to the development process/method declared by the manufacturer.

3.1.1. Documentation shall be made available in two parts:

- (a) The formal documentation package for the approval, containing the material listed in paragraph 3. (with the exception of that of paragraph 3.4.4.) which shall be supplied to the Technical Service at the time of submission of the type approval application. This documentation package shall be used by the Technical Service as the basic reference for the verification process set out in paragraph 4. of this annex. The Technical Service shall ensure that this documentation package remains available for a period determined in agreement with the Approval Authority. This period shall be at least 10 years counted from the time when production of the vehicle is definitely discontinued.

- (b) Additional material and analysis data of paragraph 3.4.4. which shall be retained by the manufacturer, but made open for inspection at the time of type approval. The manufacturer shall ensure that this material and analysis data remains available for a period of 10 years counted from the time when production of the vehicle is definitely discontinued."
- 3.2. Description of the functions of "The System"
- A description shall be provided which gives a simple explanation of all the control functions of "The System" and the methods employed to achieve the objectives, including a statement of the mechanism(s) by which control is exercised.
- Any described function that can be over-ridden shall be identified and a further description of the changed rationale of the function's operation provided.
- 3.2.1. A list of all input and sensed variables shall be provided and the working range of these defined.
- 3.2.2. A list of all output variables which are controlled by "The System" shall be provided and an indication given, in each case, of whether the control is direct or via another vehicle system. The range of control (paragraph 2.8.) exercised on each such variable shall be defined.
- 3.2.3. Limits defining the boundaries of functional operation (paragraph 2.9.) shall be stated where appropriate to system performance.
- 3.3. System layout and schematics
- 3.3.1. Inventory of components.
- A list shall be provided, collating all the units of "The System" and mentioning the other vehicle systems which are needed to achieve the control function in question.
- An outline schematic showing these units in combination, shall be provided with both the equipment distribution and the interconnections made clear.
- 3.3.2. Functions of the units
- The function of each unit of "The System" shall be outlined and the signals linking it with other units or with other vehicle systems shall be shown. This may be provided by a labelled block diagram or other schematic, or by a description aided by such a diagram.
- 3.3.3. Interconnections
- Interconnections within "The System" shall be shown by a circuit diagram for the electric transmission links, by a piping diagram for pneumatic or hydraulic transmission equipment and by a simplified diagrammatic layout for mechanical linkages. The transmission links both to and from other systems shall also be shown
- 3.3.4. Signal flow, operating data and priorities
- There shall be a clear correspondence between these transmission links and the signals and/or operating data carried between units. Priorities of signals and/or operating data on multiplexed data paths shall be stated wherever priority may be an issue affecting performance or safety as far as this Regulation is concerned.
- 3.3.5. Identification of units
- Each unit shall be clearly and unambiguously identifiable (e.g. by marking for hardware and marking or software output for software content) to provide corresponding hardware and documentation association.
- Where functions are combined within a single unit or indeed within a single computer, but shown in multiple blocks in the block diagram for clarity and

ease of explanation, only a single hardware identification marking shall be used. The manufacturer shall, by the use of this identification, affirm that the equipment supplied conforms to the corresponding document.

- 3.3.5.1. The identification defines the hardware and software version and, where the latter changes such as to alter the function of the unit as far as this Regulation is concerned, this identification shall also be changed.
- 3.4. Safety concept of the manufacturer
- 3.4.1. The Manufacturer shall provide a statement which affirms that the strategy chosen to achieve "The System" objectives will not, under non-fault conditions, prejudice the safe operation of the vehicle.
- 3.4.2. In respect of software employed in "The System", the outline architecture shall be explained and the design methods and tools used shall be identified. The manufacturer shall show evidence of the means by which they determined the realisation of the system logic, during the design and development process.
- 3.4.3. The Manufacturer shall provide the Technical Service with an explanation of the design provisions built into "The System" so as to generate safe operation under fault conditions. Possible design provisions for failure in "The System" are for example:
- (a) Fall-back to operation using a partial system.
 - (b) Change-over to a separate back-up system.
 - (c) Removal of the high level function.
- In case of a failure, the driver shall be warned for example by warning signal or message display. When the system is not deactivated by the driver, e.g. by turning the ignition (run) switch to "off", or by switching off that particular function if a special switch is provided for that purpose, the warning shall be present as long as the fault condition persists.
- 3.4.3.1. If the chosen provision selects a partial performance mode of operation under certain fault conditions, then these conditions shall be stated and the resulting limits of effectiveness defined.
- 3.4.3.2. If the chosen provision selects a second (back-up) means to realise the vehicle control system objective, the principles of the change-over mechanism, the logic and level of redundancy and any built in back-up checking features shall be explained and the resulting limits of back-up effectiveness defined.
- 3.4.3.3. If the chosen provision selects the removal of the Higher Level Function, all the corresponding output control signals associated with this function shall be inhibited, and in such a manner as to limit the transition disturbance.
- 3.4.4. The documentation shall be supported, by an analysis which shows, in overall terms, how the system will behave on the occurrence of any individual hazard or fault which will have a bearing on vehicle control performance or safety.
- The chosen analytical approach(es) shall be established and maintained by the Manufacturer and shall be made open for inspection by the Technical Service at the time of the type approval.
- The Technical Service shall perform an assessment of the application of the analytical approach(es). The audit shall include:
- (a) Inspection of the safety approach at the concept (vehicle) level with confirmation that it includes consideration of interactions with other vehicle systems. This approach shall be based on a Hazard / Risk analysis appropriate to system safety.
 - (b) Inspection of the safety approach at the system level. This approach shall be based on a Failure Mode and Effect Analysis (FMEA), a Fault

Tree Analysis (FTA) or any similar process appropriate to system safety.

- (c) Inspection of the validation plans and results. This validation shall use, for example, Hardware in the Loop (HIL) testing, vehicle on-road operational testing, or any means appropriate for validation.

The assessment shall consist of checks of hazards and faults chosen by the Technical Service to establish that the manufacturer's explanation of the safety concept is understandable, logical and that the validation plans are suitable and have been completed.

The Technical Service may perform or may require to perform tests as specified in paragraph 4. to verify the safety concept.

- 3.4.4.1. This documentation shall itemize the parameters being monitored and shall set out, for each fault condition of the type defined in paragraph 3.4.4. of this annex, the warning signal to be given to the driver and/or to service/technical inspection personnel.

- 3.4.4.2. This documentation shall describe the measures in place to ensure the "The System" does not prejudice the safe operation of the vehicle when the performance of "The System" is affected by environmental conditions e.g. climatic, temperature, dust ingress, water ingress, ice packing.

4. Verification and test

- 4.1. The functional operation of "The System", as laid out in the documents required in paragraph 3., shall be tested as follows:

- 4.1.1. Verification of the function of "The System"

The Technical Service shall verify "The System" under non-fault conditions by testing a number of selected functions from those declared by the manufacturer in paragraph 3.2. above.

For complex electronic systems, these tests shall include scenarios whereby a declared function is overridden.

- 4.1.2. Verification of the safety concept of paragraph 3.4.

The reaction of "The System" shall be checked under the influence of a failure in any individual unit by applying corresponding output signals to electrical units or mechanical elements in order to simulate the effects of internal faults within the unit. The Technical Service shall conduct this check for at least one individual unit, but shall not check the reaction of "The System" to multiple simultaneous failures of individual units.

The Technical Service shall verify that these tests include aspects that may have an impact on vehicle controllability and user information (HMI aspects)."

- 4.1.2.1. The verification results shall correspond with the documented summary of the failure analysis, to a level of overall effect such that the safety concept and execution are confirmed as being adequate.

5. Reporting by Technical Service

Reporting of the assessment by the Technical Service shall be performed in such a manner that allows traceability, e.g. versions of documents inspected are coded and listed in the records of the Technical Service.

An example of a possible layout for the assessment form from the Technical Service to the Type Approval Authority is given in Appendix 1 to this Annex.

Annex 3 - Appendix 1

Model assessment form for electronic systems

Test report No:

1. Identification

1.1. Vehicle make:

1.2. Type:

1.3. Means of identification of type if marked on the vehicle:

1.4. Location of that marking:

1.5. Manufacturer's name and address:

1.6. If applicable, name and address of manufacturer's representative:

1.7. Manufacturer's formal documentation package:

Documentation reference No:

Date of original issue:

Date of latest update:

2. Test vehicle(s)/system(s) description

2.1. General description:

2.2. Description of all the control functions of "The System", and methods of operation: ..

2.3. Description of the components and diagrams of the interconnections within "The System":

3. Manufacturer's safety concept

3.1. Description of signal flow and operating data and their priorities:

3.2. Manufacturer's declaration:

The manufacturer(s) affirm(s) that the strategy chosen to achieve "The System", objectives will not, under non-fault conditions, prejudice the safe operation of the vehicle.

3.3. Software outline architecture and the design methods and tools used:

3.4. Explanation of design provisions built into "The System" under fault conditions:

3.5. Documented analyses of the behaviour of "The System" under individual hazard or fault conditions:

3.6. Description of the measures in place for environmental conditions:

3.7. Provisions for the periodic technical inspection of "The System":

3.8. Results of "The System" verification test, as per para. 4.1.1. of Annex 3 to UN Regulation No. XXX:

3.9. Results of safety concept verification test, as per para. 4.1.2. of Annex 3 to UN Regulation No. XXX:

3.10. Date of test:

3.11. This test has been carried out and the results reported in accordance with to UN Regulation No. XXX as last amended by the series of amendments.

Technical Service¹ carrying out the test

Signed: Date:

3.12. Type Approval Authority¹

Signed: Date:

3.13. Comments:

"

¹ To be signed by different persons even when the Technical Service and Type Approval Authority are the same or alternatively, a separate Type Approval Authority authorization is issued with the report.

Submission by Co-Chairs

ACPE-XX-XX