

This proposal is based on ACSF-03-16

IWG ACSF Proposal based on ACSF-03-03-Rev1.1 – amended within the meeting
This is not a final document! This is the status at the end of the meeting.

Proposal for amendments to Regulation No. 79 to include ACSF > 10 km/h

The modifications to the Regulation are marked in bold and strikethrough characters.

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This document is a consolidation of industry comments and proposals, based on document ACSF-03-16 - Final document of the 3rd meeting.docx.

Amend paragraph 2.3.4.1. to read:

- 2.3.4.1. "Automatically commanded steering function" (ACSF) means the function within a complex electronic control system where actuation of the steering system can result from automatic evaluation of signals initiated on-board the vehicle, possibly in conjunction with passive infrastructure features, to generate continuous control action in order to assist the driver ~~in following a particular path, in low speed manoeuvring or parking operations.~~
- 2.3.4.1.1. Category A ACSF means, a function that operates at a speed no greater than 10 km/h to assist the driver, on demand, in low speed manoeuvring or parking operations.**
- 2.3.4.1.2. [“ACSF Category B means a function which is initiated/activated by the driver and which keeps the vehicle within its lane by influencing the lateral movement of the vehicle.]**
- [2.3.4.1.3. Category C ACSF means, a function which can perform a single manoeuvre (e.g. lane change) when commanded by the driver.**
- 2.3.4.1.4. Category D ACSF means, a function which can indicate the possibility of a single manoeuvre (e.g. lane change) but performs that function only following a confirmation by the driver.**
- 2.3.4.1.5. Category E ACSF means, a function which is [initiated/activated] by the driver and which can continuously determine the possibility of a manoeuvre (e.g. lane change) and complete these manoeuvres for extended periods without further driver command/confirmation.]**

Rem: (F) intend to delete “manoeuvre” and replace it by “lane change” (Cat C, D, E)

Insert new paragraph 2.4.8. to read

- 2.4.8. For Automatically commanded steering functions**

[2.4.8.1 "Motorway" means, a road section, dedicated exclusively to motor vehicles, having [a speed limit of more than 100 km/h and] at least two traffic lanes for each direction of travel and having a physical separation of traffic moving in opposite directions.]

Industry comments:

Industry would like to avoid a restriction on that a motorway must have 2 lanes.

Motorways with only one lane are compatible with ACSF, thus should not be excluded from the definition.

Of course, the lane change function of a cat E ACSF shall not operate on motorways having a single lane; yet this shall not be restricted in the definition itself, rather in the requirements section (e.g. in 5.6.1.2.1).

The definition should not define a minimum speed, to be compatible with definition of motorway in the different CPs.

RE3 definition may be an interesting alternative to creating a new definition.

2.4.8.2 "Lane" means one of the longitudinal strips into which a roadway is divided.

2.4.8.3 "Visible Lane markings" means delineators intentionally placed on the borderline of the lane that are directly visible by the driver while driving (e.g. not covered by snow, etc.).

2.4.8.4 "Lead vehicle" means a vehicle driving in front of the vehicle equipped with ACSF.

2.4.8.5 "Lane change manoeuvre" means a manoeuvre in which the vehicle changes from its initial lane to an adjacent lane

2.4.8.6 "Specified maximum speed V_{smax} " means the maximum speed up to which an ACSF is designed to work.

2.4.8.7 "Specified minimum speed V_{smin} " means the minimum speed up to which an ACSF is designed to work.

2.4.8.8 "Transition demand " means an instruction from the ACSF they have to take over manual control of the steering task again.

2.4.8.9 "Transition procedure" means the sequence of providing a transition demand by the system, taking over manual steering control by the driver and deactivation of the ACSF.

[2.4.8.10 "Conditions for safe operation" mean all circumstances like traffic situation, road category, quality of lane markings, vehicle speed, curvature of the road, lighting, sensor capabilities etc. specified by the vehicle manufacturer that have to be fulfilled when an ACSF shall be able to be activated by a driver.] (put it in the requirements?)

[2.4.8.11 "System boundaries" mean all circumstances from which on the conditions for safe operation are not fulfilled anymore, that cannot be dealt with by an activated ACSF anymore and thus request a take-over of manual steering control by the driver.

Industry proposal:

Source: ACSF-03-13 - (OICA-CLEPA) Industry Homework mother document.docx

- 2.4.8.10 **"Conditions for safe operation"** mean circumstances like traffic situation, road category, quality of lane markings, vehicle speed, curvature of the road, lighting, sensor capabilities etc. specified by the vehicle manufacturer, where the system is designed to operate.
- 2.4.8.11 **"System boundaries"** means circumstances from which on the conditions for safe operation of the system are not fulfilled anymore.
- 2.4.8.12 **"ACSF status"** means any distinct operational mode of the ACSF like "switched off" "switched on", "available to be activated", "activated" etc.
- 2.4.8.13 **"Driver availability recognition [system/function]"** means a function able to assess driver's physical availability to respond to a transition demand from an ACSF system, based e.g. on the monitoring of driver activity, presence in driver's seat etc.
- 2.4.8.14 **"Minimum risk manoeuvre"** means a procedure to reach a status with as little risk as possible in the given traffic situation, when the driver fails to respond to the takeover demand.

Industry proposal:

Source: ACSF-03-15 - (OICA-CLEPA) Minimal risk manoeuvre.docx

- 2.4.8.14 **"Minimal risk manoeuvre"** means a procedure aimed at reducing risks in traffic, which is automatically performed by the system, e.g. when the driver does not respond to a transition demand (e.g. by reducing vehicle speed).
- 2.4.8.15 **"Emergency Manoeuvre"** is a manoeuvre performed by the system in case of a sudden unexpected event in which the vehicle is in imminent danger to collide with another object, in order to avoid or mitigate a collision.]

Rem: all definitions have to be reviewed, when the requirements have been finalized.

Amend paragraph 5.1.6.1. to read:

5.1.6.1. Whenever ~~the~~ **an** Automatically Commanded Steering function becomes operational, this shall be indicated to the driver. ~~and the control action shall be automatically disabled if the vehicle speed exceeds the set limit of 10 km/h by more than 20 per cent or the signals to be evaluated are no longer being received.~~ Any termination of control shall produce a ~~short but distinctive driver warning~~ **in accordance with the requirements of paragraph 5.4.3.** ~~by a visual signal and either an acoustic signal or by imposing a tactile warning signal on the steering control.~~

Insert new paragraph 5.4.3. Renumber paragraph 5.4.3. as 5.4.4.

5.4.3. Special Warning Provisions for Automatically Commanded Steering Functions

~~5.4.3.1 Any termination of control other than in 5.4.3.2 or a transition demand (acc. to 5.6.1.5) shall produce a distinctive driver warning by a [yellow or red] visual signal and either an acoustic signal or by imposing a haptic warning signal. This warning shall be provided before the system (function) becomes in operational, if the termination is not intended by the driver. If the driver does not take over manual control the warning shall be escalating with time in terms of enlarging the intensity of the warning and/or in terms of adding and/or changing the warning means.~~

Any termination of control initiated by the system other than specified in 5.6.1.4 shall produce a distinctive driver warning including a [visual signal / optical warning] and either an acoustic [signal / warning] or an haptic [signal / warning] [until the driver has resumed manual control].

~~5.4.3.2. Any sudden termination of control caused by a failure of the system physical or functional failure shall produce immediately a distinctive driver warning by a [red] visual signal and either an acoustic signal that shall remain operational until the driver has resumed control.~~

Amend paragraph 5.5.2

Source of the proposal: ACSF-02-09-Rev1 - PTI

5.5.2. It ~~must~~ **shall** be possible to verify in a simple way the correct operational status of those **Complex** Electronic Systems, which have control over steering. If special information is needed, this shall be made freely available. **It shall be possible to verify the correct operational status of those Electronic Systems by a visible observation of the failure warning signal status, following a "power-ON" and any bulb check.**

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.

[In the case of an ACSF system able to operate at higher speed than 10km/h, it shall be possible to confirm the failure warning signal status via the use of an electronic communication interface.]

5.5.2.1. At the time of Type Approval the means implemented to protect against simple unauthorized modification to the operation of the verification means chosen by the manufacturer (e.g. warning signal) shall be confidentially outlined.

Alternatively this protection requirement is fulfilled when a secondary means of checking the correct operational status is available, **e.g. by using an electronic communication interface.**

Insert new paragraph 5.6

5.6 Special Provisions for Automatically Commanded Steering Functions

5.6.1. Special Provisions for Category E ACSF

5.6.1.1. General

Marker for 130 km/h

5.6.1.1.1. The system shall be active (deliver automatic steering) only after a deliberate action of the driver and if the conditions for safe operation of the system are fulfilled (all associated functions – e.g. brakes, accelerator, steering, camera/radar/lidar etc. are working proper).

5.6.1.1.2. The vehicle shall be equipped with a means for the driver to activate and deactivate the system. The deactivation shall be possible at any time.

5.6.1.1.3. If the driver is steering manually, ACSF shall be deactivated automatically.

5.6.1.1.4. The system shall not induce in normal driving situations a lateral acceleration of more than 3 m/s².

5.6.1.1.5. The system shall comprise a driver **availability** recognition system that is active whenever the **ACSF** system is active.

Rem: Minimum requirements tbd.

5.6.1.1.6. The activated system shall at any time control the lateral movements of the vehicle in such a way that the vehicle does not induce any safety critical situations and that the movements of the vehicle is clear to other road users.

~~5.6.1.1.7. The system shall at any time give a noticeable and distinctive signalization to the driver about the system status. This signalization shall be at least a visual signal. Any change in system status shall be indicated by an optical and [, if not initiated by the driver,] either an acoustic or haptic signal.~~

The system status shall be indicated to the driver by a visual signal.

The indication shall [at least] distinguish between the system status manual Mode, active Mode and failure mode.

The indication shall be present as long as the relevant system status persists.

When the system is manually switched off by the driver, the indication of manual mode and failure mode may be suppressed.

5.6.1.2. Operation of ACSF

5.6.1.2.1. Any lane change manoeuvre shall be initiated only if:

- the vehicle is travelling on a motorway as defined in paragraph 2.4.8. and
- any traffic that can affect the safe manoeuvre shall be identified by equipment installed on the vehicle and
- the vehicle equipment can analyze speed and distance of the identified traffic to ensure a safe manoeuvre (e.g. does not cause a deviation to the flow or direction of other traffic).

to perform lane changes through monitoring the surrounding, road traffic situation etc.,

5.6.1.2.2. If a lane change manoeuvre is carried out, the correspondent direction indicator lamps shall be automatically activated minimum [3s] prior to the steering operation.

5.6.1.2.3. The lane change manoeuvre shall be completed, except the system detects an imminent critical situation [or the system is overridden by the driver].

5.6.1.2.4. The activated system shall at any time ensure **the vehicle does not cross any lane marking, when tested in the conditions defined in Annex 7, paragraph 3.1.1 (FU1 test)**~~a safe lateral distance to other road users. The vehicle manufacturer shall~~

~~provide documentation about how such a safe distance is achieved to the technical service.~~

5.6.1.2.5. If the activated ACSF detects that due to a sudden unexpected event the vehicle is in imminent danger to collide with another road user and that the time for a safe transition procedure is too short, an emergency manoeuvre shall be carried out (e.g. by braking the vehicle).

5.6.1.2.6 **Driver availability recognition system**

~~[If the attention recognition system detects that the driver is inattentive, it shall give a warning to restore attentiveness again. The manufacturer shall provide information to the technical service how the attention recognition systems detects inattentiveness of the driver.]~~

When the system detects that the driver is not available, it shall provide a distinctive warning until appropriate actions of the driver are detected (e.g. the driver resumes manual control) or a transition demand is initiated.

When the system does not detect appropriate actions from the driver for more than [x s], a transition demand shall be initiated.

If the driver does not respond to the transition demand for more than [y s], a minimal risk manoeuvre shall be initiated.

The manufacturer shall provide information to the technical service how the driver availability recognition system detects appropriate driver activities.

5.6.1.3. **System information data**

5.6.1.3.1. Following data shall be provided together with the documentation package required in Annex 6 of this regulation to the Technical Service at the time of type approval

5.6.1.3.1.1. The values for V_{smax} and V_{smin} .

5.6.1.3.1.2. The conditions under which the system can be activated, i. e. when the conditions for safe operation of the system are fulfilled.

5.6.1.3.1.3. Information about system boundaries at which the activated system shall issue a transition demand.

5.6.1.3.1.4. The specific values for time intervals acc. to 5.6.1.5.2 which are foreseen for safe transition to manual steering under different circumstances.

5.6.1.3.1.5. Documentation about the chosen strategies regarding the ~~minimum~~ minimal risk manoeuvre which is foreseen depending on the given traffic situation.

5.6.1.3.1.6. Documentation about the chosen strategies regarding the emergency manoeuvre which is foreseen in different sudden critical events.

5.6.1.4. Transition demand

5.6.1.4.1. If the system detects that its boundaries are reached or will be reached shortly or in case of a system failure it shall provide a transition demand.

5.6.1.4.2. The timing of the transition demand shall be such that sufficient time is provided for a safe transition to manual steering.

5.6.1.4.2.1. In the case the system is about to leave the conditions for safe operation as defined in paragraph 2.4.8.10, the following shall apply:

- a) Normal case (e.g. missing lane marking, end of highway, obstacle on lane, etc.): the system shall provide a warning at least [2,7 s] before the boundaries are reached.**
- b) Emergency case (e.g. sudden crossing animal): the system shall initiate the “minimal risk manoeuvre” and the transition demand as soon as the emergency case is detected. This shall comply with the provisions of Annex 6 of this regulation.**

5.6.1.4.2.2. In the case of a failure [affecting the performance of the system], the system shall initiate the transition demand and the fail-safe strategy as declared by the manufacturer in Annex 6 of this regulation, as soon as the failure is detected.

The vehicle shall remain within the lane during at least [2,7 s] when tested according to test procedure defined in 5.6.1.4.2.2.1.

5.6.1.4.2.2.1. FU1 conditions

5.6.1.4.2.2.1.1. Drive the vehicle in the conditions of FU1

5.6.1.4.2.2.1.2. Disconnect any sensor of the ACSF while the vehicle is driven

5.6.1.4.2.2.1.3. Note the time between the sensor is disconnected and the vehicle crosses the lane marking.

Explanatory notes:

- Definition of “normal case”: the system is within the system boundaries as defined by the manufacturer, i.e. end of use-case or obstacle is at a distance greater than “2.7 s” forward of the vehicle
- Definition of “Emergency case”: sudden event is at a distance less than “2.7”s forward the vehicle (obstacle likely not possible to avoid, neither by system nor ta driver).
- Definition of “sudden”: not predictable within the 2.7 s period.

5.6.1.4.3. In case the vehicle is fitted with a built-in infotainment system, [visual] content [/information] to the driver, which is not relevant for driving, shall be deactivated as long as a transition demand is issued.

5.6.1.4.34. If the speed of the vehicle with activated ACSF exceeds $v_{\text{smax}} + 5$ km/h a transition demand shall be given.

5.6.1.4.45. If the vehicle reaches a lateral acceleration of more than 3 m/s^2 a transition demand shall be given.

~~5.6.1.4.5. If an attention recognition system detects the driver to be inattentive although a warning to restore attentiveness was provided to the driver a transition demand shall be given.~~

~~5.6.1.4.6. The system shall provide a transition demand if the driver's seatbelt is unfastened and/or if the driver's seat is left by the driver.~~

5.6.1.4.7. The transition demand shall be provided by a **[yellow]** visual signal and either an acoustic signal or by imposing a haptic warning signal. **The warning may be escalating with time in terms of enlarging the intensity of the warning and/or in terms of adding and/or changing the warning means.**

5.6.1.5. ~~Minimum~~ Minimal Risk Manoeuvre

~~5.6.1.5.1. If the system detects that after a transition demand the driver does not take over manual control of the steering again the vehicle shall carry out a minimum risk manoeuvre.~~

~~5.6.1.3.1.5. Documentation about the chosen strategies regarding the minimum risk manoeuvre which is foreseen depending on the given traffic situation.~~

Industry proposal

Source: ACSF-03-15 - (OICA-CLEPA) Minimal risk manoeuvre.docx

5.6.1.5.1. If the ACSF detects that after a transition demand the driver does not take over manual control of the steering again the vehicle shall carry out a minimal risk manoeuvre . The vehicle manufacturer shall provide information to the technical service about which kind of minimum risk manoeuvres are foreseen depending on the given traffic situation.

5.6.1.5.2. It shall at any time be possible to override the minimal risk manoeuvre by the driver

[5.6.1.5.3. During the minimal risk manoeuvre, the [available / activated] assistance functions like Advanced Emergency Braking System shall remain operational.]

5.6.2. Special Provisions for ACSF of Category D

- to be developed based on the requirements for a Category 5 system-

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5.6.3. Special Provisions for ACSF of Category C

- to be developed based on the requirements for a Category 5 system-

5.6.4. Special Provisions for ACSF of Category B

- to be developed based on the requirements for a Category 5 system-

5.6.5. Special Provisions for ACSF of Category A

- to be developed based on the requirements for a Category 5 system-

Insert new Annex 7

Annex 7

Text requirements for automatically commanded steering functions

1. General Provisions

Vehicles fitted with ACSF shall fulfill the tests requirements of this annex according to the corresponding category of ACSF specified in Table 1.

2. Test conditions

2.1. The test shall be performed on a flat, dry asphalt or concrete surface delivering good adhesion. The ambient temperature shall be between 0° C and 45° C.

2.2. Lane markings

The lane markings and the width of the lane used in the tests shall be those of one of the Contracting Parties, with the markings being in good condition and of a material conforming to the standard for visible lane markings of that Contracting Party. The lane marking layout used for the testing shall be recorded.

The test shall be performed under visibility conditions that allow safe driving at the required test speed.

2.3 Lead vehicle

The lead vehicle shall be a high volume series production passenger car of category M1 AA saloon or in the case of a soft target an object representative of such a vehicle in terms of its detection characteristics. A soft target is a target that will suffer minimum damage and cause minimum damage to the subject vehicle in the event of a collision.

2.4 Motorcycle Target (L3)

A two-wheeled vehicle with an engine cylinder capacity in the case of a thermic engine exceeding 50 cm³ or whatever the means of propulsion a maximum design speed exceeding 50 km/h.

3. Tests

Table 1 specifies which tests have to be fulfilled by each ASCF category.

| Test \ ASCF category | 1 | 2 | 3 | 4 |
|---------------------------------|---|---|---|---|
| FU1 lane keeping test | | | | X |
| FU2 lane change test | | | | X |
| TR1 tight curve | | | | X |
| TR2 missing lane marking | | | | X |
| EM1 braking behind lead vehicle | | | | X |
| EM2 braking behind motorcycle | | | | X |
| | | | | |
| | | | | |
| | | | | |

Table 1

3.1. Functionality Tests

3.1.1. Functionality Test 1 (FU1)

Drive the vehicle with activated ACSF at least 5 min on a track with various curvatures with road markings at each side of the lane at various speeds up to v_{smax} and down to v_{smin} . The usage of a lead vehicle is optional. If a lead vehicle is used and the time gap is not selected by the system, the vehicle shall drive between [2 s] and [3 s] behind the lead vehicle. The lead vehicle shall drive within the lane markings. The speed of the lead vehicle shall be selected such that the lateral acceleration is not more than 1 m/s^2 .

The requirements of the test are fulfilled if the vehicle does not cross any lane marking.

3.1.2. Functionality Test 2 (FU2)

New test t.b.d. by OICA

3.2. Transition Tests

3.2.1 Transition Test 1 (TR1)

Drive the vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane at a speed of 10 km/h below v_{smax} . The usage of a lead vehicle is optional. If a lead vehicle is used and the time gap is not selected by the system, the vehicle shall drive between [2 s] and [3 s] behind the lead vehicle. The lead vehicle shall drive within the lane markings. After a straight section of at least 200 m the vehicle shall enter a curve of more than 90° that demands a lateral vehicle acceleration of more than 3 m/s^2 . The test driver of

the vehicle shall not take over manual steering control again until the minimum risk maneuver is finished.

The requirements of the test are fulfilled if the transition demand was given at least when the lateral acceleration exceeds $[3] \text{ m/s}^2$ and the minimum risk manoeuvre as specified by the manufacturer was initiated. The vehicle shall not cross any lane marking before the minimum risk manoeuvre was initiated.

3.2.2. Transition Test 2 (TR2)

Drive the vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane at a speed of 10 km/h below v_{smax} . The usage of a lead vehicle is optional. If a lead vehicle is used and if the time gap is not selected by the system, the vehicle shall drive between $[2 \text{ s}]$ and $[3 \text{ s}]$ behind the lead vehicle. The lead vehicle shall drive within the lane markings. After a straight section of at least 200 m the vehicle shall approach a section with a length of 200 m with only one lane marking at the driver's side. The test driver of the vehicle shall not take over manual steering control again.

The requirements of the test are fulfilled if:

- the vehicle is following the initial path for the complete section with missing lane marking without crossing the lane marking, or
- the transition demand is given before the vehicle is entering the section with missing lane markings and the vehicle shall follow the initial path without crossing the lane marking for at least $[5]$ seconds after the transition demand. If the driver does not take over the driving task, a minimum risk manoeuvre as specified by the manufacturer is initiated.

3.3. Emergency Tests

3.3.1 Emergency Test 1 (EM1)

Drive the vehicle with activated ACSF at least 1 min behind a lead vehicle. If the time gap is not selected by the system, the vehicle shall drive at a gap of 3 s behind the lead vehicle. The lead vehicle shall drive within the lane markings on a track with road markings at each side of the lane at a speed 10 km/h below v_{smax} . Then the lead vehicle decelerates with 6 m/s^2 and with a mean brake jerk of 6 m/s^3 in the first second of braking.

The requirements of the test are fulfilled if the vehicle does not collide with the lead vehicle.

3.3.2. Emergency Test 2 (EM2)

Drive the vehicle with activated ACSF at least 1 min on a track with road markings at each side of the lane at a speed 10 km/h below v_{smax} . The vehicle shall approach a stationary motorcycle Target (L3) target being placed in the center of the lane.

The requirements of the test are fulfilled if the vehicle does not collide with the motorcycle Target (L3) target.

The Test is not applicable for systems which are not able to follow the lane without a lead vehicle.

- 3.4.x. The Manufacturer shall provide the technical authorities with an explanation of the design provisions built into the ACSF so as to prevent unauthorized manipulations of hardware or software.**

For the design of these protective measures, the manufacturer may assume that the protection against unauthorized physical access to the vehicle systems is assured by the means defined elsewhere in the UN-ECE regulatory framework or by equivalent means.

Justification:

The aim of the proposal here is to address the concern about security risk linked with communication between the vehicle and the exterior.

Possible design provisions for protection of "The System" are for example:

- (a) Protection and authentication of diagnostic interfaces.
- (b) Separation of vehicle dynamic control systems from open communication systems.
- (c) Secure communication channels.

Equivalent means may be based on future industry standard currently under development:

A NWIP new work item has been proposed in last meeting of ISO TC 22/SC32 (electronic components) last June in Tokyo. This NWIP ("Automotive Security Engineering") is aiming at defining the state of the art regarding cyber security.

A new working group has been created. This subject has been confirmed in last ISO TC22 meeting in Bordeaux.

Discussions are also on going between SAE and ISO chairman.