

Submitted by the expert from the Netherland based on ACSF-03-03

NL comment in green between the text of this document

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

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

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NL: General remark:

Should the software of ACSF be developed and/or tested to a certain standard? ACSF makes use of a lot of on-board sensors (and may be also from external sources). All these sensors are connected. That brings the risk of failures in the software of the system. There are standards which look after a safe development of the software. Currently we have only Annex 6. But is that enough?

Futhermore, in the end even a radar cannot look around a corner or much farther than 200 m. It may be assumed that ACSF-systems will sooner or later make use of external "sensors". We now have to be clear about the minimum requirements for the development of the software and the protection against hacking etc. There are already a lot of publications about the poor protection in cars against hacking.

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 1 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. Category 2 ACSF tbd. By OICA

2.3.4.1.3. Category 3 ACSF means, a function that operates at a speed no greater than [130 km/h] and which can perform a single manoeuvre (e.g. lane change) when commanded by the driver.

NL: When it is not allowed to have an ACSF functioning at speeds above e.g. 130 km/h this requirement should be in the general part and not in a definition.

2.3.4.1.4. Category 4 ACSF means, a function that operates at a speed no greater than [130 km/h] and which can indicate the possibility of a single manoeuvre (e.g. lane

change) but performs that function only following a ~~command~~ **confirmation** by the driver.

- 2.3.4.1.5. Category 5 ACSF means, a function that operates at a speed no greater than [130 km/h], which is ~~commanded~~ **initiated** 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**.

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.

[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 ~~travel~~ **traffic** 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 ~~request~~ **demand**" means **an instruction from the ACSF** ~~request~~ to the driver that ~~the driver has~~ **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 ~~request~~ **demand** by the ACSF, taking over manual steering control by the driver and deactivation of the ACSF ~~since manual control was detected by 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 capacities 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.

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 "Attention recognition system" means a ~~device~~ **system** to detect if the driver is vigilant, is attentive, is aware of the traffic situation

2.4.8.14 "Minimum risk manoeuvre" means a ~~procedure~~ **strategy for the [longitudinal and] lateral control of the vehicle** to reach a status with as little risk as possible in the given traffic situation, when the driver ~~fails to respond to the takeover request. is detected by the ACSF not to be available.~~

NL: editorial, "request" should be replaced by "demand" as in par. 2.4.8.8 (definition transition request demand).

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.

NL: Par. 2.4.8.15 definition "Emergency Manoeuvre"; it may be better to replace "manoeuvre" by "action" since "manoeuvre" is basically a short lasting movement in a certain direction. By using the word "manoeuvre" it is not clear if a braking action by the system is included in an "emergency manoeuvre".

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 **15-10 seconds** before the system (function) becomes in-operational, if the termination is not intended by the driver. ~~This warning shall remain operational until the driver has resumed the control.~~

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. If the driver does not take control the system shall start a minimum risk manoeuvre

NL: There should be a time specified for how much time before the system becomes in-operational. Something like 5 or 10 seconds. If the driver does not take control it must be assumed the driver is not capable to take control and that there is an emergency situation which makes a minimum risk manoeuvre necessary.

This par. deals with the same aspects as par. 5.6.1.2.6. May be there is an overlap.

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

NL: It should be impossible that the system stops suddenly because of a system failure. Sensors and important functions should be redundant. This applies especially for the systems who work with more autonomy.

The requirement could be: "Not any physical or functional failure of the system shall cause that the systems terminates suddenly. [10 s] before it stops functioning it shall produce a distinctive driver warning by a [red] visual signal and either an acoustic signal that shall remain operational until the driver has resumed control. If the driver does not take control ACSF shall initiate the minimum risk procedure

This could be tested by introducing a failure. Consequently the system shall warn and continue to work until the driver takes control or the minimum risk manoeuvre has been initiated.

Insert new paragraph 5.6

5.6 Special Provisions for Automatically Commanded Steering Functions

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5.6.1. Special Provisions for ~~of~~ Category 5 ACSF

5.6.1.1. General

5.6.1.1.1. The vehicle shall be equipped with a means for the driver to activate or deactivate the **system ACSF** at any time.

~~5.6.1.2.6.!!!! The ACSF shall be designed such that safe transition to manual steering is possible at any time. (Review after HMI discussion necessary? What is the right place?)~~

5.6.1.1.2. The **system ACSF** shall **only operate** be able to be activated by deliberate action of the driver and if the conditions for safe operation of the ACSF are fulfilled [all associated functions – e.g. brakes, accelerator, steering, camera/radar/lidar etc. are working proper).

NL: It is not clear what "to be activated" implies in this situation.

Does the system take over the steering control immediately or does the system not start until it is ensured that the environment (kind of road) is such that the system boundaries are not exceeded? The system shall recognize if it can cope with the environment. If it cannot cope with the environment (kind of roads, e.g. no lane marking, etc.) it should not be possible to switch the system

on.

Or, the system can be switched on in any case. However the system does not start until the environment allows the ACSF to work. In that case the system could take control unexpectedly. So in that case the system should ask for a re-conformation of the driver.

~~5.6.1.1.3. The system ACSF shall only be able to be activated by deliberate action of the driver.~~

5.6.1.1.4.3. The system ACSF shall be able to detect if the driver controls the steering function manually. If the ACSF detects, that the driver is steering manually , ACSF shall be deactivated automatically.

~~5.6.1.1.5.4. The ACSF may be operational up to a vehicle lateral acceleration of [3] m/s².~~
The system shall not induce a lateral acc. of more than [3] m/s²

5.6.1.1.6.5. The system ACSF shall comprise an attention recognition system that is active whenever the ACSF is active.

NL: Textual proposal par. 5.6.1.1.5: The system ACSF shall comprise an attention recognition system that checks if the driver is supervising the steering of the vehicle. This recognition system shall be that is active whenever the ACSF is active.

The function/purpose of the recognition system is added for clarity.

This function could be easily tested by a test driver e.g. hands off, eyes closed, reading a book.

~~5.6.1.2.4.~~ 5.6.1.1.6. The activated system ACSF 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 are is clear to other road users.

~~5.6.1.4.1~~ 5.6.1.1.7. The system ACSF shall at any time give a noticeable and distinctive signalization to the driver about the system ACSF status. This signalization shall be at least a visual signal. Any change in system status shall be indicated by an optical and either an acoustic or haptic signal

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 ~~motorway~~ a road 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).

NL: Does “not cause a deviation to the flow of other traffic” imply that the vehicle with ACSF shall be able to accelerate such that it gets the same speed as an approaching vehicle? Or may it choose its own speed to e.g. to overtake the vehicle in front and consequently forcing the approaching vehicle to slow down. May be a requirement should be stated how much the approaching vehicle may be forced to slow down. This could be tested in test scenario as in test EM-3.

5.6.1.2.2. If a lane change manoeuvre is carried out, the correspondent direction indicator lamps shall be automatically activated prior to the steering operation. (time necessary?)

5.6.1.2.3. ~~if the ACSF is not overridden by the driver it shall not terminate about the lane change until the manoeuvre is safely completed, except for the ACSF detects an imminent critical situation.~~

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

~~(NL: If the ACSF detects an imminent critical situation it may terminate the lane change before it is safely completed)~~

~~(B): what does this mean exactly? Difficult to understand, I think the word "not" should be deleted in the first phrase.~~

~~5.6.1.2.4. — The activated ACSF 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 are is clear to other road users.~~

5.6.1.2.5. 5.6.1.2.4 The activated system ACSF shall at any time ensure 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.

NL: What is a safe distance? It would be better if we specify the minimum distance, e.g. a distance depending on the speed. Consequently this could be tested.

~~5.6.1.2.6. — The ACSF shall be designed such that safe transition to manual steering is possible at any time. (Review after HMI discussion necessary?)~~

~~5.6.1.2.8~~ 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. ~~The vehicle manufacturer shall provide information to the technical service about the safety strategy of the system depending on in different circumstances forming a sudden critical events — and the foreseen emergency manoeuvres.~~

5.6.1.2.9. 5.6.1.2.6. 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.

(B): This warning shall be given until the moment that the driver is attentive again.

NL: proposal par. 5.6.1.2.6. If the attention recognition system detects that the driver is inattentive, it shall give a warning to restore attentiveness again. Until the driver takes control again. If driver does not take control within [3 s] after the un-attentiveness is recognized the system shall start an minimum risk manoeuvre. The manufacturer shall provide information to the technical service how the attention recognition systems detects inattentiveness of the driver.

Par 5.4.3.1 deals with the same aspects, may be the two paragraphs 5.4.3.1 and 5.6.1.2.6 can be combined.

Requirements with regard the max. duration of the inattentiveness should be added. What the maximum duration could be I do not know, but it should be rather short since the driver can e.g. have had a heart attack.

5.6.1.3. ~~System boundaries~~ 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 vehicle manufacturer shall provide~~ The values for V_{smax} and V_{smin} ~~to the technical service.~~

5.6.1.3.1.2. ~~The vehicle manufacturer shall provide an information to the technical service under which~~ The conditions ~~an ACSF~~ under which the system can be activated, i. e. when the conditions for safe operation of the system ~~ACSF~~ are fulfilled.

5.6.1.3.1.3. ~~The vehicle manufacturer shall provide~~ information to the technical service about system boundaries at which the activated system ~~ACSF must give~~ shall issue a transition request.

~~5.6.1.5.3.~~ 5.6.1.3.1.4. ~~The vehicle manufacturer shall provide~~ specific values for time intervals acc. to 5.6.1.5.2. ~~to the technical service,~~ which are foreseen for safe transition to manual steering under different circumstances.

NL: The regulation should specify the minimum time interval, [10 s]. Consequently that could be tested.

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

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. Indication of ACSF status~~

~~5.6.1.4.1. The ACSF shall at any time give a noticeable and distinctive signalisation to the driver about the ACSF status. This signalisation shall be at least a visual signal. Any change in system status shall be indicated by an optical and either an acoustic or haptic signal~~

5.6.1.5. Transition ~~request~~ demand

5.6.1.5.1. If the system ACSF detects that its system boundaries are reached or will be reached shortly it shall provide a transition ~~request~~ demand.

5.6.1.5.2. The timing of the transition ~~request~~ demand shall be such that sufficient time is provided for a safe transition ~~of the steering task from automatically commanded steering~~ to manual steering.

~~5.6.1.5.3. The vehicle manufacturer shall provide specific values for time intervals to the technical service, which are foreseen for safe transition under different circumstances~~

5.6.1.5.4.3. If the speed of the vehicle with activated ACSF exceeds v_{max} a transition ~~request~~ demand shall be given.

5.6.1.5.5.4. If the vehicle reaches a lateral acceleration of more than [3] m/s² a transition ~~request~~ demand shall be given.

NL:

1 - textual: more clear would be to write: "... before the lateral acceleration reaches [3] m/s²..." instead of "...lateral acceleration exceeds [3] m/s² ..."

2 - When the vehicle is about to reach [3] m/s² it can be a rather dynamic situation, how can be assured that the driver immediately takes over the control? May be the lateral acceleration only last very short, should the system immediately leave the control to the driver?

The system shall be capable to predict the oncoming lateral acceleration. During a lane change it is up to the system, the lateral acceleration can be controlled that case. However if the road has a curve and the vehicle drives at a speed such that the lateral acceleration will become more than 3 m/s², the system should decelerate the vehicle until the speed is such that the lateral acceleration will be less than 3m/s². Or the system shall give enough time [10s] to the driver to take control. And eventually initiate a minimum risk manoeuvre.

Test TR-2 deals with such a situation. The situation tested in test TR-1, when the test vehicle is following a lead vehicle, is not reflected in the requirements.

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

NL: There shall be a time specified how fast the system shall recognize the inattentiveness by the driver and how much time may pass before the system gives the warning and when the system shall start an minimum risk manoeuvre in the case the driver does not take control (par. 5.6.1.6.1). This could be tested by a test driver which starts reading e.g a book or smart phone. Within a few seconds the system shall issue a warning and shortly afterwards it shall start the minimum risk manoeuvre.

5.6.1.5.7.6. The ACSF shall provide a transition **request demand** if the driver's seatbelt is unfastened and/or if the driver's seat is left by the driver.

NL: The ACSF shall start immediately a minimum risk manoeuvre, obviously the driver is not present anymore. That is a very dangerous situation which asks for quick appropriate actions. This could be tested by a test driver unfastening the seat-belt or even leaving the driver's seat.

5.6.1.5.8. The transition **request demand** shall be provided by a [yellow] visual signal and either an acoustic signal or by imposing a haptic warning signal.

NL: In cases where the driver is not attentive or has left his seat all available means should be used, the vehicle is after all in a dangerous situation.

~~5.6.1.5.9. If the driver does not take over manual control immediately the transition request 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.~~

5.6.1.5.6. Minimum Risk Manoeuvre

5.6.1.5.6.1. If the **system ACSF** detects that after a transition **request demand** the driver does not take over manual control of the steering again the vehicle shall carry out a minimum 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 and circumstances at its initiation.~~

NL: For certain situations the regulation could specify what the minimum risk manoeuvre entails in those specified cases. E.g, when driving on the left lane of a motorway, the system shall change lane to the most right lane and bring the vehicle to a halt. This could then be tested.

5.6.2. Special Provisions for ACSF of Category 34

- to be developed based on the requirements for a Category 4 system-

NL, remark: We agreed to start with the development of requirements for the most advanced systems. But on second thought, it is may be more easy to start with the most simple systems. These systems will appear on the market first, we may assume. It is more easy to keep track with the relative simple functions of those early systems. Later on, during the development process of the regulation, the more advances systems can be added. The possibility that important requirements are missed out or forgotten is smaller using that method of working.

5.6.3. Special Provisions for ACSF of Category 23

- to be developed based on the requirements for a Category 4 system-

5.6.4. Special Provisions for ACSF of Category 2

- to be developed based on the requirements for a Category 4 system-

5.6.45. Special Provisions for ACSF of Category 1

- to be developed based on the requirements for a Category 4 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.

NL: In general the tests are specified to check a certain requirement. In our case the tests seem to be independent from the specified requirements. E.g. if we specify a test with a leading vehicle we should have the requirement that a system xxx is capable of following a leading vehicle in a certain way. Subsequently there is a test to check if the requirement is fulfilled under practical circumstances. The same applies with regard the test with a pedestrian etc.

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 Pedestrian soft target

A pedestrian soft target is an object representative of a human adult in terms of its detection characteristics that will suffer minimum damage and cause minimum damage to the subject vehicle in the event of a collision.

3. Tests

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

Test \ ASCF category	1	2	3	4
FU1 path following with lead				X
FU2 lane keeping w/o lead				X
TR1 tight curve with lead				X
TR2 tight curve w/o lead				X
TR3 no marking with lead				X
TR4 no marking w/o lead				X
EM1 AEB on braking rabbit				X
EM2 AEB on static pedestrian				X
EM3 abortion of lane change				X

Table 1

3.1. Functionality Tests

3.1.1. Functionality Test 1 (FU1)

Drive the vehicle with activated ACSF at least 5 min behind a lead vehicle. If the time gap is not selected by the ACSF, the vehicle shall drive between [2 s] and [3 s] behind the lead vehicle. The lead vehicle shall drive within the lane markings 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 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.

NL: A corresponding requirement to be put in paragraph 5.6:

“ACSF shall be capable of following a leading vehicle driven over a curved and straight road with lane markings at all speeds it is designed for”.

3.1.2. Functionality Test 2 (FU2)

Drive the vehicle with activated ACSF at least 5 min without a lead vehicle. The vehicle shall drive 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 speed 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.

NL: A corresponding requirement to be put in paragraph 5.6:

“ACSF shall be capable of driving over a curved and straight road with lane markings at all speeds it is designed for”.

3.2. Transition Tests

3.2.1 Transition Test 1 (TR1)

Drive the vehicle with activated ACSF at least 1 min behind a lead vehicle. If the time gap is not selected by the ACSF, the vehicle shall drive between [2 s] and [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 of 10 km/h below v_{smax} . After a straight section of at least 200 m the lead 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.

The requirements of the test are fulfilled if the transition request 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.

NL: A corresponding requirement to be put in paragraph 5.6:

“ACSF shall, when following a leading vehicle driven into a curve, where the lateral acceleration will exceed 3 m/s^2 , give a transition demand and, in the case the driver does not take control, initiate a minimum risk manoeuvre before the lateral acceleration exceeds 3 m/s^2 ”.

3.2.2. Transition Test 2 (TR2)

Drive the vehicle with activated ACSF at least 1 min without a lead vehicle. The vehicle shall drive on a track with road markings at each side of the lane at a speed of 10 km/h below v_{smax} . After a straight section of at least 200 m the vehicle shall approach a curve of more than 90° that would demand a lateral vehicle acceleration of more than 3 m/s². The test driver of the vehicle shall not take over manual steering control again.

The requirements of the test are fulfilled if the transition request was given at least when the lateral acceleration exceeds [3] m/s² 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.

NL: A corresponding requirement to be put in paragraph 5.6:

“ACSF shall, when driven into a curve, where the lateral acceleration will exceed 3 m/s², give a transition demand and initiate a minimum risk manoeuvre before the lateral acceleration exceeds 3 m/s²”.

This is more or less the same as paragraph 5.6.1.5.4.

3.2.3. Transition Test 3 (TR3)

Drive the vehicle with activated ACSF at least 1 min behind a lead vehicle. If the time gap is not selected by the ACSF, the vehicle shall drive between [2 s] and [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 of 10 km/h below v_{smax} . After a straight section of at least 200 m the lead vehicle shall enter 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 does not cross any lane marking and if the transition request was given [0 s] before the vehicle would have entered the section

with missing lane marking and the minimum risk manoeuvre as specified by the manufacturer was initiated.

NL: A corresponding requirement to be put in paragraph 5.6:

“ACSF shall, when following a leading vehicle driven from a lane with marking into a lane with only a lane marking at the driver's side, not cross the lane marking and shall give a transition demand [5 s] before it enters the lane with only the marking at the driver's side”.

3.2.4 Transition Test 4 (TR4)

Drive the vehicle with activated ACSF at least 1 min without a lead vehicle. The vehicle shall drive on a track with road markings at each side of the lane at a speed of 10 km/h below v_{smax} . 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 does not cross any lane marking and if the transition request was given [5 s] before the vehicle would have entered the section with missing lane marking and the minimum risk manoeuvre as specified by the manufacturer was initiated.

NL: A corresponding requirement to be put in paragraph 5.6:

'ACSF shall, when driven from a lane with marking into a lane with only a lane marking at the driver's side, not cross the lane marking, shall give a transition demand [5 s] before it enters the lane with only the marking at the driver's side and shall initiate the minimum risk manoeuvre'. This is could be combined with paragraph 5.6.1.5.1.

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/s² and with a mean brake jerk of 6 m/s³ in the first second of braking.

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

NL: A corresponding requirement to be put in paragraph 5.6:

"ACSF shall brake the vehicle when a vehicle in front brakes/decelerates".

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 pedestrian soft target being placed in the center of the lane.

The requirements of the test are fulfilled if the vehicle does not collide with the pedestrian soft target.

*NL: A corresponding requirement to be put in paragraph 5.6:
"ACSF shall not collide with pedestrians between the line marking of the lane".*

3.3.3. Emergency Test 3 (EM3)

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 [30 km/h] below v_{smax} or at v_{smin} , whatever is higher, between two other vehicles. If the time gap is not selected by the system, the vehicle shall drive at a gap of 3 s behind the lead vehicle. Induce by e.g. selecting a higher desired speed a lane change manoeuvre. During the lane change a further overtaking vehicle with a speed of 50 km/h above v_{smax} shall approach from backwards on the adjacent lane that was intended to be reached with the lane change. At the point in time when the vehicle is crossing the lane marking the further overtaking vehicle shall be at a TTC of [2 s] behind the vehicle.

The requirements of the test are fulfilled if the vehicle does not collide with the further overtaking vehicle or any other vehicle and aborts the lane change manoeuvre.

*NL: A corresponding requirement to be put in paragraph 5.6 (additional to par. 5.6.1.2.1?):
[ACSF shall abort lane change manoeuvre and shall not collide with other vehicles when during a lane change manoeuvre the vehicle is approached by an overtaking vehicle in the lane the ACSF is about to enter]*

or [ACSF shall not start a lane change, when in the lane it wants to enter, vehicles are approaching with a speed difference of more than [x] km/h]

or [ACSF shall not start a lane change, when in the lane it wants to enter, vehicles are approaching which would have to decelerate with a deceleration of more than [1] m/s²]

NL: additional tests

I test to check par. 5.4.3.2 9 (reaction system in case a failure);

Introduce a failure into the system, drive the vehicle and the system shall warn and continue to work until the driver takes control or the minimum risk manoeuvre has been initiated.

II test to check par. 5.6.1.1.2 (ACSF activation);

Drive the vehicle in a situation the system boundaries are exceeded and switch on the system. The system cannot be switched on or the system waits until the vehicle is driven within the system boundaries. In that case the system shall ask for a reconfirmation of the driver before it starts to work.

III test to check par. 5.6.1.1.5 and par. 5.6.1.5.5. (attention recognition);

The vehicle is driven within the systems boundaries, the driver shall:

- take the hands of the steering wheel,
- close his eyes,
- read a book,
- etc.

The ACSF shall recognize the driver is not supervising within [3] seconds and shall initiate the warnings and the minimum risk manoeuvre within [3] seconds.

IV test to check par. 5.6.1.2.4 (safe lateral distance);

The ACSF-vehicle is driven in a lane. Another vehicle is driven in an adjacent lane. This vehicle approaches the ACSF-vehicle. The ACSF shall change direction if the other vehicle comes too close, when the lateral distance becomes less than the minimum prescribed distance.

V test to check par. 5.6.1.3.4. (transition time);

The ACSF-vehicle is driven into a situation the system boundaries are going to be exceeded, the system shall issue the appropriate warning not less than 10 seconds before the boundaries are reached.

VI test to check par. 5.6.1.5.6. (unfastened seatbelt/seat left)

The ACSF-vehicle is driven in the appropriate way.

1-The driver unfastens the seatbelt, the system shall recognize this immediately, issue a warning during [3] seconds and initiates a minimum risk manoeuvre.

2-the driver leaves the seat, the system shall recognize this immediately and shall initiate a minimum risk manoeuvre within [1] second.

VII test to check par. 5.6.1.6.1 (minimum risk manoeuvre);

The ACSF is driven in the following situations;

- 1- On the left lane of a motorway. The minimum risk manoeuvre is initiated. The ACSF-vehicle shall change lane to the right and be braked to a halt in the right lane.
- 2- In a left lane of curve of the motorway. The minimum risk manoeuvre shall be initiated. The ACSF-vehicle shall continue until the lane is straight for [50] m and after that it shall change lane to the right and be braked to a halt in the right lane which is straight for at least [50] m.
- 3- Etc.

