

## Draft Proposal for category C requirements

### I. Introduction:

Document ACSF-09-14 included 2 alternatives:

- Alternative 1: Use of ACSF E sensors with a single deliberate action to initiate lane change, based on proposal from Germany and Japan ACSF-09-04.
- Alternative 2: Use of an enhanced HMI with 2 deliberate actions to initiate lane change (i.e. no rear nor side detection sensors required)

The present proposal, based on discussions at ACSF-09 meeting, is only including alternative 2. This alternative fits to the original intention pursued with ACSF C.

The main (i.e. apart from deletion of alternative 1 and document clean-up) changes to ACSF-09-14 are highlighted with **yellow marking**.

**Important note: this proposal only considers ACSF C function when coupled with and ACSF B1. The provisions of ACSF C shall be reviewed (and possibly modified or completed) once ACSF B2 requirements will be known.**

### II. Proposal:

**2.4.13** A 'lane change procedure' starts when the direction indicator lamps are activated and ends when the lane change is completed. It comprises two operations:

- Activation of direction indicator lamps
- Lane change manoeuvre

**2.4.14** A 'lane change manoeuvre' is deemed

- to start when the vehicle movement towards the targeted adjacent lane starts **or when the front wheel of the vehicle touches the lane marking,**
- to end when **the vehicle has reached the target lane and drives parallel to the lane markings, or when the rear all** wheels of the vehicle have crossed the lane marking.

*Insert a new paragraph 5.6.3, to read:*

*Reservation for ACSF of category B2.*

*Insert a new paragraph 5.6.4, to read:*

#### **5.6.4. Special Provisions for ACSF of Category C**

**Any vehicle fitted with an ACSF of category C complying with the definition in paragraph 2. of this regulation shall fulfill the following requirements.**

##### **5.6.4.1. General**

5.6.4.1.1. The vehicle shall be equipped with an ACSF of category B1 complying with the applicable requirements of this regulation.

**Kommentiert [TP1]:** B2 will be introduced here as an alternative, once B2 will be defined in this regulation.

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

~~5.6.4.1.3. The activation of a system of Category C shall be possible only on roads with at least two lanes, in the direction of travel.~~

**Kommentiert [TP2]:** This is driver's responsibility.

5.6.4.1.3. Steering by the driver shall override steering by the system. The steering control effort necessary to override the directional control provided by the system shall not exceed 50 N.

5.6.4.1.4. The lateral acceleration induced by the system during the lane change manoeuvre shall not exceed 1 m/s<sup>2</sup> in addition to the lateral acceleration generated by the curvature of the lane.

However, during a lane change, the lateral acceleration of the vehicle shall not exceed 3m/s<sup>2</sup> for M1 N1 categories of vehicle, and 2.5 m/s<sup>2</sup> for M2 M3 N2 and N3.

The moving average over half a second of the lateral jerk generated by the system shall not exceed 5 m/s<sup>3</sup>.

A lane change manoeuvre shall be completed not later than [15s] for M1 N1 vehicle categories, and [30s] for M2 M3 N2 N3.

5.6.4.1.5. The vehicle with ACSF category C shall fulfill the tests for Category C as specified paragraph xxx in Annex 8.

5.6.4.1.6. ACSF C shall be subject to the requirements of Annex 6.

5.6.4.2. Operation of ACSF category C

5.6.4.2.1 The activation of an ACSF of category C shall only be possible if an ACSF of category B1 is active.

5.6.4.2.2. Each lane change manoeuvre shall be initiated only if commanded by two subsequent deliberate actions of the driver, within an interval of not more than [10s]:

- Upon the first command, the lane change procedure shall immediately start.
- Upon the second command, the lane change manoeuvre shall immediately start.

Unless the first command is implemented by a manual activation of the direction indicator, the system shall automatically activate the relevant direction indicator (i.e. towards the targeted adjacent lane by the driver), immediately upon the first command.

5.6.4.2.3. The lane change manoeuvre shall not start before 3 flashes of the direction indicator lamps.

5.6.4.2.4. A lane change procedure shall not start if ACSF of category B1 has detected that the driver is hands-off the steering control.

- 5.6.4.2.5. The system shall inform the driver on the status of the system during the lane change procedure, i.e. at least:
- The lane change procedure has started.
  - The lane change manoeuvre is on-going.
- 5.6.4.2.6. During the **single-lateral lane change** manoeuvre, ACSF of category B1 **lane keeping function** shall be temporarily suppressed. Once the manoeuvre is completed, ACSF of category B1 shall automatically resume.
- 5.6.4.2.7. **The system shall inform the driver of a system failure at the latest when the driver has provided a command to initiate the lane change procedure. In this case, the lane change procedure shall not be started.**
- The failure indication may be suppressed when the system is deactivated or switched off.**
- 5.6.4.2.8. If a system failure occurs during a lane change manoeuvre, the failure shall be immediately signaled to the driver by an optical and an acoustic or haptic warning.
- 5.6.4.2.9. **A lane change manoeuvre shall be aborted if the manoeuvre is overridden by the driver or if the system has detected an imminent critical situation (e.g. a vehicle is detected in the blind spot).**
- 5.6.4.3. System information data
- 5.6.4.3.1. 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
- 5.6.4.3.1.1. The conditions under which the system can be activated, i.e. when the conditions for a lane change are fulfilled (e.g.  $V_{\text{smax}}$ ,  $V_{\text{smin}}$ ).
- 5.6.4.3.1.2. The means to override the system and to abort a lane change.

*Insert new paragraph in Annex 8, to read:*

*Insert a new paragraph 3.3, to read:*

*Reservation for tests of ACSF Category B2 Systems.*

*Insert a new paragraph 3.4, to read:*

### 3.4. Tests for ACSF Category C Systems

#### 3.4.1. Lane change functional test

3.4.1.1. The vehicle shall be driven with an active ACSF B1 on a straight track with at least two lanes with road markings at each side of the lane, at a test speed lower than  $V_{\text{smax}}$ .

A lane change shall then be commanded by the driver according to paragraph 5.6.4.2.2, with a time period of less than [10s] between the first and the second command by the driver.

The lateral acceleration and the lateral jerk shall be recorded during the test.

The time duration of the lane change manoeuvre shall be measured from the time when the second command is actuated.

3.4.1.2. The requirements of the test are fulfilled if:

- the lane change manoeuvre is completed,
- the recorded acceleration does not exceed  $1\text{m/s}^2$ ,
- the moving average over half a second of the lateral jerk does not exceed  $5\text{ m/s}^3$ ,
- the correspondent direction indicator lamps flashes minimum 3 times prior to the start of the lane change manoeuvre,
- The system provides an information to the driver to indicate the status of the system during the lane change procedure.
- the lane change manoeuvre is completed in less than [15s] for M1 N1 vehicle categories and [30s] for M2 M3 N2 N3 vehicle categories, and
- ACSF B1 automatically resumes after the lane change is completed

3.4.1.3 The test specified in 3.4.1.1 shall be repeated with a time period longer than [10s] between the first and the second command by the driver.

The requirements of the test are fulfilled if the lane change manoeuvre is not performed.

3.4.2. Abort of lane change and overriding force test

3.4.2.1. The vehicle shall be driven with an active ACSF B1 on a straight track with at least two lanes with road markings at each side of the lane, at a test speed lower than  $V_{\text{max}}$ .

A lane change shall then be commanded by the driver according to paragraph 5.6.4.2.2.

Once two wheels of the vehicle have crossed the lane marking, the driver shall override the system.

The force applied by the driver on the steering control during the overriding manoeuvre shall be recorded.

3.4.2.2. The requirements of the test are fulfilled if:

- the lane change is aborted and,
- the force applied by the driver on the steering control during the overriding manoeuvre is less than 50N.

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