

Draft Proposal for category [C1] requirements

EC comments based on document ACSF-13-04 (Draft Proposal for category C requirements)

I. Proposal

- 2.4.13. A 'lane change procedure' in case of Category [C1] starts when the direction indicator lamps are activated with deliberate action of the driver and ends when the direction indicator lamps are deactivated. It comprises four operations:
1. Activation of direction indicator lamps with a deliberate action of the driver
 2. Starting driving towards the lane
 3. Lane change manoeuvre
 4. Deactivation of direction indicator lamps and resume the lane keeping function by CAT B1
- 2.4.14. A 'lane change manoeuvre' is deemed
5. to start when the outside of the tyre of the vehicle's front wheel closest to the lane markings has touched the inside edge of the visible lane marking to which the vehicle is being drifted.
 6. to end when the rear wheels of the vehicle have fully crossed the lane marking

Formatiert: Englisch (Großbritannien)

Insert a new paragraph 5.6.3, to read:

Reservation for ACSF of category B2.

Insert a new paragraph 5.6.5, to read:

5.6.5. Special Provisions for ACSF of Category [C1]

Any system of Category [C1] ACSF shall fulfill the following requirements.

- 5.6.5.1. A vehicle equipped with an ACSF CAT [C1] shall also be equipped with an ACSF of category B1 complying with the requirements of this regulation.

5.6.5.2. Activation/deactivation of the system

- 5.6.5.2.1. The system status shall be default off at the initiation of each new engine start/run cycle performed by the driver.

At the time of the first system activation after a new engine start, a disclaimer shall be provided to inform the driver of their duty to monitor the traffic and road conditions prior to and throughout the lane change procedure.

- 5.6.5.2.2. The vehicle shall be equipped with a means for the driver to activate (stand by mode) and deactivate (off mode) the system. The same means as for CAT B1 may be used.

- 5.6.5.2.3. The system shall only be activated (stand by mode) after a deliberate action of the driver.

Activation by the driver shall only be possible on roads where pedestrians and cyclists are prohibited and which are equipped normally with a physical separation that divides the traffic moving in opposite directions and which have at least two lanes in the direction the vehicles are driving. [This may be achieved with the use of e.g. navigation map data or road sign recognition.]

Gelöscht: General¶
5.6.5.1.1. - Any

Gelöscht: specified

Gelöscht: in

Gelöscht: paragraph 5.6.2

Kommentiert [AL1]: old 5.6.5.2.10.1

Formatiert: Einzug: Hängend: 2 cm, Links 0 Zeich., Erste Zeile: 0 Zeich.

[1] nach unten: 5.6.5.1.2. . The system shall be active only after a deliberate action of the driver and if all conditions for operation of the system are fulfilled.

Gelöscht: ¶
5

Gelöscht: ¶

Gelöscht: 5.6.5.1

Gelöscht: 3

Gelöscht: standby

Gelöscht: mode

Formatiert: Englisch (Großbritannien)

[3] verschoben

Gelöscht: The system shall ensure that the a

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Gelöscht: of a system of Category [C1] is

5.6.5.2.4. It shall be possible to deactivate the system at any time by a single action of the driver. Following this action, the system shall only become active again as a result of a deliberate action by the driver.

5.6.5.2.5. Notwithstanding the requirements above, it shall be possible [for the type approval authority] to perform the corresponding tests in Annex 8 on test tracks which are specified by the vehicle manufacturer for the purpose of type approval and surveillance of conformity of production.

5.6.5.3. Overriding by the driver

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.

The system may remain active (standby) provided that priority is given to the driver during the overriding period. The means to override the ACSF shall be indicated in the system information data.

5.6.5.4. Lateral acceleration

The lateral acceleration induced by the system during the lane change manoeuvre:

- shall not exceed [1 m/s²] in addition to the lateral acceleration generated by the lane curvature, and
- shall not cause the total vehicle lateral acceleration to exceed the maximum values indicated in tables of paragraph 5.6.2.1.3.

The moving average over half a second of the lateral jerk generated by the system shall not exceed 5 m/s³.

5.6.5.5. HMI

5.6.5.2.2. Unless otherwise specified, the optical signals described in 5.6.5.2. shall all be different from each other (e.g. different symbol, colour, blinking, text).

5.6.5.2.3. When the system is in standby mode (i.e. ready to intervene), an optical signal shall be provided to the driver.

5.6.5.2.4. When the system reaches its boundary conditions (e.g. the specified maximum lateral acceleration $a_{y_{max}}$), the system shall continue to provide assistance and shall clearly inform the driver about this system status by an optical warning signal and additionally by an acoustic or haptic warning signal.

5.6.5.2.5. A system failure shall be signalled to the driver by an optical warning signal. However, when the system is manually deactivated by the driver, the indication of failure mode may be suppressed.

If a system failure occurs during a lane change manoeuvre, the failure shall be signaled to the driver by an optical and an acoustic or haptic warning.

5.6.5.2.6. The system shall provide a means of detecting that the driver is holding the steering control and shall warn the driver in accordance with the warning strategy set out for category B1.

5.6.5.6. Lane change procedure

5.6.5.6.1 The initiation of a lane change procedure of an ACSF of category [C1] shall only be possible if an ACSF of category B1 is already active.

5.6.5.6.2. The lane change procedure shall start immediately after the manual activation by the driver of the direction indicator to the intended side for

- Gelöscht: ¶
- [2] nach unten: . It shall be possible to
- Gelöscht: .6.5.1.2. . The system shall be active ...
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- [3] nach oben: The system shall ensure that
- [1] verschoben
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- [4] nach unten: Following this action, the
- Gelöscht: 5.6.5.1
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- Kommentiert [AL2]: Maily reordering oft he paragraph...
- Gelöscht: ¶
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- Gelöscht: 5.6.5.1...5. . Notwithstanding the
- Gelöscht: ¶
- [9] nach unten: Manual deactivation of the
- Gelöscht: 1.67.
- Formatiert
- Gelöscht: ¶
- Gelöscht: ¶
- [8] nach unten: The lane change manoeuvre
- Formatiert
- [5] nach unten: 5.6.5.1.78 . The direction
- Gelöscht: 2.... ACSF of Category [C1]
- [7] nach unten: 5.6.5.2.1 . The initiation of a
- Gelöscht: ¶
- Gelöscht: set out in paragraph 5.6.5.3.1.1. of
- Gelöscht: which prevents the function to
- Kommentiert [AL4]: HMI as well?
- Gelöscht: ¶
- Formatiert
- Gelöscht: 2.10.... . HMI requirements
- Gelöscht: 5.6.5.2.10.1 . The system status shall
- Formatiert
- [7] verschoben
- Gelöscht: 5.6.5.2.
- Gelöscht: ¶
- Formatiert
- [6] nach unten: 5.6.5.2.10.3. . The system
- Gelöscht: 5.6.5.2.10....4... . Any single...he

the lane change. The lane change procedure can only start by the deliberate action by the driver.

5.6.5.6.3. The system shall inform the driver that the lane change procedure is ongoing.

5.6.5.6.4. When the lane change procedure starts, the vehicle shall keep its lane until the lane change manoeuvre starts. The direction indicator lamps shall flash between 3 and 10s before the lane change manoeuvre can start.

5.6.5.6.6. The lane change manoeuvre shall be completed in less than

- 5 s for M1, N1 vehicle categories.
- 10 s for M2, M3, N2, N3 vehicle categories.

5.6.5.6.7. Once the lane change manoeuvre is completed, the direction indicator shall be deactivated by the system. The vehicle shall keep the new lane in accordance with B1 requirements.

5.6.5.6.8. The lane change procedure shall be aborted at least when one of the following situation occurs:

- the system detects an imminent critical situation (vehicles within the safety distance),
- the system is overridden or switched off by the driver
- the system reaches its boundaries (e.g. lane markings are not detected)
- The driver is not holding the steering control
- Manual deactivation of the direction indicator lamps shall be possible for the driver at any time and stop the lane change procedure.
- the lane change manoeuvre has not begun within the 10 s of flashing of the direction indicator lamps.

5.6.5.7. Safety distance requirements

5.6.5.7.1. The vehicle with ACSF category [C1] shall not carry out any lane change manoeuvre or shall abort an already started manoeuvre if an overtaking vehicle is within the safety distance to the rear (Sd_{Rear}) and the safety distance to the left and to the right (side). In both cases the system shall clearly inform the driver about the system status by an optical warning signal and additionally by an acoustic or haptic warning signal.

5.6.5.7.2. The safety distance to the rear (Sd_{Rear}) of the ACSF category [C1] system shall be calculated according to the following formula:

$$1) Sd_{Rear} = \max(Av * \{3.5\}, L * (v * 3.6) / 100) \quad (3.5 = TTC \text{ of } 3.5 \text{ s})$$

where:

A_v = speed difference between the vehicle speed of the vehicle equipped with ACSF category [C1] and the vehicle speed of approaching vehicle from behind, measured in m/s.

L = [15] m

v = vehicle speed of the vehicle equipped with ACSF category [C1], measured in m/s.

2) In case of A_v is larger than A_{vmax} which is defined in paragraph 5.6.5.2.12.2, A_v deems to be A_{vmax} .

[6] verschoben

Gelöscht: 5.6.5.2.10.3.

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Gelöscht: ¶

¶ 5.6.5.2.10.5. The lane change procedure shall start upon the deliberate action of the driver but

Formatiert: Nicht Hervorheben

Gelöscht: the lane change manoeuvre shall not be initiated before a period of 3s of flashing of the direction indicator lamps

[8] verschoben

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Formatiert: Englisch (Großbritannien)

Gelöscht: ¶

The system may delay initiation of the manoeuvre for a period not exceeding [6/10?] seconds after the deliberate action of the driver to confirm the traffic condition specified in paragraph 5.6.5.2.12.4. In this case the system shall inform the status to the driver. If the manoeuvre has not begun with this [6/10] seconds the execution of the procedure shall be cancelled.

[5] verschoben

Gelöscht: 5.6.5.1.78

Formatiert: Nicht Hervorheben

Kommentiert [AL7]: to be moved

Gelöscht: The direction indicator shall be deactivated by the system after the completion of the lane change manoeuvre

Gelöscht: ¶

5.6.5.2.10.6. The lane change manoeuvre shall not be initiated if the direction indicator lamps are deactivated.

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Formatiert: Nicht Hervorheben

[9] verschoben

Formatiert: Nicht Hervorheben

Gelöscht: ¶

Formatiert: Englisch (USA)

5.6.5.7.3. The safety distance to the left and to the right (side) of the ACSF category [C1] system shall be 6 m measured from the medium longitudinal centerline of the vehicle equipped with ACSF of category [C1]

5.6.5.7.4. When the system is temporarily not able to cover the minimum safety distance, the system shall indicate this to the driver by an optical warning signal and shall not perform any lane change manoeuvre.

5.6.5.8. Sensor requirements

5.6.5.8.1 The minimal detection range to the rear (s_{Rear}) of the ACSF category [C1] system shall be calculated according to the following formula:

$$1) s_{Rear} = (\Delta v_{max}) * (3.5) \quad (3.5 = TTC \text{ of } 3.5 \text{ s})$$

where:

Δv_{max} = initial speed difference between the minimum design speed of category [C1] and [130 km/h] as the maximum speed of approaching vehicle from behind, measured in m/s.

5.6.5.8.2. The minimal detection range to the left and to the right (side) of the ACSF category [C1] system shall be at least 6 m measured from the medium longitudinal centerline of the vehicle equipped with ACSF of category [C1]

5.6.5.9. System information data

5.6.5.9.1. 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.

5.6.5.9.1.1. The conditions under which the system can be activated and the boundaries for operation (boundary conditions). The vehicle manufacturer shall provide values for v_{smax} , v_{smin} and a_{ysmax} for every speed range as mentioned in the table of paragraph 5.6.2.1.3. of this Regulation;

5.6.5.9.1.2. Information about how the system detects that the driver is holding the steering control.

5.6.5.9.1.3. The means to override and to abort or cancel.

[5.6.5.9.1.4. Information about how the failure warning signal status and the confirmation of the valid software version related ACSF performance can be checked via the use of an electronic communication interface.]

5.6.5.9.1.5. Documentation about which system software version related ACSF performance is valid. This documentation shall be updated whenever a software version was amended.

5.6.5.10. The vehicle with ACSF category [C1] shall be tested in accordance with relevant vehicle test(s) specified in Annex 8 of this Regulation. For driving situations not covered by the tests of Annex 8, the safe operation of the ACSF shall be demonstrated by the vehicle manufacturer on the base of Annex 6.

*Insert a new paragraph 3.3 in Annex 8, to read:
Reservation for tests of ACSF Category B2 Systems.*

*Insert a new paragraph 3.5 in Annex 8, to read:
3.5. Tests for ACSF Category [C1] Systems*

Gelöscht: 5.6.5.2.11. . Sensor requirements¶
5.6.5.2.11.1. . The vehicle with ACSF category [C1] shall not carry out any lane change manoeuvre or shall abort an already started manoeuvre if an overtaking vehicle is within the safety distance defined under 5.6.5.2.11.2. and 5.6.5.2.11.3. In both cases the system shall clearly inform the driver about the system status by an optical warning signal and additionally by an acoustic or haptic warning signal. ¶

These sensor requirements are deemed to be satisfied if the tests for Category [C1] as specified in Annex 8 are met.¶

5.6.5.2.11.2. . The minimal distance to detect vehicles to the rear (s_{Rear}) of the ACSF category [C1] system shall be calculated according to the following formula:¶

$$1) s_{Rear} = (\Delta v_{max}) * (3.5) . . . (3.5 = TTC \text{ of } 3.5 \text{ s})¶$$

. where:¶

. Δv_{max} = initial speed difference between the minimum design speed of category [C1] and [130 km/h] as the maximum speed of approaching vehicle from behind, measured in m/s.¶

2) In case of Δv_{max} is less than 50 km/h, Δv_{max} deems to be 50 km/h.¶

5.6.5.2.11.3. . The minimal detection range to the left and to the right (side) of the ACSF category [C1] system shall be at least 6 m measured from the medium longitudinal centerline of the vehicle equipped with ACSF of category [C1]¶

5.6.5.2.11.4. . In case the system is not fulfilling the requirement of paragraph 5.6.5.2.11.2. and 5.6.5.2.11.3, under any driving conditions, the system shall indicate this to the driver by an optical warning signal and shall not perform any lane change manoeuvre.¶

Gelöscht: 3

Formatiert: Nicht Hervorheben

<< Tests to be developed after the discussion of technical requirements >>

- 3.5.1. Lane change functional test (Respecting also ay-requirements)
 - 3.5.1.1. Overtaking test (similar FU3?)
 - 3.5.1.2. Returning to the “old” lane
- 3.5.2. Abort of lane change test (similar FU2?)
- 3.5.3. Overriding test
- 3.5.4. Deactivation test
- 3.5.5. Sensor performance test (L3-vehicle)