

## Reference Document

### Development ACSF of Category B2 (SAE Level 3 & 4) Requirements

#### Objectives

The objective of the ACSF IWG (as agreed by GRRF) is to develop proposals for ACSF of Category B2 systems that align at least with the SAE Level 3 categorisation or with the SAE Level 4 categorisation.

That is 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 for extended periods without further driver command/confirmation.”

And which:

Is able to cope with all dynamic driving tasks and with any situations within its operational domain or shall otherwise transition to the driver offering sufficient lead time (in case the driver is intended as fall-back in conformity to the system’s categorisation).

The system drives and monitors (specific to the required operational domain) the environment (infrastructure and traffic).

The system requests a takeover if the operational domain boundaries are reached (planned transition, e.g. motorway exit).

In addition to the lateral control requirements, technical prescriptions for longitudinal control will be necessary for vehicles operating with ACSF of Category B2 level functionality.

The dynamic driving task comprises the operational/physical action of steering, braking and accelerating (the lateral and longitudinal control of the vehicle). This requires the vehicle to have spatial awareness (monitoring and interpreting a critical area surrounding the vehicle) and making the necessary tactical decisions (object and event detection and response) to provide a safe and lawful use of the vehicle within an agreed operational domain.

It is understood, that the development of such a system is done with no exemptions.

The technical requirements shall include:

#### **1. Determination of the acceptable operational domain**

Define specific conditions under which the system is permitted to be activated and is intended to operate. The designated specific conditions shall be defined as precisely as possible by quantifiable characteristics. Clearly, if not within the defined conditions, the system shall not be active.

A methodology to verify compliance with operational domain limits (e.g. road type, speed limit, etc.).

A methodology to verify compliance with the boundary limits of the operational domain.

## **2. Headway Control**

The Dynamic Driving Tasks have to be specified.

A methodology to determine a safe operational speed and traffic separation when under automated control:

The detection range of the visualisation system.

The integration of the visualisation system with vehicles speed and braking control systems.

## **3. Human Driver Priority**

A logical and intuitive procedure to permit the driver to resume control from the automated system but including safeguards to ensure unintended driver inputs of the automated system is avoided.

## **4. Driving Control Transition Requirements**

A logical and intuitive procedure to manage the transition from automated control to human driver control. The transition requirements shall consider:

Planned transition, e.g. journey point, operational domain boundary, etc.

Unplanned transition, e.g. temporary blinding of the visualisation system.

Emergency transition, e.g. carriageway obstruction.

The requirements shall be compatible with human response behaviour including physical and cognitive readiness.

Transition timing and transition alerts shall be established incorporating agreed HMI principles.

## **5. System Redundancy protocols**

For systems intended as SAE Level 3 operation where the driver may be called upon to intervene in a driving task the requirements will include protocols to monitor driver availability and HMI principles to ensure a timely physical and cognitive return to the driving task. The requirements will include protocols to ensure that appropriate redundancy is provided to ensure the driving task during the transition process.

Driver monitoring comprises two aspects: the driver's availability (presence) and the driver's readiness (attentiveness). The necessity and extent of monitoring the driver is closely linked to the transition process (in particular the transition duration).

For systems intended as SAE Level 4 operation, where the driver is not expected to intervene while the vehicle is operating within the operational domain, the requirements will include protocols to ensure that appropriate redundancy is provided to ensure the driving task.

The requirements shall also include protocols to monitor driver availability and agreed HMI principles to ensure a timely physical and cognitive return to the driving task when the boundaries of the operational domain are reached.

## **6. Information to the driver**

The requirements shall define the necessary information the human driver must have at all times, when the system is performing the dynamic driving task. This shall include protocols to ensure that the driver is able to manually override the system at any time and, in particular, to react appropriately to a transition demand to take over the driving task again. This requirement leads to design requirements of the human machine interface (HMI) which shall also be addressed within this topic.

## **7. Minimal risk manoeuvres and emergency manoeuvres**

The requirements shall define a safe condition of the vehicle, appropriate to the operational domain and considering the lowest possible risk for occupants of the vehicle and for other road users. This "minimal risk condition" must be respected at all times and under all driving situations.

A minimal risk manoeuvre may be required to ensure the minimal risk condition. A minimal risk manoeuvre shall be initiated by the system if the human driver has not reacted to the transition request of the system.

The requirements shall provide for minimal risk manoeuvres that address the transition conditions listed in point 4 (planned and unplanned).

The requirements shall clearly define when the minimal risk manoeuvre has to start (e.g. along with the first transition demand or after the transition procedure has ended?).

The requirements shall provide for emergency manoeuvres in case of imminent danger. An emergency manoeuvre shall start as soon as the imminent danger is detected.

## **8. Complimentary Activities**

The following additional requirements for ACSF of Category B2 systems are being developed by separate working groups:

Data Storage System for ACSF (DSSA)

Cyber Security

Software update management

Periodic Technical Inspection provisions

Revision of electric and electronic control system assessment procedures.

The requirements developed by the ACSF group shall be compatible with the outputs from those separate activities.

**03 April 2018**