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# **Automated Driving**

#### **Definition for Levels of Automation**

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### **Motivation**

- New automated driving and parking systems will be available in the foreseeable future
- To reach further progress and to avoid misunderstandings a classification of those new automated systems with a sufficient level of detail is needed.
- The classification should address legal and technical aspects
- A refined classification of existing driver assistance systems is not in the scope of this classification
- If harmonized worldwide, the definitions of the levels of automation create a common understanding for governmental institutions, regulatory bodies, OEMs, suppliers, etc.
- In future discussions, this classification can be used for
  - Legal assessment, e.g. for an evaluation which national and international laws or vehicle regulations need an amendment or clarification
  - Technical assessment, e.g. for a classification of automated driving functions with respect to functional safety
  - Communication, e.g. to outline a roadmap including introduction scenario for automated driving functions



### **Levels of Automated Driving**

Driver continuously performs the longitudinal and lateral dynamic driving task	Driver continuously performs the longitudinal <u>or</u> lateral dynamic driving task	Driver <u>must</u> monitor the dynamic driving task and the driving environment <u>at</u> <u>all times</u>	Driver <u>does not</u> need to monitor the dynamic driving task nor the driving environment at all times; must always be in a position to resume control System performs longitudinal <u>and</u> lateral driving task in a defined use case. Recognizes its performance limits and requests driver to resume the dynamic driving task with sufficient time margin.	Driver is not required during defined use case System performs the lateral and longitudinal dynamic driving task in all situations in a defined use case.	System performs the lateral <u>and</u> longitudinal dynamic driving task in all situations encountered during the <u>entire</u> journey. No driver required.	
Level 0	Level 1	Level 2	[Level 3]	Level 4	Level 5	
Driver Only	Assisted	Partial Automation	Conditional Automation	High Automation	Full Automation	
Level of automation* *terms acc. to SAE J3016						



## **Glossary of Terms**

- **Dynamic Driving Task**: Performing the lateral and the longitudinal driving task by considering the driving environment.
- **Driving Environment**: The outside surrounding of the vehicle in on-road traffic e. g.:
  - Road markings, road signs, road infrastructure
  - Other vehicles, objects on the road/roadside, other traffic members (pedestrians, cyclists, etc...)
- Monitoring (according to SAE J3016): The activities and/or automated routines that accomplish comprehensive object and event detection, recognition, classification, and response preparation, as needed to competently perform the dynamic driving task.
- Defined Use Case: A driving scenario (including e. g. the driving environment, expected velocities) for which the dynamic driving task (longitudinal and lateral control) is automated. Example: Highway Chauffeur – a function that performs only on a highway, up to a max. velocity and limited or not to certain manoeuvers (according to the system limitations and thus the level of automation).



#### **Next Steps**

Create a more detailed table which shows the different responsibilities at each Level of Automation:

- "Role of System" (ex. Lateral and/or Longitudinal control)
- "Role of Driver" (ex. Monitor, Dynamic driving ...)