

## 1. Purpose of this document

- 1.1. FRAV has established this document to facilitate and record its work in progress. Contents of this document may change in accordance with FRAV decisions.
- 1.2. This document may inform interested parties on the status of work within FRAV.
- 1.3. This document does not constitute a formal or informal proposal. FRAV will issue such proposals in one or more separate documents as determined and approved by the group.

## 2. Definitions

- 2.1. “*Automated Driving System (ADS)*” means the hardware and software that are collectively capable of performing the entire DDT on a sustained basis.<sup>1</sup>
- 2.2. “*(ADS) feature*” means an application of ADS hardware and software designed specifically for use within an ODD.<sup>2</sup>
- 2.3. “*(ADS) function*” means an application of ADS hardware and software designed to perform a specific portion of the DDT.<sup>3</sup>
- 2.4. “*ADS vehicle*” means a vehicle equipped with an ADS.<sup>4</sup>
- 2.5. “*Driver*” means a human being engaged in dynamic control of the vehicle.<sup>5</sup>
  - 2.5.1. A driver should possess the necessary qualifications and be physically and mentally fit to engage in the dynamic control of a vehicle.<sup>6</sup>
- 2.6. “*Dynamic control*” means the real-time execution of operational and tactical functions required to operate a vehicle based on perception, information processing, and decision making.<sup>7</sup>

---

<sup>1</sup> Based on FRAV-09-05.

<sup>2</sup> Ibid.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

<sup>5</sup> Based on FRAV-16-12 (A driver is a human being who is engaged in real-time in the dynamic control of a vehicle.)

<sup>6</sup> Ibid. Para. 3.2. would provide ADS requirements related to ensuring user fulfilment of safety-relevant roles and responsibilities.

<sup>7</sup> Based on FRAV-09-05, Based on FRAV-14-07/Rev.1, FRAV-16-12 per WP.1/2021/2 (“Dynamic control” refers to carrying out the real-time operational and tactical functions required to move the vehicle. This includes controlling the vehicle’s lateral and longitudinal motion, monitoring the road environment, responding to events in the road traffic environment, and planning and signaling for manoeuvres) and Michon, J.A., 1979 (update 2008). “Dealing with Danger”, Summary Report of the Workshop on Physiological and Psychological Factors in Performance under Hazardous Conditions with Special Reference to Road Traffic Accidents, Gieten, Netherlands, May 23-25, 1978.

- 2.7. “*Dynamic driving task (DDT)*” means all of the real-time operational and tactical functions required to operate the vehicle, excluding strategic functions such as trip scheduling and selection of destinations and waypoints.<sup>8</sup>
- 2.7.1. The ADS should have the means to perform all DDT functions (i.e., the entire DDT) on a sustained basis within the Operational Design Domain (ODD), if any, of the ADS’s feature(s).
- 2.7.2. DDT functions can be logically grouped under three general categories:
- Sensing and Perception
  - Planning and Decision
  - Control
- 2.7.3. The **sensing and perception** category includes:
- Monitoring the driving environment via object and event detection, recognition, and classification, which includes:
  - Perceiving other vehicles and road users, the roadway and its fixtures, objects in the vehicle’s path, and relevant environmental conditions
  - Sensing the ODD boundaries, if any, of the ADS feature
  - Positional awareness
- 2.7.4. The **planning and decision** category includes:
- Prediction of actions of other road users
  - Response preparation
  - Manoeuvre planning
- 2.7.5. The **control** category includes:
- Object and event response execution
  - Lateral vehicle motion control
  - Longitudinal vehicle motion control
  - Enhancing conspicuity via lighting, signalling and/or gesturing, etc.
- 2.8. “*ADS fallback response*” means an ADS-initiated transfer of control or an ADS-controlled procedure to place the vehicle in a minimal risk condition.<sup>9</sup>

---

<sup>8</sup> Based on FRAV-14-07/Rev.1. This document defines DDT and DDT functions specifically “in the context of an ADS-equipped vehicle”. Therefore, the DDT definition specifically refers to “ADS functions” and “ADS vehicle”. The definition proposes “collectively” in lieu of “all of the” for editorial clarity.

<sup>9</sup> Based on SAE J3016 (2021): “[DDT] Fallback: The response by the user to either perform the DDT or achieve a minimal risk condition (1) after occurrence of a DDT performance-relevant system failure(s), or (2) upon operational design domain (ODD) exit, or the response by an ADS to achieve minimal risk condition, given the same circumstances.” The FRAV mandate is limited to ADS requirements; therefore, the definition is modified to specifically address ADS fallbacks. The reasons for the fallback are omitted because the fallback triggers are addressed by the ADS safety requirements.

- 2.9. “*Fallback user*” means a user designated to assume the role of driver upon completion of a transfer of control.<sup>10</sup>
- 2.10. “*Operational Design Domain (ODD)*” means the operating conditions under which an ADS feature is specifically designed to function.<sup>11</sup>
- 2.11. “*Operational functions*” refer to basic capabilities such as the capacity to control lateral and longitudinal motion of the vehicle.<sup>12</sup>
- 2.12. “*Minimal Risk Condition (MRC)*” means a stable and stopped state of the vehicle that minimizes the risk of a crash.<sup>13</sup>
- 2.13. “*Real time*” means the actual time during which a process or event occurs.<sup>14</sup>
- 2.14. “*Road-safety agent*” means a human being engaged in directing traffic, enforcing traffic laws, maintaining/constructing roadways, and/or responding to traffic incidents.
- 2.15. “*Tactical functions*” refer to the real-time planning, decision, and execution of maneuvers.<sup>15</sup>
- 2.16. “*Transfer of control (TOC)*” means a procedure by which the ADS engages the fallback user in dynamic control of the vehicle such that the fallback user assumes the role of driver upon completion.<sup>16</sup>
- 2.17. “*(ADS) User*” means a human being engaged in the use of an ADS vehicle where dynamic control of the vehicle is entirely maintained on a sustained basis by the ADS performance of the DDT.<sup>17</sup>

---

<sup>10</sup> Based on SAE J3016 “fallback-ready user” (The user of a vehicle equipped with an engaged Level 3 ADS feature who is properly qualified and able to operate the vehicle and is receptive to ADS-issued requests to intervene and to evident DDT performance-relevant system failures in the vehicle compelling him or her to perform the DDT fallback.). In terms of WP.29 vehicle regulations, the FRAV anticipates requirements to meet the safety need for the driver to be qualified, able, and receptive. See para. 3.2.4.

<sup>11</sup> Based on FRAV-09-05.

<sup>12</sup> Michon, J.A., 1985. “A Critical View of Driver Behavior Models: What Do We Know, What Should We Do?” In L. Evans & R. C. Schwing (Eds.). *Human behavior and traffic safety* (pp. 485-520). New York: Plenum Press, 1985.

<sup>13</sup> Based on SAE J3016 (2021): “A stable, stopped condition to which a user or an ADS may bring a vehicle after performing the DDT fallback in order to reduce the risk of a crash when a given trip cannot or should not be continued.” The revised wording focuses on what an MRC is without additional references to how or why the vehicle has been placed in the MRC. Current discussions on ADS management of safety-critical situations suggest that the safety requirements would stipulate conditions under which the ADS should place the vehicle in an MRC. User decisions to place the vehicle in an MRC manually fall outside the scope of ADS requirements.

<sup>14</sup> Proposed to ensure uniform interpretation of the term “real time”.

<sup>15</sup> Op. cit. Michon, J.A., 1985.

<sup>16</sup> Based on FRAV-16-12.

<sup>17</sup> Based on FRAV-16-12.

### 3. Guidelines for ADS descriptions

#### 3.1. General considerations

3.1.1. ADS may be designed for specific purposes and to operate under prescribed conditions.<sup>18</sup>

3.1.2. The conditions under which an ADS is designed to operate are known collectively as the Operational Design Domain (ODD).

3.1.2.1. The ODD covers environmental conditions such as rainfall, scenery elements such as drivable area, and dynamic elements such as macroscopic traffic behavior and prescribed speed of the subject vehicle under the prevailing traffic laws.

3.1.3. ADS may be designed to operate with or without a qualified driver in the vehicle. The roles and responsibilities of an ADS user differ depending upon the ADS configuration, intended uses, and limitations on its use.<sup>19</sup>

3.1.4. ADS safety requirements need to address the diversity of configurations, intended uses, and limitations on use while addressing usage specifications of individual ADS.

3.1.5. Therefore, FRAV intends to provide guidelines for the manufacturer's description of an ADS, including measurable/verifiable ODD specifications, to enable the application of safety requirements to the ADS under assessment.

3.2. The manufacturer shall describe the ADS configuration and the intended uses and limitations on the use of its feature(s).

3.2.1. The manufacturer shall list the potential faults covered by the diagnostic system(s) of the ADS.<sup>20</sup>

3.3. The manufacturer shall establish the ODD conditions and boundaries of each ADS feature in measurable and/or verifiable terms.<sup>21</sup>

3.3.1. The ODD conditions addressed by the manufacturer shall, at a minimum, include:<sup>22</sup>

---

<sup>18</sup> GRVA-09-28

<sup>19</sup> Ibid.

<sup>20</sup> Based on FRAV-18-06 ("The ADS should perform self-diagnosis of faults in accordance with the OEMs prescribed list"). The proposal presupposes that the OEM provides the prescribed list, suggesting an element for inclusion in the manufacturer description of the ADS.

<sup>21</sup> Based on FRAV-18-06 ("The ODD conditions and boundaries (measurable limits) should be established by the manufacturer."). Because Section 3 will provide guidelines for declaring the ODD conditions and boundaries of each ADS feature, it is proposed to place this requirement in this section.

<sup>22</sup> Based on FRAV-18-06 ("The ODD conditions to be recognized by the ADS should include: Precipitation (rain, snow), Time of day (light intensity, including the case of the use of lighting devices), Visibility, Road and lane markings"). Per the requirement that the ADS shall recognize its ODD conditions (4.1.2. below), it seems

- 3.3.1.1. Precipitation (rain, snow)
  - 3.3.1.2. Time of day (light intensity, including the case of the use of lighting devices)
  - 3.3.1.3. Visibility
  - 3.3.1.4. Road and lane markings
  - 3.3.1.5. Country of operation<sup>23</sup>
  - 3.3.1.6. V2x dependencies<sup>24</sup>
- 3.4. The manufacturer shall establish terms for the correct use of the ADS.<sup>25</sup>
- 3.4.1. The manufacture shall provide written information on the intended uses and limitations on the use of the ADS feature(s).<sup>26</sup>
  - 3.4.2. The manufacturer shall describe means made available to the public to promote a correct understanding of the intended uses and limitations on the use of the ADS.<sup>27</sup>
  - 3.4.3. The manufacturer shall provide the following information for ADS designed to interact with a fallback user.<sup>28</sup>

---

appropriate to cross-reference this performance requirement with the manufacturer's establishment of the conditions relevant to the ADS under assessment pursuant to the Section 3 guidelines.

<sup>23</sup> Based on FRAV-18-06 ("The ADS should comply with traffic rules [in the country of operation / within the ODD]"). FRAV agreed that the country or countries of operation would be included in the ADS description to enable application of requirements specific to such jurisdictions (e.g., traffic laws, languages, special vehicle markings).

<sup>24</sup> Based on FRAV-17-09 ("The ADS should establish a stable connection and response correctly if the vehicle has V2X options.").

<sup>25</sup> Based on FRAV-18-06 ("The ADS manufacturer should provide tools for the authorized user to learn about system functionality and operation.") Input on requirements for ADS interactions with ADS users relate to the ADS configuration, intended uses, and limitations on use that would be established by the manufacturer. Per para. 3.1.3 on the diversity of possible user roles and responsibilities depending upon the ADS configuration, the manufacturer would need to provide information on correct use. This information would enable the application of requirements for user notifications and other ADS responses to incorrect use.

<sup>26</sup> Based on FRAV-18-06 ("ADS manufacturer should provide documented information on ADS (features) capabilities and limitations (the information should also refer to specific scenarios)").

<sup>27</sup> Based on FRAV-18-06 ("ADS manufacturer should describe the possible educational approach: Theoretical and practical training, How it aligns with common HMI and interaction"). Statement provided to facilitate FRAV discussions on the role of public and consumer education (if any) in the establishment of ADS safety requirements.

<sup>28</sup> Based on FRAV-18-06 ("ADS manufacturer should provide documented information on allowed transition of roles and procedure for the transition (activation/deactivation, ToC, Override)"). The proposed requirements would only concern ADS designed for use with a fallback user, so this paragraph clarifies the scope.

- 3.4.3.1. The manufacturer shall provide written information on the roles and responsibilities of the fallback user, including on non-driving-related activities.<sup>29</sup>
- 3.4.3.2. The manufacturer shall provide written instructions for the activation and deactivation of the ADS.<sup>30</sup>
- 3.4.3.3. The manufacturer shall provide written information on ADS responses to fallback user interventions in the dynamic control of the vehicle.<sup>31</sup>
- 3.4.3.4. The manufacturer shall provide written descriptions of the transfer of control procedures, including ADS notifications and fallback user responses.<sup>32</sup>

#### 4. ADS Safety Requirements

- 4.1. ADS performance of the DDT<sup>33</sup>
  - 4.1.1. The ADS shall be capable of performing the entire Dynamic Driving Task (DDT) within the ODD of its feature(s).<sup>34</sup>
  - 4.1.2. The ADS shall recognize the conditions and boundaries of the ODD of its feature(s) pursuant to the manufacturer's declaration under paragraph 3.2.<sup>35</sup>
  - 4.1.3. The ADS shall detect and respond to objects and events relevant to the DDT.<sup>36</sup>
  - 4.1.4. The ADS shall comply with safety-relevant traffic laws according to the ODD of the feature in use.<sup>37</sup>

---

<sup>29</sup> Based on FRAV-18-06 (“ADS manufacturer should provide documented information on roles and responsibility of Driver/user and ADS when ADS (feature) is on/off” and “ADS manufacturer should provide a list of NDRA allowed when an ADS feature is active”).

<sup>30</sup> Op. cit. FRAV-18-06 (“ADS manufacturer should provide documented information on allowed transition of roles and procedure for the transition (activation/deactivation, ToC, Override)”).

<sup>31</sup> Ibid.

<sup>32</sup> Ibid.

<sup>33</sup> Based on FRAV-05-02 (“ADS should drive safely”).

<sup>34</sup> Based on FRAV-18-06 (“The ADS should be capable of performing the entire Dynamic Driving Task (DDT)”; “The capability of the ADS to perform the entire DDT should be determined in the context of the ODD of the ADS”). Per GRVA-07-54, an ADS integrates functions that enable performance of the DDT within the ODD of its feature(s). A feature may use all or some of the ADS functions and features may share ADS functions.

<sup>35</sup> Based on FRAV-18-06 (“The ADS should recognize the ODD conditions and boundaries of the ODD of its feature(s)”). The manufacturer establishes the conditions for the individual ADS and its features in accordance with the guidelines under Section 3.

<sup>36</sup> Based on FRAV-18-06 (“The ADS should detect and respond to objects and events relevant for the DDT”). Under its ORU workstream, FRAV is developing a properties-based approach to defining OEDR requirements.

<sup>37</sup> Based on FRAV-18-06 (“The ADS should comply with traffic rules [in the country of operation / within the ODD]”). Per the FRAV discussions, “country of operation” has been placed under the ADS description/ODD guidelines. Regarding discussions on the proposal “ADS should comply with the traffic laws in nominal conditions, except when in specific circumstances or when necessary to enhance the safety of the vehicle’s

- 4.1.5. The ADS shall interact safely with other road users.<sup>38</sup>
  
- 4.2. ADS interactions with ADS vehicle users<sup>39</sup>
  - 4.2.1. [PLACEHOLDER FOR HF GROUP]**
- 4.3. ADS management of safety-critical situations<sup>40</sup>
  - 4.3.1. The ADS shall execute a fallback response in the event of a failure in the ADS and/or other vehicle system that prevents the ADS from performing the DDT.<sup>41</sup>
  - 4.3.2. The ADS shall signal its intention to place the vehicle in an MRC.<sup>42</sup>
  - 4.3.3. Pursuant to a traffic accident, the ADS shall stop the vehicle.
- 4.4. ADS management of system failures<sup>43</sup>
  - 4.4.1. The ADS shall detect and respond to system malfunctions and abnormalities relevant to its performance of the DDT.<sup>44</sup>
  - 4.4.2. The ADS shall be protected from unauthorized access.<sup>45</sup>
  - 4.4.3. The ADS shall signal [faults/failures] compromising its capability to perform the entire DDT relevant to the ODD of its feature(s).<sup>46</sup>
  - 4.4.4. The ADS shall prohibit unauthorized modifications to safety-critical hardware and software in accordance with best engineering practices.<sup>47</sup>

---

occupants and/or other road users”, FRAV recognizes that traffic laws aim to prioritize road safety such that the laws may permit prioritization of individual provisions over others and/or deviations from strict adherence in the interests of safety. FRAV is discussing possibilities to reflect this “safety vs. strict compliance” balance.

<sup>38</sup> Based on FRAV-18-06 (“The ADS should interact safely with other road users”).

<sup>39</sup> Based on FRAV-05-02 (“ADS should interact safely with the user”).

<sup>40</sup> Based on FRAV-05-02 (“ADS should manage safety-critical situations”).

<sup>41</sup> Based on FRAV-18-06 (“The ADS should execute a safe fallback response in the event of a failure of the ADS and/or other vehicle system that prevents the ADS from performing the DDT”).

<sup>42</sup> Based on FRAV-18-06 (“The ADS should signal its intention to place the vehicle in an MRC to: ADS user or vehicle occupants, Other road users (e.g., by hazard lights)”).

<sup>43</sup> Based on FRAV-05-02 (“ADS should safely manage failure modes”).

<sup>44</sup> Based on FRAV-18-06 (“The ADS should detect system malfunctions/abnormalities and evaluate system’s ability to fulfill the entire DDT”).

<sup>45</sup> Based on FRAV-18-06 (“The ADS should be protected from unauthorized access” and “The measures ensuring protection from an authorized access should be provided in alignment with engineering best practices”). Pursuant to FRAV-18 discussions, the text is modified to be more explicit concerning “access”.

- 4.4.5. The ADS may continue to operate in the presence of [faults/failures] that do not prevent that ADS from fulfilling the applicable safety recommendations.<sup>48</sup>
- 4.4.6. The ADS shall signal [faults/failures] compromising its ability to execute the DDT.<sup>49</sup>
- 4.5. Detailed provisions in the context of Paragraph 4 are included in the Table I.

---

<sup>48</sup> Based on FRAV-18-06 (“Provided a failure does not significantly compromise ADS performance, the ADS should respond safely to the presence of a [faults/failure] in the system.” and “The limited operation of the ADS should comply to the normally applicable safety requirements”).

<sup>49</sup> Based on FRAV-18-06 (“The ADS should signal [faults/failures] affecting the ability to execute the DDT”).



**Table I – ADS Safety Requirements and Detailed Provisions**

	<b>Safety Requirements</b>	<b>Detailed Provisions</b>	<b>Measurable / Verifiable Criteria</b>
The ADS should drive safely			
1	The ADS shall be capable of performing the entire Dynamic Driving Task (DDT) within the ODD of its feature(s)	<ul style="list-style-type: none"> <li>• The capability of the ADS to perform the entire DDT should be determined in the context of the ODD of the ADS</li> <li>• As part of the DDT, the ADS should be able to:               <ul style="list-style-type: none"> <li>○ Operate at safe speeds;</li> <li>○ Maintain appropriate distances from <b>[other road users]</b> by controlling the longitudinal and lateral motion of the vehicle;</li> <li>○ Adapt its behaviour to the surrounding traffic conditions (e.g., by avoiding disruption to the flow of traffic)</li> <li>○ Adapt its behaviour in line with safety risks (e.g., by giving all road users and passengers the highest priority)</li> </ul> </li> </ul>	
2	The ADS shall recognize the conditions and boundaries of the ODD of its feature(s) pursuant to the manufacturer’s declaration	<ul style="list-style-type: none"> <li>• The ADS should be able to determine when the conditions are met for activation.</li> <li>• The ADS should detect and respond when one or more ODD conditions are not or no longer fulfilled.</li> <li>• The ADS should be able to anticipate planned exits of the ODD</li> <li>• The ODD conditions and boundaries (measurable limits) should be established by the manufacturer.</li> <li>• The ODD conditions to be recognized by the ADS should include:               <ul style="list-style-type: none"> <li>○ Precipitation (rain, snow)</li> <li>○ Time of day (light intensity, including the case of the use of lighting devices)</li> <li>○ Visibility</li> <li>○ Road and lane markings</li> </ul> </li> </ul>	
3	The ADS shall detect and respond to objects and events relevant to the DDT	<ul style="list-style-type: none"> <li>• <b>[Objects and events might include, but are not limited, to:</b> <ul style="list-style-type: none"> <li>○ <b>Vehicles, motorcycles, bicycles, pedestrians, obstacles</b></li> <li>○ <b>Road accidents</b></li> <li>○ <b>Road safety agents / enforcement agents</b></li> </ul> </li> </ul>	

		<ul style="list-style-type: none"> <li>○ <b>Emergency vehicles]</b></li> </ul>	
4	The ADS shall comply with safety-relevant traffic laws according to the ODD of the feature in use.	<ul style="list-style-type: none"> <li>● ADS should comply with the traffic laws in nominal conditions, except when in specific circumstances or when necessary to enhance the safety of the vehicle’s occupants and/or other road users</li> </ul>	
5	The ADS shall interact safely with other road users	<p>The ADS should interact safely with other road users, such as via:</p> <ul style="list-style-type: none"> <li>● <b>[Signaling maneuver intentions]</b></li> <li>● <b>[Signaling ADS status (active/inactive)]</b></li> </ul>	
6	<del>The ADS should adapt its behavior in line with safety risks</del>		
7	<del>The ADS should adapt its behavior to the surrounding traffic conditions</del>		
8	<del>The ADS driving behavior should not disrupt the flow of traffic</del>		
<b>The ADS should interact safely with the user</b>			
9	<p><del>Activation of an ADS feature should only be possible when the conditions of its ODD have been met</del></p> <p><b>User interaction with and the interface of ADS (features) should have high-level commonality of design so as to support users’ mental model of system operation</b></p>	<ol style="list-style-type: none"> <li>1) The ADS (features) should use interfaces with high-level of commonality</li> <li>2) The <b>operation</b> of the interaction should <b>have</b> in common: <ol style="list-style-type: none"> <li>a) [use of common sequence of states in the transition/activation/overriding/...]</li> </ol> </li> <li>3) The interaction should be simplified: <ol style="list-style-type: none"> <li>a) [Limit the number of roles]</li> <li>b) [Limit the number of potential transitions]</li> <li>c) <b>[Limit the number of settings]</b></li> <li>d) <b>[Limit the number of different interaction modes]</b></li> </ol> </li> </ol>	
10	<del>The user should be informed about the ADS status (when the ADS is activated) with regards to ODD</del>	<ol style="list-style-type: none"> <li>1) The ADS should <b>inform</b> the user on the current conditions: <ol style="list-style-type: none"> <li>a) <b>ADS status information</b></li> <li>b) User Role</li> <li>c) <b>Potential roles to activate</b></li> </ol> </li> </ol>	

	<p><b>The ADS should provide clear and unambiguous information to the user</b></p>	<ul style="list-style-type: none"> <li>d) Responsibility</li> <li>e) Permitted NDRA</li> <li>f) "Standard" information <ul style="list-style-type: none"> <li>i) Vehicle speed, range and Time to Fuel</li> </ul> </li> <li>g) ADS failure information</li> <li>h) Availability of automated features</li> </ul> <p>5.</p> <p>2) The ADS should <b>inform</b> the user on the upcoming conditions:</p> <ul style="list-style-type: none"> <li>a) ODD boundaries</li> <li><b>b) Upcoming actions or change in roles</b></li> <li>c) Oncoming decisions/manoeuvres</li> <li>d) Estimated time to overtake in normal conditions</li> <li>e) Warning for upcoming transition request</li> <li>f) Confirmation request for upcoming transition</li> </ul> <p>6.</p> <p>3) The ADS should present the information so as to assure a safe interaction:</p> <ul style="list-style-type: none"> <li>a) Timing requirements</li> <li>b) Priority requirements</li> <li>c) Saliency requirements</li> </ul>	
11	<p><del>The user should be permitted to take over control from the ADS, if the ADS is designed to request and enable intervention by a human driver</del></p> <p><b>The ADS should prevent misuse and errors in operation</b></p>	<ul style="list-style-type: none"> <li>1) The ADS should be designed to prevent inadvertent activation or deactivation</li> <li>2) The controls <b>dedicated to</b> the ADS should be clearly distinguishable from other controls</li> <li>3) The ADS should be designed to avoid activation of an ADS outside its ODD</li> <li>4) The ADS should be designed to avoid illegal settings</li> </ul> <p>The ADS should provide feedback when the user attempts to enable not allowed functions</p>	
12	<p><del>The ADS should safely manage transitions of control to the user</del></p>	<ul style="list-style-type: none"> <li>1) The ADS should inform the user that preconditions for activation are met</li> <li>2) The activation should follow a common sequence <ul style="list-style-type: none"> <li>a) Common sequence to be a pass/fail criterion</li> </ul> </li> </ul>	

	<p><b>The ADS should assure a safe ADS feature activation</b></p>	<p>3) The ADS should provide confirmation that the system is activated</p>	
<p>13</p>	<p><del>The ADS should safely respond to user input errors</del></p> <p><b>The ADS should assure a safe Transition Of Control</b></p>	<p>1) The interaction should follow a common sequence in the transition of control (change of user roles)</p> <p>a) Common sequence to be a pass/fail criterion</p> <p>7.</p> <p>Figure 2 — System-initiated transition from automated to manual driving (concepts are further specified in 3.3.2 and 3.3.3)</p> <p>50</p> <p>2) Transition of control should return to a common default user role (to prevent mode confusion <b>and other risks</b>)</p> <p>a) This should normally be fully engaged driving (conventional driver)</p> <p>b) Common default user to be a pass/fail criterion</p> <p>3) The ADS should <b>continuously</b> verify <b>whether</b> the user is available for the transition of control <b>and warn the user if not available when required</b> (MRM to be specified elsewhere)</p> <p>4) The ADS should verify that the driver is in stable control of the vehicle to complete the Transfer of Control to the user</p> <p>5) <b>During transition, the ADS should remain active until the transfer of control has been completed or the ADS reaches a minimal risk condition</b></p>	

<sup>50</sup> Reference: ISOxxx

14	<p>The ADS should provide feedback to the user on its operational status</p> <p><b>The ADS should assure a safe user initiated take over</b></p>	<ol style="list-style-type: none"> <li>1) <b>Under safe conditions the user is allowed to initiate a take-over of the ADS</b></li> <li>2) The deactivation should follow a common sequence             <ol style="list-style-type: none"> <li>a) Common sequence to be a pass/fail criterion</li> </ol> </li> <li>3) The ADS should <b>prevent and</b> warn a user for a user initiated take over that <b>would likely</b> lead to an unsafe situation</li> <li>4) The ADS should provide a clear feedback of the successful user initiated take over             <ol style="list-style-type: none"> <li>a) The clear feedback should be a pass/fail criterion</li> </ol> </li> <li>5) The user initiated take over should return to a common default user role (to prevent mode confusion <b>and other risks</b>)             <ol style="list-style-type: none"> <li>a) This should normally be fully engaged driving (conventional driver)</li> </ol> </li> </ol> <p>Common default user role to be a pass/fail criterion</p>	
15	<p>The ADS should warn the user of failures to fulfill user roles and responsibilities</p> <p><b>The ADS manufacturer should provide tools for the authorized user to learn about system functionality and operation.</b></p>	<p><i>On the general mental model (common understanding):</i></p> <ol style="list-style-type: none"> <li>1) <b>ADS manufacturer</b> should describe the possible educational approach:             <ol style="list-style-type: none"> <li>a) Theoretical and practical training</li> <li>b) How it aligns with common HMI and interaction</li> </ol> </li> <li>2) <b>ADS manufacturer</b> should provide documented information on ADS (features) capabilities and limitations (the information should also refer to specific scenarios)</li> <li>3) <b>ADS manufacturer</b> should provide documented information on roles and responsibility of Driver/user and ADS when ADS (feature) is on/off</li> <li>4) <b>ADS manufacturer</b> should provide documented information on allowed transition of roles and procedure for the transition (activation/deactivation, ToC, Override)</li> <li>5) <b>ADS manufacturer</b> should provide a list of NDRA allowed when an ADS feature is active</li> </ol> <p><i>On the applied mental model (understanding the ADS-specifics)</i></p> <ol style="list-style-type: none"> <li>6) The ADS supports the user in correct operation (coaching)</li> </ol>	

		7) The ADS gives prompt feedback on erroneous operation	
16	ADS vehicles that may operate without a <b>[user-in-charge/in-vehicle driver]</b> should provide means for occupant communication with <b>[a remote operator/user-in-charge/human driver/remote assistance personnel]</b>		
The ADS should manage safety-critical situations			
17	The ADS shall execute a safe fallback response in the event of a failure in the ADS and/or other vehicle system that prevents the ADS from performing the DDT	<ul style="list-style-type: none"> <li>• In the absence of a fallback-ready user, the ADS should fall back directly to a Minimal Risk Condition (MRC)</li> <li>• If the ADS is designed to request and enable intervention by a human driver, the ADS should execute an MRM in the event of a failure in the transition of control to the user <ul style="list-style-type: none"> <li>○ <b>[Upon completion of an MRM, a user may be permitted to assume control of the vehicle]</b></li> <li>○ <b>[The user should be permitted to override the ADS to assume full control over the vehicle]</b></li> </ul> </li> </ul>	
18	<del>In the absence of a fallback-ready user, the ADS should fall back directly to a Minimal Risk Condition if a failure of the ADS and/or other vehicle system prevents the ADS from performing the DDT</del>		
19	<del>If the ADS is designed to request and enable intervention by a human driver, the ADS should execute an MRM in the event of a failure in the transition of control to the user</del>	8.	
20	The ADS shall signal its intention to place the vehicle in an MRC	<ul style="list-style-type: none"> <li>• The ADS should signal its intention to place the vehicle in an MRC to: <ul style="list-style-type: none"> <li>○ ADS user or vehicle occupants</li> <li>○ Other road users (e.g., by hazard lights)</li> </ul> </li> </ul>	

21	Pursuant to a traffic accident, the ADS shall stop the vehicle	<ul style="list-style-type: none"> <li>• ADS reactivation should not be possible until the safe operational state of the ADS has been verified</li> </ul>	
The ADS should safely manage failure modes			
22	The ADS shall detect and respond to system malfunctions and abnormalities relevant to its performance of the DDT	<ul style="list-style-type: none"> <li>• The ADS should perform self-diagnosis of faults in accordance with the OEMs prescribed list</li> <li>• The ADS should detect system malfunctions/abnormalities and evaluate system's ability to fulfill the entire DDT</li> </ul>	
23	The ADS should be protected from unauthorized access	<ul style="list-style-type: none"> <li>• The measures ensuring protection from an authorized access should be provided in alignment with engineering best practices</li> </ul>	
24	The ADS may continue to operate in the presence of [faults/failures] that do not prevent that ADS from fulfilling the applicable safety recommendations	<ul style="list-style-type: none"> <li>• The limited operation of the ADS should comply to the normally applicable safety requirements</li> <li>• <b>[For situations where the ADS is not able to perform the DDT safely, the ADS should have the function to prevent activation. If the ADS has OTA functionality, this function may be activated remotely if the authorities or the vehicle manufacturer determine that the ADS is unsafe.]</b></li> </ul>	
25	The ADS shall signal <b>[faults/failures]</b> compromising its ability to execute the DDT	<ul style="list-style-type: none"> <li>• The ADS should signal <b>[faults/failures]</b> affecting the ability to execute the DDT</li> </ul>	
The ADS should maintain a safe operational state			
26	<b>[The ADS should signal required system maintenance to the user.]</b>		
27	<b>[The ADS should be accessible for the purposes of maintenance and repair to authorized persons.]</b>		
28	ADS safety should be ensured in the event of discontinued production/support/maintenance		

Document prepared by the DDT workstream leader  
pursuant to the session discussions

Document FRAV-21-05  
21<sup>st</sup> FRAV session

17-18 November 2021