

Proposal for Interpretation / Guidance document for UN Global Technical Regulation No. [XXX] and UN Regulation No. [YYY] on Automated Driving Systems

Section [4.1 (GTR) / 6.1(UNR)] – Performance of the DDT

5. Paragraph XX (GTR) / XX(UNR)

Pr.-High

Nominal/Critical/Failure scenarios and situations: clarify when nominal becomes critical, that it is scenario not ADS focused and what happens if a failure occurs during a critical scenario. Dense topic central to the section

<"Clause Statement">

Explanation of the requirement

The regulation distinguishes between “scenarios” used in testing and “situations” which occur in the real world. Both scenarios and situations can be categorised as nominal, critical or failure depending on the conditions within them. This classification is not based on the capabilities of the ADS but rather on the characteristics of the situation itself.

Nominal situations are the baseline case, in which neither critical nor failure criteria are met. A situation is critical if prompt action by the ADS is needed to avoid or mitigate the risk of a crash, and failure situations are those in which the ADS, the vehicle, or one of their components has failed in some way that impairs the ability of the ADS to perform the DDT. If the ADS causes a collision in an otherwise nominal situation it is a noncompliance with the nominal requirements (i.e. it is not reclassified as a critical situation due to an error by the ADS). In addition, complexity alone does not make a situation critical. A nominal scenario can be complex with lots of road users interacting with each other but no prompt action required by the ADS in order to avoid a collision.

The distinction is important as different DDT requirements apply across the different categories, nominal requirements only apply “as far as reasonably practicable with the aim of minimising overall risk” in critical and failure situations. In all situations the ultimate goal is to minimise the risk of harm.

Examples

Nominal

- A queue of cars stopped at a traffic light
- A roundabout
- Urban street with pedestrians crossing ahead

Critical

- A pedestrian runs out in front of the ADS vehicle
- Harsh cut in on the highway
- ORU reversing into the ADS vehicle

Failure

- Sensor failure
- Tyre puncture
- Power loss to ADS

It should be noted that the concept of a critical occurrence is not necessarily linked to a critical situation despite both using the term “critical”

6. Paragraph 4.2.2.2.3 (GTR) / 6.2.2.2.3 (UNR)

Pr.-Medium

“The feature activation procedure (e.g., sequence of actions and states) shall take into account relevant recommendations or standards.”

Explanation of the requirement

Only those ADS states used in the regulation are defined. This list contains terms not used in the regulatory text, but are included here for completeness. Some requirements apply when the ADS is not performing the DDT (e.g. determining whether it is in the ODD in order allow activation) and so it is useful to have common terms to describe these states to avoid confusion.

“ADS Off” means the ADS is not performing any activity.

“ADS On” means either an ADS feature is performing the DDT (ADS feature active) or the system in in ADS Standby.

“ADS Standby” means no ADS feature is performing the DDT, however the ADS may be performing some other activity (e.g. determining whether the vehicle is in the ODD).

“ADS Feature Active” means the operational state in which an ADS Feature is performing the DDT.

“(ADS feature) available” means the operational state of an ADS feature pursuant to the ADS verification that the ODD conditions of the feature have been met at a time prior to activation of the feature.

“(ADS feature) Activation” means the act of changing the operational state of the ADS feature, from available to active. i.e the state in which it is performing none of the DDT to the state in which it is performing all of the DDT.

“(ADS feature) Deactivation” means the act of changing the operational state of the ADS feature, from the state in which it is performing all of the DDT to the state in which it is performing none of the DDT. (This could be a user-initiated deactivation to manual driving, a system-initiated deactivation to manual driving or the system returning to ADS Standby whilst the vehicle is stopped.)

“Switching On” means the act of changing the status from ADS Off to ADS On and in Standby.

“Switching Off” means the act of changing the status from ADS Standby to ADS Off.

Commented [PE1]: Whilst we agreed the states not interpretation this is probably not the correct line to reference since its about human factors (definitions would be better)

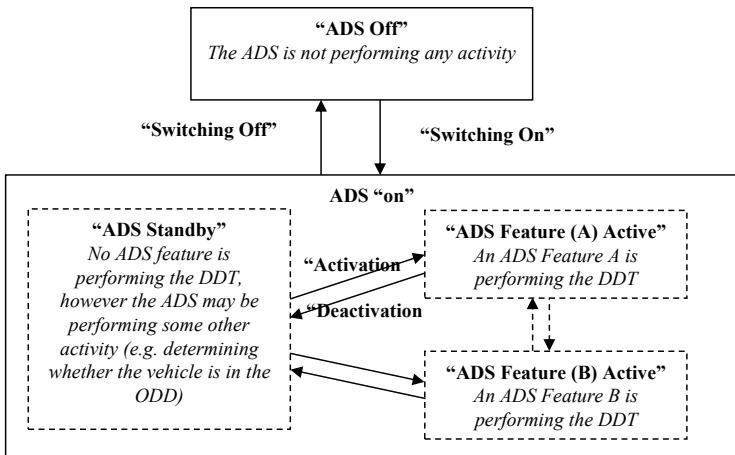


Figure 1 Diagram showing the relationship between the different possible ADS states

7. Paragraph 4.1.2.1 (GTR) / 6.1.2.1 (UNR) Pr.-Medium

“The driving behaviour of the ADS shall not cause a collision.”¹³

13. It is acknowledged that establishing causation can be complex, and not always possible. However, where it is established that the behaviour of an ADS caused a collision, this is a non-compliance with this requirement.”

Explanation of the requirement

Footnote acknowledges that establishing causation can be complex, and not always possible. However, where it is established that the behaviour of an ADS caused a collision, this is a non-compliance with this requirement.

Causation can be determined by:

- The manufacturer’s ISMR investigation,
- Authority investigation or,
- A court of law.

8. Paragraph 4.1.2.5 (GTR) / 6.1.2.5 (UNR) Pr.-Medium

“The ADS shall detect and respond to priority vehicles in accordance with the applicable traffic law(s)”

Explanation of the requirement

This requirement allows for an ADSF-1 to transfer control to the fallback user (fallback response) in the case of a priority vehicle interaction. For both ADSF-1 or ADSF-2, the manufacturer may also use non-ADS strategies to ensure the priority vehicles are responded to correctly. The manufacturer should follow guidance and best practice engaging with emergency services prior to deployment.

9. Paragraph 4.1.2.6 (GTR) / 6.1.2.6 (UNR) Pr.-Medium

“The ADS shall comply with traffic rules in accordance with application of relevant law within the area of operation”

Explanation of the requirement

This requirement uses the terms “application of relevant law” to refer to how the law is applied in practice, this covers compliance with case law for situations where a human driver would not be held liable for technically breaking a traffic rule, (e.g. entering an empty bus lane to avoid a broken down vehicle). The intention is to allow flexibility for the ADS to deal with complex real world situations but is not intended for the manufacturer to ignore traffic rules if other humans are (e.g. speeding on the motorway) in these situations case law would show humans in similar situations were still held liable. This provision is also intended to cover cases where traffic rules conflict with one another to still allow the ADS to take appropriate. The term “area of operation” refers to the specific jurisdiction the ADS is operating in and the applicable traffic rules that apply in that jurisdiction.

10. Paragraph 4.1.2.8 (GTR) / 6.1.2.8 (UNR) Pr.-Medium

“The ADS shall avoid collisions with safety-relevant objects”

Explanation of the requirement

Safety relevant objects are defined as an object that, if collided with, is likely to cause non-trivial damage to the vehicle or that is likely to pose a safety risk to other road users, vehicle occupants, or infrastructure.

Nontrivial damage is a threshold defined by the manufacturer in 7.3.2.3. This is intended to allow for cases where hitting some objects (e.g. a plastic bag) may be safer than the ADS taking evasive action or stopping to avoid it. When discussed in the group nontrivial was intended to cover anything more than a scratch or a light dent to the ADS vehicle, however this same minor damage applied to another road user may be above this threshold and considered nontrivial.

Commented [PE2]: Some discussions on this requirement are still ongoing

Commented [PE3]: Discussions are ongoing regarding whether the definition of safety relevant object can be improved

11. **Paragraph 4.1.2.11 (GTR) / 6.1.2.11 (UNR)**

Pr.-Medium

“The ADS shall have strategies in place to appropriately detect and respond to instructions from road safety agents”

Explanation of the requirement

This requirement allows for the response for an ADSF-1 to transfer control to the fallback user (fallback response) in the case of a road safety agent interaction. For either feature type the manufacturer may also use non-ADS strategies to ensure the road safety agents are responded to correctly.

12. **Paragraph 4.1.3.3.1 (GTR) / 6.1.3.3.1 (UNR)**

Pr.-Medium

“The ADS shall not resume travel unless:

- (a) The safe operational state of the ADS vehicle has been verified, and
- (b) It is permissible under the applicable laws.”

Explanation of the requirement

This requirement does not allow the ADS to move off following a collision until both points are fulfilled, its is permissible under applicable law and the operational state has been verified. This might be accomplished in a variety of ways, the ADS checking itself, the fallback user checking the operational state or a third party confirming safety in some way.

13. **Paragraph 4.1.3.3.2 (GTR) / 6.1.3.3.2 (UNR)**

Pr.-Medium

“Notwithstanding para. 4.1.3.2.1.(a), if the collision occurred while an ADSF-2 was active, when directed by a road safety agent, the ADS shall move the vehicle unless the ADS determines that the manoeuvre poses an unreasonable safety risk or is not technically possible due to damage. Alternatively, the safety case shall describe how the road safety agent's instructions will be complied with in such circumstances”

Explanation of the requirement

This requirement provides an exception to the previous one, specifically when the operational state has not yet been verified but there is still a need to move the vehicle in an emergency. E.g. moving the vehicle off the road to allow emergency services access or to move to a safer location away from a burning vehicle. This may be accomplished by the ADS or non-ADS strategy. It is limited to ADSF-2 as with an ADSF-1 the fallback user would move the vehicle.

14. **Paragraph 4.1.4.3 (GTR) / 6.1.4.3 (UNR)**

Pr.-Medium

“In response to a fault, the ADS shall either:

- (a) Execute a fallback response and prohibit activation of the impacted feature(s) if the fault prevents the ADS from performing the DDT in accordance with the requirements under paragraph 6.1., or
- (b) Adapt its performance of the DDT in accordance with the severity of the fault provided the resulting performance complies with the requirements under paragraph 6.1.”

Explanation of the requirement

Part b of this requirement covers the case where there is a fault that has impaired the ability of the ADS to perform the DDT but it is still capable of doing so with reduced performance. If the ADS continues to perform the DDT in this failure situation with reduced performance then doing so should as far as reasonably practicable continue to meet the nominal situation requirements with the aim on minimising overall risk (i.e. if it would increase risk to fall back to a MRC immediately rather than continuing to a better point, on a highway for example, then that risk assessment should be made considering the failure.)

15. **Paragraph 4.1.4.4. (GTR) / 6.1.4.4. (UNR)**

Pr.-Medium

“4.1.4.4/6.1.4.4 The ADS shall be capable of remote termination.

4.1.4.4.1/6.1.4.4.1. The procedure for remote termination of an ADS performing the DDT shall be capable of triggering include the capability to perform an ADS fallback response.

4.1.4.4.2/6.1.4.4.2 Remote termination of an ADS or ADS feature(s) shall render it unable to be activated until such time as the remote termination is rescinded”

Explanation of the requirements

This requirement refers to the capability to prevent an ADS Feature being used. This could apply to an ADS feature across many vehicles (e.g. a problem has been identified with a feature and it is dangerous to use) or a single vehicle that needs to be stopped in an emergency (e.g. an ADS vehicle is operating out of ODD in a dangerous manner). This covers both the cases where the ADS needs to immediately fallback to a MRC and where it should complete its journey and then no longer allow activation of the feature, which option is appropriate would be dependent on the specific situation. In the case where the remote termination is triggering a fallback to a MRC the ADS still performs the DDT and chooses an appropriate stopping position; this process is not remote driving. This regulation only covers the mechanism for remote termination being possible, national law would need to specify if and when it could be required.

16. Paragraph 4.1.6.2 (GTR) / 6.1.6.2 (UNR)

Pr.-Medium

“For ADSF-1, if it has not been possible to complete a system-initiated deactivation procedure, the ADS shall execute a fallback to an MRC. During the fallback to MRC the user may initiate deactivation of the ADS.”

Explanation of the requirement

The text “not been possible to complete a system-initiated deactivation procedure” means the case where the normal system-initiated deactivation process (i.e. transition demand) has not resulted in the fallback user taking the role of the driver. This could be due to fallback user not responding in the transition period determined by the manufacturer, or some external event preventing that full transition period being possible. In this latter case the fallback user may still want to take over performance of the DDT during this fallback to an MRC, rather than wait for the vehicle to come to a stop.

17. Paragraph 4.3.7. (GTR) / 6.3.7. (UNR)

Pr.-Medium

List of non-DDT tasks resulting from the screening taskforce and for which existing regulation cannot be updated before June 2026

<"Clause Statement">

While an ADSF-2 is active, the ADS shall manage relevant non-DDT-related tasks (which would otherwise be performed by a driver) in accordance with the manufacturer’s safety case. Alternatively, where the ADS does not perform such necessary tasks, the safety case shall describe how these tasks are performed.

Explanation of the requirement

<Explanation Text>

Non-DDT tasks

The following list shows non DDT tasks that have been identified and the safety case shall describe how they are handled. This is a non exhaustive list and not items will be relevant for all systems.

Checking the correct working condition of the vehicle before driving, including:

- Brake wear
- Tyre wear/tear pressure etc
- Fluid levels
- Lamps operation/angle
- Trailer correctly coupled

Commented [PE4]: This list might be better as an annex. FADS also developed some guidance on how to fulfil these non DDT tasks, is it appropriate to include that?

- Energy level
- Wheel alignment
- Locked status of doors, hood, trunk, liftgate, fuel cap etc
- Broken window, body damage or other safety hazard for occupants or other road users
- Actual mass compatible with maximum mass (including weight by axle)
- Dimensions of the vehicle with load compatible with permitted limits
- Position and situation of the load
- Presence of crew member / on-board operator (if required for that ADS feature)
- Availability of remote operation centre (if required for that ADS feature)
- Malfunction without failure warning that would be detected by a human and affects performance: unusual response of steering system, wrong speedometer value, etc.
- Malfunction with failure warning that would be detected by a human and affects performance; Malfunction indicator (MI)
- Driver warning system
- Driver inducement system
- Presence of vehicle registration documents and other mandatory documents (insurance, PTI certificate, etc.) registration plates, mandatory emergency equipment, mandatory local equipment (snow tyres in mountainous areas), etc.
- Absence of temporary general restriction on road use (due to a severe incoming weather event, public safety, curfew, etc.)
- Position of the mobile equipment mounted on the vehicle

Checking the correct working condition of the vehicle while driving, including:

- Broken window, body damage or other safety hazard for occupants or other road users
- Malfunction without failure warning that would be detected by a human and affects performance: unusual response of steering system, wrong speedometer value, etc.
- Malfunction with failure warning that would be detected by a human and affects performance; Malfunction indicator (MI)
- Driver warning system
- Driver inducement system
- Tyre wear/tear, pressure, etc.
- Position and situation of the load

Checking passenger safety before starting to drive, including:

- Safety belts fastened (if applicable)
- Airbags (operational status)
- Number of passengers compatible with vehicle capacity
- Presence and number of person with limited mobility on board
- Presence of person with limited mobility waiting for embarkment
- Absence of passengers (in vehicles of Category Y)

Checking passenger safety while driving, including:

- Safety belts unfastened (if applicable)
- Standing passengers (in vehicles not designed for standing passengers)
- Assess situation inside of the vehicle

Operating non-DDT, safety-relevant elements of the vehicle, including:

- Doors and door locks (doors can be operated automatically, or operated by the on-board or remote operator, or operated locally by the passengers) The doors can be the service doors or the emergency doors
- Tyre wear/tear, pressure, etc.
- Windows and window locks
- Folding roof, retractable hardtop, panoramic roof, etc.

- Seating position, angle
- Retractable steps (bus)
- Ramp, liftgate, etc.
- Trailer coupling
- Windscreen wipers
- Defrosting and demisting the windscreen
- Climate control
- Hatch, trunk
- Emergency exits
- Indoor lights control
- Signalisation devices (advance warning triangles)

Reacting to signals received from other vehicle systems

- Braking
- Steering
- Lighting
- Powertrain
- TMPS
- Emission control system
- Fire / smoke in a compartment (bus / coach)
- Safety belt unfastened (if applicable)
- Anti-theft
- Doors opened / unlocked (service and emergency)
- Anti-pollution
- Passenger stop request (R107)
- Passenger stop request (R ADS)
- Fire / smoke in a compartment (light duty vehicle) or in the batteries system
- Sensors
- Opening of emergency exits
- Absence/removal of fire extinguishers
- Absence/removal of emergency case
- Absence/removal of removable lamp
- Absence/removal of window breaker device
- Emergency command for door opening
- Emergency window not locked
- Hatches not closed
- Retractable step not retracted

Reacting to signals received from remote systems

- Door movement inversion requested by remote operator
- Door automatic closing process control activation, deactivation or control by remote operator
- Any other command from a remote operator to control a non-DDT element of the vehicle (see above)

Providing assistance to passengers (remote)

- Call and communication with remote supervision centre through audiovisual equipment (and specific for vision or hearing impaired people)

Strategic functions

- Setting an itinerary
- Reacting to on-board or remote operator's modifying an itinerary during operation

Giving information to Passengers

- Intention to place vehicle in an MRC
- Information for safe operation
- Emergency manoeuvres

Giving information to remote operation centre or on board operator

- Emergency manoeuvres
- Intention to place vehicle in an MRC
- Status of the vehicle, status of the ADS
- Status of the other vehicle systems
- Information useful for operation : speed, outside conditions...
- Environment of the vehicle

Giving information to other road users (if not covered by the ADS conspicuity requirements)

- Emergency manoeuvres
- Intention to place vehicle in an MRC
- Status of the ADS

Giving information to law enforcement & first responders

- Allowing the communication between operators (remote or on-board) and law enforcement officers
- Status of the ADS

18. Paragraph 4.1.2.2 (GTR) / 6.1.2.2 (UNR)

Pr.-Low

“The ADS shall adapt its driving behaviour in line with safety risks: this shall at least include:

- (a) Anticipating the risks in the driving environment to reduce the likelihood of encountering a critical situation,
- (b) Adapting its speed in line with safety risks, and
- (c) Maintaining appropriate distances from other road users by controlling the longitudinal and lateral motion of the vehicle.”

Explanation of the requirement

Adapting driving behaviour in line with safety risks (6.1.2.2): What sort of adaptations are being required

Anticipation of risks in the driving environment (6.1.2.2a): Explanation about anticipatory driving and avoiding critical situations, explanation of driving environment vs ODD

Adapting speed in line with safety risks (6.1.2.2.b): Clarify what sort of safety risks to consider

Maintaining appropriate distances from other road users (6.1.2.2.c): What is an appropriate distance

19. Paragraph 4.1.2.3 (GTR) / 6.1.2.3 (UNR)

Pr.-Low

“The ADS shall avoid unreasonable disruption to the flow of traffic in line with safety risks.”

Explanation of the requirement

What makes a disruption reasonable/unreasonable?

20. Paragraph 4.1.2.4 (GTR) / 6.1.2.4 (UNR)

Pr.-Low

“The ADS shall detect and respond to objects and events relevant to its performance of the DDT”

Explanation of the requirement

Objects and events relevant to the performance of the DDT (6.1.2.4): Examples of objects

that are and are not relevant to the DDT

Examples of objects are relevant include ORU, infrastructure, traffic furniture, not relevant include planes in the sky, people inside buildings, or may include vehicles driving on an adjacent (but completely segregated) road and leaves blowing in the wind.

21. Paragraph 4.1.3.3 (GTR) / 6.1.3.3 (UNR) *Pr.-Low*

“In the event of a collision involving the ADS vehicle, if required to stop by applicable law, the ADS shall fall back to an MRC or bring the vehicle to standstill as appropriate. [During this process the user may initiate deactivation of the ADS if the design of the ADS allows.]”

Explanation of the requirement

In this requirement the obligation to stop is determined by whether the applicable law in the area of operation would require a vehicle to stop following that collision. In some cases it would be more appropriate to bring the vehicle to an immediate standstill rather than find an appropriate MRC.

22. Paragraph XXXX (GTR) / XXXX (UNR) *Pr.-Low*

Fallback response for type 1 and type 2: Explain how the two feature types fallback response may differ

<"Clause Statement">

Explanation of the requirement

<Explanation Text>

23. Paragraph XXXX (GTR) / XXXX (UNR) *Pr.-Low*

ODD Exit

<"Clause Statement">

Explanation of the requirement

<Explanation Text>

24. Paragraph XXXX (GTR) / XXXX (UNR) *Pr.-Low*

MRC

<"Clause Statement">

Explanation of the requirement

<Explanation Text>

Commented [PE5]: What specifically should be covered by these points