The following text is reflecting the discussion during the TF ADAS special sessions dedicated to RMF

Items for update by Industry and confirmation by CPs

Edits in highlighted text

“2.3.4.4. "*Risk Mitigation Function* (RMF)" means an emergency function which can in case the driver becomes unresponsiveautomatically activate the vehicle steering system for a limited duration to steer the vehicle with the purpose of bringing the vehicle to a safe stop within a target stop area.

2.4.16. A "*Lane Change Procedure*" starts when the direction indicator lamps are activated and ends when the direction indicator lamps are deactivated. It comprises the following operations:

(a) Activation of the direction indicator lamps;

(b) Lateral movement of the vehicle towards the lane boundary;

(c) Lane Change Manoeuvre;

(d) Resumption of the lane keeping function;

(e) Deactivation of direction indicator lamps.

2.4.18. “*Target stop area*” means a potential stopping area (e.g. emergency lane, hard shoulder, beside the road, slowest lane of traffic, own lane of travel).

5.1.6.3. Vehicles equipped with an RMF shall fulfil the following requirements.

An RMF system shall be subject to the requirements of Annex 6.

5.1.6.3.1. Any RMF shall start an intervention only

* in case the driver is either directly (e.g. through a driver monitoring system) or indirectly (e.g. prolongued failed response to a warning, failed vehicle control) assessed to be unresponsive, or
* if it is manually activated.

In case the system provides a means for manual activation, this means shall be protected against unintentional operation and accessible to the driver and to passengers adjacent to the driver.

5.1.6.3.2. Unless a request for action (e.g. hands-on warning) was already given or the system was manually activated, there shall be an optical and acoustical and/or haptic (e.g. brake jerks) warning signal before every RMF intervention in order to stimulate the driver to take back control.

This warning phase shall start latest 5 seconds before the RMF starts an intervention, unless vehicle control by the system is required sooner to prevent the vehicle from crossing the lane markings or to keep an appropriate distance to other vehicles.

Every RMF intervention shall be indicated to the driver at least by a clearly visible optical and an acoustic and/or haptic (e.g. brake jerks) warning signal for as long as the intervention exists.

These warning signals shall be distinct and of a great urgency.

5.1.6.3.3. An RMF intervention shall not unreasonably deactivate or suppress the functionality of activated assistance systems (e.g. AEBS).

5.1.6.3.4. The signal to activate the hazard warning lights shall be generated with the start of the intervention.

5.1.6.3.5. It shall be possible to override the function at any time by a distinct action of the driver.

The RMF shall implement strategies to provide protection against unintentional override through input to vehicle controls (e.g. by requiring a significant change in a single input to the accelerator or brake pedal or multiple inputs to override the RMF).

These strategies shall be demonstrated to the Technical Service at the time of type approval.

5.1.6.3.6. During the RMF intervention the vehicle shall slowed down with a deceleration demand not greater than 4m/s², unless required by the surrounding traffic (e.g. a decelerating lead vehicle).

Higher deceleration demand values are also permissible for very short durations, e.g. as haptic warning to stimulate the driver to take back control.

5.1.6.3.7. Once the RMF has brought the vehicle to a safe stop in the target stop area, the vehicle shall not move away without manual input.

5.1.6.3.8. If the RMF system detects any failures preventing it from performing an intervention, this shall be signalled to the driver.

5.1.6.3.9. Additional provisions for systems with the purpose of bringing the vehicle to a safe stop outside its own lane of travel.

5.1.6.3.9.1. The RMF shall only be permitted to change lanes, if the vehicle is equipped with detection capabilities to the front, side and rear.

5.1.6.3.9.2. Lane change manoeuvres shall only be performed in an uncritical way as described in paragraphs 5.1.6.3.9.7. and 5.1.6.3.9.8. In case the target stop area cannot be reached in an uncritical way the RMF shall aim to keep the vehicle within its current lane of travel while the vehicle is stopping.

5.1.6.3.9.3. Before initiating a lane change maneuver, RMF shall, if deemed appropriate, reduce the vehicle speed to minimize the risk related to that lane change maneuver (e.g. by adapting the speed of the vehicle to that of other vehicles in the target lane).

A lane change maneuver shall not start within the first 5s following the start of the RMF intervention.

5.1.6.3.9.4. During the intervention the system shall perform a single or multiple lane change(s) across regular lanes of traffic as well as to the hard shoulder, only if under the traffic situation these lane changes can be considered to minimize the risk to safety of the vehicle occupants and other road user.

5.1.6.3.9.5. A lane change during the intervention shall only be performed if the system has sufficient information about its surrounding to the front, side and rear (as defined in paragraph 5.1.6.3.6.13.) in order to assess the criticality of that lane change.

5.1.6.3.9.6. A lane change during the intervention shall not be performed towards a lane with traffic in opposite direction.

5.1.6.3.9.7. The intervention shall not cause a collision with another vehicle or road user in the predicted path of the vehicle duringa lane change.

5.1.6.3.9.8. A lane change manoeuver shall be predictable and manageable for other road users.

5.1.6.3.9.8.1. During the lane change manoeuvre, RMF shall aim to avoid to induce a lateral acceleration of more than 1m/s2 in addition to the lateral acceleration generated by the lane curvature.

Option 1: include Par. 5.1.6.3.9.8.2. with all its sub paragraphs

~~5.1.6.3.9.8.2. A lane change manoeuvre shall only be started if a vehicle in the target lane is not forced to unmanageably decelerate due to the lane change of the vehicle.~~

~~5.1.6.3.9.8.2.1. When there is an approaching vehicle~~

~~An approaching vehicle in the target lane shall not have to decelerate at a higher level than A m/s², B seconds after the lane change manoeuvre has started, to ensure the distance between the two vehicles is never less than that which the lane change vehicle travels in C seconds.~~

~~With A equal to 3.7 m/s²~~

~~With B equal to:~~

~~(a) 0.0 s, if the lateral movement of the vehicle continued for at least 1 s while the vehicle had not yet crossed the lane marking and the direction indicator had been active for at least 3 s prior to crossing of the lane markings while a vehicle approaching from the rear was detected by the sensing system~~

~~(b) 0.4 s, if the lateral movement of the vehicle continued for less than 1 s or the direction indicator had been active less than 3 s or a vehicle approaching from the rear was not detected by the sensing system for at least 3s prior to the start of the lane change manoeuvre~~

~~With C equal to~~

~~(a) 0.5 s, if the lane change is performed towards a lane intended for slower traffic or towards the hard shoulder~~

~~(b) 1.0 s if performed towards a lane intended for faster traffic.~~

~~5.1.6.3.9.8.2.2. When there is no vehicle detected~~

~~If no vehicle is detected, the minimal gap to the rear shall be calculated under the assumptions that:~~

~~(a) An approaching vehicle on a regular lane intended for faster traffic is travelling with the allowed maximum speed whichever is lower.~~

~~(b) An approaching vehicle on a lane intended for slower traffic (including enter-, and exit lanes and shoulders temporarily opened for regular traffic) is travelling with a maximum speed difference of 20 km/h at the start of the lane change manoeuvre while not exceeding the allowed maximum speed~~

~~(c) An approaching vehicle on a hard shoulder is travelling at a maximum speed of 80 km/h and a maximum speed difference to the RMF vehicle at the start of the lane change manoeuvre of 40 km/h.~~

~~Where an allowed maximum speed does not exists, the advised maximum speed may be assumed.~~

~~5.1.6.3.9.8.2.3. When there is an equally fast or slower moving vehicle~~

~~A lane change manoeuvre shall only be started if the distance to a vehicle following behind in the target lane at equal or lower speed is greater than that which the following vehicle travels in 0.7 s.~~

~~5.1.6.3.9.8.2.4. In cases where the vehicle decelerates during a lane change procedure, the deceleration shall not exceed 2m/s~~~~2~~~~, except for the purpose of avoiding or mitigating the risk of an imminent collision.~~

~~5.1.6.3.9.8.2.5. In cases where the vehicle starts to decelerate or increase deceleration at the end of the lane change procedure with a headway time of less than [2] seconds for the vehicle behind, the vehicle shall not decelerate for at least 2 seconds after the completion of the lane change procedure, except for the purpose of avoiding or mitigating the risk of an imminent collision.~~

Option 2: Interim solution based on high-level functional requirements until specific lane change provision have been discussed and aligned with ALKS MRM:

5.1.6.3.9.8.2. A lane change manoeuvre shall only be started if a vehicle in the target lane is not forced to unmanageably decelerate due to the lane change of the vehicle.

5.1.6.3.9.8.2.1. During the lane change manoeuvre, RMF shall aim to avoid to induce a longitudinal deceleration of more than 3,7m/s2 for a vehicle approaching from the rear due to the lane change of the vehicle.

5.1.6.3.9.8.2.2. A lane change manoeuvre shall only be started if there is sufficient space to a vehicle following behind or approaching from the rear in the adjacent lane.

5.1.6.3.9.8.2.3.In case the RMF vehicle decelerates during a lane change procedure, this deceleration shall be factored in when assessing the distance to a vehicle approaching from the rear, and deceleration shall be manageable for the vehicle approaching from the rear (e.g. equal to or less than 2 m/s2 is deemed manageable).

5.1.6.3.9.8.2.4.In cases where the RMF starts to decelerate or increases the deceleration of the vehicle at the end of the lane change procedure with a headway time of less than [2] seconds for the vehicle behind, ~~the brake jerk shall be manageable for the vehicle travelling behind,~~ the vehicle shall not decelerate for a certain period of time after the completion of the lane change procedure (e.g. 2 seconds), except for the purpose of avoiding or mitigating the risk of an imminent collision.

5.1.6.3.9.8.2.5.How the provisions of paragraph 5.1.6.3.9.8.2. and its subparagraphs are implemented in the system design shall be demonstrated to the Technical Service during type approval.

5.1.6.3.9.9. The changing of a lane shall aim to be one continuous movement.

5.1.6.3.9.10. A lane change during the intervention shall be completed without undue delay.

5.1.6.3.9.11. A lane change manoeuvre shall only be started if the manoeuvre is anticipated to be completed before the vehicle comes to a standstill (i.e. in order to avoid coming to standstill while in the middle of two regular lanes due to stopped traffic ahead).

5.1.6.3.9.12 Additional provisions for system behaviour bringing the vehicle to a safe stop beside the road.

5.1.6.3.9.12.1.All provisions of 5.1.6.3.9. shall be applied except 5.1.6.3.9.11., 5.1.6.3.9.13., 5.1.6.3.9.14. and 5.1.6.3. 9.16.

5.1.6.3.9.12.2.The vehicle may come to a standstill on the lane mark beside the road.

[5.1.6.3.9.12.3.In addition to the provisions of paragraph 5.1.6.3.9.7., an acoustic warning shall be given as warning to other road users during the lane change manoeuver, when bringing the vehicle to a stop beside the road in an urban environment.]

5.1.6.3.9.12.4. When bringing the vehicle to a stop beside the road the vehicle speed shall not exceed 10 km/h.

[A tolerance of +5km/h shall apply for vehicles of category N2, N3, M2 and M3 to account for lower accuracies of vehicle speed measurement at low speeds.]

5.1.6.3.9.13. A lane change manoeuvre during an intervention shall be indicated in advance to other road users by activating the appropriate direction indicator lamps instead of the hazard warning lights~~, optionally both may flash alternately.~~

5.1.6.3.9.14. Once the lane change manoeuvre is completed the direction indicator lamps shall be deactivated in a timely manner, and the hazard warning lights shall become active again.

5.1.6.3.9.15. The system shall implement strategies to draw external attention to the emergency situation (e.g. triggering an emergency call, activating the horn, keeping the hazard warning lights active), when the driver remains unresponsive once RMF has brought the vehicle to standstill.

5.1.6.3.9.16. Notwithstanding paragraph 5.1.6.3.6.12. when several consecutive lane changes are performed as part of the risk mitigation function, the direction indicator may remain active throughout these lane changes while the lateral behaviour shall ensure that each lane change manoeuvre can be perceived as an individual manoeuvre by following traffic.

5.1.6.3.9.17. If the vehicle is equipped with the capability to perform lane changes during the RMF intervention, the manufacturer shall declare the detection ranges to the front, side and rear. The declared ranges shall be sufficient to assess that a change into a lane immediately to the left or to the right of the vehicle does not cause a critical situation with another vehicle or road user [in the predicted path of the vehicle] during a lane change.

The Technical Service shall assess the correspondence of declared detection ranges and lane change strategy and shall verify that the vehicle’s sensing system detects vehicles during the relevant test in Annex 8. These ranges shall be equal or greater than the declared ranges.

5.1.6.3.10. Special provisions for M2/M3 vehicles

5.1.6.3.10.1. In case the system provides a means for manual activation by passenger, the RMF system may provide an indication which notice its operation to the passenger who operates the means.

The indication shall start when the passenger operates the means, and continues until the RMF operation would be cancelled or overridden by the driver according to 5.1.6.3.5. or the indication of the next phase indication would start.

In case the system provides a means for manual activation by the passenger with M2 and M3 vehicles, a means for manual deactivation (e.g. deactivation switch) shall be provided for the driver.

5.1.6.3.10.2. The RMF system equipped to the vehicle with standing passenger shall provide an acoustic indication which notice the RMF intervention to the passengers before the intervention would start. An optical indication is optional.

The indication shall start before the intervention would start, and continues until the RMF operation would be cancelled or overridden by the driver according to 5.1.6.3.5. or the indication of the next phase indication would start.

Regarding the vehicle without standing passenger, this indication is optional.

5.1.6.3.10.3. The RMF system shall provide an acoustic indication which notice the RMF intervention to the passengers.

The indication shall start when the intervention starts, and continues until the RMF operation would be cancelled or overridden by the driver according to 5.1.6.3.5. An optical indication is optional.

5.1.6.3.7. System information data

The 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:

(a) Information on how the system confirms that the driver is unresponsive;

(b) Information on whether the system is capable of performing lane changes and what is considered a target stop area by the system

(c) Description of the means to detect the driving environment;

(d) Information/specification on which road types (e.g. motorway, country roads, urban areas, etc.) the system is designed to intervene and how this is ensured;

(e) Means to override the function and how the system provides protection against unintentional override;

(f) Description of the driver warning and information concept, including warning before and during an RMF intervention

(g) In case of lane change capability

i. a detailed description of the design provisions implemented to ensure safety of the manoeuvre

ii. the means by which the vehicle detects others road users, obstacles and the target stop area

iii. Description of how the system selects an appropriate target stop area and a description of the safety criteria on which this selection is based

(h) Information/specification of the maximum speed the system operates (e.g. also in dependence of the traffic environment (highway, urban, etc.) as well as information/specification on how the speed is reduced (e.g. adapted to surrounding traffic; no harsh braking endangering other road users) in order to come to a safe stop.

12.3. Transitional Provisions applicable to the 04 series of amendments:

12.3.1. As from the official date of entry into force of the 04 series of amendments, no Contracting Party applying this Regulation shall refuse to grant or refuse to accept UN type approvals under this Regulation as amended by the 04 series of amendments.

12.3.2. As from 1 September [2023], Contracting Parties applying this Regulation shall not be obliged to accept UN type approvals to the preceding series of amendments, first issued after 1 September [2023].

12.3.3. Until 1 September [2025], Contracting Parties applying this Regulation shall continue to accept UN type approvals to the preceding series of amendments to this Regulation, first issued before 1 September [2023].

12.3.4. As from 1 September [2025], Contracting Parties applying this Regulation shall not be obliged to accept type approvals issued to the preceding series of amendments to this Regulation.

12.3.5. Notwithstanding paragraphs 12.3.2. and 12.3.4., Contracting Parties applying this Regulation shall continue to accept UN type approvals issued according to a preceding series of amendments to this Regulation, for vehicles which are not affected by the provisions of paragraph 5.1.6.3.9.8.2. introduced with the 04 series of amendments.

*Paragraphs 12.3 and 12.3.1.,* re-number as 12.4. and 12.4.1.

Annex 8 Test Requirements …

3.6 Tests for RMF

The vehicle shall be driven with an activated RMF on a road with all relevant lane markings in a good visible shape.

The test conditions and the vehicle speeds shall be within the operating range of the system as declared by the manufacturer.

Specific details of the mandatory tests described below shall be discussed and agreed between the vehicle manufacturer and the Technical Service to adapt the required testing to the declared use case(s) for which the RMF is designed to operate.

In addition, the manufacturer shall demonstrate to the satisfaction of the Technical Service that the requirements defined in paragraph 5.1.6.3. are fulfilled in the whole range of the RMF operation (specified by the vehicle manufacturer in the system information data). This may be achieved on the basis of appropriate documentation appended to the test report.

3.6.1. Tests for an RMF, with the purpose of bringing the vehicle to a safe stop inside its own lane of travel:

The vehicle shall be driven in a way that an intervention is initiated.

The test requirements are fulfilled if:

(a) The ongoing intervention is indicated to the driver by at least an optical and an acoustic and/or haptic warning signal as defined in paragraph 5.1.6.3.2.

(b) The signal to activate the hazard warning lights is generated with the start of the intervention.

(c) The deceleration demand does not exceed 4m/s2 as described in paragraph 5.1.6.3.6.

(d) Once RMF has brought the vehicle to a safe stop, the vehicle does not move away without manual input.

3.6.2. Tests for an RMF, with the purpose of bringing the vehicle to a safe stop outside its own lane of travel:

3.6.2.1. Scenario A:

A Lane Change Manoeuvre is possible according to the provisions of paragraph 5.1.6.3.9.8.2.

The vehicle shall be driven in a way that an RMF intervention is initiated while a target stop area outside the current lane of travel is available. In case there is another vehicle in the target lane this shall be positioned in a way not preventing a lane change of the RMF vehicle to the target lane.

The test requirements are fulfilled if:

(a) The ongoing intervention is indicated to the driver by at least an optical and acoustic and/or haptic warning signal as defined in paragraph 5.1.6.3.2.

(b) The signal to activate the hazard warning lights is generated with the start of the intervention.

(c) The lane change manoeuvre is indicated in advance to other road users.

(d) The RMF vehicle changes the lane(s) following the provisions of paragraph 5.1.6.3.9.8. and its subparagraphs.

3.6.2.2. Scenario B:

A Lane Change Manoeuvre is not possible according to the provisions of paragraph 5.1.6.3.9.8.2.

The vehicle shall be driven in a way that an RMF intervention is initiated while a target stop area outside the current lane of travel is available. At the start of the RMF intervention there shall be another vehicle in the target lane positioned in a way preventing a lane change manoeuvre of the RMF vehicle to the target lane.

The test requirements are fulfilled if:

(a) The ongoing intervention is indicated to the driver by at least an optical and acoustic and/or haptic warning signal as defined in paragraph 5.1.6.3.2.

(b) The signal to activate the hazard warning lights is generated with the start of the intervention.

(c) The lane change manoeuvre is indicated in advance to other road users.

(d) The RMF vehicle does not start a lane change manoeuvre as long as the vehicle in the target lane is still positioned in a way preventing a lane change manoeuvre.