Ministerial Draft of the Federal Ministry for Digital and Transport

Road Traffic Remote Control Regulation – StVFernLV

A. Problem and objective

In Germany, the transformation of the automotive sector is to be supported in order to achieve the climate goals in the transport sector and to maintain and promote jobs and value creation domestically. This transformation includes enabling new technologies as drivers of new mobility concepts.

To this end, the Regulation on the Approval and Operation of Motor Vehicles with Autonomous Driving Function in Defined Operating Areas (AFGBV), which entered into force on 1 July 2022, has completed the legal framework of the Act on Autonomous Driving, which entered into force on 28 July 2021. At present, however, many possibilities that the AFGBV open up for the participation of vehicles with autonomous driving functions in public road traffic are not being fully utilised due to existing technological hurdles. It is therefore necessary to pave the way for the regular operation of motor vehicles with autonomous driving functions through alternative technologies.

Remote control of motor vehicles is an alternative technology that can open the way for Germany to innovative automotive technology. For example, if an autonomous vehicle reaches the limit of its operating area, the driving task could be taken over by a remote-controlling natural person. However, the provisions of the AFGBV cannot be applied to the remote steering of a motor vehicle, as they assume that the driving task is managed by a driverless system in accordance with level 4 of the categorisation according to SAE J3016.

In contrast to autonomous driving and thus similar to the conventional driving of a motor vehicle, the driving task in a motor vehicle with a remotely controlled driving function is carried out in an approved operating area by a human driver – who is no longer physically in the vehicle, but outside the vehicle at a control station.

In addition, the use of remote-controlled motor vehicles will enable further new mobility concepts in the future. For example, car-sharing vehicles could be used more efficiently or remote-controlled taxis could be deployed. Various uses in public transport within municipalities are also conceivable. There, various passenger transport needs could be met with smaller and larger remote-controlled motor vehicles. In the municipal area, there are also opportunities for service and supply trips. Another important area of application is in logistics and freight transport.

B. Solution

Systematically based on the existing legal regime for autonomous driving, this Regulation establishes a legal framework for the temporary testing of vehicles with remote-controlled driving functions. In a trial period of five years, which can be extended once for a further five years, findings are to be collected to further develop the applicable legal standards.

Notified in accordance with Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services (OJ L 241, 17.9.2015, p. 1).

E. Compliance costs

E.1 Compliance costs for individuals

There are no compliance costs for individuals. This is based on the assumption that citizens will not be holders of remote-controlled motor vehicles for the trial period.

E.2 Compliance costs for businesses

The compliance costs for logistics providers and rental car operators as commercial owners amount to a total of approximately EUR 2,767,000 per year. According to the current state of knowledge, it is not possible to identify a one-off compliance expense.

Of which administrative costs arising from obligations to provide information

The administrative costs for information obligations amount to a total of approximately EUR 417,000 per year. The administrative costs are included in the compliance costs.

E.3 Compliance costs for the authorities

The compliance costs for the administration amount to a total of approximately 388,000 euros per year. According to the current state of knowledge, it is not possible to identify a one-off compliance expense. The sum of the annual compliance costs results from compliance costs for the various groups of standard addressees and is composed as follows:

– Compliance costs for the federal government amounting to around EUR 150,000 per year.

– Compliance costs for the Länder, including municipalities, amounting to approximately EUR 237,000 per year.

F. Further costs

There are no additional costs for the economy and social security systems. No impact is anticipated on unit prices or price levels, in particular on consumer price levels.

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of [date]

On the basis of Section 6(1), Sentence 1, Number 18, in conjunction with (3) Number 6, and (7) Sentence 1, Number 2, and Sentence 2 of the Road Traffic Act (Straßenverkehrsgesetz

), in the version published on 5 March 2003 (Federal Law Gazette I p. 310, 919), as recast by Article 1(6) of the Act of 12 July 2021 (Federal Law Gazette I p. 3091), in conjunction with Section 1(2) of the Responsibilities Adjustment Act of 16 August 2002 (Federal Law Gazette I p. 3165), and the Organisational Decree of 8 December 2021 (Federal Law Gazette I p. 5176), the Federal Ministry of Digital Affairs and Transport, after consulting the supreme Land authorities, orders:

Article 1

Road Traffic Remote Control Regulation – StVFernLV

Section 1

Subject matter covered by the Regulation

(1) This Regulation lays down the conditions under which motor vehicles of categories M and N, as defined in Regulation (EU) 2018/858 of the European Parliament and of the Council of 30 May 2018 on the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles, amending Regulations (EC) No 715/2007 and (EC) No 595/2009 and repealing Directive 2007/46/EC (OJ L 151, 14.6.2018, p. 1, L 210, 11.8.2022, p. 19), as last amended by Delegated Regulation (EU) 2022/2236 (OJ L 296, 16.11.2022, p. 1), may participate remotely in public road traffic, notwithstanding the provisions of the Road Traffic Act, the Vehicle Registration Regulation, the Road Traffic Licensing Regulations, and the Driver’s License Regulation.

(2) Insofar as this Regulation does not determine the competence of the Federal Motor Transport Authority (Kraftfahrt-Bundesamt), the competent authority shall be the authority competent under state law.

(3) The provisions of Regulation (EU) 2018/858 shall remain unaffected.

(4) The provisions of Sections 1a to 1k of the Road Traffic Act shall remain unaffected.

Section 2

Definitions

(5) A motor vehicle with a remote-controlled driving function (remote-controlled motor vehicle) is a motor vehicle that is steered by means of technical equipment for remote control by a person who is outside the motor vehicle.

(6) The technical equipment for remote control consists of the control centre and the components and systems within the motor vehicle that enable the motor vehicle to be guided by a person remotely controlling it from outside the motor vehicle.

(7) The control station is the set of components and systems located outside the motor vehicle which enables the remote-controlling person to drive the motor vehicle.

(8) The overall system for remote control consists of the technical equipment for remote control and the motor vehicle equipped with it, for which the technical equipment for remote control is intended.

(9) Remote steering is the driving of a motor vehicle within the meaning of the Road Traffic Act by a natural person outside the motor vehicle by means of technical equipment for remote steering. The person remotely operating the motor vehicle is considered the driver within the meaning of the Road Traffic Act, as long as they are executing or required to execute the control of the motor vehicle.

(10) The operating area permit is the permit by which the competent authority designates an approved operating area for remote control.

(11) An approved operating area for remote control means the locally and spatially defined public road space in which a remotely controlled motor vehicle may be operated on the basis of an operating area permit.

(12) The travel delay is the distance, measured in metres, travelled by the remote-controlled motor vehicle without control by the remote-controlling person due to the latency of data transmission between the remote-controlled motor vehicle and the control centre.

(13) A low-risk condition of a remotely steered motor vehicle is a state of standstill into which the remotely steered motor vehicle, on its own initiative or triggered by the person driving the motor vehicle remotely, moves to the safest possible place and activates the hazard warning lights, with due regard for the traffic situation and the greatest possible safety for the vehicle occupants, other road users and third parties. The transfer to the minimum risk state can be carried out by the technical equipment for remote control by means of driving functions whose degree of automation is below the requirements of Section 1a(2) of the Road Traffic Act.

Section 3

Operation of a remotely operated motor vehicle

The operation of a remote-controlled motor vehicle shall be permitted if

1. the motor vehicle has been granted an operating licence by the Federal Motor Transport Authority pursuant to Section 4,

2. there is no reason for revoking the operating licence pursuant to Section 6,

3. the motor vehicle is remotely steered in accordance with its intended purpose in an operating area approved in accordance with Section 7 for remote steering,

4. there is no reason for a revocation of the operating area permit pursuant to Section 9,

5. the remote-controlling person meets the requirements of Section 10,

6. the remote-steering technical equipment and the remote-steering person are physically located in the national territory,

7. the motor vehicle is registered to participate in public road traffic pursuant to Section 14, and

8. neither the safety and fluidity of road traffic are compromised nor the life and limb of persons are endangered.

Section 4

Operating licence for a remote-controlled motor vehicle

(14) The holder must apply to the Federal Motor Transport Authority for the operating licence of the remote-controlled motor vehicle. The operating licence shall be granted if

1. the complete remote control system complies with the requirements set out in Annex 1;

2. one of the following approvals or permits has been granted to the motor vehicle, without prejudice to the installation of the technical equipment for remote control:

   a) an EU type-approval in accordance with the requirements of Regulation (EU) 2018/858,

   b) a general operating licence for types in accordance with the provisions of the Road Traffic Licensing Regulations or

   c) operating licence for individual vehicles in accordance with the provisions of the Road Traffic Licensing Regulations.

3. the motor vehicle does not deviate from the requirements necessary for road safety set out in the European legal acts and UN regulations referred to in Annex II to Regulation (EU) No 2018/858 or from the construction and operating rules of the Road Traffic Licensing Regulations after the installation of the technical equipment for remote steering;

4. the holder attaches to the application proof of compliance with the requirements set out in Numbers 2 and 3,

5. the holder attaches to the application a functional safety concept for the complete remote control system in accordance with Number 1.1 of Annex 1;

6. the holder attaches to the application repair and maintenance information for the complete remote control system in accordance with Number 1.2 of Annex 1,

7. the holder attaches to the application an information technology security policy in accordance with Number 3.9 of Annex 1; and

8. The holder undertakes, in agreement with the manufacturer of the remote-control technical equipment, to evaluate the operation of the remote-controlled motor vehicle in a research project pursuant to (8).

(15) The operating licence must be applied individually for each remote-controlled motor vehicle.

(16) The Federal Motor Transport Authority may request further information from the holder in addition to the documents referred to in (1) Sentence 2 Number 4, insofar as this is necessary for the granting of the permit.

(17) The operating licence shall be granted individually for each remote-controlled motor vehicle. The operating licence of a remote-controlled motor vehicle may at any time be supplemented by ancillary provisions to ensure the safe operation of the remote-controlled motor vehicle and compliance with the provisions of this Regulation.

(18) The Federal Motor Transport Authority may commission an officially recognised expert for motor vehicle traffic or a technical service with full vehicle authority of the respective vehicle categories to examine the requirements in accordance with Annex 1 and use the findings resulting from this examination in the context of the granting of operating licence for a remote-controlled motor vehicle.

(19) Before granting the operating licence, the Federal Motor Transport Authority shall check whether the requirements set out in (1) are met. The Federal Motor Transport Authority may, at any time after the operating licence has been granted, verify with the holder or have it verified by the bodies referred to in (5) whether the conditions for the operating licence of a remote-controlled motor vehicle continue to exist and whether the obligations associated with this operating licence are fulfilled. The test results pursuant to sentence 2 shall be documented in an expert opinion.

(20) Changes to the overall remote-control system made after the issuance of an operating licence for a remote-controlled motor vehicle require approval from the Federal Motor Transport Authority before they can be used on public roads.

(21) After the operating licence has been granted, the holder must evaluate the following in a scientifically independent research project in a non-personal form:

1. the impact of the operation of the remote-controlled motor vehicle on the safety and fluidity of road traffic;

2. the impact of the requirements laid down in this Regulation on the use and operation of the remote-controlled motor vehicle, and

3. the impact of the operation of the remote-controlled motor vehicle on the remote-controlling person.

The result of the research project must be presented in writing in a final report in accordance with the recognised rules of science. The final report shall evaluate the impact of the operation of a remote-controlled motor vehicle on the safety and fluidity of road traffic and on the remote-controlling person and assess the appropriateness of the requirements of this Regulation. The final report is 36. Months after the approval of the remote-controlled motor vehicle, it must be submitted to the Federal Motor Transport Authority, the Federal Highway and Transport Authority, and the Land authority responsible for approving the operating area. The holder shall submit annual interim reports on the effects pursuant to Sentence 1 and Sentence 3 to the bodies referred to in Sentence 4.

Section 5

Market monitoring

(22) The Federal Motor Transport Authority shall carry out the tasks of market surveillance with regard to remote-controlled motor vehicles which have been granted operating licence in accordance with this Regulation.

(23) The Federal Motor Transport Authority shall carry out regular checks in order to verify that

1. whether the radio-controlled motor vehicles in circulation comply with the requirements of this Regulation and

2. whether the remotely controlled motor vehicles in circulation pose risks to health, safety, the environment, or other legal interests worthy of protection in the public interest.

(24) The Federal Motor Transport Authority shall involve the Federal Office for Information Security in the assessment of the information technology security of remote-controlled motor vehicles.

(25) The Federal Motor Transport Authority shall take the necessary measures to safeguard road safety, in particular, the preparation of a revocation of the operating licence pursuant to Section 6, if it has reasonable grounds to suspect that a remote-controlled motor vehicle does not meet the requirements of this Regulation.

(26) The holder is obliged to

(27) support the Federal Motor Transport Authority in carrying out market surveillance; and

(28) to make available to the Federal Motor Transport Authority, upon request, the documents and information required for market surveillance and other technical specifications free of charge, whereby the holder must also provide access to software and algorithms on request.

Section 6

Revocation of the operating licence of a remote-controlled motor vehicle

(29) The Federal Motor Transport Authority shall revoke the operating licence granted pursuant to Section 4(1) for a remote-controlled motor vehicle if

1. the complete remote control system no longer meets the requirements of Annex 1;

2. the entire system for remote control has been modified without authorisation;

3. the holder does not fulfil or no longer fulfils ancillary provisions pursuant to Section 4(4),

4. the holder does not carry out or no longer carries out the research project pursuant to Section 4(1) Number 8 in conjunction with Section 4(8),

5. the holder withholds data or technical specifications that are essential for the decision of the Federal Motor Transport Authority on granting or revoking the operating licence or provides false information about them, or

6. the safety and ease of road traffic may be affected by the operation of the remote-controlled vehicle, or a risk to the life or limb of persons cannot be ruled out.

(30) If there is a reasonable assumption that a condition pursuant to (1) exists for the revocation, the Federal Motor Transport Authority may, without prejudice to the authority pursuant to Section 5(4) Sentence 2, order appropriate measures that are useful for further clarification, in particular the provision of documents or the presentation of the remotely controlled motor vehicle to the Federal Motor Transport Authority or to a body referred to in Section 4(5). Until the review of the reasons for revocation is completed, the Federal Motor Transport Authority can order the suspension of the operating license.

(31) If the operating licence granted pursuant to Section 4(1) has been revoked or is suspended on the basis of an order pursuant to (2) Sentence 2, the remote-controlled motor vehicle may not be operated in public street space.

(32) If the remote-controlled motor vehicle has been granted an operating area permit pursuant to Section 7(2), the Federal Motor Transport Authority shall immediately inform the competent authority pursuant to Section 7(1) of the revocation of the operating licence granted pursuant to Section 4(1) for the remote-controlled vehicle.

(33) This is without prejudice to Section 48 and Section 49 of the Administrative Procedures Act.

Section 7

Operating area permit for a remote-controlled motor vehicle

(34) The operating range of a remote-controlled motor vehicle shall require the operating area permit of the competent authority.

(35) The operating area permit is to be granted if

1. an operating licence for the remote-controlled motor vehicle concerned in accordance with Section 4(1) is present,

2. the operating area according to Annex 2, Number 2 is suitable,

3. there is a sufficient number of remote operators available for the operation of the remote-controlled motor vehicle concerned who meet the requirements laid down in Section 10,

4. the manufacturer of the technical equipment for remote control has fulfilled the obligations laid down in Section 11, and

5. the holder guarantees the fulfilment of the obligations under Section 12.

Unforeseeable circumstances, for example as a result of force majeure, shall not be taken into account when determining the suitability of the area of operation referred to in (2) Number 2. Before granting the operating area permit, the consent of the respective road construction authorities as well as the consent of the competent road traffic authorities must be obtained.

(36) Ancillary provisions may be added to the operating area permit at any time, insofar as this is necessary to ensure compliance with the conditions referred to in (2). In particular, a safety driver may be mandated, and the operating area permit may be combined with a temporary ban on the transport of passengers or goods.

(37) The license for the operating area is granted subject to the rights of others. The operating area permit shall not entitle the holder to the availability of the operating area or to the factual circumstances underlying the operating area permit remaining unchanged.

(38) The competent authority may commission one of the bodies referred to in Section 4(5) to carry out an assessment of an operational area in accordance with (2) Number 2. The competent authority may require the holder to submit, at their own expense, an opinion from one of the bodies referred to in Section 4(5) on the fulfilment of the conditions referred to in (2) Number 2.

(39) The competent authority shall immediately inform the Federal Motor Transport Authority of the issuance of an operating area permit.

Section 8

Application for an operating area permit for a remote-controlled motor vehicle

(40) The granting of approval for the operating area requires an application from the operator to the relevant authority.

(41) The application must include:

1. the description of the operating area in accordance with Number 1 of Annex 2,

2. operating licence of the remote-controlled motor vehicle concerned in accordance with Section 4 (1),

3. the declaration of the holder, in agreement with the manufacturer of the technical equipment for remote control, to evaluate the operation of the remote-controlled motor vehicle in a research project pursuant to Section 4(8),

4. the designation of the remote-controlling persons employed by him,

5. the Template

   a) proof of a currently valid employment contract with the respective person tasked with remote control who is employed by him,

   an official record of the date and place of birth of the remote-controlling person employed by him,

   c) an official document (valid driving licence) proving that the remote-controlling person employed by him/her has held an EU, EEA or Swiss driving licence for the driving licence category corresponding to the remote-controlled motor vehicle for at least three consecutive years,

   d) proof of the training of the respective remote-controlling person employed by him in accordance with Section 10(3), Sentence 2, and

   e) proof of the consent of the respective person tasked with remote control who is employed by him for the submission of the aforementioned proofs concerning them by the holder to the competent authority;

6. the confirmation by the holder that the respective remote-controlling persons employed by him otherwise meet the requirements pursuant to Section 10,

7. the designation of its business and operational premises and its consent that the police authorities of the Länder and public prosecutors' offices of the Länder may enter its business and operational premises, including the premises in which the control centre for the remotely controlled motor vehicle is located, without being asked to carry out traffic checks and prosecute traffic offences, including, where appropriate, the consent of third parties to enter those premises,

8. proof that the holder is in possession of the documents referred to in Section 11(1); and

9. a statement, together with documentation, that the holder is in a position to fulfil the obligations of Section 12.

(42) The competent authority may also request further information from the holder to the extent necessary for the granting of the operating area permit.

(43) Subsequent changes with regard to the requirements pursuant to (2), Section 7(2) or Section 10(2) shall be notified immediately by the holder to the competent authority.

Section 9

Withdrawal of the operating area permit for a remote-controlled motor vehicle

(44) The competent authority shall revoke the operating area permit granted pursuant to Section 7(2) for the respective remote-controlled motor vehicle if it becomes aware that

1. the conditions laid down in Section 7(2) are not or are no longer met,

2. ancillary provisions pursuant to Section 7(3) are not or no longer fulfilled,

3. the remote-controlled motor vehicle is used outside the operating area on public roads;

4. there is not a sufficient number of remote-controlling persons available who meet the requirements pursuant to Section 10;

5. a person is employed who does not meet or no longer meets the requirements pursuant to Section 10,

6. the holder does not or no longer fulfil the obligations under Section 12,

7. the operation of the remote-controlled motor vehicle may adversely affect the safety and fluidity of road traffic; or

8. a risk to the life or limb of persons cannot be ruled out, which goes beyond the general risk of being adversely affected by local road traffic for the area of operation applied for.

(45) If the requirements of Annex 2 are temporarily not met and the owner does not prove that safe operation of the remote-controlled motor vehicle is still ensured, the competent authority may order the suspension of an operating area permit granted in accordance with Section 7(2).

(46) If the operating area permit granted pursuant to Section 7(2) has been revoked pursuant to (1) or is suspended on the basis of an order pursuant to (2), the remote-controlled motor vehicle may not be operated in public street space.

(47) The competent authority shall immediately inform the Federal Motor Transport Authority of the revocation of an operating area permit.

(48) The provisions of state law corresponding to Sections 48 and 49 of the Administrative Procedure Act shall remain unaffected.

Section 10

Requirements for the remote-controlling person and related security obligations of the holder

(49) The holder shall ensure and document accordingly that he has at his disposal a sufficient number of remote operators for the operation of a remote-controlled motor vehicle who meet the requirements for remote operation of motor vehicles pursuant to (2). This shall be without prejudice to the powers of the competent authority pursuant to Section 3(1) and (2) of the Driving Licence Regulation.

(50) The requirements for the remote control of motor vehicles shall be fulfilled by any person who

1. is employed in the context of an employment relationship with the holder referred to in (1);

2. has reached the age of 21,

3. holds an EU, EEA, or Swiss driving licence for the category corresponding to the remote-controlled motor vehicle for at least three consecutive years; and

4. is capable of driving a motor vehicle remotely and is physically, mentally, and morally suitable.

(51) The remote-controlling person shall be qualified to remotely operate a motor vehicle within the meaning of (4) Number 2 if they have successfully completed training for that remotely operated motor vehicle by the holder, which imparts at least the following content and skills:

1. Awareness of the safety of other road users, including by adopting perspectives,

2. Awareness of the safety and comfort of the vehicle occupants, including through perspective-taking;

3. Remote control operation: legal bases, technology, process, takeover and return of vehicle control, participants and roles, organisation, directives and regulations, use cases, operating areas and conditions,

4. Control room: Components, technology, operation, login, integration into control center,

5. Latency: Causes, consequences, compensation by the remote-controlling person,

6. Communication interface and video transmission: technical background, possible errors,

7. Virtuality: sensor information and video presentation, cyber sickness, immersion and presence,

8. Challenges arising from human influences and how to deal with them: Workload, situational awareness, consequences for driving safety,

9. Communication with other operational staff, vehicle occupants, other road users, and the police;

10. remote control and driving in different traffic environments and under different environmental conditions, in particular brightness, weather conditions, traffic density, depending on the actual deployment scenarios of the remote-controlling person, and

11. Safety inspections of the remote-controlled motor vehicle before departure, during the journey, and after the vehicle has been parked.

(52) The training referred to in (3) shall not be completed until the remote-controlling person has demonstrated their ability to drive a motor vehicle safely, responsibly, and in an environmentally sound manner. The training and the completion of the training shall be documented.

(53) The remote-controlling person is physically and mentally qualified to remotely operate a motor vehicle within the meaning of (4) Number 2 if they meet the physical and mental fitness requirements of the Driving Licence Regulation applicable to obtaining a driving licence for passenger transport and is neither severely hearing impaired on one or both sides (hearing loss of 60 % or more) nor deaf on one or both sides. The visual inspection shall also cover whether the remote-controlling person is able to recognise the information relevant to remote-controlling on the screen of the control centre. In addition, there must be no facts that justify the assumption of "cyber-disease" of the remote-controlling person.

(54) The remote-controlling person is suitable in terms of character within the meaning of (2), Number 4, if they have not significantly or repeatedly violated traffic regulations or criminal laws and they offer the guarantee that they meet the special responsibility for remote-controlling a motor vehicle. The remote-controlling person is in any case deemed unfit to remotely operate a motor vehicle if they have more than three points in the driving suitability register.

(55) The remote-controlling person must immediately inform the owner of the motor vehicle and the competent authority pursuant to Section 3 of the Driving Licence Regulation if and as soon as they are charged with more than three points in the driving suitability register. It must also inform the owner of the motor vehicle immediately if the competent authority has withdrawn the driving licence for the category corresponding to the remote-controlled motor vehicle, or if it has been prohibited from remotely operating a motor vehicle pursuant to Section 3 of the Driving Licence Regulation, or if conditions or requirements have been imposed.

(56) Without prejudice to the provision in Section 8(2) Numbers 5 and 6, the holder shall, on request, provide the competent authority responsible for approving the operating area with the corresponding documentation, including the evidence provided to him by the respective remote-controlling person in accordance with (2).

(57) The owner must regularly verify the operational safety of the remote-controlling person by accompanying, recording, or otherwise monitoring journeys or test drives on a driving simulator. In the event of technical or operational changes, the owner must train the remote-controlling person.

(58) The holder shall immediately inform the competent authority of the date of termination of the employment relationship of the remote control person with the holder.

(59) The owner may not employ the remote-controlling person if they do not meet the requirements for suitability, competence, or reliability, or if they have been prohibited from

remote operation by the competent authority pursuant to Section 3(1) of the Driving Licence Regulation. Any restrictions or requirements necessary or imposed by the competent authority shall be observed.

(60) The driver must comply with the traffic regulations. It shall not operate any other remote-controlled motor vehicle simultaneously during remote control.

Section 11

Obligations of the manufacturer of the technical equipment for remote control

(61) The manufacturer of the technical equipment for remote control shall

1. develop a safety concept for functional safety for the entire system for remote control in accordance with Number 1.1 of Annex 1;

2. create repair and maintenance information for the complete remote control system in accordance with Number 1.2 of Annex 1;

3. establish a concept for information technology security in accordance with Number 3.9 of Annex 1; and

4. draw up a security concept for data processing pursuant to Section 13 that complies with Articles 24, 25 and 32 of Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (OJ L 119, 4.5.2016, p. 1; L 314, 22.11.2016, p. 72; L 127, 23.5.2018, p. 2; corresponds to L 74 of 4.3.2021 p. 35) and includes a data protection impact assessment pursuant to Article 35 of Regulation (EU) 2016/679.

(62) The manufacturer of the technical equipment for remote control shall make the documents referred to in Numbers 1 to 4 of (1) available to the holder.

Section 12

Obligations of the holder

(63) The owner is obliged to maintain the road safety and environmental compatibility of the remote-controlled motor vehicle and must take the necessary precautions for this purpose. He must

1. ensure regular maintenance of the complete remote control system, in particular, he must

   a) ensure that instructions for the proper performance of repairs and maintenance are followed; and

   b) draw up and sign reports on the execution of repair and maintenance work without delay;

2. ensure that the remote-controlling person, during the remote operation of a remotely operated motor vehicle

   a) does not simultaneously operate another remote-controlled motor vehicle,

b) comply with the applicable rules on driving and rest periods; and

c) does not transport dangerous goods within the meaning of the Dangerous Goods Transport Act,

3. to take steps to ensure that the other traffic regulations not addressed to vehicle operation are complied with.

(64) The document management for the instructions pursuant to (1), Sentence 2, Number 2 must comply with the state of the art. The state-of-the-art requirement is presumed if the requirements of ISO 9001:2015-09 Quality Management Systems – Fundamentals and Vocabulary are met. In addition, document management shall comply with Articles 24, 25 and 32 of Regulation (EU) 2016/679.

(65) The holder shall ensure that an extended departure control is carried out daily before the start of operation of the remote-controlled motor vehicle. The extended departure control consists of

1. a visual inspection of the braking system, the steering system, the lighting system, the tyres and wheels, and the chassis,

2. a visual inspection of the tell-tales for safety-relevant electronically controlled vehicle systems and the sensors for recording external and internal parameters,

3. a test of the mechanical vehicle systems for active and passive safety,

4. Examination of image-receiving facilities and

5. function test of the audio transmission.

(66) The owner shall arrange for a main inspection of the remote-controlled motor vehicle in accordance with Annex VIII in conjunction with Annex VIIIa of the Road Traffic Licensing Regulations. By way of derogation from Section 29(1) in conjunction with Number 2 of Annex VIII to the Road Traffic Licensing Regulations, the period for the general inspection shall be six months from the date of registration of the remote-controlled motor vehicle.

Section 13

Data processing

(67) The holder is obliged to store the data required by Annex 3 during remotely controlled operation.

(68) At the request of the bodies referred to in Numbers 1 to 4, the holder shall be obliged to transmit the data referred to in (1), insofar as this is necessary for their respective performance of tasks, to

1. the Federal Motor Transport Authority for the performance of its tasks pursuant to Sections 4 to 6,

2. the competent authority for the performance of its tasks in accordance with Sections 7 to 9,

3. the authorities responsible under state law for the prevention, prosecution or sanctioning of traffic violations, or

4. Third parties for the assertion, satisfaction, or defence of legal claims in connection with an event referred to in Section 7(1) of the Road Traffic Act in which the remote-controlled motor vehicle was involved.

(69) The manufacturer of the technical equipment for remote control shall equip the equipment in such a way that the holder is able to store the data referred to in (1). The manufacturer must inform the holder precisely, clearly, and in an intelligible manner about the privacy settings and the processing of data during the remote operation of the motor vehicle. The relevant software of the remote-controlled motor vehicle shall provide for choices as to the method of storage and transmission of the processed data and shall enable the holder to make appropriate adjustments. Overall, the technical equipment for remote control shall be designed in such a way that the data generated can be processed in a manner that complies with Articles 24, 25 and 32 of Regulation (EU) 2016/679.

(70) The Federal Motor Transport Authority is entitled to collect, store, use, or otherwise process the data in accordance with Annex 3 from the owner, insofar as this is necessary for monitoring the safe operation of the remote-controlled motor vehicle.

(71) The Federal Motor Transport Authority is entitled to make the non-personal data collected from the holder in accordance with Annex 3 accessible to the following bodies for transport-related public interest purposes, in particular for the purpose of scientific research in the field of digitisation, automation and networking, as well as for the purpose of accident research in road traffic:

1. colleges and universities,

2. non-university research institutions,

3. Federal, regional, and local authorities with research, development, transport planning, or urban planning tasks.

The authorities referred to in sentence 1 may use the data exclusively for the purposes referred to in sentence 1.

(72) The holder and the Federal Motor Transport Authority shall store data pursuant to (5) for the entire period of the research project and from the date of its termination until the expiry of twelve months, and then delete them immediately.

Section 14

Requirements for the application of the Vehicle Registration Regulation

(73) For the registration of a remote-controlled motor vehicle for public road use in an approved operating area, the Vehicle Registration Regulation shall apply in accordance with the following paragraphs.

(74) The registration of a remote-controlled motor vehicle shall be granted if, in addition to the requirements set out in the Sentence 2 of Section 3(1) of the Vehicle Registration Regulation

1. there is a valid operating licence for the remote-controlled motor vehicle in accordance with Section 4(1), and

2. there is a valid operating area permit in accordance with Section 7(2).

(75) With the application for the registration of a remote-controlled motor vehicle pursuant to Section 6 of the Vehicle Registration Regulation, the operating licence for a remote-controlled motor vehicle pursuant to Section 4(1) and the operating area permit pursuant to Section 7(2) must be submitted. Section 3 (3) and (4) of the Vehicle Registration Regulation shall not apply.

(76) The approval of the remote-controlled motor vehicle shall be restricted to the approved operating area. This restriction must be entered in the Part I registration certificate in accordance with Section 13 of the Vehicle Registration Regulation by indicating the operating area permit, the issuing authority, and the date of issue. The registration certificate Part I shall also include the operating licence for a remote-controlled motor vehicle pursuant to Section 4(1) with the date of issue by the Federal Motor Transport Authority, as well as further information on the technical equipment for remote control.

(77) By way of derogation from Section 13(6) of the Vehicle Registration Regulation, it is sufficient if the registration certificate Part I is kept and made available to authorised persons for examination upon request.

(78) For a transfer to a new holder pursuant to Section 15(5) Sentence 4, of the Vehicle Registration Regulation or for a re-registration pursuant to Section 16(2) Sentence 1, of the Vehicle Registration Regulation, the holder must also submit the operating area permit pursuant to Section 7(2).

(79) The procedures set out in Section 3 Subsection 3 of the Vehicle Registration Regulation shall not apply.

(80) The approval authority shall immediately notify the competent authority which granted the operating area permit of any registration, re-registration, transfer, or decommissioning of a remote-controlled motor vehicle.

(81) If an approved remote-controlled motor vehicle no longer has an operating area permit pursuant to Section 7(2), the holder shall immediately have the remote-controlled motor vehicle decommissioned in accordance with Section 16(1) of the Vehicle Registration Regulation, also in conjunction with Section 24 of the Vehicle Registration Regulation.

Section 15

Exemptions

The Bundeswehr, the police, the Federal Police, the fire brigade, the Federal Agency for Technical Relief, the Federal Office for Civil Protection and Disaster Relief, and the other units and institutions of civil and disaster protection, as well as the customs administration, shall be exempt from the provisions of this Regulation insofar as this is necessary for the performance of governmental tasks with due regard to public security and order.

Annex 1

(on Section 4(1) Number 1, Section 6(1) Number 1, Section 11(1) Numbers 1 to 3)

Technical requirements for the entire remote control system

1 Technical requirements and functional safety

1.1 The complete remote control system must meet the requirements set out in Numbers 2 to 4. The safe functioning shall be demonstrated in a safety concept in accordance with ISO 26262:2018 Road vehicles – Functional safety and ISO 21448:2022-01 Road vehicles – Safety of the intended function. In particular, the demonstration shall include measures to minimise the risks arising from latencies in the transmission of data between the remotely controlled motor vehicle and the control centre. It is also necessary to set out the measures taken to comply with the provisions of the Road Traffic Regulations (Straßenverkehrs-Ordnung), which are linked to the physical presence of a driver in the motor vehicle.

1.2 The repair and maintenance information must include instructions on how to maintain the overall system in a safe and functioning condition.

2 Data transmission and travel delay

The data transmission between the remote-controlled motor vehicle and the control room must be designed with a focus on low latency, high availability, high reliability, high robustness, and low error rates. Provision should be made for functional redundancies with regard to data transmission. Appropriate transmission of image signals, audio signals and control signals from the terminal in the direction of the telecommunications network and from the telecommunications network in the direction of the terminal shall be ensured.

2.1 Transmission of image signals

2.1.1 For the transmission of the visual representation of the environment of the remotely controlled motor vehicle, a certain latency time must be observed. This latency time is the period that elapses between the capture of the image and its complete display on the output screen of the control room. This latency time is subsequently referred to as glass-to-glass latency ($t_{LatenzGlasZuGlas}$).

2.1.2 The glass-to-glass latency ($t_{LatenzGlasZuGlas}$) shall not exceed a value of 0.2 seconds minus control command latency (Number 2.2).

$$t_{LatenzGlasZuGlas} \leq 0{,}2\,Sekunden - t_{LatenzSteuerbefehl}$$

LatenzGlasZuGlas	*LatencyGlassToGlass*
Sekunden	*Seconds*
LatenzSteuerbefehl	*Latency Control Command*

2.2 Transmission of control commands

2.2.1 A certain latency period must be observed for the transmission of control commands from the control centre to the remotely controlled motor vehicle. This latency time is the

time elapsed between the signal output of a control element at the control station and the input of the corresponding control command at the actuators controlled in the remotely controlled motor vehicle. This latency time is subsequently referred to as control command latency ($t_{LatenzSteuerbefehl}$).

2.2.2 The control command latency ($t_{LatenzSteuerbefehl}$) must not exceed a value of 0.2 seconds minus the value for glass-to-glass latency ($t_{LatenzGlasZuGlas}$ ¿).

$t_{LatenzSteuerbefehl} \leq 0{,}2\,Sekunden - t_{LatenzGlasZuGlas}$

LatenzGlasZuGlas	*LatencyGlassToGlass*
Sekunden	*Seconds*
LatenzSteuerbefehl	*Latency Control Command*

2.3 Transmission of audio signals

2.3.1 A specific latency period must be observed for the transmission of noise from the surroundings of the remotely controlled motor vehicle. This latency time is the time elapsed between the activation of the noise recording sensor in the remotely controlled motor vehicle and the output from the output actuator in the control centre. This latency time is subsequently referred to as audio latency ($t_{LatenzAudio}$).

2.3.2 The audio latency ($t_{LatenzAudio}$) must not exceed the value of the maximum glass-to-glass latency ($t_{LatenzGlasZuGlas}$ ¿).

$t_{LatenzAudio} \leq t_{LatenzGlasZuGlas}$

LatenzGlasZuGlas	*LatencyGlassToGlass*
LatenzAudio	*LatencyAudio*

2.4 Transmission of system signals

2.4.1 For the transmission of system signals from the remote-controlled motor vehicle to the control station and from the control station to the remote-controlled motor vehicle, a certain latency time must be observed. This latency time is the period that elapses between the output of the signal data by the control room systems or motor vehicle systems and the complete reception of the signal data by the motor vehicle systems or control room systems. This latency is subsequently referred to as signal latency ($t_{LatenzSignal}$).

2.4.2 For signals that directly assist the remote control person in performing the dynamic driving task, the value of the signal latency ($t_{LatenzSignal}$) must not exceed 0.2 seconds.

$t_{LatenzSignal} \leq 0{,}2\,Sekunden$

LatenzSignal	*Latency signal*
Sekunden	*Seconds*

2.4.3 Signals supporting the remote control person directly in the execution of the dynamic driving task include warnings from driver assistance systems and other signals and warnings relevant to the safe execution of the dynamic driving task, in particular warnings relating to the braking system or indications of the risk of ground frost.

2.5 Risk minimisation measures

2.5.1 The holder shall take measures to assist the remote-controlling person in minimising the security risks posed by latencies in data transmission. The remote-controlling person shall be provided with at least the following information at the control centre:

the stopping distance, divided into reaction distance, braking distance, and the travel delay caused by the sum of the latency times of the control commands and the image signals;

the lane and trajectory of the remote-controlled motor vehicle;

the currently measured sum of glass-to-glass latency and control command latency; and

where applicable, the adjusted speed referred to in Number 2.6.

2.5.2 The remote-controlling person shall be informed by an acoustic signal at the control centre that the sum of glass-to-glass latency and control command latency has exceeded 0.2 seconds.

2.6 Travel delay and adjusted speed

2.6.1 Depending on the travel delay, an adjusted speed must be calculated. The travel delay is calculated as the distance covered by the remote-controlled motor vehicle during the period resulting from the sum of glass-to-glass latency and control command latency. The adjusted speed is the actual permissible relative maximum speed for the remotely controlled person in the event of a high travel delay.

2.6.2 If the sum of glass-to-glass latency and control command latency exceeds 0.2 seconds, the current travel delay at the time of exceedance shall be calculated.

2.6.3 The adjusted driving speed is the speed at which the current, increased sum of glass-to-glass latency and control command latency results in the same travel delay as a sum of glass-to-glass latency and control command latency of 0.2 seconds.

2.6.4 Example of calculation: The following adjusted speeds are calculated if the sum of glass-to-glass latency and control command latency exceeds 0.2 seconds by 0.05 seconds:

Speed when exceeded in km/h	Calculated travel delay at latency of 0.2 seconds in m	Resulting adjusted speed at latency of 0.25 seconds in km/h
10	0.56	8
30	1.67	24
50	2.78	40
70	3.89	56
80	4.44	64

3 Further requirements for the complete system for remote control

The following additional requirements must be met by the entire remote control system.

3.1 General safety of the entire remote control system

The complete remote control system shall comply with the safety requirements set out in Letters a to e:

a) The system as a whole must enable the remote-controlling person to comply with the relevant traffic regulations for the management of the vehicle.

All components whose failure directly affects the safe control of the remotely controlled motor vehicle shall be designed in such a way as to minimise the probability of failure of those components and to maximise the availability of those components.

At standstill, the remote-controlled motor vehicle shall independently carry out a complete diagnosis of the systems required for the dynamic driving task.

d) In the event of a malfunction of motor vehicle components or a reduced availability of the data generated by the motor vehicle components, this shall be immediately communicated to the remote-controlling person, or the remote-controlled motor vehicle shall be immediately put into the minimum risk condition.

e) In the deactivated state, the technical equipment for remote control shall have no influence on the control of the motor vehicle. If it is intended for the operation of the motor vehicle that a person in the motor vehicle can take over the control of the motor vehicle by actuating the hand and foot control elements at the driving position, the actuation of the hand and foot control elements at the driving position must deactivate the technical equipment for remote steering.

3.2 Requirements for the start, implementation and termination of remote control

3.2.1 Remote control by the remote control person may only commence if the requirements of Letters a to g are met.

a) A diagnosis of the entire system is completed without safety-related error messages, and the technical equipment is active and functions without errors.

b) The required data connections are demonstrably available and function without errors. The data processing systems referred to in Annex 3 shall be operational.

c) The remote-controlled motor vehicle is verifiably located in the approved operating area or on private premises.

d) The systems at the control station required for remote control are active and function without errors.

e) The remote-controlling person is successfully authenticated and registered in the overall system.

f) The remote-controlling person confirms their readiness for action before taking over the dynamic driving task.

g) The control station systems required to determine driving ability assess the driving ability of the remote-controlling person.

3.2.2 During remote control, the requirements of Letters a to d shall be met:

The start of remote control must be clearly recognisable by a visual and audible signal to the occupants of the remote-controlled motor vehicle. If there are no persons in the motor vehicle, this requirement does not apply.

b) Remote steering must be permanently displayed to occupants of the vehicle. If there are no persons in the motor vehicle, this requirement does not apply.

c) A vehicle occupant information system shall be activated in order to provide such persons with information, such as about a breakdown, failure of remote control technical equipment, or emergency behaviour. If there are no persons in the motor vehicle, this requirement does not apply.

d) The speed of the motor vehicle shall be limited to 80 km/h.

3.2.3 The planned termination of remote control must meet the requirements of Letters a and b:

The termination of remote control must be clearly recognisable to occupants of the vehicle by an audible signal. If there are no persons in the motor vehicle, this requirement does not apply.

b) The permanent termination of remote control must be permanently recognisable to occupants of the vehicle. If there are no persons in the motor vehicle, this requirement does not apply.

3.3 Automated fallback level and minimum risk state

3.3.1 The remote-controlled motor vehicle must be capable of detecting independently:

a) the termination of a data connection that is absolutely necessary for remote control,

b) reaching the limits of the intended operating range and

c) a failure of systems or functions relevant to the dynamic driving task.

d) Near-misses as well as accidents and, in the event of a detected accident, independently reach the minimum risk state.

In the event of an accident, an emergency call system must be activated automatically by the motor vehicle and manually by the control room.

3.3.2 If the remote-controlled motor vehicle detects one of the events referred to in Number 3.3.1, it must be capable of achieving a minimal risk condition independently and without endangering other road users. The transfer to the minimum risk state can be carried out by the technical equipment for remote control by means of driving functions whose levels of automation are below the requirements of Section1a(2) of the Road Traffic Act.

3.3.3 Reaching the minimum risk state shall be reported to the remote control person, provided that the necessary data connections make this possible.

3.3.4 Once the minimum risk condition has been reached, the resumption of remote steering is only permitted once the triggering condition of the minimum risk condition has been identified and eliminated. If it is intended for the operation of the motor vehicle that a person in the motor vehicle can take over the control of the motor vehicle by actuating the hand and foot control elements at the driving position, the actuation of the hand and foot

control elements at the driving position must deactivate the technical equipment for remote steering.

3.5.2 The motor vehicle can exit the minimum risk state by taking over the driving task within the vehicle.

3.4 AEBS

The remote-controlled motor vehicle must be equipped with an emergency braking assistance system. The emergency braking assistance system shall not be functionally identical to the system for achieving a minimum-risk condition. The emergency braking assistance system shall be designed in accordance with the requirements of the regulations applicable to the type-approval of such systems, as amended, in accordance with the Agreement of 20 March 1958 on the adoption of uniform conditions for the approval of equipment and parts of motor vehicles and on the mutual recognition of approval (Federal Law Gazette 1965 II, p. 857, 858), in so far as they are applied by the Federal Republic of Germany. If the emergency braking assistance system is not designed in accordance with the above provisions, the holder shall, when applying for operating licence, demonstrate that the emergency braking assistance system meets equivalent requirements. The holder may commission an officially recognised expert for motor vehicle traffic or a technical service with full vehicle authority for the respective vehicle category to provide proof of equivalence.

3.5 Lane-keeping assistance system

If the remote-controlled motor vehicle is operated on federal motorways, it shall be equipped with a lane-keeping assistance system. The lane-keeping assistance system shall not be functionally identical to the system for achieving a minimum-risk condition. The lane keeping assistance system must be implemented in accordance with the regulations as amended in accordance with the Agreement of 20 March 1958 on the adoption of uniform conditions for the approval of equipment and parts of motor vehicles and on the mutual recognition of approval (Federal Law Gazette 1965 II p. 857, 858), in so far as these are applied by the Federal Republic of Germany.

3.6 Emergency stop switch for vehicle occupants

3.5.1 It shall be possible for the occupants of the vehicle to terminate the remotely controlled journey in a hazardous situation by means of an emergency stop switch. When the emergency stop switch is operated, the remote-controlled motor vehicle shall automatically return to the minimum risk state. The emergency stop switch shall be protected from unintentional operation.

3.7 Emergency stop switch for the remote-controlling person

For the remote-controlling person, it must be possible to terminate the remote control in a hazardous situation via an emergency stop switch. When the emergency stop switch is operated by the remote-controlling person, the remote-controlled motor vehicle shall be in the minimum risk condition.

3.8 Driving position

If it is provided that persons are transported by the motor vehicle during remote control, interference with the remote control from the vehicle shall be prevented by actuating the hand and foot controls. This is not mandatory if it is provided for the operation of the motor vehicle that a person in the motor vehicle can take over the control of the motor vehicle by actuating the hand and foot controls at the driving position.

3.9 Identification of the motor vehicle and emergency contact

The words “Remotely guided motor vehicle” must be clearly displayed on the side window next to the driver’s seat. The note must be written in black letters not less than 3 cm on a white background. In order to enable contact with the remote-controlling person in the event of blocked external doors, an emergency telephone number must be provided under the notice. The telephone number must be written in black letters not less than 1 cm on a white background.

3.10 Information security and authentication

In the field of information technology security, the holder must demonstrate information technology security to the authority responsible for granting the operating licence on the basis of a concept. The concept must include all the technical, organisational, human, and infrastructural components necessary for the operation of the remotely controlled driving function.

3.11 Radio connections

3.11.1 The holder shall provide for sufficiently stable radio connections for remote control. For this purpose, the technical equipment must take into account influences on the radio connections that are beyond the control of the holder, in accordance with the state of the art, for example, through redundancies. Disconnection of radio connections critical for remote control or unauthorised access to these radio links shall trigger the transfer of the remotely controlled motor vehicle to the minimum risk state. The radio connections shall be designed in such a way as to minimise the risk of unauthorised access to the radio links in accordance with the state of the art.

3.11.2 The basis for securing the radio connections is a public key infrastructure, which must be audited and certified according to TR-03145-1. The electronic certificates shall be issued and distributed by a certification authority. The certificate authority shall comply with the requirements of the Technical Directive TR-03145-1 of the Federal Office for Information Security. The verification of the electronic certificates shall be carried out by the issuing body.

3.11.3 The establishment of the radio link and the data transmission shall be secured and encrypted using open standards in accordance with the state of the art. The state of the art requirement applies, for example, to encryption with TLS 1.3, as in the current version of the Technical Directive TR-02102-2 Cryptographic Methods: Recommendations and key lengths[1)] are met. The electronic safety certificates shall be provided for the mutual authentication of the technical equipment within the motor vehicle and the control room.

3.11.4 In addition to the certification bodies referred to in point 3.11.2, essential requirements regarding the cybersecurity of the vehicle itself should also be implemented. In particular, the key storage devices of the vehicles must have an adequate level of protection according to the state of the art. This is to be demonstrated by a vulnerability analysis of appropriate depth through a certificate in accordance with the Common Criteria. In addition, the trust anchors should be securely embedded in the key store so that the verification of the certificate chain used can be carried out in a secure manner. .

4 Requirements for the control room

The control centre shall enable the remote-controlling person to control the motor vehicle remotely. The control centre shall comply with the requirements set out in points (a) to (d):

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1)Official note: Publication on the website of the Federal Office for Information Security

a) The control centre shall provide the remote-controlling person with the information necessary to carry out the dynamic driving task.

b) The control centre shall enable the remote-controlling person to control the remote-controlled motor vehicle by means of suitable hand controls and foot controls in accordance with 4.9.

c) The control room supports the remote-controlling person in the focused and safe execution of their tasks.

d) The control centre shall be stationary during the remote control of motor vehicles.

4.1 Authentication of the remote-controlling person

Before starting remote control, the remote-controlling person must log in and authenticate at the control centre with a personal key. The personal key of the remote control person shall be protected against unauthorised access by appropriate security measures.

4.2 Automatic control room monitoring

4.2.1 The control centre shall be equipped with a device which continuously checks the driving ability of the remote-controlling person. The driving ability of the remote-controlling person is established if

a) the remote-controlling person is present and attentive at the designated location of the control station for executing the control; and

b) before the start of the journey, it was established by an automated test of the breath alcohol concentration of the remote control person that the person is not under the influence of alcohol.

4.2.2 If the presence of the remote-controlling person is not detected, the remote-controlled motor vehicle shall be brought to a minimal risk condition. If the attention of the remote control person is not detected, the remote control person shall first be warned by appropriate measures, in particular signals. If the remote-controlling person does not respond to these measures, the remotely controlled motor vehicle must enter the minimum risk state.

4.2.3 The attention detection shall be carried out in accordance with the requirements for a driver fatigue and attention-decreasing warning system set out in Regulation (EU) 2019/2144.

4.3 Requirements for the pictorial representation of the environment of the remote-controlled motor vehicle

4.3.1 The environment of the remote-controlled motor vehicle must be visually represented by means of suitable screens at the control centre. Video glasses with motion detection may be used. The effects of possible display errors on the safe remote control of the motor vehicle by the remote-controlling person must be minimised according to the state of the art.

4.3.2 The environment of the remote-controlled motor vehicle shall be represented in the first-person perspective by visual ranges which comply with the requirements set out in Numbers 4.4 to 4.7. The representation of the environment must enable a clear classification of both stationary and moving objects and their trajectories at a distance appropriate for the dynamic driving task, even in darkness and poor visibility.

4.4 Direct vision to the front

4.4.1 For motor vehicles of categories M1 and N1, at least one field of vision with angular dimensions of 210 degrees horizontally and 40 degrees vertically shall be provided forwards in the straight direction of travel. The holder shall establish the three-dimensional coordinate system referred to in point 2.3 and the V-points referred to in Number 2.8 of UN Regulation No 125 of the United Nations Economic Commission for Europe (UNECE) — Uniform provisions concerning the approval of motor vehicles with regard to the driver's forward field of vision (OJ L 20, 25.1.2018, p. 16). The visual channel shown may differ from the driver's field of vision as defined in Number 5.1 of UN Regulation No. 125. The visual channel shall be measured from a D-point at the arithmetic centre of a line between the two V-points. From this D-point, the viewing channel shall be opened forward in the straight direction of travel. From a plane parallel to the horizontal plane X-Y, the viewing channel opens by at least 20° in the positive and negative Z direction. From a plane parallel to the vertical plane X-Z, the viewing channel opens by at least 105° in both the positive and negative Y directions.

4.4.2 Starting from the centre of the V-points, the Y-coordinate of the D-point may be centred on the vertical plane X-Z of the remotely controlled motor vehicle. The Z-coordinate of the D-point may be shifted in a positive Z-direction. The X-coordinate of the D-point may be shifted in a negative X-direction up to the windscreen. If the Z or X coordinate is shifted, the vertical angle of the representation in the negative Z direction shall be adjusted so that the visual channel in front of the remotely controlled motor vehicle begins on the road at least at the distance from the motor vehicle that is reached without displacement. In this case, the vertical angle in the positive Z direction shall continue to be at least 20°.

4.4.3 In the visual channel shown, there may only be obstructions caused by A-pillars, dividing strips of fixed or movable pop-up windows and side windows, externally mounted radio antennas, devices for indirect vision covering the indirect field of vision prescribed by law, and windscreen wipers.

4.4.4 Remote-controlled motor vehicles of categories M2, M3, N2 and N3 shall be equipped with start-up information systems. These start-up information systems shall comply with the requirements of UN Regulation No 159 — Uniform provisions concerning the approval of motor vehicles with regard to the start-up information system for the detection of pedestrians and cyclists (OJ L 184, 25.5.2021, p. 62). The application for operating licence of remote-controlled motor vehicles shall demonstrate that the visual channel shown enables the remote-controlling person to control the remote-controlled motor vehicle safely.

4.5 Rear view

For reversing, a field of vision shall be presented in accordance with Number 15.2 of the requirements of UN Regulation No 158 of the United Nations Economic Commission for Europe (UNECE) — Uniform provisions concerning the approval of devices for reversing and of motor vehicles with regard to the perception of vulnerable road users behind the motor vehicle (OJ L 184, 25.5.2021).

4.6 Indirect Vision

4.6.1 The representation of the fields of view of the indirect vision must complement the representation of the direct vision to the front or the rear view.

4.6.2 Fields of vision shall be presented in such a way that the presentation meets the requirements of UN Regulation No 46 of the United Nations Economic Commission for Europe (UNECE) — Uniform provisions concerning the approval of devices for indirect vi-

sion and of motor vehicles with regard to the installation of such devices (OJ L 237, 8.8.2014, p. 24). The requirement to create these fields of vision through the use of mirrors is no longer applicable. The assignment of the required fields of vision in accordance with UN Regulation No 46, Number 15.2.1.1.1, to the motor vehicle category of the remote-controlled motor vehicle remains in place. The driver's eye points necessary for the measurement of the fields of vision may be moved forwards in the normal direction of travel and parallel to the axis of the motor vehicle in the longitudinal direction to the foremost point of the motor vehicle on the axis of the motor vehicle.

4.7 Representation of the dimensions of the remote-controlled motor vehicle

If the external vehicle dimensions cannot be clearly seen in the direct forward view, the external vehicle dimensions must be symbolically represented in the direct forward view.

4.8 Requirements for the displays, acoustic signals and control elements of the control room

The indicators, audible signals, and hand and foot controls of the control centre must meet the requirements of the provisions applicable to the motor vehicle from which the remotely controlled motor vehicle is derived. The controls shall be implemented in such a way as to support the haptic perception of the remote-controlling person, in particular with regard to the perception of brake pressure and steering resistance. Indicators and audible signals prescribed for the motor vehicle from which the remote-controlled motor vehicle is derived shall be repeated in the control centre.

4.9 Audio playback requirements

In order to provide the remote-controlling person with a comprehensive perception of the environment of the remotely controlled motor vehicle, the control station must reproduce sounds from the environment of the remotely controlled motor vehicle at the driving position. The sounds shall be reproduced in a form that supports the spatial perception of the remote-controlled motor vehicle in its surroundings. Playback must not be deactivatable.

Annex 2

(on Section 7(2) Number 2, Section 8(2) Number 2)

Requirements for the issuance of the operating area permit

1 Application documents for the operating area permit

1.1 The documents to be submitted by the holder for the application for the operating area permit must be in an appropriate digital form as specified by the competent authority and contain the following content:

a) unambiguous identification of the road sections belonging to the operating area (e.g. ETRS 89 / UTM coordinate system); These planning documents must be oriented north, at a reasonable scale, and equipped with a uniform title block and a legend; and

b) a specific description of the purpose and conditions of operation.

c) Information on, as well as representations or descriptions of:

(aa) road geometry;

(bb) speed limits,

(cc) topography,

dd) public transport facilities,

ee) institutions requiring protection such as kindergartens, day care centres, playgrounds, high-traffic school routes, general education schools, special schools, retirement and nursing homes, facilities for people with disabilities or hospitals

(ff) danger points,

(gg) level crossings;

hh) communication with the infrastructure,

ii) administrative boundaries at municipal level (parcel-specific);

jj) directions to be followed,

(kk) connecting ramps,

(ll) traffic signs and traffic facilities in accordance with the Road Traffic Regulations and the Catalogue of Traffic Signs, special traffic signs such as signs in different colours and additional signs approved for each country;

(mm) maps of network coverage with available bandwidth in the requested operating area when using mobile communications;

(nn) Explanatory notes on the procedure for determining network coverage.

2 Appropriateness of the operating area

2.1 In order to determine whether the operating range is suitable for the remote-controlled motor vehicle, the competent authority must check whether the driving tasks in the

operating range can be handled remotely. The nature of the road infrastructure in the operational area must be taken into account. In particular, the competent authority must establish that the remote steering of the motor vehicle in this operating area does not adversely affect the safety and fluidity of road traffic or significantly endanger the life and limb of persons beyond the general risk associated with road traffic customary for the operating area applied for. In addition, the competent authority must determine that other public interests, such as those relating to emission protection, do not preclude authorisation.

2.2 In the operating area, the characteristics of the complete remote control system shall be compared with the requirements actually occurring or possible in the operating range. It must also be examined to what extent statistically known special weather phenomena, in particular fog, snowdrifts, and sandstorms, influence the requirements of the operating area.

2.3 For testing, real journeys with the remote-controlled motor vehicle can be conducted in the operating area, where sections of the operating area are driven as needed under different environmental conditions, particularly time of day, weather, and traffic intensity. In these specific circumstances, driving tests in dense traffic can also demonstrate the interaction with other road users, in particular pedestrians or other drivers, during remote driving.

2.4 In areas to be assessed as critical due to radio coverage, especially in tunnel sections or narrow urban canyons, it must be tested whether these areas are suitable for remotely controlled driving. It is also necessary to check how the overall system for remote control reacts when the limit of the operating area is exceeded. The implementation of the minimum risk condition shall be verified under real operating conditions.

2.5 If the competent authority determines that the above test sequences have been successfully completed, it is considered that the remote-controlled motor vehicle can be used in the operating area. If the result of the tests carried out is that driving tasks occurring in the operating area cannot be handled remotely, particularly in safety-critical areas such as accident hotspots, the holder must decide whether to adapt their application for an operating area permit to such an extent that an operating area permit can be granted.

Annex 3

(re Section 13(1))

Requirements for data processing

1 Obligations of the holder

1.1 The holder is obliged to store the data of the remote-controlled motor vehicle referred to in Number 2.

1.2 The data referred to in Number 2 shall be recorded during remote operation and transmitted electronically to the responsible authorities upon request, to the extent necessary for the performance of their tasks.

1.3 The data referred to in Number 2 shall be stored in the remotely controlled motor vehicle at the time of the events referred to in Letters a to f:

a) the start and end of remote control;

b) disruptions in the operation, technical malfunctions of the entire system, in particular termination of the radio connection during operation,

c) near-miss and accident scenarios,

d) conflict scenarios, in particular, leaving the lane due to the travel delay,

e) initiating the minimum risk condition; and

f) assumption of the dynamic driving task by a steering person in a motor vehicle.

1.4 For the events referred to in Number 1.3 Letters b to f, the data shall be stored for a period beginning 10 seconds before the event and ending 10 seconds after the event. The networking parameters must be stored for the entire duration of the remote control. The data stored for the events referred to in Number 1.3 Letters b to d must be transmitted to the Federal Motor Transport Authority without delay.

2 Requirements for data storage

The following table specifies datasets and data formats. The temporal resolution of the stored data is generally determined by the resolution of the data available in the system of the remote-controlled motor vehicle or the control station. The temporal resolution of the stored data must be high enough to allow an analysis of the events. Particular temporal resolution requirements are set out in column 3 of the table.

Data	Data format	Temporal resolution
1) Vehicle identification number	Alpha-numeric characters [A-Z; 0-9] Example: AAAAAA654398GFRDE	At the beginning of storage and in case of changes
2) Position data	Latitude and longitude [±ddd.ddddd°,	System resolution

	in ± degrees (°) and decimal degrees, 5 decimal places] Altitudes in metres Output in GPS exchange format as a sequence of points at which a change in direction of movement occurs; Indication of the (map) reference system	
3) Date and time of the start/end of remote control, consecutive numbering of remotely controlled journeys	Date (Year-Month-Day), Time (Hour:Minute:Second), Trip Number For example: 2019-07-16, 05:25:12, Journey 108	At the beginning of storage and in case of changes
4) Remote pilot	Certificate details, in particular the name and validity of the certificate	At the beginning of storage and in case of changes
5) System monitoring data and error memory entries including software status	Alpha-numeric characters [A-Z; 0-9] including explanation Example: P0601 engine control unit memory checksum error	At the beginning of storage and in case of changes
6) Environmental and weather conditions	Temperature/°C, brightness/ Illuminance (Lux), windscreen wiper position (on/off)	System resolution
7) Networking and data transmission	Crosslinking parameters, at least latency times as specified in Annex 1 Numbers 2.1 to 2.5 and available bandwidth	System resolution
8) Activated active and passive safety systems and triggering of these systems	For example: AEBS Emergency Braking Assistance System – Emergency Braking 1.2 seconds	System resolution
9) Speed of the remote-controlled motor vehicle	Numerical value in metres per second	System resolution
10) Longitudinal and lateral acceleration of the remote-controlled motor vehicle	Numerical value in meters per second squared	System resolution
11) Power supply of the remote-controlled motor vehicle	Numerical value in volts for on-board systems and technical equipment for remote control	System resolution
12) Commands and information sent externally to the remote-controlled motor vehicle	Commands shall be stored in the sent format. For information, metadata shall be stored: File size, file format, source, destination, transmission time	At the beginning of storage and in case of changes
13) Status of lighting equipment	Identification of the lighting device, status of the lighting device (on/off)	System resolution
14) Initiation of the minimum risk state	Date (Year-Month-Day), Time	System resolution

	(Hour:Minute:Second), Trip Number For example: 2019-07-16, 05:25:12, Journey 108	
15) Taking over the dynamic driving task by a steering person for a motor vehicle	Date (Year-Month-Day), Time (Hour:Minute:Second), Trip Number For example: 2019-07-16, 05:25:12, Journey 108	System resolution

Article 2

Entry into force, abrogation

(82) This Regulation shall enter into force on X [insert: Date of the day of the fourth calendar month following the month of promulgation of this Regulation, the number of which corresponds to that of the day of promulgation, or, in the absence of such a calendar day, the date of the first day of the following calendar month.

(83) It shall enter into force at the end of the [insert: Date of the day in the 60th calendar month following the month of entry into force of this Regulation, the number of which corresponds to that of the day of entry into force, or, in the absence of such a calendar day, the date of the first day of the following calendar month ceases to be in force.