

COMMISSION IMPLEMENTING REGULATION (EU) 2022/1362**of 1 August 2022****implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as regards the performance of heavy-duty trailers with regard to their influence on the CO₂ emissions, fuel consumption, energy consumption and zero emission driving range of motor vehicles and amending Implementing Regulation (EU) 2020/683****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 595/2009 of the European Parliament and of the Council of 18 June 2009 on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC ⁽¹⁾, and in particular Article 5c, first paragraph, point (a) thereof,

Having regard to 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 ⁽²⁾, and in particular Article 24(4), 36(4), 44(5) and 45(7) thereof,

Whereas:

- (1) The performance of vehicles of categories O₃ and O₄ with regard to their influence on CO₂ emissions, fuel consumption, electricity consumption and zero-emission driving ranges of motor vehicles may vary depending on their technical parameters. More efficient trailers have lower drag force resistance, thus improving the energy efficiency of the towing vehicle. Trailers with similar technical parameters have similar effects on the CO₂ emissions and fuel consumption of the towing vehicle. In order to reflect the diversity of the trailer sector, trailers should be divided into vehicle groups with a similar type of vehicle, axle configuration, maximum permissible axle load and chassis configuration.
- (2) Commission Regulation (EU) 2017/2400 ⁽³⁾ contains certification obligations and rules for the determination of the CO₂ emissions and the fuel consumption of heavy-duty motor vehicles. The determination of the fuel consumption is based on a computer simulation for which the Commission has developed the VECTO simulation tool pursuant to Article 5(1), point (a), of that Regulation. Since the VECTO simulation tool cannot take into account the influence of different trailers and since there is no software available on the market to be used for assessing the influence of trailers on the energy consumption of towing vehicles, the Commission developed a dedicated trailer simulation tool for that purpose.
- (3) Aerodynamic resistance is one of the forces a vehicle must overcome while driving. It is scientifically proven that the use of appropriate aerodynamic devices on a trailer can significantly reduce the aerodynamic resistance of a vehicle combination and thus its energy consumption. The reduction effect of those aerodynamic devices should therefore be certified.

⁽¹⁾ OJ L 188, 18.7.2009, p. 1.

⁽²⁾ OJ L 151, 14.6.2018, p. 1.

⁽³⁾ Commission Regulation (EU) 2017/2400 of 12 December 2017 implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as regards the determination of the CO₂ emissions and fuel consumption of heavy-duty vehicles and amending Directive 2007/46/EC of the European Parliament and of the Council and Commission Regulation (EU) No 582/2011 (OJ L 349, 29.12.2017, p. 1).

- (4) Computational fluid dynamics simulation is a method to determine the aerodynamic drag force of a vehicle and it is less expensive than a physical test. Such computational fluid dynamics simulations can only be used for aerodynamic device certification if all manufacturers of aerodynamic devices use the same 3D generic vehicle models for the reduction effect determination of those devices. In the absence of appropriate 3D generic vehicle models, the Commission has developed those models and makes them available on a dedicated platform free of charge.
- (5) Vehicle manufacturers should assess the environmental performance of their vehicles by means of a simulation tool provided by the Commission and before placing those vehicles on the market in the Union. To ensure that the environmental performance is correctly simulated, approval authorities should assess and monitor the handling of data used for the simulation and the proper use of the simulation tool. After that assessment, the approval authority should grant a licence to the vehicle manufacturer concerned for the operation of the simulation tool.
- (6) The information about the environmental performance of a trailer can be used for road toll and taxation and should therefore be shown in the manufacturer's records file and the customer information file. To prevent forgery, vehicle manufacturers should use a tool provided by the Commission to create a cryptographic hash, which should be part of the certificate of conformity or the individual approval certificate. That cryptographic hash can be used to expose discrepancies between the different documents of the vehicle concerned. For the same reasons, the same hashing principle should apply to components and their certification.
- (7) In order to avoid unnecessary burdens for vehicle manufacturers and to reduce the number of annual assessments by approval authorities, technical services should be allowed to determine the environmental performance of vehicles that are subject to individual approvals by using the simulation tool provided by the Commission. The holders of individual approvals should therefore be able to request approval authorities to refer those holders to a technical service to assess the environmental performance of their vehicles.
- (8) There are components that affect the running resistance of a vehicle very differently depending on the design parameters of those components. Manufacturers of those components should be able to certify their components by determining the energy efficiency characteristics of the components themselves, using identical methods. Vehicle manufacturers should use those certified values as input data for the simulation tool to assess the environmental performance of vehicles. In case that a component is not certified, vehicle manufacturers should use standard values instead of certified values.
- (9) In order to limit the cost of component certification, manufacturers of components should be able to group components into families. For each family of components, the component that has the least favourable characteristics as regards the environmental performance of the vehicle on which it is to be installed should be tested, and its results should apply to the entire family of components.
- (10) The provisions set out in this Regulation form part of the framework established by Regulation (EU) 2018/858 and complement the provisions for issuing the certificate of conformity and the individual approval certificate laid down in Commission Implementing Regulation (EU) 2020/683 ^(*). The corresponding annexes to Implementing Regulation (EU) 2020/683 should therefore be amended to incorporate the necessary changes into the type-approval procedure.
- (11) The measures provided for in this Regulation are in accordance with the opinion of the Technical Committee – Motor Vehicles (TCMV) referred to in Article 83 of Regulation (EU) 2018/858,

^(*) Commission Implementing Regulation (EU) 2020/683 of 15 April 2020 implementing Regulation (EU) 2018/858 of the European Parliament and of the Council with regards to the administrative requirements for the approval and market surveillance of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (OJ L 163, 26.5.2020, p. 1).

HAS ADOPTED THIS REGULATION:

CHAPTER I

SCOPE AND DEFINITIONS

Article 1

Scope

This Regulation applies to vehicles of categories O₃ and O₄, other than:

- (a) vehicles with a bodywork other than a box shaped bodywork as defined in Article 2, point (2);
- (b) vehicles with a technically permissible maximum mass lower than 8 000 kg;
- (c) vehicles with more than three axles;
- (d) link drawbar trailers and link semi-trailers;
- (e) converter dollies;
- (f) vehicles exceeding the maximum authorised dimensions laid down in Annex XIII, section E to Commission Implementing Regulation (EU) 2021/535 ⁽³⁾;
- (g) vehicles with driven axles.

Article 2

Definitions

The following definitions shall apply:

- (1) 'simulation tool' means an electronic tool, developed by the Commission, which is used to assess the performance of vehicles of categories O₃ and O₄ with regard to their influence on the CO₂ emissions and fuel consumption of motor vehicles;
- (2) 'box shaped bodywork' means an enclosed superstructure integral to the frame of the vehicle, which covers the goods being transported, and for which the attributed digits used to supplement the codes of bodywork are 03, 04, 05, 06 or 32, in accordance with Annex III, Table 3;
- (3) 'hashing tool' means an electronic tool, developed by the Commission, which provides an unequivocal association between the certified component, separate technical unit or system and its certification document, or between a vehicle and its manufacturer's records file and its customer information file;
- (4) 'manufacturer' means the person or body that is responsible to the approval authority for all aspects of the certification process and for ensuring conformity of CO₂ emissions and fuel consumption related properties of components, separate technical units and systems, irrespective of whether that person or body is directly involved in all stages of the construction of the component, separate technical unit or system which is the subject of the certification;
- (5) 'vehicle manufacturer' means a body or person responsible for issuing the manufacturer's records file and the customer information file pursuant to Article 8;
- (6) 'CO₂ emissions and fuel consumption related properties' means characteristics specific to a component, separate technical unit and system which determine the impact of the part on the CO₂ emissions and fuel consumption of a vehicle;

⁽³⁾ Commission Implementing Regulation (EU) 2021/535 of 31 March 2021 laying down rules for the application of Regulation (EU) 2019/2144 of the European Parliament and of the Council as regards uniform procedures and technical specifications for the type-approval of vehicles, and of systems, components and separate technical units intended for such vehicles, as regards their general construction characteristics and safety (OJ L 117, 6.4.2021, p. 1).

- (7) 'aerodynamic device' means a device, equipment, or a combination thereof in a specific configuration designed to reduce the aerodynamic drag of vehicle combinations consisting of at least a motor vehicle and a trailer or semi-trailer;
- (8) 'generic geometry' means a three dimensional model developed by the Commission for computational fluid dynamics simulations;
- (9) 'manufacturer's records file' means a file produced by the simulation tool which contains manufacturer related information, a documentation of the input data and input information to the simulation tool, and the performance of the vehicle with regard to its influence on the CO₂ emissions and fuel consumption of motor vehicles, and which takes the form of the template laid down in Annex IV, Part I;
- (10) 'customer information file' means a file produced by the simulation tool which contains a set of vehicle related information and the performance of the vehicle with regard to its influence on CO₂ emissions, fuel consumption, of motor vehicles, and which takes the form of the template laid down in Annex IV, Part II;
- (11) 'input data' means information on the CO₂ emissions and fuel consumption related properties of a component, separate technical unit or system which is used by the simulation tool to determine the CO₂ emissions and fuel consumption of a vehicle;
- (12) 'input information' means information about the characteristics of a vehicle which is used by the simulation tool to determine the influence on the CO₂ emissions and fuel consumption of that vehicle and which is not part of input data;
- (13) 'authorised entity' means a national authority authorised by a Member State to request relevant information from the manufacturers and vehicle manufacturers on the CO₂ emissions and fuel consumption related properties of a specific component, specific separate technical unit or specific system and CO₂ emissions and fuel consumption of new vehicles respectively.

CHAPTER II

VEHICLE GROUPS, ELECTRONIC TOOLS AND VEHICLE GENERIC GEOMETRIES

Article 3

Vehicle groups

Vehicle manufactures shall classify their vehicles in vehicle groups in accordance with Annex I, Point 2.

Article 4

Electronic tools

1. Vehicle manufacturers shall use the following electronic tools provided by the Commission free of charge in the form of downloadable and executable software:

- (a) the simulation tool;
- (b) the hashing tool.

The Commission shall maintain the electronic tools and provide modifications and updates to those tools.

2. The Commission shall make the electronic tools referred to in paragraph 1 available through a publicly available dedicated electronic distribution platform.

CHAPTER III

LICENCE TO OPERATE THE SIMULATION TOOL FOR THE PURPOSES OF TYPE-APPROVAL*Article 5***Application for a licence to operate the simulation tool to assess the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption**

1. Vehicle manufacturers shall submit to the approval authority an application for a licence to operate the simulation tool to assess the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption.
2. Vehicle manufacturers shall submit the application for a licence to operate the simulation tool to the approval authority by using the template set out in Annex II, Appendix 1.

The application for a licence to operate the simulation tool shall be accompanied by all of the following:

- (a) a detailed description of the processes referred to in Annex II, Point 1;
 - (b) the assessment referred to in Annex II, Point 2.
3. Vehicle manufacturers shall submit the application for the licence to operate the simulation tool at the latest together with the application for a type-approval or individual approval of the vehicle concerned.

*Article 6***Administrative provisions for the granting of the licence to operate the simulation tool**

1. The approval authority shall grant the licence to operate the simulation tool if the vehicle manufacturer concerned submits the application in accordance with Article 5 and proves that all the processes have been set up in accordance with the requirements laid down in Annex II, Point 1.
2. The licence shall be issued in the form of the template set out in Annex II, Appendix 2.

*Article 7***Subsequent changes to the processes set up for assessing the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption**

1. Vehicle manufacturers shall notify the approval authority without delay of any changes those manufacturers made to the processes they set up to assess the performance of new vehicles with regard to the influence of those new vehicles on CO₂ emissions and fuel consumption and that are covered by the licence to operate the simulation tool, where such changes may have an effect on the accuracy, reliability or stability of those processes.
2. Upon receipt of the notification referred to in paragraph 1, the approval authority shall inform the vehicle manufacturer concerned on whether the changed processes continue to be covered by the licence granted pursuant to Article 6.
3. Where the changes referred to in paragraph 1 are not covered by the licence to operate the simulation tool, vehicle manufacturers shall, within one month of receipt of the information referred to in paragraph 2, apply for a new licence in accordance with Article 5. The approval authority shall withdraw the license if a vehicle manufacturer does not apply for a new licence, or if the application for a new license is rejected.

CHAPTER IV

OPERATION OF THE SIMULATION TOOL

*Article 8***Obligation to assess the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption**

1. Vehicle manufacturers shall determine the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption to be sold, registered or put into service in the Union using the latest available version of the simulation tool.
2. Vehicle manufacturers shall record the results of the simulation performed with the simulation tool in the manufacturer's records file.

With the exception of the cases referred to in Article 21(2), second subparagraph, and in Article 23(3), any changes to the manufacturer's records file shall be prohibited.

3. Vehicle manufacturers shall create cryptographic hashes of the manufacturer's records file and of the customer information file using the hashing tool.
4. Each vehicle to be registered, sold or to enter into service shall be accompanied by the customer information file.

Each customer information file shall contain an imprint of the cryptographic hash of the manufacturer's records file.

5. Each vehicle to be registered, sold or entered into service shall be accompanied by a certificate of conformity or, in the case of vehicles approved in accordance with Article 44 or Article 45 of Regulation (EU) 2018/858, an individual approval certificate, including an imprint of the cryptographic hash of the manufacturer's records file and of the customer information file.

6. By way of derogation from paragraphs 1 to 5, vehicle manufacturers applying for individual approvals for vehicles that belong to the vehicle groups concerned may, at the latest together with the application for an individual approval, request the approval authority that the assessment of the performance of those vehicles with regard to their influence on CO₂ emissions and fuel consumption is carried out by a designated technical service. That request shall contain the input data and input information referred to in the template set out in Annex III, Appendix 1. The vehicle manufacturer shall provide the designated technical service with the input data and input information of the components certified in accordance with Article 11(1) in the form of XML files.

7. By way of derogation from paragraphs 1 to 5, vehicle manufacturers holding a type-approval and with an annual production of less than 30 vehicles that belong to the vehicle groups concerned may request a designated technical service to carry out the simulation for the assessment of the performance of those vehicles with regard to their influence on CO₂ emissions and fuel consumption. The request for each vehicle shall contain the input data and input information referred to in the template set out in Annex III, Appendix 1. The vehicle manufacturer shall provide the designated technical service with the input data and input information of the components certified in accordance with Article 11(1) in the form of XML files.

8. For the purposes of paragraphs 6 and 7, the approval authorities shall designate a technical service to operate the simulation tool and to draw up the manufacturer's records file and the customer information file.

*Article 9***Modifications of, updates to and malfunctionings of the simulation and hashing tool**

1. In the case of modifications or updates to the simulation tool, vehicle manufacturers shall start using the modified or updated simulation tool no later than 3 months after the modifications and updates have been made available on the dedicated electronic distribution platform.

2. If the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption cannot be assessed due to a malfunction of the simulation tool, vehicle manufacturers shall notify the Commission thereof by means of the dedicated electronic distribution platform without delay.

3. If the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption cannot be assessed due to a malfunction of the simulation tool, vehicle manufacturers shall perform the simulation for those vehicles not later than 7 calendar days after the date on which the modifications or updates were made available on the dedicated electronic distribution platform. Until the modifications or updates are available, the obligations laid down in Article 8 shall be suspended for the vehicles for which the determination of the performance with regard to their influence on CO₂ emissions and fuel consumption is not possible.

Article 10

Accessibility of the simulation tool inputs and output information

1. Vehicle manufacturers or, in case the simulation is performed by a technical service, the responsible bodies designated by the Member State, shall store the manufacturer's records file and the certificates on CO₂ emissions and fuel consumption related properties of the components, systems and separate technical units for 10 years after the production or approval of the vehicle, respectively.

2. Upon request from an authorised entity of a Member State or the Commission, vehicle manufacturers or the responsible bodies referred to in paragraph 1 shall provide the manufacturer's records file and the certificates on CO₂ emissions and fuel consumption related properties of the components, systems and separate technical units to that entity or to the Commission within 15 working days.

3. Upon request from an authorised entity or the Commission, the approval authority which granted the licence to operate the simulation tool in accordance with Article 6 or which certified the CO₂ emissions and fuel consumption related properties of a component, separate technical unit or system in accordance with Article 17 shall provide to that entity or to the Commission the application for the licence to operate the simulation tool referred to in Article 5(2) or the application for the certification of the CO₂ emissions and fuel consumption related properties referred to in Article 16(2), respectively, within 15 working days.

CHAPTER V

CO₂ EMISSIONS AND FUEL CONSUMPTION RELATED PROPERTIES OF AERODYNAMIC DEVICES AND TYRES

Article 11

Components, separate technical units and systems relevant for assessing the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption

1. The input data for the simulation tool shall contain data about the CO₂ emissions and fuel consumption related properties of the following components, separate technical units and systems:

- (a) aerodynamic devices;
- (b) tyres.

2. Vehicle manufacturers shall base the CO₂ emissions and fuel consumption related properties of aerodynamic devices on the values determined, for each family of aerodynamic devices, in accordance with Article 13, and have those properties certified in accordance with Article 17. In the absence of such determination and certification, vehicle manufacturers shall base the CO₂ emissions and fuel consumption related properties of aerodynamic devices on the standard values determined in accordance with Article 12.

3. Vehicle manufacturers shall base the CO₂ emissions and fuel consumption related properties of tyres on the certified or standard values determined pursuant to Article 12 and Article 13 of Regulation (EU) 2017/2400.

4. Where a new vehicle is to be registered, sold or put into service with a complete set of snow tyres and a complete set of standard tyres, vehicle manufacturers may choose which of the tyres to use for assessing the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption.

Article 12

Standard values

The standard values for aerodynamic devices shall be determined and allocated automatically by the simulation tool by using the parameters laid down in Annex V, Appendix 6.

Article 13

Certified values

The certified values for aerodynamic devices shall be determined in accordance with Annex V, Point 3.

Article 14

Vehicle generic geometries

1. For the determination of the aerodynamic device data specified in Annex V, manufacturers of aerodynamic devices shall use the following generic geometries:

- (a) a 4x2 tractor generic geometry;
- (b) a 4x2 tractor generic geometry for volume oriented semi-trailers;
- (c) a 4x2 rigid lorry generic geometry;
- (d) a 6x2 rigid lorry generic geometry;
- (e) a semi-trailer generic geometry;
- (f) a volume oriented semi-trailer generic geometry;
- (g) a drawbar trailer generic geometry;
- (h) a volume oriented drawbar trailer generic geometry;
- (i) a centre-axle trailer generic geometry;
- (j) a volume oriented centre-axle trailer generic geometry;
- (k) a rear flap generic geometry;
- (l) semi-trailer side covers generic geometry.

2. The Commission shall make the generic geometries referred to in paragraph 1 available free of charge in the form of downloadable .igs, .step and .stl file formats through a publicly available dedicated electronic distribution platform.

Article 15

Family concept for aerodynamic devices using certified values

1. The certified values determined for a parent aerodynamic device shall be valid for all family members of that device in accordance with the family criteria set out in Annex V, Appendix 4.

2. The CO₂ emissions and fuel consumption related properties of the parent aerodynamic device shall not be better than the properties of any member of the same family of aerodynamic devices.

3. Manufacturers of aerodynamic devices shall provide the approval authority with evidence that the parent aerodynamic device fully represents the family of aerodynamic devices.

4. Upon request of a manufacturer of an aerodynamic device, and subject to the agreement of the approval authority, the CO₂ emissions and fuel consumption related properties of the aerodynamic device, other than the parent aerodynamic device, may be indicated in the certificate of the family of aerodynamic devices.

The CO₂ emissions and fuel consumption related properties of the aerodynamic device referred to in the first subparagraph shall be determined in accordance with Annex V, Point 3.

5. Where the CO₂ emissions and fuel consumption related properties of an aerodynamic device, determined in accordance with paragraph 4, lead to a worse performance of the vehicle with regard to its CO₂ emissions and fuel consumption than in the case of the parent aerodynamic device, manufacturers of the aerodynamic devices concerned shall exclude that aerodynamic device from the existing family or apply for an extension of the certification pursuant to Article 18.

Article 16

Application for a certification of the CO₂ emissions and fuel consumption related properties of aerodynamic devices and their families

1. Manufacturers of aerodynamic devices shall submit to the approval authority the application for the certification of the CO₂ emissions and fuel consumption related properties of those devices or their respective families.

2. The application for certification referred to in paragraph 1 shall take the form of the template set out in Annex V, Appendix 2.

That application shall be accompanied by all of the following:

- (a) an explanation of the elements of design of the aerodynamic device which have a non-negligible effect on the CO₂ emissions, fuel and energy consumption related properties of the aerodynamic device;
- (b) the validation report as specified in Annex V, Point 3;
- (c) the technical report including the computer simulation results as specified in Annex V, Point 3;
- (d) a documentation package for the correct installation of the aerodynamic device;
- (e) a statement of compliance issued pursuant to Annex IV, Point 2 to Regulation (EU) 2018/858.

3. Changes to the aerodynamic device that occur after a certification shall not invalidate the certification, unless its original characteristics or technical parameters are changed in a way that affects the CO₂ emissions and fuel consumption related properties of aerodynamic device concerned.

Article 17

Certification of CO₂ emissions and fuel consumption related properties of aerodynamic devices

1. If the requirement laid down in Article 13 is met, approval authorities shall certify the values relating to the CO₂ emissions and fuel consumption related properties of the family of aerodynamic devices and issue a certificate in the form of the template set out in Annex V, Appendix 1.

2. Approval authorities shall assign a certification number in accordance with the numbering system set out in Annex V, Appendix 3.

Approval authorities shall not assign the same certification number to another family of aerodynamic devices. The certification number shall be the identifier of the technical report.

3. Approval authorities shall create a cryptographic hash of the file with the computer simulation results referred to in Article 16(2), point (c), and the certification number, by means of the hashing tool. That hashing shall be done immediately after the computer simulation results are produced. Approval authorities shall imprint the cryptographic hash along with the certification number on the certificate on CO₂ emissions and fuel consumption related properties.

Article 18

Extension to include an aerodynamic device into a family of aerodynamic devices

1. At the request of a manufacturer of aerodynamic devices, and upon approval of the approval authority concerned, a new aerodynamic device may be included into a family of aerodynamic devices if that device meets the criteria laid down in Annex V, Appendix 4, in which case the approval authority shall issue a revised certificate denoted by an extension number.

Manufacturers of the aerodynamic devices concerned shall modify the information document referred to in Article 16(2) accordingly and provide that document to the approval authority.

2. Where the CO₂ emissions and fuel consumption related properties of the aerodynamic device referred to paragraph 1 are worse than in the case of the parent aerodynamic device, the new aerodynamic device shall become the new parent aerodynamic device.

Article 19

Changes relevant for the certification of CO₂ emissions and fuel consumption related properties of aerodynamic devices

1. Manufacturers of aerodynamic devices shall notify their approval authority of any changes to the design or manufacturing process of aerodynamic devices that occur after the certification referred to in Article 17 and which may have a non-negligible effect on the performance with regard to CO₂ emissions and fuel consumption of the vehicle equipped with those devices.

2. Upon receipt of the notification referred to in paragraph 1, the approval authority concerned shall inform the manufacturer concerned whether or not the aerodynamic devices affected by the changes continue to be covered by the certificate issued, or whether a computer simulation in accordance with Article 13 is necessary.

3. Where the aerodynamic devices affected by the changes are not covered by the certificate referred to in Article 17(1), the manufacturer concerned shall apply for a new certification or an extension of that certification pursuant to Article 18(1) within one month of receipt of that information from the approval authority.

Where manufacturers of aerodynamic devices do not apply for a new certification or a revision within that deadline, or where the application is rejected, the approval authorities shall withdraw the certificate.

CHAPTER VI

CONFORMITY OF SIMULATION TOOL OPERATION, INPUT INFORMATION AND INPUT DATA*Article 20***Responsibilities of the vehicle manufacturer, the approval authority and the Commission with regard to the conformity of simulation tool operation**

1. Vehicle manufacturers shall take the necessary measures to ensure that the processes set up to assess the performance of the vehicle with regard to its influence on the CO₂ emissions and fuel consumption of motor vehicles covered by the licence granted pursuant to Article 6 continue to be adequate for that purpose.
2. Approval authorities shall perform the assessment referred to in Annex II, Point 2 annually to verify whether the processes set up by vehicle manufacturers for assessing the performance of the vehicle with regard to its influence on the CO₂ emissions and fuel consumption of motor vehicles continue to be adequate and to verify the selection of the input information and input data and the repetition of the simulations performed by the vehicle manufacturer.

Approval authorities may carry out the assessment more than once per year, but not more than four times a year, where they consider such assessments justified.

*Article 21***Remedial measures for the conformity of simulation tool operation**

1. Approval authorities that find, pursuant to Article 20(2), that the processes set up by the vehicle manufacturer to assess the performance of the vehicle with regard to its influence on the CO₂ emissions and fuel consumption of motor vehicles are not in accordance with the licence or may lead to an incorrect assessment of that performance of the vehicles concerned shall request the vehicle manufacturer to submit a plan of remedial measures no later than one month after receipt of the request from the approval authority. Approval authorities may extend the period with up to one month where the vehicle manufacturer demonstrates that more time is necessary to submit the plan of remedial measures.
2. Approval authorities shall approve or reject the plan of remedial measures referred to in paragraph 1 within one month of its receipt. Approval authorities shall notify the vehicle manufacturer concerned and all the other Member States of its decision.

Approval authorities may require vehicle manufacturers to issue a new manufacturer's records file, customer information file, individual approval certificate and certificate of conformity on the basis of a new assessment of the performance of the vehicle with regard to its influence on the CO₂ emissions and fuel consumption reflecting the changes implemented in accordance with the approved plan of remedial measures referred to in paragraph 1.

3. The vehicle manufacturer shall be responsible for the execution of the approved plan of remedial measures referred to in paragraph 1.
4. Where the plan of remedial measures referred to in paragraph 1 has been rejected by the approval authority, or where the approval authority has established that the remedial measures are not applied correctly, the approval authority shall take the necessary measures to ensure the conformity of simulation tool operation or withdraw the licence.

*Article 22***Responsibilities of the manufacturer and of the approval authority with regard to the conformity of CO₂ emissions and fuel consumption related properties of the aerodynamic devices**

Manufacturers of aerodynamic devices shall take the necessary measures in accordance with Annex IV, Point 3 to Regulation (EU) 2018/858 to ensure that the CO₂ emissions and fuel consumption related properties of the aerodynamic devices referred to in Article 11(1), point (a), which have been the subject of certification in accordance with Article 17, do not deviate from the certified values.

*Article 23***Remedial measures for the conformity of CO₂ emissions and fuel consumption related properties of aerodynamic devices**

1. Approval authorities that find, pursuant to Articles 20 and 21, that the measures taken by the manufacturer to ensure the compliance of the aerodynamic devices, referred to in Article 11(1) point (a) and certified in accordance with Article 17, are not adequate, shall request the manufacturer of those aerodynamic devices to submit a plan of remedial measures no later than one month after receipt of the request by that manufacturer. Approval authorities may extend that period with up to one month where the manufacturer of those aerodynamic devices demonstrates that more time is necessary to submit the plan of remedial measures.
2. The plan of remedial measures shall apply to all the aerodynamic devices or, if applicable, to their respective families, which have been identified by the approval authority in its request.
3. Approval authorities shall approve or reject the plan of remedial measures within one month of its receipt. Approval authorities shall notify the manufacturer of the aerodynamic devices and all the other Member States of its decision to approve or reject the plan of remedial measures.

Approval authorities may require vehicle manufacturers who installed the aerodynamic devices concerned in their vehicles to issue a new manufacturer's records file, customers information file, individual vehicle approval certificate and certificate of conformity on the basis of the CO₂ emissions and fuel consumption related properties of those aerodynamic devices obtained by means of the measures referred to in Article 22.

4. The manufacturers of the aerodynamic devices concerned shall be responsible for the execution of the approved plan of remedial measures.
5. The manufacturers of the aerodynamic devices concerned shall keep a record of every aerodynamic device recalled and repaired or modified and of the workshop which performed the repair. Approval authorities shall have access to those records on request during the execution of the plan of the remedial measures and for a period of 5 years after the completion of its execution.
6. An approval authority that rejects the plan of remedial measures or establishes that the remedial measures are not correctly applied shall take the necessary measures to ensure the conformity of CO₂ emissions and fuel consumption related properties of the family of aerodynamic devices concerned or withdraw the certificate on CO₂ emissions and fuel consumption related properties.

CHAPTER VII

FINAL PROVISIONS*Article 24***Transitional provisions**

Without prejudice to Article 9(3), where the obligations referred to in Article 8 have not been complied with, Member States shall prohibit the registration, sale or entry into service of vehicles that belong to vehicle groups for which the first two digits are 11, 12, 13, 42, 43, 61, 62 and 63 as from 1 July 2024.

*Article 25***Amendments to Implementing Regulation (EU) 2020/683**

Annexes I, II, III and VIII to Implementing Regulation (EU) 2020/683 are amended in accordance with Annex VI to this Regulation.

*Article 26***Entry into force and application**

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*. Article 8(4) shall, however, apply from 1 January 2024.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 1 August 2022.

For the Commission
The President
Ursula VON DER LEYEN

ANNEX I

CLASSIFICATION OF VEHICLES IN VEHICLE GROUPS

1. Definitions

For the purposes of this Annex, the following definitions apply:

- (1) 'soft shell box body' means a box shaped bodywork where at least the two sides of the body are covered by tarpaulin entirely or between the upper edge of the hinged side panels and the roof of the superstructure, and for which the digits used to supplement the codes of bodywork are 32, or 06.
- (2) 'hard shell box body' means a box shaped bodywork for which the digits used to supplement the codes of bodywork are 03 or 05.
- (3) 'refrigerated box body' means a box shaped bodywork for which the digits used to supplement the codes of bodywork are 04.
- (4) 'internal height of the body' means the internal height of the body dimension without taking into account internal projections (including wheel boxes, ribs and hooks) as defined in point 6.15 of Standard ISO 612:1978. If the roof is curved, the dimension shall be measured between the horizontal planes tangential to the apices of the curved surface, the dimension being measured inside the body.
- (5) 'internal length of the body' means the internal length of the body dimension without taking into account internal projections (including wheelboxes, ribs and hooks) as defined in point 6.15 of Standard ISO 612:1978. If the front or rear wall is curved, the dimension shall be measured between the vertical planes tangential to the apices of the curved surface(s), the dimension being measured inside the body.
- (6) 'volume orientation' means that the trailer is primarily designed for the transport of voluminous goods and has an internal height of not less than 2,9 meters:
 - (a) in the case of semi-trailers, measured from the landing gear to the end of the loading area;
 - (b) in the case of drawbar trailers, and centre-axle trailers, measured along the entire length of the loading area.

2. Classification of vehicles in vehicle groups

Table 1

Vehicle groups for semi-trailers

Description of elements relevant to the classification				Vehicle group	Allocation of mission profile and vehicle configuration				
Number of axles	Bodywork type	TPMLM (**) axle assembly [t]	Volume orientation		Long haul	Long haul (EMS (*))	Regional delivery	Regional delivery (EMS (*))	Urban delivery
DA semi-trailers									
1	soft shell box body	≥ 8,0 t	No	111	5RD		5RD		5RD
			Yes	111V	5RD		5RD		5RD
	hard shell box body	≥ 8,0 t	No	112	5RD		5RD		5RD
			Yes	112V	5RD		5RD		5RD
	refrigerated box body	≥ 8,0 t	No	113	5RD		5RD		5RD

2	soft shell box body	$\geq 8,0 \text{ t and } \leq 18 \text{ t}$	No	121	5LH		5LH		5LH
			Yes	121V	5LH		5LH		5LH
		> 18 t	No	122	5LH		5LH		5LH
			Yes	122V	5LH		5LH		5LH
	hard shell box body	$\geq 8,0 \text{ t and } \leq 18 \text{ t}$	No	123	5LH		5LH		5LH
			Yes	123V	5LH		5LH		5LH
		> 18 t	No	124	5LH		5LH		5LH
			Yes	124V	5LH		5LH		5LH
3	refrigerated box body	$\geq 8,0 \text{ t and } \leq 18 \text{ t}$	No	125	5LH		5LH		5LH
		> 18 t	No	126	5LH		5LH		5LH
	soft shell box body	$\geq 8,0 \text{ t}$	No	131	5LH		5LH		5LH
			Yes	131V	5LH		5LH		5LH
	hard shell box body	$\geq 8,0 \text{ t}$	No	132	5LH		5LH		5LH
			Yes	132V	5LH		5LH		5LH
4	refrigerated box body	$\geq 8,0 \text{ t}$	No	133	5LH		5LH		5LH
	soft shell box body	—	No	(141)					
		—	Yes	(141V)					
	hard shell box body	—	No	(142)					
		—	Yes	(142V)					
	refrigerated box body	—	No	(143)					

(*) EMS – European Modular System

(**) TPMLM – Technically permissible maximum laden mass

RD = Regional delivery

LH = Long haul

Table 2

Vehicle groups for link semi-trailers

Description of elements relevant to the classification in vehicle groups				Vehicle group	Allocation of mission profile and vehicle configuration				
Number of axles	Bodywork type	TPMLM (**) axle assembly [t]	Volume orientation		Long haul	Long haul (EMS (*))	Regional delivery	Regional delivery (EMS (*))	Urban delivery
Link semi-trailers									
2	soft shell box body	—	No	(221)					
	hard shell box body	—	No	(222)					
	refrigerated box body	—	No	(223)					
3	soft shell box body	—	No	(231)					
	hard shell box body	—	No	(232)					
	refrigerated box body	—	No	(233)					

(*) EMS – European Modular System

(**) TPMLM – Technically permissible maximum laden mass

Table 3

Vehicle groups for converter dollies

Description of elements relevant to the classification in vehicle groups				Vehicle group	Allocation of mission profile and vehicle configuration				
Number of axles	Bodywork type	TPMLM (**) axle assembly [t]	Volume orientation		Long haul	TPMLM (**) axle assembly [t]	Regional delivery	Regional delivery (EMS (*))	Urban delivery
SJ converter dollies									
2	converter dolly	—	No	(321)					
			Yes	(321V)					

(*) EMS – European Modular System

(**) TPMLM – Technically permissible maximum laden mass

Table 4

Vehicle groups for drawbar trailers

Description of elements relevant to the classification in vehicle groups				Vehicle group	Allocation of mission profile and vehicle configuration				
Number of axles	Bodywork type	TPMLM (**) axle assembly [t]	Volume orientation		Long haul	Long haul (EMS (*))	Regional delivery	Regional delivery (EMS (*))	Urban delivery
DB drawbar trailers									
2	soft shell box body	—	No	421	9LH		9LH		9LH
			Yes	421V	9LH		9LH		9LH
	hard shell box body	—	No	422	9LH		9LH		9LH
			Yes	422V	9LH		9LH		9LH
	refrigerated box body	—	No	423	9LH		9LH		9LH
3	soft shell box body	—	No	431	4LH		4LH		4LH
			Yes	431V	4LH		4LH		4LH
	hard shell box body	—	No	432	4LH		4LH		4LH
			Yes	432V	4LH		4LH		4LH
	refrigerated box body	—	No	433	4LH		4LH		4LH
4	soft shell box body	—	No	(441)					
			Yes	(441V)					
	hard shell box body	—	No	(442)					
			Yes	(442V)					
	refrigerated box body	—	No	(443)					

(*) EMS – European Modular System

(**) TPMLM – Technically permissible maximum laden mass

LH = Long haul

Table 5

Vehicle groups for link trailers

Description of elements relevant to the classification in vehicle groups				Vehicle group	Allocation of mission profile and vehicle configuration				
Number of axles	Bodywork type	TPMLM (**) axle assembly [t]	Volume orientation		Long haul	Long haul (EMS (*))	Regional delivery	Regional delivery (EMS (*))	Urban delivery
Link drawbar trailer									
4	soft shell box body	—	No	(541)					
	hard shell box body	—	No	(542)					
	refrigerated box body	—	No	(543)					

(*) EMS – European Modular System
 (**) TPMLM – Technically permissible maximum laden mass

Table 6

Vehicle groups for centre-axle trailers

Description of elements relevant to the classification in vehicle groups				Vehicle group	Allocation of mission profile and vehicle configuration				
Number of axles	Bodywork type	TPMLM (**) axle assembly [t]	Volume orientation		Long haul	Long haul (EMS (*))	Regional delivery	Regional delivery (EMS (*))	Urban delivery
DC centre-axle trailers									
1	soft shell box body	—	No	611	2RD		2RD		2RD
		—	Yes	611V	2RD		2RD		2RD
	hard shell box body	—	No	612	2RD		2RD		2RD
		—	Yes	612V	2RD		2RD		2RD
2	soft shell box body	≤ 13,5 t	No	621	2RD		2RD		2RD
			Yes	621V	2RD		2RD		2RD
		> 13,5 t	No	622	9LH		9LH		9LH
			Yes	622V	9LH		9LH		9LH
	hard shell box body	≤ 13,5 t	No	623	2RD		2RD		2RD
			Yes	623V	2RD		2RD		2RD
		> 13,5 t	No	624	9LH		9LH		9LH
			Yes	624V	9LH		9LH		9LH

	refrigerated box body	> 13,5 t	No	625	9LH		9LH		9LH
3	soft shell box body	—	No	631	4LH		4LH		4LH
		—	Yes	631V	4LH		4LH		4LH
	hard shell box body	—	No	632	4LH		4LH		4LH
		—	Yes	632V	4LH		4LH		4LH
	refrigerated box body	—	No	633	4LH		4LH		4LH

(*) EMS – European Modular System

(**) TPMLM – Technically permissible maximum laden mass

RD = Regional delivery

LH = Long haul

ANNEX II

REQUIREMENTS AND PROCESSES FOR THE OPERATION OF THE SIMULATION TOOL

1. The processes to be set up by the vehicle manufacturer for the operation of the simulation tool
 - 1.1. The vehicle manufacturer shall set up the following processes:
 - 1.1.1. A data management system covering sourcing, storing, handling and retrieving of the input information and input data for the simulation tool as well as handling certificates on the CO₂ emissions and fuel consumption related properties of component families, separate technical unit families and system families. The data management system shall:
 - (a) ensure the application of correct input information and input data to specific vehicle configurations;
 - (b) ensure the correct calculation and application of standard values;
 - (c) verify by means of comparing cryptographic hashes that the input files of component families, separate technical unit families and system families which are used for the simulation correspond to the input data of the component families, separate technical unit families and system families for which the certification has been granted;
 - (d) contain a protected database for storing the input data relating to the component families, separate technical unit families or system families and the corresponding certificates of the CO₂ emissions and fuel consumption related properties;
 - (e) ensure the correct management of the changes of specification and updates of components, separate technical units and systems;
 - (f) enable the tracing of the components, separate technical units and systems after the vehicle has been produced.
 - 1.1.2. A data management system covering retrieval of the input information and input data and calculations by means of the simulation tool and storing of the output data. The data management system shall:
 - (a) ensure the correct application of cryptographic hashes;
 - (b) contain a protected database for storing the output data;
 - 1.1.3. A process for consulting the dedicated electronic distribution platform referred to in Article 4(2) and Article 9(1) and (2), as well as downloading and installing the latest versions of the simulation tool.
 - 1.1.4. Appropriate training of staff working with the simulation tool.
 2. Assessment by the approval authority
 - 2.1. The approval authority shall assess whether the processes set out in point 1 for the operation of the simulation tool have been set up.

This assessment shall contain the following verifications:

 - (a) the functioning of the processes set out in points 1.1.1, 1.1.2 and 1.1.3 and the application of the requirement set out in point 1.1.4;
 - (b) that the processes used during the demonstration are applied in the same manner in all the production facilities of the vehicle manufacturer;

- (c) the completeness of the description of the data and process flows of operations related to the assessment of the performance of new vehicles with regard to their influence on CO₂ emissions and fuel consumption.

For the purpose of point 2.1.(a), the assessment shall include the determination of the performance with regard to the influence on CO₂ emissions and fuel consumption of at least one vehicle for which the licence has been applied for.

*Appendix 1***TEMPLATE OF AN INFORMATION DOCUMENT FOR THE OPERATION OF THE SIMULATION TOOL TO
ASSESS THE INFLUENCE OF NEW VEHICLES ON THE CO₂ EMISSIONS AND FUEL CONSUMPTION***SECTION I*

1. Name and address of the vehicle manufacturer:
2. Assembly plants for which the processes referred to in point 1 of Annex II of Regulation (EU) 2022/1362 have been set up for the operation of the simulation tool:
3. Vehicle groups covered:
4. Name and address of the vehicle manufacturer's representative (if any)

SECTION II

1. Additional information
 - 1.1. Data and process flow handling description
 - 1.2. Description of quality management process
 - 1.3. Additional quality management certificates (if any)
 - 1.4. Description of simulation tool data sourcing, handling and storage
 - 1.5. Additional documents (if any)
 2. Date: ...
 3. Signature: ...
-

Appendix 2

TEMPLATE OF A LICENCE TO OPERATE THE SIMULATION TOOL TO ASSESS THE INFLUENCE OF NEW VEHICLES ON
THE CO₂ EMISSIONS AND FUEL CONSUMPTION

Maximum format: A4 (210 × 297 mm)

**LICENCE TO OPERATE THE SIMULATION TOOL TO ASSESS THE INFLUENCE OF NEW VEHICLES ON THE
CO₂ EMISSIONS AND FUEL CONSUMPTION**

Communication concerning: — granting ⁽¹⁾ — extension ⁽¹⁾ — refusal ⁽¹⁾ — withdrawal ⁽¹⁾	
	Stamp
⁽¹⁾ Delete as appropriate	

of the licence to operate the simulation tool with regard to Regulation (EC) No 595/2009 as implemented by Commission Implementing Regulation (EU) 2022/1362.

Licence number:

Reason for extension:

SECTION I

0.1 Name and address of the manufacturer:

0.2 Assembly plants for which the processes referred to in Annex II, point 1 of Implementing Regulation (EU) 2022/1362 have been set up for the operation of the simulation tool

0.3 Vehicle groups covered:

SECTION II

1. Additional information

1.1. Assessment report performed by an approval authority

1.2. Data and process flow handling description

1.3. Description of quality management process

1.4. Additional quality management certificates (if any)

1.5. Description of simulation tool data sourcing, handling and storage

1.6. Additional documents (if any)

2. Approval authority responsible for the assessment

3. Date of the assessment report

4. Number of the assessment report

5. Remarks (if any):

6. Place

7. Date

8. Signature

(¹) Delete as appropriate

ANNEX III

INPUT INFORMATION ABOUT THE CHARACTERISTIC OF THE VEHICLE

1. Introduction

This Annex III describes the list of parameters to be provided by the vehicle manufacturer as input to the simulation tool. The applicable XML schema as well as example data are available at the dedicated electronic distribution platform.

2. Definitions

For the purposes of this Annex, the following definitions apply:

- (1) 'parameter ID' means the unique identifier used in the simulation tool for a specific input parameter or set of input data;
- (2) 'type': Data type of the parameter

string	sequence of characters in ISO8859-1 encoding
token	sequence of characters in ISO8859-1 encoding, no leading/trailing whitespace
date	date and time in UTC time in the format: YYYY-MM-DDTHH:MM:SSZ
integer	value with an integral data type, no leading zeros
double, X	fractional number with exactly X digits after the decimal sign ('.') and no leading zeros
boolean	accepted values 'true', 'false', and also '1' (for true) and '0' (for false)
- (3) 'unit' ... means the physical unit of the parameter;
- (4) 'trailer coupling point high' means the clevis type drawbar coupling, with a jaw and an automatic closing and locking pin on the towing vehicle for connecting to the trailer by means of a drawbar eye, with higher clearance from the centre of coupling point to the ground, commonly intended for towing trailers type DB and DC;
- (5) 'trailer coupling point low' means the clevis type drawbar coupling, with a jaw and an automatic closing and locking pin on the towing vehicle for connecting to the trailer by means of a drawbar eye, with lower clearance from the centre of coupling point to the ground, commonly intended for towing trailers type DC;
- (6) 'maximum external dimensions of body':
 - (a) 'external length of the body' means the external length of the body dimension without taking into account external body projections (aerodynamic devices and equipment).
 - (b) 'external width of the body' means the external width of the body dimension without taking into account external body projections (aerodynamic devices and equipment).
 - (c) 'external height of the body' means the external height of the body dimension without taking into account external body projections (aerodynamic devices and equipment).
- (7) 'total height of the trailer' (unladen) means the distance between the supporting surface and a horizontal plane touching the topmost part of a vehicle, as defined in point 6.3 of Standard ISO 612:1978.
- (8) 'cargo volume' means the internal volume of the body which is available to be filled with load;
- (9) 'axle-lift device' means a mechanism as defined in Annex XIII, Part 2, Section A, point 1.33 of Implementing Regulation (EU) 2021/535;
- (10) 'lift axle or retractable axle' means an axle as defined in Annex XIII, Part 2, Section A, point 1.34 of Implementing Regulation (EU) 2021/535;

(11) 'steering axle' means, for trailers, either of the following:

- (a) an axle equipped with a system designed to create a change of steering angle on wheels when acted upon by forces or moments applied through the tyre to road contact;
- (b) an axle equipped with a system in which the steering forces to change steered wheels direction are produced by a change in direction of the towing vehicle and in which the movement of the steered trailer wheels is linked to the relative angle between the longitudinal axis of the towing vehicle and that of the trailer;
- (c) an axle equipped with a system which produces the steering forces as decoupled system by an algorithm or manually;

(12) 'drop side tarpaulin body' means a bodywork with hinged tail and side panels and a tarpaulin body with a total body height comparable to that of curtain-sided bodywork.

The devices and equipment referred in Annex XIII, Part 2, Section F to Implementing Regulation (EU) 2021/535 shall not be taken into account for the determination of the length, width, height of the vehicle and maximum external dimensions of the body.

3. Set of input parameters

In Tables 1 and 2, the set of input parameters regarding the characteristics of the vehicle are specified.

Table 1

Input parameters 'Vehicle/General'

Parameter name	Parameter ID	Type	Unit	Description/Reference
Manufacturer	T001	token	[-]	
Manufacturer Address	T002	token	[-]	
Model / Commercial name	T003	token	[-]	
VIN	T004	token	[-]	
Date	T005	dateTime	[-]	Date and time when input information and input data is created
Legislative category	T006	string	[-]	Allowed values: 'O3', 'O4'
Number of axles	T007	integer	[-]	Allowed values: 1, 2, 3
Trailer type	T008	string	[-]	Allowed values: 'DA', 'DB', 'DC'
Bodywork type	T009	string	[-]	Allowed values: 'dry box', 'refrigerated', 'conditioned', 'curtain-sided', 'drop-side with tarpaulin body'
Volume orientation	T010	boolean	[-]	In accordance with Point 7 of Annex I, .to this Regulation.
Corrected mass in running order	T011	integer	[kg]	In accordance with Point 1.3.(b), Section A, Part 2, of Annex XIII, , to Implementing Regulation (EU) 2021/535. In case of vehicles with 04 bodywork without an equipment to maintain the interior temperature, a generic mass of $X[\text{kg}] = (850 \text{ kg}/85\text{m}^3) \times \text{cargo volume}[\text{m}^3]$ shall be added.

Parameter name	Parameter ID	Type	Unit	Description/Reference
TPMLM trailer	T012	integer	[kg]	In accordance with Point 1.6., Section A, Part 2, of Annex XIII to Implementing Regulation (EU) 2021/535
TPMLM axle assembly	T013	Integer	[kg]	In accordance with Point 1.13., Section A, Part 2, of Annex XIII to Implementing Regulation (EU) 2021/535 In case of trailer type 'DB', no input shall be provided.
External length of the body	T014	double, 3	[m]	In accordance with Point 2(6)(a) of Annex III to this Regulation.
External width of the body	T015	double, 3	[m]	In accordance with Point 2(6)(b) of Annex III to this Regulation.
External height of the body	T016	double, 3	[m]	In accordance with Point 2(6)(c) of Annex III to this Regulation.
Total height of the trailer	T017	double, 3	[m]	In accordance with Point 2(7) of Annex III to this Regulation.
Length from trailer front end to centre of first axle	T018	double, 3	[m]	Distance between front end of the trailer to centre of first axle. In case of 3-axle DB trailer: distance from the front end of the trailer to the centre of the last axle from the first set of axles.
Length between centres of axles	T019	double, 3	[m]	Distance between centre of first and last axle. In case of 3-axle DB trailer: distance from the centre of the last axle of the first set of axles to the first axle of the last set of axles.
Trailer Coupling Point	T020	string	[-]	Allowed values 'high', 'low'. In accordance with Points 2(4) and 2(5) of Annex III to this Regulation, . Input only relevant for trailer type DC.
Cargo volume	T021	double, 3	[m³]	In accordance with Point 2(8) of Annex III to this Regulation
Standard aerodynamic devices	T022	string	[-]	Allowed values: 'side cover short', 'side cover long', 'rear flap short', 'rear flap long'. Multiple entries allowed. Inputs to be declared in accordance with Appendix 5 to Annex V; The input of standard aerodynamic devices shall not be combined with input for certified aerodynamic devices.
Certification number aerodynamic device	T023	token	[-]	

Table 2

Input parameters ‘Vehicle/Axle configuration’ per axle

Parameter name	Parameter ID	Type	Unit	Description/Reference
Certification number tyres	T024	token	[-]	
Twin tyres	T025	boolean	[-]	
Steered	T026	boolean	[-]	
Liftable	T027	boolean	[-]	

4. Bodywork types

The vehicle manufacturer shall declare the bodywork type in the input to the simulation tool in accordance with Table 3.

Table 3

Bodywork types

Bodywork type to be declared as input	Bodywork code in accordance with Appendix 2 to Annex I to Regulation (EU) 2018/858
‘dry box’	‘03’
‘refrigerated’	‘04’
‘conditioned’	‘05’
‘curtain-sided’	‘06’
‘drop-side tarpaulin body’	‘32’ with a tarpaulin body height as defined in Annex III, point 2(12).

*Appendix 1***TEMPLATE OF AN INPUT DATA AND INPUT INFORMATION DOCUMENT FOR THE PURPOSE OF THE ASSESSMENT OF THE PERFORMANCE OF NEW VEHICLES WITH REGARD TO THEIR INFLUENCE ON CO₂ EMISSIONS AND FUEL CONSUMPTION****1. Main vehicle data**

- 1.1. Name of the vehicle manufacturer ...
- 1.2. Address of the vehicle manufacturer ...
- 1.3. Model / Commercial name ...
- 1.4. Vehicle identification number (VIN) ...
- 1.5. Legislative category (O₃, O₄) ...
- 1.6. Number of axles ...
- 1.7. Trailer type (DA; DB, DC) ...
- 1.8. Bodywork code (03,04,05,06,32) ...
- 1.9. Trailer coupling point – only for DC (high, low) ...
- 1.10. Volume orientation (yes/no)
- 1.11. Corrected mass in running order (kg)...
- 1.12. Technical Permissible Maximum Laden Mass of trailer (kg)...
- 1.13. Technical Permissible Maximum Laden Mass of axle assembly (kg)...

2. Vehicle dimensions

- 2.1. External length of the body (m)...
- 2.2. External width of the body (m)...
- 2.3. External height of the body (m)...
- 2.4. Total height of the trailer (m)...
- 2.5. Cargo volume (m³)...
- 2.6. Length from trailer front end to centre of first axle (m)...
- 2.7. Length between centres of axles (m)...
- 2.8. Trailer coupling point (high/low)

3. Aerodynamic device

- 3.1. Certification number of the certified aerodynamic device ...
- 3.2. Elements of the standard aerodynamic device (none, short side covers ...) ...

4. Axle and tyre features

4.1. Axle 1

4.1.1. Tyre certification number ...

4.1.2. Twin tyre (yes/no) ...

4.1.3. Axle steered (yes/no) ...

4.1.4. Axle liftable (yes/no) ...

4.2. Axle 2

4.2.1. Tyre certification number ...

4.2.2. Twin tyre (yes/no) ...

4.2.3. Axle steered (yes/no) ...

4.2.4. Axle liftable (yes/no) ...

4.3. Axle 3

4.3.1. Tyre certification number ...

4.3.2. Twin tyre (yes/no) ...

4.3.3. Axle steered (yes/no) ...

4.3.4. Axle liftable (yes/no) ...

ANNEX IV

TEMPLATE OF THE MANUFACTURER'S RECORDS FILE AND OF THE CUSTOMER INFORMATION FILE

PART I

Manufacturer's records file

The manufacturer's records file will be produced by the simulation tool and shall contain the following information:

1. Vehicle, component, separate technical unit and systems data**1.1. Main vehicle data**

- 1.1.1. Name and address of the manufacturer ...
- 1.1.2. Model / Commercial name ...
- 1.1.3. Vehicle identification number (VIN)...
- 1.1.4. Legislative category (O₃, O₄)...
- 1.1.5. Number of axles...
- 1.1.6. Trailer type (DA; DB, DC)
- 1.1.7. Bodywork type (e.g. dry box, refrigerated) ...
- 1.1.8. Trailer coupling point – only for DC (high, low) ...
- 1.1.9. Volume orientation (yes/no)
- 1.1.10. Corrected mass in running order (kg)...
- 1.1.11. Technical Permissible Maximum Laden Mass of trailer (kg)...
- 1.1.12. Technical Permissible Maximum Laden Mass of axle assembly (kg)...
- 1.1.13. Vehicle group in accordance with Table 1 of Annex I ...
- 1.1.14. Vehicle group in accordance with the documentation of the simulation tool...

1.2. Vehicle dimensions

- 1.2.1. External length of the body (m)...
- 1.2.2. External width of the body (m)...
- 1.2.3. External height of the body (m)...
- 1.2.4. Total height of the trailer (m)...
- 1.2.5. Cargo volume (m³)...
- 1.2.6. Length from trailer front end to centre of first axle (m)...
- 1.2.7. Length between centres of axles (m)...

1.3. Aerodynamic device

- 1.3.1. Certification number of the certified aerodynamic device ...

1.3.2. Standard values for aerodynamic devices used (no, side covers short, ...)...

1.3.3. Aerodynamic reductions

1.3.3.1. Delta $C_D \times A$ yaw 0° (%)...

1.3.3.2. Delta $C_D \times A$ yaw 3° (%)...

1.3.3.3. Delta $C_D \times A$ yaw 6° (%)...

1.3.3.4. Delta $C_D \times A$ yaw 9° (%)...

1.3.4. Hash of the aerodynamic device input data and input information

1.4. Axle and tyre features

1.4.1. Axle 1

1.4.1.1. Tyre model ...

1.4.1.2. Tyre certification number ...

1.4.1.3. Tyre size designation ...

1.4.1.4. Specific RRC (N/N) ...

1.4.1.5. Fuel efficiency class (e.g. A, B ..) ...

1.4.1.6. Hash of the tyre input data and input information ...

1.4.1.7. Twin tyre (yes/no) ...

1.4.1.8. Axle steered (yes/no) ...

1.4.1.9. Axle liftable (yes/no) ...

1.4.2. Axle 2

1.4.2.1. Tyre model ...

1.4.2.2. Tyre certification number ...

1.4.2.3. Tyre size designation ...

1.4.2.4. Specific RRC (N/N) ...

1.4.2.5. Fuel efficiency class (e.g. A, B ..) ...

1.4.2.6. Hash of the tyre input data and input information ...

1.4.2.7. Twin tyre (yes/no) ...

1.4.2.8. Axle steered (yes/no) ...

1.4.2.9. Axle liftable (yes/no) ...

1.4.3. Axle 3

- 1.4.3.1. Tyre model ...
- 1.4.3.2. Tyre certification number ...
- 1.4.3.3. Tyre size designation ...
- 1.4.3.4. Specific RRC (N/N) ...
- 1.4.3.5. Fuel efficiency class (e.g. A, B ..) ...
- 1.4.3.6. Hash of the tyre input data and input information ...
- 1.4.3.7. Twin tyre (yes/no) ...
- 1.4.3.8. Axle steered (yes/no) ...
- 1.4.3.9. Axle liftable (yes/no) ...

2. **Mission profile and payload depending values**

- 2.1. Main simulation parameters
 - 2.1.1. Generic towing vehicle configuration...
 - 2.1.2. Mission profile (e.g. long haul, regional delivery)...
 - 2.1.3. Payload (kg) ...
- 2.2. Results
 - 2.2.1. Total vehicle mass in simulation (kg) ...
 - 2.2.2. $C_D \times A$ values
 - 2.2.2.1. $C_D \times A$ value yaw angle 0° (m^2) ...
 - 2.2.2.2. $C_D \times A$ value yaw angle 3° (m^2) ...
 - 2.2.2.3. $C_D \times A$ value yaw angle 6° (m^2) ...
 - 2.2.2.4. $C_D \times A$ value yaw angle 9° (m^2) ...
 - 2.2.3. Average speed (km/h)
 - 2.2.4. Fuel consumption
 - 2.2.4.1. Fuel consumption (g/km)...
 - 2.2.4.2. Fuel consumption (g/t-km)...
 - 2.2.4.3. Fuel consumption (g/ m^3 -km)...
 - 2.2.4.4. Fuel consumption (l/100km)...
 - 2.2.4.5. Fuel consumption (l/t-km)...
 - 2.2.4.6. Fuel consumption (l/ m^3 -km)...

2.2.5. CO₂ emissions

2.2.5.1. CO₂ emissions (g/km)...

2.2.5.2. CO₂ emissions (g/t-km)...

2.2.5.3. CO₂ emissions (g/m³-km)...

2.2.6. Efficiency ratios

2.2.6.1. Efficiency ratio – kilometre based (-)...

2.2.6.2. Efficiency ratio – ton-kilometre based (-)...

2.2.6.3. Efficiency ratio – m³-kilometre based (-)...

3. **Weighted results**

3.1. Payload (kg) ...

3.2. Fuel consumption

3.2.1. Fuel consumption (g/km)...

3.2.2. Fuel consumption (g/t-km)...

3.2.3. Fuel consumption (g/m³-km)...

3.2.4. Fuel consumption (l/100km)...

3.2.5. Fuel consumption (l/t-km)...

3.2.6. Fuel consumption (l/m³-km)...

3.3. CO₂ emissions

3.3.1. CO₂ emissions (g/km)...

3.3.2. CO₂ emissions (g/t-km)...

3.3.3. CO₂ emissions (g/m³-km)...

3.4. Efficiency ratios

3.4.1. Efficiency ratio – kilometre based (-)...

3.4.2. Efficiency ratio – ton-kilometre based (-)...

3.4.3. Efficiency ratio – m³-kilometre based (-)...

4. **Generation of vehicle input data and input information**

4.1. Date and time ...

4.2. Cryptographic hash ...

5. Software information

- 5.1. Simulation tool version (X.X.X)...
- 5.2. Date and time of the simulation

PART II

Customer information file**1. Vehicle, component, separate technical unit and systems data****1.1. Main vehicle data**

- 1.1.1. Name and address of the manufacturer ...
- 1.1.2. Model / Commercial name ...
- 1.1.3. Vehicle identification number (VIN)...
- 1.1.4. Legislative category (O₃, O₄)...
- 1.1.5. Number of axles...
- 1.1.6. Trailer type (DA; DB, DC) ...
- 1.1.7. Bodywork type ...
- 1.1.8. Trailer coupling point (high, low) ...
- 1.1.9. Volume orientation (yes/no)
- 1.1.10. Corrected mass in running order (kg)...
- 1.1.11. Technical Permissible Maximum Laden Mass of trailer (kg)...
- 1.1.12. Technical Permissible Maximum Laden Mass of axle assembly (kg)...
- 1.1.13. Vehicle group in accordance with Table 1 of Annex I ...
- 1.1.14. Vehicle group in accordance with the documentation of the simulation tool...

1.2. Vehicle dimensions

- 1.2.1. External length of the body (m)...
- 1.2.2. External width of the body (m)...
- 1.2.3. External height of the body (m)...
- 1.2.4. Total height of the trailer (m)...
- 1.2.5. Cargo volume (m³)...

1.3. Aerodynamic device

- 1.3.1. Elements of a standard aerodynamic device (e.g. none, short side covers, ...) ...
- 1.3.2. Certification number of a certified aerodynamic device ...
- 1.3.3. Aerodynamic reductions
 - 1.3.3.1. Delta C_D×A yaw 0° (%)...

1.3.3.2. Delta $C_D \times A$ yaw 3° (%)...

1.3.3.3. Delta $C_D \times A$ yaw 6° (%)...

1.3.3.4. Delta $C_D \times A$ yaw 9° (%)...

1.4. **Axle and tyre features**

1.4.1. Axle 1

1.4.1.1. Tyre certification number ...

1.4.1.2. Tyre dimension ...

1.4.1.3. Fuel efficiency class in accordance with Regulation (EU) 2020/740 ...

1.4.1.4. Twin tyre (yes/no) ...

1.4.1.5. Axle steered (yes/no) ...

1.4.1.6. Axle liftable (yes/no) ...

1.4.2. Axle 2

1.4.2.1. Tyre certification number ...

1.4.2.2. Tyre dimension ...

1.4.2.3. Fuel efficiency class in accordance with Regulation (EU) 2020/740 ...

1.4.2.4. Twin tyre (yes/no) ...

1.4.2.5. Axle steered (yes/no) ...

1.4.2.6. Axle liftable (yes/no) ...

1.4.3. Axle 3

1.4.3.1. Tyre certification number ...

1.4.3.2. Tyre dimension ...

1.4.3.3. Fuel efficiency class in accordance with Regulation (EU) 2020/740...

1.4.3.4. Twin tyre (yes/no) ...

1.4.3.5. Axle steered (yes/no) ...

1.4.3.6. Axle liftable (yes/no) ...

2. **Mission profile and payload depending values**

2.1. Main simulation parameters

2.1.1. Generic towing vehicle configuration...

2.1.2. Mission profile (e.g. long haul, regional delivery)...

2.1.3. Payload (kg) ...

2.2. Results

2.2.1. Total vehicle mass in simulation (kg) ...

2.2.2. Average speed (km/h)

2.2.3. Fuel consumption

2.2.3.1. Fuel consumption (g/km)...

2.2.3.2. Fuel consumption (g/t-km)...

2.2.3.3. Fuel consumption (g/m³-km)...

2.2.3.4. Fuel consumption (l/100km)...

2.2.3.5. Fuel consumption (l/t-km)...

2.2.3.6. Fuel consumption (l/m³-km)...

2.2.4. CO₂ emissions

2.2.4.1. CO₂ emissions (g/km)...

2.2.4.2. CO₂ emissions (g/t-km)...

2.2.4.3. CO₂ emissions (g/m³-km)...

2.2.5. Efficiency ratios

2.2.5.1. Efficiency ratio – kilometre based (-)...

2.2.5.2. Efficiency ratio – ton-kilometre based (-)...

2.2.5.3. Efficiency ratio – m³-kilometre based (-)...

2.2.6. Reference ratio

2.2.6.1. Reference ratio – kilometre based (-)...

3. Weighted results

3.1. Payload (kg) ...

3.2. Fuel consumption

3.2.1. Fuel consumption (g/km)...

3.2.2. Fuel consumption (g/t-km)...

3.2.3. Fuel consumption (g/m³-km)...

3.2.3.1. Fuel consumption (l/100km)...

3.2.3.2. Fuel consumption (l/t-km)...

3.2.3.3. Fuel consumption (l/m³-km)...

3.3. CO₂ emissions

3.3.1. CO₂ emissions (g/km)...

3.3.2. CO₂ emissions (g/t-km)...

3.3.3. CO₂ emissions (g/m³-km)...

3.4. Efficiency ratios

3.4.1. Efficiency ratio – kilometre based (-)...

3.4.2. Efficiency ratio – ton-kilometre based (-)...

3.4.3. Efficiency ratio – m³-kilometre based (-)...

4. **Software information**

4.1. Simulation tool version (X.X.X)...

4.2. Date and time of the simulation

4.3. Cryptographic hash of the manufacturer's records file ...

4.4. Cryptographic hash of the customer information file ...

ANNEX V

VEHICLE'S AIR DRAG DATA

Determination of aerodynamic device data

1. INTRODUCTION

This Annex sets out the procedure for the determination of the aerodynamic device data.

2. DEFINITIONS

(1) Standard aerodynamic devices are aerodynamic devices for which standard values can be used in the vehicle certification. The standard aerodynamic device may consist of the following elements:

- (a) 'rear flaps' means an aerodynamic device composed by two or more rear fairing panels located at the rear end of the vehicle with the aim to reduce its wake;
- (b) 'short rear flaps' means rear flaps which lateral panels measure at least 2 meters and do not cover the total height of the body;
- (c) 'tall rear flaps' means rear flaps which lateral panels cover the entire height of the body with a tolerance of $\pm 3\%$ of the total height of the body;
- (d) 'side covers' means an aerodynamic device composed by panels located at the lower side of the vehicle with the aim to reduce the impact of crosswind and/or the turbulences created by the wheels on the air drag;
- (e) 'short side covers' means side covers that do not cover the area of the wheels; in case of semi-trailers, they cover only the distance between the landing gear and the beginning of the first wheel;
- (f) 'long side covers' means side covers that cover a distance between the landing gear of a semi-trailer and the rear end of the vehicle;

(2) 'CFD' means computational fluid dynamic simulation used for analysing complex fluid phenomena;

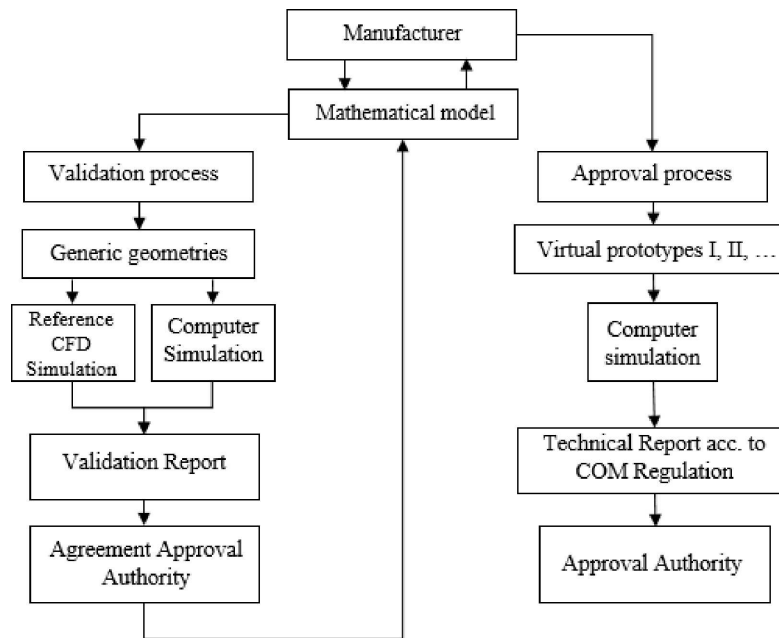
3. DETERMINATION OF AIR DRAG REDUCTION BY MEANS OF VIRTUAL TESTS USING CFD

3.1. **Validation of the CFD method**

Based on the validation process as specified in Annex VIII, Appendix 3 to Regulation (EU) 2018/858, the certification of an aerodynamic device by means of CFD shall require the CFD method to be validated against a reference CFD method as shown in Figure 1.

The CFD method to be validated shall be applied to a set of generic geometries.

Figure 1

Validation process of the CFD method

Comparability of the computer simulation results shall be proven. The manufacturer of the aerodynamic device or the technical service shall draft a validation report and submit it to the approval authority.

Any change to the CFD method or to the software that is likely to invalidate the validation report shall be brought to the attention of the approval authority, which may require that a new validation process is conducted.

Once validated, the method shall be used for certifying the aerodynamic device.

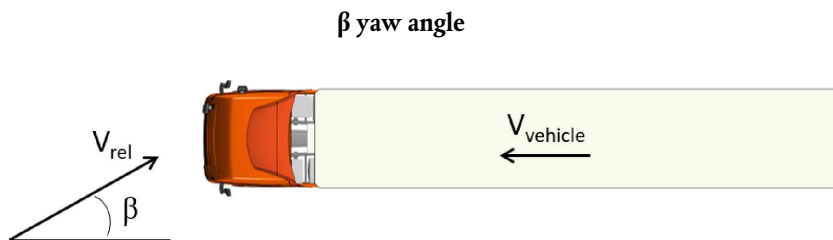
3.2. Requirements for the validation of the CFD method

The validation process shall consist of simulating three different CFD simulation sets as follows:

- (a) BASE set:
 - Generic 4x2 tractor
 - Generic ST1 semi-trailer.
- (b) TRF set:
 - Generic 4x2 tractor
 - Generic ST1 semi-trailer
 - Generic tall rear flaps
- (c) LSC set:
 - Generic 4x2 tractor
 - Generic ST1 semi-trailer
 - Generic long side covers

Each set shall be simulated at $\beta=0,0$, $3,0$ and $6,0$ degrees of yaw to account for crosswind effects coming from the left hand side of the vehicle, as shown in Figure 2.

Figure 2



The heat exchangers pressure drop shall be modelled as per equation [1]:

$$\frac{dp}{dx} = -(P_i \cdot v^2 + P_v \cdot v) \quad [1]$$

where the coefficients for each heat exchanger shall be as listed in Table 1.

Table 1

Porous media resistance coefficients

Coefficient	Condenser	Charge Air Cooler	Radiator
Inertial Resistance (P_i) [kg/m^4]	140,00	60,00	120,00
Viscous Resistance (P_v) [$\text{kg/m}^3\text{s}$]	450,00	300,00	450,00

The CFD shall comply with the requirements listed in Table 2. The compliance for the minimum CFD requirements shall be demonstrated to the approval authority.

Table 2

Minimum CFD requirements

Field	Value	Comments
Vehicle velocity	25,00 m/s	To be used as the drag coefficient reference velocity.
Vehicle frontal area	10,047 m ²	To be used as the drag coefficient reference area.
Tractor Front Wheel Rotation axis-to-Ground Vertical Distance	527,00 mm	
Semi-trailer Rear Wheel Rotation axis-to-Ground Vertical Distance	514,64 mm	
Simulation Domain dimensions. Length	Length $\geq$ 145,00 m	
Simulation Domain dimensions. Width	Width $\geq$ 75,00 m	
Simulation Domain dimensions. Height	Height $\geq$ 25,00 m	

Vehicle Position Air Inlet to Vehicle Front End Distance	$\geq 25,00$ m	
Vehicle Position Air Outlet to Vehicle Rear End Distance	$\geq 100,00$ m	
Domain Discretization. Cell Count	≥ 60 million cells	Mesh refinement applied to properly capture aero-relevant areas

The CFD method shall fulfil an accuracy for $\Delta(C_D \times A)$ during the validation for each of the six comparisons with respect to the reference ranges as shown in Table 3.

Table 3

Reference ranges for the validation process

Simulation set	Yaw Angle – β [deg]		
	0,0°	3,0°	6,0°
TRF	$-8,6 \% < C_D < -1,6 \%$	$-9,0 \% < C_D < -2,0 \%$	$-10,3 \% < C_D < -3,3 \%$
LSC	$-8,8 \% < C_D < -1,8 \%$	$-8,0 \% < C_D < -1,0 \%$	$-8,1 \% < C_D < -1,1 \%$

The validation report shall reflect the $C_D \times A$ [m²] value for all nine CFD simulations as shown in Table 4.

The validation report shall contain all of the following:

— $C_D \times A$ [m²] results:

Table 4

($C_D \times A$) [m²] results

Simulation set	Yaw Angle – β [deg]		
	0,0°	3,0°	6,0°
BASE			
TRF			
LSC			

— in the case of steady-state methods:

- raw data of the evolution of C_D (or $C_D \times A$) vs iteration, in *.csv format.
- the average of the last 400 iterations.

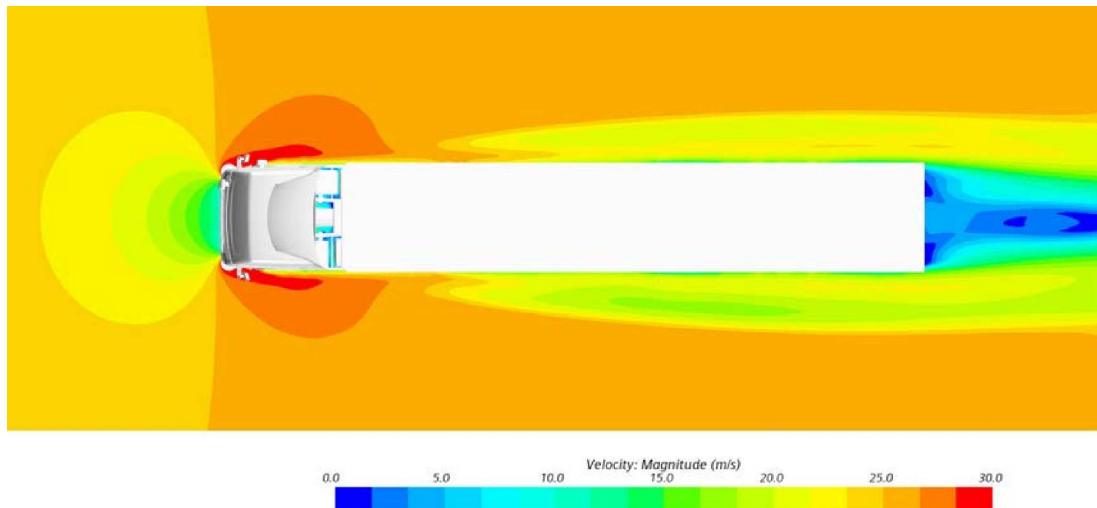
— in the case of transient methods:

- raw data of the evolution of C_D (or $C_D \times A$) vs time, in *.csv format.
- the average of the last 5,0 seconds.

- A XY plane section intersecting the entire simulation domain:
 - passing through the tractor front axle wheel rotation point,
 - showing the airflow velocity magnitude in a scale going from 0 to 30 m/s and with a colour bar divided in, at least, 18 colour levels as shown in Figure 3.

Figure 3

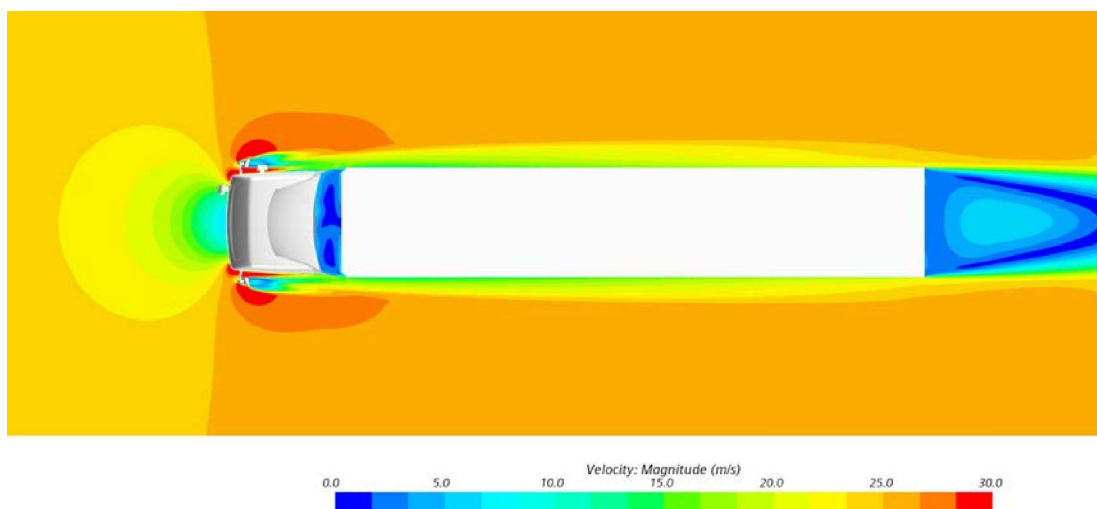
XY plane view passing through the front axle wheel rotation point



- A XY plane section intersecting the entire simulation domain:
 - passing through the tractor side mirrors,
 - showing the airflow velocity magnitude in a scale going from 0 to 30 m/s and with a colour bar divided in, at least, 18 colour levels as shown in Figure 4.

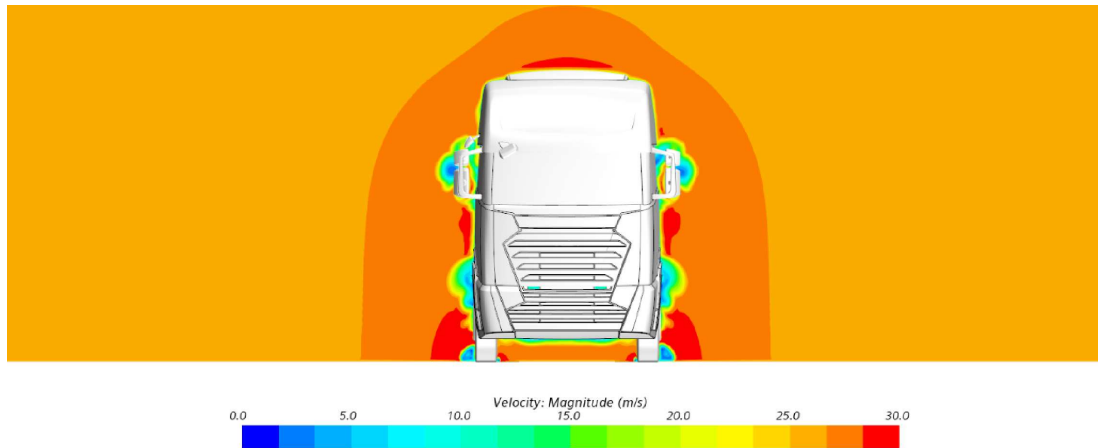
Figure 4

XY plane view passing through the tractor side mirrors



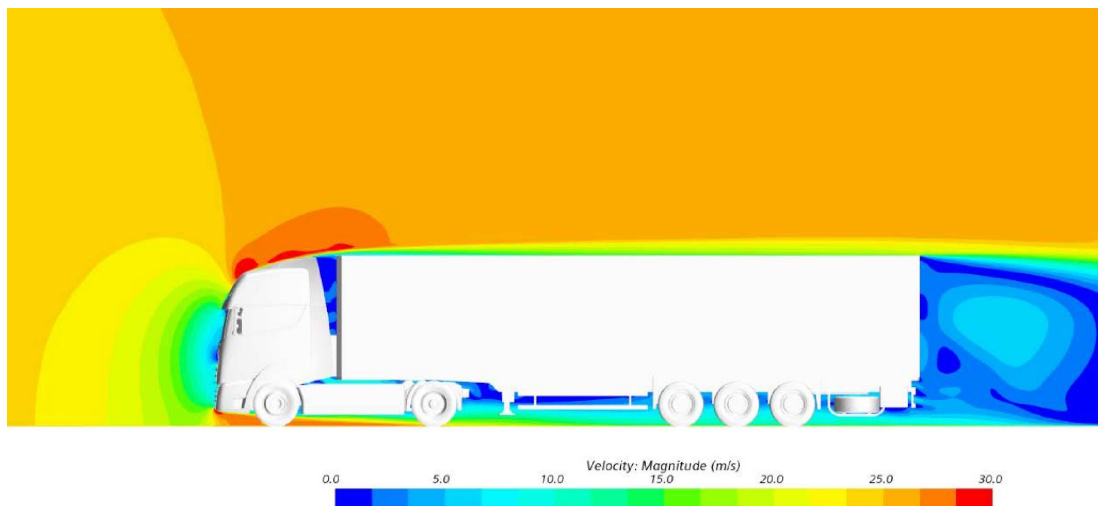
- A YZ plane section intersecting the entire simulation domain:
 - passing through the tractor front axle wheel rotation point,
 - showing the airflow velocity magnitude in a scale going from 0 to 30 m/s and with a colour bar divided in, at least, 18 colour levels as shown in Figure 5.

Figure 5

YZ plane view passing through the front axle wheel rotation point

- A XZ plane section intersecting the entire simulation domain:
- passing through the centre of the vehicle,
- showing the airflow velocity magnitude in a scale going from 0 to 30 m/s and with a colour bar divided in, at least, 18 colour levels as shown in Figure 6.

Figure 6

XZ plane view passing through the centre of the vehicle

The XY, YZ and XZ planes use a coordinate system fixed to the vehicle as shown in Figure 7, where,

- the X-axis is oriented along the longitudinal direction of the vehicle,
- the Y-axis is oriented along the width of the vehicle,
- the Z-axis is oriented along the height of the vehicle.

Figure 7

Position of the coordinate system in relation to the vehicle



3.3. Certification of an aerodynamic device

The manufacturer of the aerodynamic device shall use generic vehicle geometries to demonstrate the performance of the aerodynamic device mounted on a trailer or semi-trailer. For that purpose, the 3D model of the aerodynamic device shall be added to the generic vehicle geometries in the same position as if it were mounted on a real vehicle.

Upon agreement of an approval authority, the manufacturer of the aerodynamic device may make changes to the generic geometries if that is necessary for the correct installation or proper operation of the aerodynamic device and if that change adequately reflects reality.

The validated CFD method shall be applied to the modified geometries and $\Delta(C_D \times A)$ values for 4 yaw angles shall be computed: $\beta = 0,0, 3,0, 6,0$ and $9,0$ degree.

3.4. Declaration of air drag reduction values

The technical report shall reflect the aerodynamic benefit $\Delta(C_D \times A)$ [%] for all 4 yaw angles as shown in Table 5.

Table 5

$\Delta(C_D \times A)$ [%] per yaw angle of the modified (semi-)trailer

$\Delta(C_D \times A)(\beta)$ [%]	Yaw Angle – β [deg]			
	0,0°	3,0°	6,0°	9,0°
Modified (semi-)trailer				

computed in accordance with the following formula [2]:

$$\Delta(C_D \times A)(\beta) = \frac{C_D \times A(\beta)_{BASE} - C_D \times A(\beta)_{MOD}}{C_D \times A(\beta)_{BASE}} \times 100 \text{ [2]}$$

Where,

$C_D \times A(\beta)_{Mod}$ is the aerodynamic resistance (in m²) of the modified geometry computed by the validated CFD method for $\beta = 0,0, 3,0, 6,0$ and $9,0$ degree.

$C_D \times A(\beta)_{BASE}$ is the aerodynamic resistance (in m²) of the BASE set computed by the validated CFD method for $\beta = 0,0, 3,0, 6,0$ and $9,0$ degree.

Appendix 1

TEMPLATE OF A CERTIFICATE OF A COMPONENT, SEPARATE TECHNICAL UNIT OR SYSTEM

Maximum format: A4 (210 × 297 mm)

CERTIFICATE ON CO₂ EMISSIONS AND FUEL CONSUMPTION RELATED PROPERTIES OF AN AERODYNAMIC DEVICE FAMILY

Communication concerning: — granting ⁽¹⁾ — extension ⁽¹⁾ — refusal ⁽¹⁾ — withdrawal ⁽¹⁾	Stamp
⁽¹⁾ Delete as appropriate	

of a certificate on CO₂ emission and fuel consumption related properties of an aerodynamic device family in accordance with Commission Implementing Regulation (EU) 2022/1362 ⁽¹⁾.

Implementing Regulation (EU) 2022/1362

Certification number:

Hash:

Reason for extension:

SECTION I

0.1. Make (trade name of manufacturer):

0.2. Aerodynamic device type / family (if applicable):

0.3. Aerodynamic device family member (in case of family)

0.3.1. Aerodynamic device parent

0.3.2. Aerodynamic device types within the family

0.4. Means of identification of type, if marked on the aerodynamic device

0.4.1. Location of the marking:

0.5. Name and address of the manufacturer:

0.6. In the case of components and separate technical units, location and method of affixing of the EC certification mark:

0.7. Name(s) and address(es) of assembly plant(s):

0.9. Name and address of the representative of the manufacturer of the aerodynamic device (if any)

⁽¹⁾ Commission Implementing Regulation (EU) 2022/1362 of 1 August 2022 implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as regards the performance of heavy-duty trailers with regard to their influence on the CO₂ emissions, fuel consumption, energy consumption and zero emission driving range of motor vehicles and amending Implementing Regulation (EU) 2020/683 (OJ L 205, 5.8.2022, p. 145).

SECTION II

1. Additional information (where applicable): see Addendum
2. Approval authority or Technical Service:
3. Date of technical report:
4. Number of technical report:
5. Remarks (if any): see Addendum
6. Place:
7. Date:
8. Signature:

Attachments:

1. Information package
 2. Validation report
 3. Technical report
 4. Documentation for the correct installation of the aerodynamic device
-

Appendix 2

Aerodynamic device information document

Description sheet no.:

Issue: 000

from:

Amendment:

pursuant to ...

Aerodynamic device type or family (if applicable):

0. GENERAL

0.1. Name and address of the manufacturer of the aerodynamic device:

0.2. Make (trade name of the manufacturer of the aerodynamic device):

0.3. Aerodynamic device model:

0.4. Aerodynamic device family:

0.5. In the case of the aerodynamic device is a combination of aerodynamic devices or equipment, the main elements of the aerodynamic device:

0.6. Commercial name(s) (if available):

0.7. Means of identification of model, if marked on the aerodynamic device:

0.8. Location and affixing of the EC certification mark

0.9. Name(s) and address(es) of assembly plant(s):

0.10. Name and address of the representative of the manufacturer of the aerodynamic device (if any):

PART 1

ESSENTIAL CHARACTERISTICS OF THE (PARENT) AERODYNAMIC DEVICE AND THE AERODYNAMIC DEVICE TYPES WITHIN A FAMILY

	Parent aerodynamic device	Family members		
		#1	#2	#3

1.0. SPECIFIC AERODYNAMIC DEVICE INFORMATION

1.1. Vehicle group codes according to the input data as set out in Annex I to Commission Implementing Regulation (EU) 2022/1362

1.2. Elements of the aerodynamic device:

- 1.3. Drawings of the aerodynamic device:
- 1.4. Working principle of retractable or folding mechanism (if applicable)
- 1.5. System description

LIST OF ATTACHMENTS

No.:	Description:	Date of issue:
1	...	
2	...	

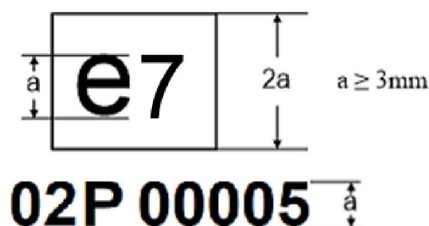
*Appendix 3***Markings**

In the case of an aerodynamic device certified in accordance with Annex V to Commission Implementing Regulation (EU) 2022/1362, the device or the devices shall bear:

- 1.1. the name or trade mark of the manufacturer of the aerodynamic device;
- 1.2. the make and identifying type indication as recorded in the information referred to in point 0.2 and 0.3 of Appendix 2 to Annex V to Implementing Regulation (EU) 2022/1362;
- 1.3. The certification mark as a rectangle surrounding the lower-case letter 'e' followed by the distinguishing number of the Member State which has granted the certificate:
 - 1 for Germany;
 - 2 for France;
 - 3 for Italy;
 - 4 for the Netherlands;
 - 5 for Sweden;
 - 6 for Belgium;
 - 7 for Hungary;
 - 8 for Czechia;
 - 9 for Spain;
 - 12 for Austria;
 - 13 for Luxembourg;
 - 17 for Finland;
 - 18 for Denmark;
 - 19 for Romania;
 - 20 for Poland;
 - 21 for Portugal;
 - 23 for Greece;
 - 24 for Ireland;
 - 25 for Croatia;
 - 26 for Slovenia;
 - 27 for Slovakia;
 - 29 for Estonia;
 - 32 for Latvia;
 - 34 for Bulgaria;
 - 36 for Lithuania;
 - 49 for Cyprus;
 - 50 for Malta
- 1.4. The certification mark shall also show in the vicinity of the rectangle the 'base certification number' as specified for Section 4 of the type-approval number set out in Annex I to Regulation (EU) 2020/683 preceded by the two figures indicating the sequence number assigned to the latest technical amendment to this Regulation and by a character 'P' indicating that the approval has been granted for airdrag.

For this Regulation, the sequence number shall be 00.

1.5. Example and dimensions of the certification mark



The above certification mark affixed to an aerodynamic device shows that the type concerned has been certified in Hungary (e7), pursuant to this Regulation. The first two digits (02) are indicating the sequence number assigned to the latest technical amendment to this Regulation. The following letter indicates that the certificate was granted for aerodynamic device (P). The last five digits (00005) are those allocated by the approval authority to the air drag as the base certification number.

- 1.6. The markings, labels, plates or stickers shall be durable for the useful life of the aerodynamic device, clearly legible and indelible. The manufacturer shall ensure that the markings, labels, plates or sticker cannot be removed without destroying or defacing them.
- 1.7. The certification mark shall be visible when the aerodynamic device is mounted on the vehicle shall be affixed to a part necessary for normal operation and not normally requiring replacement during component life.
- 1.8. The certification mark shall also be affixed to the front of the trailer including a list indicated all relevant separate element of the aerodynamic device that have a certification mark. The manufacturer of the aerodynamic device shall provide markings in the form of labels, plates or stickers to the vehicle manufacturer.
- 1.9. In case non-certified aerodynamic devices are used for the CO₂ certification of the trailer, the vehicle manufacturer shall affix a label, plate or sticker to the front of the vehicle indicating the name of the manufacturer of the aerodynamic device and the list of aerodynamic devices used for the certification.
- 1.10. The markings, labels, plates or stickers shall be durable for the useful life of the vehicle, clearly legible and indelible. The vehicle manufacturer shall ensure that the label, plate or sticker cannot be removed without destroying or defacing them.

2. Numbering

2.1. Certification number for air drag shall comprise the following:

eX*YYYY/YYYY*ZZZZ/ZZZZ*P*00000*00

section 1	section 2	section 3	Additional letter to section 3	section 4	section 5
Indication of country issuing the certificate	HDV CO ₂ certification for (semi-)trailers	Latest amending Regulation (ZZZZ/ZZZZ)	P = Air drag	Base certification number 00000	Extension 00

*Appendix 4***Family concept****1. General**

An aerodynamic device family is characterised by design and performance parameters. Those parameters shall be common to all members within the family. The manufacturer of the aerodynamic devices may decide which aerodynamic devices belong to a family, as long as the criteria listed in point 4 of this Appendix are respected. The Approval Authority shall approve aerodynamic device family. The manufacturer of the aerodynamic devices shall provide the Approval Authority with the appropriate information about the members of the family.

2. Special cases

- 2.1. In some cases, there may be interaction between parameters. The manufacturer of the aerodynamic devices shall identify those cases and take them into consideration to ensure that only aerodynamic devices with similar characteristics are included within the same family. The manufacturer of the aerodynamic devices shall notify those cases to the approval authority to take them into account as a criterion for creating a new aerodynamic device family.
- 2.2. The manufacturer shall identify parameters which are not listed in point 3 and which have a strong influence on the level of performance on the basis of good engineering practice and notify those parameters to the approval authority.

3. Parameters defining an aerodynamic device family

- (a) shape and working principle;
- (b) main dimensions;
- (c) applicability on different trailer categories/types/groups.

4. Criteria for the choice of the parent aerodynamic device

- 4.1. The manufacturer of the aerodynamic device shall select the parent aerodynamic device of each family in accordance with the following criteria:
 - (a) the aerodynamic device fits the applicable generic geometry laid down in Appendix 4 of this Annex;
 - (b) all members of the family have an equal or higher air drag reduction than the $\Delta(C_D \times A)$ declared for the parent aerodynamic device;
 - (c) the applicant for a certificate can demonstrate, based on CFD, wind tunnel results or good engineering practice, that the selection of the parent aerodynamic device meets the criteria laid down in Point 4.1.(b).
- Point (c) shall apply for all aerodynamic device variants that can be simulated by CFD as described in this Annex.
-

*Appendix 5***1. Standard values**

- 1.1. In case the aerodynamic devices are not certified in accordance with the method referred to in Point 3 of this Annex, the vehicle manufacturer shall use standard values. To use the standard values for vehicle certification, the aerodynamic device shall meet the geometry criteria listed in Table 1 to Table 6.
- 1.2. The standard values for aerodynamic reductions are allocated automatically by the simulation tool. For that purpose, the vehicle manufacturer shall use the input parameter T022 specified in Table 1 of Annex III.
- 1.3. In case of DA trailers, the vehicle manufacturer shall only use standard values for aerodynamic devices if the trailer is equipped with the following standard aerodynamic device configurations:
 - (a) short side covers;
 - (b) long side covers;
 - (c) short rear flaps;
 - (d) tall rear flaps;
 - (e) short side covers and short rear flaps;
 - (f) short side covers and tall rear flaps;
 - (g) long side covers and short rear flaps;
 - (h) long side covers and tall rear flaps.
- 1.4. In case of DB and DC trailers, the vehicle manufacturer shall only use standard values for aerodynamic devices if the trailer is equipped with the following standard aerodynamic device configurations:
 - (a) short side covers;
 - (b) short rear flaps;
 - (c) tall rear flaps;
 - (d) short side covers and short rear flaps;
 - (e) short side covers and tall rear flaps.
- 1.5. The vehicle manufacturer shall not combine standard values with the providing of input data for a certified aerodynamic device.

2. Geometry criteria

- 2.1. The dimensions laid down in Table 1, Table 2, Table 3, Table 4, Table 5 and Table 6 refer to the minimum criteria an aerodynamic device shall meet to be classified under the relevant category.

To prevent significant air flow between the bodywork and the rear flaps, the vehicle manufacturer shall attach the rear flaps to the bodywork in such a way that the gap between the flaps and the bodywork does not exceed 4 mm in open position.

Table 1

Geometry specifications of long side covers for DA trailers

Specification	Unit	External dimension (tolerance)	Remarks
Length	[mm]	(*)	(*) Enough to cover from the landing gear to the rear end
Height	[mm]	≥ 760	In the case of a volume-oriented semi-trailer, the height shall be equal to or larger than 490mm.
Fillet radius	[mm]	≤ 100	As shown in Figure 6

Table 2

Geometry specifications of short side covers for DA trailers

Specification	Unit	External dimension (tolerance)	Remarks
Length	[mm]	(**)	(**) Enough to cover from the landing gear to the beginning of the first wheel
Height	[mm]	≥ 760	In the case of a volume-oriented semi-trailer, the height shall be equal to or larger than 490mm.
Fillet radius	[mm]	≤ 100	As shown in Figure 5

Table 3

Geometry specifications of short rear flaps

Specification	Unit	External dimension (tolerance)	Remarks
Tapering angle	[°]	13 ± 2	For top and side panels
Length	[mm]	≥ 400	
Height	[mm]	$\geq 2\,000$	
Fillet radius	[mm]	≤ 200	As shown in Figure 1

Table 4

Geometry specifications of tall rear flaps

Specification	Unit	External dimension (tolerance)	Remarks
Tapering angle	[°]	13 ± 2	For top and side panels
Length	[mm]	≥ 400	

Height	[mm]	$\geq 2\,850$	Alternatively, if the height of the panel covers the entire height of the body with a tolerance of $\pm 3\%$ of the total height of the body, the device can be considered tall rear flaps
Fillet radius	[mm]	≤ 200	As shown in Figure 3

Table 5

Geometry specifications of side covers for DB trailers

Specification	Unit	External dimension (tolerance)	Remarks
Length	[mm]	(***)	(***) Enough to cover the area between the wheels
Height	[mm]	≥ 860	In the case of a volume-oriented trailer, the height shall be equal to or larger than 540mm.
Fillet radius	[mm]	≤ 100	As shown in Figure 7

Table 6

Geometry specifications of side covers for DC trailers

Specification	Unit	External dimension (tolerance)	Remarks
Length	[mm]	(****)	(****) Enough to cover the entire length of the vehicle with the exception of the area of the wheels
Height	[mm]	TPMLM axle assembly $\leq 13,5$ tonnes: ≥ 680 TPMLM axle assembly >13,5 tonnes: ≥ 860	In the case of a volume-oriented trailer, the height shall be equal to or larger than 490mm
Fillet radius	[mm]	≤ 100	As shown in Figure 8

- 2.2. The drawings in Figure 1, Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, Figure 7, and Figure 8 show examples for the aerodynamic devices:

Figure 1

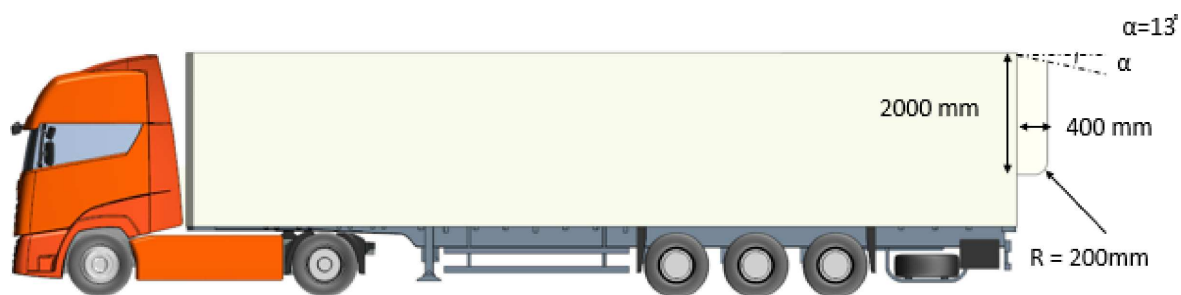
Short rear flaps, lateral view

Figure 2

Short rear flaps, top view

Figure 3

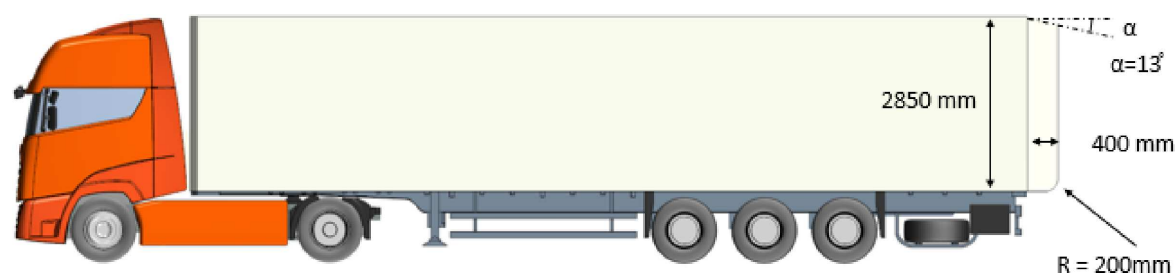
Tall rear flaps, lateral view

Figure 4

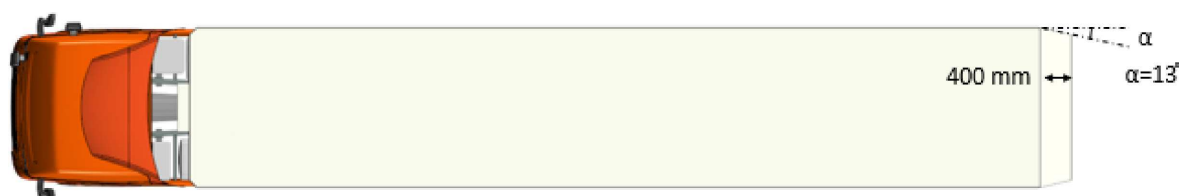
Tall rear flaps, top view

Figure 5

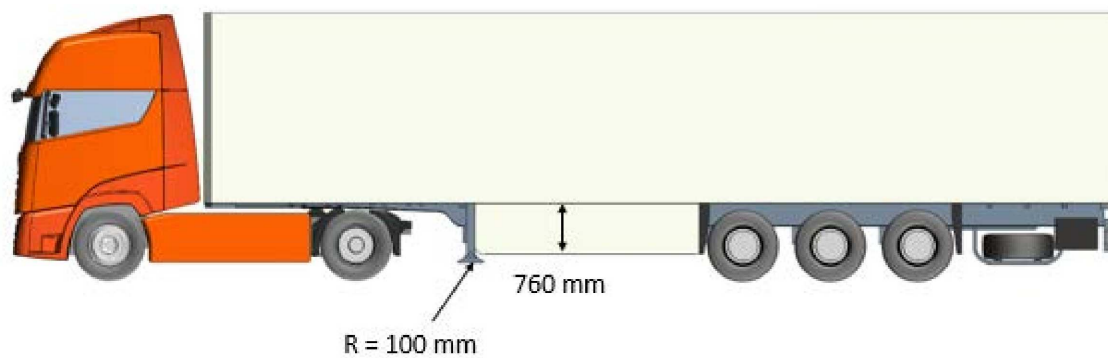
Short side covers for DA trailers, lateral view

Figure 6

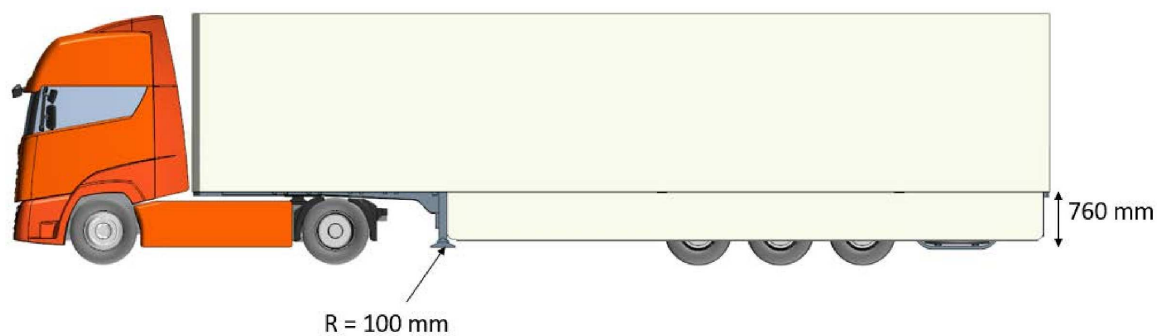
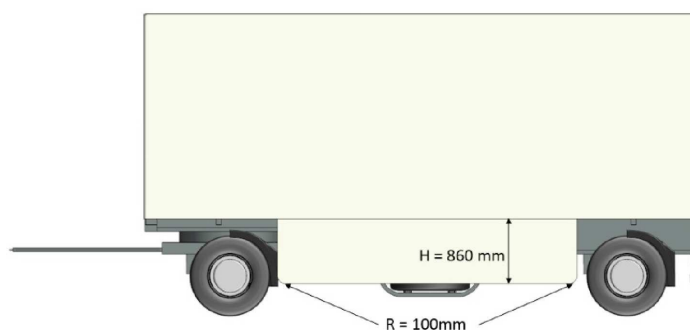
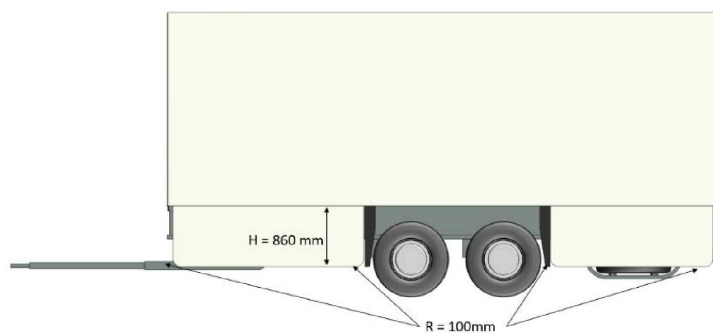
Long side covers for DA trailers, lateral view

Figure 7

Short side covers for DB trailers, lateral view

*Figure 8***Short side covers for DC trailers, lateral view**

Appendix 6

Input parameters for the simulation tool**1. Introduction**

This Appendix describes the list of parameters to be provided by the aerodynamic device manufacturer as input to the simulation tool. The applicable XML schema as well as example data are available at the dedicated electronic distribution platform.

2. Definitions

(1) 'Parameter ID': Unique identifier as used in the simulation tool for a specific input parameter or set of input data.

(2) 'Type': Data type of the parameter:

string	sequence of characters in ISO8859-1 encoding
token	sequence of characters in ISO8859-1 encoding, no leading/trailing whitespace
date	date and time in UTC time in the format: YYYY-MM-DDTHH:MM:SSZ with italic letters denoting fixed characters e.g. '2002-05-30T09:30:10Z'
integer	value with an integral data type, no leading zeros, e.g. '1800'
double, X	fractional number with exactly X digits after the decimal sign (':') and no leading zeros e.g. for 'double, 2': '2 345,67'; for 'double, 4': '45,6780'

(3) 'Unit' physical unit of the parameter

3. Set of input parameters

Table 1

Input parameters 'Aerodynamic device'

Parameter name	Parameter ID	Type	Unit	Description/Reference
Manufacturer	T028	token	[-]	
Model	T029	token	[-]	
Certification number	T030	token	[-]	
Date	T031	date	[-]	Date and time when the component hash is created
Certified aerodynamic reduction	T032	(double, 2)x4	[%]	Percent reduction in air drag compared to standard aerodynamic configuration for yaw angles 0°, 3°, 6° and 9° as to be calculated in accordance with point 3.4. of Annex V
Applicable vehicle group	T033	string	[-]	One entry per vehicle group for which the aerodynamic reduction has been certified

In case standard values in accordance with Appendix 5 are used in the simulation tool, no input data need be provided for aerodynamic device component. The standard values shall be automatically allocated according to the vehicle group and aerodynamic device configuration scheme.

ANNEX VI

Amendments to Implementing Regulation (EU) 2020/683

(1) Annex I is amended as follows:

(a) the following explanatory notes are added:

⁽¹⁷⁵⁾ Commission Implementing Regulation (EU) 2022/1362 ⁽²⁾

⁽¹⁷⁶⁾ As defined in Point (6) of Annex I, to Implementing Regulation (EU) 2022/1362

⁽¹⁷⁷⁾ Drawn up in accordance with the model set out in Part I of Annex IV to Implementing Regulation (EU) 2022/1362

⁽¹⁷⁸⁾ Drawn up in accordance with the model set out in Part II of Annex IV to Implementing Regulation (EU) 2022/1362

⁽¹⁷⁹⁾ As indicated in point 3.1. of the customer information file drawn up in accordance with the model set out in Part II of Annex IV to Implementing Regulation 2022/1362

⁽¹⁸⁰⁾ As indicated in point 3.4. of the customer information file drawn up in accordance with the model set out in Part II of Annex IV to Implementing Regulation 2022/1362

⁽¹⁸¹⁾ As indicated in point 1.2.5. of the customer information file drawn up in accordance with the model set out in Part II of Annex IV to Implementing Regulation 2022/1362

⁽¹⁸²⁾ In accordance with the tables set out in Annex I to Implementing Regulation (EU) 2022/1362

⁽²⁾ Commission Implementing Regulation (EU) 2022/1362 of 1 August 2022 implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as regards the performance of heavy-duty trailers with regard to their influence on the CO₂ emissions, fuel consumption, energy consumption and zero emission driving range of motor vehicles and amending Implementing Regulation (EU) 2020/683 (OJ L 205, 5.8.2022, p. 145).;

(b) the following points 3.5.11., 3.5.11.1. and 3.5.11.2. are inserted:

‘3.5.11. Environmental performance assessment (of heavy-duty trailers, as specified in Article 3 of Implementing Regulation (EU) 2022/1362 ⁽¹⁷⁶⁾

3.5.11.1. Simulation tool license number: ...

3.5.11.2. Volume oriented heavy goods vehicle: yes/no ⁽⁴⁾ ⁽¹⁷⁶⁾’;

(2) in Annex II, in Part I, B (Category O), the following points 3.5.11., 3.5.11.1. and 3.5.11.2 are inserted:

‘3.5.11. Environmental performance assessment (of heavy-duty trailers, as specified in Article 3 of Implementing Regulation (EU) 2022/1362

3.5.11.1 Simulation tool licence number: ...

3.5.11.2. Volume oriented heavy goods vehicle: yes/no ⁽⁴⁾ ⁽¹⁷⁶⁾’;

(3) in Annex III, Appendix 1, Categories O₃/O₄, the following is inserted after point 45.1.:

‘Environmental performance

49.1. Cryptographic hash of the manufacturer’s records file: ... ⁽¹⁷⁷⁾

49.4. Cryptographic hash of the customer information file: ... ⁽¹⁷⁸⁾

49.6. Weighted payload value ... t ⁽¹⁷⁹⁾

49.7. Vehicle group ...⁽¹⁸²⁾

49.9. Cargo volume ...m³⁽¹⁸¹⁾

49.10. Volume orientation: yes/no ⁽⁴⁾ ⁽¹⁷⁶⁾

49.11. Efficiency ratios: ... ⁽¹⁸⁰⁾

49.11.1. Efficiency ratio – kilometre based:...

49.11.2. Efficiency ratio – ton-kilometre based:...

49.11.3. Efficiency ratio – m³-kilometre based:...;

(4) in Annex VIII, Appendix, PART I, PART 2 VEHICLE CATEGORIES O₃ and O₄ (complete and completed vehicles) the following points are inserted after point 45.1.:

'Environmental performance

49.1. Cryptographic hash of the manufacturer's records file: ... ⁽¹⁷⁷⁾

49.4. Cryptographic hash of the customer information file: ... ⁽¹⁷⁸⁾

49.6. Weighted payload value ... t ⁽¹⁷⁹⁾

49.7. Vehicle group ...⁽¹⁸²⁾

49.9. Cargo volume ...m³⁽¹⁸¹⁾

49.10. Volume orientation: yes/no ⁽⁴⁾ ⁽¹⁷⁶⁾

49.11. Efficiency ratios: ... ⁽¹⁸⁰⁾

49.11.1. Efficiency ratio – kilometre based:...

49.11.2. Efficiency ratio – ton-kilometre based:...

49.11.3. Efficiency ratio – m³-kilometre based:...'
