EU CO_2-based tolling –
Eurovignette Directive and EFC standards

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Outline

1. Overview on standards and Electronic Fee Collection (EFC) standardization
2. Impact of the updated Directive 1999/62 on EFC standards
3. Overview of CO_2-related requirements from EU legislation that stem from the updated Directive 1999/62 and how these are supported by EFC standards
4. Examples of the calculation of the CO2 emission classes for heavy-duty vehicles (HDVs)

1. Overview on standards and EFC standardization

Overview on standards and EFC standardization

- **What is a standard?**
  - A document approved by a recognized standardization body (CEN, ISO,..), intended to be used repeatedly, creating synergies and reducing costs, maintained to keep abreast with market developments and technology advancements
  - Standards are not laws but sometimes referred to in legislation, i.e. 8 CEN EFC standards are referred to in the EETS legislation (European electronic toll service (EETS) respectively its Delegated Act and its Implementing Act)
- **EFC standardization**
  - Create and ensure the long-term stability of the EFC ecosystem, support agreement, open market and interoperability
  - 50+ published standards, technical specifications and technical reports
    System architecture, vocabulary, data dictionary, information exchanges for charging and compliance checking, security, testing for conformance assessment
- For more details – see Introduction to standards on electronic fee collection (EFC)

2. Impact of the updated Directive 1999/62 on EFC standards

Directive 1999/62

European Union (EU) Directive 1999/62 (aka the Eurovignette Directive) sets out how EU Member States can charge vehicles for using their road infrastructure, with the aim to:

- establish an internal market in road transport with a level playing field and ensure uniform and non-discriminatory application of rules
- strengthen the application of the user and polluter pays principles
- contribute to the financing of road infrastructures
- tackle congestion and the negative environmental and health impacts of air pollution and noise
- boost transport decarbonisation by contributing to the implementation of the **Paris Agreement** on climate change and the EU's plans to reduce CO_2 emissions

Directive 1999/62 and EFC standardization

The Directive does not refer to EFC standards

- No automatic review procedure or request to update standards from the EC
- EFC stakeholders want the updated Directive to be underpinned by standards
- CEN EFC standardization group launched a review and updating procedure to
  - Identify the relevant changes in the new directive
  - Identify the need for changes in the standards
  - Work out, agree and implement the solutions

Main changes to the Directive 1999/62 and their impacts on EFC standards

Change	Impact on EFC standards
All kinds of vehicles with at least four wheels (buses, heavy- and light-duty vehicles…)	None, already supported
In principle, time-based user charges are no longer permitted for HDVs from 25 March 2030	
Detailed regulations on time-based user charges for all types of vehicles	
Regulations on congestion charges	
HDVs are to be categorized into one of five CO_2 emission classes • Infrastructure charge may be varied according to CO_2 emission class • An external cost-charge may be added for CO_2 emissions and be modulated depending on the CO_2 emission class	**Yes**, current CO_2 class scheme is based on a static structure based on **CO_2 g/km** value ranges The new classification scheme is based on a CO_2 emission class (**CO_2 g/tkm**) and the classification of the vehicle is reassessed every six years

New CO_2 emission scheme in a nutshell

Example Truck:
- Specific CO_2-Emissions: 41,6 g/tkm
- Vehicle sub-group: 5-LH (tractor unit, >16t, 4 axles, sleeper cab, ≥ 265 kW)
- Initial Vehicle Registration date: 01.08.2021

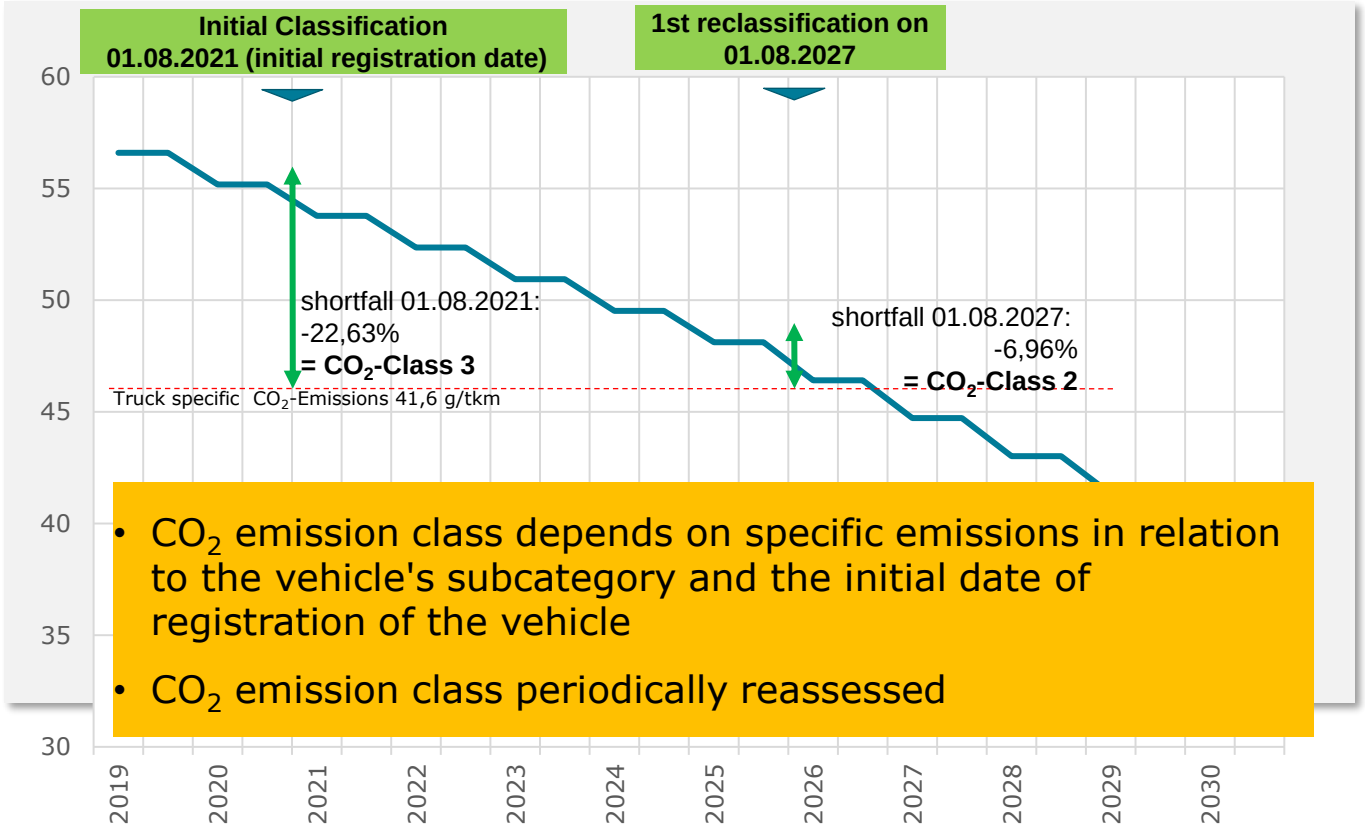
Reference CO_2 emissions for the period of 1 July 2019 to 30 June 2020 for vehicle sub group 5-LH: 56,60 g/tkm

Initial classification 01.08.2021:
- CO_2-limit for reporting period 2021: 53,77 g/tkm
- shortfall: -22,63%

= CO_2-Class 3

1st reclassification 01.08.2027:
- CO_2-limit for reporting period 2027: 44,71 g/tkm
- shortfall: -6,96%

= CO_2-Class 2



- CO_2 emission class depends on specific emissions in relation to the vehicle's subcategory and the initial date of registration of the vehicle
- CO_2 emission class periodically reassessed

[Source: based on slide of CEN/TC 278/WG 1 task force on the Eurovignette]

Relevant data for new CO2 emission classification scheme

Relevant for toll calculation according to new directive

- CO_2 emission class (1-5)

- The **CO_2 emission class** is **the only new relevant attribute** to calculate the toll adhering to the new directive
- The toll may still be differentiated according to other parameters like axles

Relevant for classification and reclassification of vehicle

- Vehicle specific CO_2 value in [g/tkm]
- Initial vehicle registration date
- Vehicle group and sub-group
- Reference CO_2 value for vehicle sub-group

- Classification and re-classification is relevant to the vehicle owner and his TSP
- TCs have to consider a change of the emission class after re-evaluation when calculating the toll
- Enforcement operators may require this information to check the TSPs provided vehicle classification

Overview of impacts on standards

Change	Impact on EFC standards
CO_2 emission classes (1-5)	**Yes**, should be supported for exchange on the white list and over the DSRC interface
Vehicle-specific CO_2 emission value [g/tkm]	**Yes**, should be supported for exchange on the white list for toll calculation and for enforcement purposes
Initial vehicle registration date	
Vehicle group or sub-group	
Reference CO_2 value for vehicle sub-group	No, this information is available in published EU legislative acts for each vehicle group and sub-group. The vehicle sub-group is determined by base values *vehicle group, vehicle type, axle or tyre configuration, cabin type* and *engine power.*
Vehicle identification number (VIN)	**Yes**. It is already exchangeable via "Provide User Data" but it is currently not part of the nominal vehicle attributes, which will also be supported in the future

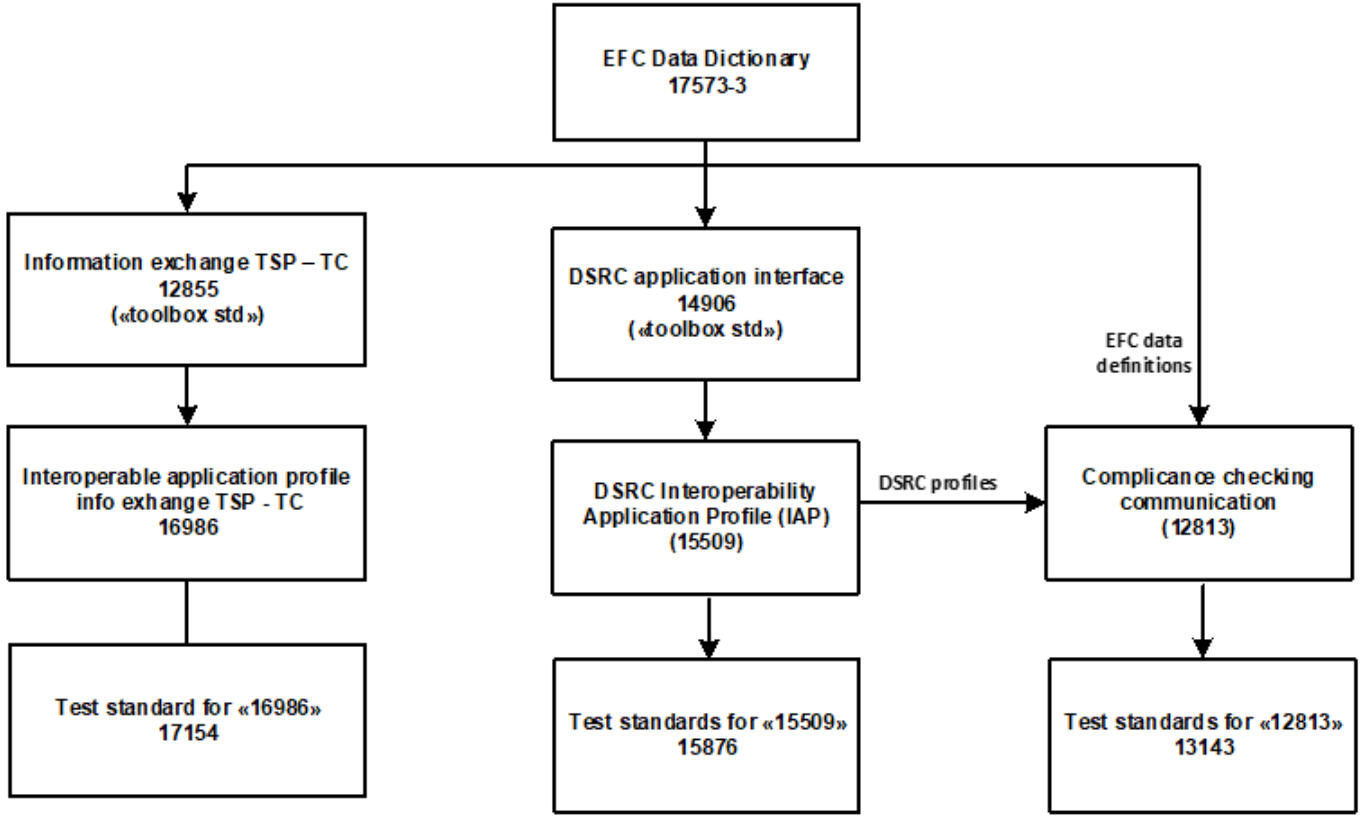
Updating approach and relationship between relevant standards

Updating approach

1. EFC data dictionary – ensures consistency across the EFC suite of standards
2. Information exchanges-related standards
   a) Toolbox standards
   b) b) Profile standards
3. Test standards - certification and homologation

The actual approach has been slightly **adapted due to ongoing revisions**

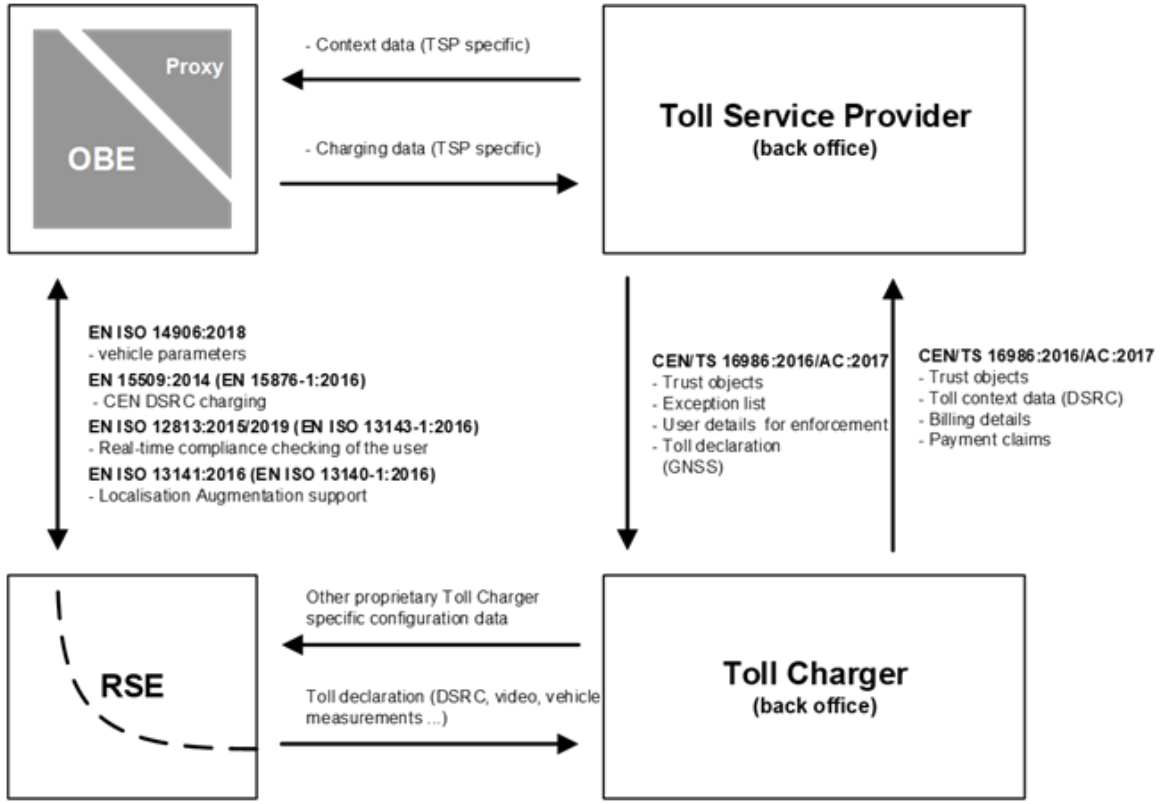
Relationship between relevant standards



Summary

- Standards are maintained to be kept up to date
- EFC standards are being updated with extended vehicle related-data (CO_2 emissions...) to underpin the new Directive
- 16986 Enquiry version includes the relevant data types to support the new Directive
- Enquiry and Formal Vote versions are also publicly available - may be relevant to consider in agreements
- The legislator decides whether to refer to (updated) standards in legislation
- The recast of the EETS legislation refers to dated versions of standards – updated versions are not automatically adopted in the EETS legislation

CEN EFC standards referenced in the EETS legislation



3. Overview of CO_2-related requirements from EU legislation that stem from the updated Directive 1999/62 and how these are supported by EFC standards

Introduction

- EU legal acts are published in the Official Journal of the European Union and made available via the EU law website. The date of entry into force is specified in the respective legal act
- EU legal acts are updated from time to time, either through recasts or amendments. A recast of legal act brings together in a single new act a legislative act and all the amendments to it. The new act passes through the full legislative process and repeals all the acts being recast
- Example: Directive 2022/362 refers to Regulation (EU) 2017/2400, Annex I, Table 1 – vehicle groups for vehicles of category N. Regulation 2017/2400 has been subject to amendments
  - Text of **12.8.2020: vehicle groups: 0-17**
  - Text of **12.8.2022: vehicle groups: 0-19**
- **Hence, the EU CO_2 tolling-related legislation has evolved since the publication of the Directive 1999/62 on 24.03.2023**
- **Other changes or amendments to EU CO_2 tolling-related legal acts are likely to happen in the next few years...**

Approach used to present the inventory of requirements 1(3)

The following slides build on and provide further details on the relevant data for new CO2 emission classification scheme

1. CO2 emission class: The only new relevant data to calculate the toll according to the updated Directive 1999/62
2. Relevant parameters for CO2 emission classification and reclassification of the heavy-duty vehicle (HDV)
   a) vehicle specific CO2 value in g/tkm
   b) initial vehicle registration date
   c) vehicle group and sub-group
   d) reference CO2 emissions per vehicle sub-group

Approach used to present the inventory of requirements 2(3)

3. Relevant parameters for verification of the heavy-duty vehicle sub-group
   a) axle configuration
   b) chassis configuration
   c) permissible maximum laden weight
   d) cab type
   e) engine power

NB: vehicle identification number and licence plate number are assumed to be known to the audience, and therefore not further discussed in this presentation

Regulation 2017/2400

vehicle groups			
Axle configuration	Chassis configuration	Technically permissible maximum laden mass (tons)	Vehicle group
4 × 2	Rigid lorry	> 3,5 –7,5	(0)
	Rigid lorry (or tractor) (**)	> 7,5 – 10	1
	Rigid lorry (or tractor) (**)	> 10 – 12	2
	Rigid lorry (or	> 12 – 16	3

Regulation 2019/1242

Table 1

Vehicle sub-groups (sg)

Heavy-duty vehicles	Cab type	Engine power	Vehicle sub-group (sg)
Rigid lorries with axle configuration 4 × 2 and technically permissible maximum laden mass > 16 tonnes	All	< 170 kW	4-UD
	Day cab	≥ 170 kW	4-RD
	Sleeper cab	≥ 170 kW and < 265 kW	
	Sleeper cab	≥ 265 kW	4-LH
Rigid lorries with axle configuration 6 × 2	Day cab	All	9-RD

Approach used to present the inventory of requirements 3(3)

Columns in the table below

- What – structured according to the previous slides
- Reference to EU legal provisions (**legal act** and relevant part within the act)
- Reference to how these are underpinned by EFC standards (reference to the clause in the main document)
  - Data dictionary (**EN ISO 17573-3**)
  - Interoperable application profiles for information exchange between Service Provision and Toll Charging (**prEN 16986**, reference to the information and table)
  - Vehicle holder data exchanges: User parameter request (table 11) + User parameter response details (table 15)
  - Exception list entries extended
    - 12855's Nominal vehicle parameters extended (table 14)
    - 16986's constrained Nominal vehicle parameters (table 39; `NominalVehicleParametersELE`)
  - AduReasonCode (table 5) and ICS Proforma (Annex B): also extended but not discussed in the slides below

Inventory of requirements 1(4)

What	EU legal provisions	EN ISO 17573-3	prEN 16986
1) CO_2 emission class	Directive (EU) 2022/362 and Directive 1999/62/EC Article 7ga (2) defines the CO_2 emission classes for heavy-duty vehicles (slide 24 provides further details) Directive 1999/37/EC, Annex I, (V.10) CO_2 emission class of heavy-duty vehicles determined at the moment of first registration	5.2.7 (part of Environmental and Future Characteristics)	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)
2a) CO_2 emissions	Commission Regulation (EU) 2017/2400, Annex IV, Part II (Customer information file), 2.6.1 - Specific CO_2 emissions [gCO2/tkm] (12.8.2022 edition) NB: point 2.3 in 12.8.2020 version	5.2.9	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)
2b) Initial registration date	Council Directive 1999/37/EC on the registration documents for vehicles, Annex I, Part I, II.5: (B) date of first registration of the vehicle	5.4.6	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)

Inventory of requirements 2(4)

What	EU legal provisions	EN ISO 17573-3	prEN 16986
2c) Vehicle group and vehicle sub-group	Commission Regulation (EU) 2017/2400, Annex I, Table 1 - Vehicle groups for vehicles of category N. Consolidated text of 01.01.2023, incorporating M1-M3 Regulation (EU) 2019/1242, Annex I, Table 1 - Vehicle sub-groups (sg)	5.3.11 EuVehicleGroup • mainEuVehicleGroup • subGroup	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)
2d) Reference CO2 emissions per vehicle sub-group	Commission Implementing Decision (EU) 2021/781, Annex II - reference CO2 emissions referred to in Regulation (EU) 2019/1242 (see slide 26 for details)	N/a	N/a

Inventory of requirements 3(4)

What	EU legal provisions	EN ISO 17573-3	prEN 16986
3a) axle configuration	Commission Regulation (EU) 2017/2400, Annex I, Table 1 (vehicle groups for vehicles of category N), Axle configuration: 4 x 2, 4 x 4, 6 x 2, 6 x 4, 6 x 6, 8 x 2, 8 x 4, 8 x 6 and 8 x 8. Regulation (EU) 2019/1242, Annex I, Table 1 - Vehicle sub-groups (sg)	5.3.29 (wheels configuration)	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)
3b) chassis configuration	Regulation (EU) 2019/1242, Art 3, definitions: (6) rigid lorry , (7) tractor	5.2.6	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)
3c) permissible maximum laden weight	Directive (EU) 2022/362, Art 3, Part I (data relating to vehicles) – technically permissible max. laden mass of the vehicle Directive 1999/37/EC, Annex I, (F.1) maximum technically permissible laden mass	5.2.53	UserParameterRequest (Tables 11) UserParamererResponseDetails (Table 15) NominalVehicleParameter (Table 14/39)

Inventory of requirements 4(4)

What	EU legal provisions	EN ISO 17573-3	prEN 16986
3d) Cab type	Regulation (EU) 2019/1242, Annex I, Table 1 - Vehicle sub-groups (sg), 1st para below the table “Sleeper cab’ means a type of cab that has a compartment behind the driver’s seat intended to be used for sleeping as reported in accordance with Regulation (EU) 2018/956” Regulation (EU) 2018/956, Annex I, Part B: Data to be monitored and reported by manufacturers of heavy-duty vehicles, 2. Data to be monitored and reported: Data no 84: Sleeper cab (yes/no)	5.2.5	UserParameterRequest (Table 11) UserParameterResponseDetails (Table 15) NominalVehicleParameter (Tables 14/39)
3e) Engine power	Commission Directive 2003/127/EC, Annex I, II.5, (P.2) maximum net power (in kW) (if available),	5.3.10 (part of EngineDetails)	UserParameterRequest (Tables 11) UserParamererResponseDetails (Table 15) NominalVehicleParameter (Table 14/39)

4. Examples of the calculation of the CO2 emission classes for HDVs

HDVs - Determination of CO_2 emissions classes per vehicle sub-group

How are the heavy-duty vehicle CO_2 emission classes defined?

- CO_2 emission classes are defined per vehicle sub-group (sg)
- Reference CO_2 emissions classes are specified by vehicle sg
- Relevant emission reduction trajectory is specified

➔ Allows determination of the thresholds for CO_2 emission classes per vehicle sg, and hence the CO_2 emission class for a specific vehicle

Two examples are used to illustrate how to determine these in practice

HDVs - CO_2 emissions classes per vehicle sub-group

Directive 1999/62, Article 7ga (2) defines the CO_2 emission classes for HDVs

a) **CO_2 emission class 1** – vehicles that do not belong to any of the CO2 emission classes;

b) **CO_2 emission class 2** – vehicles of the vehicle sg registered for the first time in the reporting period of the year Y with CO2 emissions more than 5 % below the emission reduction trajectory for the reporting period of the year Y and the vehicle sg but not belonging to any of the CO2 emission classes 3-5;

c) **CO_2 emission class 3** – vehicles of the vehicle sub-group registered for the first time in the reporting period of the year Y with CO2 emissions more than 8 % below the emission reduction trajectory for the reporting period of the year Y and the vehicle sg not belonging to any of the CO2 emission classes 4-5;

d) **CO_2 emission class 4** – low-emission HDVs (Art 2, point 30);

e) **CO_2 emission class 5** – zero-emission vehicles (Art 2, point 29).

The **classification of a vehicle belonging to CO_2 emission class 2 or 3 is reassessed every six years** after the date of its first registration and that, where relevant, the vehicle is reclassified in the relevant emission class based on the thresholds applicable at that time

HDVs - reference CO2 emissions per sub-group

Commission Implementing Decision (EU) 2021/781, Annex II - Reference CO2 emissions referred to in Article 1, second paragraph, of Regulation (EU) 2019/1242:

Sub-group *sg*	rCO_{2sg} in g/tkm
4-UD	307,23
4-RD	197,16
4-LH	105,96
5-RD	84,00
5-LH	56,60
9-RD	110,98
9-LH	65,16
10-RD	83,26
10-LH	58,26

These are the reference CO2 emissions for vehicle groups 4, 5, 9 and 10 for the period from 1 July 2019 to 30 June 2020.

The reference values for vehicle groups 1,2,3,11,12 and 16 will be specified in an implementing act (cf. Reg (EU) 2018/956, art 10), which is expected to happen within the next few months.

HDVs - emission reduction trajectory

Directive 1999/62, Article 2 (point 37) defines the (CO2) ‘emission reduction trajectory’

for the reporting period of a year (Y) and vehicle sub-group (sg), namely ETY,sg, means the product of the annual CO_2 emissions reduction factor (R-ETY) times the reference CO_2 emissions (rCO_2sg) of the sub-group (sg), namely ETY,sg = R-ETY x rCO_2sg; for years Y ≤ 2030, R-ETY and rCO_2sg are both determined in accordance with point 5.1 of Annex I to Regulation (EU) 2019/1242; for years Y > 2030, R-ETY is 0,70; rCO_2sg applies as adjusted by delegated acts adopted in accordance with Article 11(2) of Regulation (EU) 2019/1242 for the reporting periods commencing after the respective dates of application of those delegated acts;

➔

- HDVs reference CO_2 emission values and thresholds for classes 2-3
  - From 1 July 2019 to 30 June 2026 (a six-year period) a linear reduction of **2.5% per year**
  - From 1 July 2026 to 30 June 2031 (a five-year period) a linear reduction of **3.0% per year**

Thresholds for CO_2 emission classes per year per sg 5-LH

		ref Y	Y+1	Y+2	Y+3	Y+4	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	Y+11
	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	trajectory	100%	97.5%	95.0%	92.5%	90.0%	87.50%	85%	82.0%	79.0%	76.0%	73.0%	70.0%
Reference CO2 emissions rCO_{2sg} in g/tkm	56.6	56.6	55.2	53.8	52.4	50.9	49.5	48.1	46.4	44.7	43.0	41.3	39.6
class 2	53.77	53.8	52.4	51.1	49.7	48.4	47.0	45.7	44.1	42.5	40.9	39.3	37.6
class 3	52.07	52.1	50.8	49.5	48.2	46.9	45.6	44.3	42.7	41.1	39.6	38.0	36.5
class 4 LE HDVs	28.30	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3
class 5 (ZEV)	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Thresholds for CO_2 emission classes per year per sg 5-LH

		ref Y	Y+1	Y+2	Y+3	Y+4	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	Y+11
	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	trajectory	100%	97.5%	95.0%	92.5%	90.0%	87.50%	85%	82.0%	79.0%	76.0%	73.0%	70.0%
Reference CO2 emissions rCO_{2sg} in g/tkm	56.6	56.6	55.2	53.8	52.4	50.9	49.5	48.1	46.4	44.7	43.0	41.3	39.6
class 2	53.77	53.8	52.4	51.1	49.7	48.4	47.0	45.7	44.1	42.5	40.9	39.3	37.6
class 3	52.07	52.1	50.8	49.5	48.2	46.9	45.6	44.3	42.7	41.1	39.6	38.0	36.5
class 4 LE HDVs	28.30	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3	28.3
class 5 (ZEV)	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Example: threshold for class 2 at the time of the 1st reclassification

Example: threshold for class 3 at the time of the initial registration

Example: specific CO_2 emissions 41.6 g/tkm, initial registration date 1 Aug 2021

- CO_2 emission class at the initial registration date: **class 3**
- CO_2 emission class at the 1st reclassification (6 years later, i.e. 1 Aug 2027): **class 3**

Thresholds for CO_2 emission classes per year per sg 10-RD

		ref Y	Y+1	Y+2	Y+3	Y+4	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	Y+11
	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	trajectory	100%	97.5%	95.0%	92.5%	90.0%	87.50%	85%	82.0%	79.0%	76.0%	73.0%	70.0%
Reference CO2 emissions rCO_{2sg} in g/tkm	83.3	83.3	81.2	79.1	77.0	74.9	72.9	70.8	68.3	65.8	63.3	60.8	58.3
class 2	79.10	79.1	77.1	75.1	73.2	71.2	69.2	67.2	64.9	62.5	60.1	57.7	55.4
class 3	76.60	76.6	74.7	72.8	70.9	68.9	67.0	65.1	62.8	60.5	58.2	55.9	53.6
class 4 LE HDVs	41.63	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6
class 5 (ZEV)	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Thresholds for CO_2 emission classes per year per sg 10-RD

		ref Y	Y+1	Y+2	Y+3	Y+4	Y+5	Y+6	Y+7	Y+8	Y+9	Y+10	Y+11
	Year	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
	trajectory	100%	97.5%	95.0%	92.5%	90.0%	87.50%	85%	82.0%	79.0%	76.0%	73.0%	70.0%
Reference CO2 emissions rCO_{2sg} in g/tkm	83.3	83.3	81.2	79.1	77.0	74.9	72.9	70.8	68.3	65.8	63.3	60.8	58.3
class 2	79.10	79.1	77.1	75.1	73.2	71.2	69.2	67.2	64.9	62.5	60.1	57.7	55.4
class 3	76.60	76.6	74.7	72.8	70.9	68.9	67.0	65.1	62.8	60.5	58.2	55.9	53.6
class 4 LE HDVs	41.63	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6	41.6
class 5 (ZEV)	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Example: threshold for class 3 at the time of the initial registration

Example: threshold for class 3 at the time of the 1st reclassification

Example: specific CO_2 emissions 61.2 g/tkm, initial registration date 5 April 2021

- CO_2 emission class at the initial registration date: **class 3**
- CO_2 emission class at the 1st reclassification (6 years later, i.e. 5 April 2027): **class 3**

Want to know more or participate?

Co-ordination of EFC standardization in ISO/TC 204/WG 5 and CEN/TC 278/WG 1

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