

Chapter 2

Structure and Applicability of Regulations

2.1 Structure of Regulations

The legislation related to light-duty and heavy-duty vehicles is laid down in separate regulatory acts. The structure of both acts is similar. The provisions for each type of vehicles are contained in:

- a regulation of the European Parliament and the Council,
- a regulation of the European Commission.

The regulation of the European Parliament and the Council is the fundamental regulatory act for each group of vehicles. It includes the general control rules, prescribed limits of emissions and the competences of the European Commission. The regulation of the European Commission contains implementing legislation to the regulation of the European Parliament and the Council, stipulating detailed control rules and compliance testing methodology.

The regulations of the Commission do not provide a detailed description of the testing methodology. Instead, they describe it by reference to the applicable provisions contained in the regulations of the Economic Commission for Europe of the UN. Detailed descriptions are provided only in those cases where adequate methodology is missing from the referenced regulations. If amending the existing methodology is necessary, such amendments are presented as deviations from the corresponding provisions in the regulations.

In fact, UN/ECE regulations constitute the third component of the EU's regulations on the emission of pollutants.

It needs to be emphasized that the aforementioned regulations of the European Parliament and the Council and the European Commission should be enforced directly by the member states, without their transposition into national legislations. Previously applicable directives were addressed at the member states and required transposition. They also specified the dates by which the member states were required to transpose them.

The regulations for both vehicle groups cover the following issues:

- control of vehicles for pollutants emission (the so-called limited pollutants and carbon dioxide) and emission-related parameters (fuel consumption, smoke opacity, engine power),
- vehicle type approval in terms of access to repair and maintenance information,
- type approval of replacement pollution control devices intended as spare parts for vehicles approved in accordance with the underlying regulation.

The new regulations retain the previously used forms of control of vehicle type as regards emissions and emission-related parameters, i.e.:

- vehicle type approval,
- control of production conformity with the approved type,
- control of in-service conformity with the approved type (amendments to some types were introduced).

Approval in terms of access to repair and maintenance information is a new kind of approval introduced by the new legislation. The previous regulations did not provide for such approval, for either light-duty or heavy-duty vehicles.

Type approval of emission reducing systems intended as spare parts was already in use previously, but only for light-duty vehicles. As regards heavy-duty vehicles, it is a totally new kind of approval.

One common feature of Euro 5/6 and Euro VI regulations is that all of them allow the member states to apply financial incentives, e.g. in the form of tax reliefs, to accelerate the replacement of old vehicles with new vehicles meeting the new regulations even before the same become binding. Incentives can also be used for retrofitting aimed at ensuring regulatory compliance or for scrapping of vehicles unable to meet the new requirements. However, the value of the said incentives should not exceed the cost of additional equipment used to ensure compliance.

The new regulations formally introduce the term “Euro”. Thus far the term had not been used, whether in EU directives or in UN/ECE regulations. In principle, the term “Euro” is used in reference to the regulations (or requirements) regarding the emission of pollution from vehicles classified as M and N categories. It was decided that Euro regulations applicable to light-duty vehicles would be marked with numbers written in Arabic numerals (e.g. Euro 6), whereas those applicable to heavy-duty vehicles would be marked with Roman numerals (e.g. Euro VI).

Furthermore, the division of vehicle categories M and N into two groups (“light-duty” and “heavy-duty”) is officially introduced for the first time. In this publication the terms “light-duty vehicles” and “heavy-duty vehicles” are also used when referring to earlier regulatory acts, even though the terms were not previously in use.

A significant difference between light-duty and heavy-duty vehicles is found in the testing methodology of controlled pollutions, carbon dioxide emission and fuel consumption. In the case of the former, the entire vehicle is subject to testing using a chassis dynamometer. In the case of the latter, the engine alone is tested using an engine test bench.

Thus far, provisions for the parameters addressed in the new regulations (emission of limited pollutants, emission of carbon dioxide and fuel consumption, smoke opacity, engine power) were set out in separate directives. Four separate directives were in force for light-duty vehicles, and three more for heavy-duty vehicles. Each directive contained a complete set of regulations applicable to a given parameter. The division was made according to technical criteria. Each of the above parameters was subject to a separate approval, in keeping with the underlying directive. The new regulations are contained in two regulatory acts for each group of vehicles, but the division is made on a different basis: legislation of a strategic nature, common for all parameters, is determined in the regulation of the European Parliament and the Council, while the implementing legislation is provided for in the regulation of the Commission. Only one type approval is now required.

The above difference has a practical effect on the vehicle type approval procedure. Previously, type approval tests made in accordance with each directive (i.e. for individual parameters) could be held in different sites. In the light of the new regulations, testing for compliance with regard to all the parameters is held in the same site.

The new EU regulations on the emission of pollution from light-duty vehicles are stipulated in the following regulatory acts:

- Regulation (EC) No. 715/2007 of the European Parliament and of the Council [13]; this regulation took effect in June 2007,
- Commission Regulation (EC) No. 692/2008 [2] implementing and amending Regulation (EC) No. 715/2007 of the European Parliament and of the Council; this regulation took effect in July 2008,
- Regulations 24 [14], 83 [16], 85 [17], 101 [18] and 103 [19] of UN/ECE determining measurement methodology for emissions and emission-related parameters in each test; deviations from the methodology stipulated in these regulations are listed in Regulation 692/2008.

For light-duty vehicles, the above acts of law replace the previous Directives:

- 70/220/EEC [3] on the emission of pollutants,
- 80/1268/EEC [5] on fuel consumption and carbon dioxide emission measurement methodology,
- 72/306/EEC [4] on smoke opacity,
- 80/1269/EEC [6] on measuring net engine power.

As far as heavy-duty vehicles are concerned, the new EU legislation on the emission of pollutants are contained in the following acts:

- Regulation (EC) No. 595/2009 of the European Parliament and of the Council [12]; this regulation took effect in June 2009,
- Commission Regulation (EC) No. 582/2011 [1] implementing and amending Regulation (EC) No. 595/2009 of the European Parliament and of the Council,

- Regulations 24 [14], 49 [15], 85 [17] and probably 103 [19] of UN/ECE determining measurement methodology for emissions and emission-related parameters in each test; deviations from the methodology stipulated in these regulations are listed in the Commission regulation.

For heavy-duty vehicles, the above acts of law will replace the currently applicable Directives:

- 2005/55/EC [7] on the emission of pollutants,
- 72/306/EEC [4] on smoke opacity,
- 80/1269/EEC [6] on measuring net engine power.

The above light-duty and heavy-duty vehicles directives will be gradually repealed.

The key changes implemented by the new regulations address:

- the principles of dividing vehicles into light-duty and heavy-duty,
- scope of application,
- testing,
- prescribed limits.

The most recent of the EU acts – Commission Regulation (EC) No. 582/2011 implementing and amending Regulation (EC) No. 595/2009 – took effect in May 2011. Since that date the new legislation can be considered as set. The final version of the said Commission Regulation differs significantly from its first draft presented in 2008. Therefore, all earlier analyses of new EU legislation contained *inter alia* in [9, 10, 11] have become partially outdated, particularly as regards heavy-duty vehicles.

Regulations 715/2007 and 595/2009, as well as the implementing regulations of the Commission constitute the so-called separate act of law in the EU vehicle approval system. They provide a basis for issuing the so-called partial approval as regards the emission of pollutants and emission-related parameters. The general whole vehicle type approval rules of M and N vehicles as regards parameters affecting traffic safety and environmental protection, as well as acceptance conditions are currently stipulated in Directive 2007/46 [8]. It is referred to as the framework directive, as it provides the framework for approval of the said vehicles. It lists a number of directives and regulations (such as Regulations 715/2007 and 595/2009) containing conditions that must be met in order to obtain a whole vehicle type approval.

It is not the intention of this publication to discuss the fundamentals of the new EU legislation on emissions from M and N vehicles. Emphasis is put on the changes introduced *vis-à-vis* the earlier legislation, including in particular Euro 4 for light-duty vehicles and Euro V for heavy-duty vehicles. The latter, referred to as “earlier” or “previously applicable” legislation, is discussed in detail in [9], by the same authors. This publication should therefore be viewed as an update to and an extension of [9].

2.2 Classification of Vehicles as Light-Duty and Heavy-Duty

The new EU legislation introduces significant changes relating to the classification of vehicles as light-duty and heavy-duty. The classification criterion is the “reference mass” (2610 kg) which replaced the “maximum laden mass” used before (Tab. 2.1). The term “reference mass” is understood as the mass of the vehicle in running order reduced by 75 kg (standardized driver mass) and increased by a uniform mass of 100 kg. The mass of the vehicle in running order means the mass:

- with all tanks filled to 100% and the fuel tank filled to 90% (if the vehicle has different tank fuels, each such tank should be filled to 90%),
- with a spare wheel, toolkit and, in the case of the towing vehicle of a category other than M1, with a coupling device, if fitted by the manufacturer,
- with a driver and a crew member if there is a crew seat in the vehicle (the mass of the driver and the crew member is assumed to be 75 kg).

Light-duty vehicles are those whose reference mass is below 2610 kg, i.e.:

- nearly all vehicles in M1 category,
- in principle all vehicles in N1 category,
- some of the vehicles in M2 and N2 category.

Heavy-duty vehicles are:

- M1, M2, N1 and N2 category vehicles with reference mass greater than 2610 kg,
- all M3 and N3 category vehicles.

The definitions of all motor vehicle categories are presented in Tab. 2.1.

The previously applicable regulations on the emission of pollutants considered a vehicle to be “light-duty” (although the term itself was not used officially) if its maximum laden mass (MLM) was below 3500 kg. If the MLM was above that threshold, the vehicle was considered as “heavy-duty”.

In the light of the new regulations, the maximum laden mass of vehicles classified as “light-duty” can exceed 4500 kg.

The general principle discussed above, stipulating that light-duty vehicles are type-approved in accordance with Regulations 715/2007 and 692/2008, while heavy-duty vehicles are type-approved in accordance with Regulation 595/2009 and the corresponding regulation of the Commission, applies irrespectively of fuel type. In accordance with the earlier legislation, heavy-duty vehicles (of maximum laden mass in excess of 3500 kg) were type-approved either in accordance with Directive 70/220/EEC [3] (if running on petrol) or Directive 2005/55/EC [7] (if running on diesel). The scope of testing and the requirements were different in both cases.

The previous legislation allowed the manufacturer to choose the requirements for N1 vehicles with CI and SI engines running on LPG and NG (or the requirements for light-duty vehicles stipulated in Directive 70/220/EEC, or requirements for

heavy-duty vehicles stipulated in Directive 2005/55/EC). This option is removed from the new legislation. As a result, the requirements for the said category are more stringent.

Table 2.1 Vehicle categories

Vehicle category	Description
Category M – motor vehicles with at least four wheels designed and constructed for the carriage of passengers (other than those in category L)	
M1 – passenger cars	vehicles comprising no more than eight seats in addition to the driver’s seat
M2 – small buses	vehicles comprising more than eight seats in addition to the driver’s seat and having a maximum laden mass not exceeding 5,000 kg
M3 – buses	vehicles comprising more than eight seats in addition to the driver’s seat and having a maximum laden mass exceeding 5,000 kg
Category N – motor vehicles with at least four wheels designed and constructed for the carriage of goods (other than those in category L)	
N1 – light-duty vehicles	vehicles having a maximum laden mass not exceeding 3500 kg
– class I: $RM \leq 1305$ kg,	
– class II: $1305 \text{ kg} < RM \leq 1760$ kg,	
– class III: $1760 \text{ kg} < RM$.	
N2 – medium-duty vehicles	vehicles for the carriage of goods a maximum laden mass: $3500 \text{ kg} < MLM \leq 12,000$ kg
N3 – heavy-duty vehicles	vehicles for the carriage of goods a maximum laden mass exceeding 12,000 kg

* The eligibility criterion for categories M2 and M3 as well as N1, N2 and N3 is the maximum laden mass, being the heaviest mass allowed by the manufacturer. It can be equal to or greater than the maximum permissible laden mass determined by the type approving body.

The principles of classifying vehicles as light-duty or heavy-duty contain certain exceptions, which to some extent distort the underlying logic. It is possible to extend the light-duty type approval to heavy-duty vehicles (with reference mass above 2610 kg) as long as:

- the reference mass does not exceed 2840 kg,
- the vehicle meets other conditions for such extension.

In the case of heavy-duty vehicles the type approval can be extended to incomplete vehicles with reference mass below 2610 kg, if all body styles used increase that mass to a level above that threshold.

Type approval can also be extended to variants and versions of the approved heavy-duty vehicle (complete or completed) with reference mass above 2380 kg, provided that the requirements on the measurement of greenhouse gases stipulated in Regulations 715/2007 and 692/2008 are complied with. Regulations will be considered “complied with” if carbon dioxide emission is determined by means of a method stipulated in the said regulations and if the measured value is entered in the certificate of conformity.

Attention should be paid to a difference in the meaning of the term “vehicle type” in whole vehicle type approval (Directive 2007/46) and partial type approval as regards the emission of pollutants (Regulations 715/2007 and 595/2009). In whole vehicle type approval the “type” refers to vehicles that do not differ from one another in terms of the key structural features, such as the chassis (or the platform) and the propulsion system (internal combustion, hybrid, electric). In this case the type is divided into variants, and variants are divided into versions. The type definition within the meaning of Regulations 715/2007 and 595/2009 is similar to the version definition in Directive 2007/46 [8].

References

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- [3] Council Directive 70/220/EEC of 20 March 1970 on the approximation of the laws of the Member States relating to measures to be taken against air pollution by gases from positive-ignition engines of motor vehicles. OJ L076 (April 06, 1970)
- [4] Council Directive 72/306/EEC of 2 August 1972 on the approximation of the laws of the Member States relating to the measures to be taken against the emission of pollutants from diesel engines for use in vehicles. OJ L 190 (August 20, 1972)
- [5] Council Directive 80/1268/EEC of 16 December 1980 on the approximation of the laws of the Member States relating to the fuel consumption of motor vehicles. Official Journal L 375 (December 31, 1980)
- [6] Council Directive 80/1269/EEC of 16 December 1980 on the approximation of the laws of the Member States relating to the engine power of motor vehicles. Official Journal L 375 (December 31, 1980)

- [7] Directive 2005/55/EC of the European Parliament and of the Council of 28 September 2005 on the approximation of the laws of the Member States relating to measures to be taken against the emission of gaseous and particulate pollutants from compression-ignition engines for use in vehicles, and the emission of gaseous pollutants from positive-ignition engines fuelled with natural gas or liquefied petroleum gas for use in vehicles. OJ L 275 (October 20, 2005)
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- [15] United Nations. Agreement concerning the adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipment and parts. Addendum 48: Regulation No. 49. Uniform provisions concerning the approval of diesel engines with regard to the emission of gaseous pollutants. E/ECE/324 ECE/TRANS/505 Rev. 1/Add. 48 (April 5, 1982)
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- [17] United Nations. Agreement concerning the adoption of uniform conditions of approval and reciprocal recognition of approval for motor vehicle equipment and parts. Addendum 84: Regulation No. 85 to be annexed to the Agreement. Uniform provisions concerning the approval of internal combustion engines intended for the propulsion of motor vehicles of categories M and N with regard to the measurement of the net power. E/ECE/324 E/ECE/TRANS/505 Rev. 1/Add. 84 (September 9, 1991)
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