

Appendix 1

EU Emission standards for petrol vehicles

Contents

TYPE APPROVAL EMISSION LIMITS	2
Introduction and general comments	2
Key points from the type approval regulations	3

EU Emission standards for gasoline cars (< 2.5 t laden, ≤ 6 seats for pre-Euro III, and up to 9 seats for Euro III and Euro IV standards), g/km

EU Emission standards for gasoline light-duty vehicles (≤ 1250 kg reference weight), g/km, including heavy passenger cars (> 2500 kg laden) or 6-9 seats for Euro I and II standards

EU Emission standards for gasoline light-duty vehicles (between 1251 and 1700 kg reference weight), g/km, including heavy passenger cars (> 2500 kg laden) or 6-9 seats for Euro I and II standards

EU Emission standards for gasoline light-duty vehicles (> 1700 kg reference weight), g/km, including heavy passenger cars (> 2500 kg laden) or 6-9 seats for Euro I and II standards

TYPE APPROVAL EMISSION LIMITS

Introduction and general comments

Before a new vehicle can be approved for sale in the EU it must meet certain standards for exhaust emissions as specified by EU directives. These standards are vehicle type specific and for petrol fuelled vehicles are sub-divided into passenger cars and light-duty vehicles. The passenger cars are further sub-divided according to their laden weight (below or above 2.5 tonnes) and the number of seats they have, whilst the light-duty vehicles are sub-divided into three different categories by vehicle mass.

For all petrol vehicles the regulatory test cycle involves starting the engine when cold followed by driving a cycle simulating urban and sub-urban driving (ECE 15 + EUDC). The emissions are monitored for the whole cycle and, after dividing by the cycle's length (11.007 km), the emission standards are expressed in grams of pollutant per kilometre.

The European emission regulations describing the type approval testing of light-duty vehicles (cars and LD vans) are specified in the European Directive 70/220. Various amending directives have been adopted which specify limit values for gaseous emissions. Unfortunately there is no simple correlation between the new emission standards and the amending directives. For example, the emission limits that came into effect on 1/1/97, often referred to as the Euro II standard were specified in directive 94/12/EC for passenger cars, but in directive 96/69/EC for heavy motor cars and light-duty vans. The regulation was last amended in September 1998, when new emission standards for the years 2000/2005 were adopted by the EU Parliament (Directive 98/69/EC). In this report these will be referred to as 98/69/EC Stage A and Stage B limit values rather than the more ambiguous Euro III and Euro IV limit values used by some authors.

Whilst the drive cycle does not change, directive 98/69/EC does specify an important change: the emissions are to be collected from key-on rather than after a 40 second idle period. Consequently, the distance driven remains the same, 11.007 km, but the emissions collected now include cranking and the first few seconds of running where, because of the increased fuelling levels for cold starting and because the catalyst is not at its operating temperature, CO and HC emissions are especially high. The 98/69/EC Stage A CO emission standards over this new cycle are a little (4.4%) higher than for the 94/12/EC standard. However, because of the change in the test cycle this represents a real decrease in emissions relative to the 94/12/EC limit values, but makes direct comparison difficult.

Another difference introduced for the emission limit values of 98/69/EC is that the quantities of NO_x and HC are specified separately, rather than there being a limit for their sum as was the case for earlier standards.

The EU emissions standards are summarised in the four tables at the back of this Appendix.

Key points from the type approval regulations

The species whose emission limit values are specified in 98/69/EC are:

- CO
- hydrocarbons, generically
- NO_x, i.e. the sum of both NO and NO₂ tail-pipe emissions,

In contrast to diesel fuelled vehicles there is no standard for PM for new vehicles. (The in-service testing programme reflects this, there being no in-service smoke test for petrol vehicles.)

The reduction in emission levels from one standard to another is far from even. There was a large CO reduction on the introduction of directive 91/441/EEC, which made it necessary for manufacturers to fit cars with three way catalysts (TWCs) and closed loop fuel control systems, but only a 20% reduction between the limit values of 91/441/EEC and 94/12/EC. The change in the test procedure prevents a direct comparison between the limit values of 94/12/EC and 98/69/EC Stage A, whilst a 57% reduction in CO is demanded between Stages A and B of directive 98/69/EC. For NO_x and HC approximately a 50% reduction is required between Stages A and B of directive 98/69/EC for both pollutants.

Therefore, it is evident that large reductions in the emission standards for new cars have occurred over the 12 year period since the introduction of cars with TWCs (directive 91/441/EEC) to the implementation of the stage B limit values of 98/69/EC. Consequently, the in-service test needs to be fundamentally reassessed to evaluate its effectiveness at detecting vehicles whose emissions performance has deteriorated sufficiently from the “as new” values to be considered “excess emitters”.

EU Emission standards for gasoline cars (< 2.5 t laden, ≤ 6 seats for pre-Euro III, and up to 9 seats for Euro III and Euro IV standards), g/km

Euro Standard	Directive	Implementation Type approval	Test cycle				
				CO	HC	NO _x	HC+ NO _x
pre-Euro I	70/220/EEC		ECE 15 + EUDC	up to 10.0			up to 2.55
Euro I	91/441/EEC	1/1/1993	ECE 15 + EUDC	2.72			0.97
Euro II	94/12/EC	1/1/1996	ECE 15 + EUDC	2.20			0.70
Euro III	98/69/EC	1/1/2000	ECE 15* + EUDC	2.30	0.20	0.15	-
Euro IV	98/69/EC	1/1/2005	ECE 15* + EUDC	1.00	0.10	0.08	-

ECE 15* is very similar to the original ECE 15 but its start-up phase is modified: The 40 seconds idle period from engine crank to the start of bag sampling is deleted to give simultaneous engine crank and bag sampling start.

EU Emission standards for gasoline light-duty vehicles (≤ 1250 kg reference weight), g/km, including heavy passenger cars (> 2500 kg laden) or 6-9 seats for Euro I and II standards

Euro Standard	Directive	Implementation Type approval	Test cycle				
				CO	HC	NO _x	HC+ NO _x
Euro I	93/59/EEC	1/10/1994	ECE 15 + EUDC	2.72			0.97
Euro II	96/44/EC	1/1/1998 for DI only	ECE 15 + EUDC	2.20			0.70
Euro III	98/69/EC	1/1/2001	ECE 15* + EUDC	2.30	0.20	0.15	-
Euro IV	98/69/EC	1/1/2006	ECE 15* + EUDC	1.00	0.10	0.08	-

ECE 15* is very similar to the original ECE 15 but its start-up phase is modified: The 40 seconds idle period from engine crank to the start of bag sampling is deleted to give simultaneous engine crank and bag sampling start.

EU Emission standards for gasoline light-duty vehicles (between 1251 and 1700 kg reference weight), g/km, including heavy passenger cars (> 2500 kg laden) or 6-9 seats for Euro I and II standards

Euro Standard	Directive	Implementation Type approval	Test cycle				
				CO	HC	NO _x	HC+ NO _x
Euro I	93/59/EEC	1/10/1994	ECE 15 + EUDC	5.17			1.40
Euro II	96/69/EC	1/1/1998	ECE 15 + EUDC	4.00			0.60
Euro III	98/69/EC	1/1/2001	ECE 15* + EUDC	4.17	0.25	0.18	-
Euro IV	98/69/EC	1/1/2006	ECE 15* + EUDC	1.81	0.13	0.10	-

ECE 15* is very similar to the original ECE 15 but its start-up phase is modified: The 40 seconds idle period from engine crank to the start of bag sampling is deleted to give simultaneous engine crank and bag sampling start.

EU Emission standards for gasoline light-duty vehicles (> 1700 kg reference weight), g/km, including heavy passenger cars (> 2500 kg laden) or 6-9 seats for Euro I and II standards

Euro Standard	Directive	Implementation Type approval	Test cycle				
				CO	HC	NO _x	HC+ NO _x
Euro I	93/59/EEC	1/10/1994	ECE 15 + EUDC	6.90			1.70
Euro II	96/69/EC	1/1/1998	ECE 15 + EUDC	5.00			0.07
Euro III	98/69/EC	1/1/2001	ECE 15* + EUDC	5.22	0.29	0.21	-
Euro IV	98/69/EC	1/1/2006	ECE 15* + EUDC	2.27	0.16	0.11	-

ECE 15* is very similar to the original ECE 15 but its start-up phase is modified: The 40 seconds idle period from engine crank to the start of bag sampling is deleted to give simultaneous engine crank and bag sampling start.