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## DRAFT EAST AFRICAN STANDARD

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**Air quality — Vehicular exhaust emission limits**

## EAST AFRICAN COMMUNITY

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## Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

The Community has established an East African Standards Committee (EASC) mandated to develop and issue East African Standards (EAS). The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the public and private sector organizations in the community.

East African Standards are developed through Technical Committees that are representative of key stakeholders including government, academia, consumer groups, private sector and other interested parties. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the Principles and procedures for development of East African Standards.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

The committee responsible for this document is Technical Committee EASC/TC082, *Air quality*.

Attention is drawn to the possibility that some of the elements of this document may be subject of patent rights. EAC shall not be held responsible for identifying any or all such patent rights.

## Air Quality — Vehicular exhaust emission limits

### 1 Scope

This draft Standard specifies permissible limits for common pollutants found in exhaust emissions of motor vehicles, namely carbon monoxide, particulate matter (PM), oxides of nitrogen (NO<sub>x</sub>), and hydrocarbons. The standard covers emission all types of vehicles namely, passenger cars, light commercial vehicles, heavy-duty vehicles, motorcycles and motor tricycles as given in Annex A. This standard covers only vehicle with internal combustion Engines.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3833, *Road vehicles — Types — Terms and definitions*

ISO 16183, *Heavy-duty engines — Measurement of gaseous and particulate exhaust emissions using partial flow dilution systems under transient test conditions*

ISO 6460-2, *Motorcycles — Measurement method for gaseous exhaust emissions and fuel consumption — Part 2: Test cycles and specific test conditions*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 3833, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at <http://www.iso.org/obp>

#### 3.1 New vehicle

any motor vehicle, motor cycle or motor tricycle whose legal title has not been issued or not been registered in any relevant authority from any jurisdiction and whose only documentation is the manufacturer's statement of origin

#### 3.2 Used vehicle

any motor vehicle, motor cycle or motor tricycle which has previously been owned or registered in relevant authority from any jurisdiction

#### 3.3 In-use vehicle

any operating motor vehicle, motor cycle or motor tricycle that is registered in relevant authority from any jurisdiction

#### 3.4 Motor tricycle

Motor vehicle, other than a motorcycle or a tractor, that has three wheels and that is designed to be driven by means of the type of controls usually fitted to a motorcycle

**3.5 Initial inspection**

inspection which a new motor vehicle, motor cycle or motor tricycle must be inspected before operation

**3.6 Periodic inspection**

inspection which a motor vehicle, motor cycle or motor tricycle must be inspected when it is in operational on EAC roads after the term of validity of its inspection certificate has expired

**3.7 Modified inspection**

inspection which a motor vehicle, motor cycle or motor tricycle must be inspected when there are changes in the length, height, width, maximum payload and any other major modification

**3.8 On-road random inspection**

an inspection which a motor vehicle, motorcycles and moto tricycles must be inspected when it is picked up at random on the road by the relevant authority

**3.9 Towed vehicles**

non powered drive road vehicles which on account of its design and appointments, is used to transport persons or goods and is intended to be towed by a motor vehicle

**3.10 Combined vehicles**

motor vehicles coupled with one or more towed vehicle(s)

**3.11 Moped vehicles**

two wheeled or three wheeled motor vehicles with a maximum designed driving speed not exceeding 50 km/h

**3.12 Motorcycles**

two wheeled motor driven vehicles or three wheeled motor driven vehicles whose unladen weights does not exceed 400 kg

**3.12 Emission**

discharge of substances (like gasses, particulate matter, smokes,) from a road vehicle into the atmosphere

**3.13 Emission limit value**

permissible quantity of a substance contained in the waste gases from a road vehicle which may be discharged into the air during a given period of time.

**4 Requirements**

**4.1 General requirements**

**4.1.1 New vehicles**

All new diesel powered and petrol (gasoline) powered vehicles shall be type-approved to meet the requirements of Euro IV/4. The specific details shall be as given in Table 1-2.

**4.1.1** All new, imported and in -use motor vehicles, motorcycles and motor tricycles to be used on roads shall be inspected and tested for compliance with exhaust emissions limits in accordance with the relevant provisions prescribed in this EAC Draft standard.

**4.1.2** No new, imported and in -use motor vehicle, motorcycle or motor tricycle shall be registered for the first time in any of EAC Partner State without a certificate of compliance with exhaust emission limits in addition to any other requirements on roadworthiness.

**4.1.3** Imported motor vehicles, motorcycles and motor tricycles shall be accompanied by a certificate of compliance with exhaust emission limits issued by a duly approved agency in the exporting country in accordance with this EAC Draft Standard.

**4.1.4** Motor vehicles, motorcycles and motor tricycles shall be inspected and tested in inspection centres approved by relevant authority in the respective Partner State.

**4.1.5** Emissions inspection and testing may be according to the schedule laid out in Annex B or according to the national legislation of the respective Partner State.

## 4.2 Specific requirements

### 4.2.1 Exhaust emission limits

The following exhaust emission limits shall apply to the different types and categories of vehicles as outlined in Tables 1 – 4.

**Table 1: maximum emission limits for new diesel powered vehicles.**

Vehicle Category	Maximum emission limits, g/km				Test method
	CO	HC+NOx	NOx	PM	
Passenger Cars Class M	0.50	0.30	0.25	0.025	Annex C
Light Duty Commercial Vehicles ( N1 Class I,II, III)					
N1,Class I ( ≤ 1 305 kg)	0.50	0.30	0.25	0.025	Annex C
N1, Class II(1305 kg - 1 760 kg)	0.63	0.39	0.33	0.04	
N1 ,Class III (1760 kg- 3500kg )	0.74	0.46	0.39	0.06	
Heavy Duty Vehicles ( N2,N3&O)					
Vehicle Category	Maximum emission limits, g/kWh				Test method
	CO	HC+NOx	NOx	PM	
N2 (GVW > 3 500 kg < 12 000 kg)	1.50	0.46	3.5	0.02	ISO 16183
N3 (GVW > 12 000 kg)	1.50	3.96	3.5	0.02	



O (Trailers including Semi-trailers)	1.50	3.96	3.5	0.02	
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**Table 2: maximum emission limits for new gasoline and LPG powered vehicles.**

Vehicle Category	Maximum emission limits, g/km			Test method
	CO	HC	NOx	
Passenger Cars Class M	1.00	0.10	0.08	Annex C
Light Duty Commercial Vehicles ( N1Class I, II & III)				
Class I ( $\leq 1305$ kg)	1.00	0.10	0.08	Annex C
Class II ( $1305 \text{ kg} < \text{RM} \leq 1760$ kg)	1.81	0.13	0.10	
Class III ( $> 1760$ kg)	2.27	0.16	0.11	
Heavy duty vehicles Maximum emission limits, g/kWh				
O (Trailers including Semi-trailers)	4.0	0.55	3.5	
Motor Cycles (Class I & II) Maximum emission limits, g/km				
Class I (<150 cc displacement)	5.50	1.20	0.30	ISO 6460-2
Class II (150 cc displacement)	5.50	1.0	0.30	
Motor tricycles Maximum emission limits, g/km				
All Gasoline	7.0	1.50	0.40	ISO 6460-2

**Table 3: Maximum emission limits for in-use diesel powered vehicles (compression ignition engine)**

Vehicle Category	Date of manufacture(Y/M)	Maximum smoke density	Test method
All Categories	2005/01 upwards	Light absorption coefficient = 1.5 M <sup>-1</sup>	Annex E
	From 1992/07 - 2004/12	Light absorption coefficient = 2.5 M <sup>-1</sup>	
	Before 1992/07	-	

**Table 4: Maximum emission limits for in use gasoline and LPG vehicles (spark ignition engines)**

Vehicle Category	Date of manufacture(Y/M)	of CO(% volume)	HC (ppm)	Test method
Motor Vehicles				
All categories	From 2005/01 upwards	1.00	400	Annex D
	Before 2005/01	3.0	500	
	Before 1992/07	4.5	600	
Motor cycles*				
	After 31/3/2000 (4 stroke)	3.5	4500	Annex D
	After 31/3/2000 (2 stroke)	3.5	6000	
	on or before 31/3/2000 (2/4 stroke)	4.5	9000	
Motor tricycles				
All	All	3.5	4500	Annex D



## Annex A (informative)

### Vehicle categories

Category	Description
Passenger cars (M) – Motor vehicles with at least four wheels designed and constructed for the carriage of passengers.	
M1	Vehicles designed and constructed for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat and having a maximum mass ("technically permissible maximum laden mass") not exceeding 3,500 kg.
M2	Vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass ("technically permissible maximum laden mass") not exceeding 5,000 kg.
M3	Vehicles designed and constructed for the carriage of passengers, comprising more than eight seats in addition to the driver's seat, and having a maximum mass exceeding 5,000kg.
Light Commercial Vehicles (N) – Motor vehicles with at least four wheels designed and constructed for the carriage of goods.	
N1	Vehicles designed and constructed for the carriage of goods and having a maximum mass not exceeding 3 500 kg. Light commercial vehicles Classes for N1 are further divided into three Weight classes and two categories based on GVWR and the Reference Mass (RM), defined as the mass of the vehicle in running order less the uniform mass of the driver of 75 kg, and increased by a uniform mass of 100 kg.
N1 Weight Classes	
Class I	$RM \leq 1305 \text{ kg}$
Class II	$1305 \text{ kg} < RM \leq 1760 \text{ kg}$
Class III	$RM > 1760 \text{ kg}$
Heavy Duty Vehicles	
N2	Vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 3,500 kg but not exceeding 12,000 kg.
N3	Vehicles designed and constructed for the carriage of goods and having a maximum mass exceeding 12,000 kg.
O	Trailers (including semi-trailers)
Motor cycles	
Class I	Two-wheeled motor-driven vehicle whose unladen weight does not exceed 400 kg, with <150 cc displacement
Class II	Two-wheeled motor-driven vehicle whose unladen weight does not exceed 400 kg, with 150 cc displacement
Motor tricycles	
Motor tricycles	Three-wheeled motor-driven vehicle whose unladen weight does not exceed 400 kg

## Annex B (Informative)

### Emissions inspection schedule

Vehicle category	Initial Inspection	Periodic Inspection(frequency) After every 12 Months	Modification Inspection	On-road Random Inspection
<b>All categories</b>	All	All except for private passenger vehicles <sup>a</sup>	All	All

<sup>a</sup> Private passenger vehicles to be inspected after every 2 years

## **Annex C (Normative)**

### **Tests for new vehicles (locally manufactured/assembled or imported)**

#### **C.1 Worldwide Harmonized Light Vehicle Test Procedure (WLTP)**

For type approval and certification of all categories of light duty and medium duty vehicles, whether locally manufactured/assembled or imported. The WLTP defines a global harmonized standard for determining the levels of pollutants and CO<sub>2</sub> emissions, fuel efficiency, and electric range from light-duty vehicles (passenger cars and light commercial vehicles), and was developed under the guidance of UNECE World Forum for Harmonization of Vehicle Regulations.

#### **C.2 New European Driving Cycle(NEDC)**

For type approval and certification of all categories of light duty and medium duty vehicles, whether locally manufactured/assembled or imported

#### **C.3 World Harmonized Stationary Cycle (WHSC)**

For type approval and certification of all categories of heavy-duty vehicles, whether locally manufactured/assembled or imported. The WHSC test is a steady-state engine dynamometer schedule defined by the Global Technical Regulation (GTR) No. 4 developed under the guidance of UNECE World Forum for Harmonization of Vehicle Regulations. The GTR covers a world-wide harmonized heavy-duty certification (WHDC) procedure for engine exhaust emissions.

#### **C.4 World Motorcycle Test Cycle(WMTC)**

For type approval and certification of all categories of motorcycles and motor tricycles, whether locally manufactured/assembled or imported. The WMTC is a system of driving cycles used to measure fuel consumption and emissions in motorcycles and motor tricycles. The methods are stipulated as part of the Global Technical Regulation established under the guidance of UNECE World Forum for Harmonization of Vehicle Regulations.

## **Annex D** **(Normative)**

### **Tests for imported used and in-use gasoline and LPG powered vehicles**

#### **D.1 Introduction**

In-use exhaust emissions testing is applied to all petrol and LPG-powered motor vehicles, motorcycles and motor tricycles.

#### **D.2 Test procedure**

##### **D.2.1 Test for vehicle without advanced emission control**

For all petrol and LPG-powered vehicles which are not equipped with advance emission control systems such as catalytic converters the non-catalyst test procedure will apply.

##### **D.2.2 Test for vehicle with advanced emission control**

###### **D.2.2.1 Checks on the vehicle before the test**

Before carrying out the test, the Examiner will confirm that the engine is at its normal operating temperature as per the vehicle manufacturer that, in most cases, will require the use of an oil temperature probe inserted into the dipstick tube. Before proceeding, the Examiner will also check that the engine has sufficient oil and fuel to complete the test. For vehicles with manual transmission the test will be carried out with the gear lever in the 'neutral' position and with the clutch engaged. For vehicles with automatic transmission the gear selector will be in either the 'neutral' or 'park' position.

###### **D.2.2.2 Visual inspection (all vehicles)**

Once the preliminary checks have been completed, the Examiner will raise the engine speed to around 2500rpm or a half the maximum engine speed if this is lower. The engine speed will be held steady for approximately 20 seconds after which the engine will be allowed to return to its natural idle speed. Once the emissions have stabilized the Examiner will assess the smoke emitted from the tailpipe. If the exhaust is emitting dense blue or clearly visible black smoke, then the vehicle will fail the test. Vehicles manufactured before 1960 where emissions of smoke are unavoidable due to the engine design, these vehicles will not fail the test.

Note: For vehicles which not have a RPM gauge tachometers may be used

###### **D.2.2.3 Standard Emissions Test (SET)**

For vehicles that pass visual inspection (D.2.2.2), emissions level will also be checked using an approved (by the competent authority) analyzer. After completing the visual test, the Examiner will use the analyzer to assess the levels of carbon monoxide (CO) and hydrocarbons (HC) in the exhaust gases by inserting a sample probe into the exhaust tailpipe. The test is carried out with the engine at its normal idling speed and

the analyzer displays the results continuously. Once a stabilized figure is achieved the tester will record the result. The vehicle must comply with the appropriate emissions limits set out in Table 6 of the standard

#### **D.2.2.4 Basic Emissions Test (BET)**

The basic emissions test (also known as the 'catalyst test') will be applied to all petrol and LPG fueled manufactured on or after 1<sup>st</sup> July 1992. This test is primarily aimed at identifying, and assessing emissions from vehicles with advanced emissions control systems such as three-way catalytic converters. As the procedure is more complicated than the non-catalyst test, the emissions analyzers include computer software aimed at guiding the examiner through the test sequence. The test consists of checking the emissions at 'fast-idle speed' which involves running the engine at a speed between 2500 - 3000 rpm. During this test the emissions of CO and HC will be checked. The emission limits to be met are specified in Table 6.



## **Annex E** **(Normative)**

### **Tests for imported used and in-use diesel powered vehicles**

#### **E.1 Introduction**

This inspection applies to all imported used and in-use diesel engine vehicles with four or more wheels.

#### **E.1.1 Test procedure**

##### **E.1.1.1 Checks on the vehicle before the test**

Before carrying out the test, the Examiner must confirm that the engine is at its normal operating temperature as per the vehicle manufacturer. In most cases this will require the use of an oil temperature probe inserted into the dipstick tube. The Examiner will also check that the engine has adequate oil and fuel to complete the test before proceeding. In addition, the Tester will check the condition of the camshaft drive belt (where visible) and the fuel injection pump (governor) anti-tampering seals. For vehicles with manual transmission the test will be carried out with the gear lever in the 'neutral' position and with the clutch engaged. For vehicles with automatic transmission the gear selector will be in either the 'neutral' or 'park' position.

##### **E.1.1.2 Visual inspection**

For all diesel powered vehicles manufactured before 1<sup>st</sup> July 1992, a visual test will be carried out. The Examiner will check the smoke emissions by raising the engine speed to around 2500 rpm or half the maximum engine speed if this is lower. This speed will be maintained for 30 seconds to ensure that the inlet and exhaust system has been fully purged. The Examiner will then allow the engine to return to idle. Once the engine has stabilized at this speed, the emissions from the exhaust tailpipe will be assessed. If the exhaust is emitting dense blue or clearly visible black smoke for a period of 5 seconds or more the vehicle will fail the test. The Examiner will then rapidly increase the engine speed to around 2500 rpm or half the maximum engine speed if this is lower and assess whether the smoke emitted from the exhaust is likely to obscure the vision of other road users. If it is likely to do so, the vehicle will fail the test. However, vehicles manufactured before 1960 will not be failed if the smoke is unavoidable due to the engine design.

##### **E.1.1.3 Metered smoke test**

For all diesel powered vehicles manufactured on or after 1<sup>st</sup> July 1992, a metered smoke test will be carried out. Before checking the smoke emissions, the Examiner will firstly ensure that the engine inlet and exhaust system is fully purged, and the engine speed governor, where applicable, is functioning correctly. The engine speed will then be raised to around 2500 rpm or half the maximum engine speed if this is lower. Upon reaching this speed, the Examiner will hold the engine speed steady for 30 seconds to purge the inlet and exhaust systems, then the engine speed will be slowly increased to maximum to check the operation of the fuel pump governor. Where the engine speed stabilizes at its maximum speed indicating that the governor is working, the engine will then be returned to idle speed. Where it is clear that the governor is not working, the engine will be returned to idle speed and stopped, the smoke test will not be carried out and the Examiner will be unable to pass the vehicle. Provided the preliminary checks are completed satisfactorily, the Examiner will prepare the smoke meter and insert the sampling probe into the exhaust tailpipe. Having restarted the engine, the Examiner will start the smoke test as follows:

### Diesel Fast Pass

The smoke meter will indicate to the Examiner to accelerate the engine. The accelerator pedal will be depressed quickly and continuously but not violently, to reach the full fuel position in less than 1 second. After the release prompt is given, the Examiner will immediately release the throttle. The meter will calculate the maximum smoke emission during the acceleration and display the result. If, after the first acceleration, the meter reading is at or below the limits specified in Table 5, the vehicle will pass the meter test and a pass result will be displayed on the meter; if it exceeds, the vehicle will fail the test and a fail result will be displayed on the meter.

### Standard diesel test

If the smoke level reading is greater than the limits in Table 5, a further two accelerations will be requested by the meter. Provided the average of the 3 tests is at or below the appropriate limit in Table 5, the vehicle will have passed the test. The Examiner will stop the engine and remove the smoke meter probe from the tailpipe. Where the average smoke emission at the end of the third acceleration exceeds the limit in Table 5, the meter will request further tests. This will continue until either the average of the three preceding accelerations is at or below the limit in the Table 5, or a maximum of six accelerations have been completed. Once the vehicle has either passed the test or a maximum of six accelerations have been completed the Examiner will stop the test and remove the smoke meter probe from the exhaust tailpipe.

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