RWANDA STANDARD

DRS 654

First edition

yyyy-mm-dd

Air quality — Vehicular exhaust emission limits

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ICS 13.040.99

Reference number

DRS 654: 2026

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Foreword

Rwanda Standards are prepared by Technical Committees and approved by Rwanda Standards Board (RSB) Board of Directors in accordance with the procedures of RSB, in compliance with Annex 3 of the WTO/TBT agreement on the preparation, adoption and application of standards.

The main task of technical committees is to prepare national standards. Final Draft Rwanda Standards adopted by Technical committees are ratified by members of RSB Board of Directors for publication and gazettment as Rwanda Standards.

DRS XXX was prepared by Technical Committee RSB/TC 077, Air quality.

Committee membership

The following organizations were represented on the Technical Committee on *Air quality* (RSB/TC 077) in the preparation of this standard.

Ministry of Environment

Rwanda Environment Management Authority (REMA)

Rwanda Emission Inspection Program (REIP)

Ministry of Infrastructure (MININFRA)

Rwanda Utility Regulatory Authority (RURA)

Association des Transporteurs et Transitaires Agréés au Rwanda (ATAR)

Association des Transporteurs des Personnes au Rwanda (ATPR)

Private Sector Federation (PSF)

Rwanda Standards Board (RSB) – Secretariat

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Air quality — Vehicular exhaust emission limits

1 Scope

This Draft Rwanda Standard specifies permissible limits for common pollutants found in exhaust emissions of motor vehicles, namely carbon monoxide (CO), particulate matter (PM), oxides of nitrogen (NO_X) and hydrocarbons.

This draft standard covers emissions for new, imported used and in-use vehicles of all types of motor vehicles with internal combustion engines namely, passenger cars, light commercial vehicles, heavy-duty vehicles, motorcycles and motor tricycles as given in Annex A.

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.

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

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

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

3 Terms and definitions

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

3.1

new vehicle

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

3.2

used vehicle

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

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3.3

in- use vehicle

operating motor vehicle, motorcycle or motor tricycle that is registered by 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 done by a relevant authority from any jurisdiction on a new motor vehicle, motorcycle or motor tricycle before operation

3.6

periodic inspection

inspection done by a relevant authority from any jurisdiction on a motor vehicle, motorcycle or motor tricycle when operational after the term of validity of its inspection certificate has expired

3.7

modified inspection

inspection done by a relevant authority from any jurisdiction on a motor vehicle, motorcycle or motor tricycle when there are changes in the length, height, width, maximum payload and any other major modification

3.8

on-road random inspection

inspection done by a relevant authority from any jurisdiction on a motor vehicle, motorcycles and moto tricycles when it is randomly selected for inspection on the road

3.9

Motocycle

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

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3.10

emission

discharge of gases, particulate matter and/or smoke from a road vehicle into the atmosphere

3.11

emission limits

discharge of gases, particulate matter and/or smoke from a road vehicle into the atmosphere

4 Requirements

4.1 General requirements

4.1.1 All imported diesel powered and petrol (gasoline) powered vehicles shall be type-approved to comply with the requirements of Euro VI/ Euro 6. The specific details shall be as given in Table 1 and Table 2.

4.1.2 All new, imported used and in-use motor vehicles, motorcycles and motor tricycles shall be inspected and tested for compliance with exhaust emissions limits in accordance with tables 1 to 4.

4.1.3 In addition to any other requirements on roadworthiness, new, imported used, in use motor vehicle, motorcycle or motor tricycle shall not be registered for the first time without a certificate of compliance with exhaust emission limits.

4.1.4 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.

4.1.5 Motor vehicles, motorcycles and motor tricycles shall be inspected and tested in inspection centres approved by competent authority.

4.1.6 Emissions inspection and testing may be done according to the schedule laid out in Annex B

4.2 Specific requirements

The different types and categories of vehicles shall comply with exhaust emission limits given in Table 1 to Table 4 when tested in accordance with the test methods specified therein.

Table 1 — Emission limits for new diesel-powered vehicle

S/N	Vehicle category	Emission limit, max.						Test method
		THC	NH_3 (ppm)	CO	HC + NO_x	NO_x	PM	
i	Passenger cars class M, g/km			0.50	0.17 0.30	0.08 0.25	0.0045 0.025	Annex C
ii	Light duty							

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	commercial vehicles (N1 Class I, II, III), g/km: • N1, Class I (≤ 1 305 kg) • N1, Class II (1 305 kg - 1 760 kg) • N1, Class III (1 760 kg - 3 500 kg)			0.50 0.63 0.74	0.17 0.30 0.195 0.39 0.215 0.46	0.08 0.25 0.105 0.33 0.125 0.39	0.0045 0.025 0.0045 0.04 0.0045 0.06	Annex C
iii	Heavy duty vehicles (N2, N3 & O), g/kWh: • N2 (GVW > 3 500 kg < 12 000 kg) • N3 (GVW > 12 000 kg)	0.13 0.13	10 10	1.50 1.50	NA 0.46 NA 3.96	0.4 3.5 0.4 3.5	0.01 0.02 0.01 0.02	ISO 16183
iv	O (Trailers including semi-trailers)			1.50	3.96	3.5	0.02	

Table 2 — Emission limit for new gasoline and LPG powered vehicles

S/N	Vehicle category	Emission limits, max.					Test method
		CO	NMHC	HC	NOx	PM[a]	
i.	Passenger cars class M, g/km	1.00	0.068	0.10	0.06 0.08	4.5	Annex C
ii.	Light duty commercial vehicles (N1 Class I, II, III), g/km:					4.5	
	N1, Class I (≤ 1 305 kg)	1.00	0.068	0.10	0.06 0.08		
	N1, Class II (1 305 kg < RM≤ 1 760 kg)	1.81	0.09	0.13	0.075 0.10	4.5	Annex C
	N1, Class III (>1 760 kg)	2.27	0.108	0.16	0.082 0.11	4.5	
iii.	Heavy duty vehicles class O, g/kWh:		**0.16**			**0.010**	
	O (Trailers including semi-trailers)	4.0		NA	0.46 3.5		ISO 16183
iv.	Motorcycles (Class I & II), g/km:					**4.5**	
	Class I (<150 cc displacement)	1	0.68	0.1	0.06	4.5	ISO 6460-2
	Class II (150 cc displacement)	1	0.68	0.1	0.06		

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v.	Motor tricycles, g/km: All gasolines	**1.5**	**0.68**	0.1	0.06		ISO 6460-2
	NOTE Table note. [a] PM limits apply only to direct-injection petrol engines						

Table 3 — Emission limits for imported used and in-use diesel powered vehicles (compression ignition engine)

Vehicle category	Date of manufacture (Y/M)	Smoke density, max. (Light absorption coefficient) m^{-1}	Test method
All categories*	2005/01 upwards	1.5	Annex E
	From 1992/07 - 2004/12	2.5	
*For all categories of in-use diesel powered vehicles manufactured before 1992/07, the requirement for smoke density does not apply. For such vehicle a visual test shall be carried out in accordance with E.1.1.2.			

Table 4 — Emission limit for imported used and in-use gasoline and LPG vehicle (spark ignition engines)

Vehicle category	Date of manufacture (Y/M)	Emission limit, max.		Test method
		CO, % volume	HC, ppm	
Motor vehicles				
All categories	From 2005/01 upwards	1.00	400	Annex D
	From 1992/07 to 2005/01	3.0	500	
	Before 1992/07	4.5	600	
Motorcycles				
All categories	After 31/3/2000 (4 stroke)	3.5	4 500	Annex D
	After 31/3/2000 (2 stroke)	3.5	6 000	
	on or before 31/3/2000 (2/4 stroke)	4.5	9 000	
Motor tricycles				
All categories	All years	3.5	4 500	Annex D

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Annex A
(normative)

Vehicles 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 5 000 kg.
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 Gross Vehicle Weight Rating (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 ≤ 1 305 kg
Class II	1 305 kg < RM ≤ 1 760 kg
Class III	RM >1 760 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)
Motorcycles	
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	

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Motor tricycles	Three-wheeled motor-driven vehicle whose unladen weight does not exceed 400 kg

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Annex B
(informative)

Emissions inspection schedule

Vehicle category	Initial inspection	Periodic inspection [a]	Modification inspection	On-road random inspection
All categories	All	All except for private passenger vehicles [b]	All	All
a This shall be carried out after every 6 months b Private passenger vehicles to be inspected after every 12 months				

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Annex C
(informative)

Tests for new vehicles

C.1 General

The test procedure for C.2 to C.5 shall be used for type approval and certification of all categories of light duty and medium duty vehicles, heavy-duty vehicles, motorcycles and motor tricycles whether locally manufactured/assembled or imported.

C.2 Worldwide Harmonized Light Vehicle Test Procedure (WLTP)

The WLTP defines a global harmonized standard for determining the levels of pollutants and CO_2 emissions, fuel efficiency, and electric range from light-duty vehicles (passenger cars and light commercial vehicles), and was developed under the guidance of United Nations Economic Commission for Europe (UNECE) World Forum for Harmonization of Vehicle Regulations.

C.3 New European Driving Cycle (NEDC)

The test is performed on the chassis dynamometer on all categories of light duty and medium duty vehicles, where tailpipes emission of the vehicle is collected and analysed to assess the emission rates.

C.4 World harmonized Stationary Cycle (WHSC)

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.5 World motorcycle Test Cycle (WMTC)

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 GTR established under the guidance of UNECE World Forum for Harmonization of Vehicle Regulations.

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Annex D
(informative)

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-catalytic test procedure shall apply.

D.2.2 Test for vehicle with advanced emission control

D.2.2.1 Check on the vehicle before the test

D.2.2.1.1 Before carrying out the test, the examiner will conduct the check as per the vehicle manufacturer instructions to confirm the following:

a) the engine is at its normal operating temperature; and

b) the engine has sufficient oil and fuel.

D.2.2.1.2 For vehicles with manual transmission the test shall be carried out with the gear lever in the 'neutral' position and with the clutch engaged.

D.2.2.1.3 For vehicles with automatic transmission the gear selector shall be in either the 'neutral' or 'park' position

D.2.2.2 Visual inspection

Following completion of the preliminary checks in D.2.2.1;

a) raise the engine speed to around 2 500 rpm or a half the maximum engine speed if this is lower and hold it steady for approximately 20 s, after which the engine will be allowed to return to its natural idle speed.

b) after the emissions have stabilized, assess the smoke emitted from the tailpipe.

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If the exhaust is emitting dense blue or clearly visible black smoke, then the vehicle will fail the test. For 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 Standards Emissions Tests (SET)

This test shall be carried out for vehicles that pass visual inspection (D.2.2.2). Following completion of the visual test, the Standard Emissions Test is carried out with the engine at its normal idling speed and the analyzer displays the results continuously:

a) check the emissions level using an approved (by the competent authority) analyzer to assess the levels of carbon monoxide (CO) and hydrocarbons (HC) in the exhaust gases; and

b) record the result once a stabilized figure is achieved

D.2.2.4 Basic Emissions Test (BET)

The basic emissions test (catalyst test) shall be applied to all petrol and LPG fuelled vehicles manufactured on or after 1st July 1992 and is primarily aimed at identifying and assessing emissions from vehicles with advanced emissions control systems such as three-way catalytic converters.

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 2 500 rpm – 3 000 rpm. During this test the emissions of CO and HC will be checked. The emission limits shall be as specified in Table 4.

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Annex E
(informative)

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.2 Test procedure

E.2.1.1 Checks on the vehicle before the test

E.2.1.1.1 Before carrying out the test, the examiner shall conduct the check as per the vehicle manufacturer instructions to confirm the following:

c) engine is at its normal operating temperature;

d) engine has sufficient oil and fuel; and

e) the condition of the camshaft drive belt (where visible) and the fuel injection pump (governor) anti-tampering seals.

E.2.1.1.2 For vehicles with manual transmission the test shall be carried out with the gear lever in the 'neutral' position and with the clutch engaged**.**

E.2.1.1. 3 For vehicles with automatic transmission the gear selector shall be in either the 'neutral' or 'park' position.

E.1.1.2 Visual inspection

A visual test shall be carried out on all diesel powered vehicles manufactured before 1st July 1992. The examiner shall:

a) check the smoke emissions by raising the engine speed to around 2 500 rpm or half the maximum engine speed if this is lower. This speed will be maintained for 30 s to ensure that the inlet and exhaust system has been fully purged.

b) allow the engine to return to idle. Once the engine has stabilized at this speed, assess the emissions from the exhaust tailpipe. If the exhaust is emitting dense blue or clearly visible black smoke for a period of 5 s or more the vehicle will fail, the test.

c) rapidly increase the engine speed to around 2 500 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 fails the test.

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However, vehicles manufactured before 1960 are not be failed if the smoke is unavoidable due to the engine design.

E.2.1.3 Metered smoke test

A metered smoke test shall be carried out on all diesel-powered vehicles manufactured on or after 1st July 1992.

Before checking the smoke emissions, ensure that the engine inlet and exhaust system is fully purged, and the engine speed governor, where applicable, is functioning correctly ensure that the engine inlet and exhaust system is fully purged, and the engine speed governor, where applicable, is functioning correctly.

Raise the engine speed to around 2 500 rpm or half the maximum engine speed if this is lower. Upon achieving this speed, hold the engine speed steady for 30 s to purge the inlet and exhaust systems, then slowly increase the engine speed 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 carry out the smoke test as follows:

E.1.1.3.1 Diesel fast pass

The smoke meter indicates to the examiner to accelerate the engine.

Quickly and continuously, depress the accelerator pedal to reach the full fuel position in less than 1 s. After the release prompt is given, immediately release the throttle.

The meter calculates 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 3, the vehicle shall have passed the meter test. If it exceeds the limits specified in Table 3, the vehicle shall have failed the test and shall be required to undergo standard diesel test as specified in E.1.1.3.2.

E.1.1.3.2 Standard diesel test

Where the smoke level reading is greater than the limits in Table 3, the meter shall prompt for a further two accelerations.

Provided the average of the 3 tests is at or below the appropriate limit in Table 3, the vehicle shall 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 3, the meter will prompt further tests. This will continue until either the average of the three preceding accelerations is at or below the limit in the Table 3, or a maximum of six accelerations have been completed.

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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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