Maximum road speed limiters for motor vehicles—

Part 2: Specification for system and component requirements

PUBLIC REVIEW DRAFT, FEBRUARY 2018

TECHNICAL COMMITTEE REPRESENTATION

The following organizations were represented in the technical committee.

Motor Vehicle Inspection Unit Road Safety Association of Kenya Kenya Federation of Jua Kali Association Kenya Automotive Security Association Ministry of Transport, Infrastructure, Housing and Urban Development (CM&TE) Kenya Accreditation Services (KENAS) Speed Governors and Road Safety Association Saferider Management Systems Limited Pinnacle Systems Chloride Exide Matatu Welfare Association KEMRA Ekas Technologies Associated Battery Manufacturers East Africa Ltd. Kenya Bureau of Standards –
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Foreword

This Kenya Standard was developed by the Technical Committee on Extra-low Voltage equipment under the guidance of the Standards Projects Committee and is in accordance with the procedures of the Bureau.

Following the increased number of accidents that occur due to speeding, the government has put in place a number of measures aimed at curbing speeding on the Kenyan roads. Combined with the mounting of speed traps, limiting the maximum speed of the vehicle is the other technique that has been identified as

This second edition of this Kenya standard has more elaborate test methods to test for compliance and is

British Standard BS AU 217-2:1989, Maximum road speed limiters for motor vehicles

Indian Automotive Industry Standard AIS – 018/2001 (including amendments 1-4), Automotive vehicles — Speed limitation Devices — Specifications

Zambia Standard ZS 675:2006, Road vehicles — Road speed limiters — Guidelines

Acknowledgement is hereby made for assistance derived from these sources.

properly linked to Part of the standard unlike the previous edition which had no linkage. In the preparation of this Kenya Standard, reference was made to the following publications:

Road speed limiters — Guidelines

specifies requirements for the performance of systems and components designed to form part of a speed limiter intended to limit the maximum road speed of motor vehicles by control of engine power.

TABLE OF CONTENTS

DRAFT KENYA STANDARD KS 2295-2:2018

1 Scope

This Part of Kenya Standard specifies requirements for the performance of systems and components designed to form part of a speed limiter intended to limit the maximum road speed of motor vehicles by control of engine power.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references,

references, only the edition cited applies. For undated references, the latest edition of the document (including any amendments) applies.

BS 3G 100-4, Specification for General requirements for equipment for use in aircraft - Part 4 equipment - Section 2: Electromagnetic interference at radio and audio frequencies

DEF STAN 59-41-3 (issue 2) Electromagnetic compatibility- DRSO2, Radiated susceptibility.

DIN 57879:1981-3, Radio interference suppression for motor vehicles, vehicle equipment a combustion engines - Measurements of vehicle equipment.

IEC 60068-2-1, Environmental testing - Part 2-1: Tests - Test A: Cold Stability

IEC 60068-2-2, Environmental testing - Part 2-2: Tests - Test B: Dry heat Stability.

IEC 60068-2-10, Environmental testing - Part 2-10: Tests - Test J and guidance: Mould growth

IEC 60068-2-11, Environmental testing - Part 2: Tests. Test Ka: Salt mist Stability.

IEC 60068-2-14, Environmental testing - Part 2-14: Tests - Test N: Change of temperature Stab

IEC 60068-2-18, Environmental testing - Part 2-18: Tests - Test R and guidance: Water Stability

IEC 60068-2-38, Environmental testing - Part 2-38: Tests - Test Z/AD: Composite temperatu cyclic test Stability

IEC 60068-2-30, Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 1

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cyclic test Stability

3.1 Failure to function
Functioning outside the requirements of Part 1 of this standard but not suffering any permanent damage

3.2

IEC 60068-2-30, Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 + 12 h cycle)

IEC 61508, Functional safety of electrical/electronic/programmable electronic safety-related systems (all parts)

ISO 26262, Road vehicles – Functional Safety (all parts)

ISO 7637-1; Road vehicles -- Electrical disturbances from conduction and coupling -- Part 1: Definitions and general considerations

ISO 7637-2; Road vehicles -- Electrical disturbances from conduction and coupling -- Part 2: Electrical transient conduction along supply lines only

KS EAS 18-1, Cement - Part 1: Composition, specifications and conformity criteria for common cement.

KS 1586-1, Specification for radio interference measuring apparatus and measurement methods - Part 1- Radio disturbance and immunity measuring apparatus.

KS 2295-1, Maximum road speed limiters for motor vehicles — Part 1: Specification for installed requirements.

3 Definitions

For the purposes of this Part of Kenya Standard the definitions given in part 1 apply, together with the following.

kerbside mass
The mass of a vehicle when it carries: a) No person; and b) A full supply of fuel in its tank, an adequate supply of other liquids incidental to its propulsion and no load other than the loose tools and equipment with which it is normally equipped

3.3 Normal function
Functioning in accordance with the requirements of KS 2295-1.

3.4 Nominal voltage

half period of the transient response cu
et = Vmax.

ch renders it inoperative. For the purpc
ıer user serviceable circuit protection dev

20 s beginning 10 s after the set speed i(refer Fig.1), if not, the cases as given in the Fig.2, Vset = Vmax.
A voltage of 12± 1 V d.c or 24±2 V d.c.

ed (Vstab)
ed over a minimum period of 20 s l
ıg the requirements for acceptanc

3.5 Maximum Speed **(Vmax)**

ion (SLF)
uel feed of the vehicle or engine ma

3.6 Permanent damage
Damage sustained by a component or system which renders it inoperative. For the purpose of this definition the rupture of a fuse or the operation of (rother user serviceable circuit protection devices is not taken to be permanent damage

ig.1) and meeting the
ements for acceptance criteria
celeration test specified in this
ard.

3.7 stabilized vehicle speed (Vstab)
average speed calculated over a minimum period of 20 s beginning 10 s after the set speed is achieved

3.8 Speed limitation function (SLF)
function to control the fuel feed of the vehicle or engine management in order to limit the vehicle speed to a fixed maximum value

4 Tests of speed limitation device

4.1 General

Five samples of the limiter shall be provided -four samples for the performance and endurance test described in **4.2** and **4.3** below and one sample as fitted on the vehicle for carrying out the tests prescribed in **4.5** below. In the case of add-on or on-board system built in the vehicle, the involved system and its components shall be provided separately for the performance and endurance tests.

4.2 Performance Tests

All the four samples shall be tested for performance as given below.

ance tests.

4.2.1 Visual Examination

manship, finish, marking and general r
s alone.

turer;

prescribed in KS 2295-1, pertaining to the components alone.

4.2.2 Marking

Each limiter shall be marked with the following:

The number of this Kenya Standard, The name and/or trade mark of the manufacturer;

A part number.
Serial number
Country of origin

4.2.3 Functional Test and Power Consumption

The limiter shall be connected to the rated voltage. The limiter shall be coupled to a suitable test rig and tested for its function viz. limiting the speed at the set value. The maximum current consumption is noted. The maximum current of each type of limiter shall not exceed the values specified by the manufacturer if not specified KS 2295-1.

4.2.4 Electrical power supply

4.2.4.1 *Steady state voltage*

a) The limiter shall operate satisfactorily over the following voltage:

Rated Voltage of Speed Limiter	Performance Limit of Voltage	
	Maximum	Minimum
24	32	22
12	16	11

b) The limiter shall be tested at 10 V and 40 V (5 V and 28 V) d.c., for a period of 10 min at each, with a sweep between these maximum and minimum values. The change from nominal voltage to each extreme and from each extreme to nominal voltage shall take place over a time interval of 10 ms.

The limiter may fail to function but it shall not be permanently damaged and shall return to normal

function when the power supply is returned to normal.

4.2.4.2 *Ripple.* Normal operation of the limiter shall not be affected by regular or irregular variations in voltage about the prevailing supply level (excluding transients) not exceeding 3V (± 2 Vdc) peak to peak in the range 10 Hz to 10 kHz.

4.2.4.3 *Reverse polarity.* The limiter may fail to function but it shall not be permanently damaged when subjected to a reversal of polarity of the supply referred to in **4.2.3** for 1 min and shall return to normal function when the power supply is returned to normal.

4.2.4.4 *Transients.*

'ENDIX A.

4.2.4.5 ***Input/output protection***

4.2.4.5.1 Each output in turn shall withstand connection to earth for 1 min duration, without permanent damage, with the system operating and shall return to normal function when the connection is removed.

ction to earth for 1 min duration, without
normal function when the connection is r

nection to earth and to supply for 1 m
hall return to normal function when the co

accordance with British Standard 3G 1(
perate correctly with 3 V r m s interferer

12 V systems and ISO 7637-2 for 24 V systems. Transient voltage test severity levels are given in **APPENDIX A.**

4.2.4.5.2 Each input in turn shall withstand a connection to earth with the system operating and shall return

and to supply for 1 min, without permanent damage, to normal function when the connection is removed.

4.2.4.6 Electromagnetic compatibility

hen tested in acco
imiter shall operate
Hz, superimposed

4.2.4.6.1 *Supply line interference.* When

tested in accordance with British Standard 3G 100: Part 4:

Using the test proc
romagnetic emissiS

4.2.4.6.2 *Electromagnetic emissions*. Using the test procedure described in paragraph 4 of DIN 57879: Part 3:1981 and with the values of electromagnetic emissions measured on the output port of a 50 Ohm line impedance stabilizing network using a CISPR quasi-peak measuring receiver (both of which shall meet the requirements of KS 1586-1), the limiter under test shall not cause interference in the supply line exceeding the values shown in Table 1, or their equivalent if other equipment is used.

Table 1 — Maximum supply line interference levels

Frequency band MHz	**Measured level relative to 1 microvolt in 50 ohm(+ dB)**
0.15 to 0.29	70 level
0.30 to 4.90	60 level
5.00 to 29	50 level
30 to 108	Slope 50 to 30

4.2.4.6.2 *Electromagnetic emissions.* Using the test procedure described in paragraph 4 of DIN 57879: Part 3:1981 and with the values of electromagnetic emissions measured on the output port of a 50 Ohm line impedance stabilizing network using a CISPR quasi-peak measuring receiver (both of which shall meet the requirements of KS 1586-1), the limiter under test shall not cause interference in the supply line exceeding the values shown in Table 1, or their equivalent if other equipment is used.

4.2.4.7 *RF field susceptibility.* When tested in accordance with the procedure described in DEF STAN 59-41, Part 3, Issue 2:1986 (DRSO2 radiated susceptibility) the limiter shall function normally when subjected to an RF field of 140 dB above 1 µV/m (10 V/m) over a frequency range of 1 MHz to 220 MHz.

4.3 Endurance Tests

The device shall function normally during the tests and shall meet the performance requirements as given in **4.2.3** after completion of the tests while complying with the manufacturer's specifications.

However, if any breaking down of the device occurs during one of the endurance tests, a second device

may be submitted to the considered endurance tests at the manufacturer's request. The Limiter shall be mounted on a test bench simulating the attitude and movement to simulate the vehicle conditions.

Note 1 – For cases where the speed limiting function is an inbuilt feature in the Engine Control Unit (ECU), the ECU shall be submitted to the endurance test prescribed below. However, this may be omitted if the applicant demonstrates resistance to those effects.

Note 2 -"demonstration" means – Declaration by manufacturer in a format as given in **APPENDIX B** or

submission of relevant test reports.

4.3.1 System endurance test

The limiter, in a condition equivalent to new, shall be mounted and tested as prescribed in **APPENDIX C**, and, after completion of the test, shall function normally.

4.3.2 Time and temperature stability test

The limiter, in a condition equivalent to new, shall be mounted and tested as prescribed in **APPENDIX D.** During the procedures in **D.1** to **D.7** and **D.9** the sensed speed shall not differ from the set speed by more than 3.2 km/h.

4.3.3 Environmental protection

The limiter shall be subjected to the following tests, after each of which it shall continue to function normally.

4.3.3.1 Endurance Test with Damp Heat Cycling

The limiter shall be mounted and tested as described in **4.3.2** except that the limiter shall be mounted in a chamber, whose environment is varied according to Damp Heat Cycle Test as per 1A Test Cycle of Variant 1 with upper temperature of 55°C as per IEC 60068-2-30, for 6 damp heat cycles.

After completion of the test the limiter shall function normally.

4.3.3.2 Endurance Test at Low Temperature

The limiter shall be subjected to low temperature storage test in accordance with IEC 60068-2-1 at a temperature of:

a) -25 °C for cab mounted components;
b) -40 °C for engine and chassis mounted components.

The period for this test shall be 96 h after the limiter has reached the required temperature.

Return the limiter to 18 ± 2 °C at a rate not exceeding 1 °C/min and test.

4.3.3.3 Endurance Test at High Temperature

Using the component tested under **4.3.3.2**, carry out a high temperature storage test in accordance with IEC 60068-2-2 at temperature of:

a) + 80 °C for cab mounted components; b) + 140 °C for engine mounted components; c) + 100 °C for chassis mounted components.

The period for this test shall be 96 h after the component has reached the required temperature. Return the component to 18 ± 2 °C at a rate not exceeding 1 °C/min and test.

4.3.3.4 Endurance Test under humidity storage

Using the component tested under **4.3.3.3**Error! Reference source not found. carryout a humidity storage test in

4.3.3.5 Endurance Test under Vibration

Using the component tested under **4.3.3.4**Error! Reference source not found. carry out a sinusoidal vibration test as given in **APPENDIX E**, and after, test for normal function.

4.3.3.6 Endurance Test – Salt mist

Submit engine and chassis mounted components tested under **4.3.3.5** to a salt mist test in accordance with IEC 60068-2-11, for a period of 96 h and after test for normal operation.

4.4 Conditioning Tests

Additional tests which may be considered by manufacturers are listed below and described in **APPENDIX F** as appropriate.

4.4.1 Conditioning with Dust

This test is intended to determine satisfactory performance of the equipment when operated in fine dusty atmospheres.

The limiter shall be conditioned as per **F.3**

4.4.2 Conditioning with Contaminants

This test is intended to determine the suitability of the limiter to withstand contamination from fuels, oils and such other substances which it may encounter during service.

The limiter shall be conditioned as per **F.4**

4.4.3 Conditioning with Water Spray

This test is intended to determine the suitability of the limiter to withstand conditions as may be encountered while driving in the rain.

The limiter shall be conditioned as per **F.5**

4.4.4 Drop and Topple Test

This test is intended to determine the suitability of the limiter for such applications where it is likely to be accordance with IEC 60068-2-38 and test after the drying period.

dropped, or toppled, or otherwise roughly handled. A method

of test is under consideration.

4.4.5 Bump Test

This test is intended to determine the suitability of the limiter to withstand repeated shocks such as those

encountered on motor vehicles.

A method of test is under consideration.

4.5 Performance Tests on the Device as Fitted on the Vehicle

4.5.1.1 A limiter as installed on specified vehicle type shall be approved as per choice of supplier by either of the following methods; mentioned in **4.5.2** or **4.5.3**.

4.5.1.2 The general requirements specified in KS 2295-1 pertaining to a limiter as fitted on the vehicle shall be examined during the test.

4.5.2 Measurement on Test Track

When tested in accordance with the procedure given in **4.5.2.3**, the requirements given in **4.5.2.1** and **4.5.2.2** shall be met for each of the test runs. Speed shall be sensed to an accuracy of within ± 2.4 km/h of actual vehicle speed within the range Vmin to Vmax.

4.5.2.1 Transient response (see Figure 1)

After the set speed is first achieved:
a) Sensed speed shall not exceed the set speed by more than 4.8 km/h
b) The rate of change of sensed speed shall not exceed 0.5 m/s^2; and
c) The stabilized speed conditions specified in **4.5.2.2** shall be attained within 10 s of first reaching the set speed.

4.5.2.2 Stabilized speed (see Figure 1)

When stable speed control has been achieved:
a) Sensed speed shall not differ from the set speed by more than 3.2 km/h
b) Sensed speed shall not vary by more than 3.2 km/h
c) The rate of change of sensed speed shall not exceed 0.2 m/s^2.

4.5.2.3 Test conditions and procedure for demonstrating compliance with speed control requirements

NOTE Where the limiter is designed for fitting to a range of vehicles, it is recommended that the tests are performed on a "worst case" vehicle, so that the need for additional testing is minimized. Examples of worst case situations are as follows.

a) Maximum engine power to mass ratio of the tested vehicle at Vmax + 10 %.
b) Lowest overall gearing which allows the set speed to be attained, i.e. minimum vehicle speed to engine speed in top gear ratio.
c) Where the limiter actuator is a separate component in the engine power control, the minimum travel of the actuator between maximum and minimum engine power control positions.

4.5.1 General

4.5.2.3.1 Preparation of the Vehicle

a) The limiter to be approved shall be fitted on the vehicle. The settings of the engine of the test vehicle, particularly the fuel feed (carburetor or injection system) shall conform to the specification of the vehicle manufacturer

b) The vehicle shall be at its kerbside mass, plus the mass of the driver and any observer and test equipment

c) The tyres shall be nominally new, i.e. equal to or greater than 1 mm thread depth, and inflated to the pressure recommended by the vehicle manufacturer for operation at the vehicle's maximum gross weight

d) The power train components shall be within their normal operating temperature ranges

4.5.2.3.2 Ambient weather conditions

The mean wind speed measured at a height at least 1m above ground shall be less than 6m/s with gusts not exceeding 10m/s. The test surface shall be free from standing water

not exceeding 10m/s. The test surface shall be free from standing water

4.5.2.3.3 Surface condition

The test surface shall be suitable to enable stabilized speed to be maintained, and shall be uneven patches. Gradients shall not exceed 2 % and shall not vary by more than 1 %, excludir effects

4.5.2.3.4 Instrumentation

During the test, the instantaneous actual vehicle speed and sensed speed shall be continuously recorded.

NOTE 1 It is recommended that the accuracy of recorded measured speeds should be ± 0.2 % against a ti accurate to within 0.3 %.

NOTE 2 To obtain an accurate measure of vehicle speed, a number of steady speed runs in the range Vmi may be needed (using the limiter to provide these steady speeds if convenient). The runs should be perfor known distance and the time taken to cover this distance recorded. From the data collected calculations ca made of the ratios between recorded speeds and derived speeds, their mean and standard deviations.

uneven patches.
Gradients shall not exceed 2 % and shall not vary by more than 1 %, excluding camber effects
4.5.2.3.3 Surface condition

4.5.2.3.4 Instrumentation

recorded.

NOTE 1 It is recommended that the accuracy of recorded measured speeds should be ± 0.2 % against a time base accurate to within 0.3 %.

NOTE 2 To obtain an accurate measure of vehicle speed, a number of steady speed runs in the range Vmin to Vmax may be needed (using the limiter to provide these steady speeds if convenient). The runs should be performed over a known distance and the time taken to cover this distance recorded. From the data collected calculations can then be

Transient Response (Fig.1) After the set speed is reached first time,

The maximum speed shall not exceed the set speed Vset by more than 5%.

The rate of change of speed shall not exceed 0.5 m/s^2 when measured on a period greater than 0.1 s.

made of the ratios between recorded speeds and derived speeds, their mean and standard deviations.

4.5.2.3.5 Acceleration Test Method

The vehicle running at a speed, which is 10 km/h below the set speed, shall be accelerated as much as possible using a fully positive action on the accelerator controls. Maintain the accelerator at its position of maximum travel for not less than 30 s after the vehicle speed has been stabilized. The instantaneous vehicle speed shall be recorded during the test in order to establish the curve of the speed versus the time and during the operation of the speed limiting function or of the limiter as appropriate. The accuracy of speed measurements shall be ±1% and that of time measurements within 0.1s.

Conduct the test three times in each gear, which allows the set speed to be reached.

4.5.2.3.6 Acceptance Criteria for Acceleration Test

The test shall be satisfactory if following conditions are met.

The stabilized speed reached by the vehicle shall not exceed the set speed (Vstab ≤ Vset). However, a tolerance of 5% of the Vset value, or 5 km/h, whichever is higher is acceptable.

The stabilized speed conditions specified in **3.7** shall be attained within 10 s of first reaching of the set speed Vset.

Stabilized Speed (Fig.1) Vstab is the average speed calculated for a minimum time interval of 20s beginning 10s after first reaching Vset.

When stable speed control has been achieved,

-Speed shall not vary by more than 4% of the set speed Vset or 2 km/h whichever is higher
0.1 s.

Acceleration tests shall be carried out and the acceptable criteria verified for each reduction ratio of gear allowing the speed to be exceeded.

4.5.2.4 Test Method at Steady Speed

4.5.2.4 Test Method at Steady Speed

4.5.2.5 The vehicle shall be driven at full acceleration till a steady speed is achieved, then shall be maintained at this speed for at least 400 m. The test shall then be repeated in the opposite direction. Th stabilized speed for the whole test is the mean of the two average speeds measured on both directions. The whole test including the calculation of the stabilization speed shall be carried out five times. The speed measurement shall be carried out with an accuracy of ± 1%, the time measurement with an accuracy of 0.1 s.

4.5.2.6 Acceptance Criteria for Steady Speed Test

Tests are judged satisfactory if following conditions are fulfilled,

- None of the stabilization speeds Vstab obtained shall exceed set speed Vset. However, tolerance of 5% of the Vset value or 5 km/h whichever is greater is acceptable.
- *The difference between the stabilization speeds obtained during each test run shall be equal to* less than 3 km/h.
- Tests in steady speed shall be carried out and the acceptan The gear ratio allowing, in theory, the speed limit to be exceeded.

4.5.3 Tests on Chassis Dynamometer

4.5.3.1 Characteristics of Chassis Dynamometer

The equivalent inertia of the vehicle mass shall be reproduced or accuracy of ±10%. The speed of the vehicle shall be measured with be measured with an accuracy of 0.1s.

4.5.3.2 Acceleration Test Method

4.5.3.2.1 The power absorbed by the brake of the chassis dynamo correspond with the vehicle's resistance to progressive movement at -The difference between the stabilization speeds obtained during each test run shall be equal to or less than 3 km/h. -Tests in steady speed shall be carried out and the acceptance criteria verified for each reduction

-None of the stabilization speeds Vstab obtained shall exceed set speed Vset. However, a tolerance of 5% of the Vset value or 5 km/h whichever is greater is acceptable.

4.5.3.1 Characteristics of Chassis Dynamometer

The equivalent inertia of the vehicle mass shall be reproduced on the chassis dynamometer with an The speed of the

vehicle shall be measured with an accuracy of ±1%. The time shall

The power absorbed by the brake of the chassis dynamometer during the test shall be set to correspond with the vehicle's resistance to progressive movement at the tested speed(s). This power may be established by calculation and shall be set to an accuracy of ±10%. At the request of the manufacturer, the power absorbed may alternatively be set at 0.4 Pmax. (Pmax is the maximum power of the engine). The vehicle running at a speed which is 10 km/h below its set speed shall be accelerated to the maximum possible engine speeds by a fully positive action on the acceleration control. The action shall be maintained for at least 20 s, after the vehicle speed has been stabilized. The instantaneous vehicle speed shall be recorded during the test in order to establish the curve of the speed versus the time and during the operation of the speed limitation device.

4.5.3.2.2 Acceptance Criteria for the Acceleration Test

The test shall be satisfactory if conditions of para 4.5.2.3.6 are met.

4.5.3.3 Test Method for Steady Speed Test

4.5.3.3.1 The vehicle shall be installed on the chassis dynamometer. The following acceptance criteria should be met for power absorbed by the chassis dynamometer varying progressively from the maximum power Pmax to a value equal to 0.2 Pmax. The speed of the vehicle shall be recorded in the full range of

4.5.3.3.2 Acceptance criteria for steady speed tests are judged satisfactory if the conditions of 4.5.2.3.6 are fulfilled.

in the full rang
s range. Test

are fulfilled.

5 Type Approval (TA) and Conformity Of Production (COP)

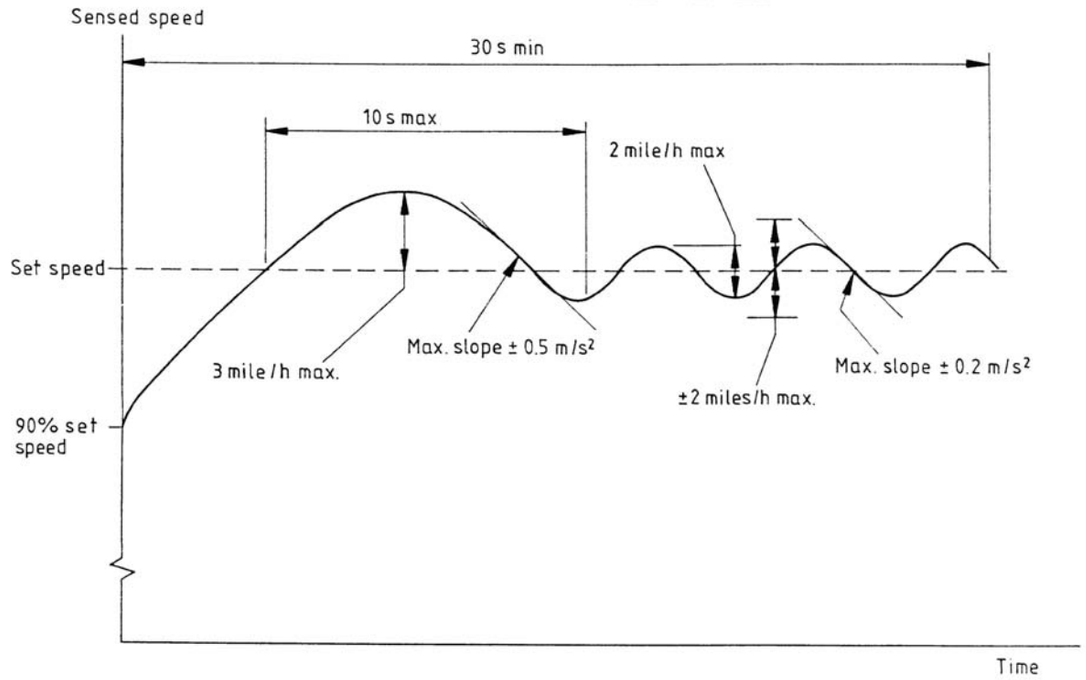
o

The manufacturer/applicant shall take all appropriate steps to ensure that the components continue comply with the requirements of ISO 26262 & IEC 61508.

d

With regards to approval of Speed Limiters Type Approval Certificate/Conformity of Production/t reports/extension reports shall be issued by same agency who has issued Type Approval.

:



5 Type Approval (TA) and Conformity Of Production (COP)

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Figure 1 – Allowed tolerances of limiter response characteristics

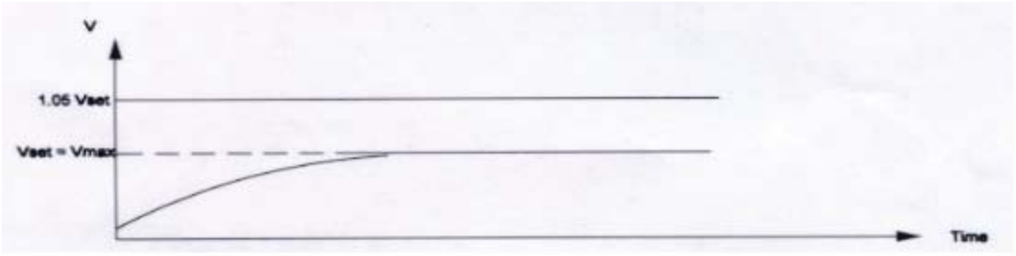

Figure 2

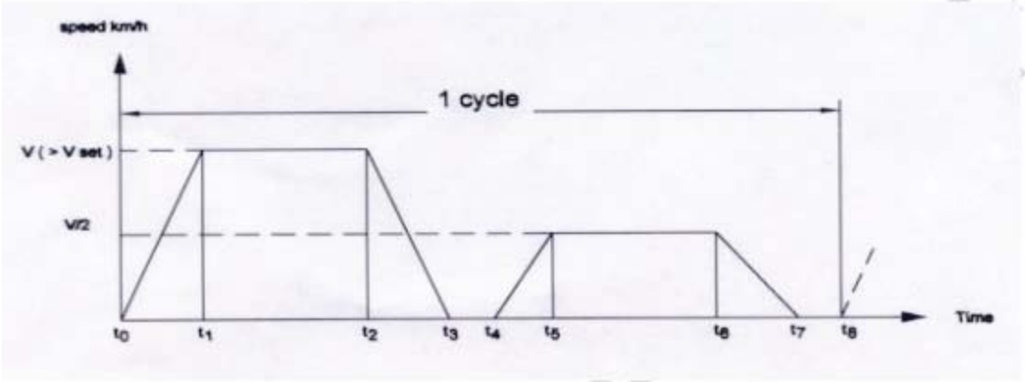

Figure 3

APPENDIX A Transient voltage test severity levels (normative)

Normal function A Fail but recover C

Table 2 — Transient voltage test severity levels

Test pulse Test level Functional status Number of pulses or test time	Remarks
1 -150 (-75) C 5000	
2 +150 (+75) C 5000	
3(a) -150 (-75) A 1h	
3(b) +150 (+75) A 1h	
4 -12(-6) C 5 pulses	1 min between each
5 +180(+80) C 1 pulse	
NOTE These values are for use in conjunction with ISO 7637-1 or ISO 7637-2	

APPENDIX B Declaration of compliance to the test according Speed limiting function of Engine Management System

Speed limitation of the vehicle is a software part of Engine Management System (EMS). EMS has undergone test according to or beyond the endurance test requirements specified for the speed limiting function.

This declaration is based on tests conducted for our internal approvals.

Model name: Identification:

Conditioning 1:

Test at ambient temperature. T = 30°C ± 5°C, 50000 cycles Test conducted (actual parameters if different than above) Test results: Test performed. No failures. [t1]

Conditioning 2:

Test at high temperature: T =65°C ± 5°C: for electronic components, 100°C±5°C: for mechanical components; 12500 cycles. Test conducted (actual parameters if different than above) Test results: Test performed. No failures. [t2]

Conditioning 3:

Test at low temperature; T = -20°C ± 5°C, 12500 cycles. Test conducted (actual parameters if different than above) Test results: Test performed. No failures. [t3]

Conditioning 4:

Test in salted atmosphere. 5 % sodium chloride, T =35°C ± 2°C, 12500 cycles. Test conducted (actual parameters if different than above) Test results: Test performed. No failures. [t4]

Conditioning 5:

Vibration test. Test 1: 10 -24 Hz, amplitude ± 2mm. Test 2: 24-1000 Hz for 2.5/5 g.

Test conducted (actual parameters if different than above)
Test results: Test performed. No failures. [t5]

Note: The declaration must be issued by authorized signatory of the manufacturer

APPENDIX C System endurance test (normative)

C.1 Connect the limiter in accordance with the manufacturer's instructions and where necessary adjust to simulate maximum load/travel conditions (worst case). Connect a 24 V (12 V) battery with the charge maintained at 28 (14) ± 1 V d.c.

C.2 Activate the system through the following test cycle (see Fig. 3):

a) Drive to a full range travel (*t*1); b) Reverse to zero output (*t*2); c) Drive to a mean position (*t*3); d) Control at mean output for 5 × (*t*1+ *t*2+ *t*3); e) Reverse to zero output; where *t*

C.3 Repeat this test cycle for the 250,000 cycles.

;
required to complete each individual oper

APPENDIX D Time and temperature stability test (normative)

D.1 Connect up the system in a test chamber at 18 ± 2 °C (see Figure B.1) to a supply of 28 (14) ± 1 V d.c., complete with simulation of components of the loop between the throttle actuator and speed (i.e. engine and transmission) outside of the test chamber.

D.2 Set simulated throttle demand to maximum.

D.3 Adjust the set speed of the system where appropriate.

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system for a further 30 min. Record the maximum deviation from

D.4

D.5 Allow the system to operate for 10 h.

D.6 Reduce the test chamber temperature to -20 ± 2 °C. After the temperature of the test chamber has stabilized, operate the system for a further 30 min.

D.7 Increase the test chamber temperature to 60 ± 2 °C. After the temperature of the test chamber has stabilized, operate the system for a further 30 min.

D.8 Increase the test chamber temperature to 80 ± 2 °C. After the temperature of the test chamber has stabilized, operate the system for a further 30 min. The system shall continue to function but the accuracy may be degraded.

D.9

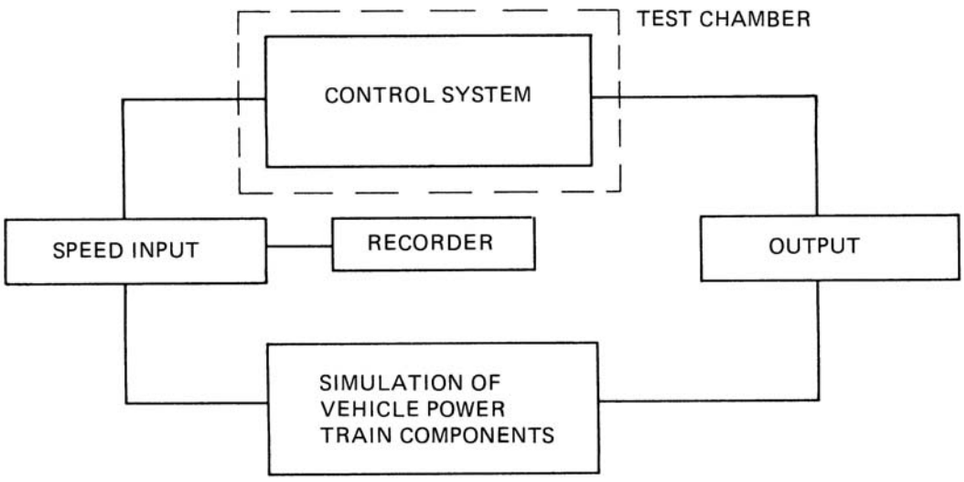

Figure D.1 – Test Layout

APPENDIX E Sinusoidal vibration test (normative)

E.1 Chassis and cab mounted components

E.1.1 General
Subject the component to be tested, mounted on its normal mount, complete with its ancillary components, to a resonance search in all three planes using a sinusoidal wave form under the conditions given in **E.1.2** followed by an endurance test under the conditions given in **E.1.3**.

E.1.2 Resonance search

Frequency range 10 Hz to 250 Hz Input 2 g_n Sweep time 2 min Duration Long enough to establish resonant frequency

E.1.3 Endurance test at resonance frequency

Frequency range 3 dB below peak for each resonance Input 2 g_n Sweep rate . 1 Hz/s Duration 7.2 h

Frequency range 10 Hz to 250 Hz Input 2 g_n Sweep rate 4 Hz/s Duration

E.2 Engine mounted components

E.2.1 General
Subject the component mounted on its normal mount, complete with its ancillary components to a resonance search in all three planes using a sinusoidal wave form under the conditions given in **E.2.2** followed by an endurance test under the conditions given in **E.2.3.**

E.2.2

40 Hz to 2000Hz Input 6 g_n Sweep time 2 min
Long enough to establish resonant frequencies

Endurance test at resonance ranges
3 dB below peak for each resonance in the ranges 40 Hz to 200 Hz and 200 Hz to 2 000 Hz Input 12 g_n6 g_n Sweep time 2 Hz/s 5 Hz/s Duration 10^7 reversals at resonant frequency

If there is no resonance, carry out a broad sweep endurance test under the following conditions: Frequency range 40

Hz to 200 Hz 200 Hz to 2 000 Hz Input 12 g_n6 g_n Sweep rate 2 Hz/s 5 Hz/s Duration 10 h/plane 10 h/plane

APPENDIX F Additional tests (informative)

F.1 General The tests given in **F.2** to **F.5** may be considered by system component manufacturers.

F.2 Change of temperature (thermal shock) Mount the component in its normal operating attitude and test in accordance with

ı test Nɑ

Na of IEC 60068-2-14 using the following minimum and maximum temperatures: a) 0 °C to + 65 °C for cab mounted components; b) –0 °C to + 120 °C for engine mounted components; c) –0 °C to + 85 °C for chassis mounted components.

7) Hydraulic power brake fluid; 8) Ethylene glycol anti-freeze (50 % solution).

Visually inspect the component for surface deterioration and test for normal operation.

F.5 Driving rain: chassis mounted components

The test chamber shall have the dimensions and 6 nozzle arrangements as shown in Figure E.1. Each nozzle includes a jet which shall emit a solid cone spray (a solid cone spray is defined as one where the water within the spray is evenly distributed). Each nozzle shall pass (455 mL/min to 758 mL/min) of water. Mount the component in the test chamber in its normal operating attitude, positioned so that the centre of the unit is approximately 6 in (152 mm) above the centre of the test chamber floor and so that the spray from all the angled jets impinges upon the

a) 0 °C to + 65 °C for cab mounted components;
b) –0 °C to + 120 °C for engine mounted components;
c) –0 °C to + 85 °C for chassis mounted components.

Subject the component to 20 cycles and use an exposure time at each temperature of 2 h.
Return the component to 18 ± 2 °C at a rate not exceeding 1 °C/min and test for normal operation.

F.3 Resistance to dust

F.3.1 Locate the component in a box 900 mm cube internally, in its normal operating attitude, on a pedestal raising it 150 mm above the base of the box, and positioned at least 150 mm from any wall of the box.

Introduce on the floor of the box a mixture of 4.5 kg of fine powdered cement complying with KS 18-1/2 and agitate by projecting blasts of air for 2 s pointed in a downward direction in such a way that the mixture is uniformly diffused within the box. Repeat the cycle every 15 min over a period of 5 h.

F.3.2 Conduct the test in accordance with APPENDIX C for 25 000 cycles and test for normal operation.

F.4 Contamination
Mount the component in its normal operating attitude and test in accordance with test Rb of IEC 60068-2-18 by applying a spray, using the following materials at the temperatures stated:

a) At 20 ± 5 °C:
1) 1,1,1-trichloroethane;
2) White spirit;
3) Unleaded petrol;
4) Methanol.

b) At 70 ± 3 °C:
1) Diesel fuel (class A1);
2) Engine oil;
3) auto-gearbox/power steering oil;
4) Manual gearbox/hypoid oil;
5) Grease: lithium soap based;
6) brake/clutch fluid;

component. Leave any drain holes open and fit all appropriate electrical leads and grommets. Where applicable, protect mounting and mechanical connections to simulate normal service conditions. Subject the component to continuous water spraying (maximum water temperature 40 °C) for a period of 25 h. Allow the test unit to drain for 1 h. At the conclusion of the preceding test, test the component for normal operation. The component shall

NOTE 1 The component may subsequently be subjected to a prolonged storage and/or endurance test. Any such test

F.6 Mycological

Test in accordance IEC 60068-2-10 as follows:

Wash the exterior of the component and the spraying equipment with a 2 % solution of liquid detergent, rinse in clean water and thoroughly dry.

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rinse in clean water and thoroughly dry.

Position the component together with any relevant ancilliary equipment in its vehicle attitude with all its connections made, in an environmental chamber for 24 h. maintain the test chamber at a temperature of 32 °C with relative humidity of not less than 95 % without precipitation.

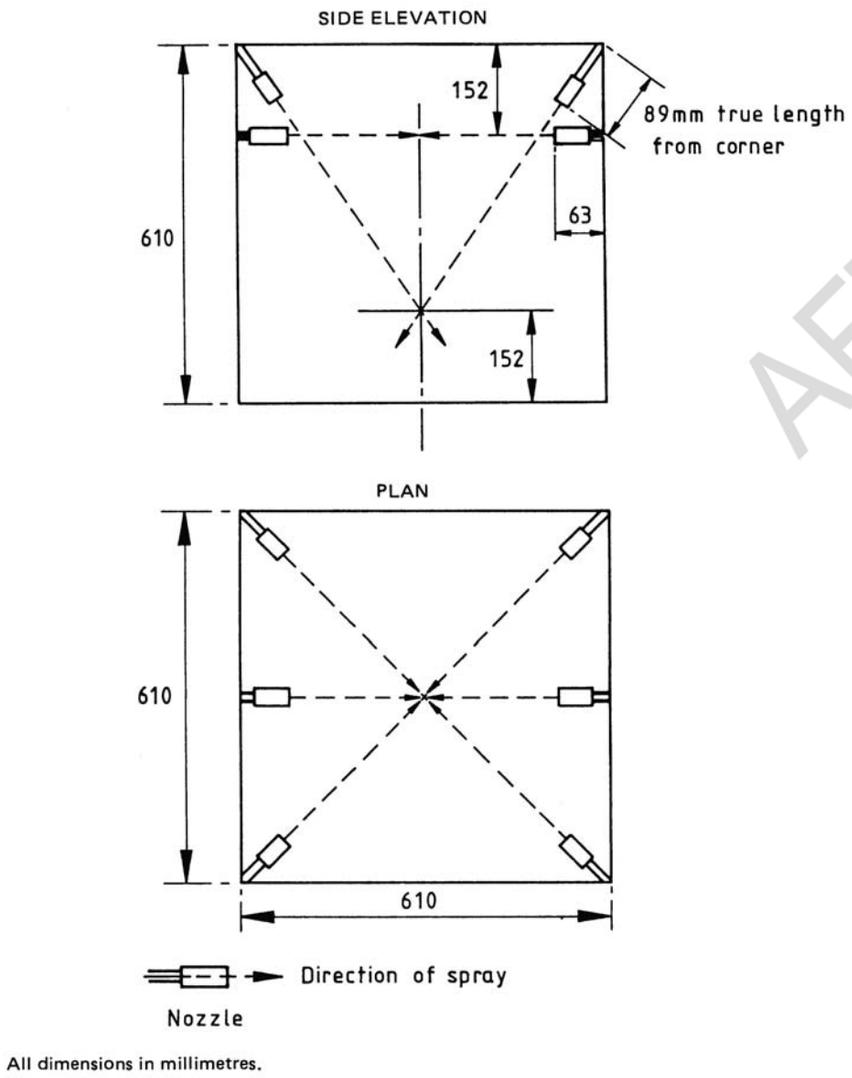
Spray the component with a suitably labeled aqueous solution of fungus spores from the following list. It is sufficient that each part be wetted with solution.

Maintain the component in the environmental conditions detailed above in darkness for a period of 28 days.

Test the component for normal operation.

The following fungus spores are required in aqueous solutions, as specified 2):
a) *Aspergillus niger;*
b) *Aspergillus amstelodami;*
c) *Paecilomyces variotii;*
d) *Stachybotrys atra;*
e) *Chaetomium globsum;*
f) *Penicillium brevicompactum;*
g) *Penicillium cyclopium*.

Figure E.1 — Driving rain test: test cabinet nozzle arrangement (6 nozzles, 4 angled, 2



gure E.1 — Driving rain test: test cabinet nozzle arrangement (6 no:
angled, 2 horizontal)

horizontal)