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Road vertical signs - Variable message traffic signs - Part 1: Product standard

Vertikale Verkehrszeichen - Wechselverkehrszeichen - Teil 1: Produktnorm

Signaux de signalisation routière verticale - Panneaux à messages variables - Partie 1: Norme produit

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This European Standard was approved by CEN on 15 March 2005 and includes Amendment 1 approved by CEN on 3 October 2009.

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Foreword

This document (EN 12966-1:2005+A1:2009) has been prepared by Technical Committee CEN/TC 226 “Road equipment”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by May 2010, and conflicting national standards shall be withdrawn at the latest by May 2010.

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

This document includes Amendment 1 approved by CEN on 2009-10-03.

This document supersedes EN 12966-1:2005.

The start and finish of text introduced or altered by amendment is indicated in the text by tags ⟨A1⟩ ⟨A1⟩.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This European Standard consists of the following Parts under the general title:

⟨A1⟩ Road vertical signs - Variable message traffic signs

- Part 1: (this part) *Variable message signs (VMS)*
- Part 2: *Initial type testing*
- Part 3: *Factory production control* ⟨A1⟩

It derives from performance requirements and test methods published in CEN, CENELEC, CIE and ISO documents together with standards of the CEN member organisations.

⟨A1⟩ Where a Member State has no legal requirement for a characteristic manufacturers are not required to determine or declare the value of that characteristic. ⟨A1⟩

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This document is designed for use by Road Authorities and private developers who wish to use variable message signs. It provides performance requirements and the means of evaluation of conformity to those requirements.

This document is a product standard covering the requirements for Variable Message Signs (VMS). A VMS is a sign where the information shown can be changed. The information can be text and/or symbols.

This document does not describe the detailed form and configuration of a VMS. Therefore test modules are used to demonstrate conformance with the requirements of this document because of the impracticality of testing some complete signs.

Because of the major demands on a sign for good legibility and visibility throughout the required viewing range, the main properties of the sign are described. These properties can vary depending on the situation. For example, it will be not necessary to ask for a minimum temperature requirement of -40 °C in Greece, but this will be considered in Lapland. For visual performance there will be a difference between installation on highways - with good distance visibility and a narrow beam width - and installation in cities, where there is only short distance legibility and when a wide beam may be required.

This document uses performance requirements, which are not dependent on technology. The visual and environmental performance is demonstrated on a test module. This document contains a number of defined requirements, some of which have to be demonstrated on the test module, others that are to be verified by the manufacturer. It is the manufacturer's responsibility to ensure that the final product is fully representative of the test module.

The main properties of VMS are divided into classes, which are designed to be selected by choosing a combination of classes dependent on the situation and purchaser requirements. This combination covers not only the regulatory requirements of the territory of destination but also issues of lifetime, quality, maintenance and construction, all of which affect the ability of a sign in its particular application, to meet safety and fitness for purpose. The details in the informative Annexes are provided as useful guidance on the additional aspects relating to VMS for those setting up purchasing contracts for signs or signing systems.

The working environment for VMS can be relatively harsh and equipment that is deemed "fit for purpose" is expected to last in an exposed, corrosive environment for a minimum of 10 years. It is essential that all materials and manufacturing processes take this into account. The manufacturer should detail all steps taken to comply with this.

A1) In Member States which have no legal requirement for any of the characteristics in this standard manufacturers are not required to determine and declare the performance of those characteristics. (A1

1 Scope

This document specifies requirements and test methods for new Variable Message Signs (VMS).

VMS comprise two types, continuous and discontinuous signs:

- continuous signs are those that are similar to fixed signs, the only difference being that by some electro-mechanical means they can show various messages.

NOTE 1 For example rotating prism signs, roller blinds.

- discontinuous signs create messages using individual elements that can be in one of two states (or more) and can thereby create various messages on the same sign face.

NOTE 2 For example fibre optic signs, LED signs.

This document covers the performance requirements for Variable Message Signs used for the instruction and guidance of road users on public and private land, including tunnels. In this document a number of different performance requirements (visual performance, EMC, environmental performance, etc) are covered, as well as durability.

The EMC, safety and environmental requirements for both types of VMS are included in this document together with the visual performance for the discontinuous types VMS.

The visual performance for continuous signs and ⟦A1⟩ externally illuminated ⟨A1⟧ discontinuous signs which are externally illuminated is covered by EN 12899-1.

This document defines performance limits and a range of performance classes for both sign assemblies without vertical support and assemblies complete with vertical support.

Not covered by this document are:

a) sign gantries, cantilevers and foundations;

⟦A1⟩ *deleted text* ⟨A1⟧

b) signal heads;

c) sizes and shapes of VMS messages;

d) control units and monitoring units unless inside the test module;

⟦A1⟩ e) sign luminance control. The control of the luminance of luminous signs with respect to the ambient light is not covered by this standard. ⟨A1⟧

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 12767, ⟦A1⟩ *Passive safety of support structures for road equipment — Requirements, classification and test methods* ⟨A1⟧

EN 12966-2, *Road vertical signs — Variable message traffic signs — Part 2: Initial type testing*

EN 12966-3, *Road vertical signs —Variable message traffic signs — Part 3: Factory production control*

[A1] EN 12899-1:2007 [A1], *Fixed, vertical road traffic signs — Part1: Fixed signs*

EN 50293, *Electromagnetic compatibility — Road traffic signal systems — Product standard*

EN 60068-2-1, [A1] *Environmental testing — Part 2-1: Tests — Tests A: Cold (IEC 60068-2-1:2007)* [A1]

EN 60068-2-2, [A1] *Environmental testing — Part 2-2: Tests — Test B: Dry heat (IEC 60068-2-2:2007)* [A1]

EN 60068-2-5, *Environmental testing — Part 2: Tests — Test Sa: Simulated solar radiation at ground level (IEC 60068-2-5:1975)*

EN 60068-2-14, *Environmental testing — Part 2: Tests — Test N: Change of temperature (IEC 60068-2-14:1984 + A1:1986)*

EN 60068-2-30, [A1] *Environmental testing — Part 2-30: Tests — Test Db: Damp heat, cyclic (12 h + 12 h cycle) (IEC 60068-2- 30:2005)* [A1]

EN 60068-2–64, [A1] *Environmental testing — Part 2-64: Tests — Test Fh: Vibration, broadband random and guidance (IEC 60068- 2-64:2008)* [A1]

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 60598-1, [A1] *Luminaires — Part 1: General requirements and tests (IEC 60598-1:2008, modified)* [A1]

EN 60664-1, [A1] *Insulation coordination for equipment within low-voltage systems — Part 1: Principles, requirements and tests (IEC 60664-1:2007)* [A1]

[A1] EN ISO 9227, *Corrosion tests in artificial atmospheres — Salt spray tests (ISO 9227:2006)* [A1]

ISO 7000, *Graphical symbols for use on equipment — Index and synopsis*

[A1] CIE 15:2004 [A1], *Colorimetry*

CIE 17.4:1987, *International lighting vocabulary — Chapter 845: lighting*

[A1] HD 60364-4-443 [A1], *Electrical installation of buildings — Part 4-44: Protection for safety – Protection against voltage disturbances and electromagnetic disturbances – Clause 443: Protection against overvoltages of atmospheric origin or due to switching (IEC 60364-4-44:2001/A1:2003, modified)*

HD 638 S1, *Road traffic signal systems*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in [A1] CIE 15:2004 [A1] and CIE 17.4:1987 and the following apply.

NOTE When reading this document for the first time, particular attention should be paid to Annex B.

3.1
backing-board
surround to the VMS, used depending on local circumstances, providing improved visibility of the VMS by means of broadening its size and by providing suitable visible contrast with the VMS background

3.2
cantilever support
support system with a single post and a cantilever arm supporting VMS(s) mounted over the traffic lane(s)

3.3
control device
equipment used to execute a change of message other than by purely manual means

3.4
display surface
visible part of a VMS that contains the elements that may be activated to display the message

3.5
element
basic visual light emitting and/or reflecting object or cluster of objects in the display surface of a VMS, activated in conjunction with other elements to form the desired message

3.6
equivalent area
see Annex A : Equivalent area

3.7
front panel
visible part of a sign comprising the display surface; and the backing-board when this is integrated in the front of the VMS

3.8
front screen
screen protecting the display surface or the parts of it against dust, water, etc.

3.9
gantry
support system spanning a carriageway with one or more posts on each side of the carriageway supporting VMS mounted over the traffic lanes

3.10
horizontal reference plane
horizontal plane containing the reference axis, when the VMS is positioned in such a way that the reference axis is horizontal

3.11
lay-out
physical arrangement of characters (text) and symbols, on the display surface

3.12
luminance ratio (LR)
ratio of luminance emitted from the sign in the ON state compared to the luminance in the OFF state. Luminance ratio shall be calculated as follows:

$$LR = \frac{L_a - L_b}{L_b}$$

where

L_a is the measured luminance of the sign in the ON-state when under external illumination;

L_b is the measured luminance of the sign in the OFF-state when under external illumination

3.13

3.13.1
matrix
grid whose intersections hold the centre of the elements used in a VMS. A matrix may cover the whole display surface or part of it. Axes X and Y of the grid may or may not be orthogonal

3.13.2
irregular matrix
spacing of intersections on either X or Y or both axes is not constant

3.13.3
regular matrix
spacing of intersections on the X and Y axes is constant but may be different

3.14
message
configuration consisting of symbols and/or text

3.15
reference axis
axis originating on the reference centre of the test module being perpendicular to the front of it, unless otherwise defined by the manufacturer

3.16
reference centre
point on or near the test module which is designated to be the centre of the device for specifying its performance and which shall be defined by the manufacturer

3.17
test angles
horizontal test angle is the angle between the test axis and the vertical reference plane; and the vertical test angle is the angle between the test axis and the horizontal reference plane

NOTE 1 When the test axis is lower than the horizontal reference plane the vertical component of the test angle is designated as negative.

NOTE 2 When the test axis is to the left of the vertical reference plane as seen from the reference centre the horizontal component is designated as negative.

3.18
test axis
line from the reference centre of the test module to the luminance meter head

3.19
variable message sign (VMS)
sign for the purpose of displaying one of a number of messages that may be changed or switched on or off as required

3.20
vertical reference plane
vertical plane containing the reference axis

3.21
VMS background
part of environmental scenery, which, to the viewer, immediately surrounds the VMS

4 Dimensions and tolerances

The limits related to performance requirements and tests specified and defined in this document are minimum or maximum values as stated. Dimensions, shape and other physical parameters, character sizes, tolerances and character spacing shall be as required by the purchaser. The dimensions of the characters and symbols shall be defined using equivalent area as detailed in Annex A.

5 General design requirements

The manufacturer shall provide a maintenance manual. This shall include details of routine maintenance recommendations of spare parts and details of estimated lifetime of components. The design shall ensure that all maintenance activities can be easily carried out. The manufacturer shall also offer a maintenance service if required.

All parts of the sign shall be securely connected to the VMS housing.

NOTE Annex E (〈A1〉 informative 〈A1〉): “Specific design issues” gives guidelines.

6 Materials

Materials used for housings and front panels shall be resistant to corrosion in accordance with EN 12899-1:2001, 5.3.5 and shall conform to the European Standard for the appropriate material where it exists. Manufacturers using materials not covered by European Standards shall demonstrate the durability of the material by reference to an appropriate European technical assessment.

NOTE This is the only occasion where tests may be carried out on material and not the whole test module.

7 Visual performance

7.1 Classification

The manufacturer shall declare the relevant class designations for his products. This shall be in accordance with those photometric parameter classes listed in Table 1.

Table 1 — Class designation of the photometric parameters of the VMS

Photometric parameter	Class designation	Remarks
Colour	C1, C2	C2 is the more restrictive
Luminance (L_a)	L1, L2, L3, L3(*)	L3 has the highest luminance (*) for specific situations
	L1(T), L2(T), L3(T)	These classes are for tunnel use
Luminance ratio (LR)	R1, R2, R3	R3 has the highest luminance ratio
Beam width	B1, B2, B3, B4, B5, B6, B7	B7 has the widest beam

NOTE 1 The purchaser should select the appropriate parameter classes relevant to the application. Care is needed because some class-combinations are not possible and/or not effective.

NOTE 2 Specific design issues are covered in 〈A1〉 D.3 〈A1〉, where guidelines are given on 〈A1〉 *deleted text* 〈A1〉 class-combinations

7.2 Colour

The colour coordinates shall be measured in accordance with 9.3.5. The chromaticity of the colours is defined in accordance with the CIE 1931 Standard Colorimetric Observer as referenced in CIE publication 15.2.

The chromaticity for the colours of the colour class C1 shall conform to Table 2. The chromaticity for the colours of the colour class C2 shall conform to Table 3. In Figure 1 these chromaticity areas are plotted in a CIE 1931 chromaticity diagram.

The colour white/yellow shall not be used when there is a need to differentiate between white and yellow. When there is a need to differentiate between white and yellow the colours shall conform to the specified chromaticities in Table 2 or Table 3 for white and yellow respectively.

The chromaticity limits in Table 2 and Table 3, with the exception of white/yellow, are recommended in CIE S 004 as colours for signal lights.

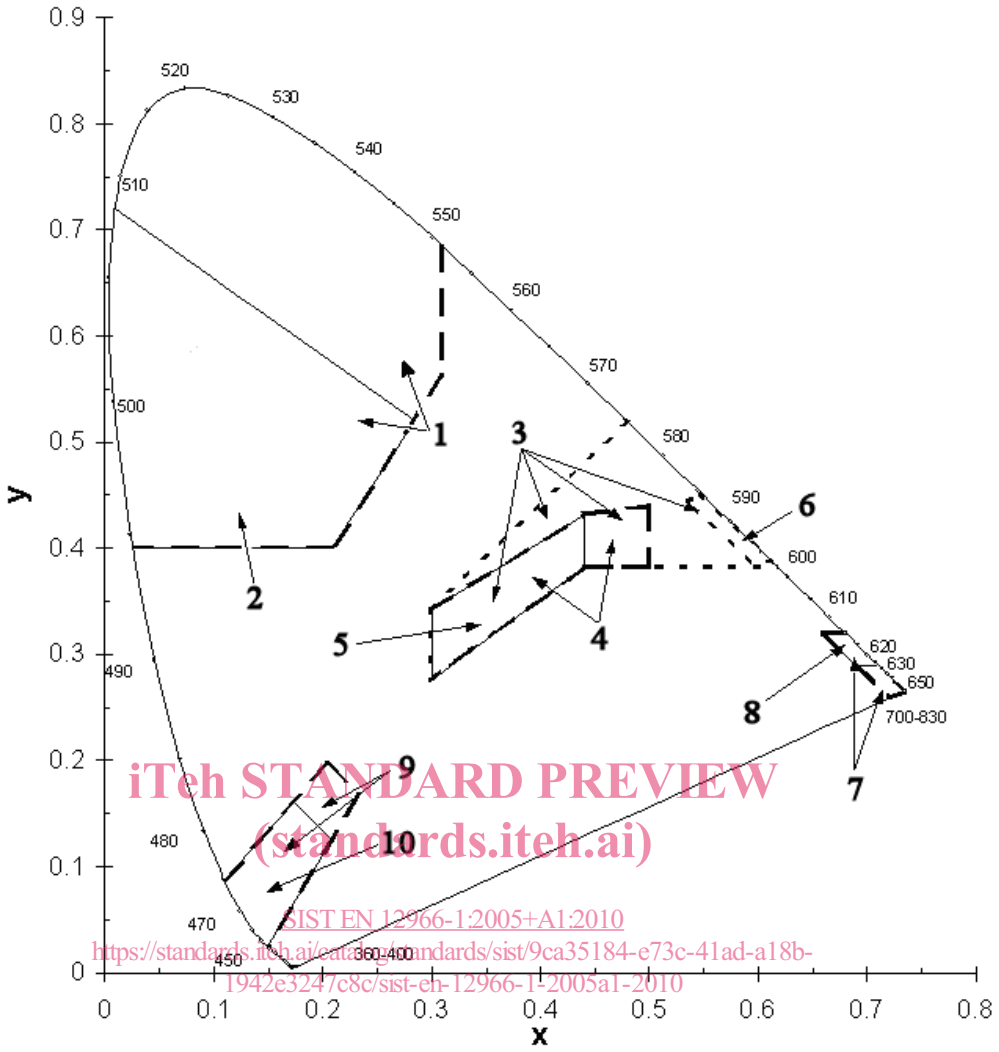
NOTE The chromaticity limits in Table 3 are recommended to be used when there is a clear need to distinguish between colours.

Table 2 — Corner points (CIE 1931 chromaticity co-ordinates x, y) of the chromaticity areas for the colours of class C1

Colour	Colour co-ordinates						
	corner point =>	1	2	3	4	5	6
Red	x	0,660	0,680	0,735	0,721	-	-
	y	0,320	0,320	0,265	0,259	-	-
Yellow	x	0,536	0,547	0,613	0,593	-	-
	y	0,444	0,452	0,387	0,387	-	-
White	x	0,300	0,440	0,500	0,500	0,440	0,300
	y	0,342	0,432	0,440	0,382	0,382	0,276
White/yellow	x	0,479	0,300	0,300	0,440	0,618	
	y	0,520	0,342	0,276	0,382	0,382	
Green	x	0,310	0,310	0,209	0,028	-	-
	y	0,684	0,562	0,400	0,400	-	-
Blue	x	0,109	0,204	0,233	0,149	-	-
	y	0,087	0,196	0,167	0,025	-	-

Table 3 — Corner points (CIE 1931 chromaticity co-ordinates x, y) of the chromaticity areas for the colours of class C2

Colour	Colour co-ordinates					
	corner point = >	1	2	3	4	5
Red	x	0,660	0,680	0,710	0,690	-
	y	0,320	0,320	0,290	0,290	-
Yellow	x	0,536	0,547	0,613	0,593	-
	y	0,444	0,452	0,387	0,387	-
White	x	0,300	0,440	0,440	0,300	-
	y	0,342	0,432	0,382	0,276	-
White/yellow	x	0,479	0,300	0,300	0,440	0,618
	y	0,520	0,342	0,276	0,382	0,382
Green	x	0,009	0,284	0,209	0,028	-
	y	0,720	0,520	0,400	0,400	-
Blue	x	0,109	0,173	0,208	0,149	-
	y	0,087	0,160	0,125	0,025	-



Key

- - - Class C1 and C2	1	green C1	6	yellow C1, C2
– – Class C1	2	green C2	7	red C1
— Class C2	3	white/yellow C1, C2	8	red C2
	4	white C1	9	blue C1
	5	white C2	10	blue C2

Figure 1 — Allowed chromaticity areas for the colour classes C1 and C2 plotted in the CIE 1931 chromaticity diagram

7.3 Luminance

[A1] The luminance shall be measured in accordance with 9.3.2, under external illumination from a solar simulator and with the test module switched on. 'With settings prescribed by the manufacturer, the luminance values measured for the test module shall comply with those of the Tables 4a to 4f that are relevant for the colours produced by the test module. [A1]

For use in tunnels, only sign luminances corresponding to sign illuminances of 400 lx or less are required. These are designated (T) in Table 1.

For specific situations (e.g. with the sun low in the sky) the purchaser can require that additional luminance and luminance ratios be measured with the external illumination set to 10 000 lx at 5°. This is denoted by an (*) in Tables 4a to Table 4f.

〈A1〉 NOTE 1 〈A1〉 The maximum luminance values of the classes L1, L2, and L3, are a factor 5 higher than the minimum luminances of class L3.

〈A1〉 NOTE 2 Specific design issues are covered in D.3, where guidelines are given on class combinations. 〈A1〉

Table 4a — Luminance (La) limits for white, on reference axis, for the luminance classes L1, L2, L3 and L3(*)

Sign illuminance (lx)	Luminance (cd/m^2)			
	Minimum			Maximum
	L3	L2	L1	L1, L2, L3
40 000	12 400	6 200	3 100	62 000
10 000	12 400 (*)	-	-	-
4 000	2 200	1 100	550	11 000
400	600	300	150	3 000
40	250	200	100	1 250
≤ 4	75	60	30	375

Table 4b — Luminance (La) limits for white/yellow, on reference axis, for the luminance classes L1, L2, L3 and L3(*)

Sign illuminance (lx)	Luminance (cd/m^2)			
	Minimum			Maximum
	L3	L2	L1	L1, L2, L3
40 000	10 540	5 270	2 635	52 700
10 000	10 540 (*)	-	-	-
4 000	1 870	935	468	9 350
400	510	255	128	2 550
40	213	170	85	1 065
≤ 4	64	51	26	320

Table 4c — Luminance (La) limits for yellow, on reference axis, for the luminance classes L1, L2, L3 and L3(*)

Sign illuminance (lx)	Luminance (cd/m^2)			
	Minimum			Maximum
	L3	L2	L1	L1, L2, L3
40 000	7 440	3 720	1 860	37 200
10 000	7 440 (*)	-	-	-
4 000	1 320	660	330	6 600
400	360	180	90	1 800
40	150	120	60	750
≤ 4	45	36	18	225

Table 4d — Luminance (La) limits for green, on reference axis, for the luminance classes L1, L2, L3 and L3(*)

Sign illuminance (lx)	Luminance (cd/m^2)			
	Minimum			Maximum
	L3	L2	L1	L1, L2, L3
40 000	3 720	1 860	930	18 600
10 000	3 720 (*)	-	-	-
4 000	660	330	165	3 300
400	180	90	45	900
40	75	60	30	375
≤ 4	23	18	9.0	115

Table 4e — Luminance (La) limits for red, on reference axis, for the luminance classes L1, L2, L3 and L3(*)

Sign illuminance (lx)	Luminance (cd/m^2)			
	Minimum			Maximum
	L3	L2	L1	L1, L2, L3
40 000	3 100	1 550	775	15 500
10 000	3 100 (*)	-	-	-
4 000	550	275	138	2 750
400	150	75	38	750
40	63	50	25	315
≤ 4	19	15	7.5	95