



SLOVENSKI STANDARD

SIST EN 12352:2002

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Traffic control equipment - Warning and safety light devices

Traffic control equipment - Warning and safety light devices

Anlagen zur Verkehrssteuerung - Warn- und Sicherheitsleuchten

Equipement de régulation du trafic - Feux de balisage et d'alerte

Ta slovenski standard je istoveten z: **EN 12352:2000**

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93.080.30	Cestna oprema in pomožne naprave	Road equipment and installations
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EUROPEAN STANDARD

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Traffic control equipment - Warning and safety light devices

Equipement de régulation du trafic - Feux de balisage et
d'alerteAnlagen zur Verkehrssteuerung - Warn- und
Sicherheitsleuchten

This European Standard was approved by CEN on 15 November 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

	Page
Foreword	3
1 Scope	3
2 Normative references	3
3 Definitions	4
4 Requirements	5
5 Sampling	10
6 Test methods	10
7 Designation	15
8 Marking, labelling and product information	15

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Foreword

This European Standard 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 August 2000, and conflicting national standards shall be withdrawn at the latest by August 2000.

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

1 Scope

This European Standard specifies the requirements for individual electrically operated light devices, called warning lights, emitting a continuous or regular intermittent light of a single colour which, by their colour and position alone, are used to warn, inform or guide road users. It specifies the requirements for visual, structural and operational performances and the relevant test methods to be used.

This European Standard is not applicable to lighting devices which convey messages by additional means (e. g. variable message signs) or which convey a mandatory instruction (e. g. traffic signals) or which are covered by vehicle lighting regulations.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 60068-2-1

Environmental testing - Part 2: Tests - Test A: Cold (IEC 60068-2-1:1990)

EN 60068-2-2

Basic environmental testing procedures - Part 2: Tests - Test B: Dry heat (IEC 60068-2-2:1974 + IEC 68-2-2A:1976)

EN 60529

Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)

EN 60598-1:1997

Luminaires - Part 1: General requirements and tests (IEC 60598-1:1996, modified)

prEN 50278 : 1997

Road traffic signal systems

CIE 15.2

Colorimetry

CIE 17.4

International lighting vocabulary

CIE 39.2

Recommendations for surface colours for visual signalling

CIE 54

Retroreflection - Definition and measurement

CIE 69

Methods of characterizing illuminance meters: performance, characteristics and specification

3 Definitions

For the purpose of this European Standard, the definitions and units used in the International Lighting Vocabulary (ILV), CIE 17.4, and the following terminology apply:

3.1 effective luminous intensity: The effective luminous intensity I_{eff} for flashing warning lights is that calculated using the Blondell-Rey equation (1):

$$I_{\text{eff}} = \frac{\int_{t_1}^{t_2} I(t) dt}{0,2 + (t_2 - t_1)} \quad (1)$$

t_2, t_1 : are time instants at which $I(t) dt = I_{\text{eff}}$

3.2 horizontal plane (360° warning lights only): The plane which passes through the photometric centre of the warning light when the warning light is in its normal operating position.

3.3 light emitting surface: A single continuous area of surface emitting light.

3.4 minimum reference luminous intensity I_{Rmin} : The required minimum (effective) luminous intensity, at the nominal voltage, measured on the reference axis or in the reference plane.

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3.5 minimum area luminous intensity I_{Amin} : The minimum permissible (effective) luminous intensity, at the nominal voltage, within the specified angle ranges excluding the reference axis or the reference plane.

NOTE: This is expressed as a percentage of I_{Rmin} in table 1.
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3.6 maximum area luminous intensity I_{Amax} : The maximum permissible (effective) luminous intensity at the nominal voltage, measured at any point within the specified in angle ranges including the reference axis or the reference plane.

3.7 minimum voltage luminous intensity I_{Umin} : The minimum permissible (effective) luminous intensity, at the minimum voltage specified by the manufacturer, measured at any point within the specified angle ranges including the reference axis or the reference plane.

NOTE: This is expressed as a percentage of I_{Rmin} in table 1.

3.8 rated voltage: The voltage of the electrical power supply (battery or mains) as specified by the manufacturer.

3.9 photometric centre: Unless otherwise specified by the manufacturer, the photometric centre is the geometric centre of the area of the light emitting surface.

3.10 principal axis (excluding 360° warning lights): The horizontal axis which lies on the vertical plane of symmetry of the lens and passes through the photometric centre of the warning light when in its normal operating position.

3.11 reference axis (excluding 360° warning lights): Unless otherwise specified by the manufacturer the reference axis is the axis of maximum luminous intensity within 2° in any direction of the principal axis.

3.12 reference plane (360° lights only): Unless otherwise specified by the manufacturer the reference plane is the plane of maximum luminous intensity within 2° above or below the horizontal plane.

3.13 on-time (t_2-t_1 , flashing lights only): That part of a single light pulse during which the actual luminous intensity is equal to or greater than the effective luminous intensity.

NOTE: On-time is expressed as a percentage of the complete on/off cycle.

4 Requirements

4.1 Photometric and colorimetric performance

4.1.1 Luminous intensity

When measured in accordance with clause 6, within the angle ranges specified for the relevant class in table 1, the luminous intensities for warning lights emitting yellow light (C yellow 1 and C yellow 2 as defined in 4.1.4) shall comply with the maximum and minimum limits specified in table 1.

For warning lights emitting red light (C red as defined in 4.1.4) all minimum luminous intensity values shall be reduced to 35 % of those specified in table 1. Maximum luminous intensity values shall be as specified in table 1.

NOTE 1: In table 1 warning lights are divided into classes primarily by area of lights emitting surface, angular limits for photometric performance and luminous intensities within those angles. Classes L2, L8 and L9 are subdivided into High (H), Medium (M) and Low (L) luminous intensity bands within the overall luminous intensity limits for each class.

NOTE 2: All the values given for the luminous intensity in table 1 are given as actual continuous values for steady warning lights and are given as effective luminous intensity for flashing warning lights. Except where limited to a specific Class F designation, shown in brackets, the luminous intensity values given apply to both steady and flashing warning lights in the same L Class.

In order to take account of uneven polar luminous intensity distribution for 360° warning lights only, luminous intensities below the minimum values in table 1 shall be disregarded provided that they are contained within no more than two sectors each of 30° of the full 360°.

All angles given in table 1 shall be measured from the reference plane for 360° warning lights (L1) and from the reference axis for all other warning lights.

Table 1: Classes of warning lights

Class	Area of light emitting surface in cm ²	Angle ranges		Luminous intensity			
				Nominal voltage			Minimum voltage
		Horizontal	Vertical	I_{Rmin} in cd	I_{Amin} (% of I_{Rmin})	I_{Amax} in cd	I_{Umin} (% of I_{Rmin})
L1	(See 4.1.2)	300°	+5° to -5°	1	100	100	50
L2L	≥ 18	+7° to -7°	+7° to -7°	25	25	100	25
L2H	≥ 18	+7° to -7°	+7° to -7°	150	25	1500	25
L3	≥ 75	+10° to -10°	+5° to -5°	2	50	100	25
L4(F2)	≥ 140	+10° to -10°	+5° to -5°	43	25	100	15
L5	≥ 140	+2° to -2°	+2° to -2°	500	25	2000	25
L6	≥ 2 x 250	+10° to -10°	+5° to -5°	10	25	100	12,5
L7	≥ 250	+10° to -10°	+5° to -5°	20	25	100	12,5
L8G	≥ 250	+7,5° to -7,5°	+5° to -5°	25	25	100	12,5
L8L	≥ 250	+7,5° to -7,5°	+5° to -5°	250	25	500	12,5
L8M	≥ 250	+7,5° to -7,5°	+5° to -5°	500	25	1500	12,5
L8H	≥ 250	+7,5° to -7,5°	+5° to -5°	1500	25	5000	12,5
L9L	≥ 700	+1,5° to -1,5°	+1,5° to -1,5°	500	25	2000	12,5
L9M	≥ 700	+1,5° to -1,5°	+1,5° to -1,5°	2000	25	8000	12,5
L9H	≥ 700	+1,5° to -1,5°	+1,5° to -1,5°	20000	25	40000	12,5

4.1.2 Light emitting surface

4.1.2.1 For 360° warning lights (class L1) the minimum area of the lens projected in any horizontal direction shall be not less than 30 cm² and the height of the lens shall be not less than 6 cm.

4.1.2.2 In all other classes (L2 to L9) the total area of the light emitting surface as indicated by the manufacturer shall be not less than the values given in table 1 and shall comply with the requirements for uniformity of luminance (4.1.3). For the projection of the lens there shall be 2 classes P defined:

Class P0: No requirements;

Class P1: The projection is a roundel

4.1.3 Uniformity of luminance

4.1.3.1 There is no requirement for uniformity of luminance for warning lights in class L1.

4.1.3.2 The luminance of the light emitting surface of a warning light in classes L2 to L5 inclusive shall be such that, when tested in accordance with 6.3.1 and 6.3.2, the ratio of luminance I_{out}/I_{total} is $\geq 0,17$.

4.1.3.3 The luminance of the light emitting surface of a warning light in classes L6 to L9 inclusive shall be such that when tested in accordance with 6.3.1 and 6.3.3 the ratio of the luminance L_{min}/L_{max} is $\geq 0,07$

4.1.4 Colorimetric performance

The class C for the colour of light emitted by warning lights shall be one of the following:

Class C red;

Class C yellow 1;
Class C yellow 2 (for light classes L2 and L5 only).

When tested in accordance with 6.4 light emitted from an assembled warning light, fitted with the light source specified by the manufacturer, shall be within the boundaries of chromaticity specified in table 2

NOTE: Warning lights meeting the requirements of class C yellow 1 will automatically meet the requirements of class C yellow 2.

Table 2: Colours of warning lights

Colour of warning light	Equation	Boundary
C red	$y = 0,290$ $y = 0,980 - x$ $y = 0,320$	red purple yellow
C yellow 1	$y = 0,387$ $y = 0,98 - x$ $y = 0,727 x + 0,054$	red white green
C yellow 2	$y = 0,380$ $y = 0,940 - x$ $y = 0,500$	red white green

4.1.5 Retroreflective devices

All warning lights shall meet the requirements of one of the following three classes R for retroreflectivity:

Class R0: No requirements,

Class R1: Shall not incorporate retroreflective areas,

Class R2: Shall be fitted with retroreflectors of the colour within the limits of chromaticity specified for C yellow class 2 in CIE 39.2.

When projected in all horizontal directions for warning lights, of class L1 and in the direction of the principal axis for all other warning lights the retroreflective area shall be a minimum of 50 cm².

For all retroreflective areas the minimum coefficients of retroreflection R' shall be as specified in table 3 for β , when measured in accordance with CIE 54 with β_2 equal to 0.

Table 3: Coefficients of retroreflection

Entrance angle β_1 ($\beta_2 = 0$)	Observation angle 12'	Observation angle 20'	Observation angle 1°
5°	50 cd · lx ⁻¹ · m ²	35 cd · lx ⁻¹ · m ²	3 cd · lx ⁻¹ · m ²
15°	35 cd · lx ⁻¹ · m ²	20 cd · lx ⁻¹ · m ²	2 cd · lx ⁻¹ · m ²

4.2 Electrical and functional requirements

4.2.1 Electrical requirements

4.2.1.1 Electrical safety

NOTE : Warning lights with a supply voltage in excess of 50 V and all warning lights with a lower rated supply voltage, but with parts having a higher voltage than 50 V shall fulfil the requirements of the Low Voltage Directive 73/23/EEC.