BS EN 15153-1:2013

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Railway applications — External visible and audible warning devices for trains

Part 1: Head, marker and tail lamps

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National foreword

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190 km/h has an equivalent value of 120 mile/h

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The UK participation in its preparation was entrusted to Technical Committee RAE/4, Railway Applications – Rolling stock systems, to Subcommittee RAE/4/-, Railway Applications – Lighting.

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A list of organizations represented on this committee can be obtained on request to its secretary.

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EUROPEAN STANDARD

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English Version

Railway applications - External visible and audible warning devices for trains - Part 1: Head, marker and tail lamps

Applications ferroviaires - Dispositifs externes d'avertissement optiques et acoustiques pour les trains - Partie 1: Signaux de face avant, signaux d'extrémité avant et signaux de face arrière

Bahnanwendungen - Optische und akustische Warneinrichtungen für Schienenfahrzeuge - Teil 1: Fernlichter, Spitzensignale und Zugschlusssignale

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Contents

Page

Foreword

This document (EN 15153-1:2013) has been prepared by Technical Committee CEN/TC 256 “Railway applications”, the secretariat of which is held by DIN.

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of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

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 supersedes EN 15153-1:2007.

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.

The main changes with respect to the previous edition are:

— technical requirements have been brought in line with the conventional TSIs, and

— requirements have been revised to permit new technologies.

This series of documents *Railway applications — External visible and audible warning devices for trains* consists of the following parts:

— *Part 1: Head, marker and tail lamps* (the present document);

— *Part 2: Warning horns.*

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

Introduction

This European Standard was produced following a review of EN 15153-1:2007 to incorporate the requirements of rolling stock TSIs.

1 Scope

This European Standard defines the functional and technical requirements for head, marker and tail lamps for trains, including high speed and conventional rail, but excluding road, metro and self-contained systems.

This European Standard also defines the requirements for testing and conformity assessment.

Portable lamps are excluded from the scope of this European Standard.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

prEN 16186-1, *Railway applications — Driver's cab — Part 1: Visibility, layout, access*

CIE 15, *Colorimetry*[1)]

CIE 69, *Methods of characterizing illuminance meters and luminance meters; performance, characteristics and specifications*[1)]

CIE 70, *The measurement of absolute luminous intensity distributions*[1)]

ISO 11664-1 (CIE S 014-1/E), *Colorimetry — Part 1: CIE standard colorimetric observers*[1)]

NOTE ISO 11664-1 was previously published as ISO 10527:2007, which has been withdrawn.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
high speed train
train which is designed to operate at speeds equal to or greater than 190 km/h

Note 1 to entry: This includes Class 1 and Class 2 high speed trains as defined in the HS RST TSI.

3.2
conventional train
train which is designed to operate at a maximum speed lower than 190 km/h and designed to travel on all or part of the conventional lines of the TEN (Trans-European rail system Network)

Note 1 to entry: See also CR LOC&PAS TSI, §2.1 (Locomotives and Passenger Rolling Stock).

3.3
head lamp
device fitted to the front of the train that emits white light, intended to provide visual warning of an approaching train, and/or to illuminate the lineside

1) Available from: International Commission of Illumination, CIE Central Bureau, Kegelgasse 27, A-1030 Wien.

3.4
marker lamp
device fitted to the front of the train that emits white light, intended to indicate the presence of a train, to provide visual warning of an approaching train and/or to illuminate retro-reflective lineside signs

3.5
tail lamp
device fitted to the rear of the train that emits red light, intended to indicate the presence of a train, and to indicate the end of the complete train formation

3.6
light source
system for generating light in a lamp

3.7
CIE (1931) standard colorimetric system (x, y, z)
system for specifying colour by determining the tristimulus values of the spectral power distribution of a coloured light using the set of reference colour stimuli [X], [Y], [Z] and the three CIE colour matching functions $x(\lambda)$, $y(\lambda)$, $z(\lambda)$, adopted by the CIE in 1931 (see CIE 15)

3.8
optical axis of lamp
axis defined by the manufacturer against which the luminous intensity requirements are assessed

3.9
centre-line of rails
line parallel and equidistant to the rails

[SOURCE: EN 13232-1:2003, modified]

3.10
lit area
active optical area of a lamp projected into a plane perpendicular to the optical axis

4 Symbols and abbreviations

For the purposes of this document, the following symbols and abbreviations apply.

cd	Candela, the SI unit for luminous intensity
CIE	International Commission on Illumination
CR	Conventional Railway
HS	High Speed railway
LED	Light Emitting Diode
RST	Rolling Stock
TEN	Trans-European rail system Network
TSI	Technical Specification for Interoperability relating to the rolling stock subsystem of the TEN
UIC	International Union of Railways

5 Requirements

5.1 General

The provision of lamps is specified in 5.2.

The technical requirements for head, marker and tail lamps are set out in 5.3, 5.4 and 5.5 (respectively).

The testing requirements are set out in Clause 6 and Annex A.

It should be noted that certain lighting technology degrades throughout its service life. It is important to ensure that the requirements in this European Standard are maintained.

5.2 Provision of lamps

A minimum of two white head lamps shall be installed at the front of the train.

Additionally, and only by agreement with the contractors, a maximum of two upper head lamps may be installed.

Three white marker lamps shall be installed at the front of the train.

Two red tail lamps shall be installed at the rear of the train.

Only by agreement with the contractors, additional tail lamp(s) and marker lamp(s) with special warning or signalling functions may be installed, provided that they comply with the prescribed optical requirements and that they do not adversely affect the parameters given in this European Standard.

Combined lamps (i.e. lamps capable of different functions) are permissible provided that the requirements for individual lamp functions are achieved.

All lamps at intermediate locations of the train shall be unlit.

5.3 Head lamps

5.3.1 Positioning of head lamps

The two head lamps shall both be located at the same height, with their geometric centres between 1 500 mm and 2 000 mm above the upper surface of the rail.

The arrangement of the two head lamps shall be such that the distance between their geometric centres is not less than 1 000 mm and that the head lamp geometric centres are symmetrical about the centre-line of rails.

Where upper head lamps are installed, these shall be located above the windscreen, as close to the vehicle centre line as possible.

5.3.2 Dimensions of head lamps

Each head lamp shall have a maximum lit area of 33 400 mm^2, a minimum lit area of 17 650 mm^2 and a minimum dimension of this lit area of 110 mm.

The whole of the head lamp area shall appear to be lit when arranged in the installed condition and viewed along the optical axis.

5.3.3 Colour of head lamps

The colour of light emitted by head lamps, when measured in accordance with 6.3, shall lie within the colour space defined by the intersection points as given in Table 1, and illustrated in Figure 1.

Table 1 — The chromaticity coordinates of the intersection points of the colour specification for head lamps

Colour of head lamp	CIE (1931) chromaticity coordinates of the intersection points						
White	Point	I*	J	J'	K'	K	L*
	x	0,310	0,440	0,500	0,500	0,440	0,310
	y	0,348	0,432	0,440	0,382	0,382	0,283

NOTE This specification is based on CIE S 004 White Class B with a restricted blue limit. The chromaticity coordinates indicated with * define the restricted blue limit.

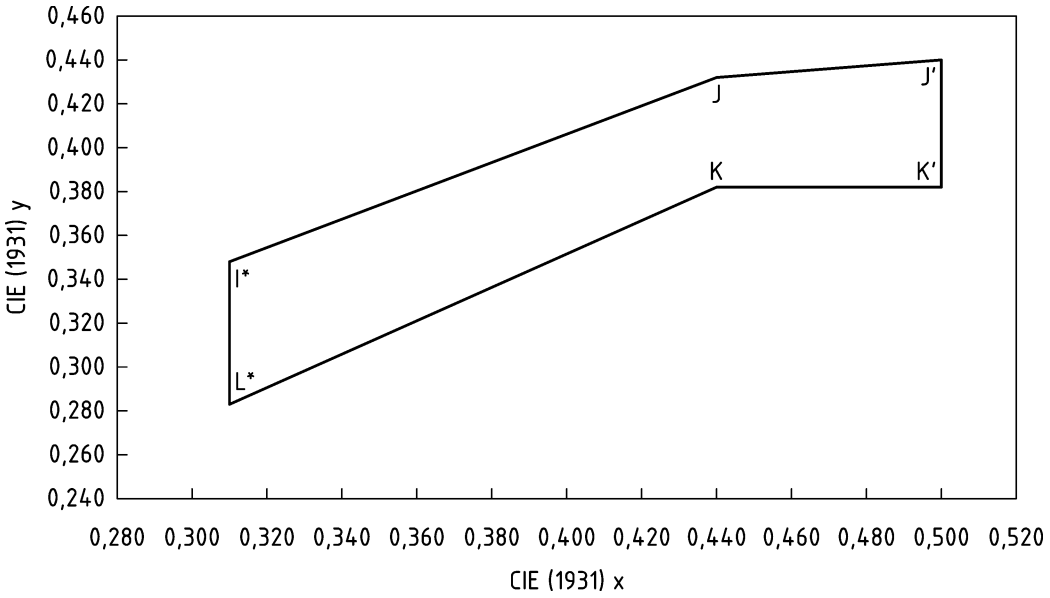

Figure 1 — Chromaticity diagram to illustrate the colour specification for head lamps according to Table 1

Where agreed between contractors, the spectral radiation distribution requirements of 5.4.4.2 shall apply to head lamps.

5.3.4 Luminous intensity of head lamps

The luminous intensities of individual head lamps shall be as shown in Table 2.

Table 2 — Luminous intensities of head lamps

Head lamp function	Dimmed head lamp, and upper head lamp where provided	Full-beam head lamp
Luminous intensity (cd) measured along the optical axis of the head lamp	12 000 to 16 000	40 000 to 70 000
Luminous intensity (cd) within 5° on either side of the optical axis in the horizontal plane	> 3 000	> 10 000

In the case of head lamps on conventional trains, only one head lamp function (dimmed or full-beam) is required.

NOTE The use of either dimmed or full beam will be dependent on Operational Rules in each Member State.

Where upper head lamps are installed, the characteristics of these head lamps may deviate from the requirements of this European Standard.

Secondary intensity maxima are permitted within ± 5° of the optical axis in the horizontal plane, provided that

a) the maximum specified on-axis intensity is not exceeded,

and

b) the difference between the intensities of any adjacent secondary maximum and minimum is no greater than 10 % of the luminous intensity measured along the optical axis of the head lamp.

Concerning the control of glare, the maximum luminous intensities for each angle above the optical axis in the horizontal plane parallel to the centre-line of rails, in the installed condition following any necessary adjustment as defined in 5.3.2, shall be as shown in Table 3.

Table 3 — Luminous intensities along set angles for full-beam and dimmed head lamps

Angle above the horizontal axis of head lamp in the vertical plane °	Maximum luminous intensity of head lamp at specified angle cd
0,25	58 400
0,50	14 600
1,00	3 650
1,50	1 620
2,00	912

An alternative control of glare is the adjustment of the downwards vertical alignment of the head lamps when installed on the vehicle, such that the vertical illuminance from each head lamp at the upper surface of the rails at a distance of 100 m is less than 0,5 lux. In this case, the requirements of Table 3 may not apply.

5.3.5 Alignment of head lamps

Head lamps shall be provided with a means of alignment adjustment. In the case of head lamps for which glare is controlled by Table 3, the angle between the optical axis of the head lamp in its installed condition and the centre-line of rails shall be 0° in the horizontal and vertical planes. In the case of head lamps for which glare is controlled by the alternative method, the downwards vertical alignment angle shall be defined for a given head lamp design.

5.4 Marker lamps

5.4.1 Positioning of marker lamps

The two lower marker lamps shall be located at the same height above the upper surface of the rail.

The centres of the two lower marker lamps shall be between 1 500 mm and 2 000 mm above the upper surface of the rail.

The distance between the centres of the two lower marker lamps shall not be less than 1 000 mm and they shall be arranged symmetrically about the centre line of the vehicle.

The upper marker lamp shall be located centrally and above the lower marker lamps. The vertical separation between the geometric centres of the upper marker lamp and the lower head and marker lamps shall be equal to or greater than 600 mm.

5.4.2 Dimensions of marker lamps

Each marker lamp shall have a maximum lit area of 22 700 mm^2, a minimum lit area of 9 500 mm^2 and a minimum dimension of the lit area of 110 mm.

5.4.3 Colour of marker lamps

5.4.3.1 General

The colour of light emitted by marker lamps, measured in accordance with 6.3, shall lie within the colour space defined by the intersection points as given in Table 4, and illustrated in Figure 2.

Table 4 — The chromaticity coordinates of the intersection points of the colour specification for marker lamps

Colour of marker lamp	CIE (1931) chromaticity coordinates of the intersection points						
White	Point	I*	J	J’	K’	K	L*
	x	0,310	0,440	0,500	0,500	0,440	0,310
	y	0,348	0,432	0,440	0,382	0,382	0,283

NOTE This specification is based on CIE S 004 White Class B with a restricted blue limit. The chromaticity coordinates indicated with * define the restricted blue limit.

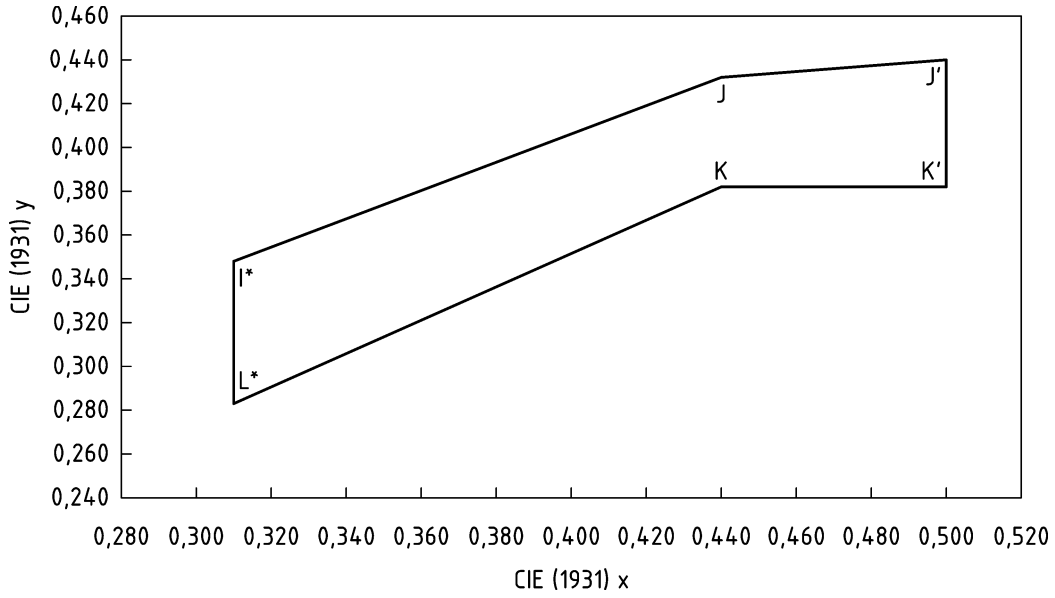

Figure 2 — Chromaticity diagram to illustrate the colour specification for marker lamps according to Table 4

5.4.3.2 Spectral radiation distribution of light

The spectral radiation distribution of the light from the marker lamp shall meet the k_{colour} requirements as set out in Table 5.

NOTE The spectral radiation distribution of the light used is substantially responsible for the correct recognition of colours and hence the correct reading and interpretation of coloured signs, warning clothing and other objects. In order to demonstrate compliance with this requirement, a ratio k_{colour} is defined between the entire visible light range and the individual spectral colour ranges to be considered.

The ratio k_{colour} shall be determined according to the formula below:

$$k_{\text{colour}} = \frac{\int_{\lambda_{\text{colour}}} S(\lambda) \cdot V(\lambda) \cdot d\lambda}{\int_{\lambda_{\text{total}}} S(\lambda) \cdot V(\lambda) \cdot d\lambda}$$

where

$S(\lambda)$ is the spectral power distribution (by spectral measurement) as the spectral radiance in W/m²sr or as the spectral distribution of the irradiance in W/m²;

$V(\lambda)$ is the relative spectral luminosity (relative luminous efficiency of a monochromatic radiation of wavelength λ);

λ_{colour} is the wavelength range of the entire colour range to be considered (see Table 5);

λ_{total} is the wavelength range of the entire visible colour range from 380 nm to 780 nm.

Table 5 — Colour ratios

	λ_{colour} nm	k_{colour}
k_{red}	610 to 780	≥ 0,14
k_{orange}	560 to 660	≥ 0,50
k_{yellow}	505 to 780	≥ 0,90
k_{blue}	380 to 505	≤ 0,10

5.4.4 Luminous intensity of marker lamps

The luminous intensities of individual marker lamps shall be as shown in Table 6. The dimmed marker lamp requirements set out in Table 6 shall apply if the operating authorities permit operation in specific circumstances at a reduced intensity.

Table 6 — Luminous intensities for marker lamps

Marker lamp function	Full lower marker lamp	Full upper marker lamp	Dimmed lower marker lamp	Dimmed upper marker lamp
Luminous intensity (cd) along the optical axis	300 to 700	150 to 350	100 to 300	50 to 150
Luminous intensity (cd) at 10 ° on both sides of the optical axis in the horizontal plane	No requirement	30 to 350	No requirement	10 to 150
Luminous intensity (cd) at 45 ° on both sides of the optical axis in the horizontal plane	15 to 40	No requirement	3 to 40	No requirement

Secondary intensity maxima are permitted within ± 5° of the optical axis in the horizontal plane, provided that:

a) the maximum specified on-axis intensity is not exceeded,

and

b) the difference between the intensities of any adjacent secondary maximum and minimum is no greater than 20 % of the luminous intensity measured along the optical axis of the marker lamp.

5.4.5 Alignment of marker lamps

The angle between the optical axis of the marker lamp in its installed condition and the centre line of rail shall be 0° ± 1° in the horizontal plane and 0° ± 1° in the vertical plane.

5.5 Tail lamps

5.5.1 Positioning of tail lamps

The two tail lamps shall be located at the same height above the upper surface of the rail.

The centres of the tail lamps shall be between 1 500 mm and 2 200 mm above the upper surface of the rail.

The distance between the centres of the tail lamps shall not be less than 1 000 mm and they shall be arranged symmetrically about the centre line of the vehicle.

5.5.2 Dimensions of tail lamps

Each tail lamp shall have a maximum lit area of 22 700 mm^2, a minimum lit area of 9 500 mm^2 and a minimum dimension of the lit area of 110 mm.

5.5.3 Colour of tail lamps

The colour of light emitted by tail lamps, measured in accordance with Clause 6, shall lie within the colour space defined by the intersection points as given in Table 7, and illustrated in Figure 3.

Table 7 — The chromaticity coordinates of the intersection points of the colour specification for tail lamps

Colour of tail lamp	CIE (1931) chromaticity coordinates of the intersection points				
Red	Point	A*	B*	D	C
	x	0,675	0,695	0,721	0,735
	y	0,305	0,305	0,259	0,265

NOTE This specification is based on CIE S 004 Red Class A with a restricted yellow limit. The chromaticity coordinates indicated with * define the restricted yellow limit.

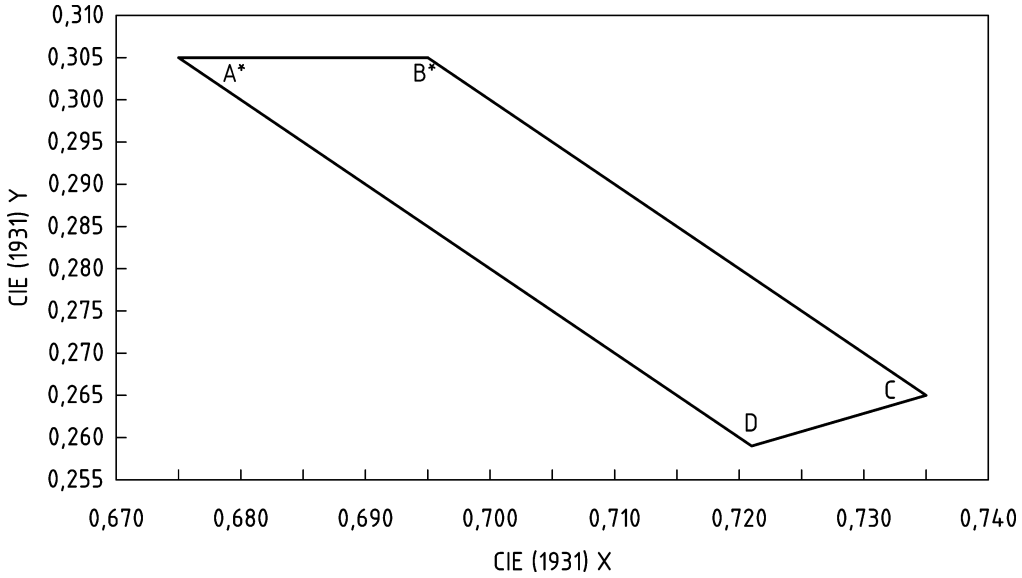

Figure 3 — Chromaticity diagram to illustrate the colour specification for tail lamps according to Table 7

5.5.4 Luminous intensity of tail lamps

The luminous intensities of individual tail lamps shall be as shown in Table 8.

Table 8 — Luminous intensities for tail lamps

Tail lamp function	Tail lamp intensity
Luminous intensity (cd) along the optical axis	15 to 100
Luminous intensity (cd) at ± 7,5 ° to the optical axis in the horizontal plane	7,5 to 100
Luminous intensity (cd) at ± 2,5 ° to the optical axis in the vertical plane	7,5 to 100

Secondary intensity maxima are permitted within ± 5° of the optical axis in the horizontal plane, provided that:

a) the maximum specified on-axis intensity is not exceeded,

and

b) the difference between the intensities of any adjacent secondary maximum and minimum is no greater than 20 % of the luminous intensity measured along the optical axis of the tail lamp.

5.5.5 Alignment of tail lamps

The angle between the optical axis of the tail lamp in its installed condition and the centre line of rail shall be 0° ± 1° in the horizontal plane and 0° ± 1° in the vertical plane.

5.6 Control of lamps

The control of lamps from the drivers cab shall be as specified in prEN 16186-1.

5.7 Operational check

A system may be provided whereby the function of all fixed head, marker and tail lamps is continuously monitored. Where such a system is provided, any failure of a lamp shall be indicated to the driver at his normal driving position, in accordance with prEN 16186-1.

6 Test requirements

6.1 General

There are two groups of tests that shall be undertaken: colorimetric tests and photometric tests. The general requirements that apply to both groups of tests are set out in 6.2, and the specific requirements that apply to each group of tests are set out in 6.3 and 6.4 (respectively).

6.2 General test requirements

6.2.1 Number of test pieces

The test shall be carried out with at least one lamp of each type (head, marker and tail lamp).

In the case where the optical design of the left and right lamp is the same and the lamps share vertical symmetry, then only one sample should be tested.

6.2.2 Test configuration

The test configuration is set out in Annex A.

Measurements of the interoperability constituent should be conducted in a test laboratory. If no suitable test configuration is possible, the measurements may be done on the sub-system. In this case, the requirements of 6.2.3 and 6.2.5 may not apply.

6.2.3 Test environment

The test shall be carried out in a test laboratory, with ambient temperature within the range 22,5 °C ± 2,5 K.

6.2.4 Equipment calibration

The equipment used for the tests shall be calibrated. The calibration of the test equipment shall be in accordance with an applicable European, International or national standard.

The date of the last calibration and a reference to the actual calibration certificate shall be recorded.

6.2.5 Goniometer

The test shall be carried out using a goniometer.

The lamp shall be fixed on the goniometer and inclined horizontally and vertically so that the centre of rotation of the lamp is coincident with the mid-point of the lit area of the lamp.

6.2.6 Test voltage

During the test, the lamp tested shall be powered at its nominal voltage for the installed condition. The voltage shall be measured as close to the lamp as possible.

The test voltage and current shall be documented in the test report.

6.2.7 Ageing and stabilising

Light sources shall be aged for a minimum period before being submitted for the test. The required minimum ageing periods for different light sources are shown in Table 9.

Light sources shall also be operated until the luminous intensity has stabilised immediately before they are tested, as shown in Table 9.

Table 9 — Ageing period for different light source types

Light source type	Ageing period	Stabilisation period
Incandescent lamp (tungsten filament or tungsten halogen)	1 % of the nominal service life, but at least 1 h	Variation of luminous intensity <1 % during a period of 5 min
LED (also known as light emitting diode)	50 h	
Metal halide lamp (also known as halogen-metal vapour lamp)	100 h	
Mercury lamp (also known as vapour high pressure lamp)	100 h	
High pressure sodium lamp (also known as sodium vapour high pressure lamp	100 h	

6.2.8 Test report

The test results shall be documented in a test report and shall as a minimum include the following details:

a) reference to this European Standard;

b) name and address of the test laboratory;

c) description of the head, marker and tail lamp (type and serial number(s), and mounting arrangements);

d) description of the lamp test conditions (test voltage, test current and thermal stabilisation time);

e) a list of the measurement equipment ;

f) test results;

g) other useful information applicable to the tests.

This list is not exhaustive and the test report shall include any relevant additional detail that is specific to the test. In the case of additional tests, all relevant information shall be given.

6.3 Specific requirements for the colorimetric tests

6.3.1 Purpose and application for the colorimetric tests

The colorimetric test determines the colour of light emitted by the lamp at the angles for which luminous intensities are specified, and applies over the whole of the lit area of the lamp.

The base documents used for the test and assessment are:

— this European Standard;

— CIE 15;

— ISO/CIE 11664-1.

6.3.2 Equipment used for the colorimetric tests

The colour of the light emitted by the lamp shall be measured using a colorimeter (filter radiometer) or spectroradiometer, the calibrated range of which shall be appropriate to the tests undertaken.

For the measurement of spectral radiation, the wavelength resolution of the spectroradiometer shall be not greater than 4 nm.

NOTE 1 CIE 15 contains information and recommendations on colorimetric practices and formulae, and on the calculation of tristimulus values and chromaticity coordinates.

NOTE 2 ISO 11664-1 contains information on partial filtering for the required 2° field size.

6.3.3 Geometry for the colorimetric tests

Measurements shall be made at a distance such that the angle subtended by the illuminated area of the lamp is not greater than 1° at the point where the measurement is taken.

6.3.4 Test procedure for the colorimetric tests

The colour of light shall be measured only at those angles for which luminous intensity specifications are given in Table 2 for head lamps, Table 6 for marker lamps and Table 8 for tail lamps.

The measurement angles applicable to the colour of head lamps according to Table 2 shall be 0° and 5° on each side of the axis.

6.3.5 Required result

The chromaticity coordinates from the colorimetric tests shall lie within the colour ranges specified in Tables 1, 4 and 7 for the head, marker and tail lamps, respectively. The k_{colour} results from the spectral radiation distribution tests shall comply with the limits given in Table 5.

6.4 Specific requirements for the photometric tests

6.4.1 Purpose and application for the photometric tests

This photometric test determines the luminous intensity of light emitted by the lamp over the range of angles for which luminous intensities are specified, and applies over the whole of the lit area of the lamp.

The base documents used for the test and assessment are:

— this European Standard;

— CIE 70;

— CIE 69.

6.4.2 Equipment used for the photometric tests

The luminous intensity of the tested lamp shall be measured using a photometer, the calibrated range of which shall be appropriate to the tests undertaken.

The distance at which the measurements are taken should be chosen such that the measurement falls within the calibrated range of the photometer.

The f_1 error of the photometer with reference to the V(λ) spectral response shall not exceed 3,0 %.

6.4.3 Geometry for the photometric tests

Measurements shall be made at a suitably large distance between the lamp and photometer, such that the detector surface is illuminated fully and uniformly.

This measurement distance shall be documented in the test report.

6.4.4 Test procedure for the photometric tests

The luminous intensity of light shall be measured only at those angles for which luminous intensity specifications are given in Table 2 for head lamps, Table 6 for marker lamps and Table 8 for tail lamps.

The measurement interval for the luminous intensity of head lamps according to Table 2 shall be 0,5°.

Where the alternative method for the control of glare is used, the vertical illuminance shall not exceed 50 lux at 10 m, when tested above top of rail at a geometric height to represent rail level at 100 m.

6.4.5 Required result

The luminous intensity results from the photometric tests shall lie within the ranges specified in Table 2 and Table 3 (as applicable) for head lamps, Table 6 for marker lamps and Table 8 for tail lamps.

In the installed position the 45° requirement for luminous intensity of marker lamps shall only apply on the outer side of the train.

Annex A
(informative)

Summary of testing requirements

Table A.1 — Interoperability constituent and sub-system testing requirements

Feature to be tested (all sub-clauses included)	**Test on sample lamp (interoperability constituent)**	**Test on sample lamp plus associated components to represent an installation on a train (sub-system)**
5.2 Provision of lamps		X
5.3.1 Positioning of head lamps		X
5.3.2 Alignment of head lamps		X
5.3.3 Dimensions of head lamps	X	
5.3.4 Colour of head lamps	X	
5.3.5 Luminous intensity of head lamps	X	
5.4.1 Positioning of marker lamps		X
5.4.2 Alignment of marker lamps		X
5.4.3 Dimensions of marker lamps	X	
5.4.4 Colour of marker lamps	X	
5.4.5 Luminous intensity of marker lamps	X	
5.5.1 Positioning of tail lamps		X
5.5.2 Alignment of tail lamps		X
5.5.3 Dimensions of tail lamps	X	
5.5.4 Colour of tail lamps	X	
5.5.5 Luminous intensity of tail lamps	X	
5.6 Control of lamps		X
5.7 Operational check		X
NOTE It is permissible to undertake part of the interoperability constituent assessment when the interoperability constituent is installed on a sub-system.		

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2008/57/EC

This European Standard has been prepared under a mandate given to CEN/CENELEC/ETSI by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the Directive 2008/57/EC[2)].

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA.1 for High Speed and Conventional Rail Locomotive and Passenger Rolling Stock, and Table ZA.2 for High Speed and Conventional Rail Operations confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

[2)] This Directive 2008/57/EC adopted on 17th June 2008 (amended by Directive 2011/18/EU of 1st March 2011) is a recast of the previous Directives 96/48/EC 'Interoperability of the trans-European high-speed rail system' and 2001/16/EC 'Interoperability of the trans-European conventional rail system' and revisions thereof by 2004/50/EC 'Corrigendum to Directive 2004/50/EC of the European Parliament and of the Council of 29 April 2004 amending Council Directive 96/48/EC on the interoperability of the trans-European high-speed rail system and Directive 2001/16/EC of the European Parliament and of the Council on the interoperability of the trans-European conventional rail system'.

Table ZA.1 — Correspondence between this European Standard, the Union Rail System, Subsystem Rolling Stock, TSI Locomotives and Passenger RST (Preliminary draft; Ref. IU-LOC_ PAS_TSI_draft; Version 0.5; Date 11/05/2012) and Directive 2008/57/EC

Clause/subclauses of this European Standard	Chapter/§ of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
5.2 Provision of lamps 5.3.1 Positioning of head lamps 5.3.4 Colour of head lamps 5.3.5 Luminous intensity of head lamps	4.2.7.1.1 Head lights	Annex III Essential Requirements 1 General Requirements 1.1 Safety 1.1.1 2 Requirements specific to each subsystem 2.4 Rolling stock 2.4.3. Technical compatibility	Some clauses of the standard EN 15153-1:2013 are quoted in the TSI and therefore mandatory. The HS+CR LOC&PAS TSI is still a draft subject to change without notice.
5.2 Provision of lamps 5.4.1 Positioning of marker lamps 5.4.4 Colour of marker lamps 5.4.5 Luminous intensity of marker lamps	4.2.7.1.2 Marker lights		
5.2 Provision of lamps 5.5.1 Positioning of tail lamps 5.5.4 Colour of tail lamps 5.5.5 Luminous intensity of tail lamps	4.2.7.1.3 Tail lights		
5.6 Control of lamps	4.2.7.1.4 Lamp controls		
Annex A Summary of testing requirements	5.3. Interoperability constituent specification 5.3.6 Head lamps 5.3.7 Marker lamp 5.3.8 Tail lamp		
6 Test requirements 6.2 General test requirements 6.3 Specific requirements for the colorimetric tests 6.34Specific requirements for the photometric tests	6.1.3 Particular assessment procedures for Interoperability constituents 6.1.3.3 Head lights 6.1.3.4 Marker lights 6.1.3.5 Tail lights		

Table ZA.2 — Correspondence between this European Standard, the HS TSI Operations (published in the Official Journal L 84 on 26 March 2008) and the CR TSI Operations (published in the Official Journal L 144 on 31 May 2011) and Directive 2008/57/EC

Clause/subclauses of this European Standard	Chapter/§ of the TSI	Corresponding text, articles/§/annexes of the Directive 2008/57/EC	Comments
5.2 Provision of lamps 5.3.1 Positioning of head lamps 5.4.1 Positioning of marker lamps 5.5.1 Positioning of tail lamps	4.2.2.1 Train visibility	Annex III Essential Requirements 1 General Requirements 1.1 Safety 1.1.1 2.6. Operation and traffic management 2.6.1. Safety 2.6.3 Technical compatibility	The HS and CR TSI will be revised for merging at short term.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

[1] GM/RT2483, Issue 1, June 2004, *Visibility Requirements for Trains*[3)]

[2] DIN V 5566-2:2000-08, *Schienenfahrzeuge — Führerräume — Teil 2: Zusatzanforderungen an Regelfahrzeuge nach EBO*[4)]

[3] DIN 6163-4:1977-07, *Colours and colour limits for signal lights; railway signal lights*[4)]

[4] NF F14-402, February 1981, *Signalisation des véhicules ferroviaires — Signalisation fixe — Signaux électriques — Disposition et caractéristiques*[5)]

[5] UIC 532, January 1979, Reprint 1991 with Amendment Nr 2, *Trailing stock — Signal lamp brackets — Coaches — Fixed electric signal lamps*

[6] UIC 534, August 2002, *Signal lamps and signal-lamp brackets for locomotives, railcars and all tractive and self-propelled stock*

[7] EN 13232-1:2003, *Railway applications — Track — Switches and crossing — Definitions*

[8] CIE S 004/E-2001, *Colours of light signals*

[9] T530, February 2009, *Research into Trainhead Lamps' Optical Performance*[6)]

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3) To be viewed free of charge on the RSSB website (www.rssb.co.uk).

4) To be purchased from: Beuth Verlag GmbH, D-10772 Berlin.

5) To be purchased from: AFNOR, 11 avenue Francis de Pressensé, F-93571 Saint-Denis La Plaine Cedex.

6) This research is associated with control of glare for UK operations and contains information on the relationships between luminous intensity, chromaticity and glare.

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