



SLOVENSKI STANDARD
kSIST FprEN 1790:2012
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Materiali za označevanje vozišča - Predoblikovane oznake

Road marking materials - Preformed road markings

Straßenmarkierungsmaterialien - Vorgefertigte Markierungen

Produits de marquage routier - Marquages routiers préformés

Ta slovenski standard je istoveten z: FprEN 1790

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Road marking materials - Preformed road markings

Produits de marquage routier - Marquages routiers
préformés

Straßenmarkierungsmaterialien - Vorgefertigte
Markierungen

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Contents	Page
Foreword.....	3
Introduction	4
1 Scope	5
2 Normative references	5
3 Terms and definitions	5
4 Requirements	7
5 Test methods.....	10
6 Evaluation of conformity.....	12
7 Marking and labelling	19
Annex A (normative) Identification of preformed road marking materials	20
Annex B (normative) Test method for Ash content	22
Annex C (normative) Thermogravimetric analysis (TGA).....	24
Annex D (normative) FT-IR spectroscopy of the TGA residue	26
Annex E (normative) Test method for ATR FT-IR spectroscopy of the adhesive layer	27
Annex F (normative) Preformed self-adhesive road marking – Test method for determination of mass per unit area of the adhesive	28
Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Directive.....	30
Bibliography	37

Foreword

This document (FprEN 1790:2012) has been prepared by Technical Committee CEN/TC 226 "Road equipment", the secretariat of which is held by AFNOR.

This document is currently submitted to the UAP.

This document will supersede EN 1790:1998.

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 the Construction Product Directive (89/106/EEC), see informative Annex ZA, which is an integral part of this document.

This European Standard belongs to the following package of inter-related European Standards:

- EN 1790, *Road marking materials — Preformed road markings*,
- EN 1824, *Road marking materials — Road trials*,
- FprEN 1871, *Road marking materials — Paint, thermoplastic and cold plastic materials – Specifications*,
- EN 12802, *Road marking materials — Laboratory methods and identification*,
- EN 13197, *Road marking materials — Turntable wear simulators*,
- EN 13212, *Road marking materials — Requirements for factory production control*,
- EN 13459, *Road marking materials — Sampling and testing*.

Introduction

A particular category of road marking materials, used for horizontal signalisation, are preformed, i.e. manufactured products in sheet form, ready for use on the road. They can be applied by means of adhesives, pressure or heat, with or without the use of a primer. Preformed road marking materials can be linear, in pieces of a certain length or in rolls. They can also be cut out in the form of symbols or signs or parts of them, making it possible to assemble them on the road to achieve the desired shape.

Preformed road marking materials can be designed for use as permanent or temporary road markings. In both cases they can be applied with a view to later removal and therefore the specific property of "removability" can be required.

Preformed road marking products are defined as Tape, preformed Cold Plastic road marking or preformed Thermoplastic road marking with or without drop-on materials.

Except for Thermoplastic road markings with drop-on materials, all the other type of products are fully finished during manufacturing and do not change significantly their properties during application.

They are completely covered by this standard.

Thermoplastic road markings with drop-on materials need the addition of drop-on materials during application on the road and therefore they are in some way similar to thermoplastic products covered by EN 1871.

This standard provides all the relevant information and cross references to EN 1871 in order to cover this kind of products.

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1 Scope

The construction products covered and specified on this European Standard are white and yellow, removable or non-removable, preformed road marking materials, under the form of tape, cold plastic, thermoplastics with or without drop-on materials, to be used for permanent and/or temporary road markings in circulation areas. Other products and colours intended for road markings are not covered in this European Standard

This European Standard gives also specifications for the evaluation of conformity for white and yellow, removable or non-removable, preformed road materials under the form of tape, cold plastic, thermoplastics with or without drop-on materials to be used for permanent and/or temporary road markings in circulation areas including type testing and factory production control.

This European Standard also includes an Annex ZA for tapes, preformed cold plastic road marking and thermoplastic road marking without drop-on materials with the clauses addressing the provisions of the EU Construction Product Directive for permanent road marking.

For preformed Thermoplastic road marking with drop-on materials, FprEN 1871:2012, Annex ZA, applies.

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.

EN 1436:2007+A1:2008, *Road marking materials — Road marking performance for road users*

EN 1824:2011, *Road marking materials — Road trials*

FprEN 1871:2012, *Road marking materials — Paint, thermoplastic and cold plastic materials — Specifications*

EN 12802, *Road marking materials — Laboratory methods and identification*

EN 13197:2011, *Road marking materials — Wear simulator Turntable*

EN 13459, *Road marking materials — Sampling from storage and testing*

EN ISO 4892-3, *Plastics — Methods of exposure to laboratory light sources — Part 3: Fluorescent UV lamps (ISO 4892-3)*

EN ISO 11358, *Plastics — Thermogravimetry (TG) of polymers — General principles (ISO 11358)*

3 Terms and definitions

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

3.1

preformed road marking

factory produced road marking system (or product), in sheet or roll form, capable of being applied to the substrate with adhesive, primer, pressure, heat or a combination of them

3.1.1

tape

preformed multilayer road marking, capable of adapting itself to the texture of the substrate, which may be precoated with pressure-sensitive adhesive, capable of being stuck to the substrate without heating the material, while the photometric, colorimetric and skid resistance characteristics are not significantly modified during application

FprEN 1790:2012 (E)**3.1.2****preformed cold plastic road marking**

preformed road marking made of cold plastic marking material as defined in FprEN 1871:2012, applied to the substrate by means of an adhesive, while the photometric, colorimetric and skid resistance characteristics are not significantly modified during application

3.1.3**preformed thermoplastic road marking without drop-on materials**

“pre-beaded” preformed road marking made of thermoplastic marking material as defined in FprEN 1871:2012, applied to the substrate by heating the material at melting temperature and without addition of any retroreflective and/or anti-skid materials during application

3.1.4**preformed thermoplastic road marking with drop-on materials**

preformed road marking made of thermoplastic road marking material as defined in FprEN 1871:2012, applied to the substrate by heating the material at melting temperature and with addition of retroreflective and/or anti-skid materials during application

3.2**removability**

characteristic of a preformed road marking capable of being removed, intact or in large pieces, without leaving permanent marks that could confuse the road user during different weather conditions

3.3**adhesive**

substance which is used to bond the preformed road marking to the substrate and the application of which may require heating

3.4**base road marking material**

according to FprEN 1871:2012, 3.4, paint, a thermoplastic or a cold plastic with a unique identification, which may, or may not, include premix glass beads

Note 1 to entry: This definition is relevant only for preformed thermoplastic road marking with drop-on materials as defined in 3.1.4.

3.5**road marking assembly**

according to FprEN 1871:2012, 3.5, base road marking material together with the precise application instructions including the identification of the manufacturer, dosages, types and proportions of drop-on materials needed to build up the applied road markings, every change to which is a new assembly and is identified with the name of the base road marking material followed by the word assembly and a correlative number

EXAMPLE Thermo AX – Assembly 1; Thermo AX – assembly 2, etc.

Note 1 to entry: This definition is relevant only for preformed thermoplastic road marking with drop-on materials as defined in 3.1.4.

3.6**structured road marking products**

road marking product without areas of regular dimensions and top surfaces, which has flat areas of a maximum width of 75,7 mm a maximum length of 125 mm at the top of the structure

Note 1 to entry: The areas may be crossed by gaps that take up minimum 25 % of the total surface area and have widths of minimum 5 mm. The areas may have ridges or edges of blocks with a height of minimum 1,2 mm.

3.7**non structured road marking products**

road marking product with areas of regular dimensions and top surfaces, which has flat areas of a minimum width of 75,7 mm a minimum length of 125 mm at the top of the structure

Note 1 to entry: The areas may be crossed by gaps that take up maximum 25 % of the total surface area and have widths of maximum 5 mm. The areas may have ridges or edges of blocks with a height of maximum 1,2 mm.

Note 2 to entry: Additional materials to those described in 3.1 to 3.3 can include, if recommended by the manufacturer, primers which are liquid products which may contain solids and liquid additives suspended in an organic solvent or in water. The solids comprise inorganic and/or organic fillers, pigments and additives. The content of volatile organic solvents is not limited.

Primers are used to precoat road surfaces before the road marking system is applied. They improve the adhesion of the road marking and protect against disintegration, discolouring, etc. caused by incompatible compounds in the road surface.

4 Requirements

4.1 Tape, Preformed Cold Plastic Road Marking and Preformed Thermoplastic Road Marking without drop-on Materials

4.1.1 General

The requirements are meant as characteristics of the materials as fully finished products. They are therefore intended as laboratory requirements.

4.1.2 Day-time visibility (reflection in daylight or under road lighting)

It represents the brightness of a road marking as seen by driver's vehicles in typical or average daylight or under road lighting. It shall be measured either by the coefficient of luminance under diffuse illumination (Q_d), expressed in $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$ or by the luminance factor (β).

- a) When luminance coefficient under diffuse illumination Q_d is measured, the preformed road marking material is tested in accordance with 5.2.2 a) and shall comply with classes Q1 to Q5 of EN 1436:2007+A1:2008, Table 1.
- b) When luminance factor β is measured, the preformed road marking material is tested in accordance with 5.2.2 b), and shall comply with Table 1:

Table 1 — Classes of luminance factor β in dry conditions

Type and colour	Class	Luminance factor β
Permanent		
White and yellow	B0	No value requested
White	B5	$\geq 0,60$
Yellow	B3	$\geq 0,40$
Temporary		
White and yellow	B0	No value requested
White	B6	$\geq 0,70$
Yellow	B3	$\geq 0,40$

4.1.3 Night-time visibility (retroreflection under vehicle headlamp illumination)

It represents the brightness of a road marking as seen by driver's vehicles under the illumination by the driver's own headlamp. The result is expressed by the coefficient of retroreflected luminance in $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$.

The coefficient of retroreflected luminance on dry conditions changes during wetness or during rain. Retroreflected luminance during wetness or during rain only applies for road markings type II.

- a) When preformed road marking material is tested on dry conditions, in accordance with 5.2.3 a), the coefficient of the retroreflected luminance R_L shall comply with classes R1 to R5 of EN 1436:2007+A1:2008, Table 3 (only for retroreflective road marking products).

FprEN 1790:2012 (E)

- b) When preformed road marking material is tested during wetness in accordance with 5.2.3 b), the coefficient of the retroreflected luminance R_L shall comply with classes RW1 to RW6 of EN 1436:2007+A1:2008, Table 4 (only for type II road marking products).
- c) When preformed road marking material is tested during rain in accordance with 5.2.3 c), the coefficient of the retroreflected luminance R_L shall comply with classes RR1 to RR6 of EN 1436:2007+A1:2008, Table 5 (only for type II road marking products).

4.1.4 Day-time visibility (Colour in daylight or under road lighting)

It shall be defined by means of (x,y) chromaticity co-ordinates.

When a white preformed road marking is tested in accordance with 5.2.4, the x, y chromaticity co-ordinates shall lie within the region defined by the corner points given in EN 1436:2007+A1:2008, Table 6 for white road markings.

When a yellow preformed road marking is tested in accordance with 5.2.4, the x, y chromaticity co-ordinates shall lie within the region Y2 defined by the corner points given in EN 1436:2007+A1:2008, Table 6 for yellow road markings.

4.1.5 Skid resistance SRT value (only for non-structured road marking products)

It represents the energy loss caused by the friction of a rubber slider over a specified length of a road marking surface in wet conditions. The result is expressed in SRT (Skid Resistance Tester) units.

Measured on samples in the laboratory according to 5.2.5, the skid resistance of preformed materials shall be in accordance with classes S1 to S5 of EN 1436:2007+A1:2008, Table 7 except for structured road marking assemblies.

4.1.6 Removability

Removability, as defined in 3.2, shall be tested in order to evaluate if the preformed road marking material is entirely removable without leaving permanent marks that could confuse the road user during the different weather conditions.

The removability of preformed road markings cannot be determined in the laboratory and shall therefore be tested on the road, in accordance with 5.2.6.

4.1.7 Resistance to UV exposure

UV resistance shall be checked in accordance with 5.2.7. The chromaticity co-ordinates of preformed materials after UV exposure shall comply with the region for white road markings of Table 6 and with region Y2 for yellow road markings in EN 1436:2007+A1:2008, Table 6, respectively for white and yellow preformed road marking.

The preformed materials shall be classified in accordance with Table 2, where $\Delta\beta$ is the difference between the luminance factor before and after UV exposure.

Table 2 — Classes of UV resistance

Colour	Class	$\Delta\beta$
White and yellow	UV0	No value requested
White and yellow	UV2	$\leq 0,10$

4.2 Preformed Thermoplastic Road Marking with drop-on Materials

Requirements for these products are defined in FprEN 1871:2012, 4.2.2.2 (Test before heat stability for base road marking materials) and in FprEN 1871:2012, 4.3 (Requirements for road marking assemblies).

Test methods are defined in 5.3.

4.3 Durability

4.3.1 General

Durability represents the capability of the preformed road marking material to achieve a certain level of performance for each characteristic after being submitted to road trials and/or wear simulator.

The information corresponding to the durability method (Road trials or Wear Simulator) shall include the specific test conditions applicable to the test.

The following performance characteristics of the road marking assemblies are tested by road trial or wear simulator:

- Retroreflection under vehicle headlamp illumination (see 4.1.3):
 - coefficient of retroreflected luminance R_L expressed as class R on dry conditions (only for retroreflective road marking products);
 - coefficient of retroreflected luminance R_L expressed as class RW during wetness (only for Type II road marking products) and/or;
 - coefficient of retroreflected luminance R_L expressed as class RR during rain (only for Type II road marking products);
- Reflection in daylight or under road lighting (see 4.1.2 and 4.1.4):
 - luminance coefficient under diffuse illumination (Q_d) or luminance factor (β);
 - chromaticity co-ordinates (x,y);
- skid Resistance (SRT value) (only for non-structured road markings) (see 4.1.5).

4.3.2 Durability on road trials

When a road marking product to be used for permanent road marking is tested according to 5.4.1, the results shall comply, at least, with roll-over class P1 of EN 1824:2011, Table 3. In the case of road trial with studded tyres class P0 applies and the actual value of wheel passages (to the nearest thousand wheel passages) shall be stated in the test report.

When a road marking product to be used for temporary road marking is tested according to 5.4.1, the results shall comply with roll-over classes T0; T1 or T2 of Table 3 of EN 1824:2011, Table 3.

For the requirements of the road marking product specified in 4.1 and 4.2, the results are expressed in terms of a class (with the exception of the colour for which pass/fail criteria is used) for the corresponding roll-over class (P) and accompanied by studded tyres (Y/N).

4.3.3 Durability of on wear simulator - turntable

When a road marking product to be used for permanent road marking is tested according to 5.4.2, the results shall comply, at least, with traffic class P4 of EN 13197:2011, Table 4.

When a road marking product to be used for temporary road marking is tested according to 5.4.2, the results shall comply, at least, with traffic class P1 of EN 13197:2011, Table 4.

For the requirements of the road marking product specified in 4.1 and 4.2, the results are expressed in terms of a class (with the exception of the colour for which pass/fail criteria is used) for the corresponding roll-over class (P).

5 Test methods

5.1 General

If not specified in the relevant test method, samples representative of each component of the material shall be taken from storage in accordance with EN 13459.

Smaller representative samples, of sufficient quantity to carry out all the tests required, could be taken from the larger samples.

5.1.1 Preparation of samples of Tape, Preformed Cold Plastic Road Marking and Preformed Thermoplastics Road Marking without drop-on Materials

For preformed materials cut in symbols, legends or other special shapes, where lengths of at least 1 m cannot be sampled, an equivalent area of at least 0,75 m², with a minimum width of 0,15 m and a length suitable for the tests mentioned in 5.2 shall be sampled.

5.1.2 Preparation of samples of Preformed Thermoplastics Road Marking with drop-on Materials

If not specified in the relevant test method, sampling shall be made according to EN 13459.

5.2 Test methods for Tape, Preformed Cold Plastic Road Marking and Preformed Thermoplastics Road Marking without drop-on Materials

5.2.1 General

The requirements of 4.1 apply to the products as they leave the manufacturing site and are therefore intended as laboratory requirements.

NOTE These parameters are not to be confused with the initial measurements, applied for durability purpose, which are carried out in accordance with EN 1824:2011, Table 4, for initial measurements column or after 10 000 wheel passages according to EN 13197:2011. They indicate the performances of the road marking material measured after a short period following subsequent to its application.

5.2.2 Day-time visibility (reflection in daylight or under road lighting)

It may be measured either by:

- a) the coefficient of luminance under diffuse illumination (Q_d), expressed in $\text{mcd}\cdot\text{m}^{-2}\cdot\text{lx}^{-1}$ according to EN 1436:2007+A1:2008, Annex A;

or

- b) by the luminance factor (β), according to EN 1436:2007+A1:2008, Annex C.

5.2.3 Night-time visibility (retroreflection under vehicle headlamp illumination)

It can be measured in different conditions as follows:

- a) coefficient of retroreflected luminance in dry conditions (R), in accordance with EN 1436:2007+A1:2008, Annex B;
- b) coefficient of retroreflected luminance with wetness (RW) in accordance with EN 1436:2007+A1:2008, Annex B;
- c) coefficient of retroreflected luminance during rain (RR) in accordance with EN 1436:2007+A1:2008, Annex B.

5.2.4 Day-time visibility (Colour in daylight or under road lighting)

It shall be tested in accordance with EN 1436:2007+A1:2008, Annex C.