



SLOVENSKI STANDARD

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Materiali za označevanje vozišča - Materiali za posipanje - Steklene kroglice, posipi za zmanjšanje drsnosti in mešanice obeh

Road marking materials - Drop on materials - Glass beads, antiskid aggregates and mixtures of the two

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Produits de marquage routier - Produits de saupoudrage - Microbilles de verre, granulats antidérapants et mélange de ces deux composants

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93.080.20 Materiali za gradnjo cest Road construction materials

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Road marking materials - Drop on materials - Glass beads, antiskid aggregates and mixtures of the two

Produits de marquage routier - Produits de saupoudrage -
Microbilles de verre, granulats antidérapants et mélange de
ces deux composants

Straßenmarkierungsmaterialien - Nachstreumittel -
Markierungs-Glasperlen, Griffigkeitsmittel und
Nachstreugemische

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Contents

Foreword.....	5
1 Scope	6
2 Normative references	6
3 Terms and definitions	6
4 Requirements	7
4.1 Glass beads.....	7
4.1.1 Surface treatments of glass beads	7
4.1.2 Visibility characteristics.....	7
4.1.3 Granulometry	8
4.1.4 Dangerous substances	10
4.1.5 Durability aspects — Resistance to chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide	10
4.2 Transparent antiskid aggregates	10
4.2.1 pH value	10
4.2.2 Granulometry	10
4.2.3 Dangerous substances	12
4.2.4 Durability aspects — Resistance to fragmentation (friability)	12
4.3 Non transparent antiskid aggregates.....	12
4.3.1 pH value	12
4.3.2 Visibility characteristics.....	12
4.3.3 Granulometry	13
4.3.4 Durability aspects — Resistance to fragmentation (friability)	14
4.4 Mixtures of glass beads and antiskid aggregates.....	14
4.4.1 General.....	14
4.4.2 Durability aspects	15
5 Testing, assessment and sampling methods	15
5.1 General.....	15
5.2 Sampling	15
5.3 Glass beads	16
5.3.1 Surface treatments of glass beads	16
5.3.2 Visibility characteristics.....	16
5.3.3 Granulometry	16
5.3.4 Dangerous substances	16
5.3.5 Durability — Resistance to chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide	16
5.4 Transparent antiskid aggregates	16
5.4.1 pH value	16
5.4.2 Granulometry	17
5.4.3 Dangerous substances	17
5.4.4 Durability — Resistance to fragmentation (friability).....	17
5.5 Non transparent antiskid aggregates	17
5.5.1 pH value	17
5.5.2 Visibility Characteristics	17
5.5.3 Granulometry	17
5.5.4 Durability — Resistance to fragmentation (friability).....	17
5.6 Mixture of glass beads and antiskid aggregates.....	17
6 Evaluation of conformity.....	18
6.1 General.....	18
6.2 Initial type testing and type testing.....	18
6.2.1 General.....	18
6.2.2 Test samples, testing and compliance criteria.....	19

6.2.3	Test reports	21
6.3	Factory Production control (FPC).....	21
6.3.1	General	21
6.3.2	Requirements.....	21
6.3.3	Product specific requirements.....	25
6.3.4	Initial inspection of factory and FPC	26
6.3.5	Continuous surveillance of FPC	26
6.3.6	Procedure for modifications	26
7	Marking	27
Annex A	(normative) Test method to determine the refractive index of the glass beads.....	28
A.1	General	28
A.2	Principle	28
A.3	Equipment and materials.....	29
A.4	Procedure.....	30
A.5	Expression of the results	30
Annex B	(normative) Test methods to determine the resistance of the glass beads to the effects of water, hydrochloric acid, calcium chloride and sodium sulphide.....	31
B.1	Resistance to the effects of water	31
B.2	Resistance to the effects of hydrochloric acid	31
B.3	Resistance to the effects of calcium chloride	31
B.4	Resistance to the effects of sodium Sulphide	31
Annex C	(normative) Glass bead defects.....	33
C.1	Oval glass beads (see Figure C.1).....	33
C.2	Satellites (see Figure C.2).....	33
C.3	Tear shaped glass beads (see Figure C.3).....	33
C.4	Glass beads fused together (see Figure C.4).....	34
C.5	Roundish glass beads (see Figure C.5)	34
C.6	Opaque glass beads (see Figure C.6).....	34
C.7	Milky glass beads (see Figure C.7).....	35
C.8	Gas inclusions (see Figure C.8).....	35
C.9	Grains (see Figure C.9).....	35
C.10	Foreign particles.....	36
Annex D	(normative) Test method to determine maximum weighted percentage of defective glass beads — Procedure.....	37
D.1	General	37
D.2	Results of counting.....	38
Annex E	(normative) Test method to determine the presence of the moisture proof coating.....	40
E.1	Procedure A	40
E.2	Procedure B	41
Annex F	(normative) Test method to determine the presence of floatation coating.....	42
F.1	General	42
F.2	Principle	42
F.3	Apparatus and reagents	42
F.4	Procedure.....	42
F.5	Results.....	42
Annex G	(normative) Test method to determine the friability index of the antiskid aggregates	43
G.1	General	43
G.2	Apparatus.....	43
G.3	Material to be tested.....	43
G.4	Procedure.....	44
G.5	Expression of results	44
G.6	Precision	45
Annex H	(informative) Alternative test methods to determine maximum weighted percentage of defective glass beads	46
H.1	General	46
H.2	Visual test method.....	46

EN 1423:2012 (E)

H.3	Automatic test method	47
Annex I (normative) Test method to determine the presence of dangerous substances		53
I.1	Reference method.....	53
I.2	Quick alternative method	54
Annex J (normative) Test method to determine glass beads and antiskid aggregates ratio in mixtures of the two		55
J.1	General.....	55
J.2	Equipment and material	55
J.3	Procedure	55
J.4	Alternative methods	55
Annex ZA (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Directive.....		57
Bibliography.....		70

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SIST EN 1423:2012

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Foreword

This document (EN 1423:2012) 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 2012, and conflicting national standards shall be withdrawn at the latest by August 2012.

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 1423:1997.

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 incorporated in this revision are:

- a) Modification of the definitions to clarify better the different products glass beads antiskid aggregates and mixtures of the two;
- b) Update of the standard to the new technologies that allow lower defects on glass beads with diameter equal or bigger than 1 mm;
- c) Addition of the essential characteristic of dangerous substances for glass beads and transparent antiskid aggregates in glass;
- d) Addition of test method to determine presence of dangerous substances;
- e) Addition of test method to determine glass beads and antiskid aggregates ratio in mixtures of the two;
- f) Modification of the order of paragraphs to comply to the template for European Standards;
- g) Addition of Clause 6 "Evaluation of conformity";
- h) Modification of parts of Annex ZA to comply to the template for product standard.

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, Croatia, 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, Turkey and the United Kingdom.

EN 1423:2012 (E)**1 Scope**

This European Standard specifies the requirements applicable to glass beads, anti-skid aggregates, and the mixture of the two, which are applied as drop-on materials on road markings products (i.e. paints, cold plastics and thermoplastics).

Glass beads and/or anti-skid aggregates, or their mixture, applied during the process of manufacturing other road marking products are not covered by this European Standard.

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 ISO 787-9, *General methods of test for pigments and extenders — Part 9: Determination of pH value of aqueous suspension (ISO 787-9)*

ISO 565:1990, *Test sieves — Metal wire cloth, perforated metal plate and electroformed sheet — Nominal sizes of openings*

ISO 2591-1, *Test sieving — Part 1: Methods using test sieves of woven wire cloth and perforated metal plate*

ISO 7724-2, *Paints and varnishes — Colorimetry — Part 2: Colour measurement*

3 Terms and definitions

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

3.1 types of drop-on materials

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3.1.1**glass bead**

transparent spherical glass particle, used to provide night visibility for the road markings by retroreflecting the incident headlight beams of a vehicle towards the driver

NOTE This product is defined by five characteristics: refractive index, maximum weighted percentage of defective glass beads, granulometry, content of dangerous substances and resistance to chemicals. In addition, surface treatment with its intended use need to be declared by manufacturer (if any).

3.1.2**antiskid aggregate**

hard grain of natural or artificial origin, used to provide antiskid qualities for the road markings

NOTE This product is defined by the following characteristics:

- transparent antiskid aggregates: granulometry, resistance to fragmentation (friability); in addition, for transparent antiskid aggregates in glass, content of dangerous substances;
- non-transparent antiskid aggregate granulometry, resistance to fragmentation (friability) chromaticity co-ordinates and luminance factor.

3.1.3**mixture of glass beads and antiskid aggregates**

product which is a combination of here above product criteria and their relative ratio

3.2**intermediate bulk container**

IBC

container with a capacity of up to 1 300 kg, used as an intermediate solution in between bags and tins (25 kg to 50 kg) and bulk transport

4 Requirements**4.1 Glass beads****4.1.1 Surface treatments of glass beads****4.1.1.1 General**

Special coatings may be applied to the surface of the glass beads to enhance their properties.

4.1.1.2 Moisture proof coating

Moisture proof coating is added to avoid that the glass bead absorb air humidity. When tested in accordance with 5.3.1.1, the presence of moisture proof coating shall be declared as "Pass" or "Fail".

4.1.1.3 Floatation coating

Floatation coating is added to glass beads mainly to allow to the beads to float (and so do not penetrate too much inside) when dropped on road marking materials in liquid phase.

When tested in accordance with 5.3.1.2 the presence of floatation coating shall be declared as "Pass" or "Fail".

4.1.1.4 Adhesion coating

Adhesion coating is added to allow higher adhesion between the binder and the glass beads when those are dropped on road marking materials.

When the manufacturer declares the presence of an adhesion coating on the glass beads it shall be tested in accordance with a test method proposed by the manufacturer. The presence of the coating shall be declared as "Pass" or "Fail".

4.1.1.5 Other coatings

When the manufacturer declares the presence of a coating, other than those in 4.1.1.2, 4.1.1.3 and 4.1.1.4, it shall be proved by testing the glass beads in accordance with a test method proposed by the manufacturer. The presence of the coating shall be declared as "Pass" or "Fail".

4.1.2 Visibility characteristics**4.1.2.1 Refractive index**

The refractive index or index of refraction of a substance is a measure of the speed of light in that substance. It is expressed as a ratio of the speed of light in vacuum relative to that in the considered medium.

The refractive index n of glass beads, shall be determined in accordance with 5.3.2.1. It shall comply with the following classes:

- Class A $n \geq 1,5$;
- Class B $n \geq 1,7$;
- Class C $n \geq 1,9$.

EN 1423:2012 (E)

4.1.2.2 Maximum weighted percentage of defective glass beads

In a collection of glass beads, maximum weighted percentage of defective glass beads is used to identify the percentage of glass beads that are not perfectly spherical.

The reference method for the determination of the maximum weighted percentage of defective glass beads is described in 5.3.2.2. Glass beads defects are listed in Annex C.

Once the reference method has been applied and only one defect per bead has been taken into consideration, the maximum weighted percentage of defective beads shall be 20 % including a maximum of 3 % of grains and foreign particles (see Table 1). If a granulometry includes beads with diameters lower than 1 mm and diameters equal to or greater than 1 mm they shall be separated by means of a sieve with nominal sizes of openings of 1 mm and checked separately.

Table 1 — Maximum weighted percentage of defective glass beads

Diameter of glass beads mm	Maximum weighted percentage of defective glass beads %	Maximum weighted percentage of grains and foreign particles %
< 1	20	3
≥ 1	20	3

During the separate checking of the glass beads with diameters lower than 1 mm and diameters equal to or greater than 1 mm, the maximum weighted percentage of defective glass beads of each fraction shall be recorded separately in the results of counting.

4.1.3 Granulometry

Granulometry is the measure of the size gradation of a collection of glass beads.

The granulometry of the glass beads shall be declared giving the minimum and the maximum percentages by mass of the cumulative retained glass beads on metal wire cloth test sieves sizes R 40/3 according to ISO 565:1990, using the test sieving procedure defined in ISO 2591-1.

Granulometries of glass beads shall be described by selecting sieves in accordance with the following rules (see also Table 2):

- the upper safety sieve shall retain 0 % to 2 % of the total mass of the antiskid aggregates;
- the upper nominal sieve shall retain 0 % to 10 % of the antiskid aggregates;
- if necessary, intermediate sieves shall be added to limit the ratio between the nominal sizes of openings of two successive sieves to a maximum of 1,7 : 1;
- for each of the intermediate sieves, the range by mass between the minimum N_1 % and the maximum N_2 % of the cumulative retained percentages shall be not more than 40 % ($N_2 - N_1 \leq 40$);
- the lower nominal sieve shall retain 95 % to 100 % of the beads.

Table 2 — Selecting sieves for glass beads

Sieves ISO 565:1990 R 40/3	Cumulative retained mass %
upper safety	0 to 2
upper nominal	0 to 10
intermediate	N_1 to N_2
lower nominal	95 to 100

The range of possible granulometries is defined in this clause and by Table 2 above.

Many granulometries are acceptable dependent on customer requirements and manufacturer specifications.

The examples showed in Table 3 and Table 4 are given to demonstrate proper interpretation of the standard. Granulometries of glass beads are not only restricted to the two examples of Table 3 and Table 4.

Table 3 — Example 1: 425-90 microns

Sieves ISO 565:1990 R 40/3 μm	Cumulative retained mass %
500	0 to 2
425	0 to 10
250	20 to 60
150	60 to 95
90	95 to 100

Table 4 — Example 2: 600-125 microns

Sieves ISO 565:1990 R 40/3 μm	Cumulative retained mass %
710	0 to 2
600	0 to 10
355	30 to 70
212	70 to 100
125	95 to 100

The granulometry of the glass beads shall be determined in accordance with 5.3.3.

EN 1423:2012 (E)**4.1.4 Dangerous substances**

Glass beads are manufactured mainly from recycled glass from industrial and domestic consumers.

Historically, glass manufacturers used some dangerous substances (arsenic, antimony and lead) as a colouring and refining agent, but improved furnace technology has enabled glass manufacturers to eliminate these toxic additives in their production processes. It is important to control the content of those dangerous substances because glass beads in their intended use are spread into the environment.

In order to check the content of arsenic, lead and antimony, the glass beads shall be tested in accordance with 5.3.4.

Each element (As, Pb, Sb) shall be separately classified into one of the following two classes:

- Class 0: no value requested;
- Class 1: ≤ 200 ppm (mg/kg).

4.1.5 Durability aspects — Resistance to chemicals: water, hydrochloric acid, calcium chloride and sodium sulphide

Resistance to chemicals is used to verify that glass beads are not affected to exposure to the environment of the road.

The resistance to chemicals shall be determined in accordance with 5.3.5 and glass beads shall not develop any surface haze or dulling when in contact with water or any of the following chemicals: hydrochloric acid, calcium chloride and sodium sulphide. When tested in accordance with 5.3.5, the resistance to chemicals of glass beads shall be declared as "Pass" or "Fail".

4.2 Transparent antiskid aggregates

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4.2.1 pH value

The pH value of the antiskid aggregates shall be determined in accordance with 5.4.1. The pH value shall be not less than 5 and not greater than 11. The result shall be declared as "Pass" or "Fail".

4.2.2 Granulometry

Granulometry is the measure of the size gradation of a collection of grains.

The granulometry of the transparent antiskid aggregates shall be described giving the minimum and the maximum percentages, by mass, of the cumulative retained particles on metal wire cloth test sieves ISO 565:1990 - sizes R 40/3 - using the test sieving procedure defined in ISO 2591-1.

Granulometry of transparent antiskid aggregates shall be described by selecting sieves in accordance with the following rules (see also Table 5):

- the upper safety sieve shall retain 0 % to 2 % of the total mass of the antiskid aggregates;
- the upper nominal sieve shall retain 0 % to 10 % of the antiskid aggregates;
- if necessary, intermediate sieves shall be added to limit the ratio between the nominal sizes of openings of two successive sieves to a maximum of 1,7 : 1;
- for each of the intermediate sieves, the range by mass between the minimum N_1 % and the maximum N_2 % of the cumulative retained percentages shall be not more than 40 % ($N_2 - N_1 \leq 40$);
- the lower nominal sieve shall retain 95 % to 100 % of the beads;

- the lower safety sieve shall retain 99 % to 100 % of the aggregates; this sieve shall not be lower than 90 μ .

Table 5 — Selecting sieves for aggregates

Sieves ISO 565:1990	Cumulative retained mass %
R 40/3	%
Upper safety	0 to 2
Upper nominal	0 to 10
intermediate	N_1 to N_2
Lower nominal	95 to 100
Lower safety	99 to 100

The range of possible granulometries is defined in this clause and by Table 5 above.

Many granulometries are acceptable dependent on customer requirements and manufacturer specifications.

The examples showed in Table 6 and Table 7 are given to demonstrate proper interpretation of the standard. Granulometries are not only restricted to the two examples of Table 6 and Table 7.

Table 6 — Example 3: 710-150 microns

Sieves ISO 565:1990	Cumulative retained mass
R 40/3	%
1 mm	0 to 2
710 μ m	0 to 10
425 μ m	5 to 25
250 μ m	40 to 80
150 μ m	95 to 100
90 μ m	99 to 100

Table 7 — Example 4: 1 000-150 microns

Sieves ISO 565:1990	Cumulative retained mass %
R 40/3	%
1,18 mm	0 to 2
1 mm	0 to 10
600 μ m	10 to 50
355 μ m	50 to 80
212 μ m	85 to 100
150 μ m	95 to 100
90 μ m	99 to 100

EN 1423:2012 (E)

The granulometry of the antiskid aggregates shall be determined in accordance with 5.4.2.

4.2.3 Dangerous substances

Transparent anti-skid aggregates in glass are manufactured mainly from recycled glass from industrial and domestic consumers. Historically, glass manufacturers used some dangerous substances (arsenic, antimony and lead) as a colouring and refining agent, but improved furnace technology has enabled glass manufacturers to eliminate these toxic additives in their production processes; it is important to control the content of those dangerous substances because antiskid aggregates in their intended use are spread into the environment.

For transparent anti-skid aggregates in glass, in order to check the content of arsenic, lead and antimony, the glass aggregates shall be tested in accordance with 5.4.3.

Each element (As, Pb, Sb) shall be separately classified into one of the following two classes:

- Class 0: no value requested;
- Class 1: ≤ 200 ppm (mg/kg).

4.2.4 Durability aspects — Resistance to fragmentation (friability)

Resistance to fragmentation is indicated by the friability index.

The friability index of transparent antiskid aggregates shall be determined in accordance with 5.4.4 and the maximum value of the friability index shall be declared.

The compliance with the durability test is presumed to retain the performances stated for the requirements.

4.3 Non transparent antiskid aggregates SIST EN 1423:2012

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4.3.1 pH value

The pH value of the antiskid aggregates shall be determined in accordance with 5.4.1. The pH value shall be not less than 5 and not greater than 11. The result shall be declared as “Pass” or “Fail”.

4.3.2 Visibility characteristics**4.3.2.1 Chromaticity co-ordinates**

The colour of non transparent antiskid aggregate shall be defined by chromaticity co-ordinates (x,y).

The chromaticity co-ordinates shall be determined in accordance with 5.5.2.1 and shall lie inside the region defined by the corner points given in Table 8.

Table 8 — Corner points of the chromaticity regions for non transparent antiskid aggregates

Corner point No.	1	2	3	4
X	0,355	0,305	0,285	0,335
y	0,355	0,305	0,325	0,375

4.3.2.2 Luminance factor

For non transparent antiskid aggregate, luminance factor shall be determined in accordance with 5.5.2.2.

The luminance factor β shall be greater than 0,70.

4.3.3 Granulometry

Granulometry is the measure of the size gradation of a collection of grains.

The granulometry of non transparent antiskid aggregates shall be described giving the minimum and the maximum percentages, by mass, of the cumulative retained particles on metal wire cloth test sieves ISO 565:1990 - sizes R 40/3 - using the test sieving procedure defined in ISO 2591-1.

Granulometry of non transparent antiskid aggregates shall be described by selecting sieves in accordance with the following rules (see also Table 9):

- the upper safety sieve shall retain 0 % to 2 % of the total mass of the antiskid aggregates;
- the upper nominal sieve shall retain 0 % to 10 % of the antiskid aggregates;
- if necessary, intermediate sieves shall be added to limit the ratio between the nominal sizes of openings of two successive sieves to a maximum of 1,7 : 1;
- for each of the intermediate sieves, the range by mass between the minimum N_1 % and the maximum N_2 % of the cumulative retained percentages shall be not more than 40 % ($N_2 - N_1 \leq 40$);
- the lower nominal sieve shall retain 95 % to 100 % of the beads;
- the lower safety sieve shall retain 99 % to 100 % of the aggregates; this sieve shall not be lower than 90 μ .

Table 9 — Selecting sieves for aggregates

Sieves ISO 565:1990	Cumulative retained mass %
Upper safety	0 to 2
Upper nominal	0 to 10
intermediate	N_1 to N_2
Lower nominal	95 to 100
Lower safety	99 to 100

The range of possible granulometries is defined in this clause and by Table 9 above.

Many granulometries are acceptable dependent on customer requirements and manufacturer specifications.

The examples showed in Table 10 and Table 11 are given to demonstrate proper interpretation of the standard. Granulometries are not only restricted to the two examples of Table 10 and Table 11.