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# Preparation of steel substrates before application of paints and related products — Specifications for metallic blast-cleaning abrasives —

## Part 4: Low-carbon cast-steel shot

The European Standard EN ISO 11124-4:1997 has the status of a British Standard

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## Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Surface Treatments and Coatings Standards Policy Committee (STC/-) to Technical Committee STC/21, upon which the following bodies were represented:

Association of Consulting Engineers  
 British Chemical Engineering Contractors' Association  
 British Coatings Federation Ltd.  
 British Constructional Steelwork Association Ltd.  
 British Grit Association  
 British Railways Board  
 British Steel Industry  
 Department of Transport  
 Electricity Association  
 Institute of Corrosion  
 National Federation of Painting and Decorating Contractors  
 Oil and Colour Chemists' Association  
 Paint Research Association  
 Royal Society of Chemistry

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## National foreword

This British Standard has been prepared by Technical Committee STC/21 and is the English language version of EN ISO 11124-4:1997 *Preparation of steel substrates before application of paints and related products — Specifications for metallic blast-cleaning abrasives — Part 4: Low-carbon cast-steel shot*, published by the European Committee for Standardization (CEN). It is identical with ISO 11124-4:1993, published by the International Organization for Standardization (ISO).

International Standard ISO 11124-4 was prepared by Technical Committee ISO/TC 35, Paints and varnishes, Subcommittee SC 12. Preparation of steel substrates before application of paints and related products.

The other Parts of BS EN ISO 11124 are:

- *Part 1: General introduction and classification;*
- *Part 2: Chilled-iron grit;*
- *Part 3: High-carbon cast-steel shot and grit.*

Together with Part 3, this Part of BS EN ISO 11124 supersedes BS 2451:1963, which is withdrawn.

### Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled “International Standards Correspondence Index”, or by using the “Find” facility of the BSI Standards Electronic Catalogue. Attention is drawn to Annex ZA, which gives the European Standards that correspond to the International Standards referred to.

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### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO title page, pages 2 to 8, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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ICS 87.020

Descriptors: Paints, varnishes, substrates, steel products, blast-cleaning, abrasives, metallic abrasives, specifications, designation

English version

# Preparation of steel substrates before application of paints and related products — Specifications for metallic blast-cleaning abrasives — Part 4: Low-carbon cast-steel shot

(ISO 11124-4:1993)

Préparation des subjectiles d'acier avant application de peintures et de produits assimilés — Spécifications pour abrasifs métalliques destinés à la préparation par projection —  
Partie 4: Grenaille ronde en acier moulé à bas carbone  
(ISO 11124-4:1993)

Vorbereitung von Stahloberflächen vor dem Auftragen von Beschichtungsstoffen — Anforderungen an metallische Strahlmittel —  
Teil 4: Stahlguß mit niedrigem Kohlenstoffgehalt, kugelig (shot)  
(ISO 11124-4:1993)

This European Standard was approved by CEN on 1997-05-28. 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.

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## CEN

European Committee for Standardization  
Comité Européen de Normalisation  
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

## Foreword

The text of the International Standard from Technical Committee ISO/TC 35, Paints and varnishes, of the International Organization for Standardization (ISO) has been taken over as a European Standard by Technical Committee CEN/TC 139, Paints and varnishes, 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 December 1997, and conflicting national standards shall be withdrawn at the latest by December 1997.

According to 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.

NOTE Normative references to International Standards are listed in Annex ZA (normative).

**WARNING — Equipment, materials and abrasives used for surface preparation can be hazardous if used carelessly. Many national regulations exist for those materials and abrasives that are considered to be hazardous during or after use (waste management), such as free silica or carcinogenic or toxic substances. These regulations are therefore to be observed. It is important to ensure that adequate instructions are given and that all required precautions are exercised.**

## 1 Scope

This part of ISO 11124 specifies requirements for 12 grades of low-carbon cast-steel shot abrasive, as supplied for blast-cleaning processes. Values are specified for hardness, density, defect/structural requirements and chemical composition.

The requirements specified in this part of ISO 11124 apply to abrasives supplied in the “new” condition only. They do not apply to abrasives either during or after use.

### **Test methods for metallic blast-cleaning abrasives are given in the various parts of ISO 11125.**

Low-carbon cast-steel shot abrasives are used in both static and site blasting equipment. They are most often selected where a facility exists for recovery and re-use of the abrasive.

NOTE 1 Information on commonly referenced national standards for metallic abrasives and their approximate relationship with ISO 11124 is given in Annex A and Annex B.

NOTE 2 Although this part of ISO 11124 has been developed specifically to meet requirements for preparation of steelwork, the properties specified will generally be appropriate for use when preparing other material surfaces, or components, using blast-cleaning techniques. These techniques are described in ISO 8504-2:1992, *Preparation of steel substrates before application of paints and related products — Surface preparation methods — Part 2: Abrasive blast-cleaning*.

## 2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 11124. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 11124 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 439:1982, *Steel and cast iron — Determination of total silicon — Gravimetric method*.

ISO 629:1982, *Steel and cast iron — Determination of manganese content — Spectrophotometric method*.

ISO 4935:1989, *Steel and iron — Determination of sulfur content — Infrared absorption method after combustion in an induction furnace*.

ISO 9556:1989, *Steel and iron — Determination of total carbon content — Infrared absorption method after combustion in an induction furnace*.

ISO 10714:1992, *Steel and iron — Determination of phosphorus content — Phosphovanadomolybdate spectrophotometric method*.

ISO 11125-1:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 1: Sampling*.

ISO 11125-2:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 2: Determination of particle size distribution*.

ISO 11125-3:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 3: Determination of hardness*.

ISO 11125-4:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 4: Determination of apparent density*.

ISO 11125-5:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 5: Determination of percentage defective particles and of microstructure*.

ISO 11125-6:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 6: Determination of foreign matter*.

ISO 11125-7:1993, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 7: Determination of moisture*.

## 3 Definitions

For the purposes of this part of ISO 11124, the following definitions apply.

### 3.1

#### **low-carbon cast-steel shot**

a metallic blast-cleaning abrasive produced by a casting process in which molten low-carbon steel is formed into shot (see also 3.2) by means of an atomization process

### 3.2 shot

particles that are predominantly round, that have a length of less than twice the maximum particle width and that do not have edges, broken faces or other sharp surface defects

### 3.3 defect

A fault or weakness in an abrasive which, if present at or above a given level, may be detrimental to the performance of the abrasive (see Table 2).

#### 3.3.1 void

a smooth-surfaced internal cavity considered undesirable when greater than 10 % of the cross-sectional area of a particle

#### 3.3.2 shrinkage defect

an internal cavity with a rough dendritic surface or a zone of microporosity, considered undesirable when greater than 40 % of the cross-sectional area of a particle

#### 3.3.3 crack

a linear discontinuity that has a length-to-width ratio of 3 : 1 or greater, that extends over more than 20 % of the diameter or shortest dimension of a particle and that is radial in direction

### 3.4 foreign matter

any material or particles mixed with the abrasive which are not attached to the abrasive particles and which are nonmagnetic

## 4 Designation of abrasives

Low-carbon cast-steel shot abrasives shall be identified by "Abrasive ISO 11124" and the abbreviation "M/LCS" indicating metallic, low-carbon cast-steel abrasive. The symbol "S" shall follow to indicate the required particle shape of the shot as purchased. The designation shall be completed by a 3-digit number denoting the grade, or nominal particle size, required.

#### EXAMPLE 1

##### **Abrasive ISO 11124 M/LCS/S100**

denotes an abrasive of the metallic, low-carbon cast-steel type, complying with the requirements of this part of ISO 11124, of particle shape shot and grade 100 (i.e. nominal particle size 1,00 mm).

It is essential that this full product designation is quoted on all orders.

NOTE 3 Grade requirements and codes are specified in Table 1. The grade code is based on a number indicating the approximate middle of the particle size range, or nominal diameter, for each grade, expressed in millimetres  $\times 100$ .

NOTE 4 Annex A provides guidance on approximately equivalent grades and codings in other commonly referenced national standards for cast metal abrasives.

## 5 Sampling

Sampling procedures shall be as specified in ISO 11125-1.

## 6 Requirements for low-carbon cast-steel shot abrasives

The requirements for low-carbon cast-steel abrasives shall be as specified in Table 2.

## 7 Package identification and lot traceability

All supplies shall be clearly marked and identified using the designation specified in clause 4. The unit of sale, i.e. pallet, drum, box, etc., shall be clearly labelled with the full product coding.

Sub-units, i.e. bags, shall be marked with the particle shape and grade codes.

NOTE 5 Inclusion of additional marking to allow product traceability to a particular production period or lot is strongly recommended. Traceability references should be included at least at the pallet, drum or box level of package marking.

## 8 Information to be provided by the manufacturer or supplier

The manufacturer or supplier shall provide, if requested, a test report detailing results for any relevant property as determined by the appropriate method specified in Table 2.



**Table 1 — Screening specifications by grade — Low-carbon cast-steel shot — Cumulative % retained**

Grade code	Sieve mesh aperture, mm																	
	3,35	2,80	2,36	2,00	1,70	1,40	1,18	1,00	0,85	0,71	0,60	0,50	0,425	0,355	0,300	0,250	0,180	0,125
S280	0		> 90	> 97														
S240		0		> 85	> 97													
S200			0		> 85	> 97												
S170				0		> 85	> 97											
S140				0	< 5		> 85	> 96										
S120					0	< 5		> 85	> 96									
S100						0	< 5		> 85	> 96								
S080							0	< 5		> 85	> 96							
S070								0	< 10		> 85	> 97						
S060									0	< 10			> 85	> 97				
S040											0	< 10			> 80		> 90	
S030													0	< 10			> 80	> 90

NOTE For convenience, a similar table is used in most parts of ISO 11124. Not all sieve mesh apertures are relevant in each case.

Table 2

Property	Requirement	Test method
Grade	See Table 1.	ISO 11125-2
Hardness	90 % of the particles tested shall have a hardness range of 390 HV to 520 HV.  Metallic abrasives sometimes contain internal shrinkage defects or voids which remain undetected beneath the surface in a mounted and polished sample. These hidden cavities cause a non-uniform hardness indentation and give an erroneous hardness reading. These indentations shall be ignored.	ISO 11125-3
Apparent density	min. $7,0 \times 10^3 \text{ kg/m}^3$ (7,0 kg/dm <sup>3</sup> )	ISO 11125-4
Defects (see 3.3)	Defects present in the particles examined shall not exceed the following levels:  Particle shape      max. 15 % non-round Voids                    max. 15 % Shrinkage defect    max. 5 % Cracks                  None Total defects         max. 20 %	ISO 11125-5
Particles with more than one of the above defects shall be counted only once in this total.		
Foreign matter (including slag)	max. 1 % (m/m)	ISO 11125-6
Structure	Low-carbon cast-steel shot abrasives shall have a bainitic or martensitic structure.  Grain boundary ferrite and pearlite phases shall be less than 5 % in any single particle.  NOTE This type of structure is essential to produce the combination of high hardness, long life and durability typical of this particular abrasive type. The specific method of manufacture is at the discretion of the producer.  No more than 15 % of the particles tested shall have undesirable microstructure.	ISO 11125-5
Chemical composition	Carbon            0,08 % (m/m) to 0,20 % (m/m) Manganese      0,35 % (m/m) to 1,50 % (m/m) Silicon           0,10 % (m/m) to 2,00 % (m/m) Sulfur            max. 0,05 % (m/m) Phosphorus     max. 0,05 % (m/m)	ISO 9556 ISO 629 ISO 439 ISO 4935 ISO 10714
Moisture	max. 0,2 % (m/m)  NOTE It is essential that low-carbon cast-steel abrasives are supplied and used in a dry condition. They should be stored indoors in dry surroundings to prevent condensation, rusting and deterioration of the abrasive, rendering it unsuitable for use.	ISO 11125-7

**Annex A (informative)****Approximately equivalent codings for shot and grit abrasives**

Commonly referenced national standards for metallic abrasives are based on different coding systems for particle size range or grade,

Approximately equivalent codings in some of these national standards are shown in Table A.1 and the nearest equivalent codings in ISO 11124 are shown alongside.

This list is purely informative and should not be taken as indicating that grades are equal. It covers the full range of ISO 11124 codings. This part of ISO 11124 may not contain all the codings listed.

ISO 11124 size limits are identical with those specified in SAE J444:1984.

**Table A.1**

	SAE J444:1984	BS 2451:1963	DIN 8201 Teil 2:1985	ISO Coding
<b>Shot</b>	S1320	S1320	—	S400
	S1110	S1110	—	S300
	S930	S950	—	S280
	S780	S800	2,0 to 2,8	S240
	S660	S660	1,6 to 2,24	S200
	S550	S550	1,25 to 2,0	S170
	S460	S470	—	S140
	S390	S390	1,0 to 1,6	S120
	S330	S340	—	S100
	S280	—	0,8 to 1,25	S080
	S230	S240	0,6 to 1,0	S070
	S170	S170	0,4 to 0,8	S060
	S110	S120	0,3 to 0,6	S040
	S70	S070	0,2 to 0,4	S030
<b>Grit</b>	—	G95	—	—
	G10	G80	2,0 to 2,8	G240
	G12	G66	1,6 to 2,24	G200
	G14	G55	1,25 to 2,0	G170
	G16	G47	1,0 to 1,6	G140
	G18	G39	1,0 to 1,6	G120
	G25	G34	0,8 to 1,25	G100
	G40	G24/G17	0,6 to 1,0/0,4 to 0,8	G070
	G50	G12	0,3 to 0,6	G050
	G80	G07	0,2 to 0,4	G030
	G120	G05	0,16 to 0,3	G020
	G200	G02	0,1 to 0,2	G010
	G325	G02	—	G005
	<b>NOTE</b>			
“S” signifies shot, i.e. round particle form.				
“G” signifies grit, i.e. angular particle form.				

## Annex B (informative)

### Bibliography

Commonly referenced national standards for metallic abrasives are as follows:

- [1] BS 2451:1963, *Specification for chilled-iron shot and grit.*
- [2] DIN 8201 Teil 1:1985, *Feste Strahlmittel; Einteilung, Bezeichnung.*
- [3] DIN 8201 Teil 2:1985, *Feste Strahlmittel; metallisch, gegossen, Kornform kugelig.*
- [4] DIN 8201 Teil 3:1985, *Feste Strahlmittel; metallisch, gegossen, Kornform kantig.*
- [5] DIN 8201 Teil 4:1985, *Feste Strahlmittel; Stahldrahtkorn.*
- [6] JIS G5903:1975, *Cast shot and grit.*
- [7] SAE J444:1984, *Cast-shot and grit size specification for peening and cleaning.*
- [8] SAE J827:1990, *Cast steel shot.*
- [9] SAE J441:1987, *Cut wire shot.*

**Annex ZA (normative)****Normative references to international publications with their relevant European publications**

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.

Publication	Year	Title	EN	Year
ISO 4935	1989	<i>Steel and iron — Determination of sulfur content — Infrared absorption method after combustion in an induction furnace</i>	EN 24935	1991
ISO 11125-1	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 1: Sampling</i>	EN ISO 11125-1	1997
ISO 11125-2	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 2: Determination of particle size distribution</i>	EN ISO 11125-2	1997
ISO 11125-3	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 3: Determination of hardness</i>	EN ISO 11125-3	1997
ISO 11125-4	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 4: Determination of apparent hardness</i>	EN ISO 11125-4	1997
ISO 11125-5	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 5: Determination of percentage defective particles and of microstructure</i>	EN ISO 11125-5	1997
ISO 11125-6	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 6: Determination of foreign matter</i>	EN ISO 11125-6	1997
ISO 11125-7	1993	<i>Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 7: Determination of moisture</i>	EN ISO 11125-7	1997

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