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

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

*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 coulé à bas carbone

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document 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*.

This second edition cancels and replaces the first edition (ISO 11124-4:1993), which has been technically revised.

The main changes compared to the previous edition are as follows:

- [Annex A](#) has been technically revised.

A list of all parts in the ISO 11124 series can be found on the ISO website.

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

Part 4: Low-carbon cast-steel shot

WARNING — Equipment, materials and abrasives used for surface preparation can be hazardous. It is important to ensure that adequate instructions are given and that all required precautions are exercised.

1 Scope

This document 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 document 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](#).

NOTE 2 Although this document 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.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

ISO 439, *Steel and iron — Determination of total silicon content — Gravimetric method*

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

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

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

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

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

ISO 11125-2, *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, *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, *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, *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, *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, *Preparation of steel substrates before application of paints and related products — Test methods for metallic blast-cleaning abrasives — Part 7: Determination of moisture*

3 Terms and definitions

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

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1

low-carbon cast-steel shot

metallic blast-cleaning abrasive produced by a casting process in which molten low-carbon steel is formed into *shot* (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

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

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

3.3.2

shrinkage defect

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

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**

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

Abrasive ISO 11124 M/LCS/S100

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

This full product designation shall be quoted on all orders.

NOTE 1 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 2 [Annex A](#) provides guidance on approximately equivalent grades and codings in other commonly referenced national standards for low-carbon cast-steel shot.

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 shot 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. commercial packaging unit, 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 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	0,180	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 — Requirements for low-carbon cast-steel shot

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	ISO 11125-3
	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.	
Apparent density	min. $7,0 \times 10^3 \text{ kg/m}^3$ (7,0 kg/dm ³)	ISO 11125-4
Defects (see 3.3)	Defects present in the particles examined shall not exceed the following levels:	ISO 11125-5
Particle shape	max. 15 % non-round	
Voids	max. 15 %	
Shrinkage defect	max. 5 %	
Cracks	None	
Total defects	max. 20 %	
Particles with more than one of the above defects shall be counted only once in this total.		
Foreign matter (including slag)	max. 1 % (mass fraction)	ISO 11125-6

Table 2 (continued)

Property	Requirement		Test method
Structure	Low-carbon cast-steel shot abrasives shall have a bainitic or martensitic structure.		ISO 11125-5
	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 micro-structure.		
Chemical composition	Carbon	0,08 % (mass fraction) to 0,20 % (mass fraction)	ISO 9556
	Manganese	0,35 % (mass fraction) to 1,50 % (mass fraction)	ISO 629
	Silicon	0,10 % (mass fraction) to 2,00 % (mass fraction)	ISO 439
	Sulfur	max. 0,05 % (mass fraction)	ISO 4935
	Phosphorus	max. 0,05 % (mass fraction)	ISO 10714
Moisture	max. 0,2 % (mass fraction)		ISO 11125-7
NOTE The low-carbon cast-steel shot abrasives can be stored indoors in dry surroundings to prevent condensation, rusting and deterioration of the abrasive, rendering it unsuitable for use.			

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