

---

**Mikrostruktura železove litine - 1. del: Razvrščanje grafita z vizualno analizo  
(ISO/DIS 945-1:2016)**

Microstructure of cast irons - Part 1: Graphite classification by visual analysis (ISO/DIS 945-1:2016)

Mikrostruktur von Gusseisen - Teil 1: Graphitklassifizierung durch visuelle Auswertung (ISO/DIS 945-1:2016)

Microstructure des fontes - Partie 1: Classification du graphite par analyse visuelle (ISO/DIS 945-1:2016)

**Ta slovenski standard je istoveten z: prEN ISO 945-1**

---

**ICS:**

|           |        |       |
|-----------|--------|-------|
| 77.080.10 | Železo | Irons |
|-----------|--------|-------|

|                                  |                 |
|----------------------------------|-----------------|
| <b>oSIST prEN ISO 945-1:2016</b> | <b>en,fr,de</b> |
|----------------------------------|-----------------|



# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 945-1

ISO/TC 25

Secretariat: BSI

Voting begins on:  
2016-08-03Voting terminates on:  
2016-10-25

---

---

## Microstructure of cast irons —

### Part 1: Graphite classification by visual analysis

*Microstructure des fontes —**Partie 1: Classification du graphite par analyse visuelle*

ICS: 77.080.10

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

[SIST EN ISO 945-1:2018](https://standards.iteh.ai/catalog/standards/sist/bd766309-c57f-4d67-9192-09e13bd621bd/sist-en-iso-945-1-2018)

<https://standards.iteh.ai/catalog/standards/sist/bd766309-c57f-4d67-9192-09e13bd621bd/sist-en-iso-945-1-2018>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

ISO/CEN PARALLEL PROCESSING



Reference number  
ISO/DIS 945-1:2016(E)

© ISO 2016

## iTeh STANDARD PREVIEW (standards.iteh.ai)

SIST EN ISO 945-1:2018

<https://standards.iteh.ai/catalog/standards/sist/bd766309-c57f-4d67-9192-09e13bd621bd/sist-en-iso-945-1-2018>



### **COPYRIGHT PROTECTED DOCUMENT**

© ISO 2016, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
[copyright@iso.org](mailto:copyright@iso.org)  
[www.iso.org](http://www.iso.org)

# Contents

Page

|   |           |
|---|-----------|
| <b>Foreword</b> .....   | <b>iv</b> |
| <b>Introduction</b> .....   | <b>v</b>  |
| <b>1 Scope</b> .....  | <b>1</b>  |
| <b>2 General</b> .....  | <b>1</b>  |
| 2.1 Designation system for classifying graphite in cast irons.....  | 1         |
| 2.2 Visual classification of graphite.....  | 16        |
| <b>3 Sampling and preparation of samples</b> .....  | <b>17</b> |
| 3.1 Samples taken from a casting.....   | 17        |
| 3.2 Sample preparation .....  | 17        |
| <b>4 Procedure for graphite classification</b> .....  | <b>17</b> |
| 4.1 Procedure for visual classification of graphite.....  | 17        |
| 4.2 Evaluation of the analysis results .....  | 17        |
| <b>5 Reference images</b> .....   | <b>18</b> |
| 5.1 General.....  | 18        |
| 5.2 Reference images for graphite form .....  | 18        |
| 5.3 Reference images for the distribution of graphite (form I).....   | 18        |
| 5.4 Reference images for graphite size.....   | 18        |
| <b>6 Designation of graphite by form, distribution and size</b> .....   | <b>19</b> |
| 6.1 Designation system.....   | 19        |
| 6.2 Designation of intermediate graphite sizes .....  | 19        |
| 6.3 Designation of mixed graphite forms, distributions and sizes .....  | 20        |
| 6.4 Designation of unclassified graphite forms.....   | 20        |
| 6.5 Nodule count.....   | 20        |
| <b>7 Report</b> .....   | <b>21</b> |
| <b>Annex A (informative) Typical graphite forms in cast-iron materials(Examples of photomicrographs)</b> .....      | <b>22</b> |
| <b>Annex B (informative) Distribution of flake (lamellar) graphite (form I)(Examples of photomicrographs)</b> ..... | <b>23</b> |
| <b>Annex C (informative) Common terminology and main occurrencesconcerning graphite in cast irons</b> .....         | <b>24</b> |
| <b>Bibliography</b> .....   | <b>26</b> |

## 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 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 Directive Part 2 (see [www.iso.org/patents](http://www.iso.org/patents)).

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 this document will be in the introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://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 meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword-Supplementary information](#).

ISO 945-1 was prepared by Technical Committee ISO/TC 25, *Cast irons and pig irons*.

Together with ISO 945-2, this second edition of ISO 945-1 cancels and replaces ISO 945-1:2008, which has been technically revised to take into account the expanding range of cast iron alloys available. In addition, photomicrographs have been included together with schematic images to aid classification.

ISO 945 consists of the following parts, under the general title *Microstructure of cast irons*:

- ISO 945, *Part 1: Graphite classification by visual analysis*
- ISO/TR 945, *Part 2: Microstructure of cast irons - Part 2: Graphite classification by image analysis*
- ISO/TR 945, *Part 3: Microstructure of cast irons- Part 3: Matrix structures*
- ISO 945, *Part 4: Microstructure of cast irons- Part 4: Test method for determining nodularity in spheroidal graphite cast irons [under development]*

## Introduction

Microstructure designation is a useful feature that provides a means of classifying the graphite form, distribution and size in cast irons.

Graphite classification by visual analysis is a well-established method which is well recognized within the foundry industry as a means of quickly determining the overall graphite microstructure of a cast iron casting.

iTeh STANDARD PREVIEW  
(standards.iteh.ai)

SIST EN ISO 945-1:2018

<https://standards.iteh.ai/catalog/standards/sist/bd766309-c57f-4d67-9192-09e13bd621bd/sist-en-iso-945-1-2018>





# Microstructure of cast irons —

## Part 1: Graphite classification by visual analysis

### 1 Scope

This part of ISO 945 specifies a method of classifying the microstructure of graphite in cast irons by comparative visual analysis.

The purpose of this part of ISO 945 is to provide information about the method of graphite classification. It is not intended to give information on the suitability of cast-iron types and grades for any particular application.

The particular material grades are specified mainly by mechanical properties and, in the case of austenitic and abrasion resistant cast irons, by their chemical composition. The interpretation of graphite form and size does not allow a statistically valid statement on the fulfilment of the requirements specified in the relevant material standard.

### 2 General

#### 2.1 Designation system for classifying graphite in cast irons

When cast iron materials are examined under a microscope in accordance with this part of ISO 945, the graphite shall be classified by

- its form, designated by Roman numbers I to VI (see [Figure 1](#) and [Annex A](#));
- its distribution, designated by capital letters A to E (see [Figure 2](#) and [Annex B](#)); the graphite distribution designation is only specified for grey cast iron (form I);
- its size, designated by numbers 1 to 8 (see [Figures 3, 4](#) and [5](#) and [Table 1](#)).

NOTE [Figures 1](#) to [5](#) show only the outlines and not the structure of the graphite.

#### FORM

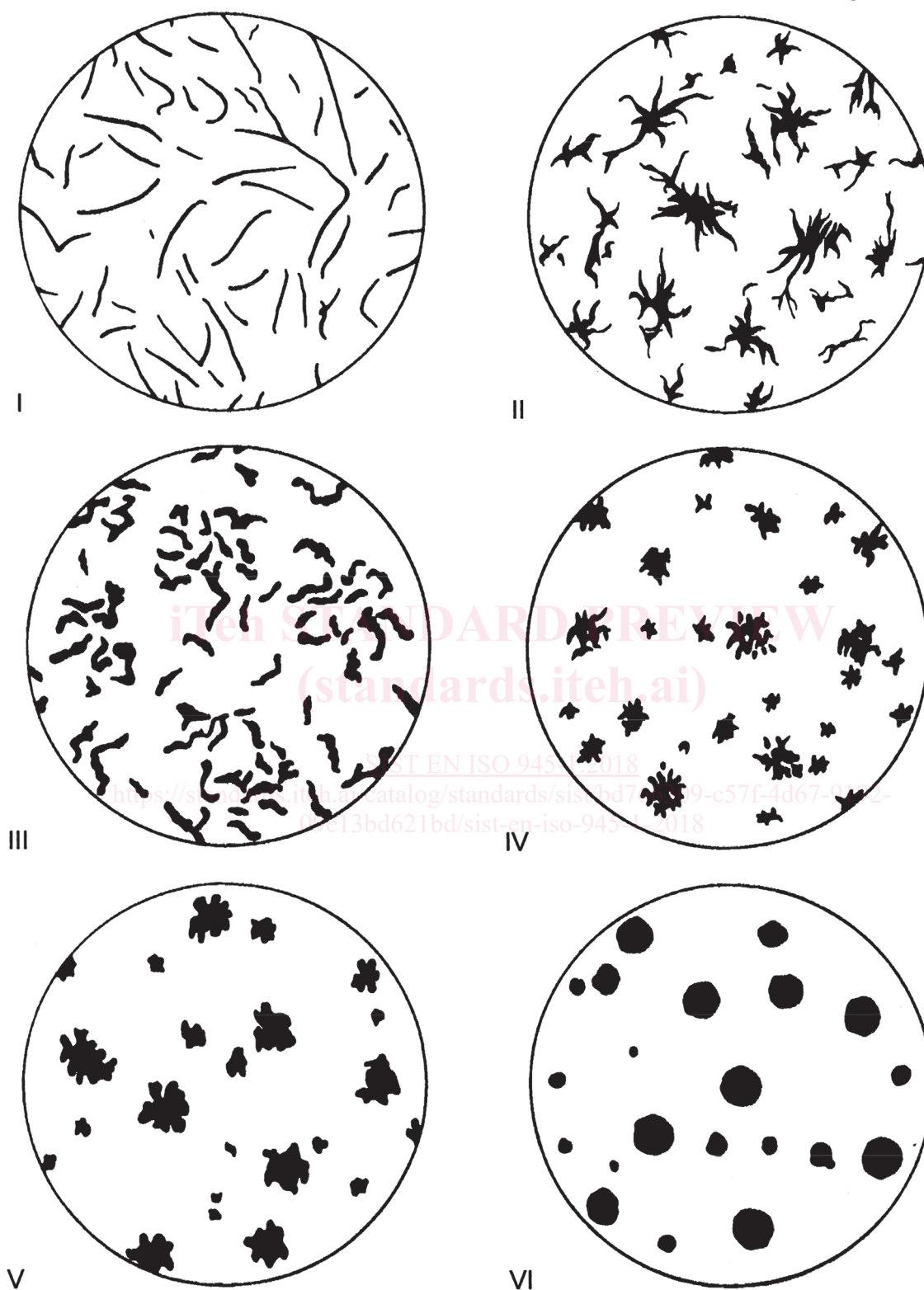
Magnification  $\times 100$ 

Figure 1 — Principal graphite forms in cast iron materials — Reference images

#### DISTRIBUTION

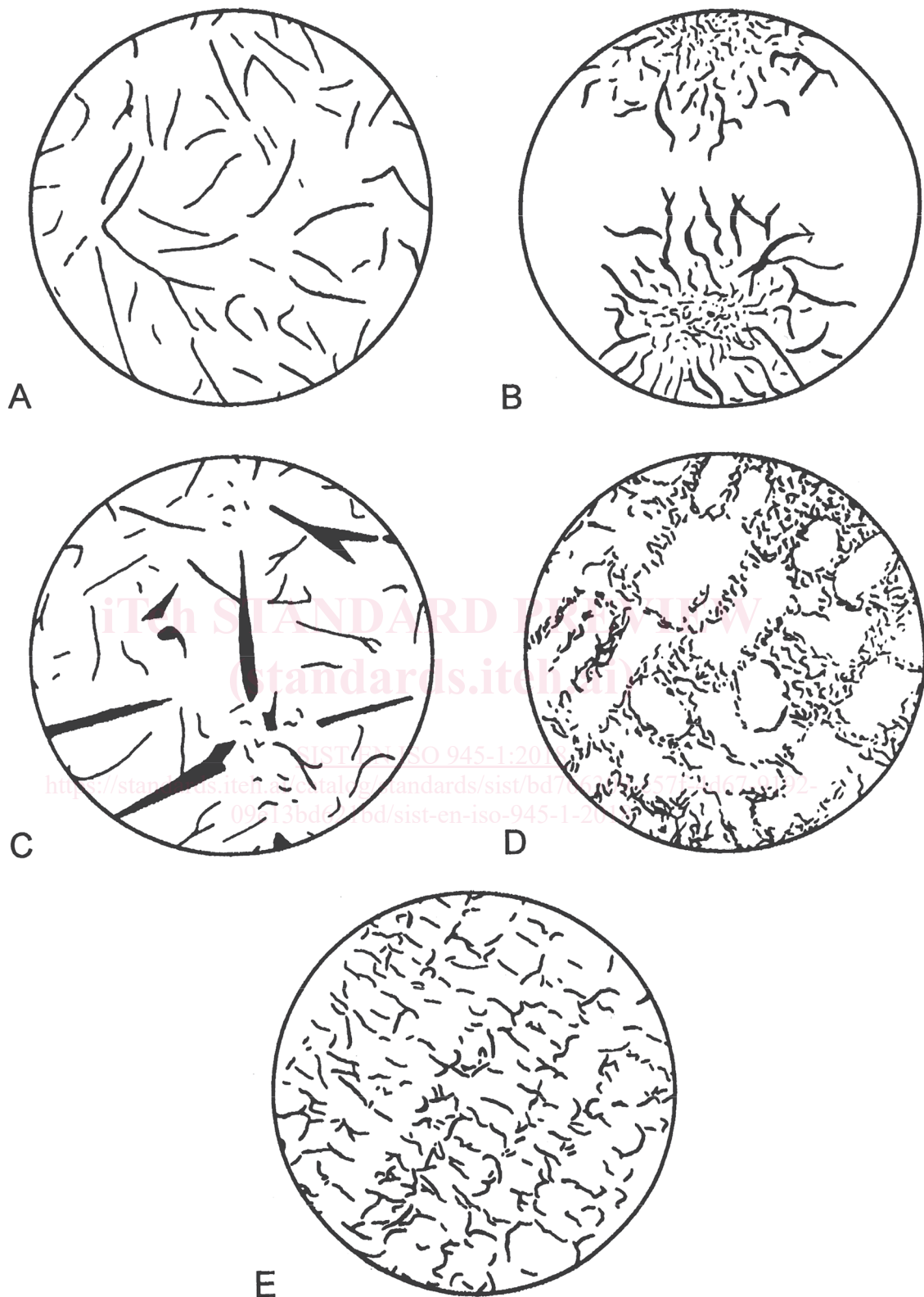
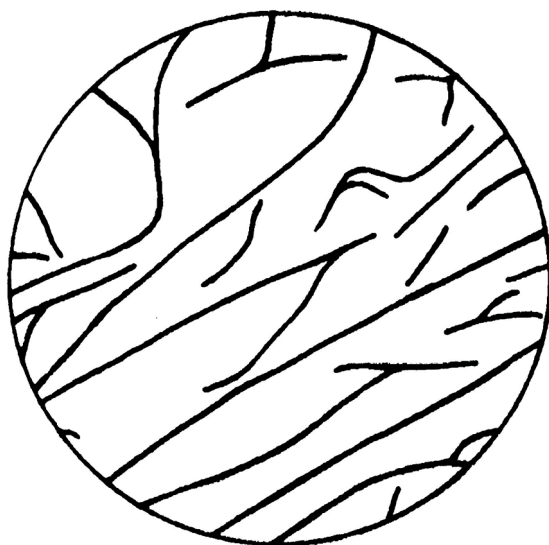
Magnification  $\times 100$ 

Figure 2 — Reference images for graphite distribution (form I)

SIZE

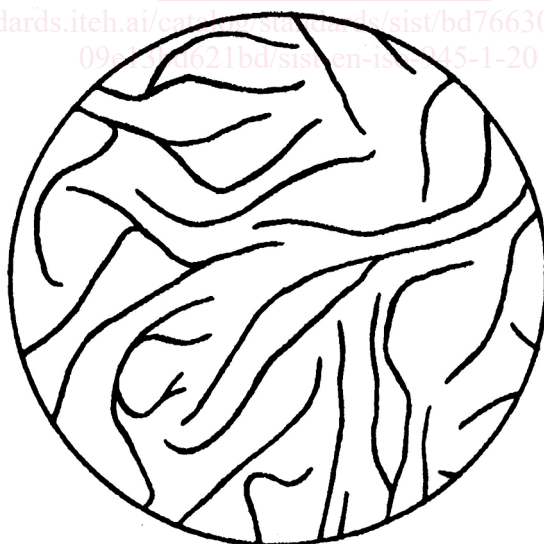


1

Magnification  $\times 100$ 

**Figure 3 a — Reference image for graphite size 1:  $\geq 1$  mm (form I)**

SIZE



2

Magnification  $\times 100$ 

**Figure 3 b — Reference image for graphite size 2: 0,5 to  $< 1$  mm (form I)**