



JAPANESE
INDUSTRIAL
STANDARD

Translated and Published by
Japanese Standards Association

JIS M 8720 : 2009

(JISF)

**Iron ores — Determination of
low-temperature
reduction-disintegration**

ICS 73.060.10

Reference number : JIS M 8720 : 2009 (E)

PROTECTED BY COPYRIGHT

M 8720 : 2009

Date of Establishment: 2001-04-20

Date of Revision: 2009-10-20

Date of Public Notice in Official Gazette: 2009-10-20

Investigated by: Japanese Industrial Standards Committee
Standards Board
Technical Committee on Iron and Steel

JIS M 8720 : 2009, First English edition published in 2010-10

Translated and published by: Japanese Standards Association
4-1-24, Akasaka, Minato-ku, Tokyo, 107-8440 JAPAN

In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

© JSA 2010

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

PROTECTED BY COPYRIGHT

KA/HN
 **Documents**
Document Sharing Hub

Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Terms and definitions	2
4 Principle	2
5 Sampling, sample preparation and preparation of test portions	3
5.1 Sampling and sample preparation	3
5.2 Preparation of test portions	3
6 Apparatus	3
7 Test conditions	4
7.1 General	4
7.2 Reducing gas	5
7.3 Heating and cooling gas	5
7.4 Temperature of the test portion	5
8 Procedure	5
8.1 Number of determinations for the test	5
8.2 Reduction	5
8.3 Tumbling	6
8.4 Sieving	6
9 Expression of results	6
9.1 Calculation of the reduction-disintegration index	6
9.2 Repeatability and acceptance of test results	7
10 Test report	7
11 Verification	8
Annex A (normative) Flowsheet of the procedure for the acceptance of test results	12
Annex JA (informative) Comparison table between JIS and corresponding International Standard	13

Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of the proposal of for revision of Japanese Industrial Standard from Japan Iron and Steel Federation (JISF), with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently **JIS M 8720 : 2001** has been replaced with this Standard.

This **JIS** document is protected by the Copyright Law.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Iron ores — Determination of low-temperature reduction-disintegration

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **ISO 4696-2** published in 2007 with some modifications of the technical contents.

The portions with dotted underlines are the matters in which the contents of the corresponding International Standard have been modified. A list of the modifications with the explanations is given in Annex JA.

1 Scope

This Standard specifies a method to provide a relative measure for evaluating the degree of size degradation of iron ores when reduced in a fixed bed at the temperature of 550 °C and then tumbled in a tumble drum at room temperature, under conditions resembling those prevailing in the low-temperature reduction zone of a blast furnace.

This Standard is applicable to natural iron ores (hereafter referred to as “sized ores”) and iron ore agglomerates [hot-bonded pellets (hereafter referred to as “pellets”) and sinter].

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows :

ISO 4696-2 : 2007 *Iron ores for blast furnace feedstocks — Determination of low-temperature reduction-disintegration indices by static method — Part 2 : Reduction with CO and N₂* (MOD)

The symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to ISO/IEC Guide 21-1.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS M 8700 *Iron ore and direct reduced iron — Vocabulary*

NOTE : Corresponding International Standard : **ISO 11323** *Iron ore and direct reduced iron — Vocabulary* (MOD)

JIS M 8702 *Iron ores — Sampling and sample preparation procedures*

NOTE : Corresponding International Standard : ISO/FDIS 3082 *Iron ores — Sampling and sample preparation procedures* (MOD)

JIS M 8706 *Iron ores and direct reduced iron — Determination of size distribution by sieving*

NOTE : Corresponding International Standard : ISO/DIS 4701 : 2007 *Iron ores and direct reduced iron — Determination of size distribution by sieving* (MOD)

JIS Z 8401 *Guide to the rounding of numbers*

JIS Z 8801-1 *Test sieves — Part 1 : Test sieves of metal wire cloth*

NOTE : Corresponding International Standard : ISO 3310-1 *Test sieves — Technical requirements and testing — Part 1 : Test sieves of metal wire cloth* (MOD)

JIS Z 8801-2 *Test sieves — Part 2 : Test sieves of perforated metal plate*

NOTE : Corresponding International Standard : ISO 3310-2 *Test sieves — Technical requirements and testing — Part 2 : Test sieves of perforated metal plate* (MOD)

3 Terms and definitions

For the purpose of this Standard, the terms and definitions given in JIS M 8700 and the following apply.

3.1 low-temperature reduction-disintegration

disintegration of sized ores or iron ore agglomerates as a result of low-temperature reduction performed under the general reduction conditions at the upper part of a blast furnace

3.2 reduction-disintegration index (*RDI-2.8*)

– 2.8 mm grading classification, expressed as a percentage by mass, of a sample obtained by tumbling in a tumbler drum after 30-min static reduction

4 Principle

A test portion with a specified size range is subjected to static and isothermal reduction (in the fixed bed) at a temperature of 550 °C for 30 min using reducing gas consisting of carbon monoxide (CO) and nitrogen (N₂). After reduction, the test portion is cooled to a temperature below 100 °C and tumbled by using a specified tumble drum for 900 revolutions in total. It is then sieved with a test sieve having nominal aperture of 2.8 mm. The reduction-disintegration index is expressed by the percentage by mass of material less than – 2.8 mm to the total mass of the test portion before tumbling.

5 Sampling, sample preparation and preparation of test portions

5.1 Sampling and sample preparation

Sampling of a lot and preparation of a test sample shall be in accordance with 10.8.2.4.1 and 10.8.2.4.3 of JIS M 8702.

A test sample of at least 2 kg, on a dry basis, sized to the following size range shall be used :

- The size range for pellets shall be $- 12.5 + 10$ mm, and, after sieving, only pellets taken at random, for example, by riffling, shall be used for the test.
- The size range of sinters and sized ores shall be $- 20 + 16$ mm.

Oven-dry the test sample to constant mass at $105\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and cool it to room temperature to supply it as test portion.

NOTE : Constant mass is achieved when the difference in mass between two subsequent measurements at 1 h interval becomes less than 0.05 % of the initial mass of the test sample.

5.2 Preparation of test portions

At least four test portions, each of approximately 500 g ($\pm$ the mass of 1 particle) shall be prepared from the test sample prepared in 5.1 by random selection.

NOTE : For sampling the test portions, manual division methods specified in JIS M 8702, such as one using a riffle divider, may be applied.

Weigh the test portions to the nearest 0.1 g and record the mass of each test portion.

6 Apparatus

6.1 Test apparatus The test apparatus used for the low-temperature reduction-disintegration test shall comprise :

- a) ordinary laboratory equipment, such as oven, hand tools, time-control device and safety equipment ;
- b) a reduction tube ;
- c) a furnace ;
- d) a gas-supply system ;
- e) a tumble drum ;
- f) drum rotation equipment ;
- g) test sieves ;
- h) a weighing device.

Figure 1 shows a schematic diagram of the reduction test apparatus.

6.2 Reduction tube, made of non-scaling, heat-resistant metal to withstand tempera-