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# JIS M 8801 : 2004

(CCUJ/JSA)

# Coal—Testing methods

**ICS** 73.040

**Reference number : JIS M 8801 : 2004 (E)**

## 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 proposal for revision of Japanese Industrial Standard submitted by Center for Coal Utilization, Japan (CCUJ)/Japanese Standards Association (JSA) 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 8801** : 1993 is replaced with this Standard.

This revision has been made based on **ISO 335** : 1974 *Hard coal—Determination of caking power—Roga test*, **ISO 501** : 1981 *Coal—Determination of the crucible swelling number*, **ISO 1953** : 1994 *Hard coal—Size analysis by sieving*, **ISO 5074** : 1994 *Hard coal—Determination of Hardgrove grindability index*, **ISO 7936** : 1992 *Hard coal—Determination and presentation of float and sink characteristics—General directions for apparatus and procedures* and **ISO 8264** : 1989 *Hard coal—Determination of the swelling properties using a dilatometer* for the purposes of making it easier to compare this Standard with International Standards; to prepare Japanese Industrial Standard conforming with International Standards; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

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.

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



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## Contents

# Coal—Testing methods

**Introduction** This Japanese Industrial Standard has been prepared based on **ISO 335** : 1974 *Hard coal—Determination of caking power—Roga test*, **ISO 501** : 1981 *Coal—Determination of the crucible swelling number*, **ISO 1953** : 1994 *Hard coal—Size analysis by sieving*, **ISO 5074** : 1994 *Hard coal—Determination of Hardgrove grindability index*, **ISO 7936** : 1992 *Hard coal—Determination and presentation of float and sink characteristics—General directions for apparatus and procedures* and **ISO 8264** : 1989 *Hard coal—Determination of the swelling properties using a dilatometer* with some modifications of the technical contents.

Portions given sidelines or dotted underlines are the matters modified from the original International Standards. A list of modifications with the explanations is given in annex (informative).

**1 Scope** This Standard specifies the method for the particle-size analysis, the method for determination of the float and sink characteristics, the method for determination of Hardgrove grindability indices, the method for determination of the crucible swelling number, the method for determination of the swelling properties, the method for determination of the fluidity properties, the method for determination of the coking properties, the method for determination of the fusibility of ash, and the method for determination of Roga indices of coal.

Remarks : The International Standards corresponding to this Standard are as follows.

In addition, 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**.

ISO 335 : 1974 *Hard coal—Determination of caking power—Roga test* (MOD)

ISO 501 : 1981 *Coal—Determination of the crucible swelling number* (MOD)

ISO 1953 : 1994 *Hard coal—Size analysis by sieving* (MOD)

ISO 5074 : 1994 *Hard coal—Determination of Hardgrove grindability index* (MOD)

ISO 7936 : 1992 *Hard coal—Determination and presentation of float and sink characteristics—General directions for apparatus and procedures* (MOD)

ISO 8264 : 1989 *Hard coal—Determination of the swelling properties using a dilatometer* (MOD)

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

JIS K 2151 *Coke—Methods for testing*

JIS M 0104 *Technical terms used in coal utilization*

JIS M 8810 *Coal and coke—General rules for sampling, analysis and testing*

JIS M 8811 *Coal and coke—Sampling and sample preparation*

JIS M 8812 *Coal and coke—Methods for proximate analysis*

JIS M 8813 *Coal and coke—Methods for ultimate analysis*

JIS M 8814 *Coal and coke—Determination of gross calorific value by the bomb calorimetric method, and calculation of net calorific value*

JIS M 8815 *Methods for analysis of coal ash and coke ash*

JIS Z 8401 *Guide to the rounding of numbers*

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

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

## 3 General matter

**3.1 Scale** The reciprocal sensibility of a scale, unless otherwise specified, shall be taken as 1/1 000 of weighing capacity. The scale which is near the weighing capacity according to the amount of sample should be preferably used.

**3.2 Handling of sample** In accordance with clause **5** of **JIS M 8810**.

**3.3 Rules for rounding of numerical values** The calculation of measured value and the report value in each test shall be rounded in accordance with **JIS Z 8401**.

**3.4 Report** In accordance with clause **12** of **JIS M 8810**.

**4 Definitions** For the purpose of this Standard, the definitions given in **JIS M 0104** and the following definitions apply:

a) **gross sample** a sample which collected all increments taken from the sub-lot or the lot which is not divided

b) **partial sample** a sample which collected two or more increments taken from the sub-lot or the lot which is not divided in order to measure the total moisture

c) **increment** a part of the lot sampled in one action of a sampler or a part of the sample taken in accordance with the increment reduction method

d) **nominal top size** the size of the minimum sieve opening (nominal size) of the test sieve (see square hole, **JIS Z 8801-2**) of which the oversize residual percentage of a sample becomes not more than 5 %

## 5 Method for particle-size analysis

**5.1 Principle of test and measurement** A sample is screened with the predetermined sieve, and the oversize residual amount on each sieve and the amount passing through the minimum hole size are weighed, and the particle size of the sample is expressed by the percentage mass (%) to the sample.

**5.2 Sieve** The required sieves selected from the sieves specified in **JIS M 8801-1** and **JIS Z 8801-2** are determined and used in accordance with the agreement between the parties concerned with delivery.

**5.3 Sampling, preparation and drying**

**5.3.1 Sampling** The primary increment of the mass specified in table 5.4 [Nominal top size and absolute minimum mass (average mass) of increment] of **JIS M 8811** shall be taken by not less than the number of pieces (for coal, the numerical value of less than 15 % of ash content is applied.) specified in table 5.1 (Minimum required number of pieces of increment sampled from the lot which is not divided) of **JIS M 8811**.

Remarks : The confirmation of the precision should be performed in accordance with clause **11** of **JIS M 8811**.

**5.3.2 Preparation of sample** Usually, the whole quantity of every increment, every partial sample, or without carrying out the reduction of gross sample as it is shall be taken as the particle-size measurement sample. However, when the mass of the sample for particle-size analysis exceeds twice the mass specified in table 5.1, it may be reduced to the mass in table 5.1 (generally, the numerical value of precision of ± 2 % may be applied.). That is to say, in the case of the gross sample, it may be reduced to the mass in table 5.1. In the case of a partial sample and an increment, they may be reduced to $m_P$ and $m_I$ which are obtained from the formula (1) and the formula (2).

$$n_P m_P = m_G \quad \cdots\cdots (1)$$

$$n_I m_I = m_G \quad \cdots\cdots (2)$$

where, $m_P$ : mass of partial sample after reduction (kg)

$n_P$ : number of partial sample

$m_G$ : mass of gross sample specified in table 5.1 (kg)

$m_I$ : mass of increment after reduction (kg)

$n_I$ : number of pieces of increment

**5.3.3 Drying of sample** The sample which is taken and prepared in accordance with **5.3.1** and **5.3.2** shall be dried at 40 °C or lower in such a degree that there is no harm in screening.

**Table 5.1 Minimum mass of gross sample for particle-size analysis**

Unit: kg

| Nominal top size of coal mm | Reduction precision and minimum mass of sample | |
|---|---|---|
| | ±1 % | ±2 % |
| 125 | 4 000 | 1 000 |
| 90 | 1 500 | 400 |
| 63 | 500 | 125 |
| 45 | 200 | 50 |
| 31.5 | 65 | 15 |
| 22.4 | 25 | 6 |
| 16 | 8 | 2 |
| 11.2 | 3 | 0.70 |
| 8 | 1 | 0.25 |
| 5.6 | 0.50 | 0.25 |
| 4 | 0.25 | 0.25 |
| 2.8 | 0.25 | 0.25 |

Remarks : The minimum mass is calculated with respect to the precision which measures the amount of coal of oversize, i.e. larger than nominal top size. The precision of other size fraction is normally better than this.

## 5.4 Procedure

**5.4.1 Manual sieving** The procedure shall be performed as follows:

a) Weigh the mass of a sample to the nearest 0.1 g, and put the sample on the sieve of the predetermined maximum hole size.

In this case, one time amount of insertion shall be under the amount of such a degree that all particles directly touch the sieve holes for each sieve when the sieving procedure is ended.

b) The sieving shall be performed by shaking the sieve by hand horizontally.

1) **In the case of the sieve of 45 mm or over in hole size** Make the sample which can pass in any direction pass, and there shall be no omission in passage.

2) **In the case of the sieve of 4 mm or over to and excluding 45 mm in hole size** Shake the sieve 8 times horizontally in a distance of about 100 mm with a speed required for the rotation movement of the oversize particles.

3) **In the case of the sieve of under 4 mm in hole size** Perform the horizontal shaking repeatedly so that the sample does not fly in all directions, sieve continuously for 5 min, and weigh the mass of the sample remained on the sieve. Return this to the same sieve, and perform the sieving procedure repeatedly. Weigh the mass again, and stop this procedure when the difference before and after sieving becomes 0.2 % or less of the first mass.

c) **Wet sieving**