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GB/T 229-2020

Replacing GB/T 229-2007

Metallic materials - Charpy pendulum impact test method

金属材料 夏比摆锤冲击试验方法

(ISO 148-1:2016, Metallic materials - Charpy pendulum impact test - Part 1: Test method, MOD)

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Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 229-2007 "Metallic materials - Charpy pendulum impact test method". Compared with GB/T 229-2007, the main technical changes are as follows:

- In the scope, ADD the unnotched specimens; MAKE requirements for the terms and definitions, symbols and descriptions, dimensional deviations, specimen installation of unnotched specimens (see Chapter 1, 3.2.1, Table 1, Table 2, 8.1, Appendix A);

- MODIFY and ADD some terms and definitions (see 3.1.3, 3.2.1, 3.2.2; 3.2.1, 3.2.2 of the 2007 edition);

- ADD the symbol B of specimen thickness; ADD the symbol α of the angle when the pendulum is released; ADD the description of the elevation angle β_1 and β_2; ADD the symbol K_N of the nominal value of the initial potential energy; ADD the symbol M of the moment; ADD the energy loss symbol p caused by pointer friction, the energy loss symbol p' caused by bearing friction and air resistance, the correction symbol p_β for the energy loss caused by the elevation angle β; MODIFY the symbol of shear section rate, which is changed to SFA; ADD the transition temperature symbol T_{t27} corresponding to the specified absorption energy value of 27J, the transition temperature symbol $T_{t50\%US}$ corresponding to 50% of the energy absorbed on the upper platform, the transition temperature symbol $T_{t50\%SFA}$ corresponding to the shear section rate of 50%, the transition temperature symbol $T_{t0.9}$ corresponding to lateral expansion value 0.9 mm (see Table 1; Table 1 of the 2007 edition);

- SUPPLEMENT and IMPROVE the principle of impact test (see Chapter 5; Chapter 5 of the 2007 edition);

- ADD the determination of friction loss (see 8.2);

- MODIFY the test temperature requirements (see 8.3.3; 8.2.3 of the 2007 edition);

- ADD the necessary and optional content of the test report [see 9.1 g), 9.2 j), k)];

- ADD the Informative Appendix E "Measuring uncertainty of absorbed energy value K" (see Appendix E);

- DELETE the Informative appendix of the high temperature or low

2975" for the convenience of actual operation;

- In Table 2, ADD the size and tolerance of U-notch specimens which have a ligament width of 8 mm; ADD the notes for unnotched specimens; ADJUST the angle tolerance between adjacent longitudinal surfaces of the specimen; DELETE the tolerance grades of the two notches, to meet China's national conditions;

- For the convenience of application, ADD the symbols KW_2 and KW_8 used for the pendulum hammer blade of the unnotched specimen in 7.3;

- In order to facilitate the operation of the application of unnotched specimens, ADD the requirements for the installation position of unnotched specimens and the pre-test inspection requirements in 8.1;

- ADD the detailed requirements for bearing friction and windage loss in 8.2.2, to facilitate the implementation of the standard;

- In 8.5, ADD the lower limit of use of the testing machine and the requirements for resolution; ADD note 2 to explain it, to improve the operability of the standard and facilitate the implementation of the standard;

- In order to increase the operability, ADD the description in 8.6 when the pendulum does not break the specimen due to insufficient impact energy of the testing machine and the measured absorbed energy exceeds the energy range of the testing machine;

- In 8.9, ADD the energy-absorption rounding-off requirements to improve the standard operability;

- In 9.1, ADD the item c) notch type and ligament width (notch depth); in item d), ADD the requirement for expression method of specimen size, to improve the standard operability;

- In Appendix A, DELETE the sentence "the size of the centering clamp with thickness of 5 mm and 3 mm" due to data errors; ADD the requirements for clamps for unnotched specimens; ADD the requirements for clamps for U-notches, to improve the standard operability, to facilitate the implementation of standards.

This standard has made the following editorial changes:

- MODIFY the standard name;

- In the note of 3.1.2, ADD the expression that "use the letter W to represent unnotched specimens".

This standard was proposed by the China Iron and Steel Association.

Metallic materials - Charpy pendulum impact test method

1 Scope

This standard specifies the Charpy pendulum impact test method for measuring the energy absorbed by impact specimens (V-shaped, U-shaped notch, unnotched specimens) in the impact test of metallic materials.

This standard applies to the Charpy pendulum impact test under room temperature, high temperature or low temperature conditions, but does not include the instrumental impact test method, the content of this part is as shown in GB/T 19748.

2 Normative references

The following documents are essential to the application of this document. For the dated documents, only the versions with the dates indicated are applicable to this document; for the undated documents, only the latest version (including all the amendments) is applicable to this standard.

GB/T 2975 Steel and steel products - Location and preparation of specimens and test pieces for mechanical testing (GB/T 2975-2018, ISO 377:2017, MOD)

GB/T 3808 Verification of pendulum-type impact testing machines (GB/T 3808-2018, ISO 148-2:2008, MOD)

GB/T 8170 Rules of rounding off for numerical values & expression and judgement of limiting values

JJG 145 Verification regulation of pendulum impact testing machines

3 Terms and definitions

The following terms and definitions apply to this document.

3.1 Energy-related definitions

3.1.1

7.3 Pendulum blade

The radius of curvature of the edge of the pendulum blade shall be either 2 mm or 8 mm. Use the subscript number of the symbol to indicate: KV_2, KV_8, KU_2, KU_8, KW_2, KW_8. The choice of pendulum blade's radius shall be based on the relevant product standards.

Note: The test results obtained by using 2 mm and 8 mm pendulum blades may be different.

8 Test procedure

8.1 General requirements

8.1.1 The specimen shall be close to the anvil of the testing machine; the distance between the symmetry plane of the specimen notch and the middle plane of the two anvils shall be no more than 0.5 mm. The strike center of the pendulum blade is located on the symmetry plane of the notch and the opposite side of the specimen notch (see Figure 1). For unnotched specimens, the strike center of the pendulum blade shall be located in the middle of the length and thickness of the specimen.

8.1.2 The anvil span shall be checked before the test; the anvil span shall be guaranteed to be within $40^{+0.2}_{0}$ mm. Check the anvil's fillet and the pendulum blade for damage or foreign metal adhesion. If any problems are found, the faulty parts shall be adjusted, ground or replaced in time, to ensure the accuracy and reliability of the test results.

8.2 Determination of friction loss

8.2.1 Check the energy loss caused by friction before starting the impact test every day. The friction loss can be evaluated according to the following methods, or other methods can be used.

Note: The energy loss of friction includes but is not limited to air resistance, bearing friction and pointer friction. The increase in friction of the testing machine will affect the measurement of absorbed energy.

8.2.2 In order to determine the loss of pointer friction, the testing machine can be operated normally without installing the specimen to obtain the elevation angle β_1 or energy value K_1 of the testing machine. Then do another idle swing without resetting the pointer, to obtain the elevation angle β_2 or energy value K_2

shall be noted in the test report.

8.9 Test results

Read the impact absorption energy of each specimen; it shall be estimated to at least 0.5 J or 0.5 division units (whichever is smaller). The test result shall retain at least two significant digits; the rounding-off method shall be implemented according to GB/T 8170.

9 Test report

9.1 Necessary content

The test report shall include the following or when the customer allows, the following information can be traced through the report number provided by the laboratory:

a) This standard number;

b) Specimen related information (such as steel grade, furnace batch number, etc.);

c) Notch type and ligament width (notch depth);

d) The size of the specimen when it is different from the standard specimen [thickness × width × length, in millimeters (mm)];

e) Test temperature;

f) Absorb energy KV_2, KV_8, KU_2, KU_8, KW_2, KW_8;

g) Whether most of the specimens or a group of specimens are broken (not required for the material acceptance test);

h) Abnormal conditions that may affect the test.

9.2 Optional content

The test report can choose to add the following information based on the content of 9.1:

a) Orientation of the specimen [5];

b) The nominal initial potential energy of the testing machine, in joules (J);

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