



**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 228.3-2019

**Metallic materials -- Tensile testing -- Part 3: Method of test at
low temperature**

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Table of Contents

Foreword...	3
Introduction...	6
1 Scope...	7
2 Normative references...	7
3 Terms and definitions...	7
4 Symbols and designations...	9
5 Principle...	10
6 Test piece...	10
7 Determination of original cross-sectional area (S_0)...	10
8 Marking the original gauge length (L_0)...	10
9 Apparatus...	10
10 Test conditions...	13
11 Determination of tensile test properties...	19
12 Rounding off for numerical values of test results...	19
13 Test report...	20
14 Measurement uncertainty...	20
15 Figures...	20
16 Annexes...	21
Annex A (Informative) Addition to GB/T 228.1-2010, Annexes B and D...	22

Foreword

GB/T 228 "Metallic materials - Tensile testing" is divided into the following 4 parts:

- Part 1: Method of test at room temperature;
- Part 2: Method of test at elevated temperature;
- Part 3: Method of test at low temperature;
- Part 4: Method of test in liquid helium.

This Part is Part 3 of GB/T 228.

This Part is drafted in accordance with the rules given in GB/T 1.1-2009.

This Part replaces GB/T 13239-2006 "Metallic materials - Tensile testing at low temperature". Compared with GB/T 13239-2006, the main technical content changes of this Part are as follows:

- Modify the standard name;
- Modify and add some terms and symbols. For example, change the indicated temperature symbol from " θ " to "T", the specified temperature symbol from " θ_{ai} " to "Ti"; ADD the term "soaking time t_s "; CHANGE "proof strength for non-proportional extension, R_p " to "proof strength for plastic extension, R_p " (see Clause 4; Clause 4 of GB/T 13239-2006);
- ADD the method of fixing the extensometer (see Clause 10);
- ADD testing rate based on strain rate control (Method A) (see Clause 10);
- Modify the rounding off for numerical values of test results (see Clause 12; Clause 10 of GB/T 13239-2006);
- ADD the example for cooling curves of steel depending on test piece dimensions and the specified test temperature (see Annex B).

This Part uses the redraft law to modify and adopt ISO 6892-3:2015 "Metallic materials - Tensile testing - Part 3: Method of test at low temperature".

The technical differences between this Part and ISO 6892-3:2015 and the reasons are as follows:

- As for the normative references, this Standard has adjusted the technical differences, to adapt to the technical conditions of China. The adjustments are mainly reflected in Clause 2 "Normative references". The specific adjustments are as follows:

? Replace ISO 6892-1:2009 with GB/T 228.1-2010 which modifies and adopts the international standard (see clauses);

? Replace ISO 7500-1 with GB/T 16825.1 identical to the international standard (see 9.1);

? Replace ISO 9513 with GB/T 12160 identical to the international

standard (see 9.2).

- Modify the errors in the international standard. For a_0 in Table A.1, change ">" to ">="; change "<=" to "< ". In Table A.2, change ">" to ">=" (see Annex A).
- In Table A.3, change the thread nominal diameter M6 to M8, M8 to M10, M10 to M12, M12 to M14 (see Annex A). The nominal diameter of the thread specified in the international standard is small, and during the test, the sample is likely to break at the thread; so according to test experience, it is recommended to increase the nominal diameter of the thread.

This Part also makes the following editorial changes:

- ADD "proof strength for total extension (R_t) (if required)" to the title of **10.4.2.3 (see 10.4.2.3);**
- MAKE the content of the rounding off for numerical values in Clause 12 j) of the international standard as one clause (see Clause 12). The number of subsequent clauses is changed accordingly;
- ADD reference to the informative Annex L of GB/T 228.1-2010 (see Clause 14);
- ADD Annex L to the list of annexes of GB/T 228.1-2010 applicable to this Part (see Clause 16);
- Modify the symbol "x" in Table C.1 in Annex C to "sqrt" (see Annex C).

This Part was proposed by China Iron and Steel Association.

This Part shall be under the jurisdiction of National Technical Committee 183 on Steel of Standardization Administration of China (SAC/TC 183).

Drafting organizations of this Part: Central Iron & Steel Research Institute, China Metallurgical Information and Standardization Institute, Technical Institute of Physics and Chemistry of the Chinese Academy of Sciences, National Quality Supervision and Inspection Center for Non-ferrous Metals, Metallic materials - Tensile testing - Part 3:

Method of test at low temperature

1 Scope

This Part of GB/T 228 specifies the terms and definitions, symbols and designations, test pieces and their dimensions measurement, test apparatus, test conditions, determination of properties, rounding off for numerical values of determination results, and test report, etc. of the tensile testing method for metallic materials at temperatures below room temperature.

This Part applies to the determination of the tensile properties of metallic materials in the temperature range $-196\text{ }^{\circ}\text{C}$ ~ $< 10\text{ }^{\circ}\text{C}$.

2 Normative references

The following documents are indispensable for the application of this document.

For the dated references, only the editions with the dates indicated are applicable to this document. For the undated references, the latest edition (including all the amendments) are applicable to this document.

GB/T 228.1-2010 Metallic materials - Tensile testing - Part 1: Method of test at room temperature (ISO 6892-1:2009, MOD)

GB/T 12160 Calibration of extensometers used in uniaxial testing (GB/T 12160-2002, ISO 9513:1999, IDT)

GB/T 16825.1 Verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Verification and calibration of the force-measuring system (GB/T 16825.1-2008, ISO 7500-1:2004, IDT)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in GB/T 228.1-2010 and the following apply.

In general, all test piece geometries/dimensions are based on measurements taken at room temperature. The exception can be the extensometer gauge length (see 3.3).

Note: The following properties are generally not determined at low temperature unless