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**Metallic Materials – Sheet and Strip – Test Method for
Bending and Folding Properties**

金属材料 薄板和薄带 弯折性能试验方法

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Table of Contents

Foreword.....	3
1 Scope.....	4
2 Normative References	4
3 Terms and Definitions	4
4 Symbols and Instructions.....	5
5 Test Principle.....	5
6 Specimen.....	7
7 Mold	7
8 Testing Machine	8
9 Test Procedure.....	9
10 Evaluation of Test Results.....	12
11 Test Report.....	12
Appendix A (Normative) Method for Determining the Limit Bending Angle $\theta_{\max}$	14

Metallic Materials – Sheet and Strip – Test Method for Bending and Folding Properties

1 Scope

This Standard specifies the terms and definitions, principles, specimens, molds, testing machines, test procedures, evaluation of test results, and test reports for the test methods of bending and folding properties of metal sheet and strip.

This Standard is applicable to the test methods for bending and folding properties of metal sheet and strip with a thickness of 0.30mm~4.00mm.

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) are applicable to this document.

GB/T 15825.2 Sheet Metal Formability and Test Methods - Part 2: General Test Rules

GB/T 15825.5 Sheet Metal Formability and Test Methods - Part 5: Bending Test

3 Terms and Definitions

For the purpose of this document, the following terms and definitions apply.

3.1 Bending failure

Cracks or significant depressions occurred on the outer surface of the sheet deformation zone.

3.2 Bending and folding properties

It reflects the cold working plasticity of sheet metal under three-point bending loading condition.

NOTE 1: The bending properties include two indexes, namely, the minimum bending radius and the limit bending angle.

vertically; and the supporting rollers on both sides shall be able to move horizontally relative to opening and closing. The movement of the indenter base and the supporting rollers on both sides shall be continuous and smooth without jumping. The displacement speed of the indenter base shall be adjustable within the range of 5mm/min~100mm/min.

8.3 In the working stroke, the bottom edge of the indenter shall be parallel to the surface of the specimen, and the deviation between the indenter and the center of the supporting roller shall not exceed 0.05mm.

8.4 The testing machine shall be able to accurately position the specimen.

8.5 The testing machine shall be able to continuously adjust the distance between the supporting rollers L (Figure 1); and can be locked after adjustment to ensure that L does not change during the test.

NOTE: According to experience, when the high-strength steel sheet is conducted less than 180° bending test, the horizontal lateral force on both sides of the supporting roller may reach 70kN. It is recommended to install a displacement measuring device between the supporting rollers, with a measurement accuracy of at least 0.01mm, so that the distance between the supporting rollers shall not change during the test.

8.6 The supporting rollers on both sides of the testing machine shall have parallel action surfaces, which can provide a compressive load to the 180° bending specimen when moving towards each other.

8.7 The testing machine shall be able to fully record the indenter force-displacement curve during the bending test.

8.8 If only measuring the minimum bending radius, the testing device in GB/T15825.5 may be used.

9 Test Procedure

9.1 Test conditions

9.1.1 The test is usually carried out at a temperature of 10°C~35°C. Tests with strict requirements on temperature shall be carried out within the range of 23°C ± 5°C.

9.1.2 Before the test, check, clean and lubricate the test equipment such as the indenter, cushion mold, and supporting roller.

9.2 Test procedures

9.2.1 The thickness of the specimen shall be measured one by one; the specimens

10 Evaluation of Test Results

10.1 In case the 180° bending test with a cushion die (or with indenter) [Figure 2a)], determine the minimum bending radius $r_{\min}$ according to Formula (4).

$$r_{\min} = r_{\text{pf}} + k_2 \quad \dots\dots\dots (4)$$

Where:

$k_2 = 0.1\text{mm}$.

10.2 During the 180° bending test without cushion mold [Figure 2b)], determine the minimum bending radius according to the following principles:

- a) When cracks or significant depressions appear on the outer surface of the deformation zone of the specimen under a 5× magnifier, the minimum bending radius $r_{\min}=0.1\text{mm}$;
- b) When there are no cracks or significant depressions on the outer surface of the deformation zone of the specimen under a 5× magnifier, the minimum bending radius $r_{\min}=0\text{mm}$.

10.3 Calculate the minimum relative bending radius $r_{\min}/t$, and retain one digit after the decimal point for the calculation result.

NOTE: When there is agreement, the nominal minimum bending radius may also be used, that is, $r_{\min}=r_{\text{pf}}$ (with cushion mold) or $r_{\min}=0$ (without cushion mold).

10.4 The determination of the limit bending angle $\theta_{\max}$ shall be carried out in accordance with the method in Appendix A; and the result shall be retained to an integer; and the method used shall be indicated in the report.

11 Test Report

The test report shall include the following:

- a) This standard number;
- b) Specimen identification;
- c) Sampling direction and pretreatment method;
- d) Specimen specifications;

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