



Determination of Impact Resistance of Plastic Components

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. The object of this test procedure is to determine the impact resistance of plastic components under specified conditions.

1.2 Applicability. This test procedure shall be used for plastic components, which are likely to be subjected to impact stresses.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3221

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment. The following apparatus shall be used for the determination of impact resistance:

3.2.1 Apparatus A - Falling Tup Testing Device (See Figure 1). A specified mass drops from a predetermined height so as to produce the specified impact energy in free fall onto the test piece.

The tup shall have the following dimensions:

- Diameter 50 mm $\pm$ 1 mm
- Nose radius 25 mm $\pm$ 1 mm

3.2.2 Apparatus B - Pendulum Impact Testing Machine (See Figure 2). A pendulum impact testing machine where an impact hammer, suspended on a pendulum of specified length, drops from a predetermined height so as to produce the specified impact energy on the test piece.

The impact hammer shall have the following dimensions:

- Diameter 50 mm $\pm$ 1 mm
- Nose radius 25 mm $\pm$ 1 mm

3.2.3 Apparatus C - Steel Ball (See Figure 3). A steel ball which drops from a predetermined height so as to produce the specified impact energy in free fall onto the test piece.

The steel ball shall have the following dimensions:

- Diameter 50 mm $\pm$ 1 mm
- Nose radius 25 mm $\pm$ 1 mm

3.2.4 Low temperature cabinet capable of maintaining -30 °C $\pm$ 3 °C.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Piece. When available, the test sample should be a production representative part.

3.3.2 Test Sample Preparation. The finished component shall be tested.

3.3.2.1 Measure and record sample thickness at impact location, if practical.

3.3.2.2 Note and/or photograph any existing marks at impact location prior to test.

3.3.3 Conditioning. To GMW3221 - Code A.

3.3.4 Test Piece Supports. Supports shall be provided such that test pieces may be securely fastened to simulate service conditions (in vehicle position) as closely as possible, and to ensure that the impact hammer will strike at a right angle to any designated spot on the surface. The supports shall be rigid enough to ensure that the impact force is totally absorbed by the test piece.

3.4 Test Time. Test time will vary depending on number of samples.

Calendar time: 1 d

Test time: Minimum 4 h for
temperature soak.

3.5 Test Required Information.

3.5.1 Impact location. Impact location shall be clearly marked on test pieces or clearly described in writing.

3.6 Personnel/Skills. Trained laboratory test engineer.

4 Procedure

4.1 Preparation. Not applicable.

4.2 Conditions. The test shall be performed under any of the following test conditions. Such conditions shall be stipulated on the relevant drawings, material specifications, etc., by the following codings:

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.2.3 Coding 1. Test after accelerated aging and cooling to +23 °C $\pm$ 5 °C. Accelerated aging according to special data; testing period X, temperature Y (defined on drawing or material specifications).

4.2.4 Coding 2. Test at a temperature of +23 °C $\pm$ 5 °C.

4.2.5 Coding 3. Maintain the plastic component for 4 h at a temperature of -30 °C $\pm$ 3 °C and test immediately after removal from the low temperature cabinet.

4.3 Instructions. The test piece shall be supported as described in 3.3.4 and subjected to the test conditions specified in 4.2.

The test piece and the test piece support shall be positioned in such a manner that the contact face is at right angles to the direction of movement of the impact apparatus.

The impact apparatus shall be lifted to the position specified and dropped.

Care shall be taken to ensure that only one impact on the same test point occurs. Tests shall not be repeated on the same test point.

Evaluate each impact location at the impact surface and opposite side of impact for fractures. Flex samples during visual inspection to separate and identify small fractures. Samples tested at Coding 3 shall be allowed to return to ambient, dry conditions (overnight) before evaluating results.