



Instructions for Preparing and Testing Samples from Finished Rubber Parts

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. This test procedure is written for a better comprehension to perform tests on samples cut from finished parts. The respective International Organization for Standardization (ISO) or ASTM International (ASTM) test procedure mostly refer to test pieces cut from sheet material or especially manufactured samples. Test pieces from finished parts often cannot obtain the dimensions required in respective ISO or ASTM test method but for final product testing it is required to determine properties listed in Table 1.

1.2 Applicability. This standard is used to clarify sample preparation and testing for the minimum size test pieces cut from finished parts.

1.2.1 Table of Tests. Table 1 describes the tests covered in this document.

Table 1: Finished Part Tests

Test/Description	Measured	Appendix Reference	Units	Minimum Dimensions
Micro hardness	Flat surface	A2	International Rubber Hardness Degrees (IRHD)	See A1.2. Flatness see A1.3.
	Contour surface	A3		See A1.4.
	Contour – cross-section	A1 and A3		See A1.1, Figure A1.
Compression Set	Elastomer only: gasket or O-ring	B	Percent (%)	See Figure B1; B2.1.2, B2.1.2.1.
	Hoses (single reinforcement layer)	B2.1.1		See B2.1.1.3, B2.1.1.6 limitations.
	Tubing (single, double wall)	B2.1.1		See B2.1.1.1 and B2.1.1.2.
	Carrier gaskets	B2.1.2.4		Carrier

1.3 Remarks.

1.3.1 This document captures finished part testing content that can be referenced in other GMW's saving time and document space.

1.3.2 Finished parts are new or unused in storage. Do not test used parts.

2 References

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

2.1 External Standards/Specifications.

ASTM D395	ISO 188	ISO 1101
ASTM D3182	ISO 815-1	

2.2 GM Standards/Specifications.

None

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. Per specific test method as described in Appendices A and B.

3.3 Test Vehicle/Test Piece. Per specific test method as described in Appendices A and B.

3.4 Test Time. Per specific test method as described in Appendices A and B.

3.5 Test Required Information. Per specific test method as described in Appendices A and B.

3.6 Personnel/Skills. Conform to company and/or laboratory requirements. Technician training records must be available upon request.

4 Procedure

4.1 Preparation. Per specific test method as described in Appendices A and B.

4.2 Conditions.

4.2.1 Environmental Conditions. See respective tests as described in Appendices A and B.

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.

4.3 Instructions. The finished part property requirements described in this document take precedence over similar property supplier methods and related industry documents.

4.3.1 Micro Hardness (IRHD), instructions see Appendix A.

4.3.2 Compression Set, instructions see Appendix B.

5 Data

5.1 Calculations. Per specific test method as described in Appendices A and B.

5.2 Interpretation of Results. Per specific test method as described in Appendices A and B.

5.3 Test Documentation. Per specific test method as described in Appendices A and B.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

7 Notes

7.1 Glossary. Not applicable.

7.2 Acronyms, Abbreviations, and Symbols.

ACM	Polyacrylate
AEM	Ethylene Acrylic Rubber
ASTM	ASTM International
CS	Compression Set Test
EPDM	Ethylene Propylene Diene Monomers'
GSSLT	Global Subsystem Leadership Team
IRHD	International Rubber Hardness Degrees
ISO	International Organization for Standardization
HNBR	Hydrogenated Nitrile Rubber.
NR	Natural Rubber
RT	Room Temperature
TS	Tension Set Test
VMQ	Silicone

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW17821

9 Release and Revisions

This standard was originated in April 2017. It was first approved by the Materials – Elastomers Global Subsystem Leadership Team (GSSLT) in December 2017. It was first published in December 2017.

Issue	Publication Date	Description (Organization)
1	DEC 2017	Initial publication.

Appendix A: IRHD Measurement on Finished Parts

A1 General Information:

A1.1 Test Area (definition). The test area is the location of the specimen which the indenter is used. The surface to be measured is as molded, not buffed and uncut. The surface shall be smooth, clean, and free from cavities or orange-peel. In case of gaskets without flat surface portion, the measurement must be done on the cross section to avoid influence of the shape. In this case, the remark measured on cross section must be stated on drawing and in test report.

A1.2 Test pieces taken from elastomeric components shall be 4.4 mm width, 6 mm to 20 mm length, and 1.5 mm thickness. Laminated test pieces are not permitted. Press-in-place gaskets may use a stabilization feature as a micro-hardness measurement pad. The pad must be 4.4 mm × 4.4 mm. The indenter width is 0.4 mm. Only a single measurement can be made from one (1) surface pad. Alternatively, the test pieces can be embedded in plastic resin.

A1.3 Specimens from sheets test area are 20 mm × 40 mm and a thickness of 2 mm ± 0.5 mm. The upper and lower surface flatness tolerance is 0.1 mm to ISO 1101 and parallelism tolerance 0.2 mm to a diameter of 150 mm (measured on a ASTM D3182 slab before cutting).

A1.4 Test pieces taken from elastomeric rings or profiles shall have a diameter of at least 1.5 mm and a thickness of at least 1 mm. The cut area shall be such that the distance between the points of test of the test piece to an edge shall be at least 0.75 mm (in case the test piece is embedded in resin).

A2 Preparation of Elastomeric Components Test Pieces with Flat Surface for Hardness Measurement

To ensure a proper contact between the lower face of the test piece and its support, especially where the test pieces have a curved surface, or measurements are to be made near the edge of the test piece, the test piece shall be embedded in a rigid non-adhesive material as in A2.1 through A2.6.

A2.1 Prepare a carrier plate, made from metal, glass or a rigid plastic, of dimensions approximately 50 mm × 25 mm × 5 mm to carry the embedding material. At least one (1) of the two (2) 50 mm × 25 mm surfaces shall be smooth and flat.

A2.2 Prepare the embedding material, suitable material is a rigid two (2) component polyester resin, and place this material in the center of the carrier plate, on the least even surface. When using the embedding material, the relevant safety procedures shall be observed.

A2.3 Place the test piece into the embedding material ensuring that no air bubbles are entrapped under the test piece, and that it is not deformed.

A2.4 Place carrier plate with embedded test piece upon a surface plate.

A2.5 The test area of the test piece shall be leveled at the maximum spot by means of a height Vernier parallel to the surface plate. Any deformation of the test piece must be avoided.

A2.6 The mounted test piece shall be maintained at +23 °C ± 5 °C for at least 2 h or until it has reached an equilibrium temperature within this range.

A3 Preparation of Elastomeric Rings or Profiles Test Pieces for Hardness Measurement

To ensure proper contact between the lower face of the test piece and its support, the test piece shall be embedded in a rigid non-adhesive material as in A2.1 through A2.6.

A3.1 Prepare sections of approximately 18 mm length cut from aluminum or plastic tubes (internal diameter approximately 25 mm to carry the embedding material).

A3.2 Place suitable paper on a smooth and flat surface and place the tube section, which shall be slightly greased on its internal face, on the paper, such that the axis of the tube is perpendicular to the paper surface.

A3.3 Prepare the embedding material as described in respective instruction (see A2.1) and fill the tube section up to its rim.

A3.4 Place the test piece into the embedding material, ensuring that no air bubbles are entrapped under the test piece, and that it is not deformed. The axis of the test piece must be perpendicular to the surface and approximately 0.5 mm below the surface of the embedding material. See Figure A1.

Figure A1: Measuring Surface



Legend: 1. Axis of O-Ring or Profile
2. Section of O-Ring or Profile
3. Embedding Material

A3.5 The mounted test piece shall be maintained at $+23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ for at least 2 h, or until it has reached an equilibrium temperature within this range.

A3.6 Press the cured embedded material out of the tube section.

A3.7 The test area (front surface of the cured embedding material) shall be ground and fine polished parallel up to the meridional section of the test piece using a grinding and polishing machine and silicon carbide paper for wet grinding.