Designation: E2203 – 14

Standard Specification for Dense Thermoplastic Elastomers Used for Compression Seals, Gaskets, Setting Blocks, Spacers and Accessories[1]

This standard is issued under the fixed designation E2203; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification describes products composed of dense thermoplastic elastomers that are fabricated into gaskets and accessories (such as compression seals, setting blocks, spacers, and shims) for use in sealing and glazing applications in building construction. These products are used to seal or serve as components of compression sealing systems between mechanically restrained surfaces in building construction.

1.2 The values stated in metric (SI) units are to be regarded as the standard. The inch-pound values given in parentheses are provided for information purposes only.

1.3 Test Method C1166, as referenced in this specification, should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment that takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory requirements prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C717 Terminology of Building Seals and Sealants

C864 Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers

C1087 Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems

C1166 Test Method for Flame Propagation of Dense and Cellular Elastomeric Gaskets and Accessories

D395 Test Methods for Rubber Property—Compression Set

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D471 Test Method for Rubber Property—Effect of Liquids

D573 Test Method for Rubber—Deterioration in an Air Oven

D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

D792 Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement

D865 Test Method for Rubber—Deterioration by Heating in Air (Test Tube Enclosure)

D925 Test Methods for Rubber Property—Staining of Surfaces (Contact, Migration, and Diffusion)

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D1566 Terminology Relating to Rubber

D2000 Classification System for Rubber Products in Automotive Applications

D2137 Test Methods for Rubber Property—Brittleness Point of Flexible Polymers and Coated Fabrics

D2240 Test Method for Rubber Property—Durometer Hardness

D3182 Practice for Rubber—Materials, Equipment, and Procedures for Mixing Standard Compounds and Preparing Standard Vulcanized Sheets

2.2 *Other Documents:*

Rubber Manufacturers Association (RMA) Standard; Rubber Handbook, Fourth ed. December 1984[3]

Uniform Freight Classification Rules[4]

[1] This specification is under the jurisdiction of ASTM Committee C24 on Building Seals and Sealants and is the direct responsibility of Subcommittee C24.73 on Compression Seal and Lock Strip Gaskets.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from the Rubber Manufacturers Association, 1400 K Street, NW, Washington, DC 20005.

[4] Available from the Western Railroad Association, Department of Services and Supply, Room 1150, 222 S. Riverside Plaza, Chicago, IL 60606-5945.

National Motor Freight Classification Rules[5]

3. Terminology

3.1 Refer to Terminology C717 for definitions of the following terms used in this specification: compound, compression gasket, edge spacer, elastomer, elastomeric, expansion gasket, gasket, hardness, seal, setting block, shim spacer, standard conditions, and spacer.

3.2 Refer to Terminology D1566 for definitions of the following terms used in this specification: compression set, ultimate elongation, tear strength, tensile strength, and polymer.

4. Significance and Use

4.1 This specification describes types (based on resistance to tearing and compression set), grades (based on durometer hardness), class (based on flame propagation requirements), and surfaces (based on surface characteristics) of products as listed in Section 5 for various applications. It is essential, therefore, that the applicable type, grade, class, and surface be specified, as well as other options stated, so that the proper product is provided for the intended use.

5. Classification

5.1 The products described by this specification are classified by type, hardness, class, and surface.

5.2 *Type:*

5.2.1 *Type T, Tear Resistant*—In general these products have a higher level of tear resistance. This type is applicable where finished products are intended to bridge or to cover a space (for example, expansion joint gaskets), or where high tear strength is required due to conditions of exposure or usage.

5.2.2 *Type C, Compression Set Resistant*—In general, these products have a higher level of compression set resistance. This type is applicable where finished products are used as compression gaskets, or where low compression set is required due to conditions of exposure or usage; and as setting blocks, spacers, shims, or other accessories in glazing and sealing systems.

5.3 *Grade*—Each type described in 5.2 is subdivided into various hardnesses, based on nominal durometer hardness as shown in Tables 1 and 2. For example, Grade H3 is 30 durometer.

5.4 *Class:*

5.4.1 Flame propagation characteristics of the finished products can be varied depending on the degree of exposure, expected usage, and intended durability desired. Products described by this specification shall be classified as to flame propagation as follows:

5.4.1.1 *Class F*—Resistance to flame propagation is required (reference Specification C864, 4.1, Table 1).

5.4.1.2 Class designation is not needed when flame propagation resistance is not required.

5.5 *Surface:*

5.5.1 Consideration of product surface requirements may be necessary. During the production of these products the use of various lubricants, release agents, dusting agents, and other solutions may be required. It may be necessary to remove these materials from the surfaces of the product because of appearance fabrication, or usage requirements. All products do not require removal of these materials or removal to the same degree of cleanliness.

5.5.2 Products may also be required to develop adhesion or to not develop adhesion to sealants with which they are in contact.

5.5.3 Products described by this specification shall be classified as to surface condition as follows:

5.5.3.1 *Surface S1*—The surface of the product shall be smooth, clean, free from any foreign matter, and shall not allow adhesion of sealants (see Note 1).

5.5.3.2 *Surface S2*—The surface of the product shall be smooth, clean, free from any foreign matter, and shall allow adhesion of sealants (see Note 1).

NOTE 1—Applied treatments, such as dusting or coating to the adhesion surface may be necessary to meet this requirement.

5.5.3.3 *Surface S3*—The product shall have a surface that is smooth, clean, and free from any foreign matter.

5.5.4 Surface designation code is not needed for products not requiring special cleaning for removal of processing agents and materials.

5.6 The following is an illustration of the use of the classification system for a line call-out. Expansion gaskets shall be ASTM E2203, TH5FS3.

5.6.1 Other examples of line call-outs would be: edge spacers for structural thermoplastic glazing shall be ASTM E2203, CH6S1; compression seal gaskets shall be ASTM E2203, CH7S2; and setting blocks shall be ASTM E2203, CH9. These examples are not to be construed as a specification for these items.

[5] Available from the National Motor Freight Association, 2200 Mill Road, Alexandria, VA 22314.

TABLE 1 Requirements for Fully Cured Elastomeric Alloy Injection Molded Plaques

Property	Requirement						Test Method
	Type I	Type II	Type III	Type IV	Type V	Type VI	
Tensile strength, min, MPa (psi)	13.8 (2000)	9.7 (1400)	7.2 (1050)	6.0 (870)	5.8 (850)	5.8 (850)	D412
Elongation at break, min, %	500	460	380	350	340	340	D412
Hardness, Type A durometer, points (5 s delay)	87 ± 3	80 ± 3	73 ± 3	70 ± 3	67 ± 3	64 ± 3	D2240
Relative Density at 23°C (73°F)	0.95 ± 0.02	0.96 ± 0.02	0.97 ± 0.02	0.97 ± 0.02	0.97 ± 0.02	0.97 ± 0.02	D792
100% Modulus, min, MPa (psi)	6.1 (890)	3.8 (550)	2.8 (400)	2.2 (320)	1.9 (280)	1.9 (280)	D412
Mass gain, max. %, (24 h at 121°C (250°F) ASTM No.3 Oil)	60	75	80	90	95	95	D471

TABLE 2 Material Requirements for Finished Products

Property	Requirement						Test Method
	Type I	Type II	Type III	Type IV	Type V	Type VI	
Tensile strength, min, MPa (psi)	13.8 (2000)	9.7 (1400)	7.2 (1050)	6.0 (870)	5.8 (850)	5.8 (850)	D412
Elongation at break, min, %	500	460	380	350	340	340	D412
Hardness, Type A durometer, points (5 s delay)	87 ± 3	80 ± 3	73 ± 3	70 ± 3	67 ± 3	64 ± 3	D2240
Ozone resistance 1 ppm 100 h at 40°C (104°F) 7× mag	No cracks	No cracks	No cracks	No cracks	No cracks	No cracks	D792
Compression set, % max. 22 h at 100°C (212°F)	45	40	38	35	35	35	D412
Compression set, % max, 70h at 100°C (212°F)	50	45	43	40	40	40	D471
Heat Aging, 70h at 100°C (212°F) change in:							D865
Hardness, Shore A, max, points (5 s delay)	3	3	3	3	3	3	
Ultimate Tensile Strength max, % loss	5	5	5	5	5	5	
Ultimate Elongation max, % loss	5	5	5	5	5	5	
Tear resistance, min, N/mm (lb/in.)	45 (257)	30 (171)	20 (114)	20 (114)	20 (114)	20 (114)	D624
Brittleness temperature, min, °C (°F)	-61 (-78)	-62 (-80)	-60 (-76)	-56 (-69)	-62 (-81)	-62 (-81)	D746
Water absorption, max, % loss/gain	5	5	6	6	7	7	D471

6. Materials and Manufacture

6.1 The products described by this specification shall be a preformed extrusion manufactured from a thermoplastic vulcanizate (TPV). This TPV shall be classified under Classification System D2000.

6.1.1 The pre-compounded TPV shall be manufactured from virgin polymer, that when properly extruded, will result in an elastomer that will comply with this specification.

6.2 The compound in its final shape shall be free of visible internal porosity, surface defects, and dimensional irregularities that affect serviceability and durability.

6.3 Unless otherwise specified, the compound color shall be black. If colors other than black are specified, the compound in the color specified shall also meet the requirements of this specification.

7. Requirements

7.1 The TPV supplied in plaque form shall conform to the material requirements prescribed in Table 1.

7.2 The finished product shall conform to the material requirements prescribed in Table 2.

7.3 The physical, mechanical, and performance properties of the material shall conform to the requirements as described by Tables 1 and 2.

8. Dimensions and Permissible Variations

8.1 The size, shape, and internal structure of the product shall be as agreed upon by the purchaser and the producer or supplier.

8.2 Dimensions can be affected by distortions induced by conditions of storage or shipping as well as temperature and humidity variations. Prior to measuring the product, it shall be unpacked and conditioned in an unstressed state for 24 h at standard conditions.

8.3 Tolerance for cross-sectional dimensions of extruded products shall be as described by Table 3 unless otherwise agreed upon between the purchaser and the supplier.

8.4 Tolerances for squareness and flatness are not included in this specification, due to the difficulty of establishing meaningful limits to satisfy a wide variety of applications. These tolerances should be as agreed upon between the supplier and purchaser.

8.5 The color of the seal shall be as agreed upon by the purchaser and the producer or supplier.

8.6 The finished product shall be free of defects in workmanship.

8.6.1 Surface imperfections are acceptable provided they are less than 3 mm (0.125 in.) in diameter and less than 5 % of the depth of the cross-sectional thickness.

8.6.2 Defects in the extrusion shall consist of the following:

8.6.2.1 Holes greater than 8.6.1,

8.6.2.2 Air bubbles greater than 8.6.1, and

8.6.2.3 Pans not conforming to 8.1.

9. Sampling

9.1 Samples for testing to the requirements of this specification shall be taken from the finished product wherever possible. In addition:

9.1.1 The TPV injection molded plaques shall be sampled and tested to determine material conformance to Table 1.

9.1.2 The finished part shall also be sampled and tested to determine whether the part conforms to the material requirements given in Table 2, tolerances, and design.

9.1.3 A lot of material shall consist of the following quantity for each:

9.1.3.1 A specified mass as manufactured by the producer. Sample each lot.

9.1.3.2 A cross section as manufactured by the producer. Sample each lot.

9.1.4 Obtain samples by one of the following methods:

9.1.4.1 Take samples provided by the producer.

9.1.4.2 Take samples at random from each shipment.

9.1.5 A sample constitutes a minimum as required to perform the tests but not less than the following:

9.1.5.1 23 kg (50 lb) of the fully cured elastomeric alloy in pellet form.

9.1.5.2 2.7 m (9 lf) of each specific size and cross section of the finished part.

9.2 When the size or shape of the finished product makes it impossible to obtain the type of samples indicated by the various test methods, the manufacturer shall furnish a sufficient number of appropriate test slabs, strips or blocks, prepared in

TABLE 3 Standards for Cross Sectional Tolerance

NOTE 1—The closer tolerance classes outlined below should not be specified unless required by the final application and they should be restricted to critical dimensions. The closer tolerances demanded, the tighter the control which must be exercised during manufacture and hence higher costs.

NOTE 2—When particular physical properties are required in the product, it is not always possible to provide them in a combination which is capable of fabrication to close tolerances. It is necessary, in these circumstances, that consultation take place between the customer and supplier. In general, softer materials need greater tolerances than harder ones. Where close tolerances are required, a specific technique of measurement should be agreed upon between purchaser and manufacturer.

NOTE 3—Tolerances on dimensions above 100 mm (3.94 in.) should be agreed on by supplier and user. General cross sectional dimensions below 1 mm (0.04 in.) are impractical.

NOTE 4—In general, softer materials and those requiring a post cure need greater tolerances.

RMA Class		1 High Precision	2 Precision	3 Commercial
Drawing Designation		E1	E2	E3
		Dimensions, mm (in.)		
Above	Up to			
0 (0)	1.5 (0.06)	± 0.15 (± 0.006)	± 0.25 (± 0.010)	± 0.40 (± 0.015)
1.5 (0.06)	2.5 (0.10)	± 0.20 (± 0.008)	± 0.35 (± 0.014)	± 0.50 (± 0.020)
2.5 (0.10)	4.0 (0.16)	± 0.25 (± 0.010)	± 0.40 (± 0.016)	± 0.70 (± 0.027)
4.0 (0.16)	6.3 (0.25)	± 0.35 (± 0.014)	± 0.50 (± 0.020)	± 0.80 (± 0.031)
6.3 (0.25)	10 (0.39)	± 0.40 (± 0.016)	± 0.70 (± 0.027)	± 1.00 (± 0.039)
10 (0.39)	16 (0.63)	± 0.50 (± 0.020)	± 0.80 (± 0.031)	± 1.30 (± 0.051)
16 (0.63)	25 (0.98)	± 0.70 (± 0.027)	± 1.00 (± 0.039)	± 1.60 (± 0.063)
25 (0.98)	40 (1.57)	± 0.80 (± 0.031)	± 1.30 (± 0.051)	± 2.00 (± 0.079)
40 (1.57)	63 (2.48)	± 1.00 (± 0.039)	± 1.60 (± 0.063)	± 2.50 (± 0.098)
63 (2.48)	100 (3.94)	± 1.30 (± 0.051)	± 2.00 (± 0.079)	± 3.20 (± 0.126)

accordance with Practice D3182. The slabs, strips, or blocks shall be prepared from the same compound and shall be of a comparable state of cure as the finished product.

10. Specimen Preparation

10.1 Maintain laboratory temperature and humidity at standard conditions.

10.2 Maintain laboratory at a relative humidity of 50 % ± 5 %.

10.3 *Test Plaque Specimens:*

10.3.1 Use equipment per Annex A1.

10.3.2 Produce 20 quality assurance test plaques in accordance with Annex A2.

10.4 *Finished Product Specimens:*

10.4.1 Cut all test specimens from the finished product sample. Except as otherwise specified in the applicable specifications or test methods given in Table 2, prepare the test specimens in accordance with the requirements of Practice D3183.

10.4.2 Prepare the test specimens for determining tensile strength and elongation using Die C (Test Methods D412) or Die D when the flat sections of a seal are too small for Die C. However, the requirements of Table 2 shall apply regardless of the die used.

10.4.3 The grain or flow pattern for all specimens prepared for tensile strength and elongation testing (Test Methods D412) shall be parallel to the length of the die.

10.4.4 Prepare the test specimens for ozone resistance in accordance with Procedure A of Test Method D518, and wipe them with toluene before testing to remove surface contamination.

10.4.5 The grain or flow pattern for all specimens prepared for tear resistance testing (Test Method D624) shall be perpendicular to the length of the die.

11. Test Methods

11.1 Determine compliance of the fully cured elastomeric alloy injection molded plaques with the requirements of Table 1 by conducting the tests in accordance with the test methods specified.

11.2 Determine compliance of the finished product with the requirements of Table 2 by conducting the tests in accordance with the test methods specified.

11.3 Determine compliance with the manufacturer's tolerances by measurements.

11.4 *Low Temperature Flexibility*—Test Methods D2137, Method A. All test specimens shall exhibit no failure at or above -40°C (-40°F). Dimethylpolysiloxane fluids shall not be used in the performance of this test method.

11.5 *Hardness*—Test Method D2240, Type A Durometer, Depending on the size and shape of the product, measure hardness on a finished surface, a squarely cut end, or a sliced or buffed flat surface (see Note 2).

NOTE 2—Hardness readings for the purpose of approximate determinations may be taken from the dumbbell test specimens, recognizing that these readings may vary slightly from those taken from the finished product.

11.6 *Compression Set*—Test Methods D395, Method B, Specimen type 1. Oven age specimens for 22 h at 100 ± 2°C (212 ± 3.6°F). Where plied test specimens are necessary, the testing results shall comply with the requirements of Tables 1 and 2.

11.7 *Tensile Strength*—Test Methods D412, Test Method A, Die C.

11.8 *Ultimate Elongation*—Test Methods D412, Test Method A, Die C.

11.9 *Heat Aging*—Test Method D573, using 70 h at 150°C (320°F).

11.10 *Ozone Resistance*—Test Method D1149, Specimen A, ozone concentration of 1 ppm with an exposure time of 100 h at 40 ± 2°C (104 ± 4°F).

11.11 *Tear Strength*—Test Method D624, using Die B.

11.12 *Flame Propagation*—Test Method C1166, Specification C864, 4.1, Table 1.

11.13 *Relative Density*—Test Methods D792, Method A-1 or A-3. Determine the relative density of the compounds that comply with the requirements of these test methods, and include those values in the report of test results. Finished products complying with these test methods shall have relative density that conform to the requirements of Table 1.

11.14 *Staining*—Test Methods D925, Test Methods A and B. The finished surface against which stain is to be tested and the acceptable degree of staining shall be specified by the purchaser.

NOTE 3—Gaskets and accessories used as components in structural thermoplastic sealant glazing systems require testing to different requirements for staining or color change of the sealant, caused by the gasket or the accessories. Refer to Test Method C1087.

11.15 *Color*—The color of the finished product, after completion of the tests in 11.4, 11.9, and 11.10, shall be the color which has been agreed upon between the purchaser and the supplier.

12. Acceptance

12.1 The acceptance of the finished product shall be based on one or more of the following procedures, when specified by the purchaser:

12.1.1 When specified in the purchase order or contract, the purchaser shall be furnished certification that samples representing each lot have been either tested or inspected or both as directed in this specification and that the requirements have been met. When specified in the purchase order or contract, a report of the test results from Tables 1 and 2 shall be furnished.

12.1.2 When specified in the purchase order or contract, certified test results shall be provided by an independent testing agent.

12.1.3 Testing by the purchaser of any or all properties in accordance with the provisions of this specification. The results shall be accompanied by a statement from an independent expert witness certifying that the material has been sampled, tested, and inspected in accordance with the provisions of this specification.

13. Product Marking

13.1 If required by the purchaser, each gasket or accessory shall be packaged for shipment in containers, on spools, or pallets clearly and legibly marked, labeled, or tagged with the name of the producer or supplier or both, identifying part number, classification (if required), size (if applicable), lot number, ASTM specification numbers (if applicable), and date of manufacture, and other identification.

14. Product Packaging and Package Marking

14.1 Gaskets and accessories shall be properly packaged to avoid cuts, abrasions, permanent distortions, or other damage to them during shipping and storage. Each package or container shall be legibly and indelibly marked with the manufacturer's name and address, project name, identifying part number, quantity of parts in each container, and other identification required by the purchaser.

14.2 Gaskets and accessories shall be shipped in closed containers. Containers and packaging shall comply with the Uniform Freight Classification Rules or National Motor Freight Classification Rules. Containers shall not be handled in a manner that will cause damage to the contents.

14.3 Gaskets and accessories shall be stored in original containers in a clean dry area, free of dust, debris, oils, solvents, welding slag spatter or sparks, or other materials and conditions that may cause damage to the containers and the contents.

15. Keywords

15.1 compression; dense; elastomer; elastomeric; gasket; glazing; preformed; seal; setting block; spacers; thermoplastic; thermoplastic vulcanizate (TPV)

ANNEXES

(Mandatory Information)

A1. EQUIPMENT NECESSARY TO PRODUCE THE TEST PLAQUES

A1.1 Injection molder, with 136 metric tons (150 tons) of clamping force, 170 to 230 g (6 to 8 oz) maximum shot size, a 45 mm (1.8 in.) screw diameter, a screw length to diameter (L/D) ratio of 61 to 1 through 19 to 1, a maximum injection pressure of 145 MPa (21 000 psi) minimum, and the capability of setting an initial injection timer to 0.01 s accuracy.

A1.2 Mold temperature control equipment.

A1.3 Two-cavity mold, capable of molding two 120 by 80 by 3 mm (4.7 by 3.2 by 0.125 in.) test plaques simultaneously.

A1.4 Heat resistant gloves.

A1.5 Side cutters, to remove runners and sprue.

A2. PLAQUE PROCESSING

A2.1 The following procedure shall be followed when processing plaques.

A2.2 Have the equipment calibrated at least once per year by the equipment manufacturer or its authorized service agent.

A2.3 Set the barrel temperature controllers, the cycle timers, and pressures in accordance with Tables A2.1 and A2.2.

A2.4 Perform a check on the safety guard interlocks and emergency stop buttons.

A2.5 Ensure that the hopper is clean and free of all contaminates, that is previous alloys tested, prior to producing test plaques.

A2.6 If necessary, adjust the equipment until all readings conform to Tables A2.1 and A2.2.

A2.7 Remove all traces of previous test sample alloys and degraded material from the molding equipment prior to producing new test plaques. Move and secure the barrel and screw unit back from the mold, and purge and flush the test sample alloy through the molder unit until the test sample alloy is pure.

A2.8 After the purging and flushing process is completed, switch the equipment to semiautomatic and start the molding cycle.

A2.9 If no problems are observed with the plaque ejection or other operations, switch the equipment to full automatic operation.

A2.10 The fabrication of the test plaques shall use the following packing technique. Increase the initial inject timer by 0.05 s increments until flash occurs. When flash is obtained, reduce the inject timer in 0.02 s increments until no flash is obtained. Record the final setting.

A2.11 The equipment will be reaching equilibrium during the fabrication of the first 12 test plaques. Testing these plaques will produce incorrect or inconsistent data. Discard these first 12 test plaques; under no circumstances are they to be used for testing.

A2.12 After the equipment has reached equilibrium and the correct fill has been achieved, fabricate 20 test plaques for testing.

TABLE A2.1 Alloy Injection Molding

Conditions	Requirements			
Alloy durometer ranges (ASTM D2240)	60 to 69A	70 to 79A	80 to 85A	86 to 90A
Set rear barrel temperature, °C (°F)	177 (350)	171 (340)	174 (345)	177 (350)
Set front barrel temperature, °C (°F)	179 (355)	171 (340)	174 (345)	177 (350)
Set nozzle temperature, °C (°F)	193 (380)	193 (380)	193 (380)	193 (380)
Expected melt temperature, °C (°F)	193 (380)	185 (365)	191 (375)	202 (395)
Stationary mold set points temperatures, °C (°F)	38 (100)	38 (100)	38 (100)	38 (100)
Moving mold set points temperatures, °C (°F)	16 (60)	16 (60)	16 (60)	16 (60)
Temperature tolerances, ± °C (°F)	10 (18)	10 (18)	10 (18)	10 (18)
Pressure first stage injection at front of screw, MPa (psi)	145 (21 000)	145 (21 000)	145 (21 000)	145 (21 000)

TABLE A2.2 Alloy Injection Molding

Conditions	Requirements			
Alloy durometer ranges (ASTM D2240)	60 to 69A	70 to 79A	80 to 85A	86 to 90A
Pressure second stage, MPa (psi)	38 (5525)	38 (5525)	38 (5525)	38 (5525)
Pressure tolerances, ± MPa (psi)	3.8 (550)	3.8 (550)	3.8 (550)	3.8 (550)
Back pressure[A]	0	0	0	0
Sprue break	OFF	OFF	OFF	OFF
Decompress	ON	ON	ON	ON
Screw speed (r/min)	200 to 250	200 to 250	200 to 250	200 to 250
Injection speed cm^3/s ($in.^3/s$)	139 (8.46)	139 (8.46)	139 (8.46)	139 (8.46)
Timers (s), initial injection first stage	0.8	0.75	0.75	0.75
± Timer tolerance (s)	0.1	0.1	0.1	0.1
Timers (s), mold second stage	7	5.5	5.5	5.5
Overall time (s)	35	35	30	30

[A] Splay on soft grades will be reduced to an acceptable level by applying minimum back pressure.

A2.13 Cut these test plaques from the sprues and runners with the side snips.

A2.14 Identify these test plaques clearly with the alloy grade and lot number.

A2.15 Store these test plaques at 23 ± 2°C (73 ± 4°F) for 16 h before testing.

A2.16 After the test plaques have been fabricated, set the equipment to manual operation.

A2.17 Empty the hopper completely of excess alloy pellets and wipe it down with a clean dry cloth.

A2.18 Draw the screw and barrel back from the mold and empty them completely of test alloy.

A2.19 When not in operation, the screw and barrel shall always be left empty with the screw in the forward position.

A2.20 When not in operation, always leave the mold almost closed but without applying clamping. When not in use for any prolonged period of time, protect the mold by spraying it with a rust preventative.

A2.21 *Precision*—The precision of this sample preparation will be determined when experience with its use has grown sufficiently to justify a cooperative study.

A2.22 *Bias*—Since there is no accepted reference material suitable for determining bias, no statement on bias is made.