



# Standard Classification System for Acrylonitrile–Styrene–Acrylate (ASA) and Acrylonitrile–EPDM–Styrene (AES) Plastics and Alloys Molding and Extrusion Materials<sup>1</sup>

This standard is issued under the fixed designation D 6865; 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 classification system covers ASA and AES materials, and ASA and AES alloys suitable for injection molding and extrusion. This classification system does not cover recycled ASA and AES materials, and recycled ASA and AES alloys.

1.2 The properties included in this standard are those required to identify the compositions covered. There may be other requirements necessary to identify particular characteristics important to specialized applications. These may be specified by using the suffixes as given in Section 5.

1.3 This classification system and subsequent line callout (specification) are intended to provide a means of calling out plastic materials used in the fabrication of end items or parts. It is not intended for the selection of materials. Material selection should be made by those having expertise in the plastic field after careful consideration of the design and the performance required of the part, the environment to which it will be exposed, the fabrication process to be employed, the costs involved, and the inherent properties of the material other than those covered by this standard.

NOTE 1—This classification system and ISO 6402 cover the same subject matter but are not technically equivalent.

1.4 The following precautionary caveat pertains only to the test method portion, Section 11, of this classification system: *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:<sup>2</sup>

D 618 Practice for Conditioning Plastics for Testing

D 883 Terminology Relating to Plastics  
D 1600 Terminology for Abbreviated Terms Relating to Plastics  
D 1999 Guide for Selection of Specimens and Test Parameters for International Commerce<sup>3</sup>  
D 3892 Practice for Packaging/Packing of Plastics  
D 4000 Classification System for Specifying Plastic Materials  
D 5630 Test Method for Ash Content in Thermoplastics  
E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications  
2.2 ISO Standards:<sup>4</sup>  
ISO 179-1 Plastics—Determination of Charpy Impact Strength—Part 1: Non-Instrumented Impact Test  
ISO 291 Plastics—Standard Atmospheres for Conditioning and Testing  
ISO 294-1 Plastics—Injection Moulding Test Specimens of Thermoplastics Materials—Part 1: General Principles, and Moulding of Multipurpose and Bar Test Specimens  
ISO 306 Plastics—Thermoplastic Materials—Determination of Vicat Softening Temperature (VST)  
ISO 527 Plastics—Determination of Tensile Properties—Part 1: General Principles and —Part 2: Test Conditions for Moulding and Extrusion Materials  
ISO 1133 Plastics—Determination of the Melt Mass Flow Rate (MFR) and the Melt Volume Flow Rate (MVR) of Thermoplastics  
ISO 3451-1 Plastics—Determination of Ash—Part 1: General Methods  
ISO 6402 Plastics—Impact-Resistant Acrylonitrile/Styrene (ASA, AES, ACS) Moulding and Extrusion materials, Excluding Butadiene-Modified Materials—Part 1: Designation System and Basis for Specification and —Part 2: Preparation of Test Specimens and Determination of Properties

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

<sup>3</sup> Withdrawn 2000.

<sup>4</sup> Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036.

### 3. Terminology

3.1 Except for the terms defined below, the terminology used in this classification system is in accordance with Terminologies D 883 and D 1600.

### 4. Classification

4.1 ASA and AES materials, and ASA and AES alloys are classified into groups according to their composition. These groups are subdivided into classes and grades as shown in Table ASA/AES.

NOTE 2—An example of this classification system is given as follows: The designation ASA0111 indicates the following:

- ASA = acrylonitrile–styrene–acrylate, as found in Terminology D 1600,
- 01 = injection molding resin (group),
- 1 = medium impact (class), and
- 1 = requirements given in Table ASA/AES (grade).

4.1.1 To facilitate incorporation of future or special materials, the “other” category for class (0), and grade (0) is shown in Table ASA/AES. The basic properties of these materials can be obtained from Table A, B, or C as they apply.

4.2 Reinforced, filled, and lubricated versions of ASA and AES materials, and ASA and AES alloys that are not in Table ASA/AES are classified in accordance with Table A, B, or C. Table ASA/AES is used to specify the group of the material and Table A, B, or C is used to specify the property requirements after the addition of reinforcements, pigments, fillers, or lubricants at the nominal level indicated (see 4.2.1).

4.2.1 Reinforced versions of the basic materials are identified by a single letter that indicates the reinforcement used and two digits that indicate the nominal quantity in percent by weight. Thus, a letter designation G for glass-reinforced for percent of reinforcement, G33, specifies a filled material with a nominal glass level of 33 %. The reinforcement letter designations and associated tolerance levels are shown in the following table:

Symbol	Material	Tolerance
C	carbon and graphite fiber reinforced	±2%
G	glass-reinforced	±2%
L	lubricants (such as PTFE, graphite, silicone, and molybdenum disulfide)	depends upon material and process—to be specified
M	mineral-reinforced	±2%
R	combinations of reinforcements or fillers, or both	±3% for total reinforcement level

NOTE 3—This part of the classification system uses the percent of reinforcements or additives, or both, in the callout of the modified basic material. The types and percentages of reinforcements and additives should be shown on the supplier’s technical data sheet unless they are proprietary in nature. If necessary, additional callout of these reinforcements and additives can be accomplished by use of the suffix part of the system (see Section 5).

4.2.2 Specific requirements for reinforced, filled, or lubricated ASA and AES materials, and ASA and AES alloys shall be shown by a six-character designation. The designation will consist of the letter “A,” “B,” or “C” and the five digits comprising the cell numbers for the property requirements in

the order as they appear in Tables A, B, or C. Although the values listed are necessary to include the range of properties available in existing materials, users should not infer that every possible combination of the properties exists or can be obtained.

4.2.3 When the grade of the basic material is not known, or is not important, the use of the “o” grade classification shall be used for the reinforced materials in this system.

NOTE 4—An example of this classification for a reinforced ASA/AES material is given as follows. The designation ASA 0120G30A55130 would indicate the following material requirements:

- ASA 0120 = Acrylonitrile-styrene-acrylate, molding resin, high impact, from Table ASA/AES,
- G30 = Glass reinforced at 30 % nominal level,
- A = Cell Table A property requirements,
- 5 = 80 MPa Tensile Stress at Yield, min,
- 5 = 7500 MPa Modulus of Elasticity in Tension, min,
- 1 = 4 kJ/m<sup>2</sup> Charpy Impact Strength of Notched Specimens, min,
- 3 = 90°C Vicat softening temperature, min, and
- 0 = unspecified

If no properties are specified, the designation would be ASA 0120G30A00000.

### 5. Suffixes

5.1 When additional requirements are needed that are not covered by the basic requirements or cell-table requirements, they shall be indicated through the use of suffixes.

5.2 A list of suffixes can be found in Classification System D 4000 (Table 3) and may be used for additional requirements as appropriate. Additional suffixes will be added to that standard as test methods and requirements are developed and requested.

### 6. General Requirements

6.1 Basic requirements from the property tables or cell tables are always in effect unless superseded by specific suffix requirements, which always take precedence.

6.2 The plastics composition shall be uniform and shall conform to the requirements specified herein.

### 7. Detail Requirements

7.1 The materials shall conform to the requirements in Tables ASA/AES, A, B, C, and suffix requirements as they apply.

7.2 For purposes of determining conformance, all specified limits for a specification (line callout) based on this classification system are absolute limits, as defined in Practice E 29.

7.2.1 With the absolute method, an observed value or a calculated value is not rounded, but is to be compared directly with the limiting value. Conformance or nonconformance is based on this comparison.

### 8. Sampling

8.1 Sampling shall be statistically adequate to satisfy the requirements of 12.4.

8.2 A batch or lot shall be constituted as a unit of manufacture as prepared for shipment and may consist of a blend of two or more “production runs.”

**TABLE ASA/AES ASA/AES Minimum Requirements**

Group	Description	Class	Description	Grade	Description	Vicat Softening Temperature, °C, ISO 306/B50	Melt Volume-Flow Rate (MVR), ISO 1133 Condition U (220°C/10kg)	Charpy Impact Strength of Notched Specimens, kJ/m <sup>2</sup> , Test Method ISO 179-1/1eA	Tensile Stress at Yield, MPa, Test Method ISO 527-2/1A/50	Modulus of Elasticity in Tension, MPa, Test Methods ISO 527-2/1A/1			
01	Injection Molding	1	medium impact	1		85	2.5	5	35	1900			
				2		85	5	5	35	1700			
				3		90	2.5	5	45	2200			
				4		90	10	7.5	40	2000			
				5		90	15	5	40	2000			
				0	other								
		2	high impact	1		85	2.5	10	30	1700			
				2		85	2.5	10	35	1700			
				0	other								
				3	high heat	1		95	2.5	5	35	2100	
						2		100	2.5	5	45	2100	
				0	other	0	other						
02	Extrusion	1	medium impact	1		85	2.5	5	35	1900			
				2		85	2.5	7.5	35	1700			
				0	other								
				2	high impact	1		85	2.5	10	30	1700	
						2		85	2.5	10	35	1700	
				0	other								
		3	high heat	1		100	2.5	5	45	2100			
				0	other	0	other						
		0	other	0	other								
03	ASA/PC or AES/PC Alloy	1	medium flow	1		105	5 <sup>A</sup>	7.5	50	2200			
				2		115	5 <sup>A</sup>	40	45	2000			
				0	other								
				2	high flow	1		110	15 <sup>A</sup>	10	50	2200	
						2		120	15 <sup>A</sup>	10	50	2100	
				0	other	0	other						
		0	other	0	other								

<sup>A</sup> All ASA/PC and AES/PC Alloys shall be tested at 260°C/5 kg.

**TABLE A Filled ASA/AES and Filled ASA/AES Alloys, Minimum Requirements**

Designation Order Number	Property	Cell Limits										
		0	1	2	3	4	5	6	7	8	9	
1	Tensile Stress at Yield, MPa, Test Method ISO 527-2/1A/5	unspecified	40	50	60	70	80	90	100	110	120	<sup>A</sup>
2	Modulus of Elasticity in Tension, MPa, Test Methods ISO 527-2/1A/1	unspecified	2000	3000	4000	5000	6000	7500	9000	11 000	13 000	<sup>A</sup>
3	Charpy Impact Strength of Notched Specimens, kJ/m <sup>2</sup> , Test Method ISO 179-1/1eA	unspecified	4	5	6	7	8	9	10	12	15	<sup>A</sup>
4	Vicat Softening Temperature, °C, ISO 306/B50	unspecified	60	70	80	900	1000	1100	1200	1300	1500	<sup>A</sup>
5	Melt Volume-Flow Rate (MVR), ISO 1133 Condition U (220°C/10 kg) <sup>B</sup>	unspecified	2	5	10	15	20	25	30	35	40	<sup>A</sup>
6	To be determined	unspecified	...	...	...	...	...	...	...	...	...	

<sup>A</sup> Specific value appears on drawing, contract, or both.

<sup>B</sup> All ASA/PC or AES/PC Alloys shall be tested at 260°C/5 kg.

**TABLE B ASA or AES, Minimum Requirements**

Designation Order Number	Property	Cell Limits										
		0	1	2	3	4	5	6	7	8	9	
1	Tensile Stress at Yield, MPa, Test Method ISO 527-2/1A/50	unspecified	15	20	25	30	35	40	45	50	60	<sup>A</sup>
2	Modulus of Elasticity in Tension, MPa, Test Methods ISO 527-2/1A/1	unspecified	1200	1400	1600	1800	2000	2200	2400	2600	3000	<sup>A</sup>
3	Charpy Impact Strength of Notched Specimens, kJ/m <sup>2</sup> , Test Method ISO 179-1/1eA	unspecified	2	5	10	15	20	25	30	35	40	<sup>A</sup>
4	Vicat Softening Temperature, °C, ISO 306/B50	unspecified	75	80	85	90	95	100	105	110	120	<sup>A</sup>
5	Melt Volume-Flow Rate (MVR), ISO 1133 Condition U (220°C/10 kg)	unspecified	2	5	10	15	20	25	30	35	40	<sup>A</sup>
6	To be determined	unspecified	...	...	...	...	...	...	...	...	...	<sup>A</sup>

<sup>A</sup> Specific value appears on drawing, contract, or both.

**TABLE C ASA or AES Alloys, Minimum Requirements**

Designation Order Number	Property	Cell Limits									
		0	1	2	3	4	5	6	7	8	9
1	Tensile Stress at Yield, MPa, Test Method ISO 527-2/1A/50	unspecified	15	20	25	30	35	40	45	50	<sup>A</sup>
2	Modulus of Elasticity in Tension, MPa, Test Methods ISO 527-2/1A/1	unspecified	1200	1400	1600	1800	2000	2200	2400	2600	<sup>A</sup>
3	Charpy Impact Strength of Notched Specimens, kJ/m <sup>2</sup> , Test Method ISO 179-1/1eA	unspecified	5	10	20	30	40	50	60	70	<sup>A</sup>
4	Vicat Softening Temperature, °C, ISO 306/B50	unspecified	50	60	70	80	90	100	110	120	<sup>A</sup>
5	Melt Volume-Flow Rate (MVR), ISO 1133 Condition U (220°C/10 kg) <sup>B</sup>	unspecified	2	5	10	15	20	25	30	35	<sup>A</sup>
6	To be determined	unspecified	...	...	...	...	...	...	...	...	<sup>A</sup>

<sup>A</sup> Specific value appears on drawing, contract, or both.

<sup>B</sup> All ASA/PC or AES/PC Alloys shall be tested at 260°C/5kg.

## 9. Specimen Preparation

9.1 The test specimens shall be injection-molded in accordance with ISO 294 using the following conditions:

	General ASA/AES	High Heat ASA/AES	ASA/PC and AES/PC Alloys
Melt temperature	250 ± 5°C	265 ± 5°C	280 ± 5°C
Mold temperature	60 ± 5°C	65 ± 5°C	75 ± 5°C
Injection velocity	200 ± 100 mm/s	200 ± 100 mm/s	200 ± 100 mm/s

## 10. Conditioning

10.1 The finished test specimens shall be conditioned and tested in a standard laboratory atmosphere of 23 ± 2°C and 50 ± 5 % relative humidity in accordance with ISO 291. Shorter conditioning times may be used if it is demonstrated that no significant differences in data occur before performing the required tests. The minimum conditioning time shall be 24 h and all test specimens shall be tested unannealed.

## 11. Test Methods

11.1 Determine the properties enumerated in this classification system by means of the test methods referenced in Section 2 using the following test parameters.

11.1.1 The Vicat softening temperature shall be determined using the center of an injection molded Type 1A or 80 by 10 by 4-mm ISO test specimen using a 50 N load and 5°C/h heating rate in accordance with ISO 306/B50.

11.1.2 The MVR shall be determined at 220°C with a 10-kg load using a sample of resin that has been dried to a moisture level of less than 0.05 % in accordance with ISO 1133 Condition U. For ASA/PC alloys, the MVR shall be determined at 260°C with a 5-kg load using a sample of resin that has been dried to a moisture level of less than 0.05 % in accordance with ISO 1133.

11.1.3 The Charpy impact strength of notched specimens shall be determined using the center of an injection molded Type 1A or 80 by 10 by 4-mm ISO test specimen with a Type A notch machined in the center and the specimen shall be tested in the edgewise position with the notched edge facing away from the hammer in accordance with ISO 179-1/1eA.

11.1.4 The tensile stress at yield of all unfilled materials shall be determined using an injection molded Type 1A ISO tensile test specimen at 50 mm/min in accordance with ISO 527-2/1A/50. The tensile stress at yield of all reinforced

materials shall be determined on a Type 1A ISO injection molding specimen at 5 mm/min in accordance with ISO 527-2/1A/5.

11.1.5 The modulus of elasticity in tension shall be determined using an injection molded Type 1A ISO tensile test specimen at 1 mm/min in accordance with ISO 527-2/1A/1.

11.1.6 The glass content of glass-reinforced materials shall be determined in accordance with ISO 3451-1.

## 12. Inspection and Certification

12.1 Inspection and certification of the material supplied under this standard specification shall be for conformance to the requirements specified herein.

12.2 Lot-acceptance inspection shall be the basis on which acceptance or rejection of the lot is made. The lot-acceptance inspection shall consist of the following tested in accordance with the parameters defined in Section 11:

12.2.1 Vicat Softening Temperature (VST), ISO 306,

12.2.2 Melt Volume Flow Rate (MVR), ISO 1133,

12.2.3 Charpy Impact Strength, ISO 179-1, and

12.2.4 Glass content of glass-reinforced materials, ISO 3451-1.

12.3 Periodic-check inspection with reference to a specification based upon this classification system shall consist of the tests for all requirements of the material under this specification. Inspection frequency shall be adequate to ensure material is certifiable in accordance with 12.4.

12.4 Certification shall be that the material was manufactured by a process in statistical control, sampled, tested and inspected in accordance with this classification system and that the average values for the lot meet the requirements of the line callout specified.

12.5 A report of the test results shall be furnished when requested. The report shall consist of results of the lot-acceptance inspection for the shipment and results of the most recent periodic-check inspection.

## 13. Packaging, Packing, and Marking

13.1 The provisions of Practice D 3892 apply to packaging, packing, and marking of containers for plastic materials.

## **14. Keywords**

14.1 acrylate; acrylonitrile; ASA; ASA alloys; ASA/PC; classification; classification system; EPDM; ethylene-propylene-diene; line callout; PC; plastic materials; plastics; polycarbonate; styrene

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