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## Standard Classification System for and Basis for Specification for Acrylonitrile–Butadiene–Styrene (ABS) Plastics and Alloys Molding and Extrusion Materials<sup>1</sup>

This standard is issued under the fixed designation D4673; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

*This standard has been approved for use by agencies of the U.S. Department of Defense.*

### 1. Scope\*

1.1 This classification system covers only ABS materials and ABS alloys suitable for injection molding and extrusion. Some of these compositions are also suitable for compression molding. ~~Recycle ABS and alloys will be addressed in a separate standard.~~

1.2 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. Materials are to be selected by personnel with expertise in the plastics field where the economics, the environment to be encountered, the inherent properties of the materials, the part design, the part performance required, and the manufacturing process to be employed all enter into the selection.

1.3 The properties included in this classification system are those required to identify the compositions covered. Other requirements necessary to identify particular characteristics important to specialized applications are addressed by using the suffixes given in Section 5. <https://www.astm.org/catalog/standards/sist/c84a596d-e849-4f02-9c5d-9b3ca6d5472a/astm-d4673-23>

1.4 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.5 The following precautionary caveat pertains only to the test methods portion, Section 12, 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, safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

~~NOTE 1—This standard and ISO 2580 address the same subject matter, but differ in technical content.~~

~~NOTE 1—This standard and ISO 19062 address the same subject matter, but differ in technical content.~~

1.6 This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

<sup>1</sup> This classification system is under the jurisdiction of ASTM Committee D20 on Plastics and is the direct responsibility of Subcommittee D20.15 on Thermoplastic Materials.

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\*A Summary of Changes section appears at the end of this standard

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

[D256 Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics](#)  
[D618 Practice for Conditioning Plastics for Testing](#)  
[D638 Test Method for Tensile Properties of Plastics](#)  
[D648 Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position](#)  
[D790 Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials](#)  
[D883 Terminology Relating to Plastics](#)  
[D1003 Test Method for Haze and Luminous Transmittance of Transparent Plastics](#)  
[D1525 Test Method for Vicat Softening Temperature of Plastics](#)  
[D1600 Terminology for Abbreviated Terms Relating to Plastics](#)  
[D3641 Practice for Injection Molding Test Specimens of Thermoplastic Molding and Extrusion Materials](#)  
[D3892 Practice for Packaging/Packing of Plastics](#)  
[D4000 Classification System for Specifying Plastic Materials](#)  
[D5630 Test Method for Ash Content in Plastics](#)  
[E29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications](#)

### 2.2 ISO Standards:<sup>3</sup>

[ISO 75-1 Plastics—Determination of Temperature of Deflection Under Load—Part 1: General Test Methods](#)  
[ISO 75-2 Plastics—Determination of Temperature of Deflection Under Load—Part 2: Plastics and Ebonite](#)  
[ISO 179 Plastics—Determination of Charpy Impact Strength of Rigid Materials Properties](#)  
[ISO 291 Plastics—Standard Atmospheres for Conditioning and Testing](#)  
[ISO 294 Plastics—Injection Moulding Test Specimens of Thermoplastics Materials](#)  
[ISO 306 Plastics—Determination of Vicat Softening Temperature \(VST\)](#)  
[ISO/DIS 527-1 Plastics—Determination of Tensile Properties—Part 1: General Principles](#)  
[ISO/DIS 527-2 Plastics—Determination of Tensile Properties—Part 2: Testing Conditions for Moulding and Extrusion Plastics](#)  
[ISO 3451-1 Plastics—Determination of Ash—Part 1: General Methods](#)  
[ISO 19062-1 Acrylonitrile-Butadiene-Styrene \(ABS\) Moulding and Extrusion Materials—Part 1: Designation System and Basis for Specifications ISO 19062-2](#)  
[ISO 19062-2 Acrylonitrile-Butadiene-Styrene \(ABS\) Moulding and Extrusion Materials, Part 2: Preparation of Test Specimens and Determination of Properties](#)  
[ISO 20753 Plastics—Test Specimens](#)

<https://standards.iteh.ai/catalog/standards/sist/c84a596d-e849-4f02-9c5d-9b3ca6d5472a/astm-d4673-23>

## 3. Terminology

3.1 *Definitions*—Definitions of technical terms used in this classification system are in accordance with Terminology [D883](#). For definitions of abbreviations used in this test method, refer to Terminology [D1600](#), unless otherwise indicated.

## 4. Classification

4.1 ABS materials, based on three or more monomers, are grouped rather than rigidly classified. These groups are then subdivided by class and then grades. In cases in which a resin meets the requirements of more than one group, the supplier will determine the specific callout(s). Table ABS has both ASTM procedure method and ISO procedure versions for callout under the preferred test system.

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

TABLE ABS ASTM/ISO Values, Requirements, Natural Color Only<sup>A</sup>

NOTE 1—For property test parameters, see Section 12.

Group	Description	Class	Description	Grade	Description	Tensile Strength, MPa, <sup>B</sup> Test Method D638/ISO 527	Modulus, MPa, Test Method Flexural D790/Tensile ISO 527	Impact		Softening; Test Method D1525, °C, 120°/h	Test Method D1525, °C, 120°/h	ISO 306, °C, 50°/h			
								Izod J/m, <sup>C</sup> Test Method D256	Charpy Temperature of Softening, KJ/m <sup>2</sup> , ISO 179, ISO 306, °C, 50°/h						
01	Molding	1	medium impact	1		45	2600	40	-	90	85				
				2		40	2400	125	6	90	85				
				3		40	2200	150	8	90	85				
				4		35	2200	80	5	90	85				
				5		32	1600	70	3	90	85				
				0	other										
				2	high impact	1		35	2100	200	13	90	85		
						2		35	2000	250	16	90	85		
						3		30	1700	275	19	90	85		
						4		30	1700	325	25	90	85		
		5				25	1500	400	30	90	85				
		6				30	1600	184	12	90	85				
		0	other												
		3	high heat	1		45	2300	100	5	115	110				
				2		40	2000	125	6	110	105				
				3		40	2400	125	6	105	100				
				4		35	2000	150	10	105	100				
				5		35	2100	80	3	105	100				
				6		34	1700	65	2	98	93				
				7		32	1800	50	-	105	100				
				0	other										
		4	plating <sup>F</sup>	1		45	2500	150	8	105	100				
				2		40	2600	80	3	105	100				
				3		40	2200	200	13	100	95				
				4		35	2000	200	13	95	90				
				5		34	2200	80	3	93	88				
				0	other										
				5	clear <sup>F</sup>	1		40	2300	80	3	85	80		
						0	other								
				6	additive FR <sup>G</sup>	1		40	2200	200	13	85	80		
2						40	2000	150	8	85	80				
3		35	2400			80	3	90	85						
4		30	2000			150	8	90	85						
5		25	1800			80	3	85	80						
0	other														
02	Extrusion	1	medium impact	0	other										
				1		50	2600	80	3	95	90				
				2		45	2400	80	3	90	85				
				3		40	2200	150	8	90	85				
				4		40	2000	80	3	90	85				
				5		35	2200	125	6	90	85				
				0	other										
				2	high impact	1		35	2400	200	13	90	85		
						2		35	2200	325	25	90	85		
						3		30	2000	275	19	90	85		
		4				30	2000	360	28	90	85				
		5				25	1800	400	30	90	85				
		6		25	1800	440	34	90	85						
		3	FR	1		40	2300	280	19	90	85				
				2		35	2000	275	19	90	85				
3				35	2000	210	17	85	80						
03	Alloys ABS/PVC	1	other	0	other										
				1		50	2700	80	5	100	95				
				2		40	1800	200	13	90	85				
				3		40	1800	275	19	80	75				
				4		35	2000	400	30	70	65				
				5		50	2100	440	34	110	105				
				6		35	2000	475	38	70	65				
				7		45	2400	200	13	80	75				
				0	other										
				04	Alloys ABS/PC	1	medium impact	0	other						
		1						55	2200	360	28	115	110		
		2						55	2400	325	25	110	105		
						3		50	2200	275	21	120	115		

Group	Description	Class	Description	Grade	Description	Tensile Strength, MPa, <sup>B</sup> Test Method D638/ ISO 527	Modulus, MPa, Test Method Flexural D790/ Tensile ISO 527	Impact		Softening; Test Method D1525, °C, 120°/h or Softening Temperature °C, 50°/h	Test Method D1525, °C, 120°/h	ISO 306, °C, 50°/h
								Izod J/m, <sup>C</sup> Test Method D256	Charpy J/m, <sup>D</sup> ISO 179 ISO 306			
				4		45	2100	275	21	110	105	
				5		40	1900	70	3	105	100	
		2	high impact	0	other							
				1		55	2400	400	30	125	120	
				2		50	2300	400	30	115	110	
				3		50	2200	475	39	125	120	
				4		48	2100	275	21	110	105	
				5		45	2000	255	19	119	114	
				0	other							
		3	high heat	1		60	2400	275	21	140	135	
				2		55	2400	400	30	130	125	
				3		55	2000	500	41	125	120	
				4		50	2300	360	28	135	130	
				5		45	2100	600	50	130	125	
				6		45	2000	325	25	128	123	
				7		45	2000	325	25	119	114	
				0	other							
		4	plating	1		50	2300	440	36	130	125	
				2		45	2200	400	30	120	115	
				3		45	2100	360	28	110	105	
				0	other							
		5	additive FR	1		60	2400	125	6	110	105	
				2		55	2400	200	13	110	105	
				3		55	2400	400	30	90	85	
				4		50	2000	440	36	110	105	
				5		45	2100	275	21	110	105	
				6		40	2000	440	36	110	105	
				0	other							
		0	other	0	other							

<sup>A</sup>All cell values are minimums.

<sup>B</sup>MPa × 145 = psi.

<sup>C</sup>J/m × 18.73 × 10<sup>-3</sup> = ft-lbf/in.

<sup>D</sup>kJ/m<sup>2</sup> × 0.476 = ft-lbf/in.<sup>2</sup>. Test configuration 1aE.

<sup>E</sup>Plating grades are those specifically recommended for plating or sputtering applications.

<sup>F</sup>Clear ABS has a light transmission of 70 % minimum. Test Method D1003 is allowed to be used.

<sup>G</sup>Specific flammability requirements shall be specified by the user.

NOTE 2—An example of this classification system is as follows:

The designation ABS0111 would indicate:

- ABS = acrylonitrile–butadiene–styrene,
- 01 (group) = injection-molding resin,
- 1 (class) = medium impact, and
- 1 (grade) = requirements given in Table ABS.

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

4.2 Reinforced and lubricated versions of the ABS materials are classified in accordance with Table ABS and Cell Table A or where Cell Table A does not reflect the required properties of the ABS material, Cell Table B. Table ABS specifies the unreinforced material and Cell Table A specifies the properties by either ASTM or ISO procedures after the addition of reinforcements or lubricants at the nominal level indicated.

4.2.1 A single letter shall be used for the major reinforcement or combination, or both, along with two digits that indicate the percentage of addition by mass, with the tolerance as seen in Table 1.

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

**TABLE 1 Reinforcement-Filler<sup>A</sup> Symbols<sup>B</sup> and Tolerances**

Symbol	Material	Tolerance
C	Carbon- and graphite-fiber reinforced	±2 %
G	Glass-reinforced	±2 %
L	Lubricants (for example, PTFE), graphite, silicone and molybdenum disulfide	depends on material and process—to be specified
M	Mineral-reinforced	±2 %
R	Combinations of reinforcements or fillers, or both	±3 % for the total reinforcement

<sup>A</sup>Ash content of filled, or reinforced material, or both, is determined using either Test Method D5630 or ISO 3451-1 where applicable.

<sup>B</sup>Additional symbols will be added to this table as required.

4.2.2 Specific requirements for reinforced, filled, or lubricated materials shall be shown by a six-character designation. The designation shall consist of the letter A and the five digits comprising the cell numbers for the property requirements in the order in which they appear in Cell Table A.

**CELL TABLE A Reinforced ABS/Alloys  
(For property test parameters, see Section 12.)**

Designation Grade	Property	Cell Limits									
		0	1	2	3	4	5	6	7	8	9
1	Tensile strength, MPa <sup>A</sup> , min	unspecified	40	50	60	70	80	90	100	110	<sup>B</sup>
	Test Method <b>D638</b> ISO 527, 1, 2	unspecified	40	50	60	70	80	90	100	110	<sup>B</sup>
2	Modulus, MPa, min	unspecified	3000	4000	5000	6000	7500	9000	11 000	15 000	<sup>B</sup>
	Test Methods <b>D790</b> , Flexural ISO 527 Tensile, chord	unspecified	3000	4000	5000	6000	7500	9000	11 000	15 000	<sup>B</sup>
3	Impact, min	unspecified	30	45	60	75	90	105	120	140	<sup>B</sup>
	Test Method <b>D256</b> , Izod, J/m <sup>C</sup> ISO 179, Charpy, kJ/m <sup>2D</sup>	unspecified	2	3	4	5	6	7	8	10	<sup>B</sup>
4	Heat deflection temperature, °C, min	unspecified	65	85	90	95	100	105	110	115	<sup>B</sup>
	Test Method <b>D648</b> ISO 75	unspecified	65	85	89	94	98	103	108	112	<sup>B</sup>
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...

<sup>A</sup>MPa × 145 = psi.

<sup>B</sup>To be specified.

<sup>C</sup>J/m × 18.73 × 10<sup>-3</sup> = ft·lbf/in.

<sup>D</sup>kJ/m<sup>2</sup> × 0.476 = ft·lbf/in<sup>2</sup>. Test configuration 1aE.

**CELL TABLE B Unreinforced ABS  
(For property test parameters, see Section 12.)**

Designation Grade	Property	Cell Limits									
		0	1	2	3	4	5	6	7	8	9
1	Tensile strength, MPa <sup>A</sup> , min	unspecified	20	25	30	35	40	45	50	55	<sup>B</sup>
	Test Method <b>D638</b> ISO 527, 1, 2	unspecified	20	25	30	35	40	45	50	55	<sup>B</sup>
2	Modulus, MPa, min	unspecified	1400	1600	1800	2000	2200	2400	2600	2800	<sup>B</sup>
	Test Methods <b>D790</b> , Flexural ISO 527, Tensile, chord	unspecified	1400	1600	1800	2000	2200	2400	2600	2800	<sup>B</sup>
3	Impact, min	unspecified	30	100	150	200	250	300	350	400	<sup>B</sup>
	Test Method <b>D256</b> , Izod, J/m <sup>C</sup> ISO 179, Charpy, kJ/m <sup>2D</sup>	unspecified	1	5	9	13	19	22	25	30	<sup>B</sup>
4	Softening temperature, °C, min	unspecified	75	90	95	100	105	110	115	120	<sup>B</sup>
	Test Method <b>D1525</b> ISO 306	unspecified	70	85	90	95	100	105	110	115	<sup>B</sup>
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...

<sup>A</sup>MPa × 145 = psi.

<sup>B</sup>To be specified.

<sup>C</sup>J/m × 18.73 × 10<sup>-3</sup> = ft·lbf/in.

<sup>D</sup>kJ/m<sup>2</sup> × 0.476 = ft·lbf/in<sup>2</sup>. Test configuration 1aE.

4.2.2.1 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 “0” grade classification shall be used for reinforced materials in this system.

NOTE 4—An example of this classification for a reinforced ABS is as follows: THE DESIGNATION ABS 120G30A55130 INDICATES:

- ABS 120 = Acrylonitrile-butadiene-styrene, molding resin, high impact
- G30 = Glass reinforced at 30 % nominal level,
- A = Cell Table A, property requirements,
- 5 = 80 MPa tensile strength, min,
- 5 = 7500 MPa flexural modulus, **D790**, or tensile modulus, chord, ISO 527, min,
- 1 = 30 J/m Izod or 2 kJ/m<sup>2</sup> Charpy impact strength, min,
- 3 = 90°C heat deflection temperature, **D648**, 89°C, ISO 75 min, and
- 0 = unspecified.

If no properties are specified, the designation would be ABS 120G30A00000.

4.3 Cell Table B has been incorporated into this classification system to facilitate the classification of special materials where Table ABS or Cell Table A does not reflect the required properties of ABS material. Cell Table B shall be used in the same manner as Cell Table A.

NOTE 5—An example of a special material using this classification system is as follows: THE DESIGNATION ABS 210B54220 WOULD INDICATE THE FOLLOWING, WITH THE MATERIAL REQUIREMENTS FROM CELL TABLE B:

- ABS 210 = Acrylonitrile-butadiene-styrene, extrusion resin, medium impact,
- B = Cell Table B property requirements,
- 5 = 40 MPa tensile strength, min,
- 4 = 2000 MPa Flexural modulus, **D790**, or tensile modulus, chord, ISO 527, min,
- 2 = 100 J/m Izod impact or 5 kJ/m<sup>2</sup> Charpy impact strength, min,
- 2 = 90°C vicat softening point, **D1525** or 85°C, ISO 306, min, and
- 0 = unspecified.

NOTE 6—Mechanical properties of pigmented or colored ABS or alloy materials can differ from the mechanical properties of natural ABS or alloy material, depending on the choice and concentration of colorants. The main property affected is ductility, as illustrated by a reduction in Izod impact strength and tensile-elongation values. If specific properties of pigmented ABS or alloy materials are necessary, prior testing between the materials supplier and end user should be initiated.

**CELL TABLE C Unreinforced ABS Alloy**  
(For property test parameters, see Section 12.)

Designation Grade	Property	Cell Limits										
		0	1	2	3	4	5	6	7	8	9	
1	Tensile strength, MPa <sup>A</sup> , min											
	Test Method <b>D638</b>	unspecified	30	35	40	45	50	55	60	65	<sup>B</sup>	
	ISO 527, 1, 2	unspecified	30	35	40	45	50	55	60	65	<sup>B</sup>	
2	Modulus, MPa, min											
	Test Methods <b>D790</b> , Flexural	unspecified	1600	1800	2000	2200	2400	2600	2800	3000	<sup>B</sup>	
	ISO 527, Tensile, chord	unspecified	1600	1800	2000	2200	2400	2600	2800	3000	<sup>B</sup>	
3	Impact, min											
	Test Method <b>D256</b> , Izod, J/m <sup>C</sup>	unspecified	100	200	300	350	450	500	550	600	<sup>B</sup>	
	ISO 179, Charpy, kJ/m <sup>2D</sup>	unspecified	5	13	22	28	36	41	46	50	<sup>B</sup>	
4	Softening temperature, °C, min											
	Test Method <b>D1525</b>	unspecified	70	80	90	100	110	120	130	140	<sup>B</sup>	
	ISO 306	unspecified	65	75	85	95	105	115	125	135	<sup>B</sup>	
5	To be determined	unspecified	...	...	...	...	...	...	...	...	...	

<sup>A</sup>MPa × 145 = psi.

<sup>B</sup>To be specified.

<sup>C</sup>J/m × 18.73 × 10<sup>-3</sup> = ft-lbf/in.

<sup>D</sup>kJ/m<sup>2</sup> × 0.476 = ft-lbf/in<sup>2</sup>. Test configuration 1aE.

4.4 Cell Table C has been incorporated into this specification to facilitate the classification of ABS alloy materials where Table ABS or Table B do not reflect the necessary properties. Cell Table C shall be used in the same manner as Cell Table A or B.

NOTE 7—AN EXAMPLE OF AN ABS ALLOY USING THIS CLASSIFICATION SYSTEM IS AS FOLLOWS: THE DESIGNATION ABS 0420C4665 WOULD INDICATE THE FOLLOWING, WITH THE MATERIAL REQUIREMENTS FROM CELL TABLE C:

ABS 0420 = Acrylonitrile-butadiene-styrene polycarbonate alloy, high impact,  
 C = Cell Table C property requirements,  
 4 = 45 MPa tensile strength, min, Test Method D638 or ISO 527, 1 and 2,  
 6 = 2600 MPa flexural modulus, in Test Methods D790 or tensile modulus, chord, ISO 527,  
 6 = 500 J/m Izod impact strength, min, Test Method D256, or 41 kJ/m<sup>2</sup> Charpy impact strength, min, ISO 179,  
 5 = 110°C vicat softening point, 120°C/h or 105°C at 50°C/h, and  
 0 = unspecified.

## 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 D4000 (Table 3) and are to 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. Basic Requirements

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

## 7. General Requirements

7.1 The material composition shall be uniform and shall conform to the requirements specified herein. Specification changes due to the effects of colorants shall be noted by both the materials supplier and the end user and, where necessary, shall be covered by suffixes.

## 8. Detail Requirements

8.1 Test specimens and testing parameters for the materials shall conform to the requirements prescribed in Table ABS, Cell Table A, B, and C, and suffix requirements as they apply.

8.2 For the purpose of determining conformance, all specified limits for a specification (line callout) based on this classification system are absolute limits, as defined in Practice E29.

8.3 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.

NOTE 8—Specimen dimensions and specific test procedure requirement for ISO test methods are found in Section 12.

## 9. Sampling

9.1 Sampling shall be statistically adequate to satisfy the requirements of 13.4.

9.2 A batch or lot is construed as a unit of manufacture as prepared for shipment and can consist of a blend of two or more “production runs.”

## 10. Specimen Preparation

10.1 The test specimens shall be molded by the injection process using procedures from Practice D3641 or ISO 294 as a guide. It is recommended the resin be dried from 2 to 4 h at 80°C for ABS resins or 100°C for ABS/PC alloy resins.