



Designation: D1765 – 23a

Standard Classification System for Carbon Blacks Used in Rubber Products¹

This standard is issued under the fixed designation D1765; 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.

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

1. Scope

1.1 This classification system covers the classification of rubber-grade carbon blacks by the use of a four-character nomenclature system. The first character gives some indication of the influence of the carbon black on the rate of cure of a typical rubber compound containing the black. The second character gives information on the average surface area of the carbon black. The last two characters are assigned arbitrarily.

1.2 All rubber-grade carbon blacks for which a number is currently assigned at the time of publication of this classification system are listed in **Table 1** together with some of their typical properties. ASTM classification numbers (“N” or “S” designation) not listed in **Table 1** have either been withdrawn or are not currently assigned. The use of inactive or unassigned N or S designations is prohibited until such a time as the designation is officially reactivated or assigned by Subcommittee D24.41

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

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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.5 *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.*

¹ This classification system is under the jurisdiction of ASTM Committee D24 on Carbon Black and is the direct responsibility of Subcommittee D24.41 on Carbon Black Nomenclature and Terminology.

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2. Referenced Documents

2.1 ASTM Standards:²

- D1508 Test Method for Carbon Black, Pelleted Fines and Attrition
- D1510 Test Method for Carbon Black—Iodine Adsorption Number
- D1513 Test Method for Carbon Black, Pelleted—Pour Density
- D1514 Test Method for Carbon Black—Sieve Residue
- D2414 Test Method for Carbon Black—Oil Absorption Number (OAN)
- D3053 Terminology Relating to Carbon Black
- D3265 Test Method for Carbon Black—Tint Strength
- D3493 Test Method for Carbon Black—Oil Absorption Number of Compressed Sample (COAN)
- D6556 Test Method for Carbon Black—Total and External Surface Area by Nitrogen Adsorption
- D7854 Test Method for Carbon Black-Void Volume at Mean Pressure

3. Basis of Classification

3.1 The first character in the nomenclature system for rubber-grade carbon blacks is a letter indicating the effect of the carbon black on the cure rate of a typical rubber compound containing the black. The letter “N” is used to indicate a normal curing rate typical of furnace blacks that have received no special modification to alter their influence on the rate of cure of rubber. The letter “S” is used for channel blacks or for furnace blacks that have been modified to effectively reduce the curing rate of rubber. Channel blacks characteristically impart a slower rate of cure to rubber compounds. Thus, the letter “S” designates a slow cure rate. Blacks may vary considerably in “curing rate” within each of the two letter classifications.

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.

TABLE 1 Carbon Black Properties

NOTE 1—The iodine adsorption number and oil absorption number values represent target values. A target value is defined as an agreed upon value on which producers center their production process and users center their specifications. All other properties shown are averages of typical values supplied by several manufacturers. Typical properties are dependent upon the target values and may vary from producer to producer at the same iodine adsorption and oil absorption numbers because of the differences in processing equipment.

ASTM Classification	Target Values ^A		Typical Descriptive Values ^A				
	Iodine Adsorption No., ^B D1510, g/kg (mg/g)	Oil Absorption No. D2414, 10 ⁻⁵ m ³ /kg (cm ³ /100 g)	Oil Absorption No. Compressed Sample, D3493, 10 ⁻⁵ m ³ /kg (cm ³ /100 g)	NSA Multipoint D6556, 10 ³ m ² /kg (m ² /g)	STSA D6556 10 ³ m ² /kg (m ² /g)	Tint Strength, D3265 %ITRB	Pour Density, D1513, kg/m ³ (lb/ft ³)
N110	145	113	97	127	115	123	345 (21.5)
N115	160	113	97	137	124	123	345 (21.5)
N120	122	114	99	126	120	129	345 (21.5)
N121	121	132	111	122	114	119	320 (20.0)
N125	117	104	89	122	121	125	370 (23.0)
N134	142	127	103	143	137	131	320 (20.0)
N135	151	135	117	141	...	119	320 (20.0)
N219	118	78	75	123	440 (27.5)
N220	121	114	98	114	106	116	355 (22.0)
N231	121	92	86	111	107	120	400 (25.0)
N234	120	125	102	119	112	123	320 (20.0)
N293	145	100	88	122	111	120	380 (23.5)
N299	108	124	104	104	97	113	335 (21.0)
N326	82	72	68	78	76	111	455 (28.5)
N330	82	102	88	76	75	104	380 (23.5)
N335	92	110	94	85	85	110	345 (21.5)
N339	90	120	99	91	88	111	345 (21.5)
N343	92	130	104	96	92	112	320 (20.0)
N347	90	124	99	85	83	105	335 (21.0)
N351	68	120	95	71	70	100	345 (21.5)
N356	92	154	112	91	87	106	...
N358	84	150	108	80	78	98	305 (19.0)
N375	90	114	96	93	91	114	345 (21.5)
N539	43	111	81	39	38	...	385 (24.0)
N550	43	121	85	40	39	...	360 (22.5)
N630	36	78	62	32	32	...	500 (31.0)
N642	36	64	62	39
N650	36	122	84	36	35	...	370 (23.0)
N660	36	90	74	35	34	...	440 (27.5)
N683	35	133	85	36	34	...	355 (22.0)
N750	27	120	81	27	26	...	360 (22.5)
N754	24	58	57	25	24
N762	27	65	59	29	28	...	515 (32.0)
N765	31	115	81	34	32	...	370 (23.0)
N772	30	65	59	32	30	...	520 (32.5)
N774	29	72	63	30	29	...	490 (30.5)
N787	30	80	70	32	32	...	440 (27.5)
N907	...	34	...	9	9	...	640 (40.0)
N908	...	34	...	9	9	...	355 (22.0)
N990	...	38	37	8	8	...	640 (40.0)
N991	...	35	37	8	8	...	355 (22.0)

^A See note above. See also Terminology D3053.

^B In general, Test Method D1510 can be used to estimate the surface area of furnace blacks but not channel, oxidized, and thermal blacks.

^C New numbers are marked to designate that the requestor has a one-year period, starting from the number's approval date as shown in Footnote 1, to revise, by letter ballot, target and typical values.

3.2 The second character in the system is a digit to designate the average surface area of the carbon black as measured by nitrogen surface area. The surface area range of the carbon blacks has been divided into ten arbitrary groups, and each has been assigned a digit to describe that group. These groups are as follows:

Group No.	Average Nitrogen Surface Area, m ² /g
0	>150
1	121 to 150
2	100 to 120
3	70 to 99
4	50 to 69
5	40 to 49
6	33 to 39
7	21 to 32
8	11 to 20
9	0 to 10

NOTE 1—Some of the carbon blacks in Table 1 were assigned prior to the establishment of the surface area classification system and may fall outside of the specified ranges.

3.3 The third and fourth characters in this system are arbitrarily assigned digits.

4. Typical Properties of Carbon Blacks

4.1 Each of the standard grades of carbon black shall have target and typical physical properties prescribed in Table 1.

4.2 The properties enumerated shall be determined in accordance with the ASTM test methods shown in Table 1.

4.3 The following carbon black properties are not included in Table 1 but do have previously established maximum values.

4.3.1 *Sieve Residue*—Test Method D1514. Screen sizes 500 μm (No. 35), maximum 10 mg/kg (ppm), and 45 μm (No. 325), maximum 1000 mg/kg (ppm) for all grades.

4.3.2 *Fines*—Test Method D1508. Screen size 125 μm (No. 120). Maximum 7 % fines on bulk units for all grades except thermal blacks. The 5-min fines test shall be used, and samples shall be taken from sample ports.

4.4 The typical values shown in Table 1 are consensus values based on input from the various carbon black producers. Typical values often vary between suppliers; therefore, the range of data used to define the typical values is shown in A1.2. These ranges in no way should be viewed as being related to specification ranges.

4.5 In order to aid in the development of test properties (for example, Void Volume, see Test Method D7854), consensus values for select N grade carbon blacks can be found at the membership area for Committee D24 (<https://member.astm.org/MyASTM/MyCommittees/CommitteeDocument>) under ‘Property Under Evaluation Void Volume.’

5. Procedures for Classifying a New Carbon Black

5.1 Data for classification of a new grade of carbon black are to be submitted to ASTM Headquarters, to the attention of

the chairman of Subcommittee D24.41 on Carbon Black Nomenclature and Terminology.

5.2 Data to be submitted shall consist of typical values for the following:

Property	Test Procedure
Nitrogen adsorption, total and external surface area	D6556
Oil absorption number, compressed sample	D3493
Tint strength (tread grades only)	D3265
Pour density	D1513

5.3 Data to be submitted shall consist of target values for the following properties:

Property	Test Procedure
Iodine number	D1510
Oil absorption number	D2414

5.4 When the chairman of Subcommittee D24.41 receives a request to assign a classification number to a new carbon black, the following action is taken:

5.4.1 Confirmation that the new carbon black meets the scope of Committee D24.

5.4.2 Confirmation that the new carbon black is commercially available.

5.4.3 Establishment of the “N” or “S” first character assignment and the second character (number) assignment based upon the data submitted with the request.

5.4.4 Establishment of the third and fourth character (number) assignments based upon the information from the requestor. Without specific information from the requestor, these characters are arbitrarily assigned by the chairman of Subcommittee D24.41.

5.4.5 A classification number that has been approved by Subcommittee D24.41 is no longer available for assignment, regardless of its status as active or withdrawn. Table 1 lists the active designation numbers. The following designations are classified as inactive and unavailable for reassignment:

N119	N155	N166	N195	S212	N230	N242	N270
N285	N294	N296	S300	S301	S315	N327	N332
N341	N345	N363	N367	N440	N472	N542	N568
N582	N601	N724	N741	N761	N770	N779	N785
N790	N880	N881					

5.4.6 Target and typical values for a new standard, noted by Footnote C in Table 1, are often based upon samples taken from a limited number of production runs. These table values may change slightly when the sample results taken over a longer period are pooled. The requestor of a new standard grade may pursue a revision of the table values by letter ballot during the first year of publication to utilize the additional pooled data. Changes to the table after the first year of publication would normally require the assignment of a new ASTM designation.

6. Keywords

6.1 carbon black; classification of carbon blacks; industry reference blacks; typical properties of carbon black types