



Designation: D8043 – 20

## Standard Guide for Carbon Black—Shelf Life<sup>1</sup>

This standard is issued under the fixed designation D8043; 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.

### 1. Scope

1.1 This guide defines the shelf life of carbon black.

1.2 *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.*

### 2. Referenced Documents

2.1 *ASTM Standards:*

[D1509 Test Methods for Carbon Black—Heating Loss](#)

[D1510 Test Method for Carbon Black—Iodine Adsorption Number](#)

[D4821 Guide for Carbon Black—Validation of Test Method Precision and Bias](#)

[D6915 Practice for Carbon Black—Evaluation of Standard Reference Blacks](#)

### 3. Significance and Use

3.1 This guide defines the shelf life of carbon black when stored under proper conditions.

### 4. Carbon Black Shelf Life

4.1 In accordance with Practice [D6915](#), the shelf life of Standard Reference Blacks (SRBs) is defined as indefinite when stored in a manner that protects it from liquid water or

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee [D24](#) on Carbon Black and is the direct responsibility of Subcommittee [D24.67](#) on Sustainability.

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high humidity environments. The only two properties of carbon black known to change over time are moisture (Test Methods [D1509](#)) and Iodine Number (Test Method [D1510](#)). The moisture content can change over the short-term (weeks or months), depending on the ambient humidity and the surface area of the carbon black, see [4.4](#). Iodine Number can change over an extended period (years) due to a slow increase in the oxygen content on the surface of the carbon black. This phenomenon is primarily observed with tread grades (N100 – N300 series) and other high surface area carbon blacks, and manifests itself by a slowly decreasing Iodine Number, although the actual surface area of the carbon black remains unchanged. For more details about the aging effect on iodine number, see subsection 5.1.1 of Guide [D4821](#).

4.2 The same reasoning for the shelf life of SRBs extends to commercial carbon black. It should be noted that the slight change in Iodine Number over an extended period does not affect actual surface area properties and in-rubber performance of the carbon black.

4.3 The in-rubber properties of a wide range of carbon black grades have shown no significant change over a 4 year period, see [Table 1](#) and [Table 2](#).

4.4 In cases where the carbon black moisture level has increased over time, heating the carbon black at 125°C for an adequate amount of time will remove the moisture and render the material fit for use.

4.5 Based on studies by ASTM Committee [D24](#), the shelf life of carbon black is indefinite.

### 5. Keywords

5.1 carbon black; shelf life

**TABLE 1 In-Rubber Properties of Tread Grade Carbon Blacks Over a 4 Year Period**

ASTM D3192 (NR)			N115					N234					N330				
			Absolute		ΔIRB-8		Diff in ΔIRB values	Absolute		ΔIRB-8		Diff in ΔIRB values	Absolute		ΔIRB-8		Diff in ΔIRB values
Unit	2011	2015	2011	2015	2011	2015		2011	2015	2011	2015		2011	2015	2011	2015	
Viscosity	ML 1 + 4	–	83	79	9	11	2	84	81	12	13	1	72	68	–2	0	2.0
Cure Data	Δmin	dNm	3.8	3.6	0.6	0.9	0.3	3.7	3.4	0.6	0.7	0.1	2.9	2.7	–0.3	0.0	0.3
	Δmax	dNm	18.8	19.2	0.3	1.3	1.0	20.2	20.4	1.7	2.5	0.8	19.1	18.3	0.4	0.4	0.0
	Δmax-Δmin	dNm	15.0	15.6	–0.3	0.4	0.7	16.5	17.0	1.0	1.7	0.7	16.3	15.6	0.7	0.4	–0.3
	t10%	min	3.2	3.4	0.4	0.6	0.2	2.6	2.5	–0.3	–0.2	0.1	2.7	3.0	–0.2	0.2	0.4
	t90%	min	34.9	30.5	1.6	4.7	3.1	29.5	23.9	–4.2	–1.8	2.4	31.0	24.7	–2.8	–1.1	1.7
Mooney scorch	t5	min	16.2	16.7	2.8	4.2	1.4	11.5	11.5	–2.1	–1.1	1.0	13.9	13.4	0.5	0.9	0.4
	t35	min	21.4	21.1	4.0	5.0	1.0	14.9	14.5	–2.8	–1.6	1.2	17.6	17.0	0.3	0.9	0.6
Stress-strain	M300%	MPa	9.2	10.3	–3.6	–3.4	0.2	12.9	14.0	–0.2	0.4	0.6	12.9	13.4	0.2	–0.2	–0.4
	EaB	%	560	560	85	95	10	470	450	–15	–15	0	470	500	0	35	35
	Tensile	MPa	20.1	21.6	–0.5	0.5	1.0	21.0	20.9	–0.9	–0.2	0.7	20.6	22.1	0.3	1.0	0.7
	Shore A	–	64	67	–1.5	0.5	2.0	68	70	2	4	2	66	66	0	0	0.0
Dispersion	no. of peaks	–	67	24	26	12	–14	68	23	43	11	–32	51	13	1	1	0
	peak area	%	2.8	0.8	1.1	0.6	–0.5	2.4	0.6	1.6	0.4	–1.2	2.4	0.4	0.2	0.2	0.0
RPA	tan δ 60°C	–	0.25	0.27	0.04	0.05	0.01	0.23	0.25	0.02	0.03	0.01	0.19	0.22	–0.01	0.00	0.01
	G*	MPa	1.71	1.70	0.03	0.09	0.06	1.96	1.94	0.29	0.33	0.04	1.76	1.68	0.04	0.07	0.03
	M300%	psi	1081	1210	–423	–394	29	1515	1645	–23	41	64	1515	1574	23	–29	–52
	rel. to IRB-8	%	526	526	80	89	9	442	423	–14	–14	0	442	470	0	33	33
	Tensile	psi	2799	3008	–70	70	140	2924	2910	–125	–28	97	2868	3077	42	139	97

**TABLE 2 In-Rubber Properties of Carcass Grade Carbon Blacks Over a 4 Year Period**

ASTM D3192 (NR)			N550					N660				
			Absolute		ΔIRB-8		Diff in ΔIRB values	Absolute		ΔIRB-8		Diff in ΔIRB values
Unit	2011	2015	2011	2015	2011	2015		2011	2015	2011	2015	
Viscosity	ML 1 + 4	–	68	60	–6	–8	–2	61	54	–14	–14	0
Cure Data	Δmin	dNm	2.5	2.0	–0.7	–0.7	0.0	2.2	1.8	–0.9	–0.9	0.0
	Δmax	dNm	17.1	17.1	–1.3	–0.9	0.4	15.3	14.7	–3.4	–3.2	0.2
	Δmax-Δmin	dNm	14.6	15.0	–0.5	–0.2	0.3	13.2	12.9	–2.5	–2.3	0.2
	t10%	min	3.1	3.1	0.2	0.3	0.1	4.0	3.8	1.3	1.1	–0.2
	t90%	min	29.0	21.6	–4.4	–4.2	0.2	33.3	24.1	1.2	–1.7	–2.9
Mooney scorch	t5	min	13.8	13.3	0.6	0.8	0.2	21.0	18.4	7.4	5.9	–1.5
	t35	min	17.7	17.3	0.5	1.2	0.7	26.8	24.0	9.2	7.9	–1.3
Stress-strain	M300%	MPa	12.9	13.6	–0.2	0.0	0.2	11.5	12	–1.1	–1.7	–0.6
	EaB	%	480	470	–10	5	15	480	490	20	25	5
	Tensile	MPa	19.8	20.2	–1.6	–0.9	0.7	18.6	20.0	–1.4	–1.1	0.3
	Shore A	–	65	67	–1	0.5	1.5	61	62	–4	–5	–1
Dispersion	no. of peaks	–	4	4	–40	–8	32	12	6	12	–18	–30
	peak area	%	0.0	0.1	–1.6	–0.2	1.4	0.4	0.1	0.2	–0.6	–0.8
RPA	tan δ 60°C	–	0.14	0.16	–0.06	–0.06	0.00	0.13	0.14	–0.08	–0.08	0.00
	G*	MPa	1.58	1.47	–0.10	–0.14	–0.04	1.25	1.21	–0.43	–0.40	0.03
	M300%	psi	1515	1598	–18	–6	12	1351	1410	–123	–194	–71
	rel. to IRB-8	%	451	442	–9	5	14	451	461	19	24	5
	Tensile	psi	2757	2813	–216	–125	91	2590	2785	–188	–153	35

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