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SPECIFICATION FOR INTERMEDIATE SUPER ABRASION FURNACE (ISAF) CARBON BLACK

(First Revision)

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Indian Standard

SPECIFICATION FOR INTERMEDIATE SUPER ABRASION FURNACE (ISAF) CARBON BLACK

(First Revision)

0. FOREWORD

0.1 This Indian Standard (First Revision) was adopted by the Indian Standards Institution on 4 August 1986, after the draft finalized by the Rubber Proucts Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 Carbon blacks are added to rubber to develop physical strength properties and are, therefore, commonly known as reinforcing agents.

0.3 This standard covers the requirements for three grades of intermediate super abrasion furnace carbon black, namely ISAF-HM, ISAF-LM and ISAF-LS, used by the rubber industry which have been given the nomenclature N220, N231 and N219 respectively by the American Society for Testing and Materials.

0.4 This standard was first published in 1976. In this revision, Industry Reference Black (IRB) No. 5 has been included as reference black instead of IRB No. 3 for measuring physical properties of the vulcanizate. Also, the requirement for benzene discoloration has been substituted by toluene discoloration and certain other requirements like acetone extract, sulphur content and *p*H of water extract have been deleted.

0.5 This standard contains clauses **3.2** and **3.4** which call for agreement between the purchaser and the supplier.

0.6 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance wlth IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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*Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements and the methods of sampling and test for intermediate super abrasion furnace (ISAF) carbon black for use in rubber industry.

2. GRADES

2.1 Three grades of intermediate super abrasion furnace carbon black have been covered by this specification which are designated as follows:

a) ISAF-HM Intermediate Super Abrasion Furnace — High Modulus – Carbon Black (N220).

b) ISAF-LM Intermediate Super Abrasion Furnace — Low Modulus — Carbon Black (N231).

c) ISAF-LS Intermediate Super Abrasion Furnace — Low Structure — Carbon Black (N219).

3. REQUIREMENTS

3.1 The material shall be free from foreign matter and any visible impurities.

3.2 Pelletization — The material shall be delivered in pelletized form. Pellet hardness shall be controlled to such a degree that satisfactory dispersion is obtained on its being compounded using standard mixing equipment as desired by the purchaser.

3.2.1 *Pellet Size Distribution* — Pellet size distribution shall be subject to agreement between the purchaser and the supplier.

3.3 The material shall also comply with the requirements given in Table 1.

3.4 Compounding — If desired by the purchaser, the material shall be compounded in natural rubber test recipe following the procedure given in Appendix A and the properties of carbon black assessed relative to IRB No. 5.

4. PACKING AND MARKING

4.1 The material shall be supplied in bags. The net mass of each bag shall be 25·0 ± 0·5 kg. The bags shall be shaped to facilitate stacking of pellets.

4.2 Marking — The packages shall be marked with the name of the manufacturer, net mass, month and year of manufacture, batch number if any, grade identification and shall have orange colour as colour code identification.

TABLE 1 REQUIREMENT FOR INTERMEDIATE SUPER ABRASION FURNACE (ISAF) CARBON BLACK

(*Clause* 3.3)

Sl No.	Characteristic	Requirement			Method of Test, Clause No. in IS : 7498-1985*
		ISAF-HM (N220)	ISAF-LM (N231)	ISAF-LS (N219)	
(1)	(2)	(3)	(4)	(5)	(6)
i)	Iodine adsorption, mg of iodine/ g of carbon black	116 to 126	117 to 127	112 to 122	5
ii)	Dibutyl phthalate absorption, ml/100 g of carbon black	109 to 119	87 to 97	73 to 83	6
iii)	Pour density, g/l	330 to 380	380 to 430	410 to 460	7
iv)	*Sieve residue, percent by mass, Max*				8
	a) On 45-micron IS Sieve	0·100 0	0·100 0	0·100 0	
	b) On 500-micron IS Sieve	0·001 0	0·001 0	0·001 0	
v)	Loss on heating, percent by mass, *Max*	2·5	2·5	2·5	9
vi)	Ash content, percent by mass, *Max*	1·0	1·0	1·0	10
vii)	Staining tendency		Non staining		12
viii)	Fines content, percent by mass, *Max*	15·0	15·0	15·0	13†
ix)	Discoloration of toluene, percent transmission, *Min*	80	80	80	16

*Methods of sampling and test for carbon black (*first revision*).

†This may be changed according to ASTM US 120 mesh (125-micron) in place of US 100 mesh (150-micron).

4.2.1 The packages may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act and the Rules and Regulations made thereunder. The ISI Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by ISI and operated by the producer. ISI marked products are also continuously checked by ISI for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

5. SAMPLING, NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

5.1 Sampling — The sampling of carbon black shall be done in accordance with 2 of IS : 7498-1985*.

5.2 Number of Tests and Criteria for Conformity — All the characteristics of ISAF carbon black given in Table 1 shall be tested on individual samples. The lot shall be declared as conforming to the requirements of the specification if all the test results of each of the individual samples satisfy the corresponding requirements.

APPENDIX A

(*Clause* 3.4)

SCHEDULE FOR COMPOUNDING AND TESTING FOR PHYSICAL EVALUATION OF CARBON BLACK

A-1. GENERAL

A-1.1 This procedure involves the incorporation of the black to be tested in rubber along with necessary auxiliary agents, to permit vulcanization, followed by testing. Along with each test black, a corresponding stock containing the Industry Reference Black No. 5 is included. The difference between the properties obtained on the reference black is simply a device to cancel the inevitable variations in test results which are due to minor variations between laboratories in equipment, materials, procedure and ambient conditions.

A-2. STANDARD FORMULA

A-2.1 The standard formula for testing carbon black is given below:

Material	*Parts by Mass*
Natural rubber grade ISNR : 5 (*see* IS : 4588-1977†)	100
Zinc oxide (*see* IS : 3399-1973‡)	5
Stearic acid (*see* IS : 1675-1975§)	3
Dibenzothiazyl disulphide (*see* IS : 8483-1976‖)	0·6
Sulphur (*see* IS : 8851-1978¶)	2·5
Carbon black (ISAF)	50

*Methods of sampling and test for carbon black (*first revision*).
†Specification for rubber, raw, natural (*second revision*).
‡Specification for zinc oxide for rubber industry (*first revision*).
§Specification for stearic acid, technical (*first revision*).
‖Specification for dibenzothiazyl disulphide.
¶Specification for sulphur for rubber industry.

A-3. MIXING METHOD

A-3.1 The method of mixing is given in **A-3.1.1** to **A-3.1.10**.

A-3.1.1 Use a two roll laboratory mill having 150 mm outside diameter and 260 to 270 mm working distance between the guides. The speed of the slow roll shall be 24·0 ± 0·5 rev/min and friction ratio 1·4 to 1. Adjust and maintain roll temperature at 70 ± 5°C and set mill opening at 1·4 mm.

A-3.1.2 The carbon black shall be conditioned before weighing, by heating in an oven at 105 ± 5°C for 1 hour.

A-3.1.3 Weigh the ingredients for a batch size which is 4 times of the parts by mass in g given in **A-2.1**.

A-3.1.4 Add rubber on the mill and band (time 2·0 minutes).

A-3.1.5 Add stearic acid and 3/4th cut twice each way (time 2·5 minutes).

A-3.1.6 Add remaining pigments and 3/4th cut twice each way (time 2 minutes).

A-3.1.7 Add carbon black. Open mill gradually to maintain approximately constant bank. 3/4th cut three times each way after all black is in (time 7·5 minutes).

A-3.1.8 Cut stock, roll and weigh. If the mass of the mixed batch is beyond the tolerance of ± 1·0 percent of the total mass of all ingredients, reject the batch (time 1 minute).

A-3.1.9 Pass end-wise six times at 0·8 mm opening, and sheet off at 2·2 mm finished gauge (time 2·5 minutes), cool on metal table top, and prepare specimen for cure.

Total mixing time is about 17·5 minutes.

A-3.1.10 Condition the stock for 1 to 24 hours and cut out suitable slabs for vulcanization.

A-4. VULCANIZATION

A-4.1 The test pieces are vulcanized for 15 and 30 minutes at 145°C in a standard 4 cavity mould which gives sheets of dimensions 150 × 150 × 2 mm. The curing press shall be capable of exerting a minimum pressure of 3·5 MN/m^2 (approx 35 kgf/cm^2) on the cavity areas of the mould during vulcanization. After vulcanization, the sheets shall be cooled immediately in water. Condition the vulcanized test slab for 16 hours at 27 ± 2°C before testing.

A-5. TESTING

A-5.1 The vulcanized sheets are tested for 300 percent modulus and tensile strength in accordance with IS : 3400 (Part 1)-1977*.

A-6. PHYSICAL PROPERTIES

A-6.1 The maximum difference in physical properties of vulcanizates containing ISAF carbon black as compared to IRB No. 5 shall be as given in Table 2.

TABLE 2 DIFFERENCE IN PHYSICAL PROPERTIES OF VULCANIZATES CONTAINING ISAF CARBON BLACK FROM IRB NO. 5

Sl No.	Grade	Cured Conditions	Tensile Strength, *Min*	300 Percent Modulus
(1)	(2)	(3)	(4)	(5)
			MPa*	MPa*
i)	ISAF-HM (N220)	15 min at 145°C	−2·93	−2·48 to −0·10
		30 min at 145°C	−2·45	−2·38 to −0
ii)	ISAF-LM (N231)	15 min at 145°C	−2·24	−4·58 to −2·10
		30 min at 145°C	−1·72	−4 48 to −2·00
iii)	ISAF-LS (N219)	15 min at 145°C	−1·79	−5·38 to −2·90
		30 min at 145°C	−1·24	−5·72 to −3·24

*1 MPa = 10·2 kgf/cm² approx.

*Methods of test for vulcanized rubbers: Part 1 Tensile stress-strain properties (*first revision*).

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INTERNATIONAL SYSTEM OF UNITS (SI UNITS)

Base Units

Quantity	Unit	Symbol
Length	metre	m
Mass	kilogram	kg
Time	second	s
Electric current	ampere	A
Thermodynamic temperature	kelvin	K
Luminous intensity	candela	cd
Amount of substance	mole	mol

Supplementary Units

Quantity	Unit	Symbol
Plane angle	radian	rad
Solid angle	steradian	sr

Derived Units

Quantity	Unit	Symbol	Definition
Force	newton	N	1 N = 1 kg.m/s^2
Energy	joule	J	1 J = 1 N.m
Power	watt	W	1 W = 1 J/s
Flux	weber	Wb	1 Wb = 1 V.s
Flux density	tesla	T	1 T = 1 Wb/m^2
Frequency	hertz	Hz	1 Hz = 1 c/s (s^{-1})
Electric conductance	siemens	S	1 S = 1 A/V
Electromotive force	volt	V	1 V = 1 W/A
Pressure, stress	pascal	Pa	1 Pa = 1 N/m^2