



उत्पाद मानुयल
बेयरिंग उद्योग मे उपयोग हेतु कार्बुरीजिंग इस्पात
IS 5489:1975 के अनुसार

PRODUCT MANUAL FOR
Carburizing Steel for use in Bearing Industry
According to IS 5489:1975

भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम की स्कीम-I के तहत यह उत्पाद मानुयल प्रमाणीकरण के प्रचलन मे रीति और पारदर्शिता के सुसंगता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों एवं लाइसेन्स धारियों द्वारा संदर्भ सामग्री के रूप मे उपयोग किया जाएगा। बीआईएस लाइसेन्स/प्रमाण पत्र प्राप्त करने के इच्छुक भावी आवेदकों द्वारा भी इस दस्तावेज़ का उपयोग किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure coherence of practice and transparency in operation of certification under Scheme-I of Bureau of Indian Standards (Conformity Assessment) Regulations, 2018 for various products. The document may also be used by prospective applicants desirous of obtaining BIS certification licence/certificate.

1.	उत्पाद Product	:	IS 5489:1975
	शीर्षक Title	:	बेयरिंग उद्योग मे उपयोग हेतु कार्बुरीजिंग इस्पात Carburizing Steel for use in Bearing Industry
	संशोधन संख्या No. of amendments	:	3
2.	नमुनाकरण दिशा निर्देश Sampling Guidelines	:	
a)	कच्चा माल Raw material	:	कोई विशेष आवश्यकता नहीं No Specific requirement
b)	समूहिकरण दिशा निर्देश Grouping Guidelines	:	कृपया Annex-A देखें Please see Annex-A
c)	नमूने का परिमाण Sample Size	:	For Chemical tests: i) For instrumental chemical analysis- 5 pieces of 5cm ii) For Wet Chemical analysis - 50 gm drillings For mechanical tests- 3 Nos. x 1 Meter
3.	परीक्षण उपकरणों की सूची List of Test Equipment	:	कृपया Annex-B देखें Please refer Annex –B

4.	निरीक्षण व परीक्षण स्कीम Scheme of Inspection and Testing	:	कृपया Annex-C देखें Please refer Annex - C
5.	एक दिन में संभावित परीक्षण Possible tests in a day	:	सभी physical and chemical परीक्षण All physical and chemical tests
6.	लाइसेन्स का कार्यक्षेत्र/ Scope of the Licence :		
	IS 5489:1975 के अनुसार मानक मुहर का उपयोग करने के लिए लाइसेन्स निम्नलिखित कार्यक्षेत्र के लिए प्रदान किया जाता है Licence is granted to use Standard Mark as per IS 5489:1975 with the following scope:		
	उत्पाद का नाम Name of the product	Carburizing Steel for use in Bearing Industry	
	Grade	14C6, 28C6,..	
	Condition of Delivery	Hot rolled/Hot rolled and Annealed/ Cold finished	
	Form	Bars/Tubes/Wire Rods/Wires	
	Size (Diameter)	Size Range as per manufacturing facilities	

ANNEXURE A

GROUPING GUIDELINES

1. Grouping of Carburizing Steel for use in Bearing Industry is carried out on the basis of method of manufacture and strength as under:
 - a) Steel Designation
 - b) Form (Bar/Tubes/Wire Rods/Wires)
 - c) Delivery Condition
 - d) Heat Treatment

2. Accordingly, for the purpose of the GOL/CSoL the product is grouped as under:

Designation	14C6, 28C6, 17Mn5Cr4, 20Ni7MO2, 20NiCr2MO2
Condition of Delivery	Hotrolled/Hot rolled and Annealed/ Cold finished
Form	Bar/Tubes/Wire Rods/Wires

3. One sample of any size may be drawn and tested from each Designation of each form and delivery condition applied for to cover all sizes of the designation for a given form and delivery condition.
4. It shall, however, be ensured that the applicant/licensee has got complete manufacturing capabilities as well as testing facilities for the sizes/designations/forms required to be covered in the licence scope.
5. During the operation of license, BO shall ensure that all steel designations&forms covered in the license are drawn for independent testing on rotation over a period of time.

ANNEX B
List of Test Equipment

Major test equipment required to test as per the Indian Standard

Sr. No	Test Equipment/Chemicals	Tests Used in with Clause Reference
1.	Rough Polishing Machine, Abrasive Cutting Machine, Fine Polishing Machine, Grinding Machine, Molding machine, Longitudinal cutting machine, lathe etc	Preparation of specimen for Chemical composition, inclusion rating, microstructure
2.	<u>Analytical method</u> (1) Carbon & Sulphur: IS 228(P-I) Carbon –Sulphur (Strohlein's type) apparatus-complete set (consisting of glass parts assembled on wooden stand, combustion furnace, thyristor based electronic control panel, Oxygen cylinder, Sulphur cup, combustion boats Barometer, Room temperature thermometer etc. Standard steel of appropriate values of carbon & Sulphur. (2) Silicon: IS 228 (Part 8) Hydrochloric acid, Sulphuric acid, Nitric acid, Silver Nitrate, Perchloric acid, Hydrofluoric acid, Weighing balance 200g, LC 0.1 mg, Muffle furnace up to 1100°C, Platinum Crucibles, Hot Plate, Porcelain dish 300ml, Filter paper pulp, Filter papers General lab glassware (3) Manganese: IS 228 (Part 2): Sulphuric Acid, Concentrated Nitric Acid -Relative density 1.42, Phosphoric Acid, Ammonium persulphate, Silver Nitrate, Sodium Chloride, Sodium carbonate, Sodium arsenite, Steel sample of known Manganese Content (4) Nickel: Cl 6,2 of 228(P-5): Hydrochloric Acid, Nitric Acid-, Perchloric Acid -, Tartaric Acid, Ammonium hydroxide, Dimethylglyoxime, Methyl Red, Ammonium Nitrate, Hydrofluoric Acid –Sintered glass crucible No. 3. (5) Chromium: IS 228 (Part 6): Wide mouth conical Flask, glass beads, Phosphoric Acid, Sulphuric Acid, Concentrated Nitric Acid, Hydrochloric Acid -, Silver Nitrate, Ammonium Persulphate Solution, Ferrous Ammonium Sulphate, Ammonium persulphate, Potassium Permanganate (AR) Sodium Oxalate (GR) (6) Phosphorus: IS 228 (Part 3). Nitric Acid conc., Potassium Permanganate, diluted Ammonium Hydroxide, Sodium Nitrite, ammonium molybdate, Phenolphthalein Solution (1%), Sodium Hydroxide, Potassium hydroxide, Potassium Nitrate, sodium carbonate, Hydrochloric Acid-, Hydrofluoric Acid, Perchloric Acid ferrous sulphate crystals (FeSO₄·7H₂O), Sulphurous Acid, Hydrobromic Acid -filter paper pulp pad. (7) Nitrogen: IS 228 (Part 19) APPARATUS FOR DETERMINATION OF NITROGEN BY	Chemical Composition (4)

	STEAMDISTILLATION(as per Fig 1 of IS 228 (Part 19)Nessler's Reagent(potassium iodide, mercuric chloride, potassium hydroxide) Potassium Sulphate, Crystals, Copper Sulphate Crystals, Sulphuric Acid $\rho_d=1.84$, Barium Chloride, Mixed Indicator Solution (Bromocresol green, Methyl Red) Devarda's Alloy, (50 Cu, 5 Al, 5 Zn.), Boric Acid, Sodium Hydroxide-Tartaric Acid, Potassium acid phthalate Note: Availability of General lab equipment Balance 200g (LC =0.1 mg), Hot plates, Fuming chambers & Glass ware i.e beakers, flasks, burette, pipettes, volumetric flask round bottom flask, funnels, Filter paper shall be insured during the visit. (8) Copper: Plate, Muffle Furnace, porcelain or silica crucible, Reagents: Hot Wash Solution(dilute sulphuric acid solution 1 : 99 v/v with hydrogen sulphide), dilute sulphuric acid, hydrogen sulphide, Dilute Nitric Acid, Sodium Fluoride, solid, Dilute Ammonium Hydroxide, Acetic Acid, Potassium Iodide, Starch Solution, Sodium Thiosulphate Solution, Ammonium Bifluoride Solution (9) Molybdenum:IS 228 (Part 10) Reagents: Perchloric Acid, Phosphoric Acid, Nitric Acid, Hydrochloric Acid, Dilute sulphuric acid, potassium thiocyanate solution, stannous chloride solution, n-butyl acetate, Iron-Mo free, molybdenum metal (99.9 pc pure) Spectrophotometer, Volumetric flask, conical flask, titration apparatus (burette, pipette etc.), hot plate, thermometer, separating funnel, dry filter paper and other laboratory glassware and apparatus	
3.	Instrumental Method -Optical Emission Spectrometer (OES) with requisite channels and certified reference materials	C,S,P,Mn,Si,Ni,Cu,Cr ,Mo Ti, V (4)
4.	Instrumental methods Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, Standard Reference Material with certificate	C, S, P, Mn, Si, V, Cu, Cr, Ni, Ti, Mo (4)
5.	Metallurgical Microscope of suitable range	Microstructure (6.1)
6.	Brinell Hardness Tester of suitable Range preferably 300 BHN with Standard Reference Blocks of Thickness 6mm, 12mm and 16mm. Conditioning Facilities - control the temperature within a range, such as $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.	Hardness(7)
7.	Metallurgical Microscope of suitable magnification (100x) polishing machine, Polishing paper, velvet cloth, Diamond compound, Muffle furnace, Nitric acid, alcohol	Inclusion Rating (8) Grain Size (10)
8.	Vision-based inspection system MPI machine, UV light, centrifuge tube	Surface Defects (9)
9.	Vernier Calipers, Micrometer, Scale, Cord, Measuring Tape, Straight Edge, spirit level bench, surface plate, weighing balance, Right Angle (For square cut ends)	Dimensions and Dimensional Tolerances (11), Size & weight (12) Burrs(5.3)

The above list is indicative only and may not be treated as exhaustive.

ANNEXURE C

Scheme of Inspection And Testing

1. LABORATORY - A laboratory shall be maintained which shall be suitably equipped (as per the requirement given in column 2 of Table 1) and staffed, where different tests given in the specification shall be carried out in accordance with the methods given in the specification.

1.1 The manufacturer shall prepare a calibration plan for the test equipments.

2. TEST RECORDS – The manufacturer shall maintain test records for the tests carried out to establish conformity.

3. PACKING AND MARKING – The Standard Mark as given in Column (1) of the First Schedule of the license and Licence Number(i.e. CM/L.....) shall be incorporated, and the marking and packing shall be done as per the provisions of the Indian Standard, provided always that the product thus marked and packed conforms to all the requirement of the specification. In addition, stencilled content or label affixed on top of package shall also contain the phrase 'Please visit www.bis.gov.in for BIS certification details'.

4. CONTROL UNIT – For the purpose of this scheme the material or part thereof representing the same cast, condition and form, processed to same nominal thickness under uniform conditions of production in a day in the same place shall constitute a control unit.

5. LEVELS OF CONTROL - The tests as indicated in column 1 of Table 1 and the levels of control in column 3 of Table 1, shall be carried out on the whole production of the factory which is covered by this plan and appropriate records maintained in accordance with paragraph 2 above.

5.1 All the production which conforms to the Indian Standards and covered by the licence should be marked with Standard Mark.

5.2 Steels covered by this standard shall be delivered in accordance with Cl 5 of IS 5489:1975.

5.3 General requirements relating to supply of material shall conform to IS 1387.

6. TEST CERTIFICATE- For each consignment of BIS Certified material conforming to IS 5489:1975 there shall be a test certificate which shall contain the Standard Mark, the cast/Control Unit number and the corresponding test results (as given in Annexure-I, enclosed)

7. REJECTIONS – Disposal of non-conforming product shall be done in such a way so as to ensure that there is no violation of provisions of BIS Act, 2016. A separate record shall be maintained giving information on quantity and cast number/coil number/control unit number, as applicable, relating to all such rejections/defective/sub-standard material of the production not conforming to the requirements of the Specification and the method of its disposal. Such

material shall in no case be stored together with that conforming to the Specification. The Standard Mark (if already applied) on rejected material should be defaced.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
5	Chemical Composition	IS 228 or any other established instrumental/chemical method					
	Ladle Analysis	4.1, 4.1.1 Table 1	IS 5489:1975	R	One	Each Heat	Applicable for manufacturers with steel making facilities only
	Product analysis	4.2, 13.1.1, Table 1&2	IS 5489:1975	R	NIL	NIL	Applicable for manufacturers with steel making facilities only
				S	One	Each Cast	Applicable for Re-rollers/Wire drawing units. See Note-3.
6	Microstructure	6.1	IS 5489:1975	R	One	Each Control Unit	In case the material is continuously heat treated, one sample shall be taken from each control unit. However, it shall be ensured that one sample shall be tested from each cast.
7	Hardness	7.1 13.2	IS 5489:1975 IS 1500 Pt.1	R	-do-	-do-	
10	Grain Size	10.1	IS 5489:1975 IS 4748	R	-do-	-do-	
8	Inclusion content	8.1	IS 5489:1975 IS 4163	S	-do-	Each Cast	
9	Surface Defect	9.1 Table-3	IS 5489:1975	R	Each finished product shall be inspected to ensure free from any surface defect.		
11	Dimensional Tolerances	11.1 to 11.4 Table-4 to 7	IS 5489:1975 IS 3739	R	Adequate inspection to ensure each item to be within the limits of specification.		
12	Size and Weight of Wire and Wire Rod	12.1	IS 5489:1975	R	Each Coil	Each Coil	Requirements shall be subjected to agreement between manufacturer and purchaser.

Note 1: Whether test equipment is required or sub-contracting is permitted in column 2 shall be decided by the Bureau and shall be mandatory. Sub-contracting is permitted to a laboratory recognized by the Bureau or Government laboratories empaneled by the Bureau

Note-2: The control unit and levels of control as decided by the Bureau are obligatory to which the licensee shall comply with.

Note-3: No testing is required if the material is ISI marked and received with test certificate.

Annexure-I

(Para 6 of the Scheme of Inspection and Testing)

XYZ COMPANY

(Registered office Address and works address)

TEST CERTIFICATE FOR Carburizing Steel for use in Bearing IndustryBIS
STANDARD
MARK

TEST CERTIFICATE No. _____

DATE _____

To M/s _____

We certified that the material described below fully conforms to IS 5489:1975 Chemical composition and Physical properties of the product, as tested in accordance with the Scheme of Inspection and Testing contained in the BIS Certification Marks Licence No. CM/L _____ are as indicated below against each order No.

(PLEASE REFER TO IS 5489:1975 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

Test Results

Order No and Date	Form	Batch /Control Unit number	Size & Weight [#] (wire/ wire rods)	Quantity	Dimensions & Tolerances	Chemical Composition										Physical Properties				Remarks
						C	Si	Mn	Cr	S	P	Cu	Ni	Mo	V	Hardness	Grain size	microstructure	Inclusion Content	

[#] as agreed between

REMARKS

WAGON NO

TRUCK NO

FOR XYZ Steel COMPANY

(It is suggested that size A4 paper be used for this test certificate)