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उत्पाद मैन्युअल
उष्मा- उपचारित इस्पात, मिश्रधातु एवं सुकटय इस्पात- बॉल और रोलर बेयरिंग इस्पात
IS 17111: 2025 के अनुसार

Product Manual for
Heat-Treatable Steels, Alloy Steels and Free-Cutting Steels — Ball and Roller Bearing Steels

According to IS 17111: 2025

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम, 2018 की योजना- I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैनुअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity 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.

1.	भारतीय मानक संख्या **IS No.**	:	IS 17111:2025
	शीर्षक **Title**	:	Heat-Treatable Steels, Alloy Steels and Free-Cutting Steels — Ball and Roller Bearing Steels
	संशोधनों की संख्या **No. of amendments**	:	0
2.	नमूना दिशानिर्देश **Sampling Guidelines**		
a)	कच्चा माल **Raw material**	:	No specific requirement. **Note: This section indicates the requirements for raw material (if specified in the IS) for which compliance is to be established during Grant of Licence/Change in Scope of Licence/Factory Surveillance**
b)	समूहीकरण दिशानिर्देश **Grouping Guidelines**	:	**Please refer Annex-A**

c)	**नमूने का परिमाण** **Sample Quantity**	:	Chemical: 5 pcs of 5cm long or 50 gm drillings Mechanical: 1m X 3 Nos. or prepared pieces (above 25 mm thickness/dia.) **Note: This section indicates the quantity of the sample of the product and/or the raw material (if applicable), required to be sent to the laboratory for testing, for the purpose of Grant of Licence/Change in Scope of Licence/ Factory Surveillance (in case of market surveillance, effort may be made to procure the required quantity of product sample, as far as possible since raw material sample may not be available in market)**
d)	**परीक्षण अनुरोध में घोषित किए जाने वाले पैरामीटर** **Parameters to be Declared in Test Request**	:	Steel Grades/Designation, Surface Condition, Heat treatment Condition, Form, Size, Optional/ Supplementary or Special Requirements (if applicable) Note: Apart from the above, any other requirements/parameters may also be declared as per the standard, as applicable.
3.	**परीक्षण उपकरणों की सूची** **List of Test Equipment**	:	**Please refer to Annex- B**
4.	**निरीक्षण और परीक्षण की स्कीम** **Scheme of Inspection and Testing**	:	**Please refer to Annex- C**
5.	**एक दिन में संभावित परीक्षण** **Possible tests in a day**		
	All tests. **Note: This section is for the guidance of BIS Certification Officers/Technical Auditors of BIS Authorized Outside Surveillance Agencies (OSAs) during factory inspection to provide ready reference regarding the tests which can be witnessed during the inspection in the factory by the officer/auditor.**		
6.	**लाइसेंस का दायरा /Scope of the Licence:**		
	IS 17111: 2025 के अनुसार मानक मुहर का उपयोग करने के लिए लाइसेंस निम्नलिखित कार्यक्षेत्र के लिए प्रदान किया जाता है Licence is granted to use Standard Mark as per IS 17111: 2025 with the following scope:		
7.	**उत्पाद का नाम** **Name of the product**	Heat-Treated Steels, Alloy Steels and Free-Cutting Steels — Ball and Roller Bearing Steels	
	Steel Grades/Designation	100Cr6,……..(As per Table 3)	
	Surface Condition	As-hot-worked, etc…. (As per Table 2)	
	Heat Treatment Condition	+U, +S, +A, etc…..(As per Table 1)	
	Form and Size	Billets: ..X …mm upto and including ..X …mm, Bars: ..X …mm upto and including ..X …mm, Rods: ..mm upto and including …mm, Wires: : ..mm upto and including …mm, etc..	

	Options/Supplementary or Special Requirements	Special surface quality, Hardenability (+H), etc…(As per Cl 5.2)

BUREAU OF INDIAN STANDARDS
Manak Bhawan, 9, Bahadur Shah Zafar Marg,
New Delhi – 110002

ANNEX-A
TO PRODUCT MANUAL FOR
Heat-Treated Steels, Alloy Steels and Free-Cutting Steels — Ball and Roller Bearing Steels According to IS 17111:2025

GROUPING GUIDELINES

IS 17111:2019 standard covers the requirements for Heat-Treated Steels, Alloy Steels and Free-Cutting Steels which are intended for Ball and Roller Bearing Steels and are delivered as billets, bars, rod, wire, tubes, rings, discs, etc...

This standard covers the following groups of steels (as per Table 3):

a) Through-hardening bearing steels (steels with about 1 % C and 1 % to 2 % Cr),
b) Case-hardening bearing steels,
c) Induction-hardening bearing steels (unalloyed and alloyed),
d) Stainless bearing steels, and
e) High-temperature bearing steels.

One sample of any Steel Grades/Designation, Surface Condition, Heat treatment condition, Form and Size may be tested from each of the above groups to cover all Steel Grades /Designation, Surface Condition, Heat treatment condition, Form and Size within the group.

It shall, however, be ensured that firm has necessary manufacturing and testing facilities for the entire range of designations/delivery conditions proposed to be covered under the scope of license.

During the operation of license, BO shall ensure that all sizes / conditions/ designations covered in the license are drawn for independent testing on rotation over a period of time.

ANNEX – B

LIST OF TEST EQUIPMENTS
(INDICATIVE LIST, FOR GUIDANCE ONLY)

Major test equipment required to test as per requirements of Indian Standard.

Sl. No.	Test Equipment/Chemicals and Identification Numbers (Where applicable)	Tests Used in with Clause Reference
1	Rough Polishing Machine, Abrasive Cutting Machine, Fine Polishing Machine, Grinding Machine, Molding machine, Longitudinal cutting machine, Lathe Machine,	Preparation of specimen
2	Instrumental methods Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, spark source optical emission spectrometry. spectropolisher(sample preparation) Spectrophotometer	7.1.2 (C, S, P, Mn, Si, Ni, Cr, Mo, V, Al, Cu, W, Ca, Ti)
3	Strohlein or Leco apparatus with all attachments Barometer with chart, Hot plate, Muffle furnace, Complete range of glass wares, measuring cylinders, Desiccator, porcelain boats or ceramic crucibles, Thermometer, Electronic Balance, Distilled Water, Hot air oven, Oxygen - 99.5 percent minimum purity, ether or acetone, Standard Reference Material (NML) with certificate Reagents for C: tin granules or pure iron fillings, acidulated water/brine water, methyl red, caustic potash Reagents for S: Ceramic boats/crucibles – desiccators, Fluxes -Low sulphur copper, tin or iron, Dilute hydrochloric acid, Starch Iodide solution, Potassium iodate	7.1.2 (for C & S, chemical method, alternative to instrumental method)
4	Weighing balance, Heater/ Heating element along with energy regulator, Ice water bath, Vol Flask Cap – 1 litre, (Whatman) filter paper No. 040, Suction Filtration Facility, Filter paper pulp pad, Standard Reference Material (NML) with certificate Potassium Permanganate (KMnO4), Sodium Nitrite (Na2NO3), Ammonium Molybdate [(NH4)2 Mo2O7], Ammonium Phosphate [(NH4)3 PO4], Potassium Nitrate (K2NO3), Phenolphthalein Solution, Rectified spirit or methyl alcohol, Sodium Hydroxide (NaOH), Hydrofluoric Acid (HF), Perchloric Acid (HClO4), Sulphurous Acid, Hydrobromic Acid (HBr) , other chemicals and reagent as applicable	7.1.2 (Phosphorus content , chemical method, alternative to instrumental method)
5	Hot plate, Conical flask Reagents: silver nitrate, ammonium persulphate sodium arsenitesolution, Dilute Nitric Acid, Phosphoric Acid, Dilute SulphuricAcid, Concentrated .Nitric Acid, NaCl Solution, Permanganic acid	7.1.2 (Manganese content , chemical method, alternative to instrumental method)

6	Medium textured filter paper, Porcelain casserole, platinum crucible filter paper pulp, hot plate, hot air oven, muffle furnace Reagents: Silver nitrate solution, concentrated nitric acid, concentrated sulphuric acid, Dilute Hydrochloric Acid, Dilute Sulphuric acid, Perchloric acid, Tartaric acid and hydroflouric acid	7.1.2 (Silicon content, chemical method, alternative to instrumental method)
7	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	7.1.2 (Cu content, chemical method, alternative to instrumental method)
8	Hot plate, stop watch Reagents: dilute sulphuric acid and phosphoric acid mixture, concentrated nitric acid, ammonium persulphate, silver nitrate, dilute hydrochloric acid, ferrous ammonium sulphate, standard potassium permanganate solution.	7.1.2 (Cr content, chemical method, alternative to instrumental method)
9	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	7.1.2 Mo content (for determination of Mo by thiocyanate photometric method) method in low and high alloy steels for Mo 0.01 to 1.50 percent)
10	Reagents: Dilute sulphuric acid, conc nitric acid, hydrofluoric acid, boric acid solution, potassium bisulphite, ferrous sulphate solution, Alpha-Bentoinoxime Solution, Bromine Water, Sulphuric AcidBenzoinoxime Wash Solution, Dilute Ammonium Hydroxide Solution, Concentrated Hydrochloric Acid, Dilute Hydrochloric Acid, Tartaric acid, solid, Hydrogen Sulphide, gas, Hydrogen sulphide Wash Solution, Cinchonine Solution Platinum crucible, Volumetric flask, conical flask, titration apparatus (burette, pipette etc.), hot plate, thermometer, separating funnel, ashless filter paper and other laboratory glassware and apparatus	7.1.2 Mo content (for determination of Mo by Alpha benzoinoxime method in alloy steels for Mo > 1 percent and not containing Tungsten)
11	Ashless paper pulp, paper pulp pad, hot plate, dessicator, Reagents: ammonium nitrate, methyl red, dilute ammonium hydroxide, concentrated hydrochloric acid, Concentrated nitric acid, Perchloric acid, Hydrofluoric Acid	7.1.2 Ni content (chemical method, alternative to instrumental method)
12	Inert gas fusion followed by determination using thermal conductivity detector	7.1.2 (Nitrogen content)
13	Infrared method after fusion under inert gas. Inert gas Helium of high purity, electronic balance, ultrasonic cleaner, single-use graphite crucible, Standard Reference Material with certificate	7.1.2 (Oxygen content)
14	Unit having Quenching fixtures, arrangement for keeping specimen in place wait water jet emerging from cone at the bottom to touch the lower end of the sample. Muffle furnace, safety equipment, Rockwell hardness tester	7.1.3 (Hardenability)

15	Brinell Hardness Tester wilt Tungsten Carbide Indenter	7.1.4 (Hardness)
16	Metallurgical Microscope with image analyzer or Metallurgical Microscope (100 X or better resolution), Heating furnace suitable for normalizing or annealing, sample preparation using compression mounting, 3 % Nital as etchant Band saw machine, Belt grinder, micro polisher, sample polishing machine, auto mount,	7.2 (Microstructure) 7.2.1 (Grain Size), 7.3 (Non Metallic Inclusions)
17	Machine grinding unit with metallographic polish paper No. 00, 000 for finer finish, etchant (see Table-1&2 of IS 7739 Pt.3), glycerin, photographic paper, 2 percent aqueous solution of sulphuric acid, hypo, ammonium molybdate (5 g per 100 ml of water), nitric acid (r.d. 1.2) , developer-made up of 5 ml of saturated stanneous chloride solution, 50 ml hydrochloric acid, 100 ml water and 1 g alum. Caustic resistant filter paper,5 percent caustic soda, 5 percent sodium sulphide solution, distilled water	7.4 (Macro etch test)
18	Alternating current (a.c.)/ single phase half wave rectified alternating current (HW) / three phase full wave rectified direct current (FWDC) induced magnetization, Magnetic powder suspended in an aqueous or a well refined, light petroleum distillate.	7.4 (Magnetic Particle Inspection Test) alternative to 11.1 (Inclusion rating)
19	Ultrasonic flaw detector with amplifier/attenuator calibrated in steps of at least 2dB, CRT/Monitor, Double Crystal probes, calibration blocks	7.4 (Internal Soundness)
20	Vision-based inspection system (10X magnifying glass), Stereo microscope	7.5 (Surface quality)
21	Vernier Calipers, Micrometer, tape	7.6 (Dimensions and Dimensional Tolerances)

Note: The above is an indicative list for the purpose of guidance only

ANNEX- C
SCHEME OF INSPECTION AND TESTING

1. QUALITY ASSURANCE PLAN

1.1 It is expected that manufacturers (licensees/applicants) will implement a Quality Assurance Plan i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing the Standard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan defining the control unit (i.e. lot/batch etc.) and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 For the guidance of manufacturers, the recommended definition of control unit is: Steels of the same Grades /Designation, Surface Condition, Heat treatment condition, Form and Size processed to same delivery condition under uniform conditions of production in a day in the same production line.

1.3.2 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in **Table 1.**

1.3.3 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan. Alternatively, the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING- It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer and testing parameters/requirements which can only be performed in the factory.

2.1 For the guidance of manufacturers, Table 1 giving the recommended levels of control is given below. Column 2 of Table 1 indicates routine tests where test equipment is required in house as “R” or other tests which can be subcontracted as “S”. Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.2 For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility for routine tests (indicated as "R" in Column 2 of Table 1) is also optional.

2.2.1 MSME manufacturers may utilize common cluster based facilities as per guidelines for the utilization of cluster based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 Large Scale manufacturers shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as "R" in Column 2 of Table 1), where different tests given in the specification shall be carried out in accordance with the method given in the specification. They shall also implement a calibration plan for the in-house test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of Sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

2.4 TEST RECORDS- The manufacturers maintaining an in-house laboratory or utilizing common cluster based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. PACKING AND MARKING - The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L…) shall be suitably incorporated on the material or each Package and on the test certificate issued along with each consignment, provided always that the product thus marked and packed conforms to all the requirement of the specification.

3.1 Packing and Marking shall be done as per the Indian Standard.

3.2 Additional Marking requirements: The material or packaging shall also be marked with the following additional requirement on each Package, coil or reel:

a) "For BIS certification details please visit www.bis.gov.in"
b) Any other requirement not specified in the Indian Standard

4. TEST CERTIFICATE – For each consignment of BIS Certified material conforming to IS 17111:2025 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).

5. REJECTION - All the production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. 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.

TABLE 1
(ONLY FOR GUIDANCE PURPOSE)

(1)				(2)	(3)		(4)
TEST DETAILS					**LEVELS OF CONTROL**		**REMARKS**
Clause	**Requirements**	**Test Method**		**Test equipment requirement R: required (or) S:Sub-contracting permitted**	**No. of Samples**	**Frequency**	
		Clause	**Reference**				
7	Chemical Composition: a) Ladle Analysis	7.1.2 & Table 3	IS 17111:2025 Relevant parts of IS 228 or any other established instrumental/ chemical method.	R	One	Each Heat	i) Applicable for manufacturers with steel making facilities. ii) Re-rollers shall maintain records in support of the material used which shall include certificate for inputs/starting material certificate indicating ladle analysis, steel manufacturing process, size of input material etc.
7	b) Product Analysis	7.1.2 & Table-4, 7	IS 17111:2025 Relevant parts of IS 228 or any other established instrumental/ chemical method.	R	i) Nil	i) Nil	i)Applicable for manufacturers with steel making facilities.

				S	ii) One	ii) Each Heat	ii) Applicable for manufacturers other than those with steel making facilities. However, No testing is required if the material received is ISI marked and received with Test Certificate.
7.3	Hardenability	7.3 & Table- 5, 7	IS 17111:2025 IS 3848 / ISO 642 IS 1586 Part 1 /ISO 6508-1	R	One	Each Heat	Applicable only when the steel is ordered to hardenability requirements by using the designations given in Table-5
7.4	Hardness	7.4 & Table-6, 7	IS 17111:2025	R	One	Each Heat	—
7.5	Microstructure	7.5	IS 17111:2025	S	As agreed to between the manufacturer and purchaser	As agreed to between the manufacturer and purchaser	—
7.5.1	Austenitic grain size of casehardening and induction-hardening bearing steels	7.5.1 Table-7 & Clause A.3	ISO 643 / IS 4748	S	One	Each Heat	Applicable only for Case-hardening steels and induction hardening steels as per Table-3 of IS 17111:2025

7.5.2	Degree of Spheroidization	7.5.2 Table-7 & Clause A.4	SEP1520 / ASTM A892/ ISO 23825	S	As agreed to between the manufacturer and purchaser	As agreed to between the manufacturer and purchaser	—
7.5.2	Distribution of Carbides	7.5.2 Table-7 & Clause A.5	ISO 5949	S	As agreed to between the manufacturer and purchaser	As agreed to between the manufacturer and purchaser	—
7.6	Non Metallic inclusions	7.6.1 Table-7 & Clause A.6	IS 4163 / ISO 4967 / JIS G0555	S	One	Each Heat	—
7.6	Macroscopic inclusions	7.6.2 & Table-7	IS 17111:2025	S	As agreed to between the manufacturer and purchaser	As agreed to between the manufacturer and purchaser	The method of assessment shall be fixed by mutual agreement between the purchaser and the manufacturer.
7.7	Internal Soundness	7.7 & Clause A.7	IS 17111:2025	S	Adequate inspection to ensure that Each Coil/bundle or package is free from internal defects. The internal soundness requirements shall be fixed by mutual agreement between the purchaser and the manufacturer.		

7.8	Surface Quality	7.8 & Clause A.8	IS 17111:2025	R	Adequate inspection to ensure that Each Coil/bundle or package is free from surface defects. The surface quality requirements shall be fixed by mutual agreement between the purchaser and the manufacturer.		
7.8	Decarburization Test	7.8 & Table-7	IS 17111:2025 IS 6396 / ISO 3887	S	As agreed to between the manufacturer and purchaser	As agreed to between the manufacturer and purchaser	The level of decarburization shall be fixed by mutual agreement between the purchaser and the manufacturer.
7.9	Dimensions and Tolerances	7.9 & Clause A.9	IS 17111:2025 IS 3739 IS 9550 IS/ISO 16124	R	One	Each Coil/bundle or package	Nominal dimensions of the billets, bars, rod, wire, tubes, rings, discs, etc. shall be as specified by the purchaser.

ISI Mark With IS No. and CM/L no.

Annexure-I
(Para 4 of the Scheme of Inspection and Testing)
XYZ IRON AND STEEL COMPANY
(Registered office Address and works address)

Test Certificate for Steels for Heat-Treated Steels, Alloy Steels and Free-Cutting Steels — Ball and Roller Bearing Steels According to IS 17111:2025

TEST CERTIFICATE NO._____

To M/s_____ Dated_____

We certified that the material described below fully conforms to IS 17111:2025 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 LicenceNo.CM/L_____are as indicated below against each order No.

(PLEASE REFER TO IS 17111:2025 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order No. & Date	Size/ Shape/ Type	Designation/ Condition	Cast	Qty.	Chemical Composition (in %)															Mechanical Properties		Additional# Tests/ Remarks
					C	Si	Mn	P	S	Ni	Cr	Mo	Cr	V	W	Cu	Al	N	Ca	Ti	Hardness	Hardenability	

as required by purchaser

Remarks
Wagon No.
Truck No.

FOR XYZ IRON AND STEEL COMPANY

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