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उत्पादमैनुअल

वर्षा को सख्त बनाने के लिए फेरिटिक-पर्लिटिक इंजीनियरिंग स्टील्स
गर्म काम का जीतापमान से
16733:2018 के अनुसार

PRODUCT MANUAL FOR

Ferritic- Pearlitic Engineering Steels for Precipitation Hardening from
Hot-Working Temperatures
According to IS 16733:2018

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 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.	मानक संख्या Product	:	IS 16733:2018/ISO 11692:1994
	शीर्षक Title	:	Ferritic-Pearlitic Engineering Steels for Precipitation Hardening from Hot-Working Temperatures
	संशोधनों की संख्या No. of amendments	:	0
2.	नमूना दिशानिर्देश Sampling Guidelines		
a)	कच्चा माल Raw material	:	No specific raw material 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 see Annex-A

c)	नमूने का परिमाण Sample Size	:	For Tensile Test ,Hardness and Structure : 2 pcs of 1 m length For Chemical analysis (Cast Analysis) (also applicable for Product Analysis (supplementary or special requirement)): 5 pcs of length 5 cm For other supplementary or special requirements such as Content of Non-Metallic Inclusion and Ultrasonic Test (Annex A), the sample size shall be as agreed to between the manufacturer and purchaser 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 (incase of market surveillance, effort may be made to procure therequired quantity of product sample, as far as possible since raw material sample may not be available in market)
3.	परीक्षण उपकरणों की सूची List of Test Equipment	:	Please refer Annex-B
4.	निरीक्षण और परीक्षण की स्कीम Scheme of Inspection and Testing	:	Please refer Annex-C
5.	एक दिन में संभावित परीक्षण Possible tests in a day	:	All tests can be performed in a day 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 readyreference regarding the tests which can be witnessed during the inspection in the factory by the officer/auditor

6.	लाइसेंस का दायरा / Scope of the License:	
	License is granted to use BIS Standard Mark as per IS 16733:2018/ISO 11692:1994 with the following scope:	
	Name of the product	Ferritic- Pearlitic Engineering Steels for Precipitation Hardening from Hot-Working Temperatures
	Steel Grades/Designation	19 MnVS 6 30 MnVS 6 38MnVS 6 46 MnVS 6 46 MnVS 3
	Heat treatment condition	Untreated(TU), Treated to improve shearability(TS), Precipitation hardened(TP).
	Surface condition on delivery	As hot worked (None or HW), As hot worked + Pickled (PI), As hot worked + blast cleaned (BC), As hot worked + surface removal, Others
	Shape (Sizes)	Hot Rolled Round/Square / Flat Bars of size fromxx.... mm to upto and includingxx.... mm Hot Rolled Billets of size fromxx.... mm to upto and includingxx....mm (The shape, dimensions and tolerances of the products shall comply with the requirements agreed upon at the time of enquiry or order)
	Options/Supplementary or Special Requirements	With or Without Non-metallic inclusion, Ultrasonic test.....

ANNEXUREA**GROUPING GUIDELINES**

- 1) IS 16733:2018 classifies Ferritic- Pearlitic Engineering Steels for Precipitation Hardening from Hot-Working Temperatures according to
 - i) **Grade Designation:** 19MnVS6, 30MnVS6, 38MnVS6, 46MnVS6, 46MnVS3.
 - ii) **Nature of heat treatment:** Untreated (TU), Treated to improve shearability (TS), Precipitation hardened (TP)
 - iii) **Surface condition on delivery:** As hot worked (HW), As hot worked + Pickled (PI), As hot worked + Blast cleaned (BC), As hot worked + Surface removal, Others
 - iv) **Form and Size:** Billet, Blooms and bars of different sizes
- 2) Accordingly, the following grouping guidelines shall apply for Grant of Licence and Change in Scope of Licence:

a) Grouping based upon Steel Designations:

Steel designations	Grouping
19 MnVS 6 30 MnVS 6 38 MnVS 6 46 MnVS 6 46 MnVS 3	Sample of each Steel Designation is required to be drawn and tested

b) Grouping based upon Heat Treatment condition:

Heat Treatment condition	Grouping
Untreated (TU) Treated to improve shearability (TS) Precipitation hardened (TP)	Separate Samples, in addition to a) above, shall be drawn and tested for each Heat Treatment condition

c) Grouping based upon Surface Conditions on Delivery:

Surface Conditions on Delivery	Grouping
As hot worked (HW), As hot worked + Pickled (PI), As hot worked + Blast cleaned (BC), As hot worked + Surface removal, Others	Samples drawn at a) and b) shall be of any Surface Condition, among the conditions intended to be covered in the licence. Separate Samples for each Surface Condition are not required to be drawn and tested. However, scope of licence with regards to Surface Conditions shall be restricted based upon manufacturing facilities available.

d) Grouping based upon Forms, Shape and Sizes:

Forms, Shape and Sizes	Grouping
Round Bars, Square Bars, Flat Bars, Billets or any other Form ,Shape and Size as agreed to between the manufacturer and purchaser	Samples drawn at a) and b) shall be of any size. Separate Samples for each Size are not required to be drawn. However, these samples shall be drawn in such a way so that samples of all Forms and Shapes (Round Bars, Square Bars, Flat Bars, Billets or any other Form /Shape) ,intended to be covered in the scope of the licence, are tested.

- 3) Scope of the licence shall be restricted based on the manufacturing and testing facilities available.
- 4) During the operation of the licence, samples of each variety covered in the scope of licence, shall be tested in rotation, to the extent possible.

ANNEXURE-B**LIST OF TESTING EQUIPMENT**

(INDICATIVE LIST, FOR GUIDANCE ONLY)

Sr.No	Tests Used in with Clause Reference	Test Equipment/Chemicals
1	Preparation of specimen	Rough Polishing Machine, Abrasive Cutting Machine, Fine Polishing Machine, Grinding Machine, Molding machine, Longitudinal cutting machine, Lathe Machine, Electrical discharge machining.
2	5.2, 5.2.1, Table3 (C, Si, Mn, P, S, V)	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
3	5.2, 5.2.1, Table3 C & S (chemical method, alternative to instrumental method)	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
4	5.2, 5.2.1, Table3 Phosphorus content (chemical method, alternative to instrumental method)	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 (KMnO ₄), Sodium Nitrite (Na ₂ NO ₃), Ammonium Molybdate [(NH ₄) ₂ Mo ₂ O ₇], Ammonium Phosphate[(NH ₄) ₃ PO ₄], Potassium Nitrate(K ₂ NO ₃), Phenolphthalein Solution, Rectified spirit or methyl alcohol, Sodium Hydroxide(NaOH), Hydrofluoric Acid(HF), Per chloric Acid(HClO ₄), Sulphurous Acid, Hydrobromic Acid(HBr) , other chemicals and reagent as applicable

5	5.2, 5.2.1, Table3 Manganese content (Chemical method, alternative to instrumental method)	Hotplate, Conical flask Reagents: Silver nitrate, ammonium persulphate sodium arsenite solution, Dilute Nitric Acid, Phosphoric Acid, Dilute Sulphuric Acid, Concentrated Nitric Acid, NaCl Solution, Permanganic acid.
6	5.2, 5.2.1, Table3 Silicon content (Chemical method, alternative to instrumental method)	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, Per chloric acid, Tartaric acid and hydrofluoric acid
7	5.2.1 (Hardness)	Brinell Hardness Tester with Tungsten Carbide Indenter
8	5.2.2 (Mechanical Properties - Tensile Test)	Universal Testing Machine with Extensometer
9	5.3.1 (Microstructure)	Metallurgical Microscope with image analyzer or Metallurgical Microscope(100X or better resolution), Sample preparation using compression mounting, 3 % Nital as etchant
10	5.3.2 (Non-metallic Inclusions)	Metallurgical Microscope with image analyzer or Metallurgical Microscope(100X or better resolution),
11	5.4 A3 (Ultrasonic test)	, Ultrasonic flaw detector with amplifier/attenuator calibrated in steps of at least 2dB, CRT/Monitor, Double Crystal probes, calibration blocks
12	5.5 (Surface Quality)	Vision-based inspection system(10X magnifying glass), Stereo microscope
13	5.6 (Shape, Dimensions and Tolerances)	Vernier Calipers, Micrometer, Tape

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.

2. RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

2.1 For the guidance of manufacturers, the recommended definition of control unit is : For the purpose of this scheme, entire quantity of material of the same grade of material, heat treated to the same condition, of the same surface condition and of the same form, shape and size manufactured from the same consignment of raw material on the same production line in one go shall be taken as one control unit.

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

2.1.2 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

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

3. 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.

3.1 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.

3.1 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.

3.1.1 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/empaneled laboratory or any other laboratory having valid NABL

accreditation as per IS/ISO/IEC 17025.

3.2 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.

3.2.1 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.

3.3 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.

4. PACKING AND MARKING - The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on each bundle or box and/or on the test certificate (See 4) provided always that the material so marked conforms to each requirement of the specification.

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

5. TEST CERTIFICATE: For each consignment of BIS Certified material conforming to the specification there shall be a test certificate which shall contain the Standard Mark, the lot number, etc. and the corresponding test results (as given in **Annexure I** enclosed).

6. 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.

SCHEME OF INSPECTION AND TESTING

TABLE1: LEVELS OF CONTROL

(1)				(2)	(3)		
Test Details					LevelsOfControl		
Clause	Requirement	Test Method		Test equipment requirement R:Required(or) S: Sub contracting permitted	No.of samples	Frequency	Remarks
		Clause	Reference				
5	Chemical composition: a) Ladle Analysis	5.2.1	IS16733:2018 Relevant parts of IS 228 or any other established instrumental/ chemical method.	R	i)One	i) Each Heat / Cast	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.
5	b) Product Analysis	5.2.1	IS16733:2018 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	One	Each Heat / Cast	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.

5.2	Hardness	5.2.1	IS16733:2018 / IS 1500	R	One	Each Control Unit	-
5.2	Mechanical Properties	5.2.2 Table 5	IS 16733:2018 / IS 1608 Pt. 1	R	One	Each Control Unit	-
5.3	Microstructure	5.3.1	IS 16733:2018	R	One	Each Control Unit	--
5.4	Internal Soundness	5.4	IS 16733: 2018 / IS 3664	R	Firm shall exercise adequate in-process controls to ensure that the material remains free from internal defects. The internal soundness requirements shall be fixed by mutual agreement between the purchaser and the manufacturer.		
5.5	Surface Quality	5.5.1 5.5.2 5.5.3	IS 16733:2018 / ISO 9443	R	Firm shall exercise adequate in-process controls to ensure that the material remains free from surface defects. . The surface quality requirements shall be fixed by mutual agreement between the purchaser and the manufacturer.		
5.6	Shape, Dimensions and Tolerances	5.6	IS16733:2018 / ISO 1035_1 / ISO 1035_3 / ISO 1035_4	R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances agreed at the time of enquiry and order . However, appropriate records shall be maintained by the manufacturer for evidence of conformity.	The shape, dimensions and tolerances of the products shall comply with the requirements agreed upon at the time of enquiry and order.	
Annex A	Supplementary or Special Requirements a) Content of non-metallic inclusion b) Ultrasonic Test c) Product Analysis d) Special	A.1, A.2, A.3,A.4,A .5	IS 16733:2018 ISO 4967 ISO 377-2 ISO/TR 9769	S	----	Levels of Controls shall be as agreed to between the manufacturer and purchaser	

	Agreements for Marking					
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Annexure-I
XYZ IRON AND STEEL COMPANY
(Registered office Address and works address)
TEST CERTIFICATE FOR SPECIFICATION FOR
Ferritic-Pearlitic Engineering Steels for Precipitation Hardening from Hot-Working Temperatures

TEST CERTIFICATE No. _____ DATE _____
To M/s _____

We certify that the material described below fully conforms to IS 16733:2018 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_____areas indicated below against each order No.

(PLEASE REFER TO IS 16733:2018 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order no and date	Form/Size* /Shape	Designation /Condition	Cast No.	Quantity	Chemical Composition								Mechanical Properties				Micro Structure	Supplementary and Special Requirements	Remarks

*The material supplied conforms to the specified dimensions and tolerances

REMARKS
WAGON NO/
TRUCK NO.
(It is suggested that size A4 paper be used for this test certificate)

FOR XYZ IRON AND STEEL COMPANY