



उत्पाद मानुयल
दाब पात्र के लिये कार्बन मैंगनीज़ स्टील' फोर्जिंग
IS 12146:1987 के अनुसार

**PRODUCT MANUAL FOR
Carbon-Manganese Steel Forgings for Pressure Vessels
According to IS 12146:1987**

भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम की स्कीम-I के तहत यह उत्पाद मानुयल प्रमाणीकरणके प्रचलन में रीति और पारदर्शिता के सुसंगत सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों एवं लाइसेन्स धारियों द्वारा संदर्भ सामग्री के रूप में 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 12146:1987
	शीर्षक Title	:	दाब पात्र के लिये कार्बन मैंगनीज़ स्टील' फोर्जिंग Specification for Carbon-Manganese Steel Forgings for Pressure Vessels
	संशोधन संख्या No. of amendments	:	1 1
2.	नमूनाकरण दिशा निर्देश Sampling Guidelines		
a)	कच्चा माल Raw material	:	No raw material requirements are specified in the standard.
b)	समूहिकरण दिशा निर्देश Grouping Guidelines	:	कृपया Annex-A देखें Please refer Annex - A
c)	नमूनेका परिमाण Sample Size	:	Tests for dimensional and tolerances shall be carried out on full forgings selected as sample in factory & conformity shall be reported against the agreed requirements between the manufacturer and purchaser For Physical test: As per Cl 9.1., Table 4 & Cl 11 of IS 12146:1987 and/or prepared test specimen for Tensile Test and Impact Test

			For chemical test : 5 pieces of 50 mm length/50 g drilling (Samples are to be drawn by discarding the heat affected zone in case of gas cutting)
			No market samples shall be drawn for the product as the product is bulky in nature.
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	:	All tests as per IS 12146:1987
6.	लाइसेन्स का कार्यक्षेत्र/Scope of the Licence :		
	IS 12146:1987 के अनुसार मानक मुहर का उपयोग करने के लिए लाइसेन्स निम्नलिखित कार्यक्षेत्रके लिए प्रदान किया जाता है Licence is granted to use Standard Mark as per IS 12146:1987 with the following scope:		
	Name of the product		Carbon-Manganese Steel Forgings for Pressure Vessels
	Grade		Grade-I / Grade-II / Grade-III

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

ANNEXURE A
TO PRODUCT MANUAL FOR
Carbon Manganese Steel Forgings for Pressure Vessels
According to IS 12146:1987

GROUPING GUIDELINES

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Carbon-Manganese Steel Forgings for Pressure Vessels according to IS 12146: 1987 are classified on the basis of increasing Minimum Yield Strength and decreasing % elongation as mentioned below:-

YS(Min)	Grade	% Elongation(Min)
	I	
	II	
	III	

The following guidelines shall be followed for considering grant of licence/inclusion as per IS 12146:1987 :

One sample of the highest grade shall be drawn to cover all grades in the scope of the licence.. If sample of Grade-III is tested and found conforming, then Grade-I & Grade-II may also be covered in the scope of the licence.

While considering inclusion of additional varieties, it shall be ensured that complete manufacturing facilities & testing facilities for all requirements are available with manufacturer for the grades to be included in the licence.

During the operation of licence, it shall be ensured that all grades covered in the scope of the license are drawn for independent testing on rotation over a period of time.

ANNEXURE B
TO PRODUCT MANUAL FOR
Carbon-Manganese Steel Forgings for Pressure Vessels
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LIST OF TEST EQUIPMENTS

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Major test equipment essentially 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.	Universal Tensile Testing Machine(UTM) with Extensometer, Brinell Hardness Testing Machine with Standard Block	Tensile test , Cl.6.1. (Table 3)
2.	Vernier Calliper, Steel scale, Micrometer, Steel Tape	Dimensions and Tolerances, Cl 7.1.
3.	Charpy Impact Tester, Cold Chamber(0 °C)	Impact Test, Cl.6.1. (Table 3)
4.	Ultrasonic flaw detector	Ultrasonic testing, Cl.11
5.	Device for instrumental chemical analysis such as Spark Optical Emission Spectrometer, Atomic Absorbtion Spectrometer etc. with all requisite channels, certified reference materials/standard reference materials OR Equipment, Apparatus and reagents as per the relevant parts of IS 228 in case of analysis as per IS 228 (chemical method)	Chemical composition, Cl 5
6.	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	C & S - cl.5. (chemical method, alternative to instrumental method)
7.	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	Phosphorus content – cl.5. (chemical method, alternative to instrumental method)

	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), Perchloric Acid (HClO ₄), Sulphurous Acid, Hydrobromic Acid (HBr), other chemicals and reagent as applicable	
8.	Hot plate, 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	Manganese content –cl.5. (chemical method, alternative to instrumental method)
9.	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 hydrofluoric acid	Silicon content –cl.5. (chemical method, alternative to instrumental method)

Note 1: The above is an indicative list for the purpose of guidance only

Note 2: The least count/accuracy, range and specification of the apparatus, chemicals and reagents used shall be as per the Indian Standards Specifications

ANNEXURE C
TO PRODUCT MANUAL FOR
Carbon-Manganese Steel Forgings for Pressure
Vessels
According to IS 12146:1987

SCHEME OF INSPECTION AND TESTING

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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. LABELLING, MARKING, PACKING - The Standard Mark as given in schedule of the licence 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 conform to all the requirements of the specification.

4. CONTROL UNIT - For the purpose of this scheme material or part thereof representing all forgings of the same cast, grade and manufactured under uniform conditions of production 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.

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

6. TEST CERTIFICATE - For each consignment of BIS Certified material conforming to IS 12146:1987 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. Any rejected material which is potentially re-salable be sheared or cut or deformed in such a manner that it cannot be used for any other purpose except re-melting. A separate record shall be maintained giving information on quantity and cast 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.

ANNEXURE C
TO PRODUCT MANUAL FOR
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According to IS 12146:1987
SCHEME OF INSPECTION AND
TESTING

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TABLE 1: LEVELS OF CONTROL

(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				
4	Manufacture	4.1 to 4.4	IS 12146	R	-----	-----	Applicable for all manufacturers including: i) manufacturers with steel making facilities i i) Manufacturers producing forgings from Ingots as raw material: Must ensure that Ingots procured by them comply with Cl 4.1 to 4.3 of IS 12146:1987 Accordingly, records in support of the same shall be maintained which shall include raw material certificate indicating steel manufacturing process, freedom from defects etc.
5	Chemical Composition						

	Ladle Analysis	5.1 & Table 1	-do-	R	One	Each Heat	
	Product Analysis	5.2 , Table-1 and Table-2	-do-	R	One	Each Heat	Sample shall be taken as per Cl 5.2 of IS 12146
	Chemical composition shall be determined either by method specified in IS 228 or any other established instrumental/Chemical Method						
6.1	Mechanical Properties	6.1 and Table 3	IS 12146	R	One	Each Heat	
8	Freedom from Defects	8	IS 12146	R	Adequate inspection to ensure each item to be free from defects		
7	Workmanship and Finish	7.1	IS 12146	R	Adequate inspection and testing to ensure finish, shapes, dimensions and tolerances as agreed between manufacturer and supplier.		
11	Ultrasonic Testing	11.1	IS 12146	R	Requirements as agreed between purchaser and manufacturer. Test Method for Ultrasonic Testing to be specified by the manufacturer.		

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 empanelled 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.

ANNEXURE I**Page 4 of 4**

(Para 6 of the Scheme of Inspection and Testing)

XYZ IRON AND STEEL COMPANY

(Registered office Address and works address)

TEST CERTIFICATE FOR Carbon-Manganese Steel Forgings for Pressure VesselsBIS
STANDARD
MARK

TEST CERTIFICATE No. _____

DATE _____

To M/s _____

We certified that the material described below fully conforms to 12146:1987 Chemical composition and Mechanical properties of the product, as tested in accordance with the Scheme of Testing and Inspection contained in the BIS Certification Marks Licence No. CM/L _____ are as indicated below against each order No.

(PLEASE REFER TO IS 12146:1987 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order No. & Date	Size	Control Unit No.	Grade	Quantity in tonnes	CHEMICAL COMPOSITION					MECHANICAL PROPERTIES					Ultrasonic testing	Remarks
					C %	S %	P %	Si %	Mn %	TS	%El	YS	% Reduction in Area	Charpy Absorbed Energy		

REMARKS

WAGON NO.

TRUCK NO.

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

FOR XYZ IRON AND STEEL COMPANY