



**PRODUCT MANUAL FOR  
Tool and Die steels  
According to IS 3748:1990**

1.	<b>Product</b>	:	<b>IS 3748:1990</b>
	<b>Title</b>	:	<b>Tool and Die steels</b>
	<b>No. of amendments</b>	:	<b>2</b>
2.	<b>Sampling Guidelines</b>		
a)	<b>Raw material</b>	:	<b>No specific requirement for raw material</b>
b)	<b>Grouping Guidelines</b>	:	Please refer Annex - A
c)	<b>Sample Size</b>	:	For Chemical tests: i) For instrumental chemical analysis - 5 pieces of 5 cm ii) For Wet Chemical analysis - 50 gm drillings For Mechanical tests- 1no x 1.5m
3.	<b>List of Test Equipment</b>	:	Please refer Annex - B
4.	<b>Scheme of Inspection and Testing</b>	:	Please refer Annex - C
5.	<b>Possible tests in a day</b>	:	All tests can be performed in a day except for additional test as per clause 14 of IS 3748:1990
6.	<b>Scope of the Licence :</b>		
	License is granted to use Standard Mark as per IS 3748:1990 with the following scope:		
	<b>Name of the product</b>	Tool and Die Steels	
	<b>Steel Designation</b>	50T8, 55T8 etc..	
	<b>Condition of supply</b>	Hot rolled and annealed/forged and annealed/cold drawn/Turned or machined etc..	
	<b>Variety/Shape/Size</b>	Hot rolled round & square bars of nominal size ..mm to ...mm, flat bars, Forged square section of Size ...mm to ..mm, Cold drawn round bars of size ..mm to ..mm, ..	
	<b>Optional Requirements</b>	With or Without macro etch test, ..	

**ANNEXURE A**  
**TO PRODUCT MANUAL FOR**  
**Tool and Die Steels**  
**IS 3748:1990**  
**GROUPING GUIDELINES**

Grouping of different steel designations has been done on the basis of phase of iron and chemical composition/alloying elements and condition of supply. Guidelines for drawing of samples from each group are as under:

Group	Steel Designation	Remarks
1	Cold Work- 50T8,55T8, 60T6,65T6, 70T6,75T6, 80T6, 85T6, 70T3, 80T3, 90T3,103T3 118T3,133T3	Two samples each from the group with one designation of minimum carbon limit and one designation of maximum carbon limit, of any variety, size, shape and condition may be tested to cover all steel designations, varieties, sizes and shapes within the group.
2	Cold Work- Steel Designations other than that covered in Group-1 (T80V2 to T50W8Cr5V2)	Sample of a designation, intended to be covered in licence scope, of any variety, size, shape, may be drawn and tested for all requirements of the specification, as applicable, to cover the designation for all shapes and size.
3	Hot Work- XT33W9Cr3V4 XT55W14Cr3V4	One sample of any steel designation within the group of any size, shape, may be drawn and tested for all requirements of the specification, as applicable, to cover all steel designations, sizes and shapes within the group.
4	Hot Work- XT35Cr5Mo1V3 XT35Cr5MoV1 XT35Cr5MoW1V3	One sample of any steel designation within the group of any size, shape, may be drawn and tested for all requirements of the specification, as applicable, to cover all steel designations, sizes and shapes within the group.

1. If the above sample passes, then licence may be granted/inclusion be done for the Steel designations, for all sizes and varieties of the Group.
2. However, it shall be ensured that the firm is having all the necessary manufacturing and testing facilities for the manufacture and testing of the sizes/grade designations /varieties of Stainless Steel bars and Flats to be included in the licence.
3. During the operation of licence, BO shall ensure that all the sizes/grade designations/ varieties covered in the license are drawn for independent testing on rotation over a period of time.

ANNEXURE B  
TO PRODUCT MANUAL FOR  
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**LIST OF TESTING EQUIPMENT**

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Major test equipment essentially required to test as per requirements of 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	Preparation of specimen
2.	Vision-based inspection system, metallurgical microscope	6.1 (Freedom from Defects)
3.	Microscope with Magnification (100x, 200x, 500x, 1000x)- computer aided	6.2, 6.2.1 (Decarburization)
4.	<p><b>Instrumental methods</b> Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, spark source optical emission spectrometry.</p> <p>Spectrophotometer</p>	<p>7 for C,S,P,Mn,Si,Ni,Cu,Cr ,N,Mo,Sn,V</p> <p>Mn,S,P,Si,Mo,</p>
5.	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	7 for C & S (chemical method, alternative to instrumental method)
6.	<p>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</p> <p>Potassium Permanganate (KMnO<sub>4</sub>), Sodium Nitrite</p>	7 (Phosphorus content) (chemical method, alternative to instrumental method)
7.	<p>Hot plate, Conical flask</p> <p>Reagents:</p> <p>silver nitrate, ammonium persulphate sodium arsenite solution, Dilute Nitric Acid, Phosphoric Acid, Dilute Sulphuric Acid, Concentrated .Nitric Acid, NaCl Solution, Permanganic acid</p>	7 (Manganese content) (chemical method, alternative to instrumental method)

8.	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	7(Silicon content) (chemical method, alternative to instrumental method)
9.	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( Cu content) (chemical method, alternative to instrumental method)
10.	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 (Ni content) (chemical method, alternative to instrumental method)
11.	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 (Cr content) (chemical method, alternative to instrumental method)
12.	Hardness Tester (Brinell)- with tungsten carbide indenter	9.1(Brinell Hardness test)
13.	Vernier Calipers, Micrometer, Scale, Cord, Measuring Tape, Straight Edge, Flat bench	10.1(tolerances for dimensions)
14.	Ultrasonic flaw detector with amplifier/attenuator calibrated in steps of atleast 2dB, CRT/Monitor, Double Crystal probes, calibration blocks	13(Ultrasonic Test)
15.	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 stannous 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	14.2 (Macro etch test)
16.	Metallurgical microscope(1000X), photomicrographs of series NA, NH, LE, LD	14.2 ( Distribution of carbides)
17.	Fixed or mobile MPI equipment, Inspection medium	14.2(Magnaflux test)
18.	Microscope with Magnification (100x, 200x, 500x, 1000x)	14.2(non-metallic inclusion content)

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

**ANNEXURE C  
To PRODUCT MANUAL FOR  
Tool and Die Steels  
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**SCHEME OF INSPECTION AND TESTING**

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**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. LABELLING & MARKING** – The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L.....) shall be incorporated, labelling and the marking shall be done as per the provisions of the Indian Standard, provided always that the product thus marked conforms to all the requirement of the specification. In addition, details of BIS website shall be marked as follows: “For details of BIS certification please visit [www.bis.gov.in](http://www.bis.gov.in)”.

**4. CONTROL UNIT** – For the purpose of this Scheme, a control unit is defined as material of same cast, finish, condition & shape and processed to same dimensions under uniform conditions of production.

**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.

**6. TEST CERTIFICATE**- For each consignment of BIS Certified material conforming to IS 3748:1990 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/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 LEVELS OF CONTROL  
(PARA 5 OF THE SCHEME OF INSPECTION AND TESTING)**

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or)S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
5	Manufacture	5.1 5.2 5.3 5.3.1	IS 3748:1990	R	Each Item	Each Item	If found defective, item shall be rejected and not be marked.
6	Freedom from Defects	6.1	IS 3748:1990	R	-do-	-do-	-do-
	Decarburization	6.2 6.2.1	3748:1990	R	One	Each Control Unit	
7	Chemical Composition	Relevant parts of IS 228 or any other established instrumental/ chemical method. However, records of referee method in case of no referee method in IS 228 and as agreed to between manufacturer & purchaser shall be maintained.					
	Ladle Analysis	7.1 7.2 11.1 Table-1	IS 3748:1990	R	One	Each Heat	
	Check analysis	7.2 11.1 12.1 Table-1,2	IS 3748:1990	R	One	Each Cast	If required by the purchaser.

9	Hardness	9.1, 11.2 12.2	IS 3748:1990 IS 1500	R	One  One	Each Control Unit  15 tonnes or part thereof of each control unit	For steels in the annealed condition.  If steel is continuously heat-treated.
10	Dimensional Tolerances	10.1 10.2 Table 3 to 13	IS 3748:1990 IS 3739 IS 10604 Pt.1&2	R	Each Item	Each item	
13	Ultrasonic test	13.1	IS 3748:1990 IS 3664	R	Each bar/blank	Each bar/blank	
14	Additional Tests	14.1,14.2	IS 3748:1990 IS 11371 IS 3703 IS 10138 Pt. 1 to 3	S	----	----	See Note-3

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.

Note-3: ----- means the levels of control in Column(3) of Table-1 are as agreed to between the manufacturer and purchaser.

**Annexure-I**  
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(Para 6 of the Scheme of Inspection and Testing)  
XYZ IRON AND STEEL COMPANY

(Registered office Address and works address)



**TEST CERTIFICATE FOR SPECIFICATION FOR Tool and Die Steels**

TEST CERTIFICATE No. \_\_\_\_\_ DATE \_\_\_\_\_  
To M/s \_\_\_\_\_

We certified that the material described below fully conforms to IS 3748:1990 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 3748:1990 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

**TEST RESULTS**

Order no and date	Size/ Shape /Type	Designation/ Condition	Cast	Quantity	Chemical Composition											Hardness	Tolerances	Additional # tests/ Remarks										
					C	Si	Mn	P	S	Ni	Cr	Mo	Cu	Cr	Ti				W									

# as required by purchaser

REMARKS  
WAGON NO.  
TRUCK NO.

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

FOR XYZ IRON AND STEEL COMPANY