

**PRODUCT MANUAL FOR
Wrought Aluminium and its Alloys-
Drawn Tubes for General Engineering Purposes
According to IS 738:1994**

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.	Product	:	IS 738:1994
	Title	:	Wrought Aluminium and its Alloys-Drawn Tubes for General Engineering Purposes
	No. of amendments	:	NIL
2.	Sampling Guidelines		
a)	Raw material	:	No specific requirement
b)	Grouping Guidelines	:	Please refer Annex – A
c)	Sample Size	:	For Mechanical test: 3m, Chemical test: 5 pcs of 5cm x 1cm
3.	List of Test Equipment	:	Please refer Annex - B
4.	Scheme of Inspection and Testing	:	Please refer Annex – C
5.	Possible tests in a day	:	All tests
6.	Scope of the Licence :		
	Licence is granted to use Standard Mark as per IS 738:1994 with the following scope:		
	Name of the product	Wrought Aluminium and its Alloys-Drawn Tubes for General Engineering Purposes	
	Alloy Designation	19000/19500 etc.	
	Size	Wall Thickness, Outside Diameter	
	Condition	Temper designation i.e. M, F, O, H etc.	

ANNEXURE A
PRODUCT MANUAL FOR
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GROUPING GUIDELINES

Designations have been divided into different groups and are arranged in order of least to most stringent based on tensile properties as given below: -

Less Stringent ↓ More stringent	Group 1	Group 2	Group 3	Group 4	Group 5
	19000	24345	31000	52000	63400
	19500				64430
					65028
					65032

1. In each group if sample of more stringent designation is drawn the lower designations may be covered for same temper designation.
2. Separate samples under each group are to be drawn for each Temper Condition to be included in Scope of Licence.
3. Sample of any one size may be drawn to cover all the sizes for which manufacturing and testing facility is available with firm.
4. However, it shall be ensured that the firm is having all the necessary manufacturing and testing facilities for the manufacture and testing of the varieties to be included in the licence.
5. During operation of licence, samples of all varieties shall be drawn by rotation.

ANNEXURE B
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LIST OF TEST EQUIPMENT

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

Sr. No.	Test Equipment	Tests used in with Clause Reference
1.	Vernier Caliper	Dimensions and Tolerances (Clause 7)
2.	Micrometer	
3.	Steel Scale	
4.	Right Angle	
5.	Measuring Tape	
6.	Feeler Gauge	
7.	Straight Surface	
8.	Universal Tensile Testing Machine	Tensile Test (Clause 9.1.1) And Flattening test (Clause 9.1.2)
9.	Extensometer	
10.	Spectrometer	Chemical Composition (Clause 8)
11.	Analytical Balance(0-200gm, LC- 0.1mg)	
12.	Hot Plate	
13.	Hot Air Oven	
14.	Photometer (Absorption cell)	
15.	Porcelain/Silica Crucible	
16.	Platinum Crucible	
17.	Thermometer	
18.	Filter Paper including ashless filter paper pad	
19.	Stainless steel/nickel beaker, Plastic/polyethene/SS Beaker	
20.	Pyrex beakers and other glassware	
21.	Reagents-Mixed Acid(Conc.HCL, Conc. Sulphuric Acid, Conc. Nitric Acid), Dilute Sulphuric Acid, Hydrofluoric Acid, Hydrogen Sulphide(gas), Hydrogen Sulphide Wash Solution, Dilute Nitric Acid, Concentrated Ammonium Hydroxide, Dilute Ammonium Hydroxide Wash Solution, Citric Acid Solution, Sodium-Diethyl-Dithiocarbonate solution, Carbon Tetrachloride, Sodium Sulphate, Standard Copper Solution, silica basin.	Copper (Below 0.1%)
22.	Reagents – Concentrated Sulphuric Acid, Concentrated Nitric Acid, Concentrated Hydrochloric Acid, Mixed Acids(Conc.HCL, Conc. Sulphuric Acid, Conc. Nitric Acid), Hydrofluoric Acid, Dilute Sulphuric Acid,	Copper (Above 0.1%)

	Ammonium Fluoride, Concentrated Ammonium Hydroxide, Acetic Acid, Urea Solution, Potassium Iodide Solution, Standard Sodium Thiosulphate Solution, Starch solution, ammonium thiocyanate, Sodium Hydroxide Solution, Sodium Sulphate Solution, Sodium Hydroxide-Sodium Sulphate Wash Solution, Dilute Nitric Acid, Sulphurous Acid, Hydrogen Sulphide(gas), Hydrogen Sulphide Wash Solution	
23.	Reagents – Sodium Hydroxide, Hydrogen Peroxide, Sodium Carbonate, Methyl Red Indicator Solution, Conc. Ammonium Hydroxide, Ammonium Chloride Wash Solution, Ammonium Chloride, Conc. Hydrochloric Acid, Ammonium Sulphide Solution, Ammonium Persulphate, Ammonium Sulphide Wash Solution, Bromine Water, 8-Hydroxyquinoline Solution, Dilute Ammonium Hydroxide, Methyl Orange Indicator Solution, Potassium Bromate-Potassium Bromide Solution, Potassium Iodide Solution, Starch Solution, Standard Potassium Iodate Solution, Standard Sodium Thiosulphate Solution	Magnesium (0.01 to 12 %)
24.	Reagents – Sodium Hydroxide Solution, Hydrogen Peroxide, Potassium Cyanide Solution, Dilute Hydrochloric Acid, Ammonium Chloride, Bromine Water, Conc. Ammonium Hydroxide, Sodium Acetate, Tartaric Acid, Chrome Blank T Indicator, Standard Magnesium Sulphate, Standard EDTA Solution.	Magnesium (0.5 to 11%)
25.	Reagents- Sodium Hydroxide Solution, Dilute Nitric Acid, Ammonium Molybdate Solution, Standard Silicon Solution.	Silicon (0.02 to 0.3%)
26.	Reagents – Sodium Hydroxide Solution, Hydrogen Peroxide, Conc. Sulphuric Acid, Sulphuric Acid-Perchloric Acid Mixture, Perchloric Acid Solution, Conc. Nitric Acid, Sulphurous Acid, Dilute Sulphuric Acid, Conc. Hydrochloric Acid, Ammonium Acetate Solution, Dilute Hydrochloric Acid, Hydrofluoric Acid	Silicon (Above 0.3%)
27.	Reagents-Sodium Hydroxide Solution, Finely granulated lead containing under 0.001% iron, Acetate Buffer Solution, Hydroxylamine Hydrochloride Solution, O-phenanthroline solution, Standard Iron Solution. Equipment – Magnet, Nickel Beaker.	Iron (0.03 to 0.10%)
28.	Reagents -Concentrated Sulphuric Acid, Concentrated Nitric Acid, Concentrated	Iron (0.01 to 2.0%)

	Hydrochloric Acid, Mixed Acids(Conc.HCL, Conc. Sulphuric Acid, Conc. Nitric Acid), Dilute Sulphuric Acid, Hydrofluoric Acid, Potassium Bisulphate, Hydrogen Sulphide, Hydrogen Sulphide Wash Solution, Potassium Permanganate Solution, Potassium Thiocyanate Solution, Standard Titanous Chloride Solution. Equipment – Apparatus for Storing Titanous Chloride Solution, Solid Glass Beads.	
29.	Reagents – Sodium Hydroxide Solution, Sodium Nitrite Solution, Acid Mixture(Conc. Nitric Acid and Phosphoric Acid), Hydrofluoric Acid, Potassium Periodate Solution, Standard Manganese Solution	Manganese (Mn content between 0.01 to 0.1%)
30.	Reagents - Sodium Hydroxide Solution, Acid Mixture(Conc. Sulphuric Acid, Phosphoric Acid and Nitric Acid), Silver Nitrate Solution, Ammonium Persulphate Solution, Ammonium Chloride Solution, Standard Arsenite-Nitrite Mixture, Sodium Arsenite, Standard Manganese Solution.	Manganese (Chromium Content up to 0.5%)
31.	Reagents – Conc. Nitric Acid, Sodium Bismuthate, Sulphurous Acid, Dilute Nitric Acid, Phosphoric Acid, Standard Ferrous Ammonium Sulphate Solution, Standard Sodium Oxalate Solution, Standard Potassium Permanganate Solution. Equipment- Asbestos Gooch Crucible.	Manganese (Mn content between 0.1 to 1.5%)
32.	Reagents – Dilute Hydrochloric Acid, Potassium Chlorate, Carbon Tetrachloride, Complex Forming Solution (Conc. Ammonium Hydroxide, Ammonium Oxalate, HCl acid, sodium acetate, sodium thiosulphate solution and sodium sulphide solution), Dithizone Solution, Sodium Sulphide Wash Solution, Standard Zinc Solution.	Zinc (Photometric Method for Zn content below 0.1%)
33.	Reagents – Mixed Acid(Conc. Sulphuric Acid, Conc. HCl and Conc. Nitric Acid), Dilute Sulphuric Acid, Hydrogen Sulphide(gas), Hydrogen Sulphide Wash Solution, Tartaric Acid Solution, Conc. Ammonium Hydroxide, Methyl Red Indicator Solution, Formic Acid Mixture, Formic Acid Wash Solution, Dilute Hydrochloric Acid, Ammonium Nitrate, Methylated Spirit, Mercuric Potassium Thiocyanate Solution, Chloroform, Standard Zinc Solution, Standard Potassium Iodate Solution.	Zinc (By Mercuric Thiocyanate Method)
34.	Reagents – Sodium Hydroxide Solution, Nitric Acid-Sulphuric Acid Mixture, Dilute Sulphuric Acid, Hydrogen Peroxide,	Titanium

	Standard Titanium Solution.	
35.	Reagents – Conc. Sulphuric Acid, Conc. Nitric Acid, Silver Nitrate, Hydrofluoric Acid, Ammonium persulphate, Dilute HCl, Standard Ferrous Ammonium Sulphate Solution, Standard Potassium Permanganate Solution.	Chromium

This is an indicative list for the purpose of guidance only and may not be taken as exhaustive

ANNEXURE C
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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. **LABELLING AND MARKING**–The Standard Mark as given in the Schedule of the license and Licence Number (i.e. CM/L.....) shall be incorporated on each tube, and the marking shall be done as per the provisions of the Indian Standard on each tube, provided always that the product thus marked and packed conforms to all the requirement of the specification.
 - 3.1 **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/cast number and the corresponding test results (as given in Annexure I enclosed).
4. **CONTROL UNIT** – For the purpose of this scheme, one shift production of tubes of one size, alloy & temper designations manufactured on each tube draw bench shall constitute one 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.
36. **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.

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TABLE 1 LEVELS OF CONTROL
(Clause 5 of the Scheme of Inspection and Testing)

TEST DETAILS				Test equipment requirement R: required (or)S: Sub-contracting permitted	LEVELS OF CONTROL		Remarks
Clause	Requirements	Test Method			No. of Samples	Frequency	
		Clause	Reference				
6	Freedom from defects	6	IS 738:1994	R	1	Each Control Unit	
7	Dimensions and tolerances	3	IS 2678:1987	R	1	-do-	
8.1	Chemical composition	3	IS 504(Part1 to 12):2002 or any other established instrumental/chemical method.	S	1	Each consignment of material of the same designation	Chemical testing is not required if material is ISI marked and received with test certificate
9.1	Tensile test	6	IS 1608:Part 1:2018	R	1	-do-	
9.1.2	Flattening test	6	IS 2328:2018	R	1	-do-	

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: Levels of control given in column 3 are only recommendatory in nature. The manufacturer may define the control unit/batch/lot and submit his own levels of control in column 3 with proper justification for approval by B.O. Head.

**ANNEXURE I
TEST CERTIFICATE FORMAT
XYZ IRON AND STEEL COMPANY**

TEST CERTIFICATE FOR Wrought Aluminium and its Alloys-Drawn Tubes for General Engineering Purposes According to IS 738:1994

TEST CERTIFICATE NO. _____ DATED _____
TO M/s _____

It is certified that the material described below fully conforms to IS 738:1994. Chemical 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. etc.

(PLEASE REFER TO IS 738:1994 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

Order no and date	Size (Thickness and OD)	Designation (19000, 19500 etc) and condition	Cast No./Lot No.	Quantity (in tonnes)	Chemical Analysis (in %)												Tensile properties			Remarks			
					Al	Cu	Mg	Si	Fe	Mn	Zn	Ti and/or other grain refining elements	Cr	Ti+V	Total impurities	Cr+Mn/Ti+Cr etc	0.2% proof stress (Mpa)	Tensile strength (Mpa)	Elongation (%)				

The material supplied conforms to specified tolerances

REMARKS

SHIPPING ADVICE NO.WAGON NOS

FOR XYZ IRON AND STEEL COMPANY

“For details of BIS certification please visit www.bis.gov.in”



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