



**PRODUCT MANUAL
FOR
Specification for Steel for the manufacture of Volute helical and laminated Spring for
Automotive Suspension
According to IS 3431:1982**

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 3431:1982
	Title	:	Specification for Steel for the manufacture of Volute helical and laminated Spring for Automotive Suspension
	No. of Amendments	:	2
2.	Sampling Guidelines:		
a)	Raw material	:	<u>No Specific Requirement</u>
b)	Grouping guidelines	:	For each grade designation one sample of any size of Flat/Bar will be drawn for covering complete Range of that section
c)	Sample Size	:	Mechanical Testing 2x1meter (For mechanical testing) Chemical: 5 pcs of 5cm x 5cm or 50 gm drillings
3.	List of Test Equipment	:	Please refer <u>ANNEX –A</u>
4.	Scheme of Inspection and Testing	:	Please refer <u>ANNEX –B</u>
5.	Possible tests in a day :		
	(i)		Chemical composition
	(ii)		Hardenability
	(iii)		Mechanical properties
	(iv)		Freedom from defect
	(v)		Surface decarburization
	(vi)		Straightness
	(vii)		Dimension and Tolerance

6.	Scope of the Licence : (Use separate annexure if required)	
	“Licence is granted to use Standard Mark as per IS 3431:1982with the following scope:	
	Name of the product	Specification for Steel for the manufacture of Volute helical and laminated Spring for Automotive Suspension
	Grade designation	55Si7/ 60Si7/ 65Si7/ 50Cr4V2/ 60Cr4V2
	Type Of Section & Size	Round Bars Dia from... to ... mm Flat of size from ... to ... mm
	Delivery Condition	1, 1a, 3, 3a, 11I, 11k
	Any other aspect required as per the Standard	With or Without Inclusion Rating

ANNEX AList of Test Equipment*Major test equipment required to test as per the Indian Standard*

Sl. No.	Tests used in with Clause Reference	Test Equipment
01	Chemical Composition Clause 5.0	<p>Instrumental methods Spectrometer: atomic-absorption spectrometry, inductively coupled plasma atomic emission, inductively coupled plasma mass spectrometry techniques, spark source optical emission spectrometry. Standard Reference Material with certificate</p> <p>For Chemical method <u>For carbon & Sulphur</u> 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.</p> <p><u>For Phosphorus</u> 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</p>

		<p><u>For Manganese –</u> 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.</p> <p><u>For Chromium</u> 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.</p>
02	Hardness/Hardenability/ Cold shearability (Cl 6.1, 7.1 & 9.1)	Hardness Tester (Vickers/Brinell/Rockwell) Muffle Furnace Quenching arrangement
03	Freedom from defects (Cl. 10.1,10.2, 10.3)	Visual
04	Freedom from defects (Inclusion rating) (Cl. 10.4 & IS 4163)	Arrangement for cutting and Polishing, 100X microscope
05	Surface Condition/ Decarburization (Cl. 11.1)	Optical microscope with image Analyzer
06	Mechanical Properties (Clause 8.0)	Universal Tensile testing machine Hardness Tester (Vickers/Brinell/Rockwell)
07	Dimensions And Tolerances & straightness (Clause 12 & 13)	Vernier Caliper, Height gauge, Micrometer, Steel Scale, Measuring Tape, Feeler gauge, Straight Edge

The above list is indicative only and may not be treated as exhaustive.

ANNEX B

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 Schedule of the license and Licence Number (i.e. CM/L.....) shall be stamped on each bar/flat

3.1 Each bar of over 12 mm diameter or of equivalent cross section shall be stamped with the name or trade-mark of the manufacturer, grade, and the cast number or any other identification mark by which the steel may be traced to the cast from which it has been made. Such marking shall be made at the extreme end of each bar

3.2 Bars of 12 mm diameter or of equivalent cross section and below shall be bundled as agreed to between the purchaser and the supplier and 10 IS :3431- 1982 a metal tag attached to each bundle shall bear similar markings as described 3.1

3.1 Marking and packing shall be done as per the provisions of the Indian Standard, provided always that the product thus marked and packed conforms to all the requirement of the specification.

4. CONTROL UNIT For the purpose of this scheme, steel bars/Flats of the same shape, dimensions, tolerance and Designation manufactured from same cast/heat under identical conditions 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.

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

6. 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.

TABLE 1

(1)				(2)	(3)		
Test Details				Test equipment requirement R: required (or) S: Sub-contracting permitted	Levels of Control		
Cl.	Requirement	Test Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
5.0	Chemical Composition (Ladle Analysis)	5.0	IS 3431 & IS 228	R	One	Each Cast	.
5.0	Chemical Composition (Product Analysis)	5.0	IS 3431 & IS 228	R	One	Each Cast	
7.0	Hardness/Hardness/ Cold shearability	Cl 6.1, 7.1 & 9.1	IS 3431	R	One	Each control unit	
10.0	Freedom from defects	Cl. 10.1,10.2, 10.3	IS 3431	R	Adequate inspection to ensure each item conforms to the requirement of the specification		
10.0	Inclusion Rating (Optional requirement)	Cl. 10.4	IS 4163	R	As desired by the purchaser		
8.0	Mechanical Properties	8.0	IS 3431	R	One	Each control unit	
13.0	Dimensions & Tolerances	12.0 & 13.0	IS 3431	R	Adequate inspection to ensure each item conforms to dimensions specified by the purchaser and tolerances as stipulated in the standard.		
12.0	Straightness	12.0	IS 3431	R	-do-		
11.0	Surface Decarburization	11.0	IS 3431	R	One	Each Control Unit	

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.