



उत्पाद मानुयल
Specification for Steel for the Manufacture of Volute, Helical and Laminated
Springs for Automotive Suspension
IS 3431:1982 के अनुसार

PRODUCT MANUAL
FOR
Specification for Steel for the Manufacture of Volute, Helical and Laminated
Springs for Automotive Suspension
According to IS 3431:1982

भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन (विनियम की स्कीम-I के तहत यह उत्पाद मानुयल प्रमाणीकरणके प्रचलन मे रीति और पारदर्शिता के सुसंगता सुनिश्चित करने के लिए सभी क्षेत्रीय/शाखा कार्यालयों एवं लाइसेन्स धारियों द्वारा संदर्भ सामग्री के रूप मे 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 3431:1982 |
| | शीर्षक Title | : | Specification for Steel for the manufacture of Volute helical and laminated Spring for Automotive Suspension |
| | संशोधन संख्या No. of Amendments | : | 3 |
| 2. | नमुनाकरण दिशा निर्देश Sampling Guidelines: | | |
| a) | कच्चा माल Raw material | : | No Specific Requirement |
| b) | समूहिकरण दिशा निर्देश Grouping guidelines | : | For each grade designation and treatment condition, one sample of any size of Bar/Flat will be drawn for covering complete range of that section |
| c) | नमूनेका परिमाण | : | Mechanical Testing 2x1meter (For mechanical testing) Chemical: 5 pcs of 5cm x 5cm or 50 gm drillings |

| | | | |
|----|---|--|------------------------------|
| | Sample Size | | |
| 3. | परीक्षण उपकरणों की सूची List of Test Equipment | : | Please refer <u>ANNEX –A</u> |
| 4. | निरीक्षण व परीक्षण स्कीम Scheme of Inspection and Testing | : | Please refer <u>ANNEX –B</u> |
| 5. | एक दिन में संभावित परीक्षण Possible tests in a day : | | |
| | All tests are possible to be carried out in a day | | |
| 6. | लाइसेन्स का कार्यक्षेत्र /Scope of the Licence : | | |
| | IS 3431:1982 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 3431:1982with the following scope: | | |
| | Name of the product | Specification for Steel for the Manufacture of Volute Helical and Laminated Springs for Automotive Suspension | |
| | Grade designation | 55Si7/ 60Si7/ 65Si7/ 50Cr4V2/ 60Cr4V2 | |
| | Type Of Section & Size | Bars of Diameter from ...xx ... mm to up to and including ...xx.... mmFlats of Thickness from ...xx ... mm to up to and including ...xx ... mm , Width from ...xx ... mm to up to and including ...xx ... mm | |
| | Treatment Condition | As-rolled (Untreated)/ Quenched for Through-Hardenability/Soft Annealed/ Quenched and Tempered | |
| | Any other aspect required as per the Standard | With or Without Inclusion Rating | |

**ANNEX A TO THE PRODUCT MANUAL
FOR SPECIFICATION FOR STEEL FOR THE MANUFACTURE OF VOLUTE, HELICAL
AND LAMINATED SPRINGS FOR AUTOMOTIVE SUSPENSION AS PER IS 3431:1982**

List 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 7.1,7.1.2 & 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) | 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 TO THE PRODUCT MANUAL
FOR SPECIFICATION FOR STEEL FOR THE MANUFACTURE OF VOLUTE, HELICAL
AND LAMINATED SPRINGS FOR AUTOMOTIVE SUSPENSION AS PER IS 3431:1982**

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.

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

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

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 Grade 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.

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 3431:1982 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.

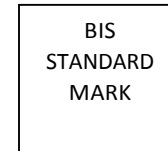
TABLE 1
LEVELS OF CONTROL (para 5 of Scheme of Inspection and Testing)

| (1) | | | (2) | (3) | | | |
|--------------|---|-----------------|--|-------------------|--|-------------------|--|
| Test Details | | | Test equipment requirement R: required (or) S: Sub-contracting permitted | Levels of Control | | | |
| Cl. | Requirement | Test Method | | No. of Sample | Frequency | Remarks | |
| | | Clause | Reference | | | | |
| 5.0 | Chemical Composition (Ladle Analysis) | 5.0 | IS 228 | R | One | Each Cast | ----- |
| 5.0 | Chemical Composition (Product Analysis) | 5.0 | IS 228 | R | One | Each Cast | ----- |
| 7.0 | Hardness/Hardenedability/ Cold shearability | 7.1,7.1.2 & 9.1 | IS 3431 IS 1586 (Part 1) | R | One | Each control unit | ----- |
| 10.0 | Freedom from defects | 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) | 10.4 | IS 4163 | R | As desired by the purchaser | | |
| 8.0 | Mechanical Properties | 8.1 to 8.3.1 | IS 3431 IS 1608 (Part 1) IS 1500 (Part 1) | 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 | Adequate inspection to ensure that each item conforms to the requirement of the specification or as agreed to between the manufacturer and purchaser | | |
| 11.0 | Surface Decarburization | 11.0 | IS 3431 | R | One | Each Control Unit | The limit of decarburization may be fixed by agreement between the purchaser and the supplier. Test Method for Surface Decarburization to be declared by 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 1
 (Para 6 of the scheme of Testing and inspection)
 XYZIRONANDSTEELCOMPANY



(Registered Office Address and Works Address)

TEST CERTIFICATE FOR SPECIFICATION FOR STEEL FOR THE MANUFACTURE OF VOLUTE, HELICAL AND LAMINATED SPRINGS FOR AUTOMOTIVE SUSPENSION

TEST CERTIFICATE NO. _____

DATE _____

TO M/s _____

We certify that the material described below fully conforms to IS 3431:1981. Chemical composition and mechanical 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 below against each order no.

(please refer to IS 3431:1982 FOR DETAILS OF SPECIFICATION REQUIREMENTS)

TEST RESULTS

| Order No. & DATE | Size | CAST/ COIL/ LOT NO/HEAT | QUANTITY | CHEMICALS ANALYSIS | | | | | | | MECHANICAL PROPERTIES | | | | Hardenability | Surface Decarburization | Grade Designation | Treatment Condition |
|------------------|------|-------------------------|----------|--------------------|------|------|-----|-----|------|-----|-----------------------|--------------|----------|--------------|---------------|-------------------------|-------------------|---------------------|
| | | | | C % | Si % | Mn % | S % | P % | Cr % | V % | Tensile strength MPS | Yield Stress | Hardness | Elongation % | | | | |
| | | | | | | | | | | | | | | | | | | |

REMARKS
 TRUCK NO.
 WAGON NO.

SIGNATURE
 DESIGNATION
 FOR XYZIRONANDSTEEL