PM/ IS 398 (Part 6)/ 2/December 2024

उत्पाद मैन्युअल

आई एस 398-6 : 2021 के अनुसार

ओवरहेड ट्रांसमिशन प्रयोजनों के लिए एल्यूमिनियम कंडक्टर भाग 6:

उच्च चालकता एल्यूमिनियम मिश्र धातु फंसे कंडक्टर के लिए

दस्तावेज़ संख्या – पी एम/आई एस 398 (भाग-6) /2/ दिसंबर 2024

विभिन्न उत्पादों के लिए भारतीय मानक ब्यूरो (अनुरूपता मूल्यांकन) विनियम, 2018 की योजना- I के तहत प्रमाणन के संचालन में एकरूपता और पारदर्शिता के लिए इस उत्पाद मैन्युअल का उपयोग सभी क्षेत्रीय / शाखा कार्यालयों और लाइसेंसधारियों द्वारा संदर्भ सामग्री के रूप में किया जाएगा। दस्तावेज़ का उपयोग बीआईएस प्रमाणन प्राप्त करने के इच्छुक संभावित आवेदकों द्वारा भी किया जा सकता है।

PRODUCT MANUAL FOR

Aluminium Conductors for Overhead Transmission Purposes Part 6:
High conductivity Aluminium Alloy Stranded Conductors
According to IS 398 (Part 6): 2021

Document No. - PM/ IS 398 (Part 6)/2 / December 2024

This Product Manual shall be used as reference material by all Regional/Branch Offices & licensees to ensure uniformity of practice and transparency in operation of certification underScheme-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.

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PRODUCT MANUAL FOR ALUMINIUM CONDUCTORS FOR OVERHEAD TRANSMISSION PURPOSES PART 6 HIGH CONDUCTIVITY ALUMINIUM ALLOY STRANDED CONDUCTORS ACCORDING TO IS 398 (Part 6): 2021

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1.	**मानक संख्या** **IS No.**	:	IS 398 (Part 6) : 2021	
	शीर्षक **Title**	:	Aluminium Conductors for Overhead Transmission Purposes Part 6 High Conductivity Aluminium Alloy Stranded Conductors — Specification	
	संशोधनों की संख्या **No. of amendments**	:	1	
2.	**नमूना दिशानिर्देश** **Sampling Guidelines:**			
a)	**कच्चा माल** **Raw material**	:	-	
b)	**समूहीकरण दिशानिर्देश** **Grouping Guidelines**	:	Please refer ANNEX – A	
c)	**नमूने का परिमाण** **Sample Quantity**	:	Before Stranding	Aluminium Wire- 5m
			Stranded conductor	25 m (For Complete testing including types tests) 5 m (For Acceptance and Routine tests)
3.	**परीक्षण उपकरणों की सूची** **List of Test Equipment**	:	Please refer ANNEX – B	
4.	**निरीक्षण और परीक्षण की स्कीम** **Scheme of Inspection and Testing**	:	Please refer ANNEX – C	

5.	**एक दिन में संभावित परीक्षण Possible tests in a day:**	:	All Acceptance and Routine Tests
6.	**लाइसेंस का दायरा /Scope of the Licence**	:	License is granted to use Standard Mark as per IS 398 (Part 6): 2021 with the following scope:
	High Conductivity Aluminium Alloy Stranded Conductors for overhead power transmission purposes, of sizes upto and including …….mm^2 (Actual Area of Aluminium Conductor)		

ANNEX A

समूहीकरण दिशानिर्देश
Grouping Guidelines

1. High Conductivity Aluminium Alloy Stranded Conductors are grouped below based on the Actual Area of the Aluminium Conductor:

Sl.no.	Group	Nominal Aluminium Area (mm^2)
1	A	Below 100 mm^2
2	B	100 mm^2 and above

Note 1: Grouping is based on classification of tests, where, only conductors of sizes 100 mm^2 and above shall be subjected to Ultimate tensile strength test (Cl 16.9), DC resistance test (Cl 16.10), Stress-strain test on conductor (Cl 16.11).

Note 2: In addition to the samples of varieties drawn for independent testing as per the above guidelines, factory test reports (for Acceptance and Routine tests) of all other varieties intended to be covered in scope of license, shall also be submitted by the manufacturer.

2. For considering GoL / CSoL, sample of largest size of conductor shall be tested to cover all other sizes in that group.

3. The firm shall declare the sizes of conductors/ steel wires they intend to cover in the license. The scope of license may be restricted based on the manufacturing and testing capabilities of the manufacturer. The conductor cross sectional area recommended for GoL / CSoL shall not be larger than that of the tested conductor.

4. During the operation of the Licence, BO shall ensure that all the Varieties covered in the Licence are tested in rotation to the extent possible.

ANNEX B

परीक्षण उपकरणों की सूची

List Of Test Equipment

(INDICATIVE LIST, FOR GUIDANCE ONLY)

Major test equipment required to test as per the Indian Standard

Sl. No.	Test Equipment	Tests used in with Clause Reference	
		Cl. Ref.	Tests
1	Vernier Caliper	9.2.1 16.3 16.6 16.9	Outer diameter of conductor Measurement of lay ratio, Elongation Test Ultimate tensile strength test
2	Steel Scale		
3	Flat Anvil Micrometer	16.4	Measurement of Diameter
4	Tensile Testing machine	16.5 16.6 16.9	Breaking Load Test Elongation Test Ultimate tensile strength test
5	Micro-Ohm Meter / Kelvin Double Bridge	16.7 16.10	Resistivity test DC resistance test
6	Mandrels	16.8	Wrapping Test
7	Wrap Tester		
8	Weighing Balance	9.2.1	Overall Mass of conductor
9	Vernier Calipers	16.11	Stress-strain test
10	Steel Scale		
11	Tensile Testing machine		
12	Strain gauge		

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

ANNEX C

निरीक्षण और परीक्षण की स्कीम

Scheme Of Inspection And Testing

1. QUALITY ASSURANCE PLAN

1.1 It is expected that manufacturers (licensees/applicants) will implement a Quality Assurance Plan i.e. a plan of regular testing and in-process controls, designed to ensure that the product bearing theStandard Mark conforms to all requirements of the Indian Standard.

1.2 The manufacturers shall define a Quality Assurance Plan defining the control unit (i.e. lot/batch etc.) and the levels of control (i.e. the frequency and number of samples for conducting the different tests as per the Indian Standard) and submit the same to BIS Branch Office for information. The manufacturer shall comply with the same and maintain test records in accordance with para 2.4.

1.3 **RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:**
For the guidance of manufacturers, the recommended definition of control unit is: **Aluminium Stranded conductor of continuous production of same size, produced in a day from the same heat treated batch of raw material, shall constitute a control unit.** The manufacturer has the choice to define their own control unit/batch/lot and submit the same to the BIS.

1.3.1 For the guidance of manufacturers in preparing the Quality Assurance Plan, recommended levels of control are given in Table 1.

1.3.2 The manufacturer shall ensure inspection and testing as per the Quality Assurance Plan submitted by them on the whole production of the factory which is covered by this plan. Alternatively, the manufacturer has the option of adherence to the quality plan as per levels of control recommended in column 3 of Table 1.

1.4 However, all manufacturers shall ensure compliance of their products to all the requirements of the Indian Standard.

2. ENSURING COMPLIANCE THROUGH TESTING- It is expected that manufacturers (licensees/applicants) will establish a suitably equipped and staffed in house laboratory (In house testing facility) for testing at least those parameters of the Indian Standard which require routine testing for ensuring quality of the product. This includes in-process controls as may be defined and put in place by the manufacturer and testing parameters/requirements which can only be performed in the factory.

2.1 For the guidance of manufacturers, Table 1 giving the recommended levels of control is given below. Column 2 of Table 1 indicates routine tests where test equipment is required in house as “R” or other tests which can be subcontracted as “S”. Subcontracting is permitted to BIS recognized/empanelled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025.

2.2 **For MSME manufacturers, the requirement of maintaining a laboratory/in-house testing facility for routine tests (indicated as “R” in Column 2 of Table 1) is also optional**.

2.2.1 MSME manufacturers may utilize common cluster-based facilities as per guidelines for the utilization of cluster-based test facilities by MSMEs or the provisions of Sharing of testing facilities or get testing done from BIS recognized/empaneled laboratory or any other

laboratory having validNABL accreditation as per IS/ISO/IEC 17025.

2.3 **Large Scale manufacturers shall maintain an in-house laboratory equipped at least with test facilities for routine tests (indicated as "R" in Column 2 of Table 1)**, where different tests given in the specification shall be carried out in accordance with the method given in the specification**.** They shall also implement a calibration plan for the in-house test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, large scale manufacturers can also utilize the provisions of sharing of testing facilities as per the Guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process). Even for subcontracted tests, provisions for sharing of testing facilities can be utilized.

2.4 **TEST RECORDS**- The manufacturers maintaining an in-house laboratory or utilizing common cluster-based facilities or shared test facilities shall maintain test records for the tests carried out to establish conformity. For the tests being subcontracted to BIS recognized/empaneled laboratory or any other laboratory having valid NABL accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. MARKING - The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on the reels or drums. Marking shall be done as per **Cl. 13 of IS 398 (Part 6): 2021**.

4. Additional Marking requirements: The following additional requirement shall also be marked:

a) "For BIS certification details please visit www.bis.gov.in"

5. REJECTION - All the production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark. 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 Methods			No. of Sample	Frequency	Remarks
		Clause	Reference				
5	**Material Composition**	5	IS 398 (Part 6)	S	01	Each Heat / Consignment	No further testing required if supplied with test certificate or BIS Standard mark
	Before Stranding						
7	**Strength and Elongation of Wire**						
	Diameter of Wire (mm)	Table 1	IS 398 (Part 6)	R	01	Each drum	-
	Minimum Tensile Strength of Wire			R			
	Minimum Elongation			R			
8	**Freedom from Defects**	8		R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity		
	In-Process Controls						
9	**STANDARD SIZES**						
9.1	Wires	9.1.2 & Table 2	IS 398 (Part 6)	R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity		
9.2	Stranded Conductors	9.2.1 & Table 3		R			
10	Joints in Wires	10		R			
11	**Stranding**						
	Lay Ratio	11.2 to 11.4 & Table 4	IS 398 (Part 6)	R	Firm to have adequate in-process controls to check compliance of this parameter as per the tolerances given in the Indian Standard. However, appropriate records shall be maintained by the manufacturer for evidence of conformity		
	Test(s) on Final Conductor						

16.2	**Visual Examination**	16.2		R	01	Each Control Unit	
16.3	**Measurement of Lay Ratio/Direction of Lay**	11.3 & Table 4		R	01		
16.5	**Breaking Load Test**	16.5 & Table 2		R	01		
16.6	**Elongation Test**	16.6 & Table 1		R	01		
16.7	**Resistivity Test**	16.7		R	01		
16.8	**Wrapping Test**	16.8		R	01		
16.9	**Ultimate Tensile Strength Test on Stranded Conductor**	16.9		S	01	Once in a year for each lay ratio	
16.10	**d.c. Resistance Test on Stranded Conductor**	16.10 & Table 3		S	01		
16.11	**Stress-strain Test**	13.11	IS 398 (Part 2)	S	01		