



PM/ IS 814/ 2/ Aug 2020

**PRODUCT MANUAL FOR  
(Covered Electrodes for  
Manual Metal Arc Welding of Carbon and  
Carbon Manganese Steel)  
According to IS 814:2004**

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.	<b>Product</b>	:	IS 814:2004
	<b>Title</b>	:	Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel
	<b>No. of amendments</b>	:	2
2.	<b>Sampling Guidelines</b>		
a)	<b>Raw material</b>	:	The core wire used for the manufacture of electrodes shall conform to IS 2879
b)	<b>Grouping Guidelines</b>	:	NA
c)	<b>Sample Size</b>	:	2 cartons for each size / Variety
3.	<b>List of Test Equipment</b>	:	Please refer Annex – A
4.	<b>Scheme of Inspection and Testing</b>	:	Please refer Annex – B
5.	<b>Possible tests in a day</b>	:	Dimension ( Cl 7.1 ), Bare Length of Electrode ( Cl 7.21 & 7.2.2 ), Concentricity of Flux covering with core wire ( Cl 7.3 ), Coating ratio ( Cl 5.2, Annex B )
6.	<b>Scope of the Licence :</b>		
			Licence is granted to use Standard Mark as per IS 814:2004 with the following scope:
	<b>Name of the product</b>		Covered Electrodes for Manual Metal Arc Welding of Carbon and Carbon Manganese Steel
	<b>Class</b>		Code for classification of electrode as per Cl. 5 of IS 814
	<b>Size</b>		Diameter and Length



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

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

Sr. No.	Test Equipment / chemical	Tests used in with Clause Reference Test used in with clause no
1	Device for instrumental analysis such as optical spectrometer or carbon sulphur (Strohlein) apparatus, muffle furnace, induction furnace along with all necessary apparatus, analytical balance and reagents for chemical analysis	Core wire for electrodes (CI 6.0) Chemical analysis (CI 8.2) Characteristics of covering and coating ratio
2	Micrometer ( 0- 25 mm, LC 0.01 mm )	Dimensions ( CI 7)
3	Steel scale/measuring tape ( 0- 500mm LC 0.5 mm / 1mm )	Dimensions ( CI 7)
4	<ul style="list-style-type: none"> <li>• Weld assemblies as per Annex F</li> <li>• Machine for bevelling and machining test pieces</li> <li>• Heating oven</li> <li>• Heat treatment furnace/Muffle furnace</li> <li>• Dry Ice bath</li> <li>• Universal Testing Machine</li> <li>• ( 0 – 100 KN, LC 1 kN )</li> <li>• Charpy Impact Testing Machine</li> <li>• Temperature indicating crayons/surface thermometers/other temperature indicators</li> <li>• Formers/Mandrels of required dimensions</li> </ul>	All weld mechanical tests for tensile and impact (CI 9.1)  Butt weld bend test (CI 9.2)
5	Weld assembly as given in Annex H with three electrodes.	Running performance test (CI 9.3)
6	Test plates of carbon steel (max0.25% C) of approx dimensions 300 x 75 x 10 mm, Weld assembly with AC/DC source and five electrodes of same brand and batch, weighing scale, dampened ammeter (Class 2), thermometer	Increased metal recovery test (CI 9.4)



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<b>7</b>	Diffusible Hydrogen Apparatus (Mercury/Glycerin/Gas Chromatograph method)	Diffusible Hydrogen Evaluation Test (CI 9.5)
<b>8</b>	Radiography setup, weld assembly and radioactivity protection arrangements	Radiographic quality test ( CI 9.6 )

**The above list is meant only for guidance and may not be treated as exhaustive.**



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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. PACKING AND MARKING** –The Standard Mark, as given in the Schedule of the license shall be printed on the body of the container and on any other packaging unit provided that the unit thus marked conforms to the requirement of the specification. Where paper packing cases or wrappers are used the Standard Mark shall be applied in such a manner that it cannot be misused.

3.1 Packing and Marking shall be done as per the provisions of IS 814. In addition, details of BIS Certification i.e. BIS Licence Number CM/L—and BIS website shall be marked on the packaging unit as follows “For details of BIS certification please visit [www.bis.gov.in](http://www.bis.gov.in)”

3.2 Note 2: If the licensee wants to mention any other information which is not related to IS specification, he should preferably use separate label or demarcation for the same

**4. CONTROL UNIT/BATCH** – For the purpose of this scheme a batch is defined as a lot of covered electrodes manufactured in a day on each extruder of one size, classification produced from coating identified by a dry mix or more than one dry mix of controlled chemical composition and core wire identified by a heat number of controlled chemical composition

**4.1 TEST PAD:** Weld pad for checking electrode properties shall prepared as recommended in Annex-F, G & H of IS 814:2004.

**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.

5.2 **INITIAL TESTS:** The initial tests shall be carried out once in a year on each type (classification) of electrodes manufactured during one operative year.



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5.2.1 Whenever there is a change in basic material or production condition, the initial tests shall be carried out before the production is marked.

5.3 **PERIODIC CHECK TESTS:** The periodic check test shall be carried out once in a month on each type (classification) of electrodes manufactured during the month. When the production of a type of electrodes after stoppage of production for more than six months is restarted, the periodic check test shall be conducted. The electrodes manufactured thereof shall be dispatched only after conformity of test results.

5.4 In case any size of electrodes fails to satisfy periodic check test, two further test specimens shall be prepared using electrodes drawn from the counter samples (electrodes from the same batch). If any samples fail in any of the retests, the marking of that size of electrodes shall be suspended. Causes of failure shall be investigated and necessary corrective measures shall be undertaken. Fresh samples from the products manufactured thereafter shall be tested for initial test and if the samples meet the requirements of the specification the marking may be resumed.

5.5 **QUALITY CONTROL TESTS:** Weld deposit from each batch of electrodes shall be analysed for chemical composition and the results obtained shall be within the manufacturers acceptance limit.

5.5.1 The manufacturer shall declare the range of chemical composition of weld metal for each classification and brand of electrodes.

6. **STORAGE** – Storage shall be done as per the provisions of IS 814.

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 resalable be sheared or cut or deformed in such a manner that it cannot be used for any other purpose. A separate record shall be maintained giving information on quantity and batch number/control unit number, as applicable, relating to all such rejections/defective/substandard 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.

**SCHEME OF INSPECTION AND TESTING  
FOR Covered Electrodes for  
Manual Metal Arc Welding of Carbon and  
Carbon Manganese Steel  
ACCORDING TO IS 814 : 2004 ( including 2 Amendments )**

**TABLE 1  
LEVELS OF CONTROL  
(Clause 5 of SIT)**

(1)				(2)	(3)		
TEST DETAILS				Test Equipment R: required S: Sub Contracting	LEVELS OF CONTROL		
Cl.	Requirement	Test Methods			No. of samples	Frequency	Remarks
		Clause	Reference				
6.	Core Wire for electrodes	6	IS 814	S	1	One sample from each cast or every 20 coils whichever is less.	If the material is ISI Marked, no further testing is required.
8.1.3	Parent metal for test pieces	8.1.3	IS 814	S	1	Each consignment	-do-
3.	Coating ingredients	As per company standard		S	1	-do-	In case accompanied with manufacturer's test certificate, no further testing is required.
7.	Dimensions						
	a) Diameter	7.1	IS 814	R	1	Every half an hour	Maximum, minimum diameter of each coil of the Wires should be recorded.
	b) Length	7.1	-do-	R	1	Every half an hour.	Minimum and maximum length shall be recorded.
	c) Bare length of electrodes	7.2.1 & 7.2.2	-do-	R	1 of each type & size	Every hour	Sample tests to determine robustness, resistance to withstand normal conditions of handling and use and ability to burn or fire evenly should be carried out by the Inspecting officer during his visit.

	d) Concentricity of flux covering with core wire	7.3	-do-	R	-do-	Every half an hour.	
5.2	Coating ratio	5.2 Annex B	-do-	R	-do-	-do-	-do-
8.3	Initial Tests	8.3	IS 814				
	a) All weld metal mechanical tests for tensile and Impact	9.1	-do-	S	One sample from each type	Once in a year	PI see 5.2 of SIT
	b) Butt weld bend tests	9.2	-do-	-do-	-do-	-do-	-do-
	c) Running performance test	9.3	-do-	-do-	-do-	-do-	-do-
	d) Increased metal recovery tests (for electrodes claiming recovery 110% and above)	9.4	-do-	-do-	-do-	-do-	-do-
	e) Diffusible hydrogen estimation test (for hydrogen controlled electrodes)	9.5	-do-	-do-	-do-	-do-	-do-
	f) Radiographic quality test (for radiographic quality electrodes)	9.6	-do-	-do-	-do-	-do-	-do-
7	Periodic check test	8.4	-do-				

	a) All weld metal mechanical tests for tensile and impact	9.1	-do-	R	One sample from each type	Once in a month	PI See 5.3 of SIT
	b) Running Performance test	9.3	-do-	-do-	-do-	-do-	-do-
8.5	Quality control test	8.5	-do-	-do-	One batch of electrodes	Each batch	PI See 5.5 of SIT
8.6	Additional tests	8.6	-do-	-do-	Subject to agreement with the manufacturer. The purchaser may request for additional tests to be made or certification to be provided for each batch of electrodes supplied. If so, the tests and batch definition shall be agreed between the purchaser and the manufacturer.		
11	Packing and storage	11	-do-	-do-	One carton of each size	Once in a shift	
13	Marking	13	-do-	-do-	-do-	Each carton	PI see 3 of SIT

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 empaneled 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