PRODUCT MANUAL FOR
Arc welding equipment: Part 1 Welding power source
ACCORDING TO IS 16593 (Part 1): 2021 / IEC 60974 (Part 1): 2017

उत्पाद मैनुअल
आर्क वेल्डिंग उपकरण: भाग 1 वेल्डिंग पावर स्रोत के लिए
आईएस 16593 (भाग 1): 2021 / आईईसी 60974 (भाग 1): 2017 के अनुसार

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 मैनुअल 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।

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 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.

1.	**मानक संख्या** **IS No.**	:	IS 16593 (Part 1): 2021 / IEC 60974-1: 2017
	शीर्षक **Title**	:	Arc welding equipment: Part 1 Welding power source
	संशोधनों की संख्या **No. of amendments**	:	Nil
2.	**नमूना दिशानिर्देश** **Sampling Guidelines**		
a)	**कच्चामाल** **Raw material**	:	Firm has to ensure the conformity of component / materials as per relevant Indian Standard, wherever applicable. In case, the raw material / component is notified under mandatory BIS certification, the raw material/ component shall bear the BIS Standard Mark under a valid licence. E.g. Plugs: as per IS 1293, Cables: as per IS 694/ IS 9968 (Part 1), Switches as per IS 3854, Steel – IS 6911, IS 277 etc.
b)	**समूहीकरण दिशानिर्देश** **Grouping Guidelines**	:	Please refer **ANNEX – A**
c)	**नमूने का परिमाण** **Sample Quantity**	:	1 machine (with all the accessories) Licence is to be operated on Factory test basis (Sample for EMC test as per IS / IEC 16593 (Part 10) is to be drawn every third year)

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 test except EMC test.
6.	**लाइसेंस का दायरा /Scope of the Licence:**		

"License is granted to use Standard Mark as per ***IS 16593 (Part 1): 2021 / IEC 60974-1: 2017*** with the following scope:

Name of the product	Arc welding equipment: Part 1 Welding power source
Model	
Welding Power Source	
Welding Process	
Welding current	Direct current / Alternating current / Direct and alternating current at the same output / Any other
EMC requirement and Classification of EMC requirements	With / without EMC requirements and Class A (or) Class B classification conforming to EMC classification

ANNEX -A

Grouping Guidelines

1. For Grant of Licnce/ Change in Scope of Licence, each 'Model' of 'Welding power source' is to be tested.

2. During the operation of the Licence, BO shall ensure that all the model(s) covered in the Scope of the Licence are tested in rotation to the extent possible.

3. Firm has also to submit the design of the rating plates(s) with complete details as specified in the Standard for each of the model of Welding power source.

4. Firm has to submit the technical parameters specifying the following details:

   i. Components used and certificate conforming to the relevant specifications. Moreover, if the components are under any mandatory certification they shall bear ISI mark.
   ii. Declarations regarding conforming of products to the local or national regulation and the details of the regulation to which they are conforming (if any).
   iii. Classification of EMC requirements.

5. In addition, the manufacturer has to submit the instruction manual for each of the model of the Welding power source applied for licence as per Cl. 17.1 of IS 16593-1. Instruction manual should consist of the concerned technical specifications of each of the model (as specified in the standard). Pl. see the details given below for guidance:

Model	
Welding Power Source	
Welding Process	
Welding current	Direct current / Alternating current / Direct and alternating current at the same output / Any other
EMC requirement and Classification of EMC requirements	With / without EMC requirements and Class A (or) Class B classification conforming to EMC classification
Suitability for use in Increased Risk	Suitable / Not suitable
Rated no-load voltage	U_o ……V (peak value in case of dc / r.m.s. value in case of ac)
Reduced rated no-load voltage in case of a voltage reducing device	U_r ……V
Switched rated no-load voltage in case of an AC to DC switching device	U_s ……V
Range of output, minimum welding current and its corresponding conventional load voltage or less, maximum	... A/... V to... A/... V

welding current and its corresponding conventional load voltage or greater	
Duty Cycle	
Rated welding current	I_2 ….. (in A)
Conventional load voltage	U_2….. (in V)
Energy supply	
Class of Insulation	
Pollution degree	
Efficiency	(to be declared by the manufacturer)
Electrically powered welding power sources (Additional Information)	
Rated supply voltage	U_1 …..(in V)
Rated maximum supply current	I_{1max}….(in A)
Maximum effective supply current	I_{1eff}……(in A)
Protection against harmful ingress of water or particulate matter	
Class of Equipment	Class I / Class II
Mechanically powered welding power sources (Additional Information)	
Rated load speed	n…..min^{-1}
Rated no-load speed	n_0…..min^{-1}
Rated idle speed	n_i…..min^{-1}
Maximum power consumption	P_{1max} ….(in kW)
Any other declarations as per the declarations of the manufacturer	

ANNEX- B
List of Test Equipment & Documents
Major test equipment required to test as per the Indian Standard

Sl. No.	Tests used in with Clause Reference	Test Equipment
1.	Creepage distance as per Cl. 6.1.3 Isolation of the welding circuit as per Cl. 6.2.4 Isolation between windings of the supply circuit and the welding circuit as per 6.3.2	Digital vernier caliper Filler Gauge
2.	Heating test as per Cl. 7.1, Temperature measurement test as per Cl. 7.2, Temperature rise test as per Cl. 7.3, Thermal protection test as per Cl. 8, Abnormal operation test as per Cl. 9.1, Supply network test as per Cl. 10.1, Type test values of the conventional load voltage as per Cl. 11.2	Digital multimeter Digital Clamp meter Stop watch
3.	Insulation resistance test as per Cl. 6.1.4	Megger
4.	Dielectric strength (HV) test as per Cl. 6.1.5	HV Tester
5.	Touch current test in normal condition as per Cl. 6.2.6 Touch current test in faulty condition as per Cl. 6.3.6	Digital Oscilloscope Touch Current setup
6.	Power factor measurement test as per Cl. 11.2.8	Power meter
7.	Heating test as per Cl. 7.1, Temperature measurement test as per Cl. 7.2, Temperature rise test as per Cl. 7.3, Thermal protection test as per Cl. 8, Abnormal operation test as per Cl. 9.1, Supply network test as per Cl. 10.1	Thermocouple (K-Type) with Data Logger and Resistive Load bank
8.	Protection provided by enclosure test as per Cl. 6.2.1	Ingress Protection (IP) setup
9.	Marking (General requirements) as per Cl 15.1	Cloth and Petroleum Spirit

Note 1: The above list is indicative only and may not be treated as exhaustive.
Note 2: The licensee shall provide the Instruction Manual as per the provisions of IS 16593 (Part 1): 2021 for each model in the scope of license.

ANNEX C
Scheme of Inspection and Testing

1. QUALITY ASSURANCE PLAN

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

1.2 The manufacturers shall define a Quality Control system 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 2.5.

1.3 RECOMMENDED LEVELS OF CONTROL/CONTROL UNIT:

1.3.1 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 valid NABL accreditation as per IS/ISO/IEC 17025.

2.3 Large Scale manufacturers (including foreign manufacturers) shall maintain an in-house laboratory, which shall be suitably equipped (as given in column 2 of Table 1) and staffed, 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 test equipment.

2.3.1 Alternatively, in lieu of an in-house laboratory, these manufacturers can also utilize the provisions of Sharing of testing facilities as per the Annexure-X (Relaxation in test facilities) of the guidelines for Grant of Licence available on BIS website www.bis.gov.in. (Under Conformity Assessment>Product Certification Process)

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/empanelled laboratory or any other laboratory having valid accreditation as per IS/ISO/IEC 17025, test reports issued by the laboratories shall be available for inspection by BIS.

3. PACKING AND MARKING - The Standard Mark as given in the Schedule of the licence shall be incorporated legibly and indelibly on each ***Welding power source*** equipment provided always that the material so marked conforms to each requirement of the specification.

3.1 Marking shall be done as per Cl. 15.1 of IS 16593 (Pat 1): 2021.

3.2 Additionally, a clear and indelibly marked rating plate shall also be fixed securely to or printed on each Welding power source as per Cl. 15.1 of IS 16593 (Part 1): 2021.

3.3 **Additional Marking requirements**: The material shall also be marked with the following additional requirement on each product and packaging:

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

3.3 All the production which conforms to the Indian Standard and covered under the scope of this licence shall be marked with the Standard Mark.

4. HYGIENIC CONDITIONS (if applicable) – NA.

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 Method			No. of Sample	Frequency	Remarks
		Clause	Reference				
	Components and Raw materials						
5.3	Conformity of Components	Annex – P	IS 16593-1	S	Each Lot received	Conformity of components and materials are to be declared and submitted by the firm. No further testing is required if accompanied with Test Certificate or ISI marked.	
10.9	Supply cables	10.9	IS 16593 -1	S			
11.7	Welding cables	11.7	IS 16593 -1	S			
14.2	Enclosures	14.2	IS 16593-1	S			
5.5	**Routine Test**						
6.1.5	Dielectric strength	6.1.5	IS 16593 -1	R	Each Equipment		
10.5	Protective circuit	10.5.1 10.5.2 10.5.3	IS 16593 -1	R			
11.1	Rated no-load voltage	11.1.1 to 11.1.6	IS 16593 -1	R			
13.2	Types of hazard reducing devices	13.2.1 13.2.2	IS 16593 -1	R			
13.3.1	Disabling the hazard reducing device	13.3.1	IS 16593 -1	R			
13.3.2	Interference with operation of a hazard	13.3.2	IS 16593 -1	R	Each Equipment		

	reducing device					
13.3.3	Indication of satisfactory operation	13.3.3	IS 16593 -1	R	Each Equipment	
13.3.4	Fail to a safe condition	13.3.4	IS 16593 -1	R		
15.4.b)	rated minimum welding current I_{2min}		IS 16593 -1	R		
	minimum conventional load voltage U_{2min}		IS 16593 -1	R		
15.4.c)	rated maximum welding current I_{2max}		IS 16593 -1	R		
	maximum conventional load voltage U_{2max}		IS 16593 -1	R		
	Marking Requirements					
15.1	General requirements	15.1	IS 16593 -1	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.	
15.2	Description	15.2	IS 16593 -1	R		
15.3	Contents	15.3	IS 16593 -1	R		
15.5	Direction of rotation	15.5	IS 16593 -1	R		
17.1	Instruction	17.1	IS 16593 -1	R		
17.2	Marking	17.2	IS 16593 -1	R		
5.4	**Type Test**					
6.1	*Protection against electric shock*					
6.1.2	Clearances	6.1.2	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
6.1.3	Creepage distances	6.1.3	IS 16593 -1	R		

6.1.4	Insulation resistance	6.1.4	IS 16593 -1	R	One	Every Six month	
6.2	*Protection against electric shock in normal service (direct contact)*						
6.2.1	Protection provided by the enclosure	6.2.1	IEC 60529	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.	
6.2.2	Capacitors	6.2.2	IS 16593 -1	R			
6.2.3	Automatic discharge of supply circuit capacitors	6.2.3	IS 16593 -1	R			
6.2.4	Isolation of the welding circuit	6.1	IS 16593 -1	R			
6.2.5	Welding circuit touch current	6.2.5	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.	
6.2.6	Touch current in normal condition	6.2.6	IS 16593 -1	R			
6.3	*Protection against electric shock in case of a fault condition (indirect contact)*						
6.3.1	Protective provisions	6.3.1	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.	
6.3.2	Isolation between windings of the supply circuit and the welding circuit	6.3.2	IS 16593 -1	R			
6.3.3	Internal conductors and connections	6.3.3	IS 16593 -1	R			
6.3.4	Additional requirements for plasma cutting systems	6.3.4	IS 16593 -1	R			
6.3.5	Movable coils and cores	6.3.5	IS 16593 -1	R			
6.3.6	Touch current in fault condition	6.3.6 Annex N	IS 16593 -1	R			
7	*Thermal requirements*						

7.1	Heating test	7.1.1 7.1.2 7.1.3	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
7.2	Temperature measurement	7.2.1 to 7.2.6	IS 16593 -1	R		
7.3	Limits of temperature rise	7.3.1 7.3.2 7.3.3	IS 16593 -1	R		
7.4	Loading test	7.4	IS 16593 -1	R		
7.5	Commutators and slip-rings	7.5	IS 16593 -1	R		
8	*Thermal protection*					
8.1	General requirements		IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
8.2	Construction		IS 16593 -1	R		
8.3	Location		IS 16593 -1	R		
8.4	Operating capacity		IS 16593 -1	R		
8.5	Operation		IS 16593 -1	R		
8.6	Resetting		IS 16593 -1	R		
8.7	Indication		IS 16593 -1	R		
9	*Abnormal operation*					
9.1	General requirements		IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
9.2	Stalled fan test		IS 16593 -1	R		
9.3	Short circuit test		IS 16593 -1	R		
9.4	Overload test		IS 16593 -1	R		

10	*Connection to the supply network*					
10.1	Supply voltage		IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
10.2	Multi-supply voltage		IS 16593 -1	R		
10.3	Means of connection to the supply circuit		IS 16593 -1	R		
10.4	Marking of terminals		IS 16593 -1	R		
10.6	Cable anchorage		IS 16593 -1	R		
10.7	Inlet openings		IS 16593 -1	R		
10.8	Supply circuit on/off switching device		IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
10.10	Supply coupling device (attachment plug)		IS 16593 -1			
11	*Output*					
11.2	Type test values of the conventional load voltage	11.2.1 to 11.2.8 Annex H	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
11.3	Mechanical switching devices used to adjust output		IS 16593 -1	R		
11.4	Welding circuit connections	11.4.1 to 11.4.6	IS 16593 -1	R		
11.5	Power supply to external devices connected to the welding circuit	11.5	IS 16593 -1	R		
11.6	Auxiliary power supply	11.6	IS 16593 -1	R		
12	*Control Circuits*					
12.1	General requirement	12.1	IS 16593 -1	R	One	Once every six months for each of the model produced

12.2	Isolation of control circuits	12.2	IS 16593 -1	R		during the period. In addition, testing is to be done whenever there is a change in design of the model.
12.3	Working voltages of remote control circuits	12.3	IS 16593 -1	R		
13	*Hazard reducing device*					
13.1	General requirements	13.1 Table 14	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
14	*Mechanical provisions*					
14.1	General requirements	14.1	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
14.2	Enclosure	14.2	IS 16593 -1	R		
14.3	Handling means	14.3	IS 16593 -1	R		
14.4	Drop withstand	14.4	IS 16593 -1	R		
14.5	Tilting stability	14.5	IS 16593 -1	R		
16	*Adjustment of the output*					
16.1	Type of adjustment	16.1	IS 16593 -1	R	One	Once every six months for each of the model produced during the period. In addition, testing is to be done whenever there is a change in design of the model.
16.2	Marking of the adjusting device	16.2	IS 16593 -1	R		
16.3	Indication of current or voltage control	16.3	IS 16593 -1	R		
	EMC requirements	17.1. r)	IEC 60947-10	S	One	Once in every three years for each of the model produced during the period or whenever there is a change in raw material components / design. Conformity to be accessed as per the declaration of the firm.

Note-1: In addition, the test(s) shall be done whenever there is a change in design of the product, components or parts.

Note-2: Report of the Factory Sample drawn for EMC testing by BIS will be shared with the manufacturer. During the operation of licence, licensee has to ensure that all the model(s) covered in the scope of the licence are tested in rotation.