BUREAU OF INDIAN STANDARDS
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प्रारंभिक मसौदा

शैक्षणिक संस्थाओ में उपयोग के लिए तार लिपटे सरकंबा संपर्क धारा नियंत्रक — विशिष्टि

(IS 8622 *का दूसरा पुनरीक्षण*)

Preliminary Draft

Wire Wound Sliding Contact Rheostats for Use in Educational — Specification Institutions

(*Second Revision of* IS 8622)

ICS 29.240.30

Educational Instruments and Equipment Sectional Committee, PGD 22	Last date for receipt of comment is **14 September 2024**

FOREWORD

(*Formal clauses will be added later on*)

The product is required in the physics laboratories of schools and colleges and polytechnics, where a continuously variable current regulator or a potential divider is required.

This standard specifies the terminology, material for different parts, tests, dimensions and safety aspects of rheostat.

This standard was first published in 1977 and subsequently revised in 1999. This second revision has been taken up to keep pace with the latest technological developments and international practices. In this revision the following major changes have been made:

a) Figure of rheostat has been added,
b) Material clause has been modified, and
c) Reference clause has been added.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*).’ The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Preliminary Draft

WIRE WOUND SLIDING CONTACT RHEOSTATS FOR USE IN EDUCATIONAL INSTITUTIONS — SPECIFICATION

(*Second Revision of* IS 8622)

1 SCOPE

This standard specifies the general requirements and tests for a sliding contact resistance rheostat for use as series resistance or as a potentiometer.

2 REFERENCE

The standards listed below contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below.

IS No.	*Title*
IS 12045 : 1987	Specification for alloys used in electrical resistance metallic heating elements

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply.

3.1 Contact — Device used for varying the resistance in the electric circuit (*see* Fig.1).

3.2 Endbands — A metallic strip -provided at each end of the wire winding and covering the tube.

3.3 Former — A pipe of insulating material over which the resistance wire is wound.

3.4 Guide Rod — A rod provided to guide the movement of the metal block with the sliding contact.

3.5 Terminals — Points of connection in an electric circuit.

3.6 Supports — The feet attached to either side of the wire wound tube.

3.7 Rated Resistance — The nominal resistance marked on the rheostat.

3.8 Rated Current — The nominal current value marked on the rheostat.

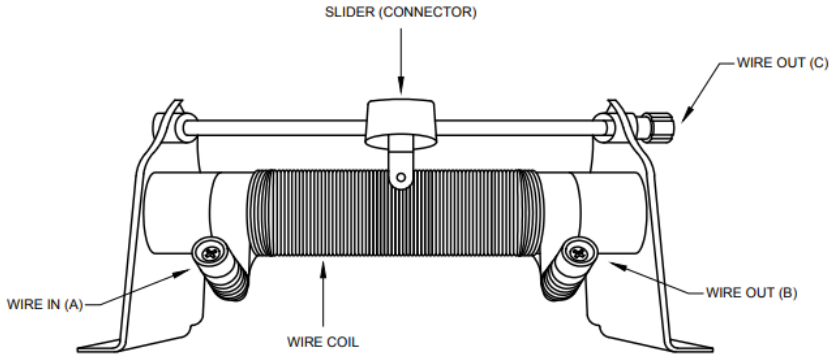

FIG. 1 RHEOSTAT

4 MATERIAL

4.1 Material for different parts of the rheostat shall be as given in Table 1.

Table 1 Materials for Parts of Rheostat
(*Clause* 4.1)

Sl No.	Parts of the Rheostat	Material
(1)	(2)	(3)
i)	Contact	Laminated phosphor bronze strip or copper graphite
ii)	Contact Block	Brass or Aluminum
iii)	End bands	Brass
iv)	Former	Non-inductive, non magnetic, Non porous full backed porcelain or glazed ceramic
v)	Guide rod	Brass
vi)	Supports	Cast iron or aluminium die casted
vii)	Terminals	Brass or brass embedded with insulting material such as bakelite.
viii)	Terminals screws	Brass
ix)	Wire	Constantan or nichrome

NOTE — for the rheostats up to secondary level, an ordinary porcelain pipe can be used instead of glazed ceramic for former.

4.2 The composition of nichrome wire shall conform to Type 1 alloy of IS 12045.

5 GENERAL REQUIREMENTS

5.1 Contact — There are two types of contacts:

a) *Laminated Phosphor Bronze —* At least 5 strips shall be fitted to make the contact sturdy and springy. The thickness of the strip shall not be less than 0.32 mm.

b) *Copper Graphite* — It shall be made by copper graphite brush and shall be spring loaded.

5.2 Contact Block

It shall be of brass or aluminium fitted with an insulated moulded bakelite finger grip knob for sliding the contact. The block shall be provided with a true bore (square or round) so that it may slide smoothly in the guide rod without any jerks.

5.3 Endbands

For wire from SWG 36 (0.193 mm) a to SWG 22 (0.711 mm) the thickness of the endbands shall not be less than 0.56 mm. For wires from SWG 21 (0.819 mm) to SWG 14 (0.203 mm) the thickness of the endbands shall not be less than 0.9 mm. The breadth of the endbands in both the cases shall not be less than 12 mm. The endbands shall be properly chrome plated to avoid corrosion due to laboratory and extreme weather conditions.

5.4 Former

It shall be of uniform shape throughout length, enabling the contact to slide over the winding without jerks.

5.5 Guide Rod

It shall be straight throughout length, round or square. The diameter or the cross section of the rod shall not be less than 9 mm. It shall be properly chrome plated to minimize corrosion due to laboratory fumes and extreme weather conditions.

5.6 Supports

These shall be stable when placed on the plane surface. A hole on the foot of each support shall be provided to facilitate mounting of the rheostat.

5.7 Terminals

These shall be at least three in number, properly knurled and shall be of double nut type. The length of the terminal shall not be less than 25 mm. Each terminal nut shall not be less than 15 mm in diameter and 5 mm in thickness. A hexagonal nut of 15 mm diameter shall also be provided to tighten the terminal.

NOTE—for the rheostat up to school level the thickness of the endbands may be about 0.56 mm for all the types of rheostats.

5.7.1 *Terminal Screws*

These shall be non-flying type and not less than 5 mm in diameter and 50 mm in length. The screw shall have very fine threads to give tight grip to the connection wire by the terminals.

5.7.2 The position of the terminals shall be as given below:

a) There shall be enough space for connecting appropriate external wire or cable. The terminals should be insulated from the wire and the guide rod by bakelite moulded bushes and washers.

b) The terminals shall not be adversely affected by heat from the resistor. To eliminate this the terminals shall be fitted at the supports of the rheostats.

The connections to the terminals from the wire ends of the rheostats shall be done with a reasonable thick copper conductor.

5.8 Winding

The winding on the tubes shall be uniform, tight and without kinks or similar visible defects so that the wire does not become loose after use. Two types of wires may be used as given in **5.8.1** and **5.8.2**.

5.8.1 *Eureka or Constantan (UN NE) Wire*

Highly oxidized wire shall be wound closely on the tubes.

5.8.2 *Nichrome (Nickel-Chromium) Wire*

Since this type of wire cannot be oxidized, therefore, shall be wound in grooves to avoid short circuiting. The winding shall be coated with a cement or silicon compound to eliminate loosening of wires due to heat.

5.8.3 The winding shall be done with recommended gauges of wires as given in Annex A to avoid excessive temperature rise and:

a) The temperature rise shall not be so excessive that the winding may get loose.
b) The rise in temperature shall not affect the smooth sliding of the contact on the hot wire.
c) With the rise in temperature the current shall not fall considerably and after about 45 minutes the rheostat shall attain steady state.

5.9 Safety Cover

The rheostat shall be supplied with a suitable outer perforated cover to shield the students from coming in contact accidentally with the hot winding. The temperature at any point on the outer cover shall not exceed 40°C.

6 TOLERANCE

6.1 Current

Actual current carrying capacity of rheostat shall be 10 percent of the rated current carrying capacity.

6.2 Resistance

The actual resistance of rheostat shall be with in ± 10 percent of the rated resistance.

7 TESTS

The resistance of the rheostat shall be measured with a Wheatstone bridge to verify the specified tolerance (*see* **5.2**).

7.1 Insulation Test

This test shall be carried out with the help of-a megger of 500 Vdc. The insulation resistance shall not be less than 10 MΩ.

7.2 Insulation Test at High voltage

This test shall be carried out with a high voltage break down tester for one minute to ensure that there is no leakage of current in between the body and the live portion of the rheostat.

NOTE —This test is not required for the rheostats up to higher Secondary level.

7.3 Mechanical Endurance Test

The rheostat shall be tested by actual operation for 1000 times. The sliding contact shall be made to slide on the windings for 1000 times. There shall be no mechanical deterioration of any part of the rheostat, after this test.

7.4 Load Test

The rheostat shall be tested for declared current carrying capacity as explained below:

a) Accessories required for this test:

i) Variac (Auto Transformer) — Single phase have a minimum current capacity of 15 A.
ii) AC ammeter has a range of 10 to 15 A with accuracy class 0.5.
iii) Voltmeter up to a range of 300 V with accuracy class 0.5.

b) Procedure

The rheostat shall be connected to the mains through the variac.

The ammeter shall be connected to rheostat in series and a voltmeter in parallel to read the current and voltage respectively.

Adjust the variac to set the voltage between 230 to 250 V as required. Adjust the contact of the rheostat till the ammeter reads the marked current of the rheostat. Test the rheostat

in this condition for an hour and check that there is no deterioration of wire or the contact of the rheostat.

Then increase the current in the rheostat by 10 percent by adjusting the sliding contact and the test the same for 30 minutes. Again, check that there is no deterioration of wire during this test and the contact is sliding with ease on the hot winding.

8 MARKING

8.1 Each rheostat shall have a name plate which shall be clearly and indelibly marked with the following particulars:

a) Manufacturer's name or trade-mark, if any,
b) Serial number, model number and year of manufacture,
c) Total resistance in ohms,
d) Maximum current carrying capacity, and
e) Rated voltage.

8.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the standard mark.

9 PACKING

9.1 The rheostat shall be packed in a suitable packaging to prevent from damage during handling and transportation.

9.2 Marking on Packing

The requirements for marking specified at **8** shall also be marked on packaging of rheostat.

ANNEX A

(*Clause* 5.8.3)

RECOMMENDED GAUGES OF WIRES FOR USE WITH RHEOSTATS

A-1 EUREKA OR CONSTANTAN WIRES

Current (A)	Wire No. (SWG)	Wire Diameter (mm)
8.0	14	(2.03)
7.0	15	(1.829)
6.5	16	(1.626)
6.0	17	(1.422)
5.5	18	(1.219)
4.5	19	(1.016)
3.5	20	(0.914)
2.8	21	(0.819)
2.3	22	(0.711)
1.8	23	(0.61)
1.6	24	(0.559)
1.4	25	(0.508)
1.2	26	(0.457)
1.0	27	(0.416)
0.8	28	(0.38)
0.6	30	(0.315)
0.5	32	(0.274)
0.4	34	(0.233)

A-2 NICHROME (NICKEL CHROMIUM)

Current (A)	Wire No. (SWG)	Wire Diameter (mm)
9.0	14	(2.03)
7.5	16	(1.626)
6.0	18	(1.219)
5.0	19	(1.016)
4.0	20	(0.914)
3.2	21	(0.819)
2.5	22	(0.711)
2.0	23	(0.61)
1.8	24	(0.559)
1.6	25	(0.508)
1.4	26	(0.457)
1.2	27	(0.416)
0.9	28	(0.38)
0.6	32	(0.274)
0.5	34	(0.233)
0.4	36	(0.193)
0.3	38	0.152)