BUREAU OF INDIAN STANDARDS
DRAFT FOR COMMENTS ONLY

Draft Indian Standard

Winding Wires for Submersible Motors — Specification Part 3 Methods of Tests

(Second Revision of IS 8783 Part 3)

Winding Wire Sectional Committee, ETD 33	Last date for comments- 30-10-2025

FOREWORD

(Formal clauses of the draft will be added later)

This standard was initially published in 1978, covering PVC insulated winding wires for submersible motors designed for 85 °C operation. Subsequently, two related standards—IS 10051 : 1981, Specification for PVC insulated winding wires for submersible motors for 105 °C operation, and IS 12788 : 1989, Specification for PVC insulated winding wires overcoated with nylon for submersible motors—were introduced but later withdrawn.

This part of the series covers the methods of test applicable to winding wires for submersible motors.

In view of the prolonged absence of revision in the IS 8783 series, the associated winding wire standards for submersible motors are now being revised and circulated for public comments.

Although the committee did not observe significant technical changes in the construction or application of submersible winding wires, it approved wide circulation of the revised drafts with updated normative references to facilitate broader stakeholder consultation for following standards:

IS 8783	Winding wires for submersible motors — Specification
Part 1 : 1995	Part 1 Conductor data
Part 2 : 1995	Part 2 Materials for dielectric and jacket
Part 3 : 1995	Part 3 Methods of tests
Part 4/Sec l : 1995	Part 4 Specification for individual wires, Section 1 HR PVC insulated winding wires
Part 4/Sec 2 : 1995	Part 4 Specification for individual wires, Section 2 Cross linked polyethylene insulated and polyamide jacketed wires
Part 4/Sec 3 : 1995	Part 4 Specification for individual wires, Section 3 Polyester and polypropylene insulated winding wires

This revision includes the incorporation of amendments.

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.

Draft Indian Standard

WINDING WIRES FOR SUBMERSIBLE MOTORS —SPECIFICATION

PART 3 METHODS OF TESTS

(Second Revision of IS 8783 Part 3)

1 SCOPE

This draft standard prescribes methods of tests for winding wires for submersible motors.

2 REFERENCES

The standards listed in Annex C 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.

3 TERMINOLOGY

For the purpose of this standard, in addition to the definitions given in IS 1885 (Part 32) the following shall apply.

3.1 Tolerance

The permissible deviation (magnitude) of an actual reading from that of prescribed.

3.2 Crack

A crack is an opening in the insulation, which exposes the bare conductor when viewed with naked eye.

3.3 Type Test

Tests carried out to prove conformity with the specification. These are intended to prove the general quality and design of a given type of wire.

3.4 Acceptance Test

Tests carried out on samples taken from the lot for the purpose of acceptance of the lot.

3.5 Routine Test

Tests carried out on each length to check requirements which are likely to vary during production.

3.6 Lot

All the wires of same type and design manufactured under similar conditions of production, offered for acceptance; a lot may consist of the whole or part of the quantity ordered.

4 DETAILS OF TESTS

4.1 Tests on Conductor

Tests	*For Test Method, Refer to*
Conductor diameter	Annex A
Conductor resistance	Part 5 of IS 10810
Annealing test	Part 1 of IS 10810

4.2 Tests on Insulation and Jacket

Tests	*For Test Method, Refer to*
Test for thickness	Part 6 of IS 10810
Tensile strength and elongation	Part 7 of IS 10810
Thermal ageing in air	Part 11 of IS 10810
Heat shock	Part 14 of IS 10810
Hot set	Part 30 of IS 10810
Melting point	Annex B
Spark test	Part 44 of IS 10810

NOTE — Spark test shall be conducted for dual coated wires at the insulation stage.

4.3 Tests on Finished Wire

Tests	*For Test Method, Refer to*
Overall dimensions	Annex A
High voltage test	Part 45 of IS 10810
Spark test	Part 44 of IS 10810
Insulation resistance	Part 43 of IS 10810
Shrinkage	Part 12 of IS 10810
Hot deformation	Part 15 of IS 10810
Water absorption	Part 33 of IS 10810

5 CATEGORIZATION OF TESTS

5.1 Type Test

All the tests specified under **4** shall constitute as type test.

5.2 Acceptance Test

Following tests shall constitute as acceptance test:

a) Conductor diameter,
b) Conductor resistance,
c) Annealing test,
d) Test for thickness of insulation,
e) Tensile strength and elongation at break (before ageing),
f) Hot set,
g) Overall dimensions,
h) High voltage test, and
j) Insulation resistance.

5.3 Routine Test

Following tests shall constitute as routine test:

a) Conductor resistance,
b) High voltage,
c) Overall dimensions, and
d) Conductor diameter.

6 GENERAL TEST CONDITIONS

6.1 Unless otherwise specified, all tests shall be carried out within a range of 15 lo 35 °C and a relative humidity range of 45 to 75 percent. Before measurements are made, the specimens shall be preconditioned under these atmospheric conditions for a time sufficient to allow the wire to reach stability.

The wire to be tested shall be removed from the packing in such a way that the wire will not be subjected to tension or unnecessary bends.

6.2 Before each test, discard sufficient wire to ensure that any damaged wire is not included in test specimens.

7 SCALE OF SAMPLING AND CRITERIA FOR CONFIRMITY

7.1 Scale of Sampling

7.1.1 The number of reels, or spools to be selected shall depend upon col 1 and 2 of Table 1.

Table 1 Scale of Sampling and Permissible Number of Defectives

(*Clause* 7.1.1 *and* 7.2.1)

Sl No.	Lot Size (No. of reels/spools in the Lot)	Sample Size	Permissible Number of Defectives
(1)	(2)	(3)	(4)
i)	Up to 50	5	0
ii)	51 to 150	8	0
iii)	151 to 300	20	1
iv)	301 to 500	32	2
v)	501 and above	50	3

NOTE — Whenever the lot size is less than 5, all the reels/spools shall be tested.

7.1.2 The reels, or spools from each lot shall be selected at random, for this purpose provision contained in IS 4905 shall be followed.

7.2 Number of Tests and Criteria for Conformity

7.2.1 From each of the selected reels/spools as in col 1 and 2 of Table 1, adequate length of wire shall be cut to give enough length to carry out all the acceptance tests. If a sample length fails in any one of the acceptance tests, reels or spools from which the sample was drawn, shall be called

defective. If the number of defectives is less than or equal to the corresponding permissible number of defectives (*see* col 3 of Table 1), these shall be declared as conforming to acceptance tests.

8 TABUIATION AND OBSERVATIONS

8.1 Conductor Diameter

Observation No.	Conductor Diameter, mm
1	d_1
2	d_2
3	d_3
4	d_4
5	d_5
6	d_6

8.2 Overall Diameter

9 CALCULATION

9.1 For conductor diameter

Average conductor diameter

$$= \frac{d_1+d_2+d_3+d_4+d_5+d_6}{6}$$

9.2 For overall diameter

Average overall diameter

$$= \frac{D_1+D_2+D_3+D_4+D_5+D_6}{6}$$

10 REPORT

10.1 Test for Conductor/Overall Diameter

Winding wire type

Batch No./Lot No.

Winding wire No./Drum No.

10.2 Results

Reference Specification

Conductor diameter	Observed	Specified
Average		
Minimum		
Overall diameter	Observe	Specified
Average		
Minimum		

10.3 Conclusion

Specimen meets/does not meet the requirements of specification.

ANNEX A

(*Clauses* 4.1 *and* 4.3)

METHOD OF TEST ON CONDUCTOR DIAMETER AND OVERALL DIAMETER

A-1 SCOPE

This Annex covers methods for measurement of conductor diameter and overall diameter of winding wires.

A-2 SIGNIFICANCE

The measurement of such diameters determine the range of such dimension and ensure that the requirements of the specification are satisfactorily met.

A-3 APPARATUS

A-3.1 Micro meter gauge capable of measuring to two decimal figures (least count 0.01 mm).

A-3.2 Vernier calipers capable of reading to two decimal figures (least count 0.01 mm).

A-3.3 Any suitable optical measuring device.

A-4 MATERIAL

No material other than test specimen is required for performing this test.

A-5 TEST SPECIMEN

A-5.1 Specimen for measuring the conductor diameter and overall diameter is to be prepared in a manner suitable for different types of measuring apparatus as described in **A-3**. Test specimen may be the conductor/winding wire piece.

A-5.2 Conductor/Wire Piece

Approximately 1.5 m length of conductor/wire shall be taken from the end of factory length.

6 CONDITIONING

No special conditioning of test specimen is required. The measurements of diameters may be taken at prevailing room temperature unless otherwise agreed. The lubricant may be applied to assist in the handling of the wire. This lubricant shall be kept to a minimum and shall have no insulating materials expected to be used with the insulated wire.

A-7 PROCEDURE

A-7.1 Conductor Diameter

The insulation shall be removed at two places 1 m apart by any method that does not damage the conductor. A micro-meter gauge or a vernier calliper shall be used. Three measurements at 120° angular displacement shall be made around the circumference of the conductor at each of two places

1 m apart.

A-7.1.1 For stranded conductor, number of strands to be counted and overall diameter as per **A-7.2** to be measured.

A-7.2 Overall Diameter

The diameter shall be determined over insulation. A micro-meter gauge or a vernier calliper shall be used. Three measurements at 120° angular displacement shall be made around the circumference of wire at each of two places 1 m apart.

ANNEX B

(*Clause* 4.2)

METHOD OF TEST FOR DETERMINATION OF MELTING POINT

B-l Any of the following two methods shall be applied:

a) If the determination is made by means of apparatus that is, with an aluminium plate heated by an electric current passing through a controlled resistance the sample is placed between two 18 mm cover glasses fitting into a well in the heated plate. A magnifier above the sample makes it possible to view it, and determine when melting actually takes place. The temperature is indicated by a thermometer which has the bulb immediately below the plate. For the purpose of testing by this method, specimens shall be prepared by removing a sample from the completed wire and cutting a small rectangular section having sides approximately 3.0 mm by 1.0 mm. Specimens having clean cut edges and square corners are preferred. With the specimen inserted between the cover glasses, the temperature of the heated plate shall be raised rapidly to about 140 °C whereupon the heating shall be controlled so that it rises at a rate of approximately 4 °C/min.

b) If, the determination is made by means of an electrically heated capillary melting apparatus, a small silver of the nylon covering shall be inserted in the capillary tube, which is then placed in the electrically heated block in close proximity to the thermometer bulb. The sample shall be viewed through a magnifying lens against an illuminated background. The temperature shall be raised rapidly to about 140 °C, whereupon the heating shall be controlled so that it rises at a rate of approximately 4 °C/min.

NOTE — Any other method agreed between purchaser and supplier may also be applied.

ANNEX C

(*Foreword*)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 4905 : 2015	Random sampling and randomization procedures (*first revision*)
1885 (Part 32) : 2019	Electrotechnical vocabulary Part 32 Electric cables (*second revision*)
10810	Methods of test for cables:
Part 1 : 1984	Annealing test for wires used in conductors
Part 5 : 1984	Conductor resistance test
Part 6 : 1984	Thickness of thermoplastic and elastomeric insulation and sheath
Part 7 : 1984	Tensile strength and elongation at break of thermoplastic and elastomeric insulation and sheath
Part 11 :1984	Thermal ageing in air
Part 12 : 1984	Shrinkage test
Part 14 : 1984	Heat shock test
Part 15 : 1984	Hot deformation test
Part 30 : 1984	Hot set test
Part 33 : 1984	Water absorption test (Gravimetric)
Part 43 : 1984	Insulation resistance test
Part 44 : 1984	Spark test
Part 45 : 1984	High voltage test