IS : 1370 - 1965

Indian Standard
SPECIFICATION FOR FRICTION SURFACE RUBBER TRANSMISSION BELTING
(Revised)

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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 1

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Indian Standard
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0. FOREWORD

0.1 This Indian Standard (Revised) was adopted by the Indian Standards Institution on 4 June 1965, after the draft finalized by the Pulleys and Belts Sectional Committee had been approved by the Mechanical Engineering Division Council.

0.2 This standard deals with friction surface rubber transmission belting and was first published in 1959. In this revision all quantities are given in metric units as it is considered that the industry is in a position to changeover completely to metric system. This standard is one of a series of the Indian Standard specifications on belting for power transmission. Other specifications in the series published so far are:

IS : 529-1959 Specification for solid-woven impregnated cotton belting for power transmission (*revised*)

IS : 530-1959 Specification for solid-woven impregnated hair belting for power transmission (*revised*)

IS : 2240-1962 Specification for vegetable tanned leather belting for power transmission

IS : 2241-1962 Specification for round leather belting for small machines

0.3 Methods of test for testing the belting are given in Appendices A to D. Also in order to obviate difficulties in procuring right type of belts, it is recommended that the purchaser should give the particulars mentioned in Appendix E, when placing an enquiry or order.

0.4 The satisfactory service and life of a belt depends on proper conditions of use. To help users in selection of the right type and size of belt; to give them guidance with respect to the installation and use, and the precautions that should be observed, IS : 2122-1962* has been published.

0.5 It is recommended that IS : 1691-1960† should be consulted while designing industrial drives.

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*Code of practice for installation and maintenance of belt drives for power transmission.
†Specification for cast iron and mild steel flat pulleys.

0.5.1 The minimum pulley diameters, for given belt speeds and belt plies representative of present day engineering practice, are given in Appendix F for the information of user.

0.6 In the preparation of this standard, assistance has been derived from the following:

ISO/R 22-1956 Widths of flat transmission belts and corresponding pulleys. International Organization for Standardization.

ISO/R 36-1957 Determination of the adhesion of vulcanized natural or synthetic rubbers to textile fabrics. International Organization for Standardization.

B. S. 351 : 1950 Friction surface rubber transmission belting. British Standards Institution.

0.7 For the purpose of deciding whether a particular requirement of this standard is complied with, the final values, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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1. SCOPE

1.1 This standard covers the requirements for friction surface rubber transmission belting, that is, fabric belting possessing no distinct rubber cover other than that imparted to the fabric by impregnation with rubber.

2. CONSTRUCTION

2.1 The belting shall consist of plies of woven cotton canvas, impregnated with rubber compound, and vulcanized together in a uniform manner. The belting may be of folded or cut edge construction, as may be required by the purchaser.

2.1.1 The folded edge belting is constructed with a separate outside jacket ply and the seam in this ply shall be completely filled with rubber cord or seam strip and shall comply with the requirements of **6.4**.

2.2 The belting shall be straight when laid flat. It shall be free from any transverse joints.

3. FABRIC

3.1 The cotton canvas used in the manufacture of transmission belting shall be evenly and firmly woven and shall be as free from foreign matter

*Rules for rounding off numerical values (*revised*).

and defects such as knots, lumps and irregularities of twist, as is normal in the best manufacturing practice.

3.2 The type and nominal weight of the fabric used in the construction of the belting shall be one of the following, as may be specified by the purchaser:

Type of Fabric	*Nominal Weight* g/m²
Soft	815 930
Hard	900 975

3.2.1 The weight of a sample of the fabric when determined by the method specified in IS : 1964-1961* shall not differ from the appropriate nominal weight by more than +5 percent or −2 percent.

4. DIMENSIONS AND TOLERANCES

4.1 Length — The length of the belting shall be as specified by the purchaser subject to the following tolerance:

a) For belts delivered in the endless state and mounted in that way	± 0·5 percent
b) For open belts	+ 2·0 percent − 0·5 percent

4.2 Widths and Thicknesses — The widths and thicknesses of transmission belts shall conform to those given in Tables 1 and 2 respectively.

4.2.1 The width of the belt shall at no point vary from the specified nominal width by more than the tolerances given in Table 1.

4.2.2 The thickness of a transmission belt of hard type fabric shall at no point vary from the nominal thickness by more than the tolerances given in Table 2.

5. SAMPLING

5.1 Depending upon the length of the transmission belt of the same characteristics (type, grade, width, etc) ordered, the samples shall be drawn in accordance with Table 3.

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*Methods for determination of weight per square metre and weight per linear metre of fabrics.

TABLE 1 WIDTHS OF FRICTION SURFACE RUBBER TRANSMISSION BELTING

(*Clauses* 4.2 *and* 4.2.1)

Nominal Belt Width	Tolerance on Width of Belt
mm	mm
25, 32, 40, 50, 63	± 2·0
71, 80, 90, 100, 112, 125	± 3·0
140, 160, 180, 200, 224, 250	± 4·0
280, 315, 355, 400, 450, 500	± 5·0

TABLE 2 THICKNESSES OF FRICTION SURFACE RUBBER TRANSMISSION BELTING

(*Clauses* 4.2 *and* 4.2.2)

Ply Construction	Nominal Belt Thickness, Hard Type Fabric	Tolerance
(1)	(2)	(3)
	mm	mm
3 ply	3·9	± 0·5
4 ply	5·1	± 0·7
5 ply	6·4	± 0·8
6 ply	7·7	± 0·9
7 ply	9·1	± 1·0
8 ply	10·4	± 1·1

TABLE 3 SAMPLING PLAN FOR TRANSMISSION BELTS

(*Clause* 5.1)

LENGTH ORDERED m	NO. OF SAMPLES*
Up to 500	1
501 to 1 000	2
1 001 „ 2 000	3
2 001 „ 3 500	4
3 501 „ 5 000	5
5 001 „ 7 000	6
7 001 „ 10 000	7

*A sample shall consist of the full width of the finished belting and not less than 600 mm in length.

5.1.1 When placing the order, the purchaser shall state whether tests are required and if so, additional length for the sample shall be included in the total length ordered and paid for by the purchaser.

6. TESTS

6.1 Elongation Test — The average warp elongation of the fabric of the finished belting, when tested in the manner described in Appendix A, shall be not less than 4 percent and not more than 8 percent under a load of 1·8 kgf/mm of width per ply.

6.2 Tensile Test — The average tensile strength of the fabric of the finished belting when tested in the manner described in Appendix B, shall be not less than the values given in Table 4.

TABLE 4 TENSILE STRENGTH OF FABRIC IN FINISHED BELTING

TYPE OF FABRIC	WEIGHT OF FABRIC PER SQUARE METRE	TENSILE STRENGTH	
		Warp	Weft
(1)	(2)	(3)	(4)
	g/m²	kgf/mm of Width	kgf/mm of Width
Soft	815	6·25	3·00
Hard	900	6·25	3·60
Soft	930	7·10	3·30
Hard	975	7·10	4·50

6.2.1 The tensile strength of any individual fabric ply, warp or weft, of the finished belting, shall be not less than 80 percent of the figures given in Table 4.

6.2.2 In case of narrow belts from which test pieces of sufficient length cannot be obtained, the weft strength shall be determined from prepared test slabs.

6.3 Adhesion Test — The adhesion between the plies shall be such that, when tested in the manner described in Appendix C, average force in kgf/cm width required to cause separation of the plies at 25 mm/min to 12·5 mm/min shall be at least the following:

Type of Fabric	*Adhesion in kgf/cm*
Soft	4·4
Hard	3·6

6.3.1 In the case of narrow belts from which test pieces of sufficient lengths cannot be obtained, the adhesion test shall be carried on prepared test slabs.

6.4 Test on Seam Strip — The seam strip of all belts 100 mm wide and over, when tested according to the method prescribed in Appendix D, shall not show any signs of cracking or loosening in the seam.

7. TESTING FACILITIES AND REJECTION

7.1 The manufacturer shall, at his own cost, supply all labour and appliances for the tests. In the absence of facilities at his own premises for carrying out prescribed tests, the tests shall be carried out by an approved authority at the cost of the manufacturer.

7.2 Rejection — Should any sample fail to comply with the specified tests, two additional sets of samples shall be drawn and tested at the cost of the manufacturer. In the event of either of these two failing to comply with the tests, the whole consignment shall be rejected.

8. MARKING

8.1 The belting shall be marked on at least every 8 m with the manufacturer's name and trade-mark, if any. The year of manufacture may also be marked if required by the purchaser.

8.1.1 The beltings may also be marked with the ISI Certification Mark.

NOTE — The use of the ISI Certification Mark is governed by the provisions of the Indian Standards Institution (Certification Marks) Act, and the Rules and Regulations made thereunder. Presence of this mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard, under a well-defined system of inspection, testing and quality control during production. This system, which is devised and supervised by ISI and operated by the producer, has the further safeguard that the products as actually marketed are continuously checked by ISI for conformity to the standard. Details of conditions, under which a licence for the use of the ISI Certification Mark may be granted to manufacturers or processors, may be obtained from the Indian Standards Institution.

9. PACKING

9.1 The belting shall be packed in double hessian cloth or as mutually agreed to between the purchaser and the manufacturer. Information about the number of fabric plies in the belting and the nominal weight of fabric shall also be indicated on the packing.

APPENDIX A

(*Clauses* 0.3 *and* 6.1)

METHOD OF CONDUCTING ELONGATION TEST OF FABRIC

A-1. PREPARATION OF TEST PIECE

A-1.1 Separate the various plies of the sample of the finished belting and then cut test pieces along the warp threads in the form of strips, 30 mm wide and 330 mm long. Prepare one test piece from each ply or at least six test pieces from as many plies as possible. Take care not to include longitudinal joints in the test pieces. Fray the entire length of the test piece from each side to a width of 25 mm as shown in Fig. 1. Draw reference lines at the ends of the centre portion to give a gauge length of 180 mm, an initial load of one kilogram being applied to the test pieces before marking.

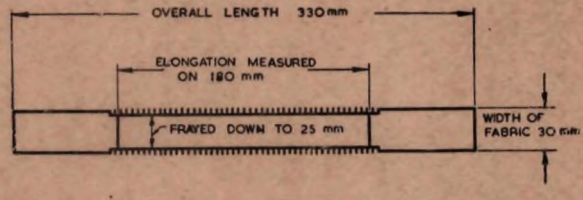

FIG. 1 FORM OF TEST PIECE

A-2. CONDITIONING OF TEST PIECES

A-2.1 Before testing, expose the test pieces to moisture equilibrium in a standard atmosphere of 65 $\pm$ 2 percent relative humidity and 27° $\pm$ 2°C temperature (*see* IS : 196-1950*) for at least 40 hours, and then immediately test at that temperature in a suitable testing machine.

*Atmospheric conditions for testing.

A-3. APPARATUS

A-3.1 The requirements as specified in **6** of IS : 1969-1961* shall be considered in selecting a suitable fabric testing machine.

A-4. PROCEDURE

A-4.1 Carry out the test as described under **9** of IS : 1969-1961*.

APPENDIX B

(*Clauses* 0.3 *and* 6.2)

METHOD OF CONDUCTING TENSILE TEST OF FABRIC

B-1. PREPARATION OF TEST PIECE

B-1.1 For determining warp tensile strength, use the elongation test pieces (*see* **A-1**).

B-1.2 For determining weft tensile strength, prepare an equal number of smaller test pieces of the same type (*see* **A-1.1**).

B-2. CONDITIONING OF TEST PIECE

B-2.1 Condition the test pieces as described in **A-2.1**.

B-3. APPARATUS

B-3.1 Same as that used for elongation test (*see* **A-3**).

B-4. PROCEDURE

B-4.1 Carry out the test as described under **9** of IS : 1969-1961*.

APPENDIX C

(*Clauses* 0.3 *and* 6.3)

METHOD OF CONDUCTING ADHESION TEST OF PLIES

C-1. TEST PIECES

C-1.1 Cut eight test pieces, each 25·0 ± 0·5 mm wide and of sufficient length, to allow a minimum test length of 100 mm, from the sample in the

*Method for determination of breaking load and elongation at break of woven fabric (by constant-rate-of-traverse machine).

direction of warp and weft (making four test pieces in each direction), using a sharp tool which leaves a clean edge. The thickness of the ply which is to be separated shall not exceed 6 mm. If the ply which is to be separated exceeds 6 mm in thickness, cut it down to the requisite thickness before proceeding with the test. The thickness of this ply shall be not greater than the thickness of the remainder of the test piece.

C-2. CONDITIONING OF TEST PIECES

C-2.1 Before testing, expose the test pieces to moisture equilibrium in a standard atmosphere of 65 $\pm$ 2 percent relative humidity and 27° $\pm$ 2°C temperature for at least 24 hours (*see also* IS : 196-1950*), and then immediately test at that temperature.

C-3. TEST MACHINE

C-3.1 The adhesion testing machine shall be power driven and of such capacity that the load required to maintain the separation of the plies is not greater than 85 percent or less than 15 percent of the maximum of the load scale. The machine shall be equipped to give a continuous indication of the load causing the separation of the plies. Because of the rapidly fluctuating loads obtained in adhesion tests, the machine shall be of a type having the shortest possible time contrast and it shall be operated so that any device for maintaining maximum load indication does not function. In pendulum type machines the weight lever arm shall swing as a free pendulum without engagement of pawls.

NOTE — A machine having a pendulum with a large moment of inertia is unsuitable for the test.

C-3.1.1 The grips shall be capable of holding the test piece and ply to be separated without slipping. Provision shall be made to maintain the test piece during the test in the approximate plane of the grips either by the attachment of sufficient weights to the free end of the test piece or by fitting a supporting plate to the non-driven grip.

C-3.1.2 The machine may be provided with mechanism for the autographic recording of the load required to cause the separation of the plies.

C-4. PROCEDURE

C-4.1 Break the bond to be tested over a distance of approximately 75 mm using sharp knife and pincers. Mount the test piece in the machine with the body of the test piece in the non-driven grip and the ply to be separated in the power driven grip so that the angle of separation is approximately 180°. Adjust the test piece in the grips so that the tension is distributed uniformly and no twisting occurs in the ply to be separated

*Atmospheric conditions for testing.

during the test. Start the machine and maintain the rate of travel of the power driven grip from 50 to 250 mm per minute. Take the readings of the load causing separation, at intervals of 12·5 mm over a length of 100 mm. Alternatively an autographic recording of the test may be taken. Repeat the procedure on separate plies from the face ply to the centre ply. Test the second test piece in the same way commencing with the back ply and proceeding again to the centre ply. Repeat the whole test with a second pair of test pieces.

C-4.2 Two pairs of test pieces in the warp direction and two pairs in the weft direction shall be tested in the above manner.

C-5. EXPRESSION OF THE RESULTS

C-5.1 Express the adhesion value as the average force in kgf/cm width required to cause separation of the plies at 25 mm/min to 12·5 mm/min. The results are the average for four test pieces where an autographic record is taken. Where readings are taken at 12·5 mm intervals the average of 32 readings is taken.

APPENDIX D

(*Clauses* 0.3 *and* 6.4)

METHOD OF TESTING SEAM STRIP

D-1. PROCEDURE

D-1.1 Take a transverse section of the sample of the belting 100 mm long. Beginning on the seamless side, remove the plies until only three remain intact. Draw a line down the middle of the seam strip. Draw another line on each side of the middle line, 15 mm distant from it and parallel to it. Double the section alng the centre line and insert in a vice so that the jaws grip the test piece on the two outer lines. Tighten the vice until the inner surface of the doubled sample just touch at the top of the vice, and hold the test piece in that position for 10 minutes.

APPENDIX E

(*Clause* 0.3)

INFORMATION TO BE GIVEN WITH ENQUIRY OR WHEN PLACING AN ORDER

E-1. INFORMATION TO BE SUPPLIED

E-1.1 The following information should be supplied when placing an enquiry or order for a belt:

a) Maximum power to be transmitted in kilowatts;

b) Belt speed (or diameter and rev/min of driving pulley);

c) Widths of pulleys;

d) Diameters of pulleys;

e) Positions and diameters of snub and idler pulleys;

f) Centre to centre distance between pulleys;

g) Type of drive, that is, open or crossed; horizontal or inclined; particulars of machinery; tight side — upper or lower; type of fork used, if any;

h) Conditions under which belt is to be used, particularly whether corrosive liquids or vapours are present; and

j) Other relevant details of operating conditions.

NOTE — The maximum ratings in kilowatts per centimetre width of belting at 180° arc of contact are given below for information:

Type of Fabric	*Weight of Fabric* g/m²	*Pulley Diameter* mm	*Belt Speed* m/s	*Rating per cm Width per ply* kW
Soft	815	250	5	0·12
	930	250	5	0·15
Hard	900	250	5	0·12
	975	250	5	0·15

APPENDIX F

(*Clause* 0.5.1)

MINIMUM PULLEY DIAMETER FOR GIVEN BELT SPEEDS AND BELT PLIES

F-1. MINIMUM PULLEY DIAMETERS

F-1.1 The minimum pulley diameters for given belt speeds and belt plies representative of present day good engineering practice are given in Table 5.

TABLE 5 MINIMUM PULLEY DIAMETERS FOR GIVEN BELT SPEEDS AND BELT PLIES IN MILLIMETRES

No. of Plies	Maximum Belt Speeds (Metres per Second)				
	10	15	20	25	30
(1)	(2)	(3)	(4)	(5)	(6)
2	50	63	80	90	112
3	90	100	112	140	180
4	140	160	180	200	250
5	200	224	250	315	355
6	250	315	355	400	450
7	355	400	450	500	560
8	450	500	560	630	710
9	560	630	710	800	900
10	630	710	800	900	1 000