SLS 1028:1994

Sri Lanka Standard
SPECIFICATION FOR AUTOMOTIVE V-BELTS

SRI LANKA STANDARDS INSTITUTION

Draft Sri Lanka Standard
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FOREWORD

This standard was finalized by the Sectoral Committee on Polymer and Polymer Products and was authorized for adoption and publication as a Sri Lanka Standard, by the council of the Sri Lanka Standards Institution on 94/12/22.

For the purpose of deciding whether a particular requirement of this specification is complied with, the final value, observed or calculated, expressing the result of a test or an analysis, shall be rounded off in accordance with CS 102. The number of significant places retained in the rounded off value shall be the same as that of the specific value in this specification.

Guidelines for the determination of a compliance of a lot with the requirements of this standard based on statistical sampling and inspection is given in Appendix A.

In the preparation of this standard, the valuble assistance derived from the following publication is gratefully acknowledged.

BSAU 150b : 1984 Specification for Automotive V-belts and Pulleys.

1 SCOPE

This specification prescribes the requirements, methods of test for automotive rubber V-belts

2 REFERENCES

SLS	37	Soft soaps
CS	102	Presentation of numerical values
SLS	297:Part 4	Determination of hardness
SLS	428	Random sampling methods.
ISO	1813	Antistatic endless V-belts - Electrical conductivity characteristic and method of test
ISO	1817	Rubber, Vulcanized - Determination of the effect of liquids.

3 DEFINITIONS

For the purpose of this specification, the following definitions shall apply;

3.1 **V-belt** : An endless flexible belt having a cross section that approximates to a regular trapezium. On a cross section of a straight sided belt, the trapezium . is outlined by the base, sides and top of the belt. The intersection of the extended profiles of the base, sides and top occurs when the corners are cut short or rounded.

3.2 **V-groved pulley** : A pulley with one or more grooves around the circumference. The grooves have profiles of a truncated, non truncated or rounded "V" that is symmetrical to the pulley axis.

3.3 **Effective width (We)** : A groove width dimension characterizing the groove profile. It is a defined value not subject to tolerance (see figure 4).

3.4 **Effective diameter (de)** : The diameter of the pulley at the effective width of the pulley groove (see figure 4).

3.5 **V-belt drive** : A drive comprising one or more belts mounted on V-grooved pulleys. The profiles of the belts and the pulley grooves are such that the belts only come into contact with the sides of the pulley grooves and not with the base of the grooves.

3.6 **Top-width (W)** : The larger width of the trapezium outlined on a cross section (see Figure 1)

3.7 **Height (T)** : The height of the trapezium outlined on a cross section (see Figure 1).

3.8 **Angle (A)** : The included angle obtained by extending the side of the belt (see Figure 1).

3.9 **Effective length (Le)** : The length of a line circumscribing a belt at the effective diameter (see 3.4) of the measuring pulleys.

3.10 **Ride-out** : The distance from the top of the belt to the effective width level of the pulley (see figure 2).

3.11 **effective circumference (Ce)** : The circumference of a circle with a diameter equal to the effective diameter.

3.12 **Groove angle (a)** : The included angle obtained by extending the sides of the pulley grooves (see figure 4)

Note :

For any given belt section the pulley groove angle will have a value dependent on the effective diameter of the pulley.

4 DESIGNATION

V-belts shall be designated by the groove profile (AV 10 or AV 13) and by their nominal effective length.

Eg. AV 10 1250

groove profile (mm) ←

effective length (mm) ←

5 DIMENSIONS

5.1 Cross section dimensions

The nominal cross section dimensions and the nominal . included angle shall be as given in Table 1.

TABLE 1 - Nominal dimensions of belt cross section

Sl. No. (1)	Belt designation (2)	Top width (W) mm (3)	Height (T) mm (4)	Included angle (A°) (5)
i	AV 10	10	8	40
ii	AV 13	13	10	40

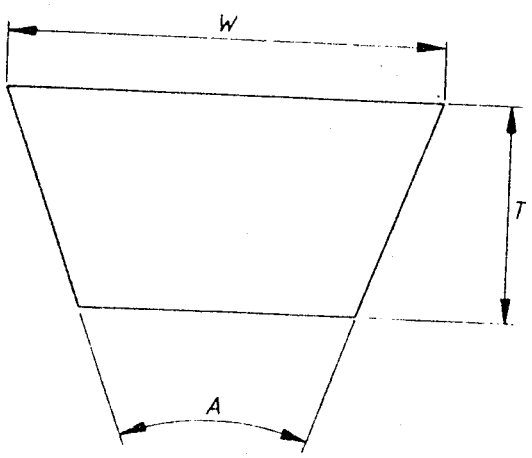


FIGURE 1 - Cross section of V-belt

5.2 Effective length (Le)

The effective length shall be as agreed to between the purchaser and the supplier. It shall be measured in accordance with the method given in Appendix C.

5.3 Tolerance on nominal belt length

The tolerance on nominal belt length shall be ± 0.6 per cent or ± 6 mm, whichever is greater.

NOTE - A range of recommended nominal belt lengths are given in Appendix B.

5.4 Matched set tolerance

In order to avoid an uneven distribution of load, belts used on a multi-belt drive shall be length matched. The maximum variation of length within a matched set shall be 0.3 per cent or 2 mm whichever is greater.

5.5 Variation of belt cross section

The variation of the belt cross section shall be such that, when the belt is rotated slowly for at least one complete revolution of length on the measuring fixture described in Appendix C the pulley centre distance shall not vary by more than 1.0 mm.

5.6 Belt ride-out

The mean value of the ride-out (see Figure 2) for the belt given in Appendix B shall not exceed 1.6 ± 0.8 mm.

Except for variations due to fabric splices or brand identifications, the variations in the belt ride-out shall be not more than 1.0 mm when the belt is rotated slowly for at least one complete revolution of length on the measuring fixture described in Appendix C.

NOTE

Variations due to fabric splices or brand identifications should be ignored.

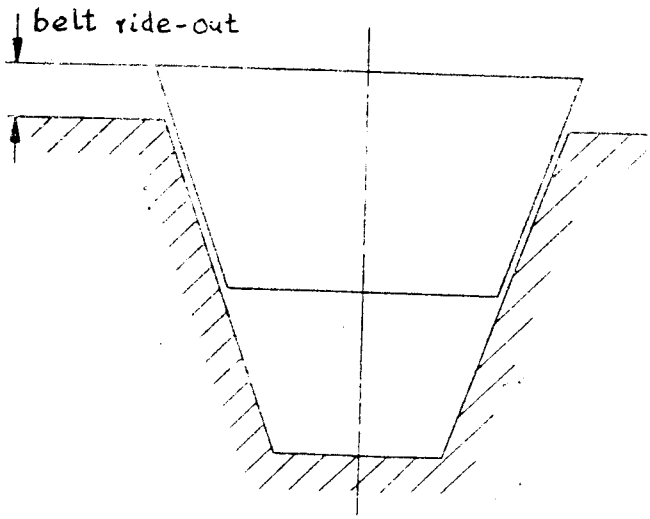


FIGURE 2 - belt ride-out measuring pulley

6 PERFORMANCE REQUIREMENTS

6.1 Electrical resistance

The electrical resistance, R (in Ω), when tested in accordance with Appendix D shall not be greater than the value of the expression ;

$$\frac{0.6\ L}{I} \times 10^6$$

where,

L is the dry distance, in mm between electrodes;
I is the sum of lengths, in mm, of the two sloping sides of the belt = 2T sec (A/2);
T is the height; and
A is the include angle.

6.2 Resistance to Oil

The value for oil resistance shall be as agreed to between the purchaser and the supplier, when tested in accordance with Appendix E.

6.3 Hardness of rubber core

The hardness shall be as agreed to between the purchaser and the supplier when tested in accordance with SLS 297 : Part 4.

6.4 Resistance to high temperature

The V-belt shall be free from cracks or other visible defects that would impair its service behavior and life, when tested in accordance with the method given in Appendix F.

7 MARKING

V-belts shall be marked legibly and indelibly on the outer surface with the belt designation.

APPENDIX A
COMPLIANCE OF A LOT

Sampling scheme given in this Appendix should be applied where compliance of a lot to the requirements of this standard is to be assessed based on statistical sampling and inspection.

Where compliance with this standard is to be assured based on manufacturer's control system coupled with type tests and check tests or any other procedure, appropriate scheme of sampling and inspection should be adopted.

A.1 LOT

In any consignment all V-belts belonging to one batch of manufacture or supply shall constitute a lot.

A.2 SCALE OF SAMPLING

Lot - In any consignment all the V-belts of the same designation and manufacture under the same conditions of manufacture shall constitute a lot.

A.2 Scale of sampling

A.2.1 Number of V-belts to be selected from a lot shall be in accordance with following table :

Table 2 - Scale of sampling

Number of V-belts in a lot (1)	Number of V-belts to be selected (2)	Size of a sub sample (3)
upto 1200	8	2
1201-3200	13	3
3201-10,000	20	4
10,000 and above	32	5

A.2.2 The V-belt shall be selected in random. In order to ensure randomness of selection, random number tables as given in SLS 428 shall be used.

A.3 Number of tests

A.3.1 Each belt selected as in A.2.1 shall be inspected for marking and requirements given in 5

A.3.2 Four subsamples each having size as given in column 3 of Table 2 shall be selected from the sample selected as in A.2.1 and shall be tested as follows:

Sub sample 1 - Electrical resistance
Sub sample 2 - Resistance to oil
Sub sample 3 - Hardness of rubber core
Sub sample 4 - Resistance to high temperature

A.4 Criteria for conformity

A lot shall be declared as conforming to the requirements of this specification if the following conditions are satisfied.

A.4.1 Each belt inspected as in A.3.1 satisfies relevant requirements.

A.4.2 Test result of each subsample satisfies relevant requirements.

APPENDIX B
RECOMMENDED NOMINAL BELT LENGTHS

For AV 10 groove section

Effective length, mm	
Preferred	Non preferred
600	
	613
625	
	638
650	
	663
675	
	688
700	
	713
725	
	738
750	
	763
775	
	788
800	
	813
825	
	838
850	
	863
875	
	888
900	
	913
925	
	938
950	
	963
975	
	988
1000	
	1013
1025	
	1038
1050	
	1063
1075	
	1088
1100	
	1113
1125	
	1138

Effective length, mm	
Preferred	Non preferred
1150	
	1163
1175	
	1188
1200	
	1213
1225	
	1238
1250	
	1263
1275	
	1288
1300	
	1313
1325	
	1338
1350	
	1363
1375	
	1388
1400	
	1413
1425	
	1438
1450	
	1463
1475	
	1488
1500	
	1513

For AV13 groove section

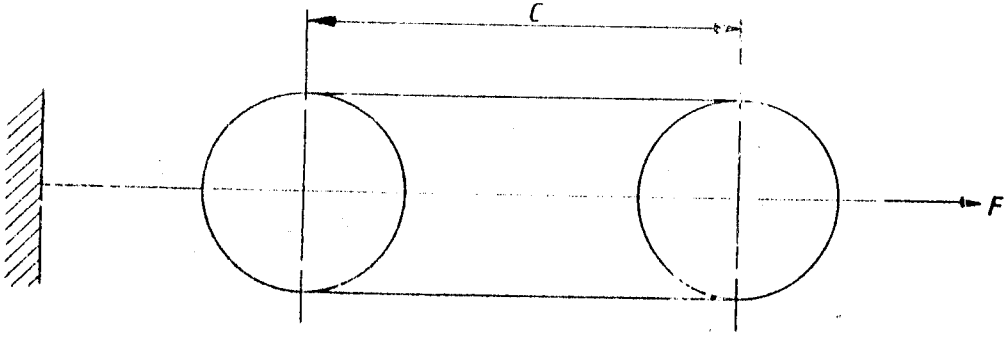
Effective length, mm	
Preferred	Non preferred
775	
	788
800	
	813
825	
	838
850	
	863
875	
	888
900	
	913
925	
	938
950	
	963
975	
	988
1000	
	1013
1025	
	1038
1050	
	1063
1075	
	1088
1100	
	1113
1125	
	1138
1150	
	1163
1175	
	1188
1200	
	1213
1225	
	1238
1250	
	1263
1275	
	1288
1300	
	1313

Effective length, mm	
Preferred	Non preferre
1325	
	1338
1350	
	1363
1375	
	1388
1400	
	1413
1425	
	1438
1450	
	1463
1475	
	1488
1500	
	1513
1525	
	1538
1550	
	1563
1575	
	1588
1600	
	1613
1625	
	1638
1650	
	1663
1675	
	1688
1700	
	1713
1725	
	1738
1750	
	1763
1775	
	1788
1800	

APPENDIX C
MEASUREMENT OF EFFECTIVE LENGTH

B.1 APPARATUS

Measuring fixture, consisting of two pulleys with dimensions as shown in Table 3 and Figure 3, with a groove section as shown in Figure 4, and with one pulley centre fixed. The other pulley shall be movable in a plane at right angles to the axes of the pulleys and in a line with the grooves of the pulleys. The pulleys shall be fully rotatable and a means of applying a measuring force shall be provided.



NOTE. This figure is diagrammatic only.

FIGURE 3 - Layout of measuring fixture

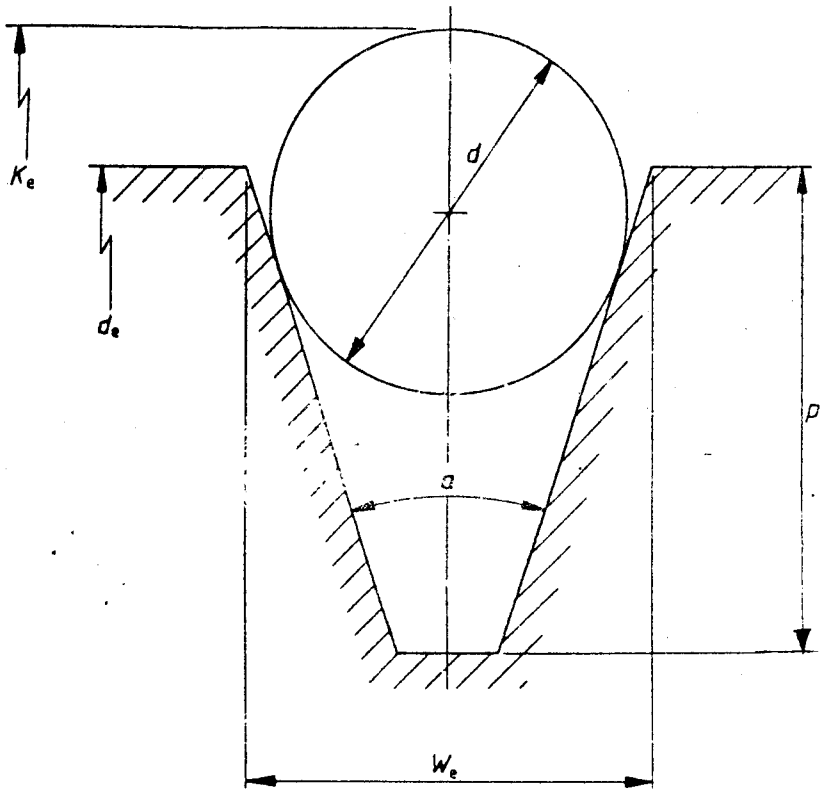


FIGURE 4 - Groove cross section of measuring fixture pulley

Table 3 - Dimensions and characteristics of measuring fixture pulleys

Sl. No.	Belt desi-gan-tion	Effec-tive width (We), mm	Effec-tive diameter (de), mm	Effec-tive circum-ference (Ce), mm	Groove angle (a) mm	Groove depth (p), mm	Diameter of balls/ rollers for checking pully groove (d), mm	Distance between external tangent plane of balls/ rollers (Ke), mm
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i	AV 10	9.7	95.5±0.2	300	36±0.2	11.0	9 ± 0.01	103.77±0.05
ii	AV 13	12.7	95.5±0.2	300	36±0.2	13.5	12 ± 0.01	107.25±0.05

B.3 PROCEDURE

Mount the belt on the measuring fixture (B.1) and position in the grooves under a force of 270 N. Rotate the pulleys at least twice to seat the belt properly,before making any measurements, so that the measuring force (F) is equally divided between the two strands of the belt.

B.4 CALCULATION

Effective length of the belt (Le) in mm = 2C + Ce

where,

C is the centre distance of the measuring pulleys (see Figure 2), (in mm) and

Ce is the effective circumference, of the measuring pulley (see column 5 of Table 3)(in mm)

APPENDIX D
DETERMINATION OF ELECTRICAL RESISTANCE

D.1 PRINCIPLE

To determine the electrical resistance of belts using an insulation tester under specified limits of humidity and temperature.

D.2 Test pieces : The test shall be carried out on new, endless v-belts.

D.3 APPARATUS

D.3.1 Insulation tester, having a nominal open-circuit d.c.voltage of 500V or any suitable instrument known to give comparable results. The test instrument shall be sufficiently accurate to determine resistance to within 5 per cent and shall not dissipate more than 3W in the belt under test.

D.3.2 Cotton wool pad or clean cloth

D.3.3 Liquid electrodes, comprising a conducting liquid consisting of the following :

		Ratio
(a)	Anhydrons polyethylene glycol of relative molecular mass 600	800
(b)	Water	200
(c)	Soft soap in accordance with SLS 37	01
(d)	Potassium chloride	10

D.3.4 Metal contacts, preferably made of brass, 25 mm wide, constructed with a V groove and with an included angle appropriate to the belt under test Metal contacts shall be clean. (See Figure 5)

D.4 REAGENTS

D.4.1 Dry fullers earth

D.4.2 Distilled water

D.5 Mechanical conditioning

After being strained under the conditions specified in Appendix C, maintain the belt in the unstrained state at room temperature for 24 h.

D.6 Preparation for test

After mechanical conditioning as described in D.5, store the belt for not less than 2h at room temperature in air with a relative humidity of less than 70%.

Clean the surfaces of the conditioned belt which are to be used in the test with the dry fullers earth (D.4.1) using clean pad of cotton wool (D.3.2) and take care to avoid straining the belt.

After all traces of powder have been cleaned away, wipe the surfaces over with a cotton wool pad moistened with distilled water (D.4.2) and rub dry with a clean cloth.

D.7 PROCEDURE

D.7.1 Preparation of liquid electodes and contacts

After the preparation of the belt for test in accordance with D.5, apply the liquid electodes (D.3.3) to two areas of the belt, each extending 25 mm along the length of the belt, and across the full width of the surfaces which make contact with the pulley groove and located so that the dry distance between them is 100 ± 6 mm.

Keep the electrode area completely wet until the end of the test.

Apply the clean metal contacts (D.3.4) to the wetted areas of the belt so that only the driving surfaces of the belt are in contact. Apply a force of 1 N/mm to top width of the belt to press it into the V-groove to ensure adequate electrical contact (see figure 5).

Ensure that the surface of the belt do not deform during the application of the contacts or during the test.

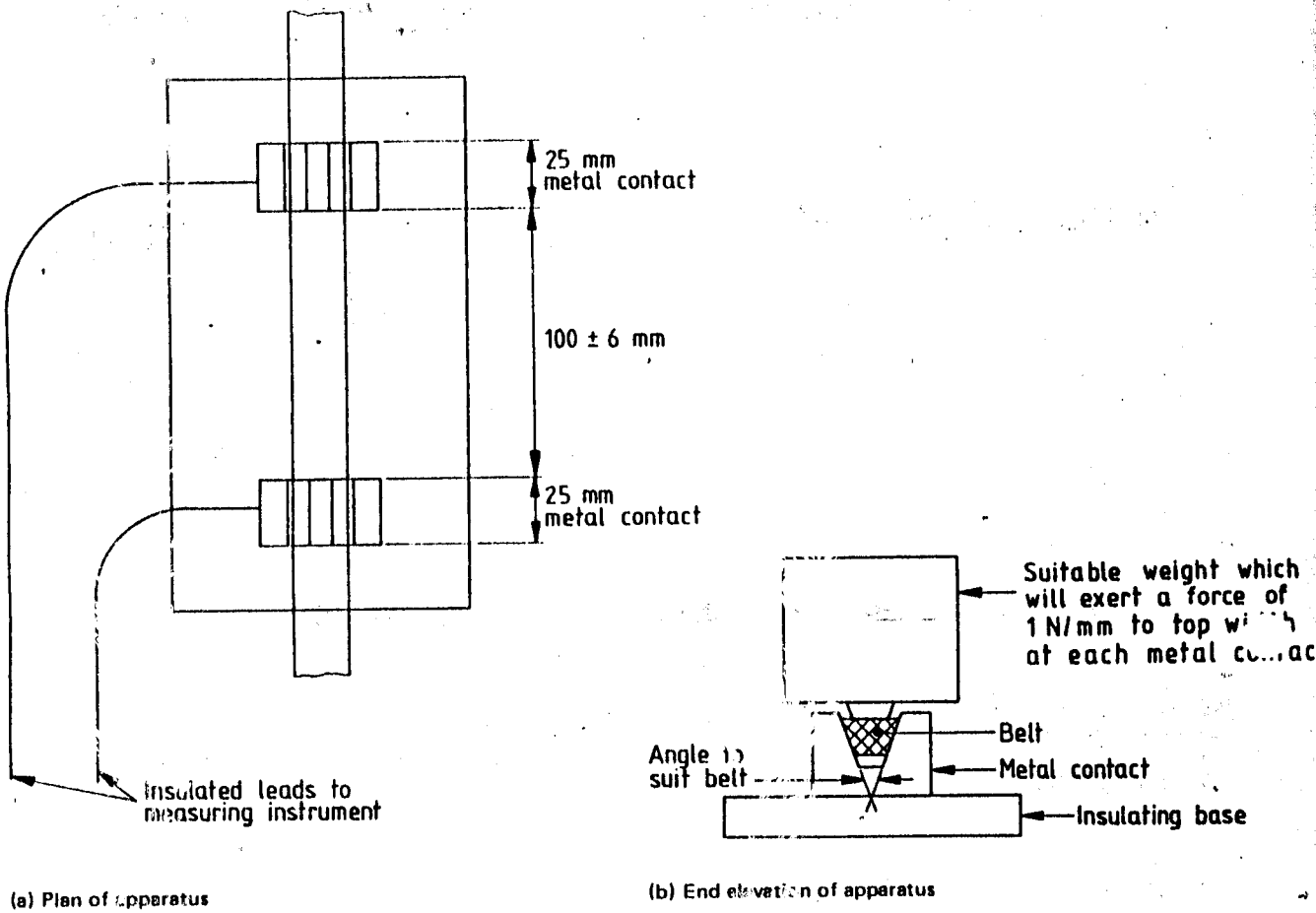


Figure 5-Apparatus for measuring the electrical resistance of belts.

D.7.2 Test

After mechanical coditioning and preparation apply the liquid electrodes and metal contacts, as described in D.7.1 to the belt. Measure the distance L between the contact areas of the belt and the sum I of the heights of the two sidewalls of the belt. In no case shall the voltage applied to the belt be less than 40 v.

D.7.3 Number of tests

At least five tests shall be made on different areas of the belt, spaced so that the tests will be representative of the whole belt.

D.8 INTERPRETATION OF RESULTS

The specified limit value, R is calculated from the formula which is defined in 6.1. None of the individual values obtained shall be more than the specified value.

Appendix E

Determination of belt resistance to oil

Follow the procedure for the volumetric method described in ISO 1817-1985 using oil no.1 for the test liquid. Immerse the test piece for 72 h at 70 ± 1 °C. Record the percentage change in volume.

Appendix F

Determination of belt resistance to high temperature.

Age a belt in its natural shape for 70 h at 100 ± 2 °C. Allow the belt to return to room temperature and Flex the belt backwards around a 75 mm diameter mandrel.