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SAE J1459 AUG88

**V-Ribbed Belts
and Pulleys**

SAE Standard
Revised August 1988

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PARTS AND COMPONENTS STANDARD

Submitted for recognition as an American National Standard

SAE J1459

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Superseding J1459 AUG84

Ø V-RIBBED BELTS AND PULLEYS

1. SCOPE:

This standard covers dimensions, tolerances, and methods of measurement of V-ribbed belts and pulleys for use on automotive¹ drives.

2. V-RIBBED BELTS: V-ribbed belts are produced in a variety of cross-sectional sizes which are given letter designations. It has been determined that the "PK" ("K") and "PL" ("L") section V-ribbed belts are applicable for automotive use. Because of different constructions and different methods of manufacture, the cross-sectional shape, dimensions, and included angle between the sidewalls of the belt may differ with different manufacturers. Belts are to be dimensioned in such a way that they are functional in pulleys dimensioned as described in a subsequent section.

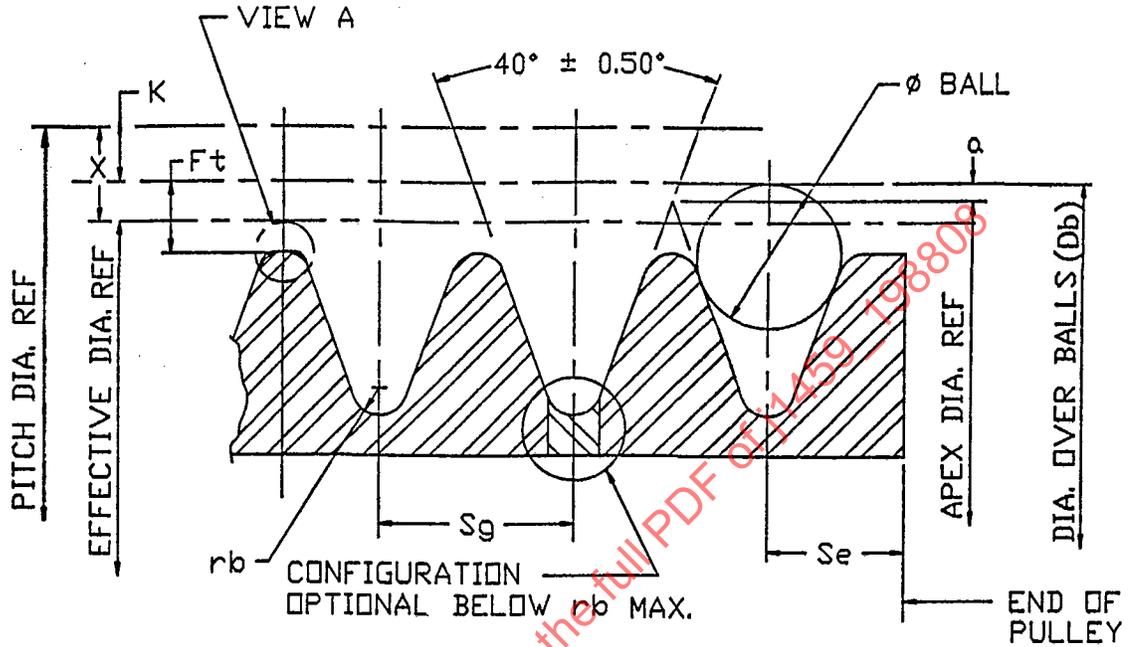
3. PULLEYS FOR V-RIBBED BELTS:

Pulleys are to conform to requirements of Fig. 1 and Tables 1A or 1B.

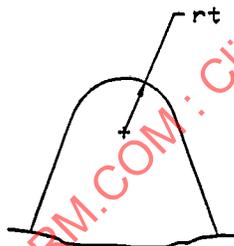
¹For non-automotive drives, see Engineering Standard IP-26 published by: Rubber Manufacturers Association, Inc., 1901 Pennsylvania Avenue, Washington, DC 20006. Pulleys produced to Engineering Standard IP-26 will meet all of the requirements of this standard.

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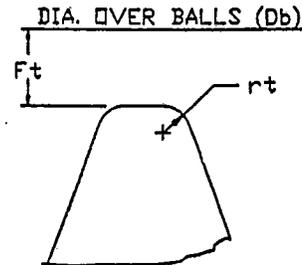
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TWO ALLOWABLE CONFIGURATIONS
(VIEW A ENLARGED)



- ① FULL RADIUS TANGENT TO GROOVE SIDEWALLS



- ② TRUNCATED WITH STRAIGHT LINE PARALLEL TO PULLEY AXIS HAVING r_t CORNER RADII TANGENT TO BOTH THE GROOVE SIDEWALL AND THE TRUNCATION LINE.

NOTE: APEX, EFFECTIVE, & PITCH DIA. CANNOT PHYSICALLY BE MEASURED ON PULLEY. THEY ARE FOR REFERENCE ONLY.

IT IS RECOMMENDED THE FOLLOWING TABLE BE USED ON THE DRAWING.
Db = DIA. OVER BALLS

EXAMPLE SHOWN IS FOR 'PK' GROOVE

FOR CALCULATION PURPOSES ONLY	
EFFECTIVE DIAMETER	$Db - 0.99$
PITCH DIAMETER	$Db + 2.01$
APEX DIAMETER	$Db - 0.03$

FIGURE 1 - Standard Groove Dimensions

TABLE 1A - Groove Dimensions - Millimeters

Cross Section Size	Minimum Recommended Effective Diameter	Sg ^a ±0.05	Se Min	rt		rb max	Ft ^b max	2a	2k	2x ^c	ØBALL ±0.010
				min	max						
PK	45	3.56	2.50	0.35	0.50	0.50	1.00	0.03	0.99	3.0	2.500
PL	75	4.70	3.30	0.40	0.70	0.40	1.75	0.82	2.36	1.54	3.500

^aSummation of the deviations from Sg for any one belt groove set in a pulley shall not exceed ±0.30 mm.

^bFt is measured from the actual ride position of the ball or rod in the pulley.

^cThis number may vary with belt manufacturer.

TABLE 1B - Groove Dimensions - Inches

Cross Section Size	Minimum Recommended Effective Diameter	Sg ^a ±0.002	Se Min	rt		rb max	Ft ^b max	2a	2k	2x ^c	ØBALL ±0.0004
				min	max						
K	1.8	0.140	0.100	0.014	0.020	0.020	0.039	0.001	0.039	0.118	0.0984
L	3.0	0.185	0.130	0.016	0.028	0.016	0.069	0.032	0.093	0.061	0.1378

^aSummation of the deviations from Sg for any one belt groove set in a pulley shall not exceed ±0.012 in.

^bFt is measured from the actual ride position of the ball or rod in the pulley.

^cThis number may vary with belt manufacturer.

4. V-RIBBED BELT SIZE:

The belt-cross sectional size can be determined by the basic dimension S_g . The belt width for a cross section is determined by the number of ribs. The belt length is determined by measurement as described in a subsequent section. Belt size is designated by a standard series of alphanumeric characters. Belts measured on a metric length system are designated by the number of ribs followed by the belt-cross-sectional size ("PK" or "PL") and the effective length in millimeters. For example, 6PK1370 signifies a 6-rib "PK" section belt, with an effective length of 1370 mm. Belts measured on an inch-length system are designated by the effective length to the nearest tenth of an inch followed by the belt-cross-sectional size ("K" or "L") and the number of ribs. For example, 540K6 signifies a belt with an effective length of 54.0 in, a "K" cross section, and 6 ribs.

5. V-RIBBED PULLEY SIZE:

Pulley size is designated by the effective diameter, the groove-cross-sectional size, and the number of grooves. The effective diameter can be determined by measuring the diameter over the balls or rods and subtracting 2K. The groove-cross-sectional size can be determined by measuring the dimension S_g . The pulley width for a cross section is determined by the number of grooves.

6. MEASUREMENT OF V-RIBBED BELTS:

The length of a V-ribbed belt is determined by use of a measuring fixture comprised of two pulleys of equal diameter, a method of applying force, and a means of measuring the center distance between the two pulleys. One of the two pulleys is fixed in position while the other is movable along a graduated scale. Both pulleys are allowed to rotate. The fixture is shown schematically in Fig. 2. Grooves of master inspection pulleys shall be machined to dimension tolerances shown in Tables 1A and 2A, or 1B and 2B, treated to resist wear, and checked periodically for wear and damage.

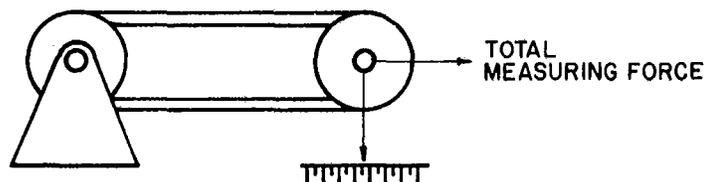


FIGURE 2 - Diagram of a Fixture for Measuring V-Ribbed Belts

6.1 **Length:** To measure the length, the belt is placed on the measuring fixture at the total measuring force shown in Tables 2A and 2B, and rotated around the pulleys at least two revolutions to seat the belt properly in the pulley grooves and to divide the total force equally between the two strands of the belt. The midpoint of the center distance travel of the movable pulley defines the center distance and will be measured through a minimum of one revolution of the belt after the two seating revolutions. The belt effective length is equal to two times the center distance plus the pulley effective circumference. Standard belt center distance tolerances are shown in Tables 3A and 3B. For center distance tolerances less than standard, the belt manufacturer should be consulted.

TABLE 2A - Measuring Conditions - Millimeters

Cross Section Size	Effective Diameter (reference)	Effective Circumference (reference)	d_g Ball or Rod Diameter ± 0.010	Diameter Over Ball or Rods ± 0.10	Total Measuring Force Per Rib (N)
PK	95.49	300	2.500	96.48	100
PL	159.15	500	3.500	161.51	200

TABLE 2B - Measuring Conditions - Inches

Cross Section Size	Effective Diameter (reference)	Effective Circumference (reference)	d_g Ball or Rod Diameter ± 0.0004	Diameter Over Ball or Rods ± 0.004	Total Measuring Force Per Rib (lb)
K	3.759	11.8	0.0984	3.798	22
L	6.266	19.7	0.1378	6.359	45

TABLE 3A - Standard Belt Center Distance Tolerances - Millimeters

Belt Length	Tolerance on Center Distance
1250 and less	± 3.2
Over 1250 - 1600, incl	± 4.0
Over 1600 - 2000, incl	± 4.8
Over 2000 - 2500, incl	± 5.6
Over 2500 - 3150, incl	± 6.4
Over 3150 - 4000, incl	± 7.2

TABLE 3B - Standard Belt Center Distance Tolerances - Inches

Belt Length	Tolerance on Center Distance
49 and less	±0.13
Over 49 - 63, incl	±0.16
Over 63 - 79, incl	±0.19
Over 79 - 98, incl	±0.22
Over 98 - 124, incl	±0.25
Over 124 - 157, incl	±0.28

7. STANDARD LENGTHS:

Standard lengths up to and including 2000 mm (79 in) are to be in 10 mm (0.4 in) increments. Standard lengths over 2000 mm (79 in) up to and including 4000 mm (157 in) are to be in 25 mm (1.0 in) increments.

NOTES:

- The sides of the groove are to be $3.2 \mu\text{m}$ (125 μin) A.A. maximum.
- Radial and axial run-out is not to exceed 0.35 mm (0.014 in) full indicator movement (FIM). Run-out in the two directions is measured separately with a ball mounted under spring pressure to follow the groove as the pulley is rotated.
- The diameters over the ball gauges are not to vary from groove to groove more than 0.25 mm (0.010 in) for any one belt groove set in a pulley.
- Centerline of groove is to be 90.0 ± 0.5 deg with pulley axis.
- The pitch diameter is used for calculation of speed ratio. The "x" dimension is radial. "2x" is to be added to the effective diameter to determine the pitch diameter.
- The apex diameter may be helpful for layout of pulley grooves or production tooling. "2a" is subtracted from the diameter over the balls to determine the apex diameter.

The phi (\emptyset) symbol is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.