

**(R) V-Ribbed Belts and Pulleys**

1. **Scope**—This SAE Standard covers the dimensioning technique, tolerances, and methods of measurement of V-ribbed belts and mating pulleys for use on automotive accessory drives.
2. **References**—There are no referenced publications specified herein.
3. **V-Ribbed Belts**—Although several v-ribbed cross sections are available, this document shall be confined to “PK” (K) section belts which are used in automotive applications, including trucks at least up to Class 3. Belts shall conform to Figure 1.
4. **Pulleys Mating with V-Ribbed Belts**—It is the intention of this document to relate the belt profile to the pulley profile using the variables associated with the 2.50 mm ball used in measuring pulley diameters. Pulleys shall conform to Figure 2 for diameter over balls less than 70.00 mm and to Figure 3 for diameters of 70.00 mm or greater.
- 4.1 **Pulley Diameter Definitions**—The diameter over balls is the only diameter actually measured on a pulley. There are other diameters used that are calculated from this value. The ball diameter is defined as 2.500 mm ± 0.010 mm. See Tables 1A and 1B.

**TABLE 1A—PULLEY DIAMETER - 40 DEGREES GROOVE  
(for calculation purposes only – 40 degrees groove)**

Diameter	Definition
Effective	Db - 0.99 (Groove Dia. with 0.25R Tip)
Apex	Db - 0.03 (Flank Intersect.)
Pitch	Db + 2PBΔg (To Cord Line) Db + 2.01 Ref. (Previous Defined Estimate)

**TABLE 1B—PULLEY DIAMETER - 37 DEGREES GROOVE  
(for calculation purposes only – 37 degrees groove)**

Diameter	Definition
Effective	Db - 0.82 (Groove Dia. with 0.25R Tip)
Apex	Db - 0.26 (Flank Intersect.)
Pitch	Db + 2PBΔg (To Cord Line)

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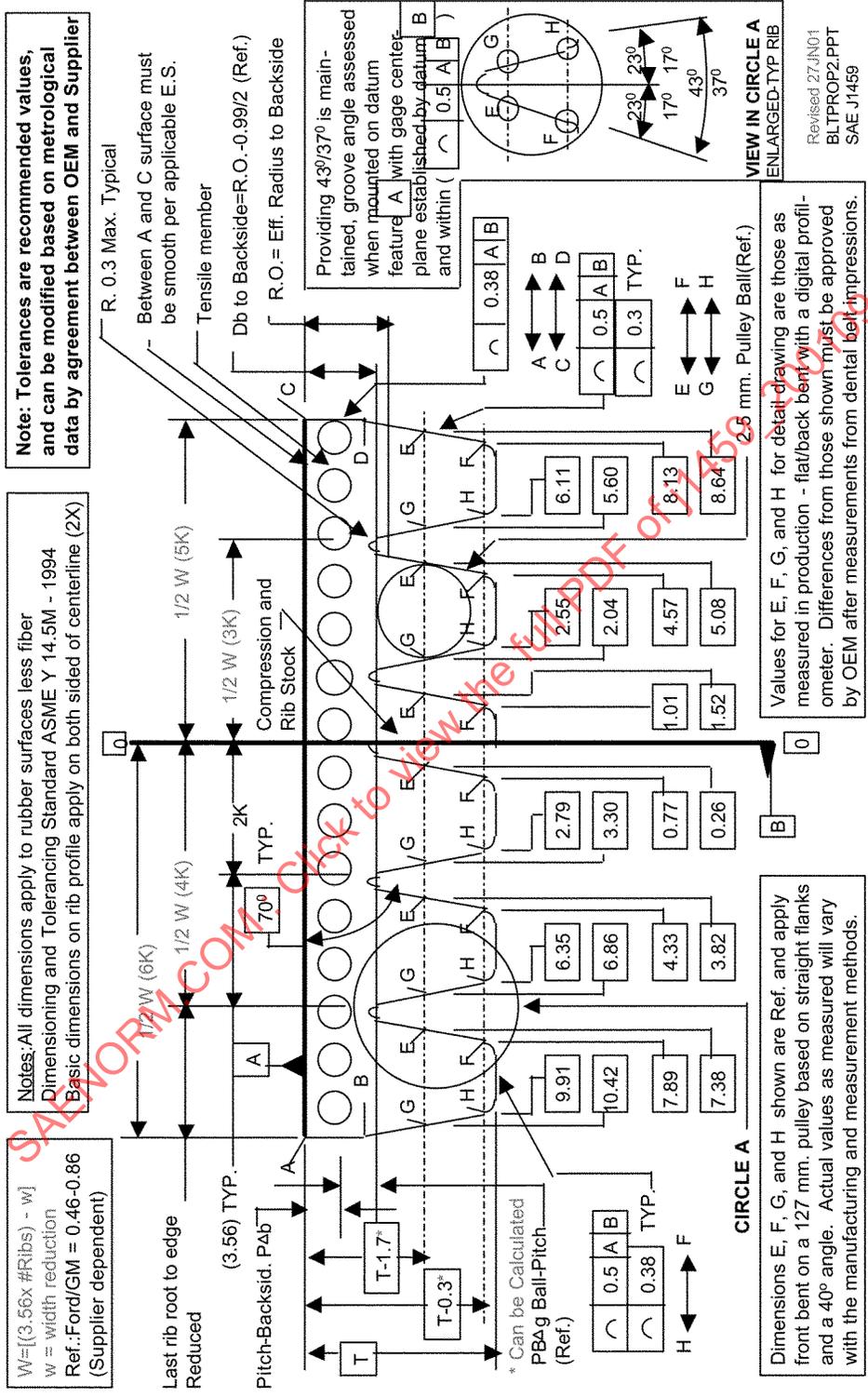
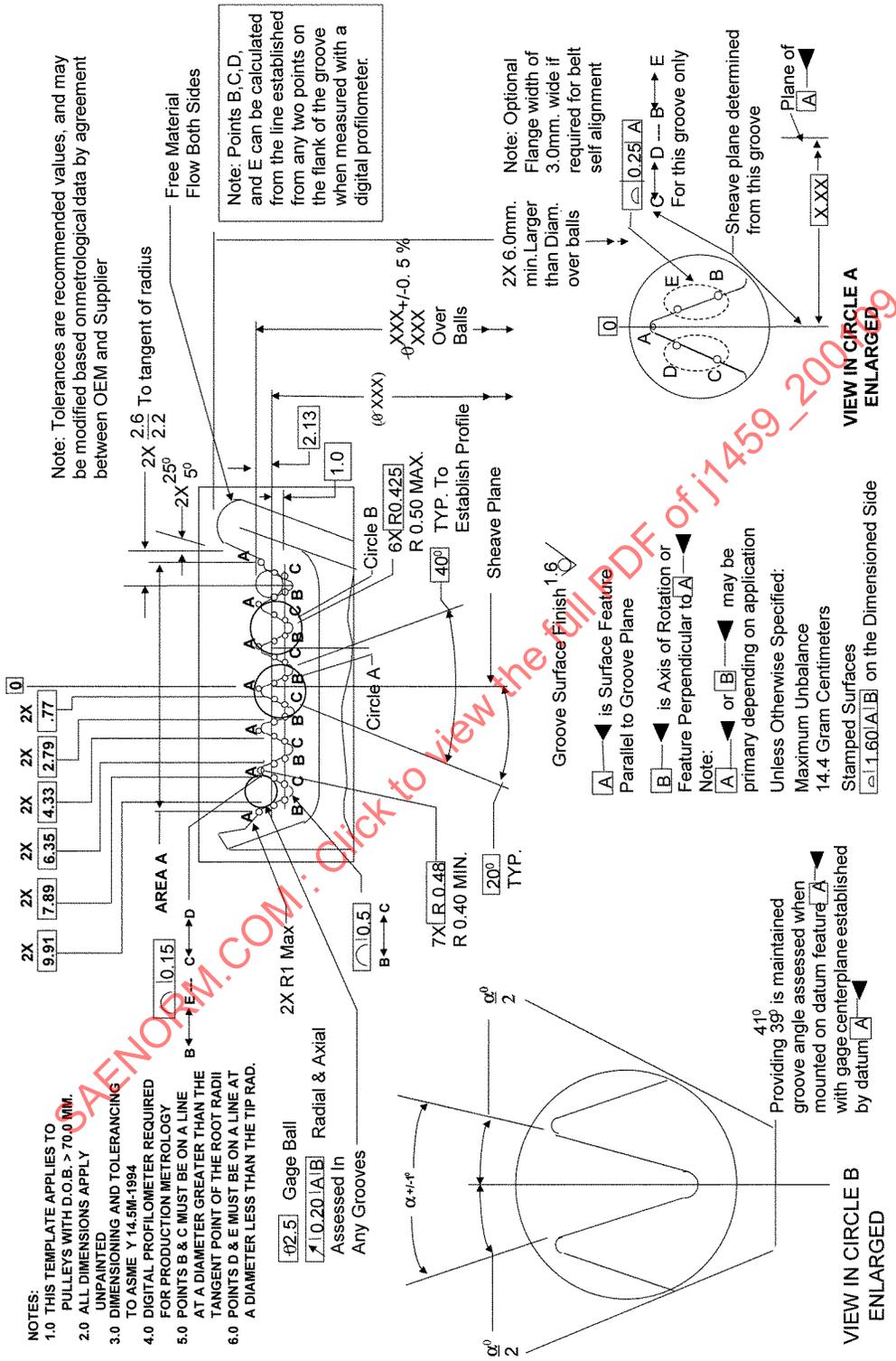


FIGURE 1—BELT DIMENSIONING TEMPLATE





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FIGURE 3—PULLEY DIMENSIONING TEMPLATE (6) GROOVE SHOWN (TYPICAL)

5. **Measurement Method**—Since the templates in Figures 1 to 3 have profile of a line callouts, it is necessary to capture the entire profile digitally and compare it to the drawing dimensions. This requires a digital profilometer and eliminates the optical comparator as acceptable for metrology. Because of the inherent speed of these devices, the frequency of audit may have to be reduced, depending on the process used in production. If verification of ongoing quality requires more frequent measurement, the audit with the profilometer is still required, while the supplier can use traditional methods to measure additional belts to satisfy an internal process control characteristic, if they feel the need.
6. **Belt Dimension Determination**—The shape of the belt profile changes with bending, either as profiled back bent, if it is not molded, or between manufacture and measurement. The intent of the document is to achieve a precise mating of the belt as bent around a grooved pulley. The 37 degree pulley standard deals with the distortion of the belt around small diameter pulleys. For larger pulleys, the 40 degree belt rib angle is to be defined on a 127 mm pulley as measured in an arch with a dental compound casting, or equivalent. The detail drawing is to show the rib dimensions as measured in production with the digital profilometer (usually flat). These dimensions may be different from those measured in the arch. Once the relationship between the arch and the production measurements due to the rubber distortion is established, the arch dimensions shall not be measured on an ongoing basis, but rather the detail drawing dimensions representing the flat profilometer method.
7. **Metrological Issues**—In order to facilitate the execution of the programs for digital profilometers to measure both belts and pulleys, it is permissible to calculate the points defined on the flanks of the belt ribs or pulley grooves. This can be done from the line defined by points along the rib/groove flank line between the tangent points of the tip and root radii. Gage R&R improves with increasing distance between the points selected. Precise methodology can be mutually agreed upon between supplier and OEM.
8. **V-Ribbed Belt Size**—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.
9. **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 Figure 4. Grooves of master inspection pulleys shall be machined to dimension tolerances shown in Table 2, treated to resist wear, and checked periodically for wear and damage.

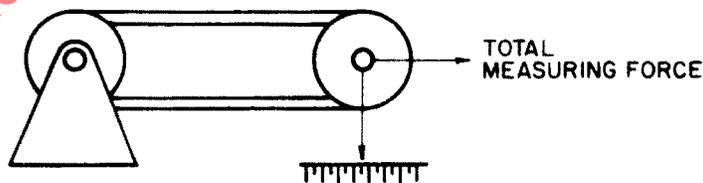


FIGURE 4—DIAGRAM OF A FIXTURE FOR MEASURING V-RIBBED BELTS