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INTERNATIONAL STANDARD

ISO 9981

First edition
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Belt drives — Pulleys and V-ribbed belts for the automotive industry — Dimensions — PK profile

Transmissions par courroies — Poulies et courroies striées pour la construction automobile — Dimensions — Profil PK

Reference number
ISO 9981 : 1990 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 9981 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Sub-Committee SC 1, *Veebelts and grooved pulleys*.

Annex A of this International Standard is for information only.

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Introduction

A V-ribbed belt drive is composed of an endless belt with a longitudinally ribbed traction surface which engages and grips, by friction, pulley grooves of similar shape. The belt ribbed surface fits the pulley grooves to make substantially total contact.

Belt drives — Pulleys and V-ribbed belts for the automotive industry — Dimensions — PK profile

1 Scope

This International Standard specifies the principal dimensional characteristics of V-ribbed pulley groove profiles, together with the corresponding endless V-ribbed belts, of PK profile which are used predominantly for automotive accessory drive applications.

The complete array of V-ribbed belts and pulleys of PH, PJ, PK, PL and PM profile for industrial and other non-automotive applications is the subject of ISO 9982. PK belt profile dimensions and tolerances are the same in both International Standards.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

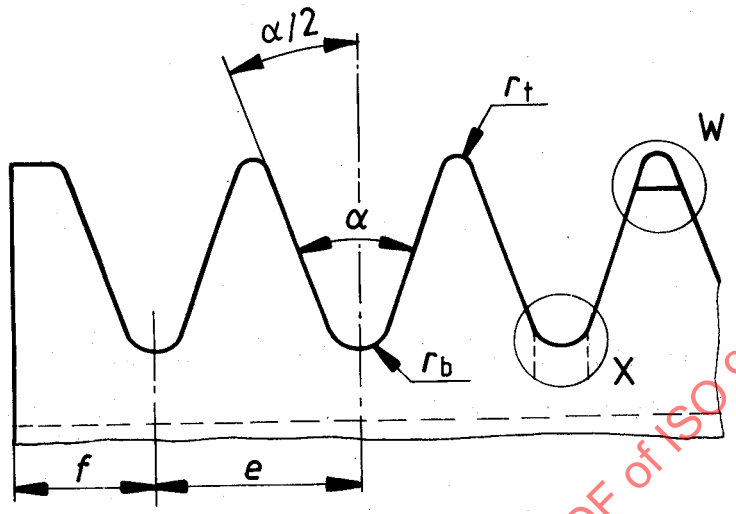
ISO 254 : 1981, *Quality, finish and balance of transmission pulleys.*

ISO 468 : 1982, *Surface roughness — Parameters, their values and general rules for specifying requirements.*

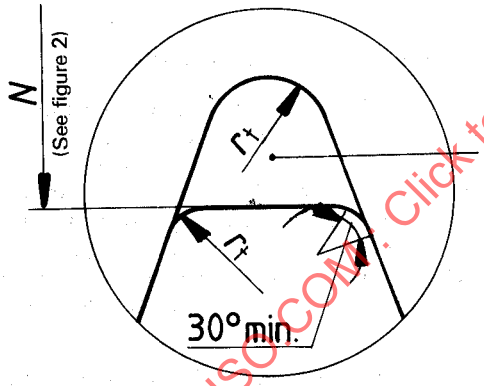
3 Pulleys

3.1 Groove dimensions and tolerances

The groove dimensions of PK pulleys are shown on figures 1 and 2, and given in table 1.

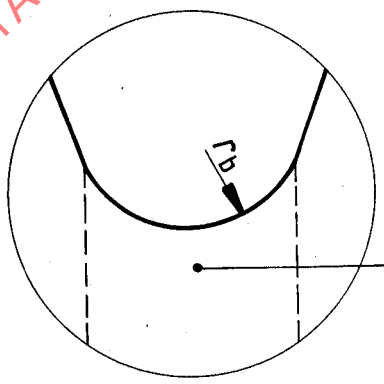


W Alternative: Pulley tip profile



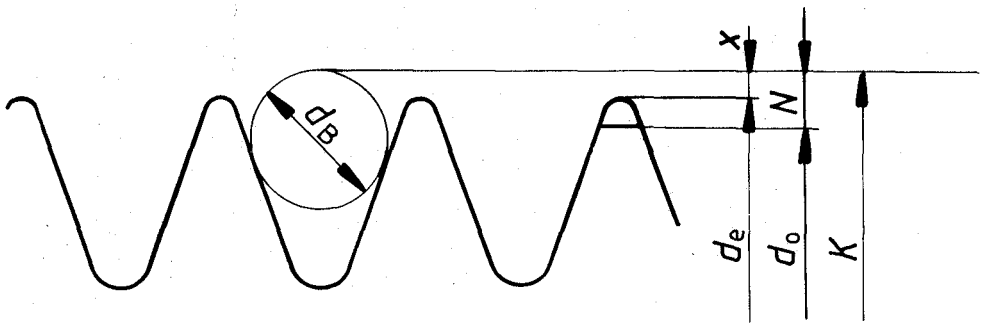
The actual configuration of the tip profile may lie anywhere between the maximum and minimum indicated. Any configuration shall have a transitional radius r_t corresponding to a 30° minimum arc tangent to the groove sidewall

X Alternative: Pulley groove bottom



The configuration of the groove bottom below r_b is optional

Figure 1 — Cross-section of pulley grooves



d_e = effective diameter

d_o = outer diameter

K = diameter over balls or rods

d_B = checking ball or rod diameter

Figure 2 — Pulley diameters

Table 1 — Dimensions of PK pulley grooves

Dimensions in millimetres

Groove pitch, e	± 0,05[1), 2)]	3,56
Groove half-angle, $\alpha/2$[3)]	± 0° 15′	20°
r_t	min.	0,25
r_b	max.	0,5
Checking ball or rod diameter, d_B	± 0,01	2,5
$2x$	nom.	0,99
$2N$[4)]	max.	2,06
f	min.	2,5

1) The tolerance on e applies to the distance between the axes of two consecutive grooves.

2) The sum of all deviations from the nominal value e for all grooves in any one pulley shall not exceed ± 0,3.

3) The centreline of the groove shall make an angle of 90° ± 0,5° with the axis of the pulley.

4) N is not related to the nominal diameter of the pulley but is measured from the actual ride position of the ball or rod in the pulley.

3.2 Minimum effective diameter

The minimum recommended effective diameter, d_e, for PK pulleys is 45 mm.

3.3 Tolerances on finished pulley

3.3.1 Checking conditions

Profile, diameter and run-out tolerances shall be checked on the finished pulley without surface coating.

3.3.2 Groove-to-groove diameter tolerances

The variation in diameters between the grooves in any one pulley shall not exceed 0,15 mm. This variation is obtained by comparing the diameters over balls or rods.

3.3.3 Radial and axial circular run-out

Radial and axial circular run-outs shall not exceed 0,25 mm total indicator reading (TIR). Run-out in the two directions is measured separately with a ball mounted under spring pressure to ensure contact with the groove as the pulley is rotated.

3.3.4 Groove finish

The pulley grooves shall have a surface roughness $R_a \leqslant 3{,}2$ µm. See ISO 254 and ISO 468 for definitions and the method of measurement.

3.4 Pitch diameter, d_p

The fit of a V-ribbed belt in the corresponding pulley is shown in figure 3. The true pitch diameter of a V-ribbed pulley is slightly larger than the effective diameter and its exact value is determined with the particular belt being used.

A nominal value of the effective line differential, b_e, of 2 mm may be used to calculate the speed ratio. If more precision is required, the belt manufacturer should be consulted.

Further information is given in ISO 8370.

3.5 Designation of pulleys

A V-ribbed pulley for the automotive industry is characterized by the number of grooves, the profile and the effective

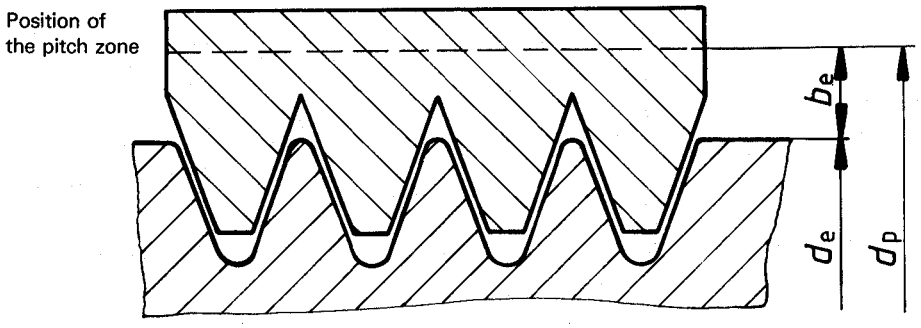


Figure 3 — Determination of pitch diameter

diameter. It is designated by a series of numbers and letters as follows:

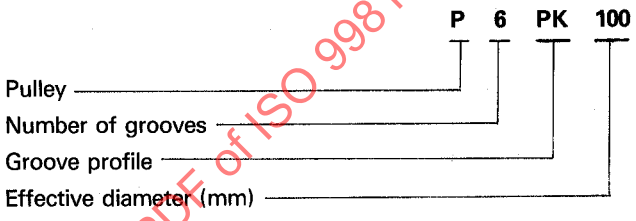
a) the first letter "P" indicates a pulley;

b) the first set of numbers indicates the number of grooves;

c) the second set of letters indicates the groove profile;

d) the second set of numbers indicates the effective diameter, in millimetres.

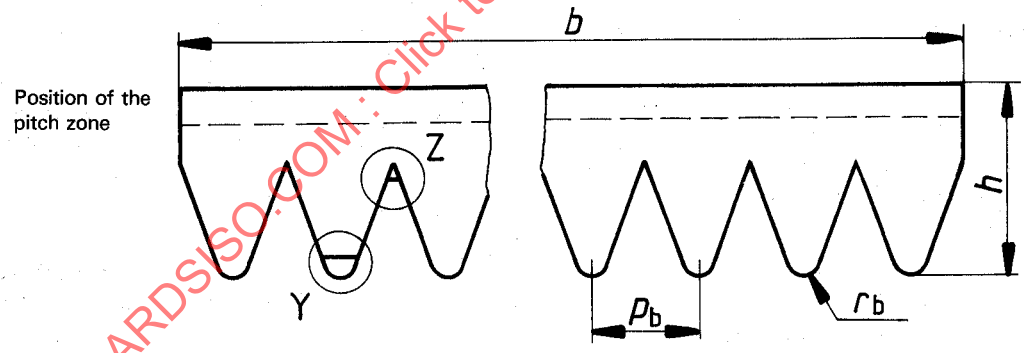
EXAMPLE



4 Belts

4.1 Belt dimensions

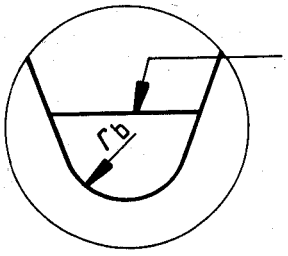
The dimensions of the PK belts are shown on figure 4 and given in table 2.



Nominal width of the belt $b = n \times p_b$
where n is the number of ribs

Y

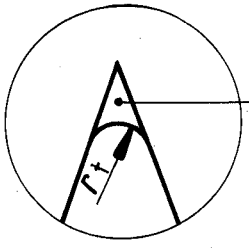
Alternative: Belt rib tip



The flat belt tip is optional

Z

Alternative: Belt groove bottom



The configuration of the belt groove bottom may lie anywhere between the maximum and minimum indicated

Figure 4 — Cross-section of belt

Table 2 — PK belt dimensions

Dimensions in millimetres

Rib pitch, p_b		3,56
r_b	min.	0,5
r_t	max.	0,25
Belt height, h	≈	4,5 to 6

NOTE — Rib pitch and belt height are shown as reference dimensions only. Cumulative rib pitch tolerance is an important value. However, it is a value that is frequently affected by the tension at which the belt operates and the modulus of the tension member.

4.2 Measurement of the effective belt length

4.2.1 Measuring fixture (see figure 5)

The effective belt length shall be determined by placing the belt on a measuring fixture composed of the following elements.

4.2.1.1 Two pulleys of equal diameter, one of which is fixed and the other movable. Their profile shall comply with figure 1 and table 1, and their recommended effective diameter shall be determined from the values given in table 3.

4.2.1.2 A means of applying a total measuring force to the movable pulley.

4.2.1.3 A means of measuring the centre distance between the two pulleys.

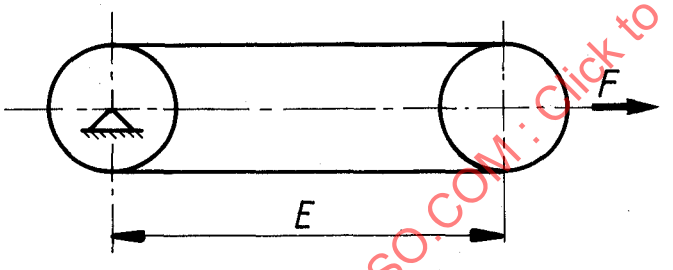


Figure 5 — Effective length measuring fixture

Table 3 — Measuring pulley and measuring force

Dimensions in millimetres and force in newtons

Pulley effective circumference (at level of effective diameter), U_e		300
Diameter over balls or rods, K	± 0,13	96,48
Measuring force per rib, F		100

4.2.2 Measuring force

The measuring force to be applied for measuring the effective length of belts is given in table 3.

4.2.3 Procedure

In measuring the effective length of a belt, rotate the belt at least two revolutions to seat it properly and to divide the total force equally between the two strands of the belt.

Then measure the centre distance between the pulleys, E, and hence calculate the effective length, L_e, of the belt using the following formula:

$$L_e = 2E + U_e$$

where

U_e is the effective circumference of the measuring pulleys;

E is the centre distance between the pulleys.

4.3 Designation of belts

A V-ribbed belt for the automotive industry is characterized by the number of belt ribs, the profile and the effective length. It is designated by a series of numbers and letters as follows:

a) the first set of numbers indicates the number of belt ribs;

b) the letters indicate the belt profile;

c) the second set of numbers indicates the effective length, in millimetres.

EXAMPLE