INTERNATIONAL STANDARD

ISO 9980

Second edition
2012-11-01

Belt drives — Grooved pulleys for V-belts (system based on effective width) — Geometrical inspection of grooves

Transmissions par courroies — Poulies à gorges pour courroies trapézoïdales (système basé sur la largeur effective) — Contrôle géométrique des gorges

Reference number
ISO 9980:2012(E)

COPYRIGHT PROTECTED DOCUMENT

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 9980 was prepared by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 1, *Friction*.

This second edition cancels and replaces the first edition (ISO 9980:1990), of which it constitutes a minor revision.

Introduction

In drives using V-belts, the dimensions of the pulley grooves can be defined either on the basis of the datum width or on the basis of the effective width. As a result, two systems for the definition and description of the dimensions of pulleys and belts have been developed. The two systems are independent of each other.

For the geometrical inspection of grooves defined on the basis of the effective width, necessary tests to ensure by mechanical means the conformity of a grooved pulley with standard specifications were specified, but modern quick or serial checking procedures for grooved pulley production control were not.

Belt drives — Grooved pulleys for V-belts (system based on effective width) — Geometrical inspection of grooves

1 Scope

This International Standard specifies the methods of checking the regularity of the grooves and pulleys for V-belts specified in the system based on effective width. The grooved pulleys can be designed for use with classical or narrow V-belts. The V-belts can be either single or joined units.

It is intended to specify the inspection parameters and tolerances of grooved pulleys in future International Standards.

2 Principle

Complete inspection of a grooved pulley carried out in four successive checking operations, in the following order:

— inspection of groove profile (see Clause 3);

— inspection of groove spacing (see Clause 4);

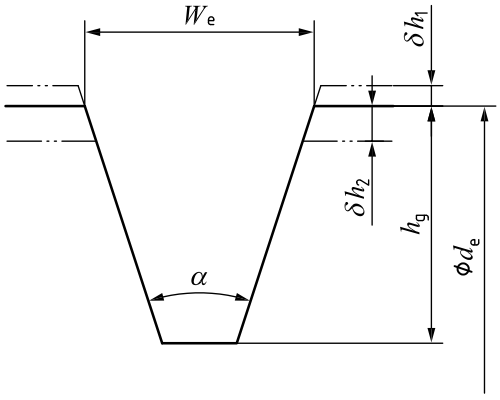
— inspection of effective diameter (see Clause 5);

— inspection of run-out (see Clause 6).

3 Groove profile

3.1 Specifications

The groove profile shall be specified in the corresponding International Standard by the dimensions shown in Figure 1 and given in Table 1.



NOTE The flanks of the grooves are straight up to at least $d_e - 2\delta h_2$.

Figure 1 — Groove profile

Table 1 — Groove profile specifications

Dimension	Symbol	Tolerance
Effective width	w_e	A specified value not subject to tolerance
Groove angle	α	$\pm\Delta\alpha$
Groove depth	h_g	Minimum value
Sidewall bevel depth	δh_2	Maximum value
Groove land height	δh_1[a]	Maximum value
[a] Only for grooved pulleys for use with joined V-belts.		

3.2 Inspection

3.2.1 Limit gauges

The groove profile shall be checked using a limit gauge shown diagrammatically in Figure 2 or Figure 7.

A gauge for each of the standard angles applicable to each groove section in the corresponding International Standard is required.

The limit gauges shall be marked with the groove section and the groove angle.

3.2.2 Inspection of grooves for single V-belts

The limit gauge is shown in Figure 2.

The α_{min} end of the limit gauge is used to check the minimum value of the groove angle. The gauge shall come into contact with the groove at the lower corners (see Figure 3) or be in contact uniformly along the sidewalls.

The α_{max} end of the limit gauge is used to check the maximum value of the groove angle, the effective width, the groove depth and the sidewall bevel depth, δh_2, in the same operation.

The groove angle, the effective width, the groove depth and the sidewall bevel depth, δh_2, comply with specifications if the corners of the gauge at width, w_1, contact the straight sidewalls of the groove (see Figure 4).

The groove angle is too great if only the lower corners of the α_{max} end of the gauge are in contact with the groove.

The effective width is too small or the sidewall bevel depth, δh_2, too great if the top corners of the gauge at width, w_1, lie above the straight sidewalls of the groove (see Figure 5).

The groove depth is too small if the gauge touches the bottom of the groove (see Figure 6).

3.2.3 Inspection of grooves for joined V-belts

The limits gauge is shown in Figure 7.

The α_{min} end of the limit gauge is used to check the minimum value of the groove angle. The gauge shall come into contact with the groove angle. The gauge shall come into contact with the groove at the lower corners (see Figure 3) or uniformly along the sidewalls.

The α_{max} end of the limit gauge is used to check the maximum value of the groove angle, the effective width, the groove depth, the sidewall bevel depth, δh_2, and the groove land height, δh_1, in the same operation.

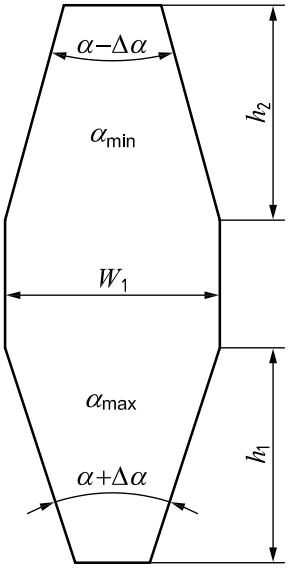
The groove angle, the effective width, the groove land height, the sidewall bevel depth and the groove depth comply with specifications if the corners of the gauge at width, w_1, come into contact with the straight sidewalls of the groove (see Figure 8).

The groove angle is too great it only the lower corner of the α_{max} end of the gauge comes into contact with the groove.

The groove land height, δh_1, is too great if the shoulder of the gauge comes into contact with the groove land without the gauge being seated firmly in the groove (see Figure 9).

The effective width is too small or the sidewall bevel depth, δh_2, too great if the top corners of the gauge at width, w_1, lie above the straight sidewalls of the groove (see Figure 10).

The groove depth is too small if the gauge touches the bottom of the groove (see Figure 6).



The dimensions are:

$w_1 = w_e - 2\delta h_2 \cdot \tan \alpha/2$

$h_1 = h_g - \delta h_2$

$h_2 \leq h_1$

Figure 2 — Limit gauge for single V-grooved pulleys

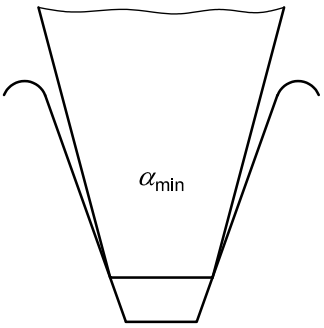


Figure 3 — Fitting of limit gauge in the groove to be checked (good)

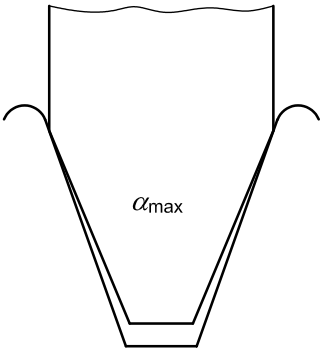


Figure 4 — Inspection of groove profile (good)

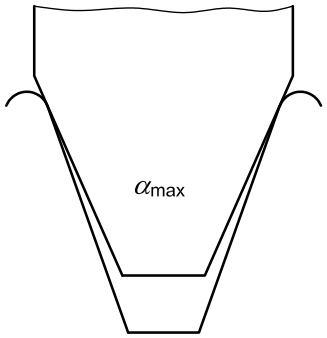


Figure 5 — Inspection of groove profile (bad)

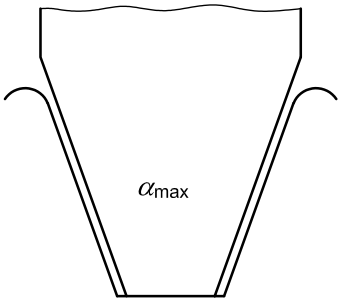
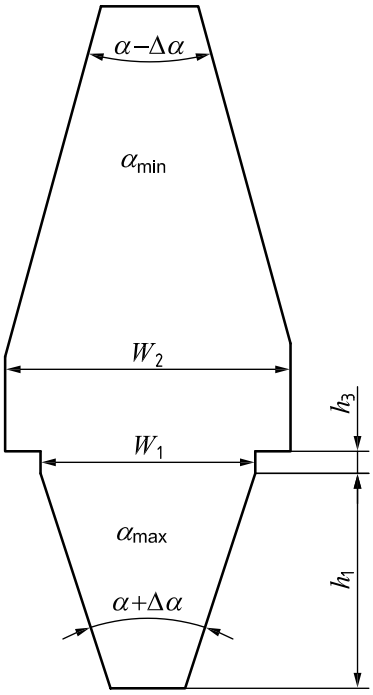


Figure 6 — Inspection of groove profile (bad)



The dimensions are:

$w_1 = w_e - 2\delta h_2 \cdot \tan \alpha/2$

$w_2 > e$ (see 4.1.1)

$h_1 = h_g - \delta h_2$

$h_3 = \delta h_1 + \delta h_2$

Figure 7 — Limit gauge for multiple V-grooved pulleys

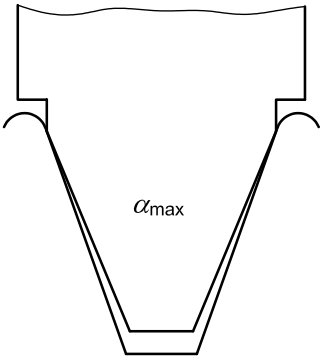


Figure 8 — Inspection of groove profile (good)

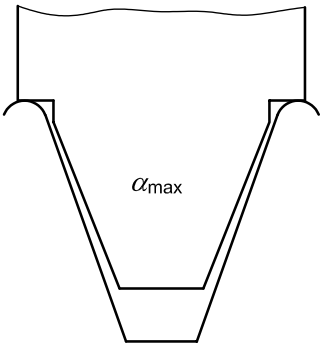


Figure 9 — Inspection of groove profile (bad)

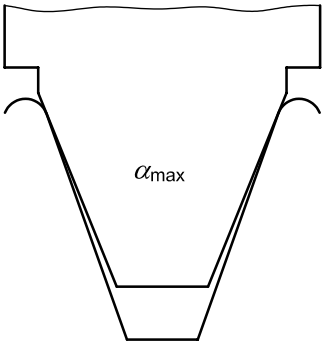


Figure 10 — Inspection of groove profile (bad)

4 Groove spacing

4.1 Specifications

4.1.1 Groove spacings

The following dimensions shall be specified in the corresponding International Standard for multiple groove pulleys (see Figure 11):

— the distance between the axes of two consecutive grooves: nominal value, e;

— the permissible tolerance on the nominal value, e;

— for grooved pulleys for use with joined V-belts, a maximum value for the sum of all deviations from the nominal value, e, for all grooves in any one pulley.

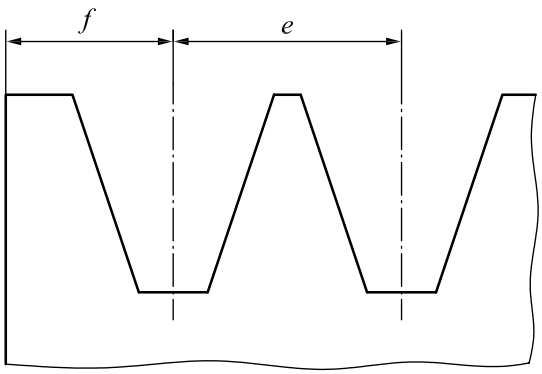


Figure 11 — Multiple groove pulley

4.1.2 Distance between edge of pulley and first group centre

A minimum value shall be specified for the distance, f, between the outside of the rim and the axis of the first groove for all single and multiple groove pulleys. A plus and minus tolerance may be assigned to the value of f in order to facilitate the alignment of the pulleys.

4.2 Inspection

Measure pulley groove spacing using a sheave groove tool and sets of interchangeable balls for each individual groove section. The ball diameter shall be as specified in 5.1.2.

Measure the groove spacing e, using the groove spacing locator as shown in Figure 12. The movable ball slide shall be tightened after the balls have been properly placed in the grooves. Measure the distance, x, using a Vernier micrometer caliper. The measured groove spacing, e, is equal to the measured dimension, x, minus the diameter of the inspection ball used.

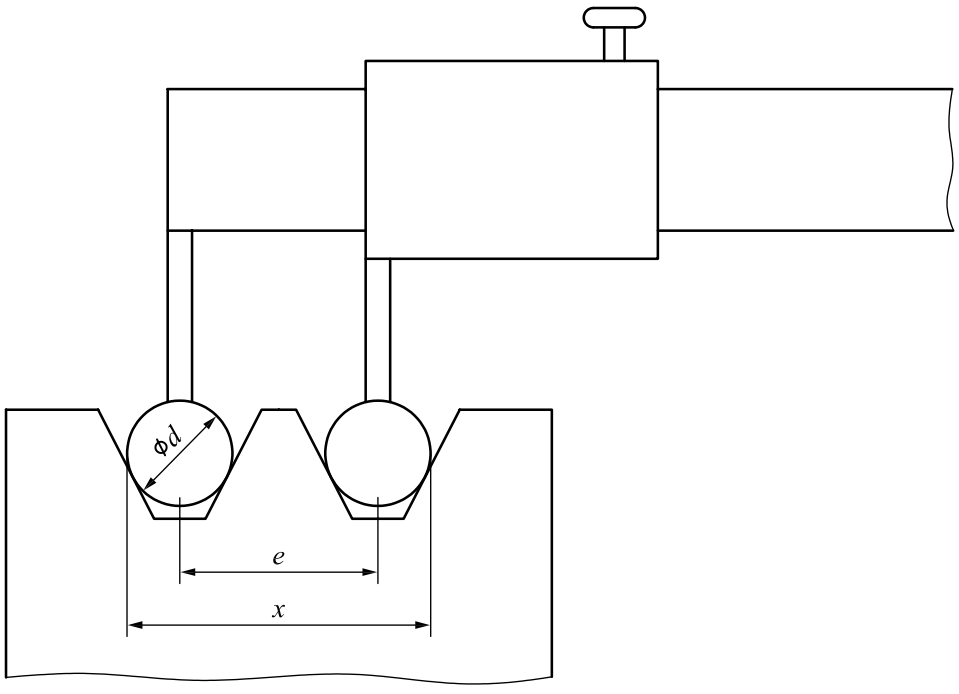


Figure 12 — Groove spacing locator

5 Effective diameter

5.1 Specifications

5.1.1 Effective diameter

The following dimensions shall be specified in the corresponding International Standard:

— the effective diameter: nominal value, d_e;

— the permissible tolerance on the nominal value, d_e;

— for multiple groove pulleys, the permissible variation of the effective diameters measured from groove to groove.

NOTE Knowledge of the deviations in effective diameters between the grooves of a single service pulley is more important than that of the exact value of the effective diameters.

5.1.2 Checking balls or rods

The following dimensions shall be specified in the corresponding International Standard:

— the diameter of balls or rods, d;

— the permissible tolerance on d;

— the corrective term $2h_s$.

The corrective term, $2h_s$, is calculated using Formula (1):

$$2h_s = d\left(1+\frac{1}{\sin\alpha/2}\right)-w_e\frac{1}{\tan\alpha/2} \quad (1)$$

where

w_e is the effective width;

α is the groove angle;

d is the diameter of balls or rods.

The corrective term, $2h_s$, may be rounded off in an appropriate way [see Formula (1)].

5.2 Inspection

Use two cylindrical balls or rods of diameter, d, in accordance with 5.1.2. Place these two balls or rods in the groove to be checked (see Figure 13). Measure the distance, K, between the planes which are externally tangent to the balls or rods and parallel to the axis of the pulley. This distance may be measured using a plane and parallel assay instrument, for example a Vernier caliper.

The effective diameter, d_e, of the groove is then given by the relationship in Formula (2):

$$d_e = K - 2h_s \quad (2)$$

where $2h_s$ is the corrective term given in 5.1.2.

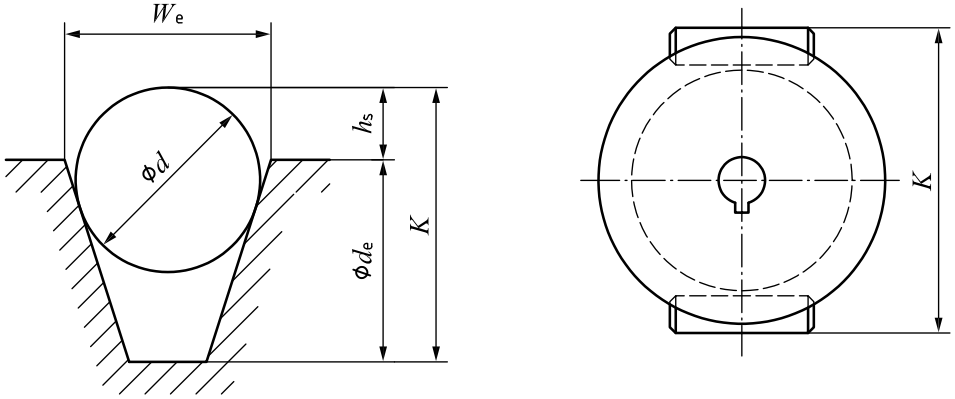


Figure 13 — Fitting of rods in the groove to be checked

6 Run-out tolerances

6.1 Specifications

The following dimensions shall be specified in the corresponding International Standard (see Figure 14):

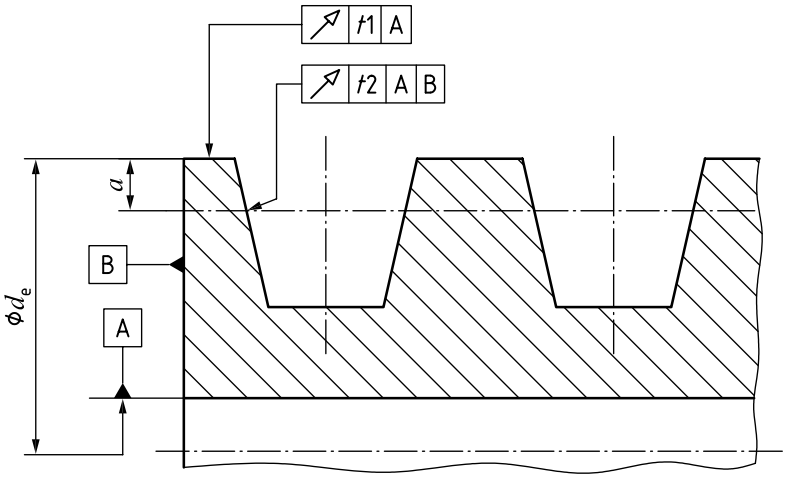
— the radial circular run-out tolerance, t_1, of the outside diameter. The datum A is the axis of the bore;

— the axial circular run-out tolerance, t_2, measured perpendicular to the groove sidewall at level a. The common datum is formed by the datum A of the axis of the bore and the datum B of the grooved pulley face fitted to the collar of the shaft;

— the distance, a, between the measurement position and the effective diameter, d_e.

6.2 Inspection

The radial and axial run-outs shall not be greater than the values specified at the measurement position (see Figure 14) during one revolution about the datum axis A.



NOTE Radial and axial circular run-out tolerances are represented according to ISO 1101.

Figure 14 — Radial and axial circular run-out tolerances

Bibliography

[1] ISO 1081, *Belt drives — V-belts and V-ribbed belts, and corresponding grooved pulleys — Vocabulary*

[2] ISO 1101, *Geometrical product specifications (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

[3] ISO 2790, *Belt drives — V-belts for the automotive industry and corresponding pulleys — Dimensions*

[4] ISO 5290, *Belt drives — Grooved pulleys for joined narrow V-belts — Groove sections 9N/J, 15N/J and 25N/J (effective system)*

[5] ISO 5291, *Belt drives — Grooved pulleys for joined classical V-belts — Groove sections AJ, BJ, CJ and DJ (effective system)*

ICS 21.220.10

Price based on 9 pages