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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
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Foreword

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

Annex A of this International Standard is for information only.

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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 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.

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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 may be designed for use with classical or narrow V-belts. The V-belts may be either single or joined units.

The inspection parameters and tolerances of grooved pulleys will be specified 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);

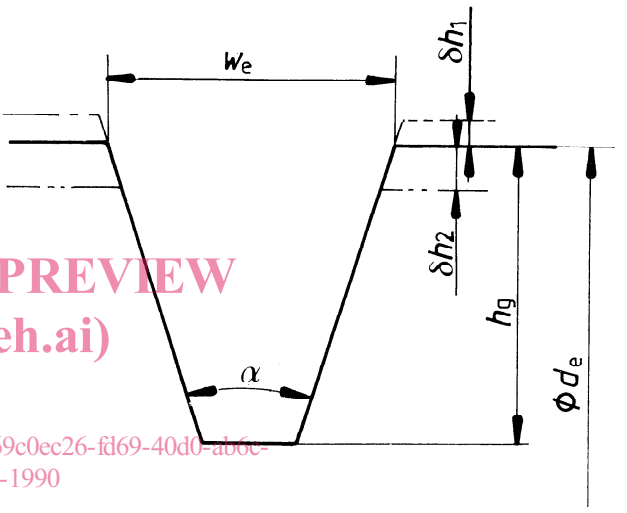
— inspection of effective diameter (see clause 5);

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

3 Groove profile

3.1 Specification

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 straight up to at least $d_e - 2\delta h_2$.

Figure 1 — Groove profile

Table 1 — Groove profile specification

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 [1]	Maximum value

1) 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 "MIN." end of the limit gauge is used to check the minimum value of the groove angle. The gauge shall contact the groove at the lower corners (see figure 3) or uniformly along the sidewalls.

The "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 "MAX." end of the gauge contact 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 limit gauge is shown in figure 7.

The "MIN." end of the limit gauge is used to check the minimum value of the groove angle. The gauge shall contact the groove at the lower corners (see figure 3) or uniformly along the sidewalls.

The "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.

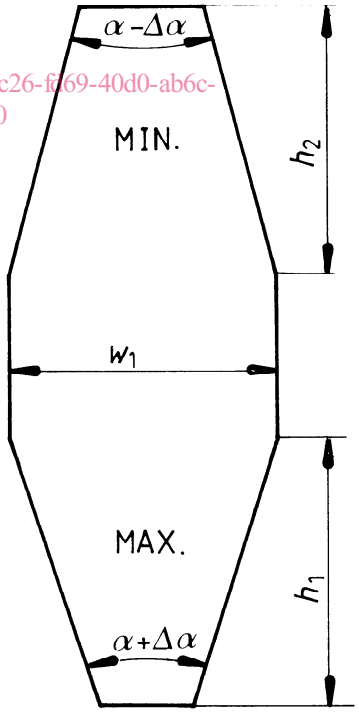
The groove angle, the effective width, the groove land height, the sidewall bevel depth, and the groove depth comply with specifications if the corners of the gauge at width w_1 contact the straight sidewalls of the groove (see figure 8).

The groove angle is too great if only the lower corners of the "MAX." end of the gauge contact the groove.

The groove land height δh_1 is too great if the shoulder of the gauge contacts the groove land without the gauge seating 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).



Dimensions

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

$h_1 = h_g - \delta h_2$

$h_2 \leqslant h_1$

Figure 2 — Limit gauge for single V-grooved pulleys

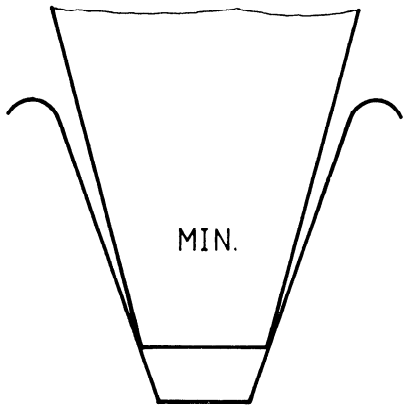


Figure 3 — Fitting of limit gauge in the groove to be checked

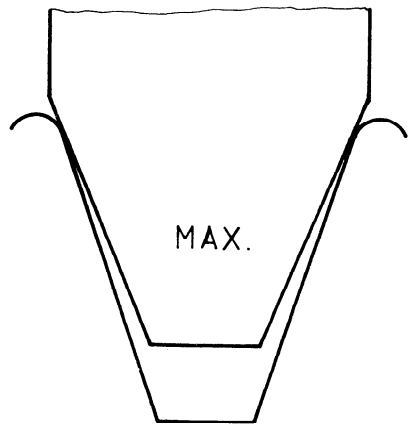


Figure 5 — Inspection of groove profile (bad)

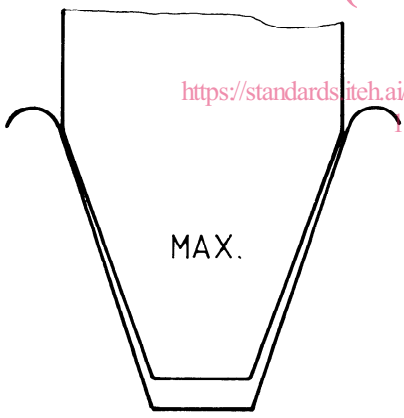


Figure 4 — Inspection of groove profile (good)

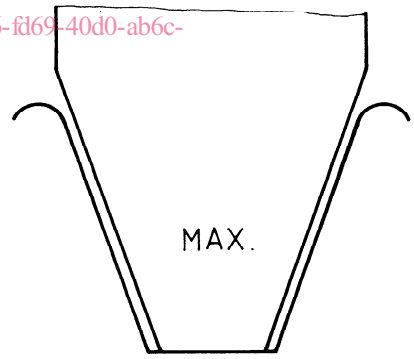
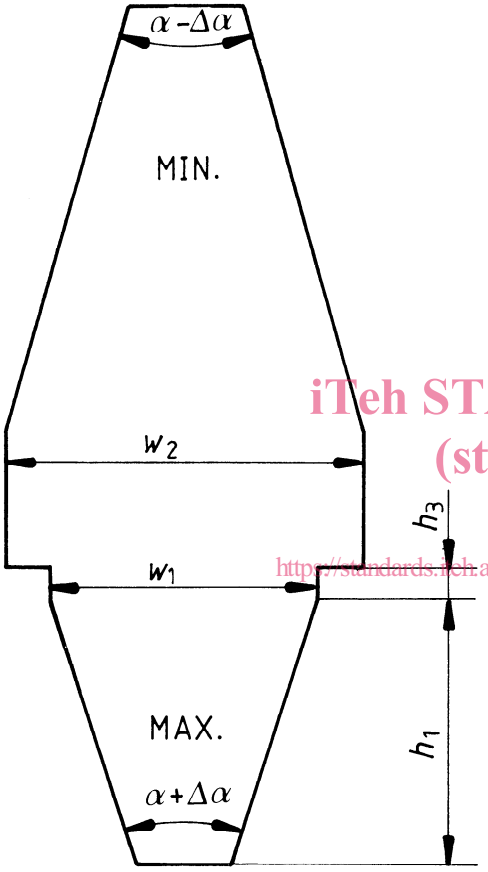


Figure 6 — Inspection of groove profile (bad)



Dimensions

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

$w_2 > e$ (voir 4.1.1)

$h_1 = h_g - \delta h_2$

$h_3 = \delta h_1 + \delta h_2$

Figure 7 — Limit gauge for double V-grooved pulleys

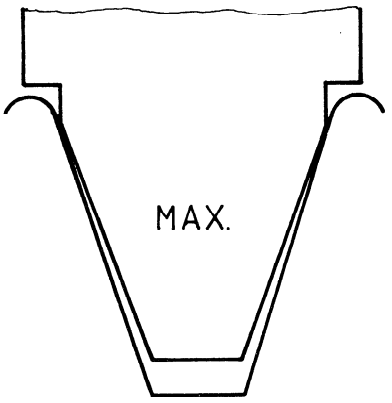


Figure 8 — Inspection of groove profile (good)

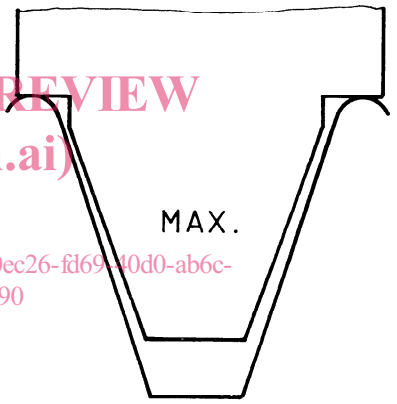


Figure 9 — Inspection of groove profile (bad)

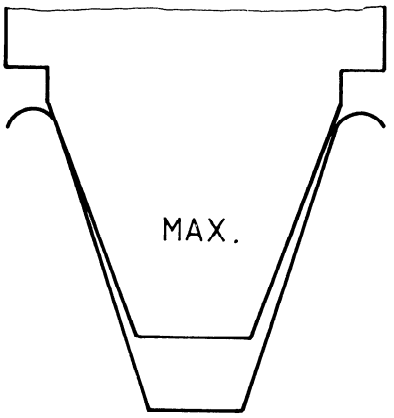


Figure 10 — Inspection of groove profile (bad)

4 Groove spacing

4.1 Specification

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.

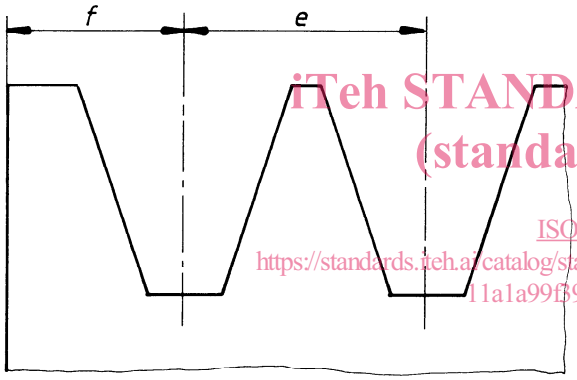


Figure 11 — Multiple groove pulley

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 caliper or micrometer. The measured groove spacing, e, is equal to the measured dimension, x, minus the diameter of the inspection ball used.

5 Effective diameter

5.1 Specification

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 1 It should be noted that 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 $2h_s$.

NOTE 2 The corrective term $2h_s$ is calculated from the following equation:

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

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 in an appropriate way (see the note in 5.1.1).

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 that are externally tangent to the balls or rods and parallel to the axis of the pulley. This distance can be meas-