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Belt drives — Pulleys for V-belts (system based on datum width) — Geometrical inspection of grooves

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

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

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

This third edition cancels and replaces the second edition (ISO 255:1990), which has been technically revised.

The main changes are as follows:

— the normative references list has been updated, including adding of ISO 1081 (vocabulary);

— in Clause 2 and Bibliography, normative references are no longer dated;

— modifications made for clarification and to be in line with ISO drafting rules.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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 datum 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.

For user clarification, the interaction of this document with other relevant documents developed by ISO/TC 41/SC 1 and ISO/TC 213 "Dimensional and geometrical product specifications and verification" is given in Figure 1.

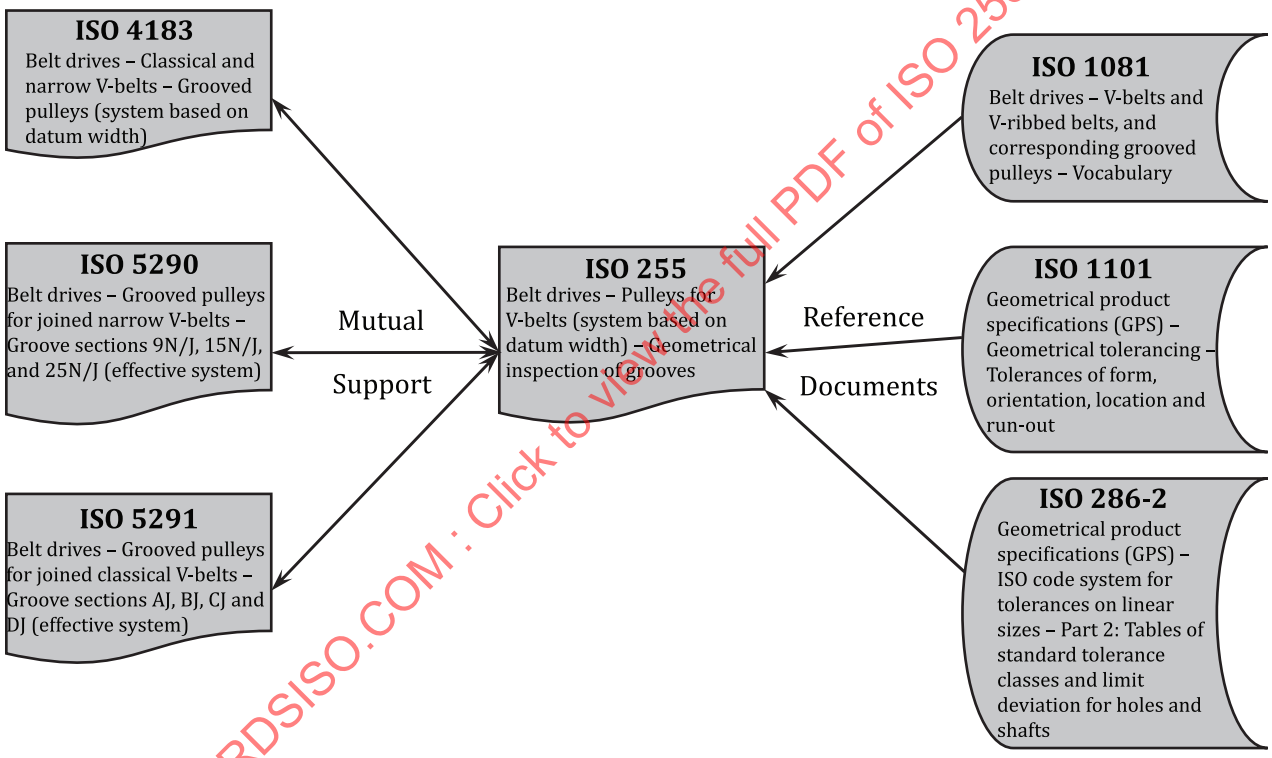


Figure 1 — Interaction of this document with other relevant documents developed by ISO/TC 41/SC 1 and ISO/TC 213

Belt drives — Pulleys for V-belts (system based on datum width) — Geometrical inspection of grooves

1 Scope

This document specifies the methods of checking the regularity of the grooves and pulleys for V-belts specified in the system based on datum width. The grooved pulleys may be designed for use with classical or narrow V-belts.

Inspection parameters and tolerances of grooved pulleys are covered by appropriate International Standards.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 1081 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Symbols

For the purpose of this document, the symbols given in ISO 1081 and the following apply.

Symbol	Definition
b	Groove height above datum width
d	Diameter of balls or rods
d_d	Datum diameter - nominal value
d_o	Outside diameter – nominal value
e	Distance between the axes of two consecutive grooves - nominal value
f	Distance between the outside of the rim and the axis of the first groove for all single- and multiple-groove pulleys
h	Groove depth below datum width
h_s	Corrective term
K	Distance between the planes that are externally tangent to the balls or rods and parallel to the axis of the pulley
t_1	Radial circular run-out tolerance of the outside diameter
t_2	Axial circular run-out tolerance measured perpendicular to the groove sidewall at the datum diameter
w_d	Datum width

Symbol	Definition
x	Measured dimension
α	Groove angle

5 Principle

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

— inspection of groove profile (see Clause 6);

— inspection of groove spacing (see Clause 7);

— inspection of datum diameter (see Clause 8);

— inspection of run-out (see Clause 9).

6 Groove profile

6.1 Specification

The groove profile dimensions (see dimensions shown in Figure 2 and summarized in Table 1) are given in ISO 4183.

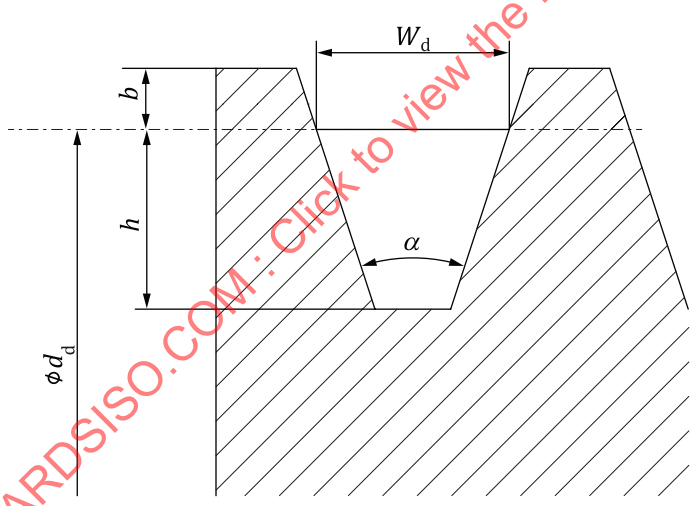


Figure 2 — Groove profile

Table 1 — Groove profile specification

Dimension	Symbol	Tolerance
Datum width	w_d	Specified value not subject to tolerance
Groove angle	α	$\pm\Delta\alpha$
Groove height above datum width	b	Minimum value
Groove depth below datum width	h	Minimum value

6.2 Inspection

6.2.1 Limit gauges

The groove profile shall be checked using a limit gauge shown diagrammatically in Figure 3.

A gauge for each of the standard angles applicable to each groove section, as specified in ISO 4183, is required.

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

6.2.2 Operation

The limit gauge is shown in Figure 3.

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 4) or uniformly along the sidewalls.

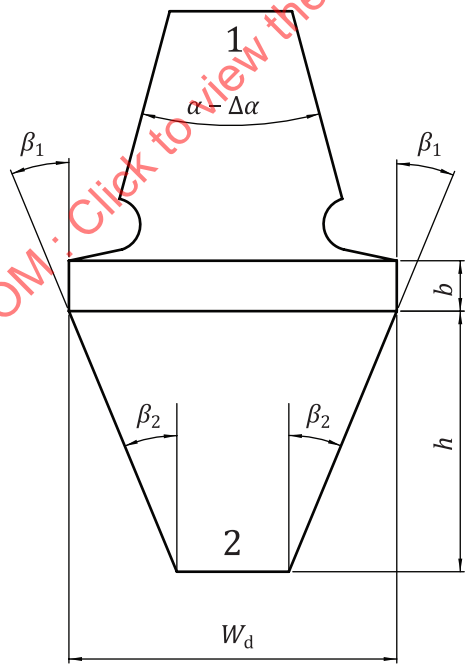
The "max" end of the limit gauge is used to check the maximum value of the groove angle, the datum width, the groove height, b, and the groove depth, h, in the same operation.

The groove angle, the datum width, the groove height, b, and the groove depth, h, conform with the specifications if the corners of the gauge at width w_d contact the sidewalls of the groove and if the horizontal steps of the gauge are situated within the straight sidewalls of the groove (see Figure 5).

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

The datum width is too small or the groove height, b, too low if the horizontal steps of the gauge are situated above the straight sidewalls of the groove (see Figure 6).

The groove depth, h, is too low if the gauge touches the bottom of the groove and the corners of the gauge at width w_d do not contact the sidewalls of the groove (see Figure 7).



Key

1 min

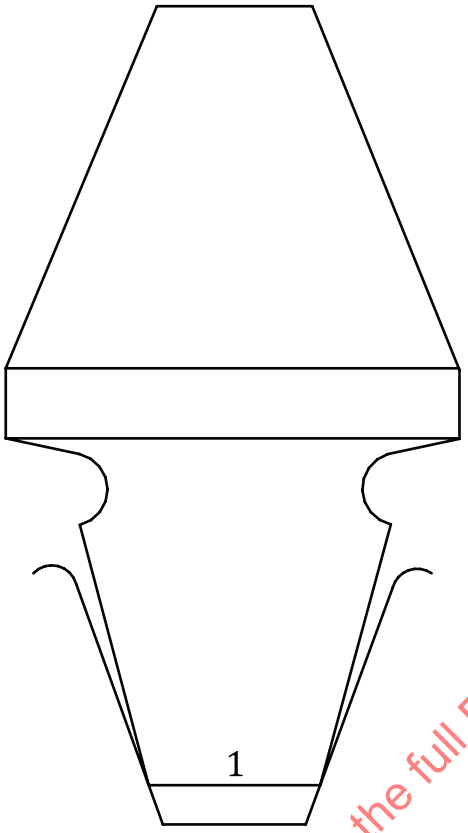
2 max

β_1 and β_2 are defined by the following formulae:

$$\beta_1 = \frac{\alpha - \Delta\alpha}{2}$$

$$\beta_2 = \frac{\alpha + \Delta\alpha}{2}$$

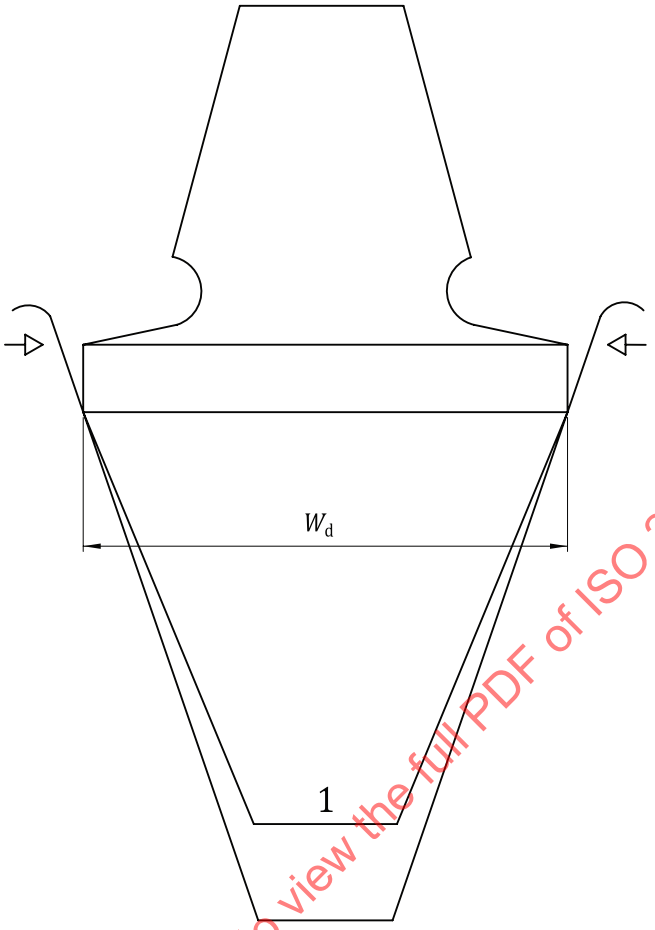
Figure 3 — Limit gauge



Key

1 min

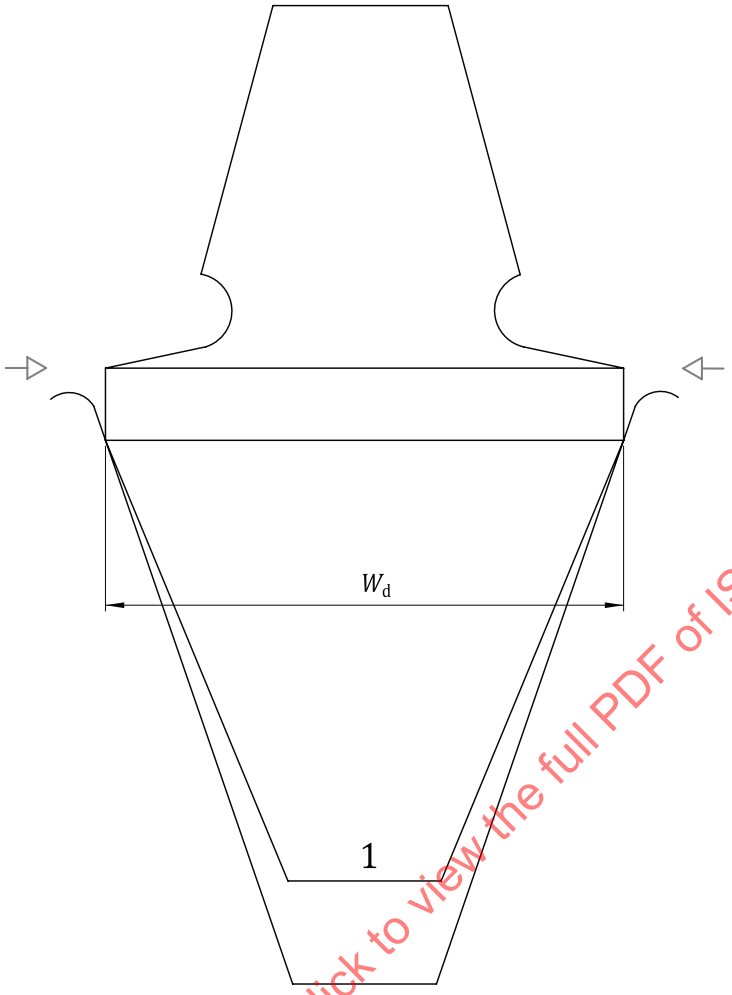
Figure 4 — Fitting of limit gauge in the groove to be checked



Key

1 max

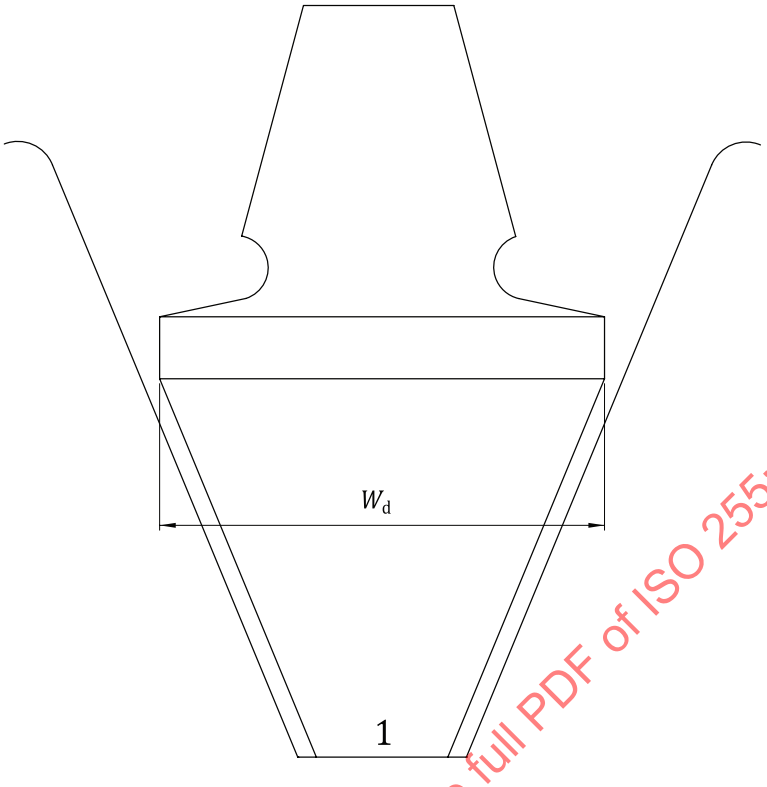
Figure 5 — Inspection of groove profile (good)



Key

1 max

Figure 6 — Inspection of groove profile (bad)



Key

1 max

Figure 7 — Inspection of groove profile (bad)

7 Groove spacing

7.1 Specification

7.1.1 Groove spacings

The following dimensions for multiple groove pulleys (see Figure 8) are given in ISO 5291:

— the distance between the axes of two consecutive grooves – nominal value *e*;

— the permissible tolerance on the nominal value *e* for the distance between any two grooves of a single pulley.

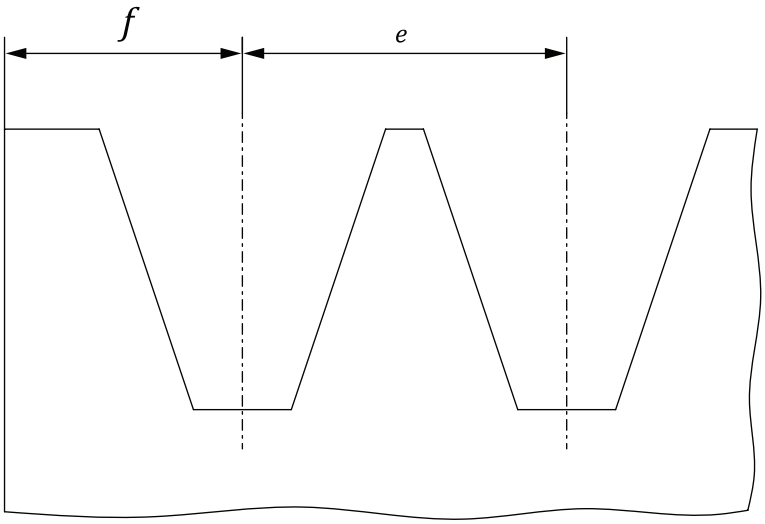


Figure 8 — Multiple groove pulley

7.1.2 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.

7.2 Inspection

Measure pulley groove spacing using a pulley groove tool and sets of interchangeable balls for each individual groove section. The ball diameter shall be as specified in 8.1.2.

Measure the groove spacing, *e*, using the groove spacing locator which consists of a vernier gauge incorporating sets of interchangeable balls for each individual groove section (see Figure 9); the ball diameters are given in Table A.1. 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.

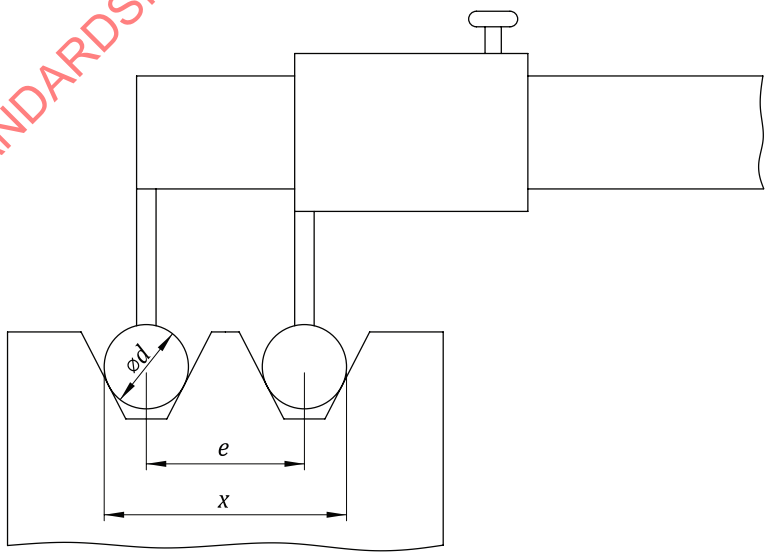


Figure 9 — Groove spacing locator

8 Datum diameter

8.1 Specifications

8.1.1 Datum diameter

The following dimensions for datum diameter are given in ISO 4183:

— the datum diameter – nominal value d_d;

— for multiple-groove pulleys, the permissible variation of the datum diameters measured in any two grooves of a single pulley.

8.1.2 Checking balls or rods

For inspection parameters and tolerances from ISO 5291, Annex A shall be used.

The following dimensions for checking balls or rods are from ISO 5291:

— the diameter of balls or rods, d;

— the permissible tolerance on d;

— the corrective term $2h_s$.

The diameters, d, shall be determined so that the simultaneous contact of the ball or the rod with the two groove sidewalls is very closely made at the level of the datum diameter.

8.2 Inspection

Use two cylindrical balls or rods of diameter d in accordance with 8.1.2. Place these two balls or rods in the groove to be checked (see Figure 10). 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 measured using a plane and parallel assay instrument, for example a vernier caliper.

The datum diameter, d_d, of the groove is then given by Formula (1).

$$d_d = K - 2h_s \tag{1}$$

where $2h_s$ is the corrective term given in 8.1.2.

If the pulley has several grooves, each of them shall be checked separately.

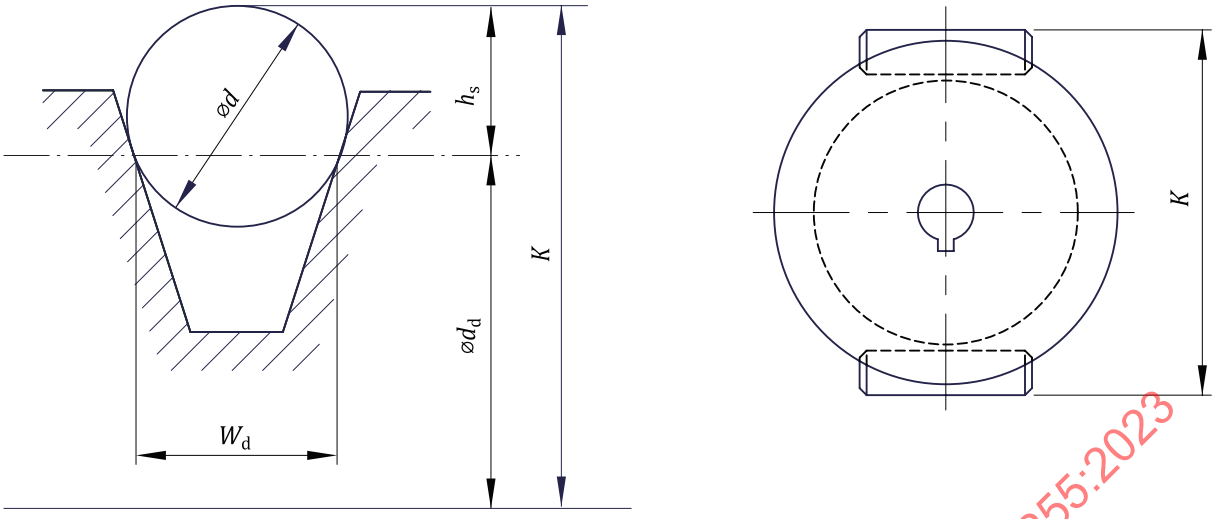


Figure 10 — Fitting of rods in the groove to be checked

9 Run-out tolerances

9.1 Specifications

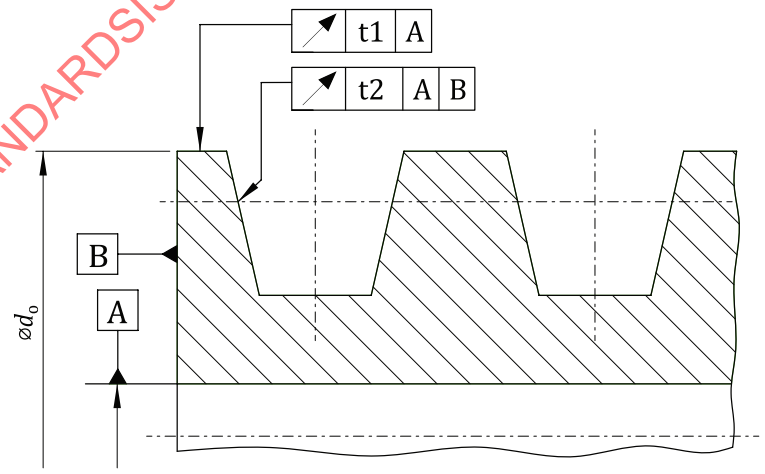
The following dimensions for run-out tolerances (see Figure 11) are given in ISO 5291:

— 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 the datum diameter. 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.

9.2 Inspection

The radial and axial circular run-outs shall not be greater than the values specified at the measurement positions (see Figure 11) during one revolution about the datum axis A.



NOTE The radial and axial circular run-out tolerances are shown in accordance with ISO 1101.

Figure 11 — Radial and axial circular run-out tolerances