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**Belt drives — V-ribbed belts for the  
automotive industry — Fatigue test**

*Transmissions par courroies — Courroies striées pour la construction  
automobile — Essai de fatigue*

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# Contents

	Page
Foreword.....	iv
<b>1 Scope.....</b>	<b>1</b>
<b>2 Normative references.....</b>	<b>1</b>
<b>3 Terms and definitions.....</b>	<b>1</b>
<b>4 Symbols.....</b>	<b>1</b>
<b>5 Principle.....</b>	<b>2</b>
<b>6 Apparatus.....</b>	<b>7</b>
<b>7 Test room conditions.....</b>	<b>9</b>
<b>8 Test method.....</b>	<b>10</b>
8.1 Test conditions.....	10
8.1.1 Test with fixed belt tensioning force.....	10
8.1.2 Test with constant belt tensioning force.....	10
8.2 Procedure.....	11
8.2.1 Preparation.....	11
8.2.2 Test.....	11
8.2.3 Retensioning.....	12
<b>9 Test report.....</b>	<b>12</b>
<b>Bibliography.....</b>	<b>14</b>

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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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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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](http://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 11749:2014), which has been technically revised.

The main changes are as follows:

- addition of [Table 1](#) with symbols;
- addition of the test condition with constant belt tensioning force in [8.1.2](#) and [8.2.1.3](#);
- change in pulley surface roughness  $R_a$  to  $< 3,2 \mu\text{m}$ ;
- revision of test pulley dimensions ([Table 2](#)).

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](http://www.iso.org/members.html).

# Belt drives — V-ribbed belts for the automotive industry — Fatigue test

## 1 Scope

This document specifies a dynamic test method for the quality control of V-ribbed belts (PK profile) which are used predominantly for accessory drive applications in the automotive industry.

The dimensional characteristics of the belts and of corresponding pulleys are the subject of ISO 9981.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

No terms and definitions are listed in this document.

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 [Table 1](#) apply.

**Table 1 — Symbols**

Symbols	Designation	Unit
$b_e$	effective line differential	mm
$d_B$	checking ball or rod diameter	mm
$d_e$	effective diameter	mm
$d_{e1}$	effective diameter of driving and driven pulleys	mm
$d_{e2}$	effective diameter of idler pulley	mm
$d_p$	pitch diameter	mm
$d_{r3}$	outside diameter of reverse bending idler pulley	mm
$e$	groove pitch	mm
$f$	lateral distance	mm
$F$	belt tensioning force	N
$g$	additional slip	%
$i_f$	rotational frequency ratio at measurement of the additional slip	—
$i_o$	rotational frequency ratio at the initial	—
$k$	standard value to calculate belt tensioning force	N/kW
$K$	diameter over balls or rods	mm
$M$	torque load	Nm
<sup>a</sup>	Rotations per minute.	

**Table 1** (continued)

Symbols	Designation	Unit
$n$	number of grooves	—
$n_f$	final rotational speed of the driven shaft	r/min <sup>a</sup>
$n_o$	initial rotational speed of the driven shaft	r/min <sup>a</sup>
$N$	driver speed	r/min <sup>a</sup>
$N_f$	final rotational speed of the driving shaft	r/min <sup>a</sup>
$N_o$	initial rotational speed of the driving shaft	r/min <sup>a</sup>
$P_s$	specified power	kW
$r_b$	radius at the groove root	mm
$r_t$	radius at the groove tip	mm
$R_a$	surface roughness	µm
$2x$	position of the ball or rod to groove tip	mm
$\alpha$	groove angle	°

<sup>a</sup> Rotations per minute.

## 5 Principle

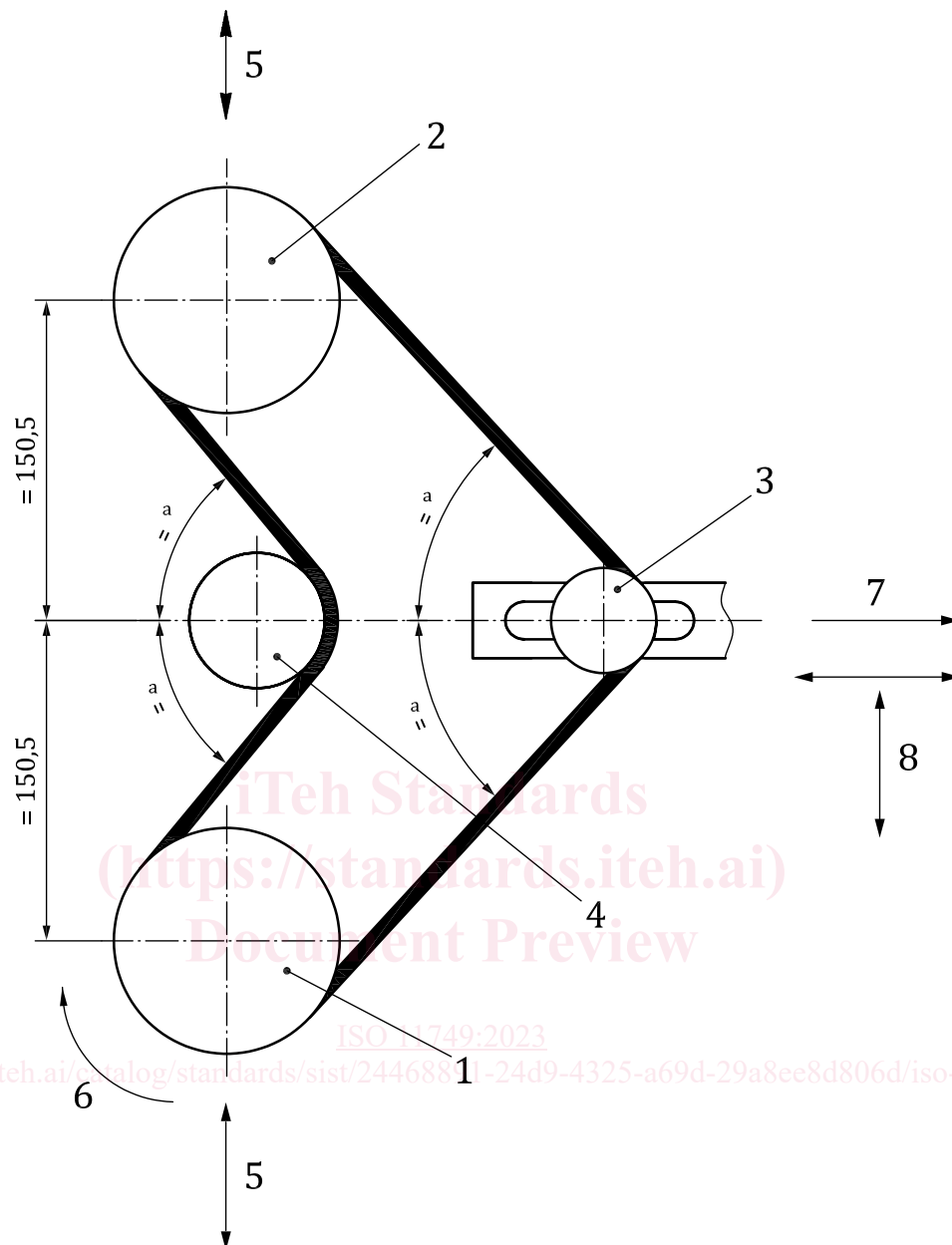
Determination of the performance of a belt under specified conditions on a two-, three-, or four-pulley test machine is as described in [Clause 6](#).

The shortest V-ribbed belt which can be tested on the four-pulley test machine (see [Figures 1](#) and [2](#)) is approximately 1 000 mm. Belts with lengths between 800 mm and 1 000 mm inclusive can be tested on the three-pulley test machine (see [Figure 3](#)). Shorter belts should be tested on the two-pulley test machine (see [Figure 4](#)) as described in [8.2.1.2](#).

A number of conditions with fixed belt tensioning force shall be agreed between the manufacturer and user, including the power to be transmitted and the number of times the belt can be retensioned.

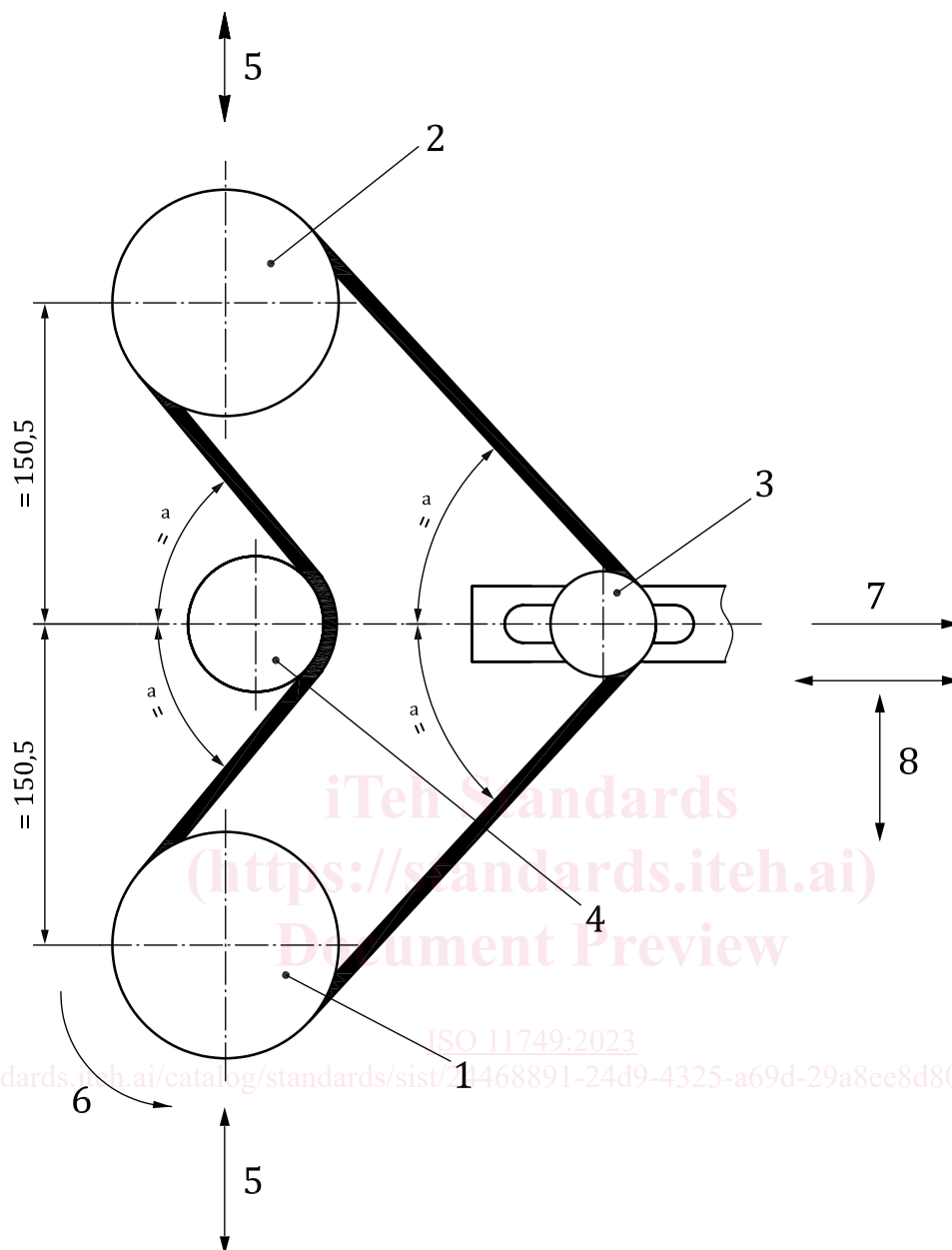
The minimum acceptable life, in hours, shall be agreed between the manufacturer and users.

Belt failure occurs when the belt no longer satisfies the agreed conditions.

**Key**

- 1 driving pulley
- 2 driven pulley (power-absorption unit)
- 3 idler pulley, set in slide
- 4 reverse bending idler pulley
- 5 direction of adjustment of driving and driven pulley
- 6 direction of rotation with fixed belt tensioning force
- 7 belt tensioning force applied to the idler pulley
- 8 direction of adjustment of idler pulley assembly and its support
- a Equal (=), the angle as shown by [Figure 1](#) is specified for the initial test layout and may change slightly with retensioning during the course of the test.

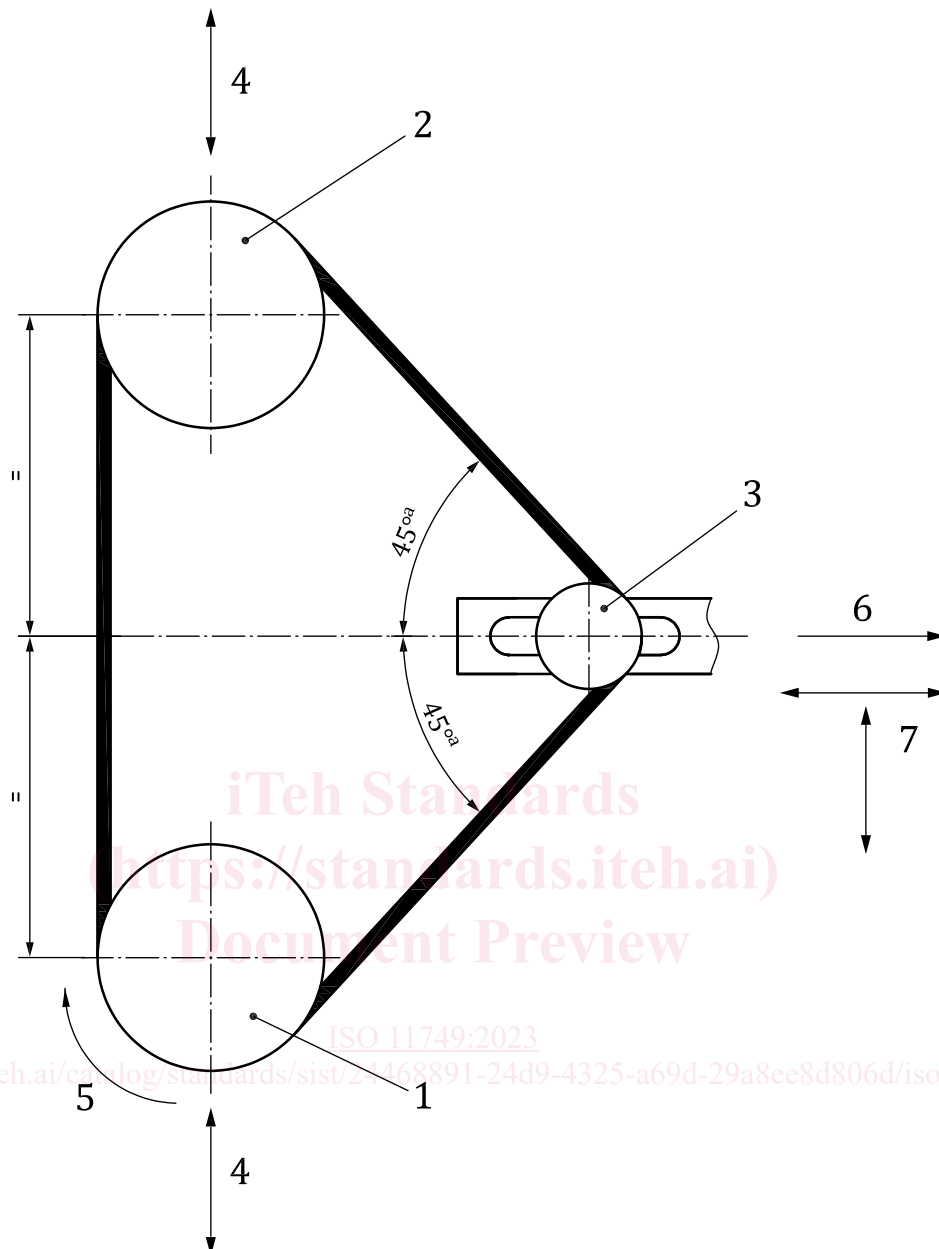
**Figure 1 — Four-pulley test machine layout (fixed belt tensioning force)**



- Key**
- 1 driving pulley
  - 2 driven pulley (power-absorption unit)
  - 3 idler pulley, set in slide
  - 4 reverse bending idler pulley
  - 5 direction of adjustment of driving and driven pulley
  - 6 direction of rotation with constant belt tensioning force
  - 7 belt tensioning force applied to the idler pulley
  - 8 direction of adjustment of idler pulley assembly and its support
  - a Equal (=), the angle as shown by [Figure 2](#) is specified for the initial test layout and may change slightly with retensioning during the course of the test.

**Figure 2 — Four-pulley test machine layout (constant belt tensioning force)**



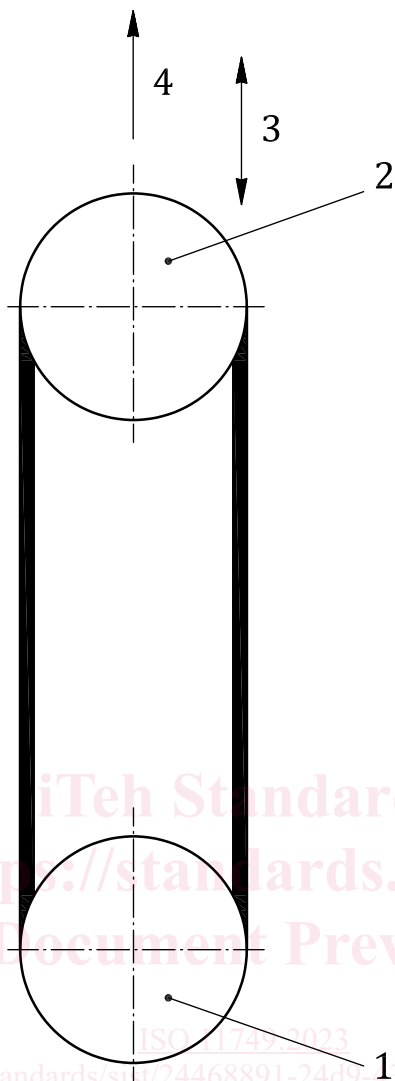
**Key**

- 1 driving pulley
- 2 driven pulley (power-absorption unit)
- 3 idler pulley, set in slide
- 4 direction of adjustment of driving and driven pulley
- 5 direction of rotation
- 6 belt tensioning force applied to the idler pulley
- 7 direction of adjustment of idler pulley assembly and its support

The belt, mounted on the test pulleys shall be aligned to within  $\pm 0,25^\circ$  in relation to the plane through the centre of each pulley.

<sup>a</sup>  $45^\circ$  is specified for the initial test layout and may change slightly with retensioning during the course of the test.

**Figure 3 — Three-pulley test machine layout**



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**Key**

- 1 driving pulley
- 2 driven pulley (power-absorption unit)
- 3 direction of adjustment of the movable pulley (method of locking in place)
- 4 belt tensioning force applied to the movable pulley

The belt, mounted on the test pulleys, can be aligned to within  $\pm 0,25^\circ$  in relation to the plane through the centre of each pulley.

**Figure 4 — Two-pulley test machine layout**