



BSI Standards Publication

**Belt drives — Pulleys — Limiting  
values for adjustment of centres**

---

## National foreword

This British Standard is the UK implementation of [ISO 155:2019](#). It supersedes [BS ISO 155:1998](#), which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee MCE/10, Belts & Pulley Drive.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2019  
Published by BSI Standards Limited 2019

ISBN 978 0 580 97943 9

ICS 21.220.10

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 March 2019.

### **Amendments/corrigenda issued since publication**

Date	Text affected
------	---------------

---

# INTERNATIONAL STANDARD

# ISO 155

Fourth edition  
2019-03-15

---

---

## **Belt drives — Pulleys — Limiting values for adjustment of centres**

*Transmissions par courroies — Poulies — Limites de  
réglage d'entraxe*



Reference number  
ISO 155:2019(E)

© ISO 2019



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
Ch. de Blandonnet 8 • CP 401  
CH-1214 Vernier, Geneva, Switzerland  
Tel. +41 22 749 01 11  
Fax +41 22 749 09 47  
copyright@iso.org  
www.iso.org

## Contents

Page

Foreword.....	iv
<b>1</b> <b>Scope</b> .....	<b>1</b>
<b>2</b> <b>Normative references</b> .....	<b>1</b>
<b>3</b> <b>Terms and definitions</b> .....	<b>1</b>
<b>4</b> <b>Symbols</b> .....	<b>1</b>
<b>5</b> <b>Specifications</b> .....	<b>2</b>
<b>6</b> <b>Factors</b> .....	<b>3</b>
<b>Bibliography</b> .....	<b>6</b>

## 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)).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 fourth edition cancels and replaces the third edition ([ISO 155:1998](http://www.iso.org/iso/155:1998)), which has been technically revised. The main changes compared to the previous edition are as follows:

- adding of curvilinear sections to [Table 6](#);
- editorial clarifications of the document.

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 — Pulleys — Limiting values for adjustment of centres

## 1 Scope

This document specifies the limiting values for the adjustment of centres of two transmission pulleys.

It is applicable to:

- crowned pulleys for flat belts;
- grooved pulleys for V-belts, either single, multiple or joined;
- grooved pulleys for V-ribbed belts;
- toothed pulleys for synchronous belts.

## 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 terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

## 4 Symbols

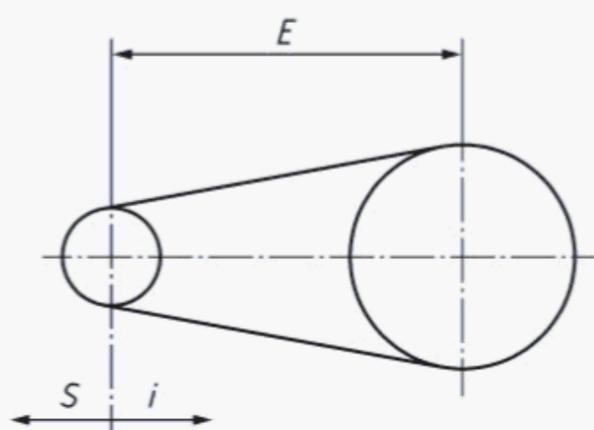
For the purpose of this document, the following symbols apply.

Symbol	Definition	Unit
$d \pm \delta_1$	Limits of small flat pulley diameter	mm
$D \pm \delta_2$	Limits of large flat pulley diameter	mm
$e$	Groove pitch of a V-ribbed pulley	mm
$E$	Nominal centre distance	mm
$E - i$	Lower limit for the adjustment of centre distance	mm
$E + s$	Upper limit for the adjustment of centre distance	mm
$i_1$	Factor related to the pulley dimensions and tolerances	—
$i_2$	Factor related to belt length tolerances	—
$L$	Nominal belt length	mm

$p_b$	Pitch of synchronous belt teeth	mm
$s_1$	Factor related to the pulley dimensions and tolerances	—
$s_2$	Factor related to belt length tolerances	—
$s_3$	Factor related to flat pulley crowning	—
$s_4$	Factor related to elastic properties of the belt	—
$W_d$	Datum width of a V-groove	mm
$W_e$	Effective width of a V-groove	mm

## 5 Specifications

Limiting values for adjustment of centre distance are specified in terms of factors  $i$  and  $s$  which are respectively subtracted from and added to the nominal centre distance,  $E$  (see [Figure 1](#)).



**Figure 1 — Limiting values for adjustment of centre distance of pulleys**

Values of  $i$  and  $s$  shall be rounded to the nearest millimetre.

Values of  $i$  and  $s$  are expressed as the sums of various components parts:

— for slack-off, see [Formula \(1\)](#):

$$i = i_1 + i_2 \quad (1)$$

where

$i_1$  is a factor related to the pulley dimensions and tolerances;

$i_2$  is a factor related to belt length tolerances;

— for take-up, see [Formula \(2\)](#):

$$s = s_1 + s_2 + s_3 + s_4 \quad (2)$$

where

- $s_1$  is a factor related to the pulley dimensions and tolerances;
- $s_2$  is a factor related to belt length tolerances;
- $s_3$  is a factor related to flat pulley crowning;
- $s_4$  is a factor related to elastic properties of the belt.

Factors with subscripts 1 to 3 determine the centre distance adjustment necessary to install a belt onto the pulleys and to readjust working tension.

Factor  $s_4$  determines the centre distance adjustment necessary to maintain correct operation of a belt under the influence of belt extension and dimensional wear.

These limiting values should be considered by the belt manufacturers as maxima, and by the designers and makers of the machinery as minima.

## 6 Factors

The values of the different factors are given in the following tables:

- for factor  $i$  and factor  $s$ , see [Table 1](#);
- for diameter tolerance for flat pulley, see [Table 2](#);
- for datum widths for V-belts, see [Table 3](#);
- for effective widths for joined V-belts, see [Table 4](#);
- for Groove pitch for V-ribbed belts, see [Table 5](#);
- for values of  $i_1$  for synchronous belts, see [Table 6](#);
- for values of  $s_4$  related to belt material, see [Table 7](#).

**Table 1 — Factor  $i$  and  $s$**

Factor	Belt type				Variation of centre distance	
	Flat	Classical and narrow V-belt		V-ribbed		Synchronous
		Individual	Joined			
$i_1$	$2 (\delta_1 + \delta_2)$	$2 w_d$	$5,1 w_e$	$5,1 e^a$	(see <a href="#">Table 6</a> )	Slack-off
$i_2$	$0,01 L$	$0,009 L$		$0,009 L$	0	
$s_1$	$1,5 (\delta_1 + \delta_2)$	0	0	0	0	Take-up
$s_2$	$0,01 L$	$0,009 L$		$0,009 L$	0	
$s_3$	$0,003 (d + D)$	0		0	0	
$s_4$	(see <a href="#">Table 7</a> )	$0,011 L$		(see <a href="#">Table 7</a> )	$0,005 L$	

<sup>a</sup> In case of the pulleys with flanges, the value shall be agreed with the belt manufacturers.

**Table 2 — Diameter tolerance for flat pulley**

Dimensions in millimetres

$d$	$\delta_1$
40	0,5
45 and 50	0,6
56 and 63	0,8
71 and 80	1
90 to 112	1,2
125 and 140	1,6
160 to 200	2
224 and 250	2,5
280 to 355	3,2
400 to 500	4
560 to 710	5

$d$	$\delta_2$
800 to 1 000	6,3
1 120 to 1 400	8
1 600 to 2 000	10

**Table 3 — Datum widths for V-belts**

Dimensions in millimetres

Classical section	Narrow section	Datum width $w_d$
Y	—	5,3
Z	SPZ	8,5
A	SPA	11
B	SPB	14
C	SPC	19
D	—	27
E	—	32

**Table 4 — Effective widths for joined V-belts**

Dimensions in millimetres

Classical section	Effective width $w_e$	Narrow section	Effective width $w_e$
AJ	13	9J	8,9
BJ	16,5	15J	15,2
CJ	22,4	20J	20,9
DJ	32,8	25J	25,4

**Table 5 — Groove pitch for V-ribbed belts**

Dimensions in millimetres

Profile	Groove pitch <i>e</i>
PH	1,6
PJ	2,34
PK	3,56
PL	4,7
PM	9,4

**Table 6 — Values of  $i_1$  for synchronous belts**

Dimensions in millimetres

Pitch designation	$P_b$	$i_1^a$		
		With flange on belt assembly side of large pulley or on both pulleys	With flange on belt assembly side of small pulley only	Without flange on belt assembly side
MXL	2,032	$2,5 p_b$	1,3 $p_b$	0,9 $p_b$
XXL	3,175	$2,5 p_b$		
XL	5,08	$1,8 p_b$		
L	9,525	$1,5 p_b$		
H	12,7	$1,5 p_b$		
XH	22,225	$2 p_b$		
XXH	31,75	$2 p_b$		
H3M, R3M	3	$4,8 p_b$	2,5 $p_b$	2,0 $p_b$
H5M, R5M	5	$4,8 p_b$		
G8M, H8M, R8M, S8M	8	$3,8 p_b$		
H14M, R14M, S14M	14	$3,8 p_b$		
H20M, R20M	20	$3,8 p_b$		
T2.5	2,5	$3,0 p_b$	1,5 $p_b$	0,9 $p_b$
AT3	3	$3,3 p_b$	1,7 $p_b$	
T5/AT5	5	$2,4 p_b$	1,3 $p_b$	
T10/AT10	10	$2,4 p_b$	1,3 $p_b$	
T20/AT20	20	$2,0 p_b$	1,1 $p_b$	

<sup>a</sup> Values are valid for minimum flange heights as specified in [ISO 19347:2015](#), Table A.1, [ISO 13050:2014](#), Annex D and [ISO 17396:2017](#), Table A.6. If these flange heights are exceeded, the centre adjustment values should be increased accordingly.

**Table 7 — Values of  $s_4$  related to belt material**

Material of belt, tensile members	$s_4$
Low modulus of elasticity, e.g. polyamide or similar	0,016 $L$
Mid modulus of elasticity, e.g. polyester or similar	0,011 $L$
High modulus of elasticity, e.g. aramid, glass fibre or metal	0,005 $L$

## Bibliography

- [1] ISO 22, *Belt drives — Flat transmission belts and corresponding pulleys — Dimensions and tolerances*
- [2] ISO 4183, *Belt drives — Classical and narrow V-belts — Grooved pulleys (system based on datum width)*
- [3] ISO 4184, *Belt drives — Classical and narrow V-belts — Lengths in datum system*
- [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)*
- [6] [ISO 8419](#), *Belt drives — Narrow V-belts — Sections 9N/J, 15N/J and 25N/J (lengths in the effective system)*
- [7] [ISO 9982](#), *Belt drives — Pulleys and V-ribbed belts for industrial applications — PH, PJ, PK, PL and PM profiles: dimensions*
- [8] [ISO 13050:2014](#), *Synchronous belt drives — Metric pitch, curvilinear profile systems G, H, R and S, belts and pulleys*
- [9] [ISO 17396:2017](#), *Synchronous belt drives — Metric pitch — Tooth profiles T and AT endless and open ended belts and pulleys*
- [10] [ISO 19347:2015](#), *Synchronous belt drives — Imperial pitch trapezoidal profile system — Belts and pulleys*



# British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

## About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards-based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

## Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at [bsigroup.com/standards](http://bsigroup.com/standards) or contacting our Customer Services team or Knowledge Centre.

## Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at [bsigroup.com/shop](http://bsigroup.com/shop), where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

## Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit, or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

## Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
  - The standard may be stored on more than 1 device provided that it is accessible by the sole named user only and that only 1 copy is accessed at any one time.
  - A single paper copy may be printed for personal or internal company use only.
- Standards purchased in hard copy format:
- A British Standard purchased in hard copy format is for personal or internal company use only.
  - It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than 1 copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

## Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright & Licensing team.

## Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to [bsigroup.com/subscriptions](http://bsigroup.com/subscriptions).

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

**PLUS** is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit [bsigroup.com/shop](http://bsigroup.com/shop).

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com).

## Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

## Useful Contacts

### Customer Services

**Tel:** +44 345 086 9001

**Email (orders):** [orders@bsigroup.com](mailto:orders@bsigroup.com)

**Email (enquiries):** [cservices@bsigroup.com](mailto:cservices@bsigroup.com)

### Subscriptions

**Tel:** +44 345 086 9001

**Email:** [subscriptions@bsigroup.com](mailto:subscriptions@bsigroup.com)

### Knowledge Centre

**Tel:** +44 20 8996 7004

**Email:** [knowledgecentre@bsigroup.com](mailto:knowledgecentre@bsigroup.com)

### Copyright & Licensing

**Tel:** +44 20 8996 7070

**Email:** [copyright@bsigroup.com](mailto:copyright@bsigroup.com)

## BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK