
**Agricultural machinery — Endless
hexagonal belts and groove sections of
corresponding pulleys**

*Machines agricoles — Courroies hexagonales sans fin et profils de
gorges des poulies correspondantes*

STANDARDSISO.COM : Click to view the full PDF of ISO 5289:2018



STANDARDSISO.COM : Click to view the full PDF of ISO 5289:2018



COPYRIGHT PROTECTED DOCUMENT

© ISO 2018

All rights reserved. Unless otherwise specified, or required in the context of its implementation, 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
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Symbols and abbreviated terms	1
5 Dimensions and tolerances	2
5.1 Belts	2
5.1.1 General	2
5.1.2 Cross-sections	2
5.1.3 Lengths	3
5.2 Grooved pulleys	4
5.2.1 Pulleys having parallel axes of rotation	4
5.2.2 Pulleys having axes of rotation which are not parallel	4
6 Measurement of lengths of belts	4
6.1 Measuring device	4
6.2 Procedure	5
6.3 Groove section of measuring pulleys	5
7 Calculation of speed ratio, R	6
7.1 General	6
7.2 Correction factor for the datum diameter, d_d , for pulley grooves according to ISO 4183 (datum system)	6
7.3 Correction factor for the effective diameter, d_e , for pulley grooves according to ISO 5291 (effective system)	7
Bibliography	8

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).

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).

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.

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

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.

This third edition cancels and replaces the second edition (ISO 5289:1992), which has been technically revised. The main changes compared to the previous edition are as follows:

- in [5.1.3](#), the length tolerance and range of belts have been changed based on ISO 24035;
- in [Table 1](#), the dimensions of measuring pulleys and measuring forces have been changed based on ISO 24035;
- in [6.2](#), the length measuring procedure and formula has been changed.

Agricultural machinery — Endless hexagonal belts and groove sections of corresponding pulleys

1 Scope

This document specifies the main dimensions of endless hexagonal belts intended for use on agricultural machinery (and, in particular, harvester-thresher machines), together with the groove section of the corresponding fixed-diameter pulleys.

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 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 and abbreviated terms

For the purpose of this document, the symbols and abbreviated terms given in ISO 1081 and the following apply. (see [Table 1](#))

Table 1 — Symbols and abbreviated terms

Symbol	Designation	Unit
b_d	Correction factor	—
b_e	Effective line differential	—
C_e	Effective circumference of the measuring pulleys	mm
d_e	Effective diameter	mm
d_d	Datum diameter	mm
d_p	Pitch diameter	mm
$E_{\min}$	Minimum centre distance measured during the measuring cycle	mm
$E_{\max}$	Maximum centre distance measured during the measuring cycle	mm
F	Measuring force	N
h	Minimum groove depth	mm
L_e	Nominal effective length	mm
R	Speed ratio	—
T	Height	mm
w	Width	mm

Table 1 (continued)

Symbol	Designation	Unit
w_d	Datum width of the pulley groove	mm
w_e	Effective width	mm
w_p	Pitch width of the belt	mm
α	Groove angle	degree
HAA	Profile of the belt as defined in Table 2	—
HBB	Profile of the belt as defined in Table 2	—
HCC	Profile of the belt as defined in Table 2	—
HDD	Profile of the belt as defined in Table 2	—

5 Dimensions and tolerances

5.1 Belts

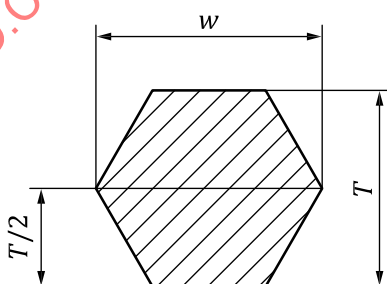
5.1.1 General

An endless hexagonal belt on agricultural machinery transmits a high degree of force per unit of section; when it approaches a groove pulley, its cross-section undergoes appreciable deformations. For this reason, the various dimensions specified in this document are to be taken as being those of the belt placed on the device used for the measurement of its length, and subjected to the force, F . The dimensions, w and T , are those relating to the parts of the belt when in contact with the measuring pulleys.

5.1.2 Cross-sections

The theoretical profile of these belts is a hexagon consisting of two equal isosceles trapezia joined at their wider base; the neutral axis, coinciding in practice with the transverse diagonal of this hexagon, is therefore located at half the height of the section (see [Figure 1](#)).

The dimensions of these cross-sections depending on profile are given in [Table 2](#).

**Figure 1** — Cross-section of a belt**Table 2** — Cross-section nominal dimensions depending on profile

Dimensions in millimetres

Parameter	Symbol	Cross-section nominal dimension depending on profile			
		HAA	HBB	HCC	HDD
Width	w	13	17	22	32
Height	T	10	13	17	25

5.1.3 Lengths

The range of effective lengths is that of the R 40 series of preferred numbers (see ISO 3) from 1 320 mm to 10 000 mm (see Table 3).

Table 3 — Standard length of belt and tolerance depending on profile

Dimensions in millimetres

Nominal effective length L_e	Tolerance	Standard sizes			
		HAA	HBB	HCC	HDD
1 320	±13	X	X	—	—
1 400	±13	X	X	—	—
1 500	±13	X	X	—	—
1 600	±13	X	X	—	—
1 700	±13	X	X	—	—
1 800	±13	X	X	—	—
1 900	±13	X	X	—	—
2 000	±13	X	X	—	—
2 120	±13	X	X	—	—
2 240	±13	X	X	X	—
2 360	±13	X	X	X	—
2 500	±13	X	X	X	—
2 650	±16	X	X	X	—
2 800	±16	X	X	X	—
3 000	±16	X	X	X	—
3 150	±16	X	X	X	—
3 350	±20	—	X	X	—
3 550	±20	—	X	X	—
3 750	±20	—	X	X	—
4 000	±20	—	X	X	X
4 250	±25	—	X	X	X
4 500	±25	—	X	X	X
4 750	±25	—	X	X	X
5 000	±25	—	X	X	X
5 300	±32	—	X	X	X
5 600	±32	—	X	X	X
6 000	±32	—	X	X	X
6 300	±32	—	X	X	X
6 700	±40	—	X	X	X
7 100	±40	—	X	X	X
7 500	±40	—	X	X	X
8 000	±40	—	—	X	X
8 500	±50	—	—	X	X
NOTE 1 Reduced tolerances on length can be used, for example, by agreement between the manufacturer and user.					
NOTE 2 "X" is for "Standard size".					
NOTE 3 For availability of belt size, consult the belt manufacturer.					

Table 3 (continued)

Nominal effective length L_e	Tolerance	Standard sizes			
		HAA	HBB	HCC	HDD
9 000	±50	—	—	X	X
9 500	±50	—	—	—	X
10 000	±50	—	—	—	X
NOTE 1 Reduced tolerances on length can be used, for example, by agreement between the manufacturer and user.					
NOTE 2 "X" is for "Standard size".					
NOTE 3 For availability of belt size, consult the belt manufacturer.					

5.2 Grooved pulleys

5.2.1 Pulleys having parallel axes of rotation

The hexagonal belts can be used with pulley groove profiles for classical belt sections in accordance with ISO 4183 or ISO 5291 (see [Table 4](#)).

Table 4 — Groove profiles used for a belt profile

Hexagonal belt profile	Groove profile	
	ISO 4183	ISO 5291
HAA	A	AJ
HBB	B	BJ
HCC	C	CJ
HDD	D	DJ

5.2.2 Pulleys having axes of rotation which are not parallel

In such cases, it is often necessary to increase the outside diameter of the pulley in relation to the effective diameter, and sometimes the angle of the groove, in order to allow the belts to approach and leave the grooves without friction occurring at their edges.

It is not possible to determine an outline of groove which would suit all cases of transmission between shafts that are not parallel. However, local specifications define the geometrical characteristics that govern transmission between orthogonal shafts (known as quarter-turn drives) and particularly the special groove profile (known as a "deep groove") to be used in this case.

6 Measurement of lengths of belts

6.1 Measuring device

The device recommended, shown in sketch form in [Figure 2](#), consists essentially of two grooved pulleys of similar functional dimensions, one of which is movable in the same plane as the belt by the measuring force, F (see [Table 5](#)).

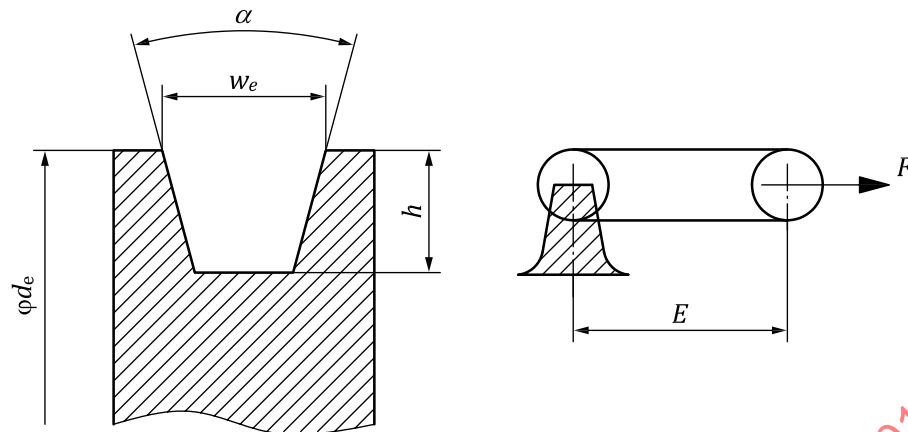


Figure 2 — Measuring device

Table 5 — Dimensions of measuring pulleys and measuring forces

Parameter	Symbol	Unit	Parameter values depending on profile			
			HAA	HBB	HCC	HDD
Effective width	w_e	mm	13	16,5	22,4	32,8
Minimum groove depth	h	mm	12	14	19	26
Effective diameter $\pm 0,10$	d_e	mm	95,5	143,2	222,8	318,3
Effective circumference	C_e	mm	300	450	700	1 000
Diameter of ball or rod $\pm 0,01$	d_B	mm	12,5	15,5	21,0	30,5
Diameter over ball or rods $\pm 0,10$	K	mm	108,2	157,7	242,2	346,6
Measuring force	F	N	300	450	850	1 800
Groove angle $\pm 0,25$	α	degree	34	34	34	36

6.2 Procedure

For the measurement of the effective length, set the belt up on two identical pulleys given in Table 5. The pulleys shall be mounted on parallel horizontal axes on a testing bench. Apply the measuring force indicated in Table 5 to the sliding pulley. Rotate the pulleys in order that the belt effects one to three rotations and, thus, sits properly in the pulley grooves. Measure the distance between the axes of the pulleys.

The effective length, L_e , of any belt is given by Formula (1).

$$L_e = E_{\max} + E_{\min} + C_e \quad (1)$$

where

$E_{\max}$ is the maximum centre distance measured during the measuring cycle, in millimetres;

$E_{\min}$ is the minimum centre distance measured during the measuring cycle, in millimetres;

C_e is the effective circumference of the measuring pulleys, in millimetres.

6.3 Groove section of measuring pulleys

Only the values of w_e , C_e and the angle of the groove, α , are of importance; the depth, h , given in Table 5 is for reference only.

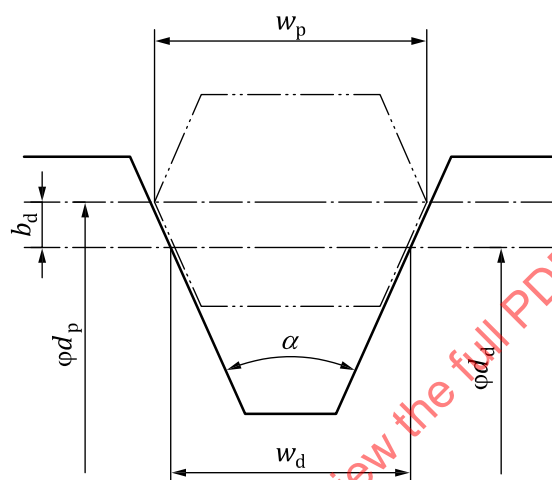
7 Calculation of speed ratio, R

7.1 General

For calculations of the speed ratio, R , knowledge of the pitch diameters, d_p , of the two pulleys in the drive is necessary. For approximate calculations the procedure given in 7.2 and 7.3 may be used.

7.2 Correction factor for the datum diameter, d_d , for pulley grooves according to ISO 4183 (datum system)

If hexagonal belts are used in pulleys with a datum diameter, d_d , as defined in ISO 4183, a correction factor shall be used to obtain the pitch diameter, d_p , for this unique belt section. See Figure 3.



Key

- w_d datum width of the pulley groove
 w_p pitch width of the belt

Figure 3 — Pulley diameters

The correction factor, b_d (the datum line differential as defined in ISO 1081), is used in Formula (2) to obtain the pitch diameter, d_p .

$$d_p = d_d + 2 \cdot b_d \quad (2)$$

The values of $2 \cdot b_d$ depending on groove angle, α , are given in Table 6.

Table 6 — Value of $2 \cdot b_d$ depending on groove angle

Dimensions in millimetres

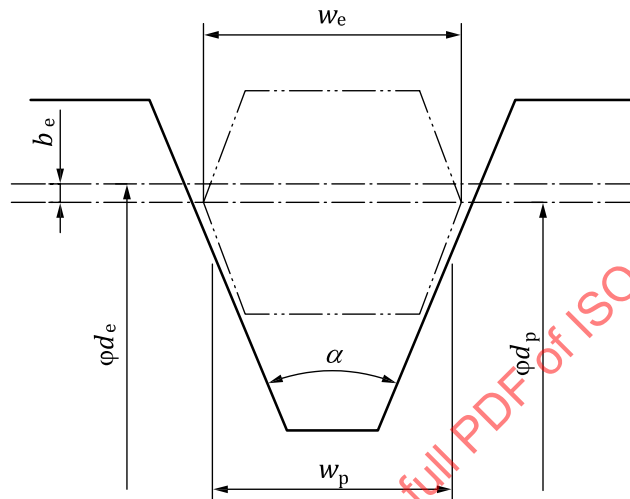
Belt profile	Groove profile	Value of $2 \cdot b_d$ depending on groove angle		
		34°	36°	38°
HAA	A	6,5	—	5,8
HBB	B	8,2	—	7,3
HCC	C	11,1	—	9,9
HDD	D	—	17,9	16,8

7.3 Correction factor for the effective diameter, d_e , for pulley grooves according to ISO 5291 (effective system)

Because of the unique belt section of hexagonal belts, the value, b_e (the effective line differential as defined in ISO 1081), can be considered to be zero.

Therefore, the pitch diameter, d_p , of such a drive is approximately equal to the effective diameter, d_e .

Figure 4 shows the pulley diameters.



Key

- w_e effective width of the pulley groove
- w_p pitch width of the belt

Figure 4 — Pulley diameters