INTERNATIONAL STANDARD

ISO 24035

First edition
2014-05-01

Belt drives — V-belts and the corresponding pulleys for agricultural machineries — Dimensions

Transmissions par courroies — Courroies trapézoïdales et poulies correspondantes pour les machines agricoles — Dimensions

Reference number
ISO 24035:2014(E)

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Foreword

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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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 41, *Pulleys and belts (including veebelts)*, Subcommittee SC 1, *Friction*.

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Belt drives — V-belts and the corresponding pulleys for agricultural machineries — Dimensions

1 Scope

This International Standard provides dimensional details of the V-drive belts used on agricultural machinery. It is intended to reflect practice (at the time of publication) in the design of such drives and to provide, where practicable, links to International Standards for similar belts used on industrial machinery.

NOTE All dimensions in this International Standard are in millimetres (mm).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

ISO 4183, *Belt drives — Classical and narrow V-belts — Grooved pulleys (system based on datum width)*

ISO 5290, *Belt drives — Grooved pulleys for joined narrow V-belts — Groove sections 9N/J, 15N/J and 25N/J (effective system)*

ISO 5291, *Belt drives — Grooved pulleys for joined classical V-belts — Groove sections AJ, BJ, CJ and DJ (effective system)*

ISO 9982, *Belt drives — Pulleys and V-ribbed belts for industrial applications — PH, PJ, PK, PL and PM profiles: Dimensions*

3 Terms and definitions

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

4 Symbols

For the purposes of this document, the symbols given in ISO 1081 apply.

5 Belt cross-sections and nominal dimensions

The belt cross-section is characterized by the top width, W, and height, h_b. In the case of joined V-belts and V-ribbed belts, the cross-section spacing is also relevant. The angle of the belt sides is usually 40° except in the case of variable speed belts where the angle is commonly 32° but may be different on some applications.

The nominal dimensions of belt cross-sections are shown in Table 1 and Figure 1.

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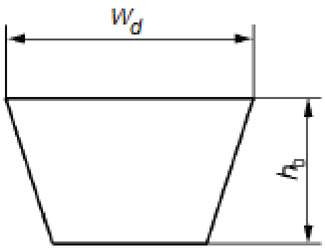
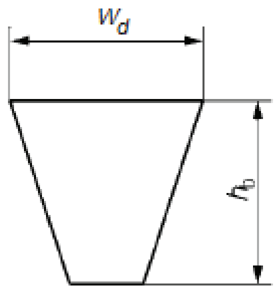
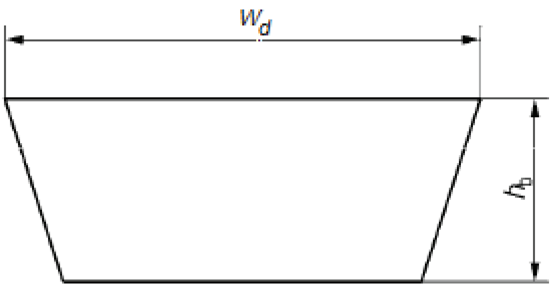
The belt cross-sections supplied by different manufacturers may vary slightly due to manufacturing methods and/or the tooling used. All belts of a given cross-section shall work in the pulley grooves specified in this International Standard for that section.



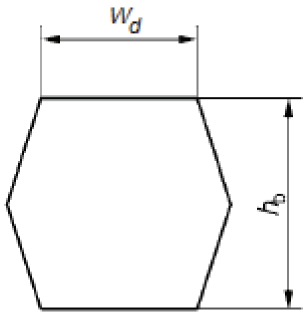
a) Classical section V-belts



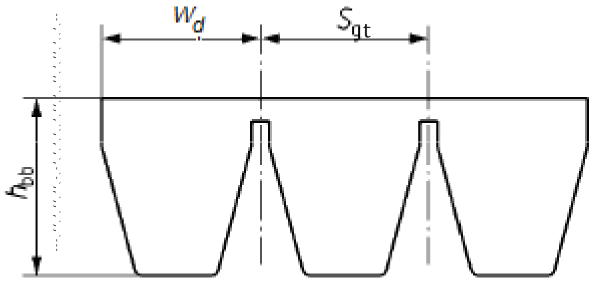
b) Narrow or wedge section V-belts



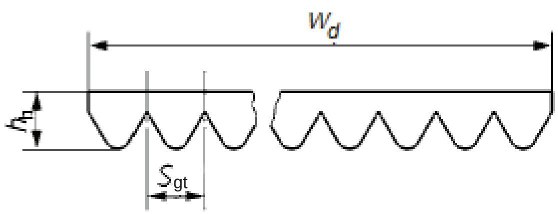
c) Variable speed drive belts



d) Hexagonal section V-belts



e) Joined V-belts



f) V-ribbed belts

Figure 1 — Belt types

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$$W_d = N_e \times S_{gt} \quad (1)$$

where

N_e is the number of ribs;

S_{gt} is the specified sheave groove spacing;

W_d is the width of the belt;

W_2 is the dimension of variable speed belts and hexagonal belts.

Table 1 — Nominal dimensions of cross-sections

Dimensions in millimetres

Belt type	Cross-section	W	W_d	T	h_b [a]	S_{gt} [b]
Classical V-belts	HA HB HC HD	12 17 22 32	11 14 19 27	8 11 14 20	9,9 13,0 16,2 22,4	15,88 19,05 24,40 36,53
Wedge/ narrow V-belts	SPZ SPA SPB SPC 3V/9N 5V/15N 8V/25N	10 13 17 22 9 15 25	8,5 11 14 19	8 10 14 18 8 14 23	10,5 12,5 15,6 22,6 10,0 16,0 25,5	12,00 15,00 19,00 25,50 10,30 17,50 28,60
Hexagonal V-belts	HAA HBB HCC	13 17 22	11 14 19	10 13 17		
Variable speed V-belts	HI HJ HK HL HM HN HO HQ	25,4 31,8 38,1 44,5 50,8 57,2 63,5 76,0	23,6 29,6 35,5 41,4 47,4 53,2 29,1 30,0	12,7 15,1 17,5 19,8 22,2 23,9 25,4		
V-ribbed belts	PJ PL PM	See Figure 1		4 8 15		2,34 4,70 9,40

NOTE The "H" prefix in the description of classical V-belts, hexagonal section V-belts, and variable speed V-belts indicates that belts can be manufactured to a higher specification to meet specific application criteria than standard industrial belt specifications.

[a] Classical and wedge/narrow V-belts are also available in the joined or banded configuration as illustrated in Figure 1.

[b] Specified groove spacing.

6 Belt lengths

6.1 V-belts, banded, or joined belts and variable speed belts for agricultural machinery traditionally identify length using "effective outside length" whereas similar belts for industrial machinery may use "datum length".

Effective outside length shall be measured at a position on the measuring pulleys where the groove top width is a closely specified value (see Table 5).

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Datum length shall be measured at a position within the grooves of the measuring pulleys where the datum width is a closely specified value. The datum width is set to coincide approximately with the neutral axis of the belt section.

There is a direct relationship between the belt effective outside length and its datum length. Please consult the belt manufacturer.

6.2 Hexagonal section V-belts for agricultural machinery identify length using “effective length”.

Effective length shall be measured on the same pulleys used for measuring classical section belt effective outside length and is close to the length of the belt at the widest point of the section.

6.3 Ribbed belts identify length using “effective length”.

Effective length shall be measured at the outside diameter of the measuring pulleys and is therefore close to the belt length at the bottom of the grooves between the ribs.

Table 2 — Effective length ranges

Dimensions in millimetres

Classical section V-belts[a]		**Wedge section V-belts**[a]		**Variable speed V-belts**		**Hexagonal section V-belts**		**Ribbed belts**	
Section	Range	Section	Range	Section	Range	Section	Range	Section	Range
HA	635 to 3 300	SPZ	635 to 3 550	HI	1 020 to 3 175	HAA	1 270 to 3 300	PJ	455 to 2 540
HB	760 to 7 620	SPA	732 to 4 500	HJ	1 270 to 4 065	HBB	1 270 to 7 620	PL	1 270 to 3 685
HC	1 400 to 9 270	SPB	1 250 to 8 000	HK	1 525 to 4 570	HCC	2 160 to 9 270	PM	2 285 to 9 270
HD	3 050 to 9 270	SPC	2 000 to 12 500	HL	1 780 to 5 080				
		3V/9N	635 to 3 560	HM	2 030 to 5 080				
		5V/15N	1 270 to 9 020	HN	2 160 to 5 080				
		8V/25N	2 540–15 240	HO	2 285–5 080				

[a] Includes joined or banded belts.

Table 3 — Effective length tolerance (all belt types)

Dimensions in millimetres

Effective length range	**Effective length tolerance**
Up to and including 1 300	±10
Over 1 300 and including 2 500	±13
Over 2 500 and including 3 150	±16
Over 3 150 and including 4 000	±20
Over 4 000 and including 5 000	±25
Over 5 000 and including 6 300	±32
Over 6 300 and including 8 000	±40
Over 8 000 and including 10 000	±50

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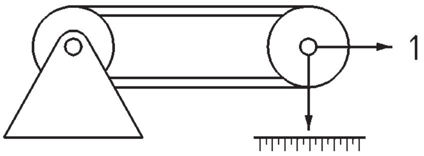
Table 4 — Limits of difference in effective length for matching sets

Dimensions in millimetres

Effective length range	Matching limits for one set	
	Normal belt construction	High-modulus belt construction[a]
Up to and including 1 375	4	2
Over 1 375 up to and including 2 820	6	3
Over 2 820 up to and including 6 000	10	5
Over 6 000 up to and including 10 000	16	6

NOTE Matched set tolerances are not applicable to joined V-belts or V-ribbed belts as they are designed to be a single unit.

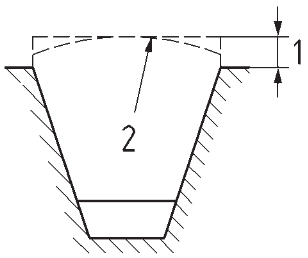
[a] Examples of high-modulus belt constructions are those with reinforcing cords made from aramid, glass fibre or steel.



Key

1 total measuring force

Figure 2 — Layout of measuring fixture



Key

1 belt ride out

2 variations to corner contours

Figure 3 — Measuring belt ride out, V-belt

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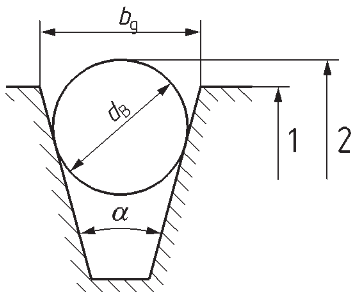
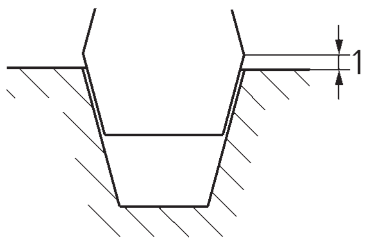


Key

1 outside diameter

2 diameter over balls

Figure 4 — V-belt measuring pulley groove



Key

1 belt ride out

Figure 5 — Measuring belt ride out, hexagonal V-belt

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Table 5 — Data for use in measuring belt effective length

Dimensions in millimetres

Belt cross-section	Pulley datum or outside diameter ± 0,10	Pulley effective circum-ference	Pulley groove angle ±0,25 °	Pulley groove top width b_g	Diameter ball or rod d_B ±0,01	Diameter over balls or rods ±0,10	Groove depth h_g min.	Total measuring force per belt N	Maximum ride position of belt with respect to top of groove	
									Not joined	Joined
HA	95,5	300	34	13,0	12,5	108,2	12	300	2,5	4,5
HB	143,2	450	34	16,5	15,5	157,7	14	450	2,5	5,0
HC	222,8	700	34	22,4	21,0	242,2	19	850	2,5	6,5
HD	318,3	1 000	36	32,8	30,5	346,6	26	1 800	3,0	7,0
HAA	95,5	300	34	13,0	12,5	108,2	12	300	0,8	
HBB	143,2	450	34	16,5	15,5	157,7	14	450	0,8	
HCC	222,8	700	34	22,4	21,0	242,2	19	850	0,8	
SPZ	95,5[a]	300	38	9,91			11	360	1,1	
SPA	143,2[a]	450	38	12,96			14	560	1,3	
SPB	191,0[a]	600	38	16,45			17,5	900	1,4	
SPC	318,3[a]	1 000	38	22,35			23,8	1 500	1,5	
3V/9N-J	95,5	300	38	8,89	8,5	104,3	8,5	445	2,5	5,1
5V/15N-J	191,0	600	38	15,24	15,0	207,8	15,0	1000	3,0	6,4
8V/25N-J	318,3	1 000	38	25,40	25,0	346,3	25,1	2225	4,1	7,6
HI	127,3	400	26	25,40	24,5	150,7	20	800	4,1	
HJ	159,2	500	26	31,75	30,5	187,8	23	1 300	4,1	
HK	191,0	600	26	38,10	36,5	224,8	26	1 800	4,6	
HL	222,8	700	26	44,45	42,5	261,7	29	2 500	5,1	
HM	254,6	800	26	50,80	48,5	298,7	32	3 300	5,1	
HN	286,5	900	26	57,00	54,5	336,4	34	3 300	5,6	
HO	318,3	1 000	26	63,00	60,0	372,1	37	3 300	5,6	

NOTE See Figure 2.

[a] These diameters are datum diameters. All other diameters in this column are outside diameters.

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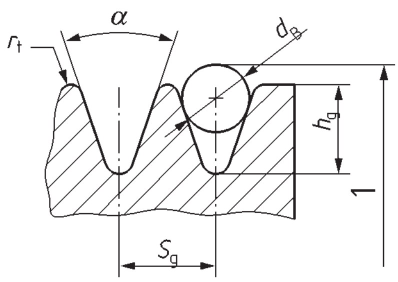
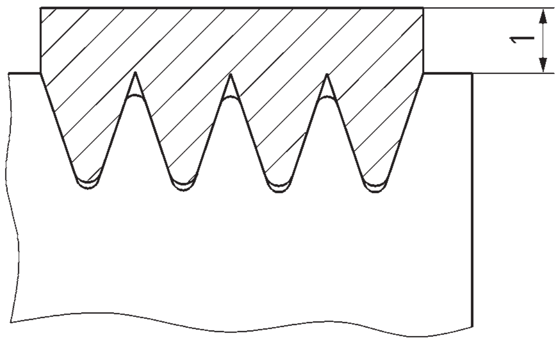


Key

1 diameter over balls

Figure 6 — V-ribbed belt measuring groove



Key

1 belt ride out

Figure 7 — Measuring belt ride out, V-ribbed belt

Table 6 — Data for use in measuring V-ribbed belt effective length and ride

Dimensions in millimetres

Cross-section	**Pulley outside dia meter ref erence**	**Pulley effective circum-ference**	**Pulley groove angle,** degrees °	**Pulley groove spacing** S_{gt}	**Diameter ball or rod** d_B ±0,01	**Diameter over ball or rod** ±0,10	**Groove depth** h_g min.	**Top radius** r_t +0,15 −0,00	**Total measuring force per rib** N	**Max. ride of belt with respect to top of groove**
PJ	95,5	300	40	2,34 ±0,03	1,50	97,5	2,06	0,20	50	2,50
PL	159,2	500	40	4,70 ±0,05	4,00	163,5	4,92	0,40	200	5,60
PM	254,6	800	40	9,40	7,00	259,2	10,03	0,75	450	7,60

7 Belt length measurement method — Manufactured belt dimensions

7.1 Belt length shall be determined using a measuring fixture as illustrated in Figure 2, consisting of two pulleys of equal diameter having groove dimensions as specified in Tables 5 and 6. Both pulleys are

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free to rotate. One of the pulleys has a fixed centre while the other can slide horizontally under the action of a measuring force applied horizontally through the sliding pulley centre.

7.2 The apparatus should have a means of accurately measuring the distance between the pulley centres and applying the measuring force.

7.3 The belt to be measured shall be mounted on the measuring pulleys and the measuring force shall be applied to the sliding pulley. The pulleys are rotated through at least two revolutions to seat it properly and to equalize the tension between the two spans of the belt.

7.4 The belt length shall be determined by adding the circumference of one of the measuring pulleys to twice the centre distance between the two pulleys.

7.5 The belt ride dimension is checked by measuring the distance from the top of the belt to the top of the measuring pulley groove (see Figures 3, 5 and 7). This dimension should be within the maximum shown in Tables 5 and 6.

8 Specifications for pulleys used with V-belts and V-ribbed belts

8.1 Make reference to the International Standards shown in Table 7 for the pulley groove dimensions appropriate to the belt under consideration.

Table 7

Belt section	International Standard
Classical sections — single belts HA, HB, HC, HD	ISO 4183
Classical sections — joined belts HA, HB, HC, HD	ISO 5291
Narrow or wedge sections — single or joined SPZ, SPA, SPB, SPC 3V/9N/9J, 5V/15N/15J, 8V/25N/25J	ISO 4183 ISO 5290
Hexagonal sections HAA, HBB, HCC	ISO 4183
V-ribbed sections PJ, PL, PM	ISO 9982
NOTE 1 If there is any uncertainty concerning the latest issue of any of the International Standards mentioned, please consult with your national standards body. NOTE 2 It is recommended that the belt manufacturer be consulted where the drive design necessitates special situations such as “quarter turn”. It might be important to use pulleys with deeper than normal grooves. NOTE 3 Pulley materials and constructions are detailed in the International Standards mentioned.	

8.2 Pulleys formed from sheet metal are permissible provided the groove dimensions are uniform throughout the circumference of the pulley, and that the thickness of the metal used is such that the groove profile will not change under the pressures exerted by the belt.

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[1] ISO 5289, *Agricultural machinery — Endless hexagonal belts and groove sections of corresponding pulleys*

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