
**Synchronous belt drives — Imperial
pitch trapezoidal profile system —
Belts and pulleys**

*Transmissions synchrones par courroies — Système de profil
trapézoïdal pour pas impérial — Courroies et poulies*

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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 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 4, *Synchronous belt drives*.

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Synchronous belt drives — Imperial pitch trapezoidal profile system — Belts and pulleys

1 Scope

This International Standard specifies the principal characteristics of synchronous endless belts and pulleys for use in synchronous endless belt drives¹⁾ for mechanical power transmission and where positive indexing or synchronization is required.

The principal characteristics includes the following:

- a) belt nominal tooth dimensions;
- b) belt length and width dimensions and tolerances;
- c) belt length-measurement specifications;
- d) pulley grooves dimensions and tolerances;
- e) pulley dimensions and tolerances;
- f) pulley quality specification.

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 254, *Belt drives — Pulleys — Quality, finish and balance*

ISO 1101, *Geometrical product specification (GPS) — Geometrical tolerancing — Tolerances of form, orientation, location and run-out*

3 Profiles

Seven profiles for synchronous drives are standardized: MXL, XXL, XL, L, H, XH, XXH.

The profiles and the corresponding belt pitches are given in [Table 1](#).

1) These drives have been known under various names in the past, for example: timing belt drives, positive belt drives, gear belt drives.

Table 1 — Profiles

Profiles	Belt pitch ^a	
	mm	in
MXL	2,032	0,080
XXL	3,175	0,125
XL	5,080	0,200
L	9,525	0,375
H	12,700	0,500
XH	22,225	0,875
XXH	31,750	1,250

^a Carried to third decimal place because belt pitch is a defined value.

4 Belt dimensions and tolerances

4.1 Belt tooth dimensions

The nominal belt tooth dimensions are the same for one-sided and double-sided belts; they are given in [Table 2](#) and are shown in [Figures 1, 2, and 3](#).

Two types of double-sided synchronous belts are standardized. Type A (see [Figure 2](#)) has symmetrical teeth and Type B (see [Figure 3](#)) has staggered teeth.

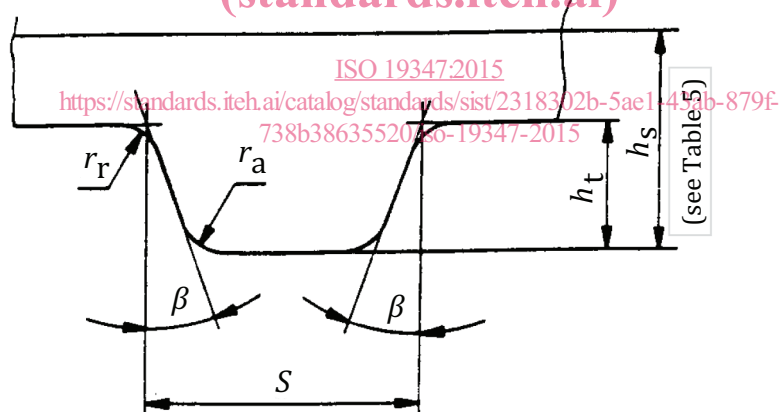


Figure 1 — Tooth profile, one-sided

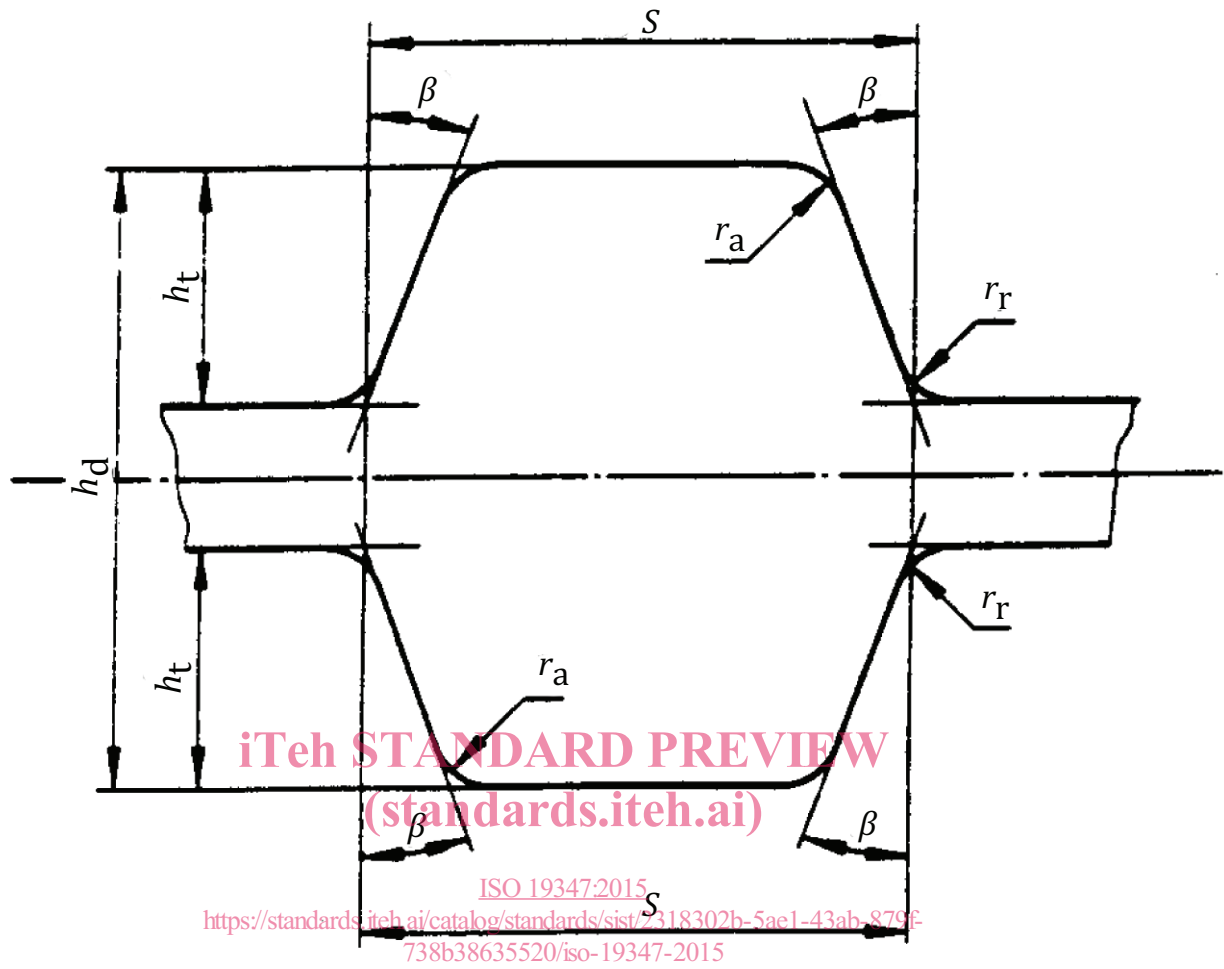


Figure 2 — Tooth profile, double-sided (Type A)

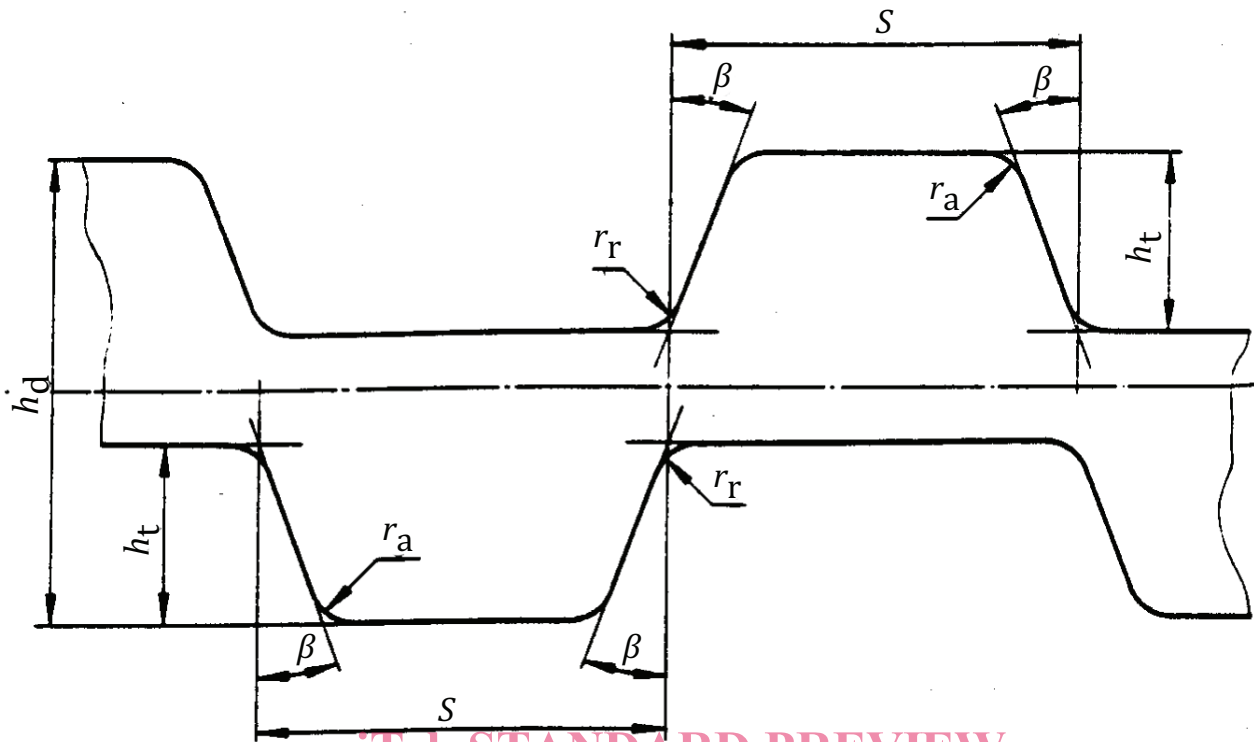


Figure 3 — Tooth profile, double-sided (Type B)

Table 2 — Nominal tooth dimensions
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Profiles	2β degrees	S		ht		rr		ra	
		mm	in	mm	in	mm	in	mm	in
MXL	40	1,14	0,045	0,51	0,02	0,13	0,005	0,13	0,005
XXL	50	1,73	0,068	0,76	0,03	0,2	0,008	0,3	0,012
XL	50	2,57	0,101	1,27	0,05	0,38	0,015	0,38	0,015
L	40	4,65	0,183	1,91	0,075	0,51	0,020	0,51	0,02
H	40	6,12	0,241	2,29	0,09	1,02	0,040	1,02	0,04
XH	40	12,57	0,495	6,35	0,25	1,57	0,062	1,19	0,047
XXH	40	19,05	0,750	9,53	0,375	2,29	0,090	1,52	0,06

4.2 Belt pitch lengths and tolerances

4.2.1 Single-sided belts

The belt pitch length and tolerances are given in [Tables 3](#) and [4](#).

Table 3 — Pitch lengths and tolerances — Profiles XL, L, H, XH, XXH

Belt length designation	Pitch length		Tolerance		Number of teeth for standard lengths				
	mm	in	mm	in	XL	L	H	XH	XXH
60	152,40	6,000	±0,41	±0,016	30				
70	177,80	7,000	±0,41	±0,016	35				
80	203,20	8,000	±0,41	±0,016	40				
90	228,60	9,000	±0,41	±0,016	45				
100	254,00	10,000	±0,41	±0,016	50				
110	279,40	11,000	±0,46	±0,018	55				
120	304,80	12,000	±0,46	±0,018	60				
124	314,33	12,375	±0,46	±0,018		33			
130	330,20	13,000	±0,46	±0,018	65				
140	355,60	14,000	±0,46	±0,018	70				
150	381,00	15,000	±0,46	±0,018	75	40			
160	406,40	16,000	±0,51	±0,020	80				
170	431,80	17,000	±0,51	±0,020	85				
180	457,20	18,000	±0,51	±0,020	90				
187	476,25	18,750	±0,51	±0,020	50				
190	482,60	19,000	±0,51	±0,020	95				
200	508,00	20,000	±0,51	±0,020	100	56			
210	533,40	21,000	±0,61	±0,024	105				
220	558,80	22,000	±0,61	±0,024	110	60			
225	571,50	22,500	±0,61	±0,024					
230	584,20	23,000	±0,61	±0,024	115				
240	609,60	24,000	±0,61	±0,024	120	64	48		
250	635,00	25,000	±0,61	±0,024	125				
255	647,70	25,500	±0,61	±0,024		68			
260	660,40	26,000	±0,61	±0,024	130				
270	685,80	27,000	±0,61	±0,024		72	54		
285	723,90	28,500	±0,61	±0,024		76			
300	762,00	30,000	±0,61	±0,024		80	60		
322	819,15	32,250	±0,66	±0,026		86			
330	838,20	33,000	±0,66	±0,026			66		
345	876,30	34,500	±0,66	±0,026		92			
360	914,40	36,000	±0,66	±0,026			72		
367	933,45	36,750	±0,66	±0,026		98			
390	990,60	39,000	±0,66	±0,026		104	78		
420	1 066,80	42,000	±0,76	±0,030		112	84		

Table 3 (continued)

Belt length designation	Pitch length		Tolerance		Number of teeth for standard lengths				
	mm	in	mm	in	XL	L	H	XH	XXH
450	1 143,00	45,000	±0,76	±0,030		120	90		
480	1 219,20	48,000	±0,76	±0,030		128	96		
507	1 289,05	50,750	±0,81	±0,032				58	
510	1 295,40	51,000	±0,81	±0,032		136	102		
540	1 371,60	54,000	±0,81	±0,032		144	108		
560	1 422,40	56,000	±0,81	±0,032				64	
570	1 447,80	57,000	±0,81	±0,032			114		
600	1 524,00	60,000	±0,81	±0,032		160	120		
630	1 600,20	63,000	±0,86	±0,034			126	72	
660	1 676,40	66,000	±0,86	±0,034			132		
700	1 778,00	70,000	±0,86	±0,034			140	80	56
750	1 905,00	75,000	±0,91	±0,036			150		
770	1 955,80	77,000	±0,91	±0,036				88	
800	2 032,00	80,000	±0,91	±0,036			160		64
840	2 133,60	84,000	±0,97	±0,038				96	
850	2 159,00	85,000	±0,97	±0,038			170		
900	2 286,00	90,000	±0,97	±0,038			180		72
980	2 489,20	98,000	±1,02	±0,040				112	
1 000	2 540,00	100,000	±1,02	±0,040			200		80
1 100	2 794,00	110,000	±1,07	±0,042			220		
1 120	2 844,80	112,000	±1,12	±0,044			250	128	
1 200	3 048,00	120,000	±1,12	±0,044					96
1 250	3 175,00	125,000	±1,17	±0,046					
1 260	3 200,40	126,000	±1,17	±0,046				144	
1 400	3 556,00	140,000	±1,22	±0,048			280	160	112
1 540	3 911,60	154,000	±1,32	±0,052				176	
1 600	4 064,00	160,000	±1,32	±0,052					128
1 700	4 318,00	170,000	±1,37	±0,054			340		
1 750	4 445,00	175,000	±1,42	±0,056				200	
1 800	4 572,00	180,000	±1,42	±0,056					144

Table 4 — Pitch lengths and tolerances — MXL and XXL belt sections

Belt length designation	Pitch length		Tolerance		Number of teeth for standard lengths	
	mm	in	mm	in	MXL	XXL
36,0	91,44	3,600	±0,41	±0,016	45	
40,0	101,60	4,000	±0,41	±0,016	50	
44,0	111,76	4,400	±0,41	±0,016	55	
48,0	121,92	4,800	±0,41	±0,016	60	
50,0	127,00	5,000	±0,41	±0,016		40
56,0	142,24	5,600	±0,41	±0,016	70	
60,0	152,40	6,000	±0,41	±0,016	75	48
64,0	162,56	6,400	±0,41	±0,016	80	
70,0	177,80	7,000	±0,41	±0,016		56
72,0	182,88	7,200	±0,41	±0,016	90	
80,0	203,20	8,000	±0,41	±0,016	100	64
88,0	223,52	8,800	±0,41	±0,016	110	
90,0	228,60	9,000	±0,41	±0,016		72
100,0	254,00	10,000	±0,41	±0,016	125	80
110,0	279,40	11,000	±0,46	±0,018		
112,0	284,48	11,200	±0,46	±0,018	140	88
120,0	304,80	12,000	±0,46	±0,018		96
124,0	314,96	12,400	±0,46	±0,018	155	
130,0	330,20	13,000	±0,46	±0,018		104
140,0	355,60	14,000	±0,46	±0,018	175	112
150,0	381,00	15,000	±0,46	±0,018		120
160,0	406,40	16,000	±0,51	±0,020	200	128
180,0	457,20	18,000	±0,51	±0,020		144
200,0	508,00	20,000	±0,51	±0,020	225	160
220,0	558,80	22,000	±0,61	±0,024	250	176

4.2.2 Double-sided belts

The nominal belt lengths for the double-sided belts are the same as those listed in Tables 3 and 4 for the single-sided belts. The positive length tolerance is equal to 1,5 times the tolerance of the equivalent single-sided belt. The negative tolerance is equal to 2 times the tolerance of the equivalent single-sided belt.

4.3 Belt standard widths and heights

The belt standard widths and tolerances are given in Table 5. The nominal heights for single-sided belts are also given in Table 5, while the nominal heights for double-sided belts are given in Table 6.

Table 5 — Widths and heights — single-sided belts

Profiles	Nominal height (see Figure 1) h_s		Standard widths			Tolerances on width for belt pitch lengths							
			Dimension		Designation	up to 838,2 mm (33 in) inclusive		from 838,2 mm (33 in) up to 1 676,4 mm (66 in) inclusive		over 1 676,4 mm (66 in)			
	mm	in	mm	in		mm	in	mm	in	mm	in		
MXL	1,14	0,045	3,2	0,125	012 ^a	+0,5	+0,02						
			4,8	0,190	019							-0,8	-0,03
			6,4	0,250	025								
XXL	1,52	0,06	3,2	0,125	012 ^a	+0,5	+0,02						
			4,8	0,190	019							-0,8	-0,03
			6,4	0,250	025								
XL	2,3	0,09	6,4	0,250	025	+0,5	+0,02						
			7,9	0,310	031							-0,8	-0,03
			9,5	0,375	037 ^a								
L	3,6	0,14	12,7	0,5	050	+0,8	+0,03	+0,8	+0,03				
			19,1	0,75	075							-0,8	-0,03
			25,4	1	100								
H	4,3	0,17	19,1	0,75	075	+0,8	+0,03	+0,8	+0,03	+0,8	+0,03		
			25,4	1	100							-0,8	-0,03
			38,1	1,5	150								
			50,8	2	200							-1,3	-0,05
			76,2	3	300								
			76,2	3	300							+1,3	+0,05
76,2	3	300	-1,3	-0,05	-1,3	-0,05	-1,5	-0,06					
XH	11,2	0,44	50,8	2	200			+4,8	+0,19	+4,8	+0,19		
			76,2	3	300							-4,8	-0,19
			101,6	4	400								
XXH	15,7	0,62	50,8	2	200					+4,8	+0,19		
			76,2	3	300							-4,8	-0,19
			101,6	4	400								
			127	5	500								

^a Designations are 012 and 037 although the widths of belts is 0,125 in and 0,375 in.