

International Standard



5294

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION • МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ • ORGANISATION INTERNATIONALE DE NORMALISATION

Synchronous belt drives — Pulleys

Transmissions synchrones par courroies — Poulies

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Descriptors : belt drives, pulleys, dimensions, dimensional tolerances.

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council.

International Standard ISO 5294 was developed by Technical Committee ISO/TC 41, *Pulleys and belts (including veebelts)*, and was circulated to the member bodies in February 1978.

It has been approved by the member bodies of the following countries :

Austria	India	Spain
Belgium	Ireland	Sweden
Canada	Italy	United Kingdom
Chile	Mexico	USA
Czechoslovakia	Poland	USSR
France	Romania	
Germany, F. R.	South Africa, Rep. of	

No member body expressed disapproval of the document.

Attention is called to the fact that the synchronous pulleys specified in this International Standard are subject to patent rights held by Uniroyal, Inc.

The patent holder in authorizing the inclusion of the details of this patented item in this International Standard has given the assurance that it would be willing to negotiate licenses under patent and like rights with applicants throughout the world on reasonable terms and conditions.

Synchronous belt drives — Pulleys

1 Scope and field of application

This International Standard specifies the principal characteristics of synchronous pulleys for use in synchronous endless belt drives¹⁾ for mechanical power transmission and where positive indexing or synchronization may be required. The principal characteristics include : tooth dimensions and tolerances; standard pulley dimensions and tolerances, and quality specification.

2 Reference

ISO/R 254, *Quality, machining and balancing of transmission pulleys.*²⁾

3 Standard tooth dimensions

3.1 Involute teeth

3.1.1 The involute tooth profile results in different dimensions for each pulley diameter. Therefore, to specify the involute tooth dimensions would require a very voluminous table. For this reason, as well as because of the difficulty in specifying the curved sides of an involute tooth, dimensions are specified for the rack generating tool required to produce the involute tooth.

3.1.2 Dimensions and tolerances for the rack generating tool for synchronous pulleys with involute teeth are given in table 1 and figure 1.

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

2) Under revision.

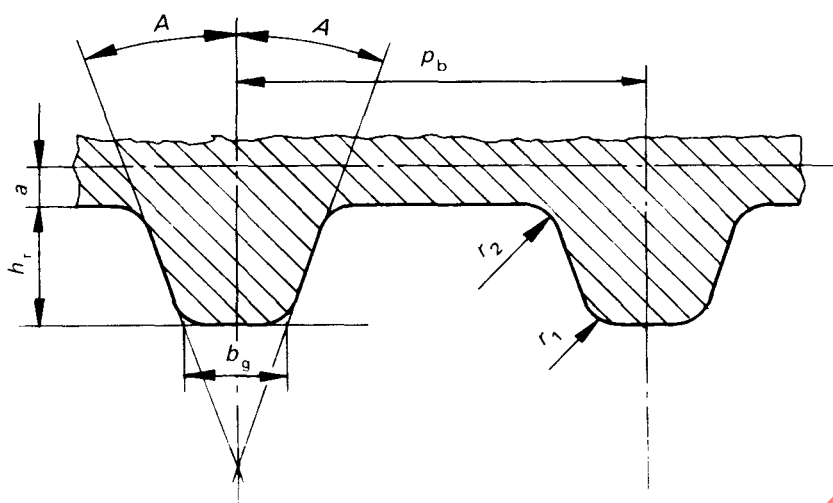


Figure 1 — Generating tool rack for pulleys with involute teeth

Table 1 — Dimensions and tolerances for generating tool rack for pulleys with involute teeth

Pitch code	Number of teeth in pulley	p_b		A degrees $\pm 0,12$	h_r		b_g		r_1		r_2		$2a$	
		mm $\pm 0,003$	in $\pm 0.000\ 1$		mm $+ 0,05$ 0	in $+ 0.002$ 0	mm $+ 0,05$ 0	in $+ 0.002$ 0	mm $\pm 0,03$	in ± 0.001	mm $\pm 0,03$	in ± 0.001	mm	in
XL	10 and over	5,080	0.200 0	25	1,40	0.055	1,27	0.050	0,61	0.024	0,61	0.024	0,508	0.020
L	10 and over	9,525	0.375 0	20	2,13	0.084	3,10	0.122	0,86	0.034	0,53	0.021	0,762	0.030
H	14 to and including 19	12,700	0.500 0	20	2,59	0.102	4,24	0.167	1,47	0.058	1,04	0.041	1,372	0.054
	over 19										1,42	0.056		
XH	18 and over	22,225	0.875 0	20	6,88	0.271	7,59	0.299	2,01	0.079	1,93	0.076	2,794	0.110
XXH	18 and over	31,750	1.250 0	20	10,29	0.405	11,61	0.457	2,69	0.106	2,82	0.111	3,048	0.120

3.2 Straight-sided teeth

3.2.1 Involute teeth are normally recommended for synchronous belt drives. Since straight-sided teeth are in use, their specifications are also included.

3.2.2 Dimensions and tolerances for straight-sided teeth (see figure 2) are given in table 2.

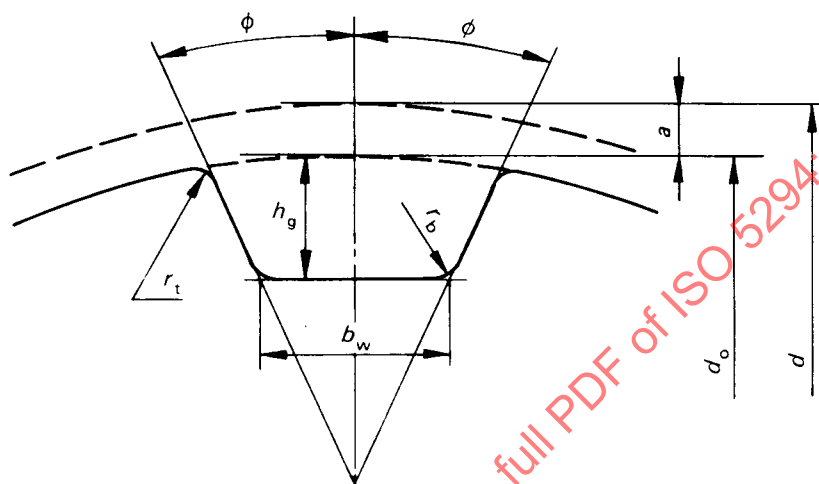


Figure 2 — Straight-sided teeth

Table 2 — Dimensions and tolerances for pulleys with straight-sided teeth

Pitch code	b_w		h_g		ϕ degrees $\pm 1,5^\circ$	r_b max.		r_t		$2a$	
	mm	in	mm	in		mm	in	mm	in	mm	in
XL	$1,32 \pm 0,05$	$0,052 \pm 0,002$	$1,65 \begin{smallmatrix} 0 \\ -0,08 \end{smallmatrix}$	$0,065 \begin{smallmatrix} 0 \\ -0,003 \end{smallmatrix}$	25	0,41	0,016	$0,64 \begin{smallmatrix} +0,05 \\ 0 \end{smallmatrix}$	$0,025 \begin{smallmatrix} +0,002 \\ 0 \end{smallmatrix}$	0,508	0,020
L	$3,05 \pm 0,10$	$0,120 \pm 0,004$	$2,67 \begin{smallmatrix} 0 \\ -0,10 \end{smallmatrix}$	$0,105 \begin{smallmatrix} 0 \\ -0,004 \end{smallmatrix}$	20	1,19	0,047	$1,17 \begin{smallmatrix} +0,13 \\ 0 \end{smallmatrix}$	$0,046 \begin{smallmatrix} +0,005 \\ 0 \end{smallmatrix}$	0,762	0,030
H	$4,19 \pm 0,13$	$0,165 \pm 0,005$	$3,05 \begin{smallmatrix} 0 \\ -0,13 \end{smallmatrix}$	$0,120 \begin{smallmatrix} 0 \\ -0,005 \end{smallmatrix}$	20	1,60	0,063	$1,60 \begin{smallmatrix} +0,13 \\ 0 \end{smallmatrix}$	$0,063 \begin{smallmatrix} +0,005 \\ 0 \end{smallmatrix}$	1,372	0,054
XH	$7,90 \pm 0,15$	$0,311 \pm 0,006$	$7,14 \begin{smallmatrix} 0 \\ -0,13 \end{smallmatrix}$	$0,281 \begin{smallmatrix} 0 \\ -0,005 \end{smallmatrix}$	20	1,98	0,078	$2,39 \begin{smallmatrix} +0,13 \\ 0 \end{smallmatrix}$	$0,094 \begin{smallmatrix} +0,005 \\ 0 \end{smallmatrix}$	2,794	0,110
XXH	$12,17 \pm 0,18$	$0,479 \pm 0,007$	$10,31 \begin{smallmatrix} 0 \\ -0,13 \end{smallmatrix}$	$0,406 \begin{smallmatrix} 0 \\ -0,005 \end{smallmatrix}$	20	3,96	0,156	$3,18 \begin{smallmatrix} +0,13 \\ 0 \end{smallmatrix}$	$0,125 \begin{smallmatrix} +0,005 \\ 0 \end{smallmatrix}$	3,048	0,120

3.3 Pitch-to-pitch tolerances

Tolerances on the amount of deviation of belt pitch between adjacent teeth, and on the summation of deviations within 90°

arc of a pulley, are given in table 3. This tolerance applies to the distance between the same point on either the right or left corresponding flanks of adjacent teeth.

Table 3 — Pitch-to-pitch tolerances

Outside diameter d_o		Allowable deviation of pitch			
		Between any two adjacent teeth		Summation within a 90° arc	
mm	in	mm	in	mm	in
Up to and including 25,40	Up to and including 1.000	0,03	0.001	0,05	0.002
Over 25,40 up to and including 50,80	Over 1.000 up to and including 2.000	0,03	0.001	0,08	0.003
Over 50,80 up to and including 101,60	Over 2.000 up to and including 4.000	0,03	0.001	0,10	0.004
Over 101,60 up to and including 177,80	Over 4.000 up to and including 7.000	0,03	0.001	0,13	0.005
Over 177,80 up to and including 304,80	Over 7.000 up to and including 12.000	0,03	0.001	0.15	0.006
Over 304,80 up to and including 508,00	Over 12.000 up to and including 20.000	0,03	0.001	0,18	0.007
Over 508,00	Over 20.000	0,03	0.001	0,20	0.008

4 Standard pulley dimensions

4.1 Pulley widths

The standard pulley width designation, the nominal pulley width, and the minimum actual pulley width required, b_f for flanged pulleys, b_f' for unflanged pulleys (see figure 3), are given in table 4.

Users are advised that the values given for b_f apply also to pulleys with only one flange.

4.2 Pulley diameters

4.2.1 Standard pulley diameters are given in table 5.

Table 4 — Standard pulley widths

Pitch code	Standard pulley width designation	Nominal pulley width		Minimum flanged pulley width b_f		Minimum unflanged pulley width b_f'	
		mm	in	mm	in	mm	in
XL	025	6,4	0.25	7,1	0.28	8,9	0.35
	031	7,9	0.31	8,6	0.34	10,4	0.41
	037	9,5	0.37	10,4	0.41	12,2	0.48
L	050	12,7	0.50	14,0	0.55	17,0	0.67
	075	19,1	0.75	20,3	0.80	23,3	0.92
	100	25,4	1.00	26,7	1.05	29,7	1.17
H	075	19,1	0.75	20,3	0.80	24,8	0.98
	100	25,4	1.00	26,7	1.05	31,2	1.23
	150	38,1	1.50	39,4	1.55	43,9	1.73
	200	50,8	2.00	52,8	2.08	57,3	2.26
	300	76,2	3.00	79,0	3.11	83,5	3.29
XH	200	50,8	2.00	56,6	2.23	62,6	2.46
	300	76,2	3.00	83,8	3.30	89,8	3.54
	400	101,6	4.00	110,7	4.36	116,7	4.59
XXH	200	50,8	2.00	56,6	2.23	64,1	2.52
	300	76,2	3.00	83,8	3.30	91,3	3.59
	400	101,6	4.00	110,7	4.36	118,2	4.65
	500	127,0	5.00	137,7	5.42	145,2	5.72

NOTE — The minimum unflanged pulley width (b_f') may be reduced when the alignment of the drive can be controlled, but shall not be less than the minimum flanged pulley width (b_f).

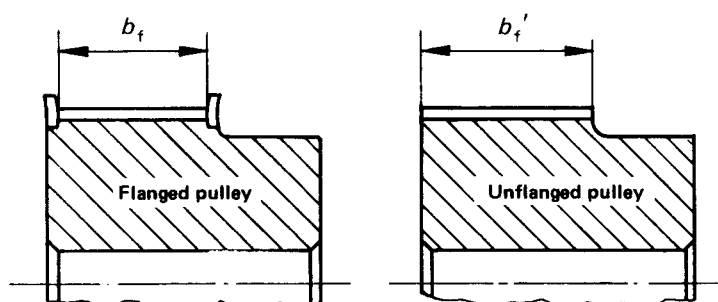


Figure 3 — Minimum pulley width

Table 5 — Standard pulley diameters

Number of teeth	Standard diameters																	
	Pitch code XL						Pitch code L						Pitch code H					
	Pitch diameter		Outside diameter		Pitch diameter		Pitch diameter		Outside diameter		Pitch diameter		Pitch diameter		Outside diameter		Pitch diameter	
	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in
10	16,17	0,637	15,66	0,617														
11	17,79	0,700	17,28	0,680														
12	19,40	0,764	18,90	0,744	36,38	1,432	35,62	1,402										
13	21,02	0,828	20,51	0,808	39,41	1,552	38,65	1,522										
14	22,64	0,891	22,13	0,871	42,45	1,671	41,68	1,641										
15	24,26	0,955	23,75	0,935	45,48	1,790	44,72	1,760										
16	25,87	1,019	25,36	0,999	48,51	1,910	47,75	1,880	63,31	2,492								
17	27,49	1,082	26,98	1,062	51,54	2,029	50,78	1,999	67,35	2,652								
18	29,11	1,146	28,60	1,126	54,57	2,149	53,81	2,119	71,39	2,811	127,34	5,013	124,55	4,903				
19	30,72	1,210	30,22	1,190	57,61	2,268	56,84	2,238	75,44	2,970	134,41	5,292	131,62	5,182				
20	32,34	1,273	31,83	1,253	60,64	2,387	59,88	2,357	79,48	3,129	141,49	5,570	138,69	5,460				
(21)	33,96	1,337	33,45	1,317	63,67	2,507	62,91	2,477	83,52	3,288	148,56	5,849	145,77	5,739				
22	35,57	1,401	35,07	1,381	66,70	2,626	65,94	2,596	87,56	3,447	155,64	6,127	152,84	6,017	222,34	8,754	219,29	8,634
(23)	37,19	1,464	36,68	1,444	69,73	2,745	68,97	2,715	91,61	3,607	162,71	6,406	159,92	6,296	232,45	9,151	229,40	9,031
(24)	38,81	1,528	38,30	1,508	72,77	2,865	72,00	2,835	95,65	3,766	169,79	6,685	166,99	6,575	242,55	9,549	239,50	9,429
25	40,43	1,592	39,92	1,572	75,80	2,984	75,04	2,954	99,69	3,926	176,86	6,963	174,07	6,853	252,66	9,947	249,61	9,827
(26)	42,04	1,655	41,53	1,635	78,83	3,104	78,07	3,074	103,73	4,084	183,94	7,242	181,14	7,132	262,76	10,345	259,72	10,225
(27)	43,66	1,719	43,15	1,699	81,86	3,223	81,10	3,193	107,78	4,243	191,01	7,520	188,22	7,410	272,87	10,743	269,82	10,623
28	45,28	1,783	44,77	1,763	84,89	3,342	84,13	3,312	111,82	4,402	198,08	7,799	195,29	7,689	282,98	11,141	279,93	11,021
(30)	48,51	1,910	48,00	1,890	90,96	3,581	90,20	3,551	119,90	4,721	212,23	8,356	209,44	8,246	303,19	11,937	300,14	11,817
32	51,74	2,037	51,24	2,017	97,02	3,820	96,26	3,790	127,99	5,039	226,38	8,913	223,59	8,803	323,40	12,732	320,35	12,612
36	58,21	2,292	57,70	2,272	109,15	4,297	108,39	4,267	144,16	5,676	254,68	10,027	251,89	9,917	363,83	14,324	360,78	14,204
40	64,68	2,546	64,17	2,526	121,28	4,775	120,51	4,745	160,33	6,312	282,98	11,141	280,18	11,031	404,25	15,915	401,21	15,795
48	77,62	3,056	77,11	3,036	145,53	5,730	144,77	5,700	192,67	7,585	339,57	13,369	336,78	13,259	485,10	19,099	482,06	18,979
60	97,02	3,820	96,51	3,800	181,91	7,162	181,15	7,132	241,18	9,495	424,47	16,711	421,67	16,601	606,38	23,873	603,33	23,753
72	116,43	4,584	115,92	4,564	218,30	8,594	217,53	8,564	289,69	11,405	509,36	20,054	506,57	19,944	727,66	28,648	724,61	28,528
84					254,68	10,027	253,92	9,997	338,20	13,315	594,25	23,396	591,46	23,286	848,93	33,423	845,88	33,303
96					291,06	11,459	290,30	11,429	386,71	15,225	679,15	26,738	676,35	26,628	970,21	38,197	967,16	38,077
120					363,83	14,324	363,07	14,294	483,73	19,045	848,93	33,423	846,14	33,313	1 212,76	47,746	1 209,71	47,626
156									629,26	24,774								

Values for number of teeth in brackets are listed for information only and should be regarded as non-preferred sizes.

4.2.2 Tolerances on pulley diameters are given in table 6.

4.3 Flange dimensions

The pulley flange dimensions are given in table 7 and figure 4.

Table 6 — Tolerances on diameter

Outside diameter		Tolerances	
mm	in	mm	in
Up to and including 25,40	Up to and including 1.000	+ 0,05 0	+ 0.002 0
Over 25,40 up to and including 50,80	Over 1.000 up to and including 2.000	+ 0,08 0	+ 0.003 0
Over 50,80 up to and including 101,60	Over 2.000 up to and including 4.000	+ 0,10 0	+ 0.004 0
Over 101,60 up to and including 177,80	Over 4.000 up to and including 7.000	+ 0,13 0	+ 0.005 0
Over 177,80 up to and including 304,80	Over 7.000 up to and including 12.000	+ 0,15 0	+ 0.006 0
Over 304,80 up to and including 508,00	Over 12.000 up to and including 20.000	+ 0,18 0	+ 0.007 0
Over 508,00	Over 20.000	+ 0,20 0	+ 0.008 0

Table 7 — Minimum flange height

Pitch code	Minimum flange height	
	mm	in
XL	1,0	0.04
L	1,5	0.06
H	2,0	0.08
XH	4,8	0.19
XXH	6,1	0.24

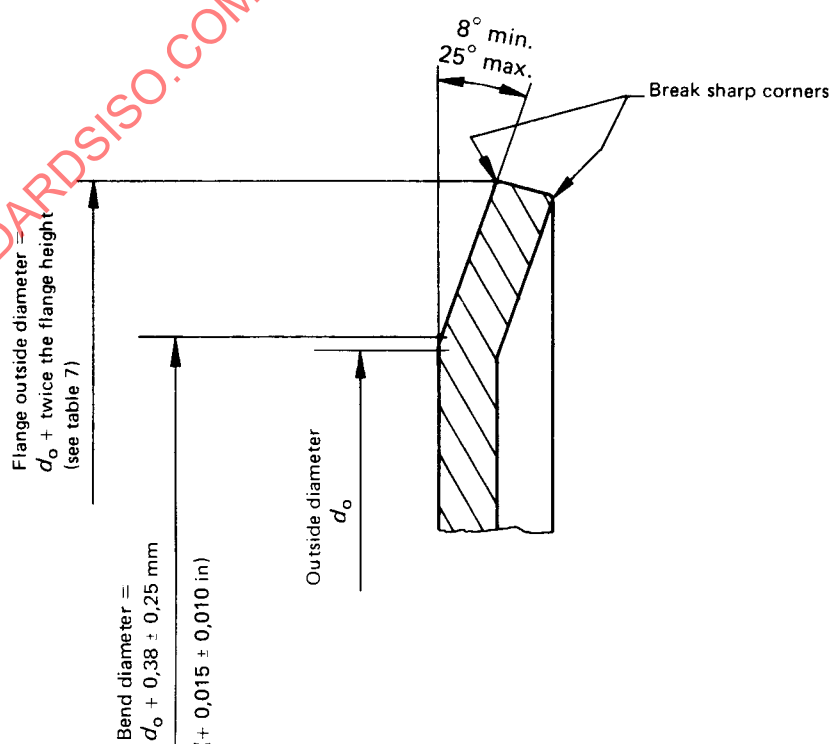


Figure 4 — Flange dimensions