

MPTA B1c-2010

BORE AND KEYWAY TOLERANCES
FOR V-BELTED SHEAVES



MPTA STANDARD

Contributors

B&B Manufacturing, Inc.	LaPorte, IN	www.bbman.com
Baldor Dodge Maska	Greenville, SC	www.baldor.com
Carlisle PT Products, Inc.	Miamisburg, OH	www.carlislebelts.com
Custom Machine & Tool Co., Inc.	East Weymouth, MA	www.cmtco.com
Diamond Precision Products A Division of Saelens Corporation	Johnson Creek, WI	www.diamondprecision.com
Emerson Power Transmission	Maysville, KY	www.emerson-ept.com
Gates Corporation	Denver, CO	www.gates.com
Goldens' Foundry & Machine Co.	Columbus, GA	www.gfmco.com
Lovejoy, Inc.	Downers Grove, IL	www.lovejoy-inc.com
Martin Sprocket & Gear, Inc.	Arlington, TX	www.martinsprocket.com
Maurey Manufacturing Corp.	Holly Springs, MS	www.maurey.com
New Hampshire Industries, Inc. H. Neuman & Company Myers Manufacturing	Lebanon, NH	www.nhipulleys.com
TB Wood's Incorporated	Chambersburg, PA	www.tbwoods.com
Torque Transmission	Fairport Harbor, OH	www.torquetrans.com
Veyance Technologies, Inc. Goodyear Engineerer Products	Fairlawn, OH	www.goodyearep.com/PTP

This publication is presented for the purpose of providing reference information only. You should not rely solely on the information contained herein. Mechanical Power Transmission Association (MPTA) recommends that you consult with appropriate engineers and /or other professionals for specific needs. Again, this publication is for reference information only and in no event will MPTA be liable for direct, indirect, incidental or consequential damages arising from the use of this information.

Abstract

This standard defines the bore and keyway tolerances to be used for V-belted sheaves.

Foreword

This foreword is provided for informational purposes only and is not to be construed to be part of any technical specification.

This standard was revised to expand the metric bore and keyway tolerances to include the range as stated in ISO R773.

Suggestions for the improvement of, or comments on this publication are welcome. They should be mailed to Mechanical Power Transmission Association, 6724 Lone Oak Blvd., Naples, FL 34109 on your company letterhead.

Scope

This standard applies to sheaves for rubber V-Belts covered under RMA/MPTA publications IP-20 (Classical), IP-21 (Double -V), IP-22 (Narrow), IP-23 (Light Duty), and IP-26 (V-Ribbed). It does not cover timing pulleys and sprockets.

This standard applies to cylindrical finished bore (bored-to-size) sheaves and does not apply to tapered bores of any kind, including those for tapered bushings.

This standard applies to bore lengths up to and including 3 times the bore diameter, up to and including a maximum length through bore of 6 inches. For bores beyond these lengths, consult the manufacturer. Longer bores may be difficult to make with standard processes and may become more costly to produce.

Nomenclature

Symbol	Description
d	Hub keyway depth
D	Bore diameter
H	Key height
T	Distance from the top of hub keyway to opposite side of hub bore
t2	Distance from the bore radius to the top of the keyway
W	Key and keyway width

1 Bore and Keyway Tolerances, Inches

1.1 Bore Tolerance

Bores conforming to this standard will have the tolerances listed in Table 1 (Adopted from ISO 286-2, H9).

Table 1, Bore Tolerance (Inches)

Bore, D		Plus Tolerance	Minus Tolerance
Over	Through		
0	3/8	0.0014	0.0000
3/8	11/16	0.0017	0.0000
11/16	1 5/32	0.0020	0.0000
1 5/32	1 15/16	0.0024	0.0000
1 15/16	3 1/8	0.0029	0.0000
3 1/8	4 11/16	0.0034	0.0000
4 11/16	7 1/16	0.0039	0.0000
7 1/16	9 13/16	0.0045	0.0000
9 13/16	12 3/8	0.0051	0.0000

1.2 Hub Keyway Tolerance

This standard specifies the keyway width tolerance in a traditional way; as a positive tolerance. The keyway depth tolerance is specified in a way that differs from previous MPTA practice.

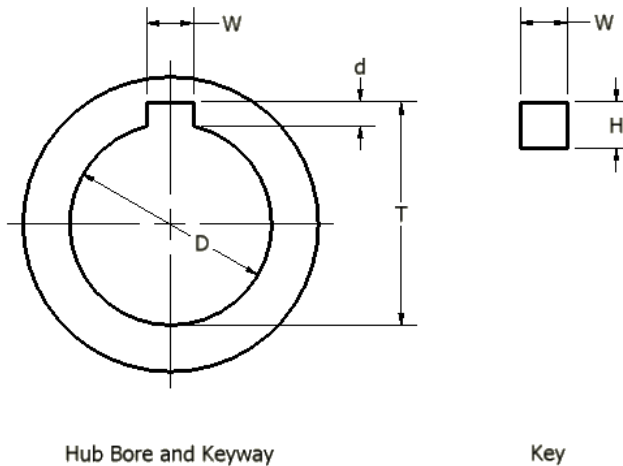
American keyway depths are identified by the depth of the keyway sidewall. The sidewall dimension is measured from the corner where the keyway intersects the bore to the top of the keyway. For instance, a "1/4 x 1/8" keyway has two sidewalls that are 1/8 inch deep, shown as "d" in figure 1. Dimension "d" provides an effective method of specifying and determining the nominal keyway depth. However, since the corner of the keyway is normally chamfered, it is difficult to accurately measure a keyway's depth during manufacture.

As a result, this standard applies the depth tolerance to a "T" dimension. The "T" dimension is the distance from the top of the keyway to the opposite side of the bore, shown in Figure 1. The "T" dimension is calculated using Formula 1 and will have a unique value for each bore and key combination. To ensure a clearance fit, the depth tolerance is large enough to accommodate the bore tolerance range. Table 2 provides the keyway width and depth tolerances. Table 3 provides the "T" dimension for common bore and key combinations.

Table 2, Hub Keyway Tolerances (Inches)

Nominal Key Width		Hub Keyway Tolerance	
Over	Through	Width, $W \pm \text{tol}$	Depth, $T \pm \text{tol}$
0.0000	0.3125	+0.0020 -0.0000	+0.016 -0.000
0.3125	0.5000	+0.0025 -0.0000	+0.016 -0.000
0.5000	1.0000	+0.0030 -0.0000	+0.016 -0.000
1.0000	1.5000	+0.0035 -0.0000	+0.016 -0.000
1.5000	2.0000	+0.0040 -0.0000	+0.016 -0.000

Figure 1



Formula 1

$$T = \frac{D + H + \sqrt{D^2 - W^2}}{2} + 0.005$$

Where:

D = Nominal shaft or bore diameter, inches

H = Nominal key height, inches

T = Distance from the top of hub keyway to opposite side of hub bore, inches.

W = Nominal key and keyway width, inches

Table 3, Sample of T dimensions for common bores (Inches)

Bore D	Nominal Key		T
	W	H	
5/8	3/16	3/16	0.709
7/8	3/16	3/16	0.964
1 1/8	1/4	1/4	1.241
1 3/8	5/16	5/16	1.518
1 5/8	3/8	3/8	1.796
1 7/8	1/2	1/2	2.096
2 1/8	1/2	1/2	2.350
2 3/8	5/8	5/8	2.651
2 7/8	3/4	3/4	3.205
3 3/8	7/8	7/8	3.760

2 Bore and Keyway Tolerances, Millimeters

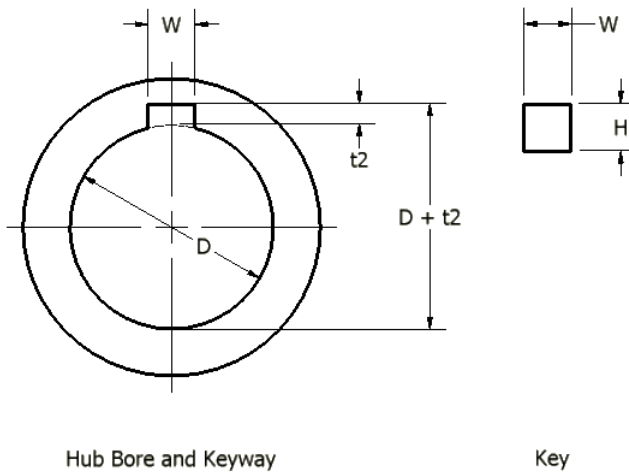
2.1 Bore Tolerance

Bores conforming to this standard will have the tolerances listed in Table 4 (Adopted from ISO 286-2, H9).

Table 4, Bore Tolerance (mm)

Bore, D		Plus Tolerance	Minus Tolerance
Over	Through		
6	10	0.036	0.000
10	18	0.043	0.000
18	30	0.052	0.000
30	50	0.062	0.000
50	80	0.074	0.000
80	120	0.087	0.000
120	180	0.100	0.000
180	250	0.115	0.000
250	315	0.130	0.000
315	400	0.140	0.000
400	500	0.155	0.000

Figure 2



Where:

D = Nominal shaft or bore diameter, inches

H = Nominal key height, inches

t_2 = Distance from the bore radius to the top of the keyway.

W = Nominal key and keyway width, inches

2.2 Hub Keyway Tolerance

Keyway dimensions and tolerances listed in Table 5 were specified according to ISO/R773 (Normal Fit).

Table 5, Keyway dimension and tolerance (mm)

Bore Diameter, D		Key Size		Hub Keyway Dimensions			
Over	Through	Width W	Height H	Width		Depth	
				W	W ± tol	t2	t2 ± tol
6	8	2	2	2	0.0125	1.0	+0.1 -0.0
8	10	3	3	3	0.0125	1.4	+0.1 -0.0
10	12	4	4	4	0.0150	1.8	+0.1 -0.0
12	17	5	5	5	0.0150	2.3	+0.1 -0.0
17	22	6	6	6	0.0150	2.8	+0.1 -0.0
22	30	8	7	8	0.0180	3.3	+0.2 -0.0
30	38	10	8	10	0.0180	3.3	+0.2 -0.0
38	44	12	8	12	0.0215	3.3	+0.2 -0.0
44	50	14	9	14	0.0215	3.8	+0.2 -0.0
50	58	16	10	16	0.0215	4.3	+0.2 -0.0
58	65	18	11	18	0.0215	4.4	+0.2 -0.0
65	75	20	12	20	0.0260	4.9	+0.2 -0.0
75	85	22	14	22	0.0260	5.4	+0.2 -0.0
85	95	25	14	25	0.0260	5.4	+0.2 -0.0
95	110	28	16	28	0.0260	6.4	+0.2 -0.0
110	130	32	18	32	0.0310	7.4	+0.2 -0.0
130	150	36	20	36	0.0310	8.4	+0.3 -0.0
150	170	40	22	40	0.0310	9.4	+0.3 -0.0
170	200	45	25	45	0.0310	10.4	+0.3 -0.0
200	230	50	28	50	0.0310	11.4	+0.3 -0.0
230	260	56	32	56	0.0370	12.4	+0.3 -0.0
260	290	63	32	63	0.0370	12.4	+0.3 -0.0
290	330	70	36	70	0.0370	14.4	+0.3 -0.0
330	380	80	40	80	0.0370	15.4	+0.3 -0.0
380	440	90	45	90	0.0435	17.4	+0.3 -0.0
440	500	100	50	100	0.0435	19.5	+0.3 -0.0