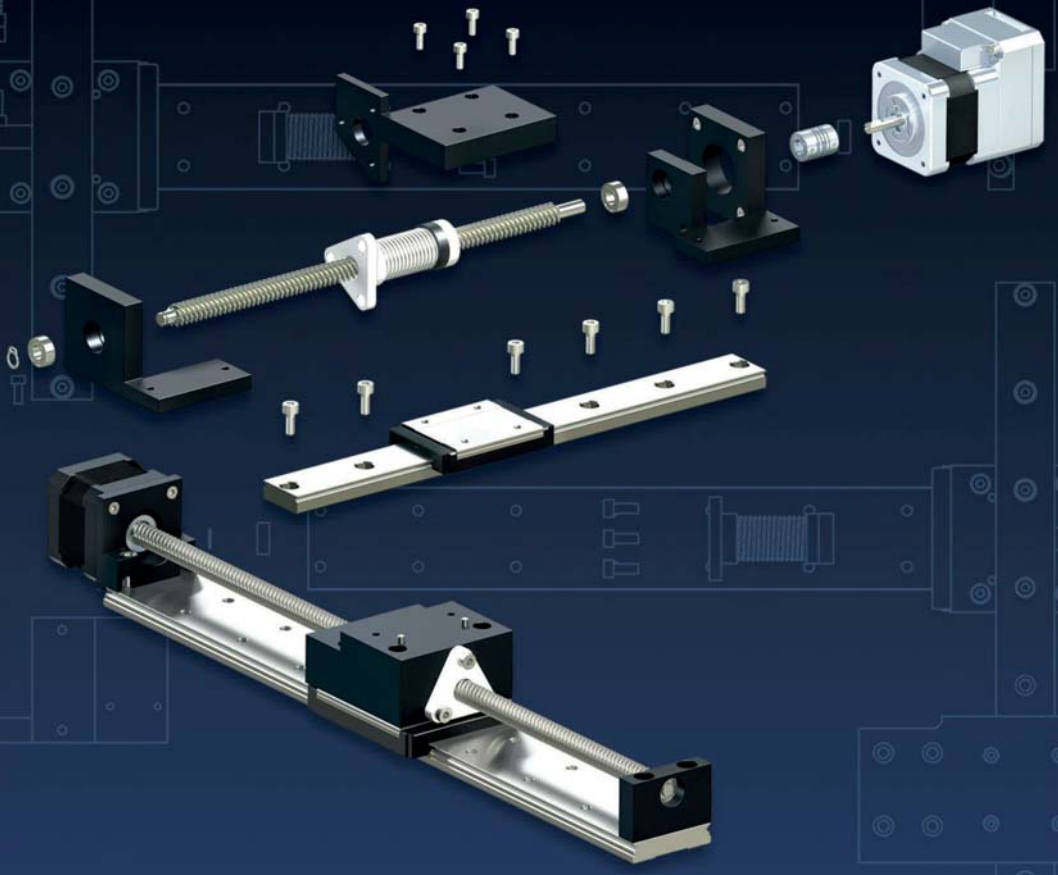
Reliance®
Precision Limited



Precise Motion Control Solutions

Belts and Pulleys

Contents

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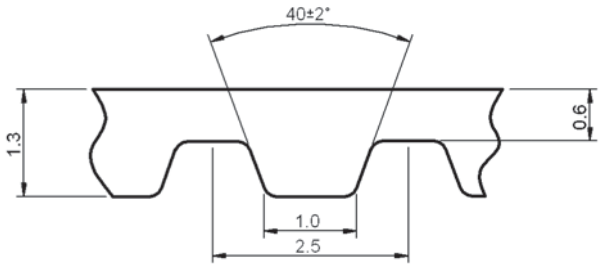
All dimensions in mm
Material: High tensile steel reinforced polyurethane

Associated Products
Timing pulleys: page 10-3



Part number selection table

Example Part No:- **TXM25 F6- 168**

Basic Part Number	Belt Width	Standard Lengths#			
		Number of Pitches	Length mm	Number of Pitches	Length mm
TXM25	6 mm F6-	48	120.0	127	317.5
		58	145.0	132	330.0
		64	160.0	152	380.0
		71	177.5	168	420.0
		72	180.0	192	480.0
		73	182.5	200	500.0
		80	200.0	240	600.0
		92	230.0	248	620.0
		98	245.0	260	650.0
		106	265.0	312	780.0
		114	285.0	380	950.0
		116	290.0		

The belt thickness may differ if a non-standard length is ordered

Features and options

- Temperature range: -10°C to +80°C
- Maximum allowable peripheral load: 6 mm wide = 65 N
- Maximum peripheral speed: 80 m/s
- Special polyurethanes available
- Double-sided belt available
- Alternative lengths available#
- Alternative colours available
- Kevlar tension members available
- Anti-static belts available

Technical support

- Technical information - see page T10-1
- Design guidelines - see page T10-2

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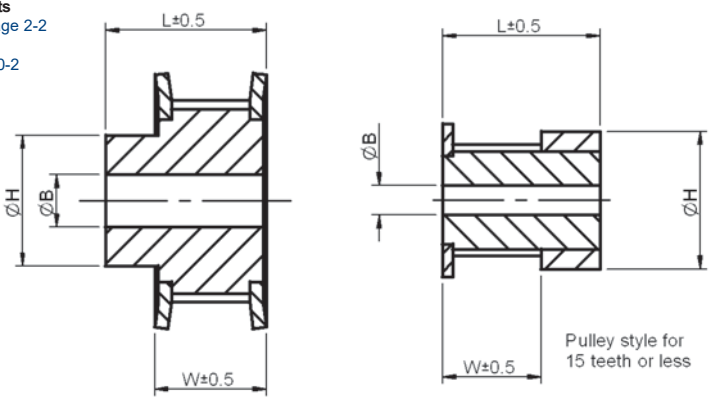
Associated Products
Intelligent motors: page 2-2
Shafts: page 11-2
Timing belts: page 10-2

All dimensions in mm
Materials: Aluminium alloy pulley with zinc plated steel flanges



Part number selection table

When belt width = 6, W=10 & L=16

Example Part No:- **TPMP25 F6- 60**

Basic Part Number	Belt Width	No. of Teeth	Pitch Diameter	Bore ØB (H8)	Hub Diameter ØH ±1.0
TPMP25	6 mm F6-	12	9.55	3	13
		14	11.14		15
		15	11.94		15
		18	14.32	4	10
		19	15.12		10
		20	15.92		11
		24	19.10		12
		25	19.89		13
		30	23.87	6	16
		32	25.46		16
		36	28.65		20
		40	31.83		22
		48*	38.20		26
		60*	47.75	8	34

*Pulleys with 48 and 60 teeth are unflanged

Features and options

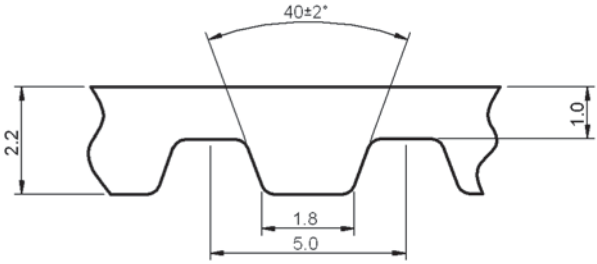
- Zero-backlash pulleys
- Other numbers of teeth available
- 0, 1 or 2 flanges available
- Tapped holes in hubs available
- Alternative bore diameters available
- Alternative mountings available
- Keyed bores available

Technical support

- Technical information - see page T10-1
- Design guidelines - see page T10-2

All dimensions in mm
Material: High tensile steel reinforced polyurethane

Associated Products
Timing pulleys: page 10-5



Part number selection table

Example Part No:- **TXM50 F10- 168**

Basic Part Number	Belt Width	Standard Lengths#					
		Number of Pitches	Length mm	Number of Pitches	Length mm	Number of Pitches	Length mm
TXM50	10 mm F10-	**20**	100	**66**	330	**126**	630
		30	150	**68**	340	**138**	690
		33	165	**73**	365	**140**	700
		36	180	**80**	400	**145**	725
		37	185	**82**	410	**150**	750
		40	200	**84**	420	**156**	780
		42	210	**91**	455	**163**	815
	or	**43**	215	**96**	480	**168**	840
		45	225	**100**	500	**180**	900
		49	245	**102**	510	**185**	925
	16 mm F16-	**50**	250	**105**	525	**188**	940
		52	260	**110**	550	**198**	990
		54	270	**115**	575	**215**	1,075
		56	280	**122**	610	**243**	1,215
		59	295	**124**	620	**276**	1,380

The belt thickness may differ if a non-standard length is ordered

Features and options

- Temperature range: -10°C to +80°C
- Maximum allowable peripheral load: 10 mm wide = 330 N, 16 mm wide = 570 N
- Maximum peripheral speed: 80 m/s
- Special polyurethanes available
- Double-sided belt available
- Alternative lengths available#
- Alternative colours available
- Kevlar tension members available
- Anti-static belts available

Technical support

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Associated Products
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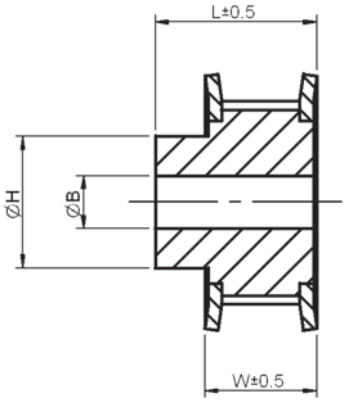

All dimensions in mm
Materials:Aluminium alloy pulley with zinc plated steel flanges

Part number selection table

When belt width = 10, W=15 & L=21
When belt width = 16, W=21 & L=27

Example Part No:- **TPMP50 F10- 60**

Basic Part Number	Belt Width	No. of Teeth	Pitch Diameter	Bore ØB (H8)	Hub Diameter ØH ±1.0
TPMP50	10 mm F10- or 16 mm F16-	10	15.92	4	8
		12	19.10		11
		14	22.28	6	13
		15	23.87		16
		16	25.46		18
		18	28.65		20
		19	30.24		22
		20	31.83		23
		24	38.20		26
		25	39.79		26
		27	42.97	8	30
		30	47.75		34
		32	50.93		38
		36	57.30		38
		40	63.66		40
		48*	76.39		50
		60*	95.49		65

*Pulleys with 48 and 60 teeth are unflanged

Features and options

- Zero-backlash pulleys
- Other numbers of teeth available
- 0, 1 or 2 flanges available
- Tapped holes in hubs available
- Alternative bore diameters available
- Alternative mountings available
- Keyed bores available

Technical support

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INTRODUCTION

Timing belts are endless toothed belt systems available in 2.5 mm and 5 mm pitch; intended for applications requiring a level of power transmission.

ENGINEERING DATA

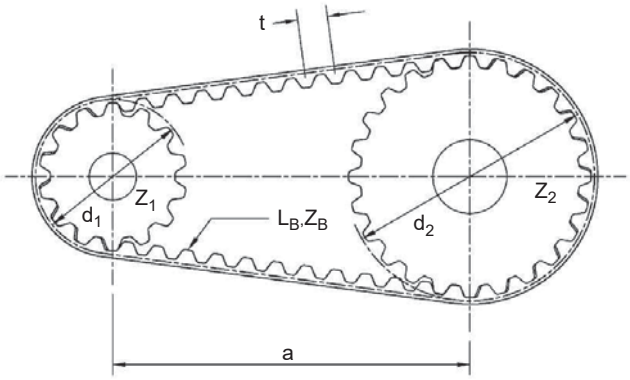
1. Belt and Chain Length

Knowing the centre distance, the belt length can be calculated from the following:

For ratios = 1:1 $L_B = Z_1 \times t + 2a$ [mm]

For ratios ≠ 1:1 (approximate formula) $L_B \approx \frac{t}{2}(Z_2 + Z_1) + 2a + \frac{1}{4a}\left[\frac{(Z_2 - Z)t}{\pi}\right]^2$ [mm]

a	=	Centre distance			
L_B	=	Belt length	t	=	Belt pitch
d_1	=	Pitch diameter small pulley	d_2	=	Pitch circle diameter large pulley
Z_1	=	No of teeth, small pulley	Z_2	=	No of teeth, large pulley
Z_B	=	No of teeth in belt	Z_e	=	No of teeth in mesh



2. Centre Distance Calculation

Knowing the belt length, the centre distance can be calculated from the following;

For ratios = 1:1

$$a = \frac{(Z_B - Z_1)t}{2} \quad \text{[mm]}$$

For ratios ≠ 1:1

(approximate formula)

$$a \approx \frac{L_B - \frac{\pi}{2} \times (d_2 + d_1)}{4} + \sqrt{\left(\frac{L_B - \frac{\pi}{2} \times (d_2 + d_1)}{4}\right)^2 - \frac{(d_2 - d_1)^2}{8}} \quad \text{[mm]}$$

$$d_1 = \frac{Z_1 \times t}{\pi} \quad \text{[mm]} \qquad d_2 = \frac{Z_2 \times t}{\pi} \quad \text{[mm]}$$

3. Design Guidelines

Timing belt efficiency ranges from 95 to 98%, better than flat vee belts which rely on friction to transmit power. The 2.5 mm and 5 mm pitch timing belts are manufactured in wear resistant polyurethane with high grade steel wire tension members, therefore any elongation due to load and pre-tension will follow Hookes' law. The manufacturing process for these timing belts produces the 'classical' trapeziodal tooth form to close tolerances. This ensures an even distribution of load during use and the transmission of high torques. These belts are suitable for indexing, positioning and conveying drives.

It is possible to design drives with fixed centres but generally the drive centres should be adjustable or have idler pulleys. This is particularly important in multi-shaft or high power drives. The idler pulleys should be fitted to the slack side of the drive and must not be spring loaded. Timing belt drives do not require as much tension as other belt drives which depend on friction to transmit load. The belt should be installed with a snug fit, neither taut nor loose. As a general guide the correct level of tension can be determined by measuring the force necessary to deflect the belt an amount equal to 1/64th of the span centres "a". Values for the measuring force recorded on a spring balance applied mid-span should be within 20% of the values shown below.

2.5 mm - 0.07kg 5 mm - 0.30kg

The belts must be rigidly mounted. Variation in centre distance can lead to premature wear. The belt and pulley system must be assembled loose to prevent over stretching. The belts are guided on the pulleys by flanges. One pulley should be flanged on both sides, or two alternative flanges provided, one on each pulley. For drives with vertical shafts, both pulleys should be flanged on both sides.

For a belt to transmit full power, a minimum of 6 teeth must be in mesh on each pulley. The number of teeth in mesh can be determined from the following formula:

$$Ze = \frac{Z_1}{180} \cdot \arccos \frac{(Z_2 - Z_1) \times t}{2 \pi a}$$

Number of teeth in mesh calculation is always based on the smallest pulley.

To minimise belt fatigue, pulleys with a minimum of 20 teeth are recommended. As a general guide larger pulleys reduce the amount of belt flexing and therefore improve belt life.

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