Reliance®

Precision Mechatronics

Standard and Customised Components and Assemblies

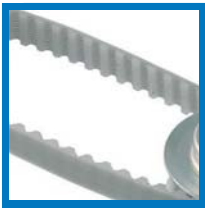
A complete source for precise motion control

Belts and Pulleys

Steel reinforced polyurethane belts with aluminium pulleys.

Pulleys

Pitches from 2.5mm and 5mm
Bores from Ø3mm to Ø8mm



Timing Belts

Lengths up to 1380mm
Widths from 6mm to 16mm

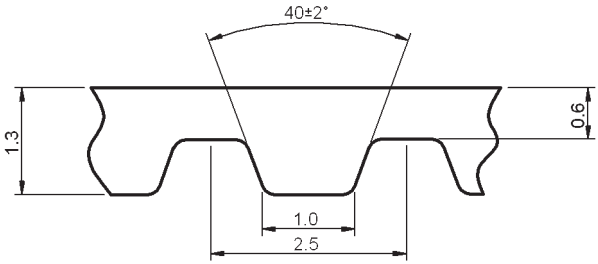
Belts and Pulleys

Section Contents

For Technical Information
please see Page T10-1

All dimensions in mm
General tolerances ±0.13mm
Material: High tensile steel reinforced polyurethane
Width: 6mm and 10mm

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	6mm F6-	22	55.0	116	290.0
		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
	10mm F10-	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

- Temperature range: -30°C to +80°C
- Maximum allowable peripheral load: 6mm wide = 65N, 10mm wide = 117N
- Maximum peripheral speed: 80m/s
- Belt width tolerance: ±0.3mm

Non-standard options, please contact our sales team

- Coloured
- With Kevlar tension members
- Anti-static
- Special polyurethanes
- Double-sided belt
- Alternative lengths

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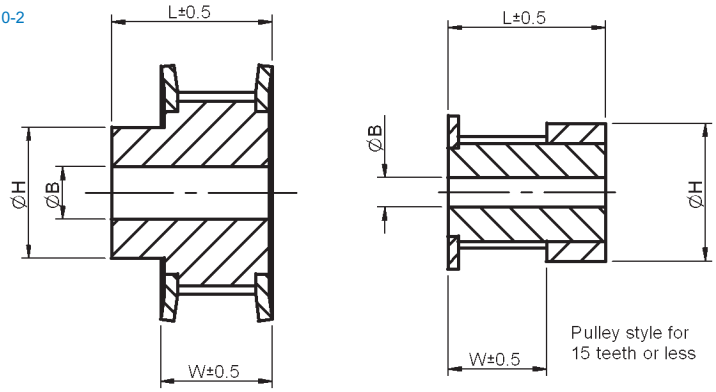
Associated Products
Motors: page 2-1
Shafts: page 11-2
Timing belts: page 10-2

All dimensions in mm
General tolerances ±0.13mm
Materials: Free machining aluminium alloy pulley, zinc plated steel flanges



Part number selection table

When Belt width = 6, W=10 & L=16
Belt width = 10, W=14 & L=20

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

Basic Part Number	Belt Width	No. of Teeth	Pitch Diameter	Bore ØB (H7)	Hub Diameter ØH ±1.0	Backlash
TPMP25	6mm F6- or 10mm F10-	12	9.55	3	12	±0.08mm
		14	11.14		14	
		15	11.94		15	
		18	14.32	4	10	
		19	15.12		10	
		20	15.92		12	
		24	19.10		14	±0.15mm
		25	19.89		14	
		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

Non-standard options, please contact our sales team

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

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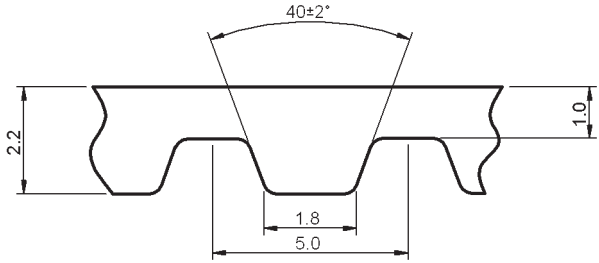
All dimensions in mm
General tolerances ±0.13mm
Material: High tensile steel reinforced polyurethane
Width: 10mm and 16mm

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
		20	100	66	330	126	630
		30	150	68	340	138	690
		33	165	73	365	140	700
	10mm	36	180	80	400	145	725
	F10-	37	185	82	410	150	750
		40	200	84	420	156	780
		42	210	91	455	163	815
TXM50	or	43	215	96	480	168	840
		45	225	100	500	180	900
		49	245	102	510	185	925
	16mm	50	250	105	525	188	940
	F16-	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

- Temperature range: -30°C to +80°C
- Maximum allowable peripheral load: 10mm wide = 330N, 16mm wide = 570N
- Maximum peripheral speed: 80m/s
- Belt width tolerance: ±0.3mm

Non-standard options, please contact our sales team

- Coloured
- With Kevlar tension members
- Anti-static
- Special polyurethanes
- Double-sided belt
- Alternative lengths

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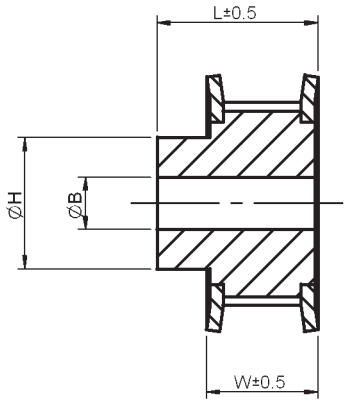
Associated Products
Motors: page 2-1
Shafts: page 11-2
Timing belts: page 10-4

All dimensions in mm
General tolerances ±0.13mm
Materials: Free machining aluminium alloy pulley, zinc plated steel flanges



Part number selection table

When Belt width = 10, W=15 & L=21
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 (H7)	Hub Diameter ØH ±1.0	Backlash
TPMP50	10mm F10-	10	15.92	4	8	±0.08mm
		12	19.10		12	
		14	22.28	6	14	
		15	23.87		16	
		16	25.46		18	
		18	28.65		20	
		19	30.24		22	
	or	20	31.83		24	
		24	38.20		26	±0.15mm
		25	39.79		26	
	16mm F16-	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

Non-standard options, please contact our sales team

- Zero-backlash pulleys
- Any boss size/length
- 0, 1 or 2 flanges
- Tapped holes in hubs
- Hubless
- Keyed bores

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INTRODUCTION

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

ENGINEERING DATA

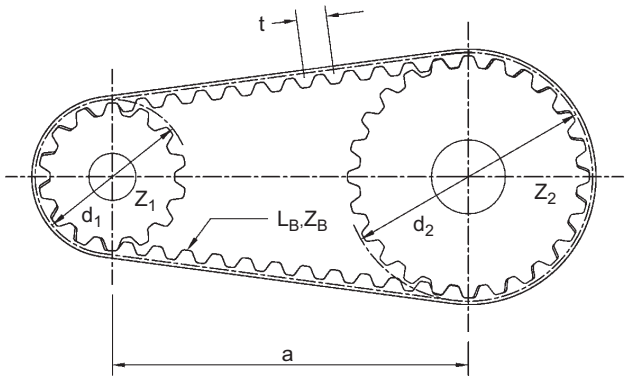
1. Belt and Chain Length

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

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

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



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2. Centre Distance Calculation

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

For ratios = 1:1

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

For ratios ≠ 1:1 (approximate formula)

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

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

3. Design Guidelines

Timing belt efficiency ranges from 95 to 98%, better than flat vee belts which rely on friction to transmit power. The 2.5mm and 5mm 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.

2.5mm - 0.07kg 5mm - 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:

$$Ze = \frac{Z_1}{180} * \text{arc cos} \quad \frac{(Z_2 - Z_1) \times t}{2 \pi a}$$

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.

In addition to these conditions of sale, our standard Conditions of Sale also apply. A copy of these is available on request and from our website www.rpmechatronics.co.uk/en/help

Minimum order charge - Orders are subject to a minimum order charge of £25.00 unless they have been placed on our website at www.rpmechatronics.co.uk

Carriage and packing - Additional charges are made for carriage and packing.

Payment - Payment terms are 30 days. New customers are requested to complete an application form for a credit account. Customers who do not have a credit account with Reliance are requested to supply cheque with order. In addition, orders may be paid for by Visa and Mastercard.

Telephone orders - An order number must be quoted by customers and a written confirmatory order, clearly marked "CONFIRMATION", sent within 7 days. We reserve the right to supply parts against a telephone order. All telephone orders are accepted subject to these conditions of sale and those detailed on the acknowledgement of order. An acknowledgement will normally be sent by Reliance on receipt of order and goods will be supplied in accordance with the order acknowledgement.

Certificates of Conformance - Reliance's quality management system is certified to AS9100 and ISO 9001. A Certificate of Conformance can be supplied at an additional charge of £10.00 per delivery. Alternatively, a Certificate with full material traceability can be supplied at a charge of £20.00 per delivery.

Confirmation - All orders, other than telephone orders with a value of less than £500 and orders placed through our website, are subject to acceptance in writing by Reliance Precision Mechatronics.

Order amendments - Order amendments are subject to our approval and a charge will be made for reasonable compensation for any costs incurred.

Returns - Unused items may, solely at our discretion, be accepted for credit within 90 days of delivery. Any parts so accepted will be subject to a 20% service charge for re-inspection and handling. No credit can be allowed after the above period, or for any used or modified part, or for parts manufactured to a customer's specification.

Additional charges - Reliance reserves the right to charge for all additional expenses and taxes incurred over and above published prices (including without limitation duty, VAT, exchange rate fluctuations etc.)

Alterations - As a result of continuous product development, Reliance reserves the right to alter prices and other details without prior notice and to change dimensions where this does not affect the function of the item.

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