Power Transmission

Inklusive:

optibelt *ZRM:* AT5 und AT10

optiflex: Sortiment

TECHNICAL MANUAL

OPTIBELT POLYURETHANE TIMING BELT DRIVES

optibelt
Power Transmission

Technical Manual
for
Polyurethane Timing Belt Drives

Optibelt ZRM/ZRP/ZRL timing belts are made from polyurethane and are especially suitable for use in difficult environmental conditions

Endless Optibelt ZRM/ZRP timing belts, with corresponding Optibelt ZRS pulleys, provide non-slip, synchronous transmission of power up to several hundred kilowatts.

Where the requirement is for precise positioning in linear drives and smoothly operating conveyor systems, the open-ended and the joined endless Optibelt ZRL timing belts provide the answer.

All essential information and the methods for calculating drives using Optibelt polyurethane timing belts are contained in this manual. Should you have any further questions, the free service provided by our application engineers is readily available.

Power Transmission

Produktionsstätten und Vertriebsorganisation der Arntz Optibelt Gruppe
Manufacturing and Distribution Organisation of the Arntz Optibelt Group

Produktionsstätten **Factories**

Arntz Optibelt GmbH
Postfach 10 01 32 · D-37669 Höxter/Germany
Corveyer Allee 15 · D-37671 Höxter/Germany
Tel. +49 (0) 52 71-6 21
Fax +49 (0) 52 71-97 62 00

Optibelt Produktions GmbH & Co. KG
Carl-Vollrath-Straße 4
D-07422 Bad Blankenburg
Tel. +49 (0) 3 67 41-48 30
Fax +49 (0) 3 67 41-4 21 01

A & M Belting Company Ltd.
Ballyraine Industrial Estate
Letterkenny Co. Donegal
Ireland
Tel. +353 (0) 74 91-2 50 66
Fax +353 (0) 74 91-2 50 61
a+m@optibelt.com

Arntz Belting Company Ltd.
Pennyburn Pass
Londonderry BT48 0AE
Northern Ireland
Tel. +44-28 71-26 12 21
Fax +44-28 71-26 33 86
abc@optibelt.com

Transac S.A.
54, Rue de la Gare
F-68520 Burnhaupt-le-Haut/France
Tél. +33-3-89 62 75 20
Fax +33-3-89 62 75 29

Vertriebsorganisation Deutschland **Distribution Organisation Germany**

Optibelt GmbH
Corveyer Allee 15
37671 Höxter
Tel. +49 (0) 52 71-6 21
Fax +49 (0) 52 71-97 62 00
info@optibelt.com
www.optibelt.com

Optibelt GmbH
Verkaufsbüro Nord
North Sales District
Corveyer Allee 15
D-37671 Höxter
Tel. +49 (0) 52 71-6 23 03
Fax +49 (0) 52 71-97 62 00

Optibelt GmbH
Verkaufsbüro Süd
South Sales District
Pfauhauser Straße 43
D-73240 Wendlingen
Tel. +49 (0) 70 24-71 00
Fax +49 (0) 70 24-5 27 92

Vertriebsorganisation Europa **Distribution Organisation Europe**

Finnland Finland
Optibelt Finland Oy
PL 58
Lampputie 4
FIN-00751 Helsinki
Puh. +358-9-3 46 14 00
Faksi +358-9-3 46 15 00
optibelt@co.inet.fi

Schweden Sweden
Optibelt Skandinaviska AB
Stadiongatan 60
S-21762 Malmö
Tel. +46-40-59 21 20
Direct +46-40-59 21 27
Fax +46-40-49 90 10
optibelt@optibelt.se

Dänemark Denmark
Optibelt Danmark A/S
International House
Center Boulevard
DK-2300 København S
Tlf. +45-32-47 32 34
Fax +46-40-49 90 10
optibelt@optibelt.dk

Großbritannien
United Kingdom
Optibelt (UK) Ltd.
5 Bishops Court
Winwick Quay
GB-Warrington WA2 8QY
Cheshire
Tel. +44-19 25-41 33 11
Fax +44-19 25-57 37 51
optibelt@optibeltuk.co.uk

Niederlande Netherlands
Optibelt Nederland B.V.
Postbus 39
NL-2140 AA Vijfhuizen
Schipholweg 955
NL-2143 CE Boesingheliede
Tel. +31-23-5 55 16 51
Fax +31-23-5 55 19 26
t-online@optibelt.nl

Belgien Belgium
Optibelt GmbH
Filiaal België
Cornelis Schutstraat 28
B-2100 Deurne
Tél. +32-3-3 25 22 75
Fax +32-3-3 26 09 55
optibelt@skynet.be

Österreich Austria
Optibelt Österreich GmbH
Carlbergergasse 38
A-1230 Wien
Tel. +43-1-8 65 43 97
Fax +43-1-8 65 43 96
office@optibelt.at

Frankreich France
Optibelt France S.A.S
54, Rue de la Gare
B.P. N° 13
F-68520 Burnhaupt-le-Haut
Tél. +33-3-89 62 75 10
Fax +33-3-89 62 75 19
optibelt-france@optibelt.fr

Schweiz Switzerland
Optibelt AG
Bodenackerstrasse 70
CH-4657 Dulliken
Tel. +41-62-285 50 00
Fax +41-62-285 50 01
vertrieb@optibelt.ch

Spanien Spain
Optibelt España, S.A.
Apartado 1141
Rois de Corella, 12
E-08205 Sabadell
Tel. +34-93-7 20 79 60
Fax +34-93-7 11 64 90
administracion@optibelt.net

Italien Italy
Optibelt AG
Via Dandolo, 1
I-20025 Legnano (Mi)
Tel. +39-0331-48 10 20
Fax +39-0331-48 10 75
optibeltitalia@libero.it

Polen Poland
Optibelt Polska Sp. z o.o.
ul. Budowlanych 11
PL-41-303 Dąbrowa Górnicza
Tel. +48-32-260 1175/76
Faks+48-32-260 4208
biuro@optibelt.net.pl

Ost-Europa
Eastern Europe GUS
Optibelt Russland
Varshavskoje Shosse,
125D, Korpus 1
113587 Moskau
Tel./Fax +7 09 59 95 05 41
Mobile +7 90 37 74 35 34
optibeltrus@ccs.ru

Südost-Europa
South Eastern Europe
Optibelt GmbH
Südost-Europa · Office Wien
Carlbergergasse 38
A-1230 Wien
Tel. +43-1-8 65 31 00 19
Fax +43-1-8 65 31 00 27
office@optibelt.at

Vertriebsorganisation Nord- u. Südamerika **Distribution Organisation North & South America**

USA USA
Optibelt Corporation
1120 W. National Avenue
Addison, Illinois 60 101/USA
Tel. +1-630-628-84 00
Fax +1-630-628-61 75
optibelt@msn.com

Kanada Canada
Optibelt (Canada) Inc.
351 Steelcase Road West, Unit 8 & 9
L3R 4H9 Markham, Ontario/Canada
Tel. +1-905-477-8114
Fax +1-905-477-0857
info@optibelt.ca

Brasilien Brasil
Optibelt do Brasil Ltda.
Rua Henrique Monteiro Nr. 90
10 Andar-Pinheiros
CEP 05423-020 São Paulo-SP/Brasil
optibeltdobrasil@optibelt.com

Vertriebsorganisation Asien **Distribution Organisation Asia**

Singapur Singapore
Optibelt Asia Pacific Pte. Ltd.
No. 4 Loyang Way 1, # 01-02/03
Singapore 508708
Tel. +65-6545 4682
Fax +65-6545 4685
sales@optibelt.com.sg

China China
Optibelt Power Transmission (Shanghai) Co., Ltd.
55 Miaosan Road, Songjiang District
Shanghai 201612/P.R. China
Tel. +86-21-5768 7465
Fax +86-21-5768 7462
sales@optibelt.com.cn

www.optibelt.com

optibelt
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1 Product Description
1.1 Construction

Introduction

Since the introduction of the first timing belt at the end of the 40's, this type of drive element has gained in importance for the synchronous transmission of torque and power. The non-slip timing belt has been successfully employed in many standard drives and has provided economical design solutions in every sector of mechanical engineering.

The position that the timing belt occupies today is due to the development of tooth profiles and belt design. The Optibelt ZRM/ZRP/ZRL single and double-section polyurethane timing belts are a result of this progress. The properties specific to the polyurethane, offer the following advantages:

- **High resistance to abrasion**
- **Good to very good resistance to oil, grease and a number of aggressive chemicals**
- **Colour fast**
- **Simple to weld, for attaching cleats and joining endless to make belts of any length**
- **High resistance to tooth shear**
- **Good thermal tolerance (–30 °C to +80 °C)**
- **Good electrical insulation properties using polyurethane with Aramid tension cord**
- **Ageing resistant**
- **Ozone and UV resistant**

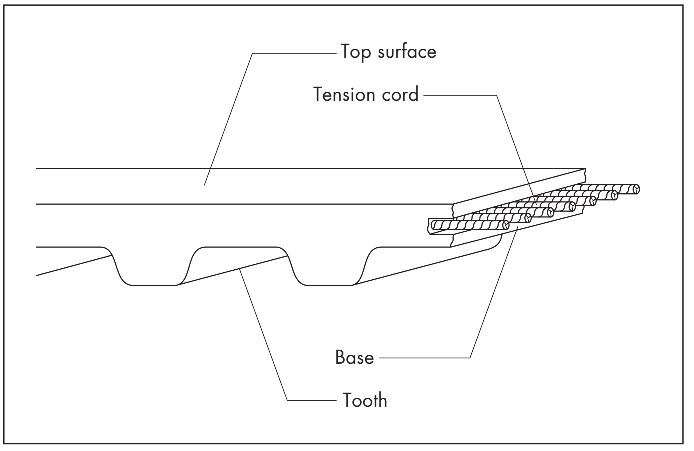
Apart from the higher noise level at high belt speeds when compared to V-belt drives, the timing belt has all of the advantages of other drive mechanisms.

- **Synchronous speed transmission, high angle and positional accuracy due to the low-stretch tension member and to the positive pulley/belt interlock.**
- **Double section belts permit multi-pulley arrangements and contra-rotating pulleys.**
- **Belt flexibility allows high drive ratios requiring minimum space.**
- **Low belt specific mass enables high belt speeds.**
- **Low-stretch tension cord means zero maintenance.**
- **High drive efficiency due to belt flexibility and lack of slip.**
- **The low drive tension allows the use of smaller drive bearings.**
- **No drive lubricant necessary, thus the drive is environmentally friendly.**
- **Durable belt components ensure longer belt life.**

In addition to the features of the standard synchronised drive, the Optibelt ZRM/ZRP/ZRL timing belts offer the additional advantages of polyurethane, as shown above, as a contribution to the economical solution of design problems.

Construction: Timing belts

Fig. 1.1: Timing belts



a) Top surface

The top surface of the belt is polyurethane. Its function is to hold and support the tension cord. This abrasion-proof, thin and extremely flexible layer also protects the tension cord against wear and the effects of ambient conditions.

b) Tension cord

The tension cord of the endless Optibelt ZRM/ZRP timing belt is spirally wound steel cord. The teeth, base and top surface form a unit so that the tension cord is enclosed in polyurethane.

The extremely strong, low stretch tension cord has a very small cross section.

The open-ended Optibelt ZRL-M belting has parallel steel or Aramid tension cords. This is also the case with the joined endless Optibelt ZRL-V timing belt.

c) Teeth and base

The polyurethane teeth transfer power between the pulley teeth and the belt tension cord, whilst the polyurethane base cushions the tension cord against the abrasion from the top of the pulley teeth (see Fig. 1.3).

The durable, shear resistant belt teeth are so formed and arranged as to engage with the matching pulley with minimum friction and maximum precision. When six teeth on the belt type ZRL-V, and twelve teeth or more on the ZRM, ZRP and ZRL-M belts are in mesh with the small pulley at any one time, their shear resistance exceeds the maximum permitted circumferential force of the timing belt.

Power Transmission

1 Product Description
1.1 Construction

Construction of the double section timing belt

The construction of the double section timing belt is similar to the normal timing belt already described. The number and spacing of the teeth are identical on both sides of the belt, but the two sides are offset to each other (see Fig. 1.2).

The tension cord and its position relative to the base and teeth are the same. The maximum permitted power of the double section timing belt is therefore not doubled but is the same as for the corresponding normal belt. The power can be transmitted by both sides of the belt as required.

The tooth pitch 't' is the distance between two corresponding points on adjacent teeth on either the belt or the pulley effective diameter.

When the timing belt is laid flat the tooth pitch 't' can be measured from tooth centre to centre.

When the belt is bent around a pulley the tooth pitch 't' is measured at the level of the tension cord, also called the effective radius. The effective diameter 'd_d' thus describes a circle which lies outside the perimeter of the pulley ($d_d > d_a$).

Fig. 1.2: Double section timing belt

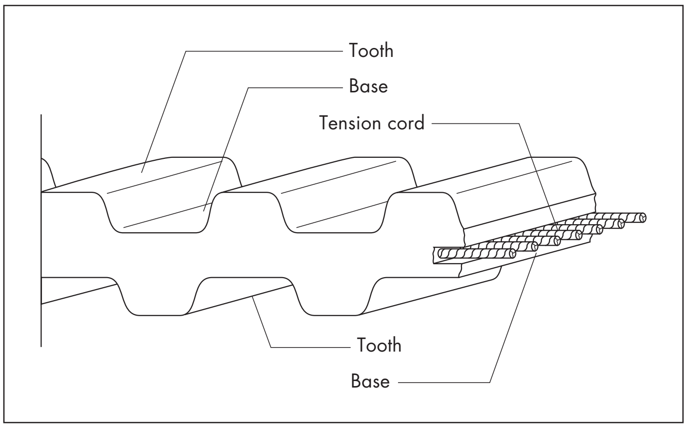


Fig. 1.3: Timing belt / pulley relationship

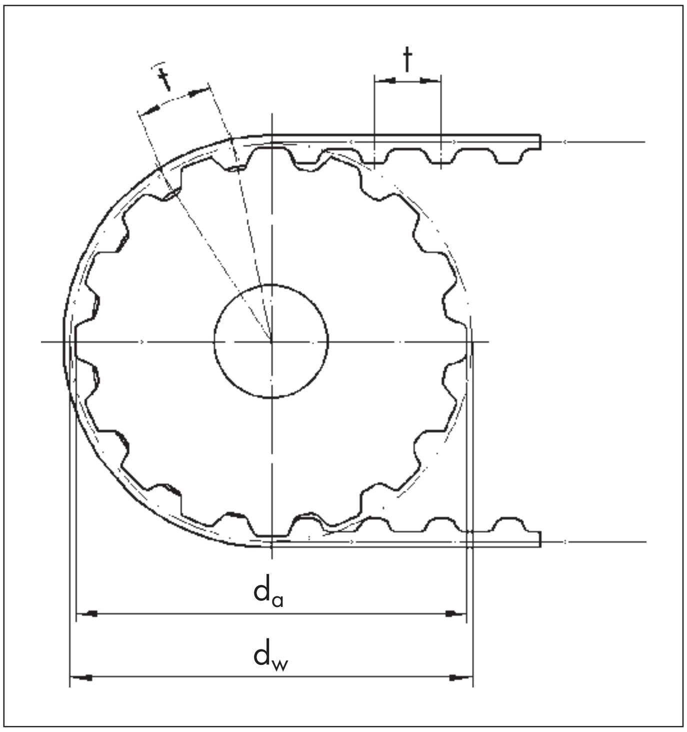


Table 1.1: Section dimensions, sections see Fig. 1.5, page 8, Standards see Table 5.6, page 48

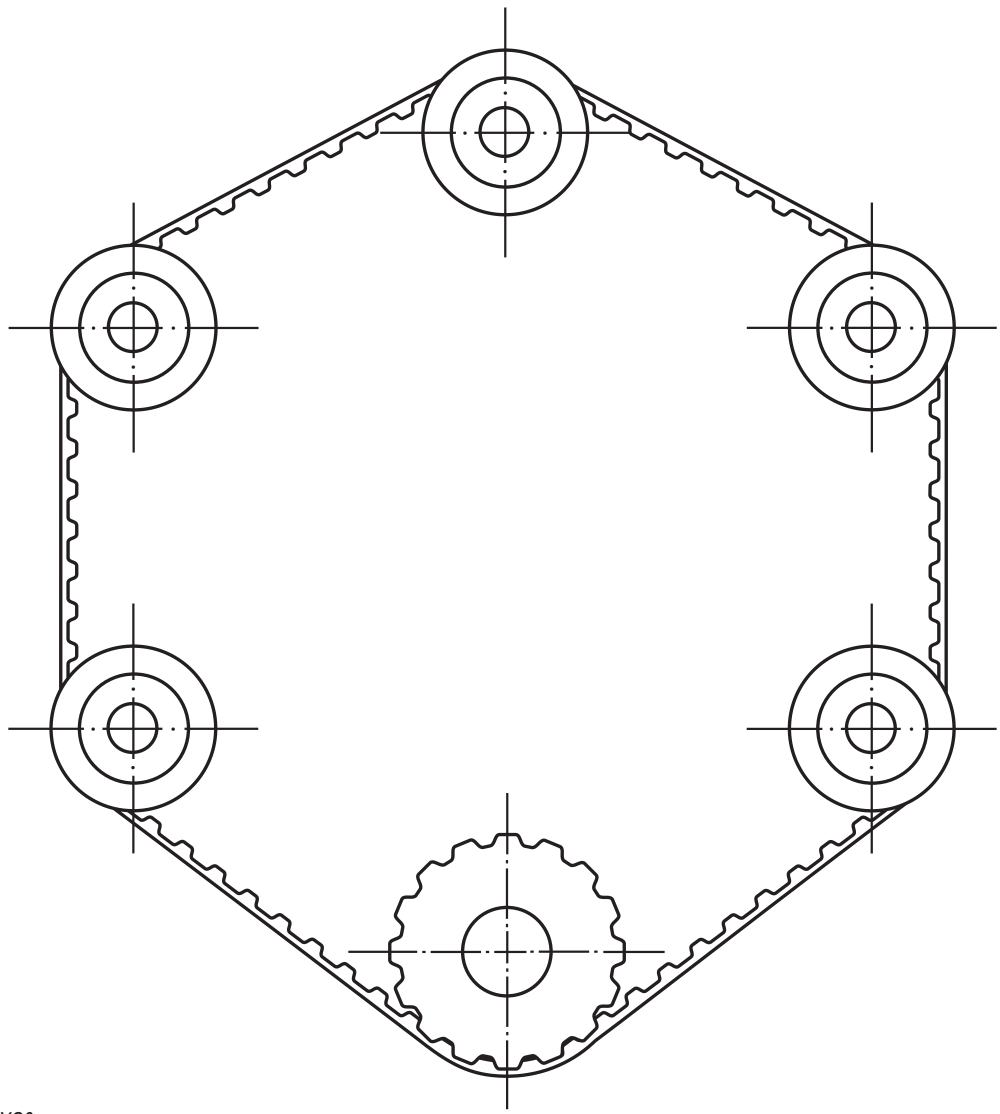
Section	Tooth pitch t (mm)	Overall belt thickness h_s (mm)	Overall belt thickness h_{s1} (mm)	Tooth depth h_t (mm)	Tooth width at base s (mm)	Tooth width at top b (mm)	Tooth angle 2 β (°)
MXL	2.032	1.14	—	0.51	1.14	—	40
XL	5.080	2.30	—	1.27	2.57	—	50
L	9.525	3.60	—	1.91	4.65	—	40
H	12.700	4.30	—	2.29	6.12	—	40
XH	22.225	11.20	—	6.35	12.57	—	40
T2.5	2.500	1.30	—	0.70	1.50	—	40
T5	5.000	2.20	—	1.20	2.65	—	40
T5D	5.000	—	3.4	1.20	2.65	—	40
T10	10.000	4.50	—	2.50	5.30	—	40
T10D	10.000	—	7.0	2.50	5.30	—	40
T20	20.000	8.00	—	5.00	10.15	—	40
T20D	20.000	—	13.0	5.00	10.15	—	40
AT5	5.000	2.70	—	1.20	—	2.50	50
AT10	10.000	5.00	—	2.50	—	5.00	50
AT20	20.000	9.00	—	5.00	—	10.00	50
5M	5.000	3.60	—	2.10	—	—	—
8M	8.000	5.60	—	3.38	—	—	—
14M	14.000	10.00	—	6.10	—	—	—

1 Product Description
1.2 Applications

Table 1.2: Types and applications

Type	**ZRM**	**ZRP**	**ZRL**	
			ZRL-M	**ZRL-V**
Applications	Synchronous power transmission		Linear drives	Conveying
Examples:	Machine tools Textile machines Printing presses Packaging machines Domestic appliances Office machines Medical equipment		Doors and door drives Washing systems Reciprocating drives Mechanical handling equipment Robots Positioning drives	Conveyor systems Ram conveyors Feeding systems Haul-off belts Drives with large centre distances

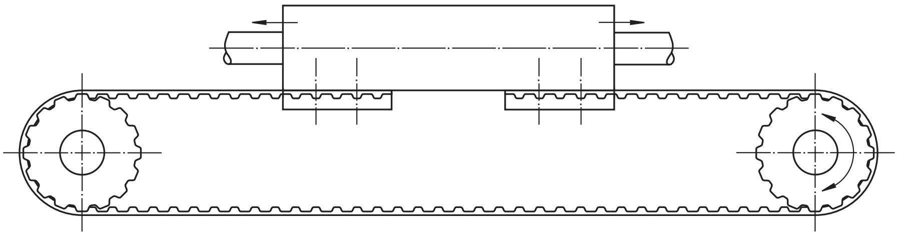
Fig. 1.4.1: Synchronous power transmission



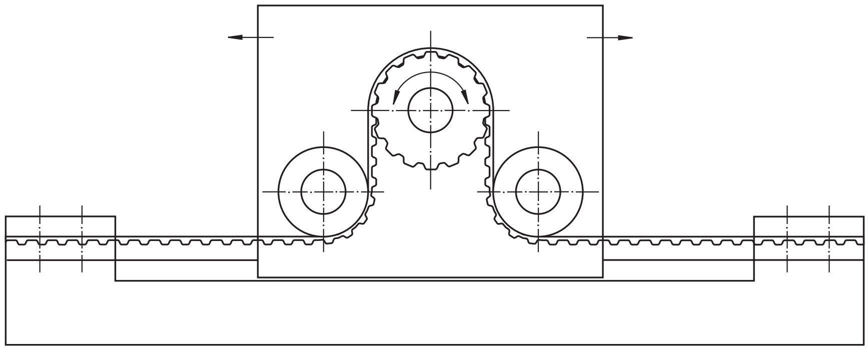
Multi-spindle drives

1 Product Description
1.2 Applications

Fig. 1.4.2: Linear drives

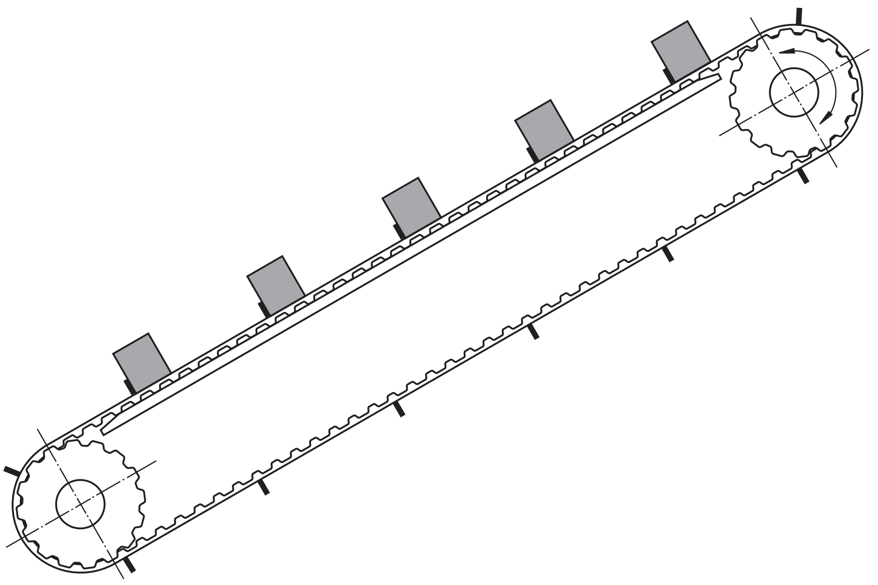


Positioning drives



Trolley drives

Fig. 1.4.3: Conveying



Inclined conveyors with cleats

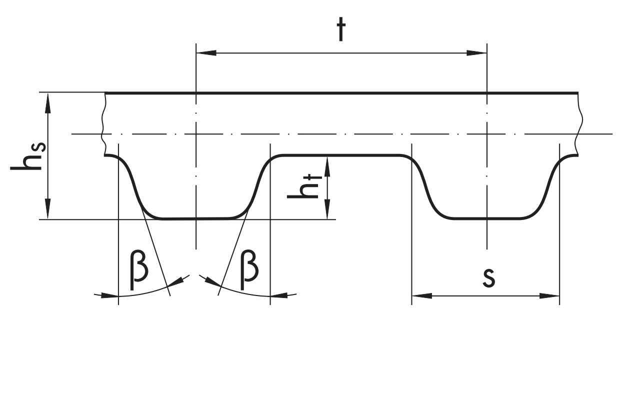
1 Product Description
1.3 Types and sections

Table 1.3: Types and sections

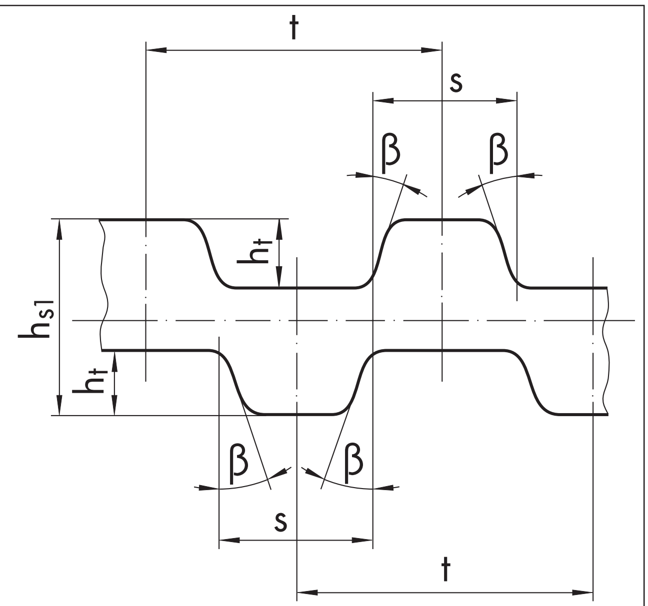
Type	ZRM	ZRP	ZRL	
			ZRL-M	ZRL-V
Construction	manufactured endless		open-ended	joined endless
Measurement/ identification units	metric	inch	metric and inch	
Section	T2.5 T5 T5D AT5* T10 T10D AT10* T20* T20D* AT20*	MXL* XL L	T5 AT5 XL 5M* L T10 AT10 8M* H T20 AT20* 14M* XH	T5 AT5 XL L T10 AT10 H T20 XH 5M 8M 14M
Verzahnung ???	single, double (D)	single	single	
Standard tension cord	steel (St), MXL = Aramid (AR)		steel (St), Aramid (AR)	
Special tension cord	Aramid (AR)		—	

* Non stock (8M and 14M with steel tension cord can be supplied from stock)

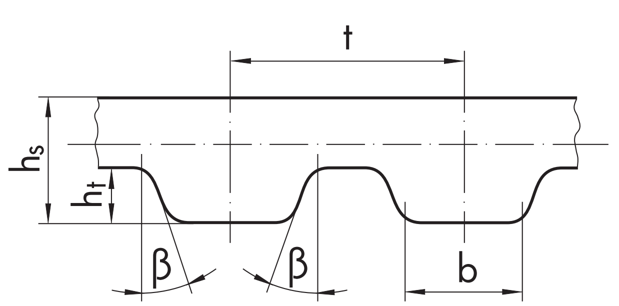
Fig. 1.5: Sections, section dimensions see Table 1.1, page 5



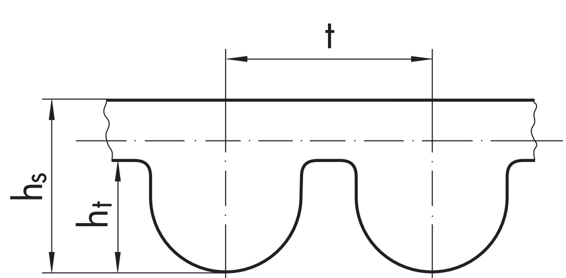
Sections MXL; XL; L; H; XH; T2.5; T5; T10; T20



Sections T5D; T10D; T20D



Sections AT5; AT10; AT20



Sections 5M; 8M; 14M

1 Product Description
1.4 Special constructions

Table 1.4: Additional top surfaces

Designation and colour	Material	Hardness approx. (Shore A)	Temperature resistance ca. (° C)	Properties	Standard thicknesses (mm)	Oil and grease-proof	Typical application
Linatex, red	Natural rubber	40	– 30 to + 60	patterned (to 1.6 mm thick), smooth (from 2.4 mm thick), very good coefficient of friction, abrasion resistant	1.2; 1.6; 2.4; 3.2; 4.8; 6.4; 8.0; 10.0; 12.7	no	furniture industry, haul-off and conveying systems
Supergrip, blue-green	PVC	40	– 30 to + 80	coarse structure, good coefficient of friction, abrasion resistant under certain conditions	4.5	conditionally	woodworking industry, inclined transport
HV 1-film, HV 2-film, transparent	Polyurethane	85	– 30 to + 80	smooth, very good abrasion resistance, superior wear resistance	1.0; 2.0	yes	food industry, glass transport
Foam Vulkolan, beige	PUR foam	40	– 30 to + 80	fine grain, good coefficient of friction, good abrasion resistance, cut resistant	1.0; 2.0; 3.0; 4.0; 5.0; 6.0	yes	packaging industry (lightweight goods), transport of sharp-edged objects
Solid Vulkolan, beige	Polyurethane	70	– 30 to + 80	fine grain, good coefficient of friction, good abrasion resistance, superior wear resistance	2.0; 3.0; 5.0; 6.0	yes	packaging industry (heavy goods), transport of sharp-edged objects
Porol, black	Cellular rubber	25	– 30 to + 90	fine grain, very good coefficient of friction, abrasion resistant under certain conditions, cut resistant	2.0; 3.0; 5.0; 8.0; 10,0	yes	transport of impact-sensitive goods, suction systems (lightweight materials)
PU 06, yellow or grey	Polyurethane	50	– 30 to + 80	very fine grain, high density, good coefficient of friction, good abrasion resistance, cut resistant	2.0; 3.0; 4.0; 5.0; 8.0	yes	glass industry, packaging industry, transport of sharp-edged objects
Studs, white	PVC	65	– 30 to + 80	coarse structure, good coefficient of friction, abrasion resistant under certain conditions	1.5	yes	food industry, woodworking industry

Intermediate thicknesses can be made by doubling or grinding the top surface cover.
Top surfaces other than the examples given in Table 1.4 are also available.

1 Product Description
1.4 Special constructions

Optibelt timing belts can be adapted to the most varied of applications in the conveying, control and handling fields, by the appropriate choice of top surfaces, fabric facings and cleats.

The Optibelt ZRM/ZRP timing belts, intended for use for power transmission can also be provided with an additional top surface.

Table 1.5: Special constructions

Special construction	ZRM	ZRP	ZRL	
			ZRL-M	ZRL-V
Fabric facings – top face (PAR) – toothed face (PAZ)			● ●	● ●
Additional top surfaces	●	●	●	●
Conveyor cleats			●	●

The special constructions shown in Table 1.5 can be combined with one another.

Fabric facing

Optibelt timing belts can be supplied with polyamide fabric on either the top face or the toothed face of the belt. This fabric offers less friction resistance than polyurethane and is ideally suited for facing on belts (PAR) used on ram conveyor applications. Fabric covering on the toothed face (PAZ) is used to reduce static and sliding friction on belts which need to be supported on this face by plastic or metal rails. Support rails are used primarily on belt haul-off and feeder sections where support idlers are widely spaced.

Fig. 1.6: Timing belt with fabric facing on both sides

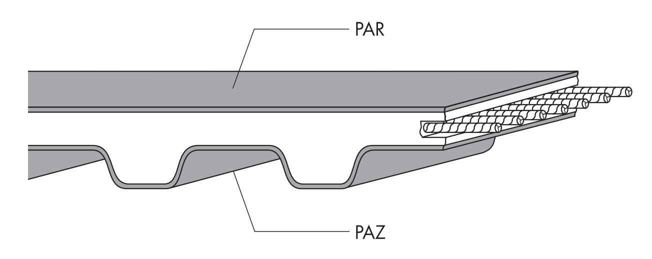


Table 1.6: Coefficients of friction

Contact materials	Coefficients of friction			
	Polyurethane without PAZ/PAR fabric facing		Polyurethane with PAZ/PAR fabric facing	
	static friction μ_0	sliding friction μ	static friction μ_0	sliding friction μ
Steel, R_z = 16 µm	55	≥ 0.40 ≤ 0.70	45	≥ 0.25 ≤ 0.45
Aluminium, R_z = 6,3 µm	50	≥ 0.50 ≤ 0.90	35	≥ 0.20 ≤ 0.30
Polyethylene	25	≥ 0.30 ≤ 0.50	25	≥ 0.20 ≤ 0.35
Glass, smooth	50	≥ 0.85* ≤ 1.00*	30	≥ 0.30 ≤ 0.50
Wood, with the grain	35	≥ 0.50 ≤ 0.85	0.35	≥ 0.20 ≤ 0.35

* polyamide fabric is required where sliding friction is important

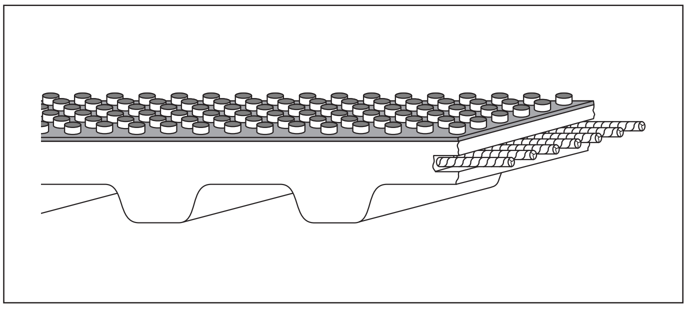
Which of the coefficients of friction is used depends upon whether the conveyed components are static or sliding on the belt. The coefficients of friction apply for dry conditions and can vary with belt speed, heat dissipation rate and texture of the surface of the materials in contact. The upper and lower limits of the coefficients of sliding friction are based on a belt speed of 0.1 to 1.0 m/sec.

1 Product Description
1.4 Special constructions

Additional top surfaces

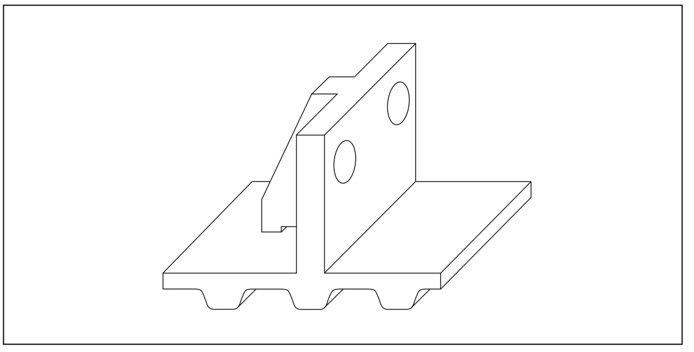
The top surface materials listed in Table 1.4 on page 9 improve conveying rates by increasing the coefficient of friction. They also protect the top surface of the belt. They allow the belt to be used on a small incline or on a haul-off arrangement in which the belt is used to overcome level differences. Where stringent demands are made on the uniformity of the surface or thickness, the top surface can also be ground.

Fig. 1.7: Additional top surfaces e.g. studs, white



The shapes and sizes of the cleats are adapted to the function they are required to carry out. They can, for example, be provided with holes if fixtures are to be attached e.g. for vertical conveying. Cleats with V-shaped grooves on their upper faces are suitable for conveying in longitudinal and transverse directions.

Fig. 1.8: Cleats with unwelded back supports for large loads and with holes for fixtures



Conveyor cleats

The belts in the Optibelt programme can be fitted with conveyor cleats. Like the timing belt, they are made of polyurethane and are welded to the back of the belt.

By making positive contact with the transported goods, the conveyor cleats extend the range of applications for ZRL timing belting as follows:

- **uniform feed e.g. for production and assembly lines**
- **conveying of bulky items using belts running in parallel**
- **inclined and vertical conveying to bridge differences in levels**
- **positioning and switching in handling and control systems**

Cleats should be narrow in the area of the weld and are usually arranged opposite a belt tooth. The original flexibility of the timing belt is thus retained. In order to achieve this, the required cleat spacing a_m must coincide with the tooth pitch t, and the belt length L_w must be matched to the number n_m of cleats required for the length of the conveyor in question. With particularly long timing belts, the length tolerance of the belt must be taken into consideration (see Table 5.2, page 43).

$L_w = a_m \cdot n_m$ $a_m = t \cdot x$ x total number of teeth

2 Basics of Drive Design

2.1 Service factors, additional factors and formulae

Total service factor c_2

The total service factor comprises the basic service factor c_0 and two further correction factors c_6 and c_8.

$$c_2 = c_0 + c_6 + c_8$$

Basic service factor c_0

The basic service factor c_0 takes into account the daily duration of operation, the type of prime mover and the type of driven machine. As it is virtually impossible to cover every combination of prime mover/machine/operating condition in a single standardised summary, the basic service factors must be taken as **guides** only. The final drive will depend upon the loads involved in each case.

Table 2.1: Basic service factor c_0

c_0	**Service conditions and examples of prime movers**			
	Steady operation Electric motors High-speed turbines Piston engines with large number of cylinders		**Intermittent operation** Hydraulic motors Low-speed turbines Piston engines with small number of cylinders	
	Service factor c_0 at number of operating hours per day			
Type of service and examples of machine applications	up to 16 h	over 16 h	up to 16 h	over 16 h
Lightweight drives, shock-free and steady running Measuring equipment Film cameras Office machinery Belt conveyor systems (lightweight goods)	1.3	1.4	1.4	1.5
Medium drives, intermittent operation with low to medium shock loading Mixing machines Kitchen machines Printing machines Textile machines Packaging machines Belt conveyor systems (heavy goods)	1.6	1.7	1.8	1.9
Heavy duty drives, intermittent operation with medium to high shock loading Machine tools Woodworking machines Eccentric drives Belt conveyor systems (heavy goods)	1.8	1.9	2.0	2.1
Very heavy duty drives, continuous operation with high shock loading Grinding mills Calenders Extruders Piston pumps and compressors Lifting gear	2.0	2.1	2.2	2.3

2 Basics of Drive Design

2.1 Service factors, additional factors and formulae

Correction factors c_6 and c_8

Like the basic service factor c_0, the factors to be added for pulleys and idlers c_6 and for start/stop frequency under load c_8 are to be taken as **approximations** only. These factors are allowances to be made for unusual operating conditions and are added where applicable to the basic service factor c_0.

Table 2.2: Correction factors c_6 and c_8 for special operating conditions

Type of operating conditions	Designation and value of correction factor	Remarks
Use of tensioning and guide idlers	$c_6 = 0.2$	0.2 per idler to a maximum of 1.0
Start/stop and/or reversing under load	$c_8 = 0.1 \dots 0.3$	depending upon frequency, up to approx. 1.5 times nominal torque with low start-up torque (e.g. star/delta connection)
	$c_8 = 0.3 \dots 0.5$	depending upon frequency, above approx. 1.5 times nominal torque with high start-up torque

The correction factor c_6 applies when more than two pulleys are used. Such use of additional pulleys must be separately checked at the design stage.

Large drive torque of inertia should be classified as external loads.

Drive calculation ZRM/ZRP see page 26
Drive calculation ZRL-M see page 34
Drive calculation ZRL-V see page 37

Length factor c_3 for ZRM/ZRP belts

The **approximate values** for the length factor c_3 are given in Table 2.3 and apply only to rotating highly loaded drives fitted with ZRM/ZRP timing belts.

The length factor c_3 takes into account the increase or decrease of belt flexing when using a short or long belt.

Table 2.3: Length factor c_3 for ZRM/ZRP belts

Section	Pitch length L_w (mm)	Length factor c_3
MXL; T2.5	≤ 190 $> 190 \leq 260$ $> 260 \leq 400$ > 400	0.8 0.9 1.0 1.1
XL; T5 (D); AT5	≤ 440 $> 440 \leq 555$ $> 555 \leq 800$ > 800	0.8 0.9 1.0 1.1
L; T10 (D); AT10	≤ 600 $> 600 \leq 920$ $> 920 \leq 1500$ > 1500	0.8 0.9 1.0 1.1
T20 (D); AT20	≤ 1260 $> 1260 \leq 1880$ $> 1880 \leq 3000$ > 3000	0.8 0.9 1.0 1.1

Formulae for explanation of symbols see page 14

For $i = 1$ or $z = z_1 = z_2$

$$L_w = 2 \cdot a_{nom} + z \cdot t \quad \text{(mm)}$$

$$a_{nom} = \frac{z_R - z}{2} \, t \quad \text{(mm)}$$

General

$$z_R = \frac{L_w}{t}$$

driven torque and driven power

$$M_{Ab} = \frac{d_{w2} \cdot S_{n3}}{2000} \quad \text{(Nm)}$$

$$M_{Ab} = \frac{d_{w2} \cdot P_{Ab}}{2 \cdot v_{eff}} \quad \text{(Nm)}$$

$$M_{Ab} = \frac{9550 \cdot P_{Ab}}{n_{2eff}} \quad \text{(Nm)}$$

$$P_{Ab} = \frac{M_{Ab} \cdot n_{2eff}}{9550} \quad \text{(kW)}$$

$$P_{Ab} = \frac{S_{n3} \cdot v_{eff}}{1000} \quad \text{(kW)}$$

$$P_{Ab} = \frac{S_{n3} \cdot d_{w2} \cdot n_{2eff}}{19100 \cdot 1000} \quad \text{(kW)}$$

General

$$v_{eff} = \frac{d_{w1} \cdot n_1}{19100} = \frac{d_{w2} \cdot n_{2eff}}{19100} \quad \left(\frac{m}{s}\right)$$

$$i_{eff} = \frac{z_2}{z_1} = \frac{d_{w2}}{d_{w1}} = \frac{n_1}{n_{2eff}} \qquad i = \frac{n_1}{n_2}$$

$$d_{w1} = \frac{z_1 \cdot t}{\pi} \qquad d_{w2} = \frac{z_2 \cdot t}{\pi} \quad \text{(mm)}$$

Note the units used for the individual parts of the formulae. The formulae for the driven torque and driven power also apply for the driver side using the formula symbols M_{An}, P_{An}, d_{w1} and n_1 in place of M_{Ab}, P_{Ab}, d_{w2} and n_{2eff}.

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Power Transmission

2 Basics of Drive Design
2.2 Symbols used in formulae

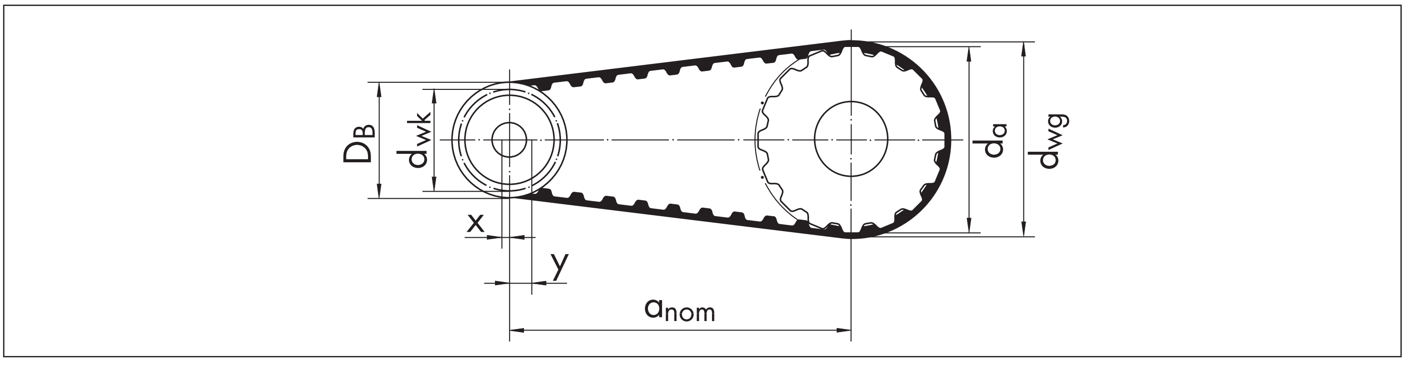
Table 2.4 defines the essential parameters and relevant units used in the formulae listed on page 13, and the drive design process.

Table 2.4: Symbols

Symbol	Description	Unit
a	Required drive centre distance	(mm)
a_{nom}	Drive centre distance with standard belt length	(mm)
b_{St}	Standard belt width	(mm)
b_{th}	Theoretical belt width	(mm)
c_v	Tension factor	
c_0	Basic service factor	
c_2	Total service factor	
c_{2vorh}	Actual service factor	
c_3	Length factor	
c_6	Pulley and idler correction factor	
c_8	Correction factor for start/stop and reversing under load	
d_a	Outside diameter of pulley	(mm)
D_B	Outside diameter of pulley over flanges	(mm)
d_{wg}	Pitch diameter of the large pulley	(mm)
d_{wk}	Pitch diameter of the small pulley	(mm)
d_{w1}	Pitch diameter of the driver pulley	(mm)
d_{w1th}	Theoretical pitch diameter of the driver pulley	(mm)
d_{w2}	Pitch diameter of the driven pulley	(mm)
e_v	Belt deflection for checking belt tension	(mm)
F_v	Load used to set belt tension	(N)
i	Ratio required	
i_{eff}	Ratio calculated from the number of pulley teeth	
L	Span length	(mm)
L_{wnom}	Pitch length of joined endless/open ended timing belts (ZRL-V/ZRL-M)	(mm)
L_{wSt}	Standard pitch length of endless timing belts (ZRM/ZRP)	(mm)
L_{wth}	Theoretical pitch length of timing belts	(mm)
M_{Ab}	Torque	(Nm)
M_{Abth}	Theoretical torque	(Nm)
M_{An}	Driver torque	(Nm)
M_B	Design torque including service factor	(Nm)
M_{Bth}	Theoretical design torque	(Nm)
M_{spez}	Transferrable torque per engaged tooth and 10 mm belt width	(Nm/cm)

Symbol	Description	Unit
n_k	Speed of small pulley	(min^{-1})
n_1	Speed of driver pulley	(min^{-1})
n_2	Required speed of driven pulley	(min^{-1})
n_{2eff}	Speed of driven pulley calculated from the number of teeth	(min^{-1})
P_{An}	Driver power	(kW)
P_{Ab}	Driven power	(kW)
P_B	Design power including total service factor	(kW)
P_{spez}	Power per engaged tooth, 10 mm belt width and 1 tooth of the small pulley	(W/cm)
S_a	Static shaft loading at correct tension	(N)
S_{Bn3}	Design circumferential force including total service factor	(N)
S_{n3}	Circumferential force	(N)
S_{spez}	Transferrable circumferential force per engaged tooth and 10 mm belt width	(N)
S_{zul}	Transferrable circumferential force at maximum standard width	(N)
t	Tooth spacing	(mm)
v	Required belt speed	(m/s)
v_{eff}	Actual speed	(m/s)
x	Allowance for centre distance adjustment a_{nom} for belt tensioning	(mm)
x_v	Deflection at correct tension (ZRL-M/ZRL-V)	(mm)
$y_{1/2/3}$	Allowance for centre distance adjustment a_{nom} for belt installation, determined from pulley arrangement	(mm)
z_e	Number of teeth in mesh with the small pulley – for power transmission calculation	
z_{emax}	Maximum number of teeth in mesh with the small pulley – for power transmission calculation	
z_{enom}	Number of teeth in mesh with the small pulley – actual	
z_k	Number of teeth on the small pulley	
z_R	Number of teeth on the timing belt	
z_1	Number of teeth on the driver pulley	
z_2	Number of teeth on the driven pulley	

Fig.2.1: Drive arrangement



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Power Transmission

3.1 ZRM/ZRP resistance to chemicals

Resistance of endless optibelt *ZRM/ZRP* timing belts

The data given on the chemical resistance of the Optibelt ZRM/ZRP timing belts refers to the material polyurethane and is based on laboratory figures arrived at under ideal conditions.

Classification of chemical resistance

1. No impairment of physical properties and working life
2. Minor impairment of physical properties and working life
3. Clearly visible swelling/disintegration, reduced physical properties and shortened working life
4. Rapid disintegration

Table 3.1: ZRM/ZRP chemical resistance

Medium	Temperatur (°C)	Beständigkeit
Aluminium chloride, 5% aqueous solution	20	2
Formic acid	20	4
Ammonia 10% aqueous solution	20	2
Aniline	20	4
ASTM oil No. 1	80	3
ASTM oil No. 2	80	3
ASTM oil No. 3	80	3
Acetone	20	4
Petrol, "normal"	20	3
Petrol, "super"	20	3
Benzol	20	4
Borax solution	20	1
Boric acid, aqueous solution	20	1
Butane	20	1
Butanol	20	2
Butyl acetate	20	4
Calcium chlorate (I), 5% aqueous solution	20	4
Calcium chloride, aqueous solution	20	1
Calcium hydrogen sulphide, aqueous solution	20	1
Chlorine, gaseous	20	4
Chromic acid 10 : 50% aqueous solution	20	4
Cyclohexane	20	2
Cyclohexanol	20	1
Diesel fuel	20	2
Dimethyl formamide	20	4
Ferric (III) chloride, 5% aqueous solution	40	3
Acetic acid, 20% aqueous solution	20	3
Ethanol	20	3
Ethyl acetate	20	4
Ethyl ether	20	3
Formaldehyde, 37% aqueous solution	20	3
Freon-11	20	2
Freon-113	20	1
Freon-12	54	1
Freon-22	20	3
Glycerine	20	1
Hydraulic fluid	20	2
Iso-octane	70	1
Iso-propanol	20	3
Potassium hydroxide, 1-N aqueous solution	20	3
Kerosene	20	2
Carbon dioxide	20	1
Copper chloride, aqueous solution	20	1
Copper sulphate, aqueous solution	20	1
Methanol	20	4
Methanol/petrol mixture 15 : 85	20	4
Methylene chloride	20	3
Methylethylketone	20	4
Mineral oil	80	3
n-Heptane	20	1
n-Hexane	50	1
Naphtha	20	2
Sodium carbonate, saturated aqueous solution	20	2
Sodium chloride, saturated aqueous solution	20	2
Sodium hydroxide, 1-N aqueous solution	20	2
Sodium phosphate, aqueous solution	20	1
Sodium soap, 20% aqueous solution	80	4
Sodium soap fat	20	3
Oleic acid	20	1
Palmitic acid	20	1
Phosphoric acid, 20-70% aqueous solution	20	1
Phosphoric acid, 85% aqueous solution	20	3
Mercury	20	1
SAE-10 oil	70	1
Nitric acid, 20% aqueous solution	20	4
Hydrochloric acid, 20% aqueous solution	20	2
Hydrochloric acid, 37% aqueous solution	20	4
Grease	20	2
Sulphuric acid, 20% aqueous solution	20	4
Sulphuric acid, 5% aqueous solution	20	2
Sulphurous acid	20	4
Seawater	20	2
Soap solution, aqueous	20	1
Soya oil	20	1
Stearic acid	20	1
Tannic acid, 10% aqueous solution	20	1
Turpentine	20	4
Carbon tetrachloride	20	4
Tetrahydrofuran	20	4
Toluol	20	4
Trichlorethane	20	4
Tricresyl phosphate	20	2
Water	100	4
Water	90	3
Water	20	1
Hydrogen	20	1
Plasticising oils	20	2
Xylol	20	4

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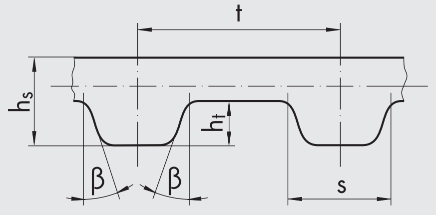
3.2 ZRM/ZRP timing belt range

optibelt *ZRM* timing belts, metric sizes



Order example for ZRM: 10 T2.5/200

Width (mm) – 10

Section – T2.5

Pitch length (mm) – 200

Construction: polyurethane with steel tension cord

Section	Pitch t (mm)	Tooth depth h_t (mm)	Overall belt thickness h_s (mm)	Tooth width s (mm)	Tooth angle 2 β (°)
T2.5	2.5	0.70	1.30	1.50	40
T5	5.0	1.20	2.20	2.65	40
T10	10.0	2.50	4.50	5.30	40

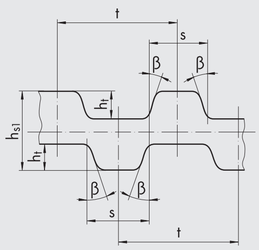
Table 3.2: ZRM timing belt range

Section T2.5 – pitch 2.5 mm			**Section T5 – pitch 5 mm**						**Section T10 – pitch 10 mm**		
Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R	Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R	Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R	Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R
T2.5/120	120.0	48	T5/165	165.0	33	T5/ 550	550.0	110	T10/ 260	260.0	26
T2.5/160	160.0	64	T5/185	185.0	37	T5/ 560	560.0	112	T10/ 370	370.0	37
T2.5/177.5	177.5	71	T5/200	200.0	40	T5/ 575	575.0	115	T10/ 400	400.0	40
T2.5/200	200.0	80	T5/215	215.0	43	T5/ 590*	590.0	118	T10/ 410	410.0	41
T2.5/230	230.0	92	T5/220	220.0	44	T5/ 600	600.0	120	T10/ 440	440.0	44
T2.5/245	245.0	98	T5/225	225.0	45	T5/ 610	610.0	122	T10/ 450	450.0	45
T2.5/265	265.0	106	T5/245	245.0	49	T5/ 620	620.0	124	T10/ 500	500.0	50
T2.5/285	285.0	114	T5/250	250.0	50	T5/ 625*	625.0	125	T10/ 530	530.0	53
T2.5/305	305.0	122	T5/255	255.0	51	T5/ 630	630.0	126	T10/ 550*	550.0	55
T2.5/317.5	317.5	127	T5/260	260.0	52	T5/ 640	640.0	128	T10/ 560	560.0	56
T2.5/330	330.0	132	T5/270	270.0	54	T5/ 650	650.0	130	T10/ 600	600.0	60
T2.5/380	380.0	152	T5/275	275.0	55	T5/ 660	660.0	132	T10/ 610	610.0	61
T2.5/420	420.0	168	T5/280	280.0	56	T5/ 675*	675.0	135	T10/ 630	630.0	63
T2.5/480	480.0	192	T5/295	295.0	59	T5/ 690	690.0	138	T10/ 650	650.0	65
T2.5/500	500.0	200	T5/300	300.0	60	T5/ 700	700.0	140	T10/ 660	660.0	66
T2.5/540	540.0	216	T5/305	305.0	61	T5/ 720	720.0	144	T10/ 690	690.0	69
T2.5/600	600.0	240	T5/325	325.0	65	T5/ 725	725.0	145	T10/ 700	700.0	70
T2.5/650	650.0	260	T5/330	330.0	66	T5/ 750	750.0	150	T10/ 720	720.0	72
T2.5/780	780.0	312	T5/340	340.0	68	T5/ 780	780.0	156	T10/ 750	750.0	75
T2.5/915	915.0	366	T5/350	350.0	70	T5/ 800*	800.0	160	T10/ 780	780.0	78
T2.5/950	950.0	380	T5/355	355.0	71	T5/ 815	815.0	163	T10/ 800*	800.0	80
			T5/360*	360.0	72	T5/ 840	840.0	168	T10/ 810	810.0	81
			T5/365	365.0	73	T5/ 850	850.0	170	T10/ 840	840.0	84
			T5/375	375.0	75	T5/ 860*	860.0	172	T10/ 850*	850.0	85
			T5/390	390.0	78	T5/ 900	900.0	180	T10/ 880	880.0	88
			T5/400	400.0	80	T5/ 940	940.0	188	T10/ 890	890.0	89
			T5/410	410.0	82	T5/ 990	990.0	198	T10/ 900	900.0	90
			T5/420	420.0	84	T5/1000	1000.0	200	T10/ 910	910.0	91
			T5/425	425.0	85	T5/1075	1075.0	215	T10/ 920	920.0	92
			T5/440*	440.0	88	T5/1100	1100.0	220	T10/ 950	950.0	95
			T5/445*	445.0	89	T5/1115*	1115.0	223	T10/ 960	960.0	96
			T5/450	450.0	90	T5/1140*	1140.0	228	T10/ 970	970.0	97
			T5/455	455.0	91	T5/1215	1215.0	243	T10/ 980	980.0	98
			T5/460*	460.0	92	T5/1350*	1350.0	270	T10/1000*	1000.0	100
			T5/475	475.0	95	T5/1380	1380.0	276	T10/1010	1010.0	101
			T5/480	480.0	96	T5/1440	1440.0	288	T10/1050	1050.0	105
			T5/500	500.0	100				T10/1080	1080.0	108
			T5/510	510.0	102				T10/1100	1100.0	110
			T5/525	525.0	105				T10/1110	1110.0	111
			T5/545	545.0	109				T10/1140	1140.0	114
Standard widths b_{St} (mm): 4, 6, 8, 10, 12			**Standard widths b_{St} (mm):** 6, 8, 10, 12, 16, 20, 25						**Standard widths b_{St} (mm):** 10, 12, 16, 20, 25, 32, 50		

Further sizes on request. * Non stock

3.2 ZRM/ZRP timing belt range

optibelt *ZRM* double section timing belts, metric sizes



Order example for ZRM D: 50 T 10/1420 D

Width (mm)	50
Section	T 10
Pitch length (mm)	1420
Double section timing belts	D

Construction:
polyurethane with steel tension cord

Section	Pitch t (mm)	Tooth depth h_t (mm)	Overall belt thickness h_{s1} (mm)	Tooth width s (mm)	Tooth angle 2 β (°)
T5D	5.0	1.20	3.40	2.65	40
T10D	10.0	2.50	7.00	5.30	40

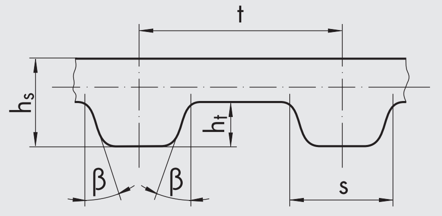
Table 3.2 continued

Section T10, continued			**Section T5D – pitch 5 mm**			**Section T10D – pitch 10 mm**		
Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R	Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R	Belt No.	Pitch L_{wSt} (mm)	No. of teeth z_R
T10/1150	1150.0	115	T5/ 300 D*	300.0	60	T10/ 260 D	260.0	26
T10/1200	1200.0	120	T5/ 350 D*	350.0	70	T10/ 530 D	530.0	53
T10/1210	1210.0	121	T5/ 400 D*	400.0	80	T10/ 600 D	600.0	60
T10/1240	1240.0	124	T5/ 410 D	410.0	82	T10/ 630 D	630.0	63
T10/1250	1250.0	125	T5/ 450 D*	450.0	90	T10/ 660 D	660.0	66
T10/1300	1300.0	130	T5/ 460 D	460.0	92	T10/ 700 D	700.0	70
T10/1320	1320.0	132	T5/ 480 D	480.0	96	T10/ 720 D	720.0	72
T10/1350	1350.0	135	T5/ 500 D	500.0	100	T10/ 750 D	750.0	75
T10/1390	1390.0	139	T5/ 515 D	515.0	103	T10/ 800 D	800.0	80
T10/1400	1400.0	140	T5/ 550 D	550.0	110	T10/ 840 D	840.0	84
T10/1420	1420.0	142	T5/ 590 D	590.0	118	T10/ 900 D	900.0	90
T10/1440	1440.0	144	T5/ 600 D*	600.0	120	T10/ 980 D	980.0	98
T10/1450	1450.0	145	T5/ 620 D	620.0	124	T10/1000 D*	1000.0	100
T10/1460	1460.0	146	T5/ 650 D	650.0	130	T10/1100 D	1100.0	110
T10/1500	1500.0	150	T5/ 700 D	700.0	140	T10/1200 D*	1200.0	120
T10/1560	1560.0	156	T5/ 750 D	750.0	150	T10/1210 D	1210.0	121
T10/1600	1600.0	160	T5/ 800 D	800.0	160	T10/1240 D	1240.0	124
T10/1610	1610.0	161	T5/ 815 D	815.0	163	T10/1250 D	1250.0	125
T10/1700	1700.0	170	T5/ 850 D*	850.0	170	T10/1300 D*	1300.0	130
T10/1750	1750.0	175	T5/ 860 D	860.0	172	T10/1320 D	1320.0	132
T10/1780	1780.0	178	T5/ 900 D	900.0	180	T10/1350 D	1350.0	135
T10/1800*	1800.0	180	T5/ 940 D	940.0	188	T10/1400 D	1400.0	140
T10/1880	1880.0	188	T5/1100 D	1100.0	220	T10/1420 D	1420.0	142
T10/1960	1960.0	196				T10/1500 D	1500.0	150
T10/2250	2250.0	225				T10/1600 D*	1600.0	160
						T10/1610 D	1610.0	161
						T10/1700 D	1700.0	170
						T10/1800 D	1800.0	180
						T10/1880 D	1880.0	188
T20 and AT sizes on request								
Standard widths b_{St} (mm): 10, 12, 16, 20, 25, 32, 50			**Standard widths b_{St} (mm):** 6, 8, 10, 12, 16, 20, 25			**Standard widths b_{St} (mm):** 10, 12, 16, 20, 25, 32, 50		

Further sizes on request. * Non stock

3.2 ZRM/ZRP timing belt range

optibelt *ZRP* timing belts, inch sizes



Order example for ZRP: K 120 XL 037

- K = plastic (polyurethane)
- Pitch length code: Pitch length (inch x 10)
- Section
- Width code: Width (inch x 100)

Section	Pitch t (mm)	Tooth depth h_t (mm)	Overall belt thickness h_s (mm)	Tooth width s (mm)	Tooth angle 2 β (°)
MXL	2.032	0.51	1.14	1.14	40
XL	5.080	1.27	2.30	2.57	50
L	9.525	1.91	3.60	4.65	40

Construction: polyurethane with Aramid (MXL) or steel tension cord (XL, L)

Table 3.3: ZRP timing belt range

Section MXL* – pitch 2.032 mm

Belt No.	Pitch length L_{wSt} (inch)	Pitch length L_{wSt} (mm)	No. of teeth z_R	Belt No.	Pitch length L_{wSt} (inch)	Pitch length L_{wSt} (mm)	No. of teeth z_R
K 240 MXL	2.40	60.96	30	K 1840 MXL	18.40	467.36	230
K 280 MXL	2.80	71.12	35	K 1880 MXL	18.80	477.52	235
K 320 MXL	3.20	81.28	40	K 1920 MXL	19.20	487.68	240
K 360 MXL	3.60	91.44	45	K 1960 MXL	19.60	497.84	245
K 400 MXL	4.00	101.60	50	K 2000 MXL	20.00	508.00	250
K 440 MXL	4.40	111.76	55	K 2040 MXL	20.40	518.16	255
K 480 MXL	4.80	121.92	60	K 2080 MXL	20.80	528.32	260
K 520 MXL	5.20	132.08	65	K 2120 MXL	21.20	538.48	265
K 560 MXL	5.60	142.24	70	K 2160 MXL	21.60	548.64	270
K 600 MXL	6.00	152.40	75	K 2200 MXL	22.00	558.80	275
K 640 MXL	6.40	162.56	80	K 2240 MXL	22.40	568.96	280
K 680 MXL	6.80	172.72	85	K 2280 MXL	22.80	579.12	285
K 720 MXL	7.20	182.88	90	K 2320 MXL	23.20	589.28	290
K 760 MXL	7.60	193.04	95	K 2360 MXL	23.60	599.44	295
K 800 MXL	8.00	203.20	100	K 2400 MXL	24.00	609.60	300
K 840 MXL	8.40	213.36	105	K 2480 MXL	24.80	629.92	310
K 880 MXL	8.80	223.52	110	K 2560 MXL	25.60	650.24	320
K 920 MXL	9.20	233.68	115	K 2640 MXL	26.40	670.56	330
K 960 MXL	9.60	243.84	120	K 2720 MXL	27.20	690.88	340
K 1000 MXL	10.00	254.00	125	K 2800 MXL	28.00	711.20	350
K 1040 MXL	10.40	264.16	130	K 2880 MXL	28.80	731.52	360
K 1080 MXL	10.80	274.32	135	K 2960 MXL	29.60	751.84	370
K 1120 MXL	11.20	284.48	140	K 3040 MXL	30.40	772.16	380
K 1160 MXL	11.60	294.64	145	K 3120 MXL	31.20	792.48	390
K 1200 MXL	12.00	304.80	150	K 3200 MXL	32.00	812.80	400
K 1240 MXL	12.40	314.96	155				
K 1280 MXL	12.80	325.12	160				
K 1320 MXL	13.20	335.28	165				
K 1360 MXL	13.60	345.44	170				
K 1400 MXL	14.00	355.60	175				
K 1440 MXL	14.40	365.76	180				
K 1480 MXL	14.80	375.92	185				
K 1520 MXL	15.20	386.08	190				
K 1560 MXL	15.60	396.24	195				
K 1600 MXL	16.00	406.40	200				
K 1640 MXL	16.40	416.56	205				
K 1680 MXL	16.80	426.72	210				
K 1720 MXL	17.20	436.88	215				
K 1760 MXL	17.60	447.04	220				
K 1800 MXL	18.00	457.20	225				

Sleeve width: 127 ± 10 mm

Standard widths b_{St}:

1/8" = 3.175 mm	3/16" = 4.764 mm	1/4" = 6.35 mm	5/16" = 7.94 mm
Code No.: 012	019	025	031

Section XL – pitch 5.08 mm

Belt No.	Pitch length L_{wSt} (inch)	Pitch length L_{wSt} (mm)	No. of teeth z_R
K 60 XL*	6.00	152.40	30
K 70 XL*	7.00	177.80	35
K 76 XL*	7.60	193.04	38
K 80 XL*	8.00	203.20	40
K 84 XL*	8.40	213.36	42
K 90 XL*	9.00	228.60	45
K 94 XL*	9.40	238.76	47
K 96 XL*	9.60	243.84	48
K 100 XL	10.00	254.00	50
K 102 XL*	10.20	259.08	51
K 104 XL*	10.40	264.16	52
K 106 XL*	10.60	269.24	53
K 110 XL	11.00	279.40	55
K 114 XL*	11.40	289.56	57
K 116 XL*	11.60	294.64	58
K 120 XL	12.00	304.80	60
K 124 XL*	12.40	314.96	62
K 126 XL*	12.60	320.04	63
K 128 XL*	12.80	325.12	64
K 130 XL	13.00	330.20	65
K 136 XL*	13.60	345.44	68
K 140 XL	14.00	355.60	70
K 150 XL	15.00	381.00	75
K 152 XL*	15.20	386.08	76
K 154 XL*	15.40	391.16	77
K 160 XL	16.00	406.40	80
K 166 XL*	16.60	421.64	83
K 170 XL	17.00	431.80	85
K 180 XL	18.00	457.20	90
K 186 XL*	18.60	472.44	93
K 190 XL	19.00	482.60	95
K 200 XL	20.00	508.00	100
K 210 XL	21.00	533.40	105
K 212 XL*	21.20	538.48	106
K 220 XL	22.00	558.80	110
K 230 XL	23.00	584.20	115
K 240 XL	24.00	609.60	120
K 250 XL	25.00	635.00	125
K 254 XL*	25.40	645.16	127
K 260 XL	26.00	660.40	130

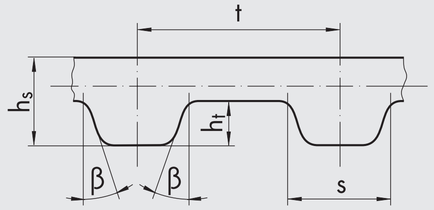
Standard widths b_{St}, continued on page 19:

1/4" = 6.35 mm	5/16" = 7.94 mm
Code No.: 025	031

Further sizes on request. * Non stock: minimum order 1 sleeve

3.2 ZRM/ZRP Timing Belt Range

optibelt *ZRP* timing belts, inch sizes



Order example for ZRP: K 480 L 150

- K = plastic (polyurethane)
- 480 = Pitch length code – Pitch length (inch x 10)
- L = Section
- 150 = Width code – Width (inch x 100)

Section	Pitch t (mm)	Tooth depth h_t (mm)	Overall belt thickness h_s (mm)	Tooth width s (mm)	Tooth angle 2 β (°)
MXL	2.032	0.51	1.14	1.14	40
XL	5.080	1.27	2.30	2.57	50
L	9.525	1.91	3.60	4.65	40

Construction: polyurethane with Aramid (MXL) or steel tension cord (XL, L)

Table 3.3, continued:

Section XL – pitch 5.08 mm, continued

Belt No.	Pitch length L_{wSt} (inch)	Pitch length L_{wSt} (mm)	No. of teeth z_R
K 270 XL	27.00	685.80	135
K 290 XL	29.00	736.60	145
K 300 XL	30.00	762.00	150
K 320 XL*	32.00	812.80	160
K 330 XL	33.00	838.20	165
K 360 XL*	36.00	914.40	180
K 376 XL*	37.60	955.04	188
K 384 XL*	38.40	975.36	192
K 390 XL	39.00	990.60	195
K 414 XL*	41.40	1051.56	207
K 460 XL*	46.00	1168.40	230
K 480 XL*	48.00	1219.20	240
K 512 XL*	51.20	1300.48	256
K 550 XL*	55.00	1397.00	275
K 564 XL*	56.40	1432.56	282
K 630 XL*	63.00	1600.20	315
K 670 XL*	67.00	1701.80	335

Sleeve width: 150 ± 10 mm

Standard widths b_{St}, continued for page 18:

3/8" = 9.53 mm	1/2" = 12.7 mm
Code No.: 037	050

Section L – pitch 9.525 mm

Belt No.	Pitch length L_{wSt} (inch)	Pitch length L_{wSt} (mm)	No. of teeth z_R
K 124 L	12.40	314.30	33
K 150 L	15.00	381.00	40
K 165 L*	16.50	419.10	44
K 173 L*	17.30	439.42	46
K 187 L	18.70	476.20	50
K 210 L	21.00	533.40	56
K 225 L	22.50	571.50	60
K 240 L	24.00	609.60	64
K 255 L	25.50	647.70	68
K 270 L	27.00	685.80	72
K 285 L	28.50	723.90	76
K 300 L	30.00	762.00	80
K 322 L	32.20	819.10	86
K 345 L	34.50	876.30	92
K 367 L	36.70	933.40	98
K 375 L*	37.50	952.50	100
K 390 L	39.00	990.60	104
K 420 L	42.00	1066.80	112
K 427 L*	42.70	1084.58	114
K 450 L	45.00	1143.00	120
K 480 L	48.00	1219.20	128
K 510 L	51.00	1295.40	136
K 525 L*	52.50	1333.50	140
K 540 L	54.00	1371.60	144
K 600 L	60.00	1524.00	160

Sleeve width: 150 ± 10 mm

Standard widths b_{St}:

1/2" = 12.7 mm	3/4" = 19.05 mm	1" = 25.4 mm	1 1/2" = 38.1 mm
Code No.: 050	075	100	150

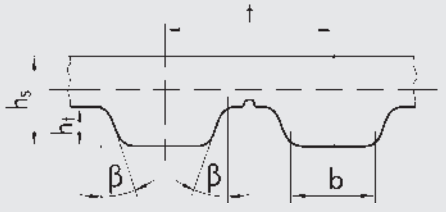
Further sizes on request. * Non stock: minimum order 1 sleeve

optibelt

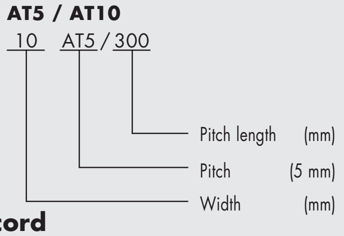
Power Transmission

3.2 ZRM/ZRP timing belt range

optibelt *ZRM* timing belts, metric



Construction: polyurethane with steel-wire cord



Type	t (mm)	h_t (mm)	h_s (mm)	b (mm)	β
AT5	5.0	1.20	2.70	2.50	50°
AT10	10.0	2.50	5.00	5.00	50°

Table 3.4

Type AT5 – pitch 5 mm			**Type AT10 – pitch 10 mm**		
Belt No.	Pitch length (mm)	Number of teeth	Belt No.	Pitch length (mm)	Number of teeth
AT5/ 225	225.00	45	AT10/ 500	500.00	50
AT5/ 255	255.00	51	AT10/ 560	560.00	56
AT5/ 280	280.00	56	AT10/ 600	600.00	60
AT5/ 300	300.00	60	AT10/ 610	610.00	61
AT5/ 340	340.00	68	AT10/ 660	660.00	66
AT5/ 375	375.00	75	AT10/ 700	700.00	70
AT5/ 390	390.00	78	AT10/ 730	730.00	73
AT5/ 420	420.00	84	AT10/ 780	780.00	78
AT5/ 450	450.00	90	AT10/ 800	800.00	80
AT5/ 455	455.00	91	AT10/ 840	840.00	84
AT5/ 500	500.00	100	AT10/ 890	890.00	89
AT5/ 545	545.00	109	AT10/ 920	920.00	92
AT5/ 600	600.00	120	AT10/ 960	960.00	96
AT5/ 610	610.00	122	AT10/ 980	980.00	98
AT5/ 660	660.00	132	AT10/1000	1000.00	100
AT5/ 710	710.00	142	AT10/1010	1010.00	101
AT5/ 720	720.00	144	AT10/1050	1050.00	105
AT5/ 750	750.00	150	AT10/1080	1080.00	108
AT5/ 780	780.00	156	AT10/1100	1100.00	110
AT5/ 825	825.00	165	AT10/1150	1150.00	115
AT5/ 860	860.00	172	AT10/1200	1200.00	120
AT5/ 975	975.00	195	AT10/1210	1210.00	121
AT5/1050	1050.00	210	AT10/1250	1250.00	125
AT5/1125	1125.00	225	AT10/1280	1280.00	128
AT5/1500	1500.00	300	AT10/1300	1300.00	130
			AT10/1320	1320.00	132
			AT10/1350	1350.00	135
			AT10/1360	1360.00	136
			AT10/1400	1400.00	140
			AT10/1420	1420.00	142
			AT10/1480	1480.00	148
			AT10/1500	1500.00	150
			AT10/1600	1600.00	160
			AT10/1700	1700.00	170
			AT10/1720	1720.00	172
			AT10/1800	1800.00	180
			AT10/1860	1860.00	186
			AT10/1940	1940.00	194

Standard widths:
6 mm – Code **6**; 8 mm – Code **8**; 10 mm – Code **10**; 12 mm – Code **12**; 16 mm – Code **16**; 20 mm – Code **20**; 25 mm – Code **25**.

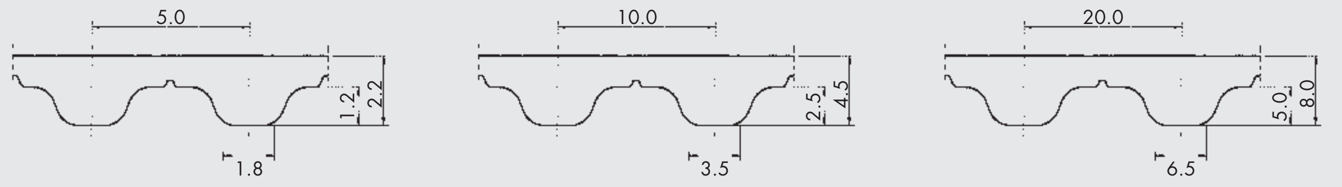
Standard widths:
10 mm – Code **10**; 12 mm – Code **12**; 16 mm – Code **16**; 20 mm – Code **20**; 25 mm – Code **25**; 32 mm – Code **32**; 50 mm – Code **50**.

Further sizes on request.

Power Transmission

3.2 ZRM/ZRP timing belt range

optiflex timing belts, endless manufactured



Construction: polyurethane with steel-wire cord

Type T5 – pitch 5 mm			Type T10 – pitch 10 mm			Type T20 – pitch 20 mm		
Belt No.	Pitch length (mm)	Number of teeth	Belt No.	Pitch length (mm)	Number of teeth	Belt No.	Pitch length (mm)	Number of teeth
T5/1500•	1500.00	300	T10/1500•	1500.00	150	T20/1500•	1500.00	75
T5/1600•	1600.00	320	T10/1600•	1600.00	160	T20/1600•	1600.00	80
T5/1700•	1700.00	340	T10/1700•	1700.00	170	T20/1700•	1700.00	85
T5/1800•	1800.00	360	T10/1800•	1800.00	180	T20/1800•	1800.00	90
T5/1900•	1900.00	380	T10/1900•	1900.00	190	T20/1900•	1900.00	95
T5/2000•	2000.00	400	T10/2000•	2000.00	200	T20/2000•	2000.00	100
T5/2100•	2100.00	420	T10/2100•	2100.00	210	T20/2100•	2100.00	105
T5/2200•	2200.00	440	T10/2200•	2200.00	220	T20/2200•	2200.00	110
T5/2300•	2300.00	460	T10/2300•	2300.00	230	T20/2300•	2300.00	115
T5/2400•	2400.00	480	T10/2400•	2400.00	240	T20/2400•	2400.00	120
T5/2500•	2500.00	500	T10/2500•	2500.00	250	T20/2500•	2500.00	125
T5/2600•	2600.00	520	T10/2600•	2600.00	260	T20/2600•	2600.00	130
T5/2700•	2700.00	540	T10/2700•	2700.00	270	T20/2700•	2700.00	135
T5/2800•	2800.00	560	T10/2800•	2800.00	280	T20/2800•	2800.00	140
T5/2900•	2900.00	580	T10/2900•	2900.00	290	T20/2900•	2900.00	145
T5/3000•	3000.00	600	T10/3000•	3000.00	300	T20/3000•	3000.00	150
T5/3200•	3200.00	640	T10/3200•	3200.00	320	T20/3200•	3200.00	160
T5/3400•	3400.00	680	T10/3400•	3400.00	340	T20/3400•	3400.00	170
T5/3600•	3600.00	720	T10/3600•	3600.00	360	T20/3600•	3600.00	180
T5/3800•	3800.00	760	T10/3800•	3800.00	380	T20/3800•	3800.00	190
T5/4000•	4000.00	800	T10/4000•	4000.00	400	T20/4000•	4000.00	200
T5/4200•	4200.00	840	T10/4200•	4200.00	420	T20/4200•	4200.00	210
T5/4400•	4400.00	880	T10/4400•	4400.00	440	T20/4400•	4400.00	220
T5/4600•	4600.00	920	T10/4600•	4600.00	460	T20/4600•	4600.00	230
T5/4800•	4800.00	960	T10/4800•	4800.00	480	T20/4800•	4800.00	240
T5/5000•	5000.00	1000	T10/5000•	5000.00	500	T20/5000•	5000.00	250
T5/5200•	5200.00	1040	T10/5200•	5200.00	520	T20/5200•	5200.00	260
T5/5400•	5400.00	1080	T10/5400•	5400.00	540	T20/5400•	5400.00	270
T5/5600•	5600.00	1120	T10/5600•	5600.00	560	T20/5600•	5600.00	280
T5/5800•	5800.00	1160	T10/5800•	5800.00	580	T20/5800•	5800.00	290
T5/6000•	6000.00	1200	T10/6000•	6000.00	600	T20/6000•	6000.00	300

Optiflex timing belts are available with PAZ fabric.
Length: 1500 mm - 24 000 mm

Minimum quantity: according to production capability (100 mm or 150 mm)

Double-toothed timing belts section T5D / T10D – on request.

Lengths over 6 000 mm on request.

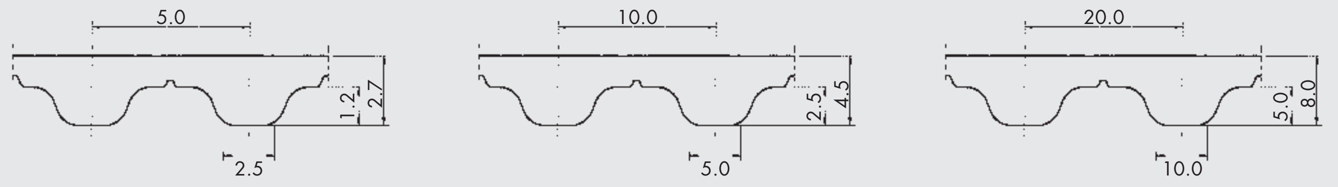
• Non stock items.

Standard widths:
16 mm – Code **16**; 25 mm – Code **25**; 32 mm – Code **32**; 50 mm – Code **50**; 75 mm – Code **75**; 100 mm – Code **100**.

optibelt
Power Transmission

3.2 ZRM/ZRP timing belt range

optiflex timing belts, endless manufactured



Construction: polyurethane with steel-wire cord

Type AT5 – pitch 5 mm			Type AT10 – pitch 10 mm			Type AT20 – pitch 20 mm		
Belt No.	Pitch length (mm)	Number of teeth	Belt No.	Pitch length (mm)	Number of teeth	Belt No.	Pitch length (mm)	Number of teeth
AT5/1500•	1500.00	300	AT10/1500•	1500.00	150	AT20/1500•	1500.00	75
AT5/1600•	1600.00	320	AT10/1600•	1600.00	160	AT20/1600•	1600.00	80
AT5/1700•	1700.00	340	AT10/1700•	1700.00	170	AT20/1700•	1700.00	85
AT5/1800•	1800.00	360	AT10/1800•	1800.00	180	AT20/1800•	1800.00	90
AT5/1900•	1900.00	380	AT10/1900•	1900.00	190	AT20/1900•	1900.00	95
AT5/2000•	2000.00	400	AT10/2000•	2000.00	200	AT20/2000•	2000.00	100
AT5/2100•	2100.00	420	AT10/2100•	2100.00	210	AT20/2100•	2100.00	105
AT5/2200•	2200.00	440	AT10/2200•	2200.00	220	AT20/2200•	2200.00	110
AT5/2300•	2300.00	460	AT10/2300•	2300.00	230	AT20/2300•	2300.00	115
AT5/2400•	2400.00	480	AT10/2400•	2400.00	240	AT20/2400•	2400.00	120
AT5/2500•	2500.00	500	AT10/2500•	2500.00	250	AT20/2500•	2500.00	125
AT5/2600•	2600.00	520	AT10/2600•	2600.00	260	AT20/2600•	2600.00	130
AT5/2700•	2700.00	540	AT10/2700•	2700.00	270	AT20/2700•	2700.00	135
AT5/2800•	2800.00	560	AT10/2800•	2800.00	280	AT20/2800•	2800.00	140
AT5/2900•	2900.00	580	AT10/2900•	2900.00	290	AT20/2900•	2900.00	145
AT5/3000•	3000.00	600	AT10/3000•	3000.00	300	AT20/3000•	3000.00	150
AT5/3200•	3200.00	640	AT10/3200•	3200.00	320	AT20/3200•	3200.00	160
AT5/3400•	3400.00	680	AT10/3400•	3400.00	340	AT20/3400•	3400.00	170
AT5/3600•	3600.00	720	AT10/3600•	3600.00	360	AT20/3600•	3600.00	180
AT5/3800•	3800.00	760	AT10/3800•	3800.00	380	AT20/3800•	3800.00	190
AT5/4000•	4000.00	800	AT10/4000•	4000.00	400	AT20/4000•	4000.00	200
AT5/4200•	4200.00	840	AT10/4200•	4200.00	420	AT20/4200•	4200.00	210
AT5/4400•	4400.00	880	AT10/4400•	4400.00	440	AT20/4400•	4400.00	220
AT5/4600•	4600.00	920	AT10/4600•	4600.00	460	AT20/4600•	4600.00	230
AT5/4800•	4800.00	960	AT10/4800•	4800.00	480	AT20/4800•	4800.00	240
AT5/5000•	5000.00	1000	AT10/5000•	5000.00	500	AT20/5000•	5000.00	250
AT5/5200•	5200.00	1040	AT10/5200•	5200.00	520	AT20/5200•	5200.00	260
AT5/5400•	5400.00	1080	AT10/5400•	5400.00	540	AT20/5400•	5400.00	270
AT5/5600•	5600.00	1120	AT10/5600•	5600.00	560	AT20/5600•	5600.00	280
AT5/5800•	5800.00	1160	AT10/5800•	5800.00	580	AT20/5800•	5800.00	290
AT5/6000•	6000.00	1200	AT10/6000•	6000.00	600	AT20/6000•	6000.00	300

Optiflex timing belts are available with PAZ fabric.
Length: 1500 mm - 24000 mm

Minimum quantity: according to production capability (100 mm or 150 mm)

Double-toothed timing belts section AT5D / AT10D – on request.

Lengths over 6000 mm on request.

• Non stock items.

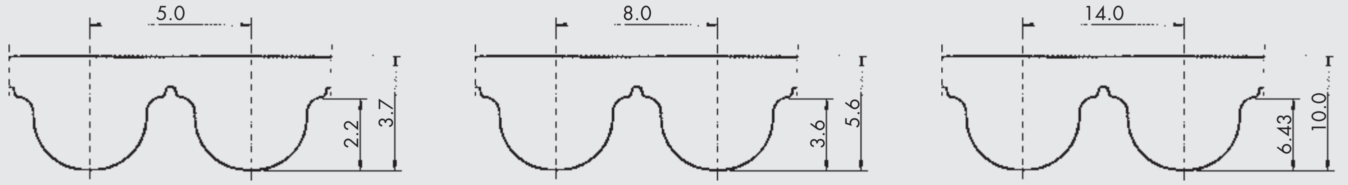
Standard widths:
16 mm – Code **16**; 25 mm – Code **25**; 32 mm – Code **32**; 50 mm – Code **50**; 75 mm – Code **75**; 100 mm – Code **100**.

optibelt

Power Transmission

3.2 ZRM/ZRP timing belt range

optiflex timing belts, endless manufactured



Construction: polyurethane with steel-wire cord

Type 5M – pitch 5 mm

Belt No.	Pitch length (mm)	Number of teeth
5M/1500•	1500.00	300
5M/1600•	1600.00	320
5M/1700•	1700.00	340
5M/1800•	1800.00	360
5M/1900•	1900.00	380
5M/2000•	2000.00	400
5M/2100•	2100.00	420
5M/2200•	2200.00	440
5M/2300•	2300.00	460
5M/2400•	2400.00	480
5M/2500•	2500.00	500
5M/2600•	2600.00	520
5M/2700•	2700.00	540
5M/2800•	2800.00	560
5M/2900•	2900.00	580
5M/3000•	3000.00	600
5M/3200•	3200.00	640
5M/3400•	3400.00	680
5M/3600•	3600.00	720
5M/3800•	3800.00	760
5M/4000•	4000.00	800
5M/4200•	4200.00	840
5M/4400•	4400.00	880
5M/4600•	4600.00	920
5M/4800•	4800.00	960
5M/5000•	5000.00	1000
5M/5200•	5200.00	1040
5M/5400•	5400.00	1080
5M/5600•	5600.00	1120
5M/5800•	5800.00	1160
5M/6000•	6000.00	1200

Type 8M – pitch 8 mm

Belt No.	Pitch length (mm)	Number of teeth
8M/1504•	1504.00	188
8M/1600•	1600.00	200
8M/1704•	1704.00	213
8M/1800•	1800.00	225
8M/1904•	1904.00	238
8M/2000•	2000.00	250
8M/2104•	2104.00	263
8M/2200•	2200.00	275
8M/2304•	2304.00	288
8M/2400•	2400.00	300
8M/2504•	2504.00	313
8M/2600•	2600.00	325
8M/2704•	2704.00	338
8M/2800•	2800.00	350
8M/2904•	2904.00	363
8M/3000•	3000.00	375
8M/3200•	3200.00	400
8M/3400•	3400.00	425
8M/3600•	3600.00	450
8M/3800•	3800.00	475
8M/4000•	4000.00	500
8M/4200•	4200.00	525
8M/4400•	4400.00	550
8M/4600•	4600.00	575
8M/4800•	4800.00	600
8M/5000•	5000.00	625
8M/5200•	5200.00	650
8M/5400•	5400.00	675
8M/5600•	5600.00	700
8M/5800•	5800.00	725
8M/6000•	6000.00	750

Type 14M – pitch 14 mm

Belt No.	Pitch length (mm)	Number of teeth
14M/1512•	1512.00	108
14M/1596•	1596.00	114
14M/1694•	1694.00	121
14M/1750•	1750.00	125
14M/1806•	1806.00	129
14M/1904•	1904.00	136
14M/2002•	2002.00	143
14M/2100•	2100.00	150
14M/2198•	2198.00	157
14M/2296•	2296.00	164
14M/2394•	2394.00	171
14M/2450•	2450.00	175
14M/2506•	2506.00	179
14M/2604•	2604.00	186
14M/2702•	2702.00	193
14M/2800•	2800.00	200
14M/2898•	2898.00	207
14M/2996•	2996.00	214
14M/3094•	3094.00	221
14M/3150•	3150.00	225
14M/3206•	3206.00	229
14M/3304•	3304.00	236
14M/3402•	3402.00	243
14M/3500•	3500.00	250
14M/3598•	3598.00	257
14M/3696•	3696.00	264
14M/3794•	3794.00	271
14M/3850•	3850.00	275
14M/3906•	3906.00	279
14M/4004•	4004.00	286
14M/4102•	4102.00	293
14M/4200•	4200.00	300
14M/4298•	4298.00	307
14M/4396•	4396.00	314
14M/4494•	4494.00	321
14M/4550•	4550.00	325
14M/4606•	4606.00	329
14M/4704•	4704.00	336
14M/4802•	4802.00	343
14M/4900•	4900.00	350
14M/4998•	4998.00	357
14M/5096•	5096.00	364
14M/5194•	5194.00	371
14M/5250•	5250.00	375
14M/5306•	5306.00	379
14M/5404•	5404.00	386
14M/5502•	5502.00	393
14M/5600•	5600.00	400
14M/5698•	5698.00	407
14M/5796•	5796.00	414
14M/5894•	5894.00	421
14M/5950•	5950.00	425
14M/6006•	6006.00	429

Optiflex timing belts are available with PAZ fabric.

Length: 1500 mm - 24000 mm

Minimum quantity: according to production capability (100 mm or 150 mm)

Double-Toothed Timing Belts Section D-5M – on request.

Lengths over
6000 mm on request (Section 5M / 8M).
6006 mm on request (Section 14M).

• Non stock items.

Standard widths:
15 mm – Code **15**; 25 mm – Code **25**; 50 mm – Code **50**; 75 mm – Code **75**; 100 mm – Code **100**.

Standard widths:
20 mm – Code **20**; 25 mm – Code **25**; 30 mm – Code **30**; 50 mm – Code **50**; 85 mm – Code **85**; 100 mm – Code **100**.

Standard widths:
25 mm – Code **25**; 40 mm – Code **40**; 55 mm – Code **55**; 85 mm – Code **85**; 100 mm – Code **100**.

3.3 ZRM/ZRP belt selection graphs

Power rating graphs for section selection and maximum belt speeds for optibelt *ZRM/ZRP* timing belts, Z_{emax} = 12

The maximum belt speeds for the individual timing belt sections in these graphs are based on pulleys with 60 teeth, at least 12 of which are in mesh. In addition each maximum width is based on a combination of standard timing belts and standard pulleys (see Table 3.4).

Wider belts can be used with special pulleys allowing increased power transmission.

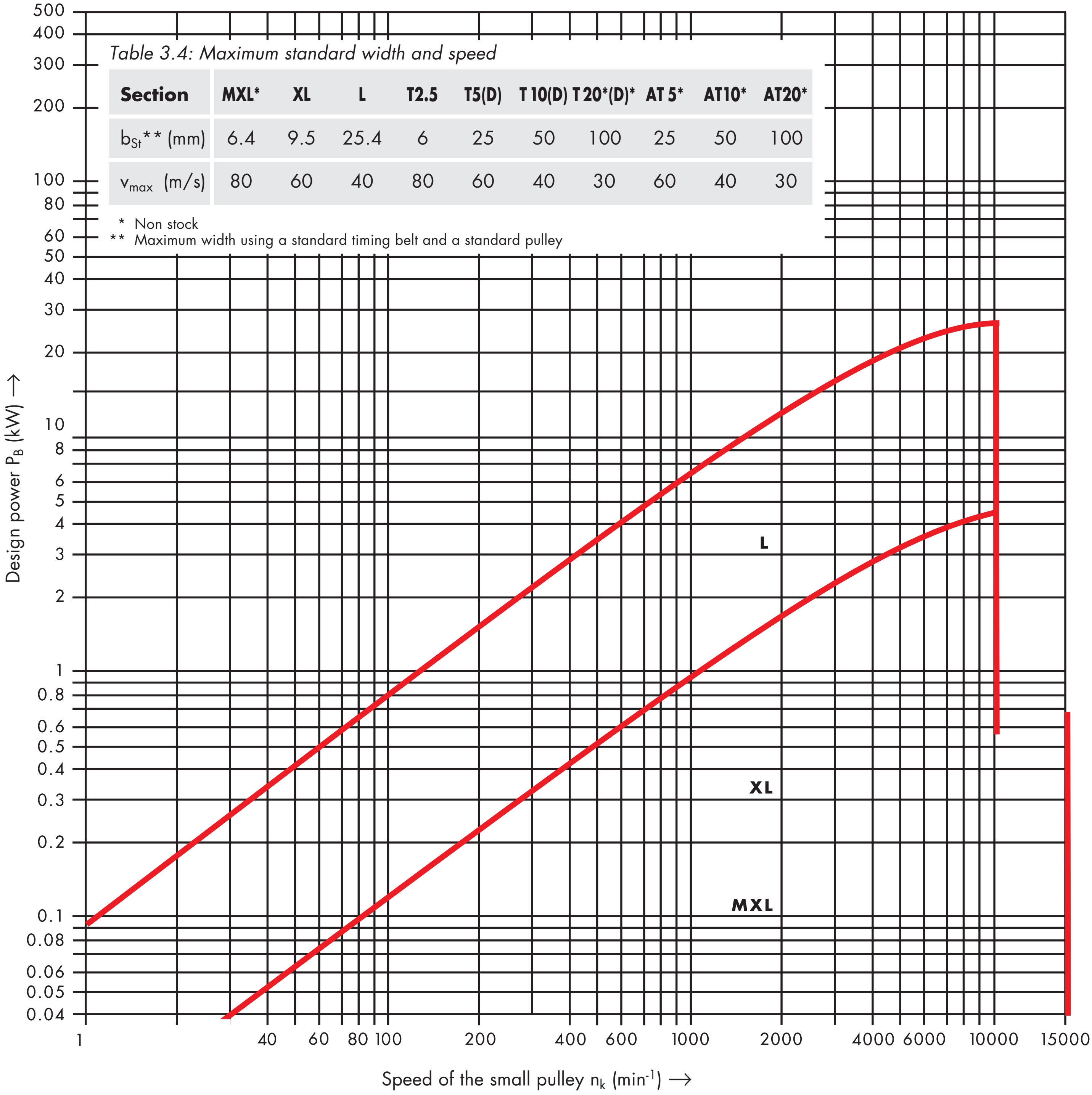
Specifying smaller pulley diameters, a smaller number of teeth in mesh or narrower belts, will reduce the maximum power limits proportionally.

Graph 3.1: ZRP power ranges

Table 3.4: Maximum standard width and speed

Section	MXL*	XL	L	T2.5	T5(D)	T 10(D)	T 20*(D)*	AT 5*	AT10*	AT20*
b_{St}** (mm)	6.4	9.5	25.4	6	25	50	100	25	50	100
v_{max} (m/s)	80	60	40	80	60	40	30	60	40	30

* Non stock
** Maximum width using a standard timing belt and a standard pulley



3.3 ZRM/ZRP belt selection graphs

Power rating graphs for section selection and maximum belt speeds for optibelt *ZRM/ZRP* timing belts, Z_{emax} = 12

The belt speeds given in Table 3.4 should not be exceeded for the standard drives. For belt speeds close to these maximum values, increased belt tension is necessary.

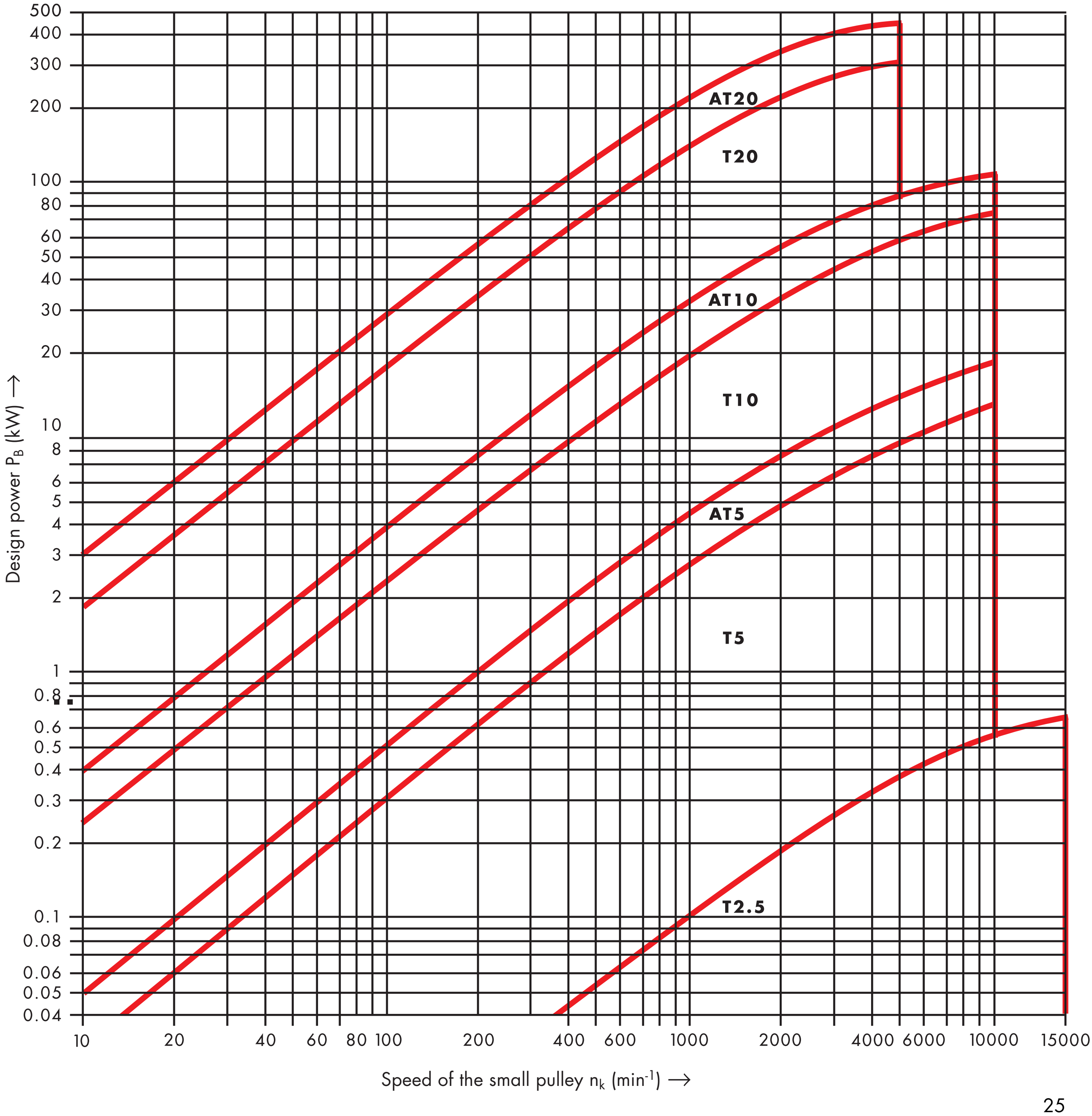
$$v = \frac{d_{w1} \cdot n_1}{19100} = \frac{d_{w2} \cdot n_2}{19100} \quad \left(\frac{m}{s}\right)$$

The smaller of the two drive pulleys is used for the calculation irrespective of whether it is used as a driver or a driven pulley.

The values given for the transmissible power P_{spez} (W/cm) in Table 3.5, page 25 are based on one tooth in mesh, a 10 mm timing belt width and one tooth of the small pulley.

These values are not based on the belt tension cord strength, but on the shear strength of the teeth based on the particular mode of operation.

Graph 3.2: ZRM power ranges



3.4 ZRM/ZRP drive design

Drive calculation for optibelt *ZRM/ZRP* timing belts, Z_{emax} = 12

Prime mover

Prime mover:	three-phase squirrel cage electric motor
Power:	P_{An} = 6.0 kW
Speed:	n_1 = 1450 min^{-1}
Starting torque:	M_A = 2.0 M_N
Pulley clearance diameter:	as required
Drive width:	b_1, B < 80 mm

Operating conditions

Daily operation:	max. 16 hours
Starts/stops:	approx. 150 per day
Ambient conditions:	standard room temperature, contact with cutting oil
Drive centres:	a = 410 ± 20 mm

Driven machine

Driven machine:	drill
Absorbed power:	P_{Ab} = 5.0 kW
Driven speed:	n_2 = 600 ± 10 min^{-1}
Start condition:	no load
Type of loading:	intermittent operation with average shock loading
Pulley clearance diameter:	< 300 mm
Width:	b_1, B as required

Formulae	Calculation example

Design power and belt selection

Formulae	Calculation example
Total service factor c_2	
$c_2 = c_0 + c_6 + c_8$	$c_2 = 1.8 + 0 + 0 = 1.8$
Basic service factor — c_0 Table 2.1, page 12	$c_0 = 1.8$
Pulley and idler factor — c_6 Table 2.2, page 13	$c_6 = 0$
Start/stop factor — c_8 Table 2.2, page 13	$c_8 = 0$

Formulae	Calculation example
Design power P_B	
$P_B = P_{Ab} \cdot c_2$ $\qquad P_{Ab} = \frac{M_{Ab} \cdot n_2}{9550}$	$P_B = 5.0 \cdot 1.8 = 9.0$ kW
If P_{Ab} unknown: $\quad P_B = P_{An} \cdot c_2$ $\quad$ Formulae page 13	
Select section from graph pages 24 and 25 using small pulley speed n_k	Section T10 $\qquad n_k = n_1 = 1450$ min^{-1}

Pulleys

Formulae	Calculation example
For standard pulley ranges see pages 54 to 86,	T10 for standard pulleys see page 82
For pulley materials and fitting see Table 5.3, page 44	

Formulae	Calculation example
Number of teeth z_1, z_2, pitch diameter d_{w1}, d_{w2} and calculation of the drive ratio i	
z_1, d_{w1} see standard pulley range	$z_1 = 25$ $\qquad d_{w1} = 79.58$ mm $\qquad$ see page 82
$z_2 = z_1 \cdot i$ $\qquad i = \frac{n_1}{n_2}$	$z_2 = 25 \cdot 2.42$ $\qquad i = \frac{1450}{600} = 2.42$
z_2, d_{w2} see standard pulley range	$z_2 = 60$ $\qquad d_{w2} = 190.98$ mm $\qquad$ see page 82
Are clearance diameters and permissible sizes acceptable?	Bore: $\quad d_1$ from 12 ... 30 mm $\quad d_2$ from 16 ... 60 mm
Clearance diameter including space to fit belt > d_a (resp. D_B) + 2 · h_s	Clearance diam. >189.1 + 2 · 4.5 ≙ 198.1 mm < 300 mm, h_s see p. 5

Formulae	Calculation example
Driven speed n_{2eff} and drive ratio i eff	
$n_{2eff} = \frac{n_1 \cdot z_1}{z_2}$ $\qquad i_{eff} = \frac{z_2}{z_1}$	$n_{2eff} = \frac{1450 \cdot 25}{60} = 604$ min^{-1} $\qquad i_{eff} = \frac{60}{25} = 2.4$

Pitch length and drive centres with allowances

Formulae	Calculation example
Drive centres and pulley flange arrangements	Flanges on small pulley, y_{2k} see Table 5.1 page 43
$0.5 \cdot (D_{Bk} + d_{wg}) + y < a < 2 \cdot (d_{wg} + d_{wk})$	$0.5 \cdot (83 + 190.98) + 10 = 147$ mm $\quad 147$ mm $< a < 541$ mm

Formulae	Calculation example
Theoretical and standard belt lengths L_{wth}, L_{wSt}*	
$L_{wth} = 2\,a + \frac{\pi}{2} \cdot (d_{wg} + d_{wk}) + \frac{(d_{wg} - d_{wk})^2}{4\,a}$	$L_{wth} = 2 \cdot 410 + \frac{\pi}{2} \cdot (190.98 + 79.58) + \frac{(190.98 - 79.58)^2}{4 \cdot 410}$
	$L_{wth} = 1252.6$ mm
L_{wSt} see standard belt range, pages 16 to 19	$L_{wSt} = 1250$ mm for Section T10 see page 17

3.4 ZRM/ZRP drive design

Drive calculation for optibelt *ZRM/ZRP* timing belts, z_{emax} = 12

Formulae

Pitch length and drive centres with allowances

Nominal centres a_{nom}

$$a_{nom} = K + \sqrt{K^2 - \frac{(d_{wg} - d_{wk})^2}{8}}$$

$$K = \frac{L_{wSt}}{4} - \frac{\pi}{8}(d_{wg} + d_{wk})$$

Centre distance allowances for installation and tensioning a_{nom} see Table 5.1, page 43;
installation: allowance y
tensioning: allowance x

$y = y_{1,2,3}$ depending on which pulleys are flanged

x

$a_{min} \leq a_{nom} - y$ $\qquad a_{nom} + x \leq a_{max}$

For calculation and setting of tension, see page 28

Timing belt and pulley width

Calculation of z_{enom}, z_e in mesh with small pulley, z_{emax} = 12, to be taken into account

$z_{enom} \geq z_{emax} \longrightarrow z_e = z_{emax}$

$z_{enom} < z_{emax} \longrightarrow z_e = z_{enom}$

$$z_{enom} = \frac{z_k}{6}\left(3 - \frac{d_{wg} - d_{wk}}{a_{nom}}\right)$$

Power P_{spec} per tooth in mesh, 10 mm belt width and one tooth of small pulley from Table 3.5, see page 29

P_{spez} (Profil, n_k)

Calculation for belt width b_{th}, b_{st}

$$b_{th} = \frac{P_B \cdot 10000}{P_{spez} \cdot c_3 \cdot z_k \cdot z_e}$$

c_3 from Table 2.3, page 13

Standard belt width b_{St} page 16 to 19, $b_{St} \geq b_{th}$

Drive width within specification?

Actual drive service factor c_{2vorh}

$$c_{2vorh} = c_2 \frac{b_{St}}{b_{th}}$$

Order example

Timing belt and pulley designation

Quantity, type, width, section, pitch length
(special constructions or features if required)

Calculation example

$$a_{nom} = 206.251 + \sqrt{206.251^2 - \frac{(190.98 - 79.58)^2}{8}} = 408.71 \text{ mm}$$

$$K = \frac{1250}{4} - \frac{\pi}{8}(190.98 + 79.58) = 206.251 \text{ mm}$$

With fixed centres, a tension idler is necessary, see page 45

Flanges on small pulley $\qquad y_{2k}$ = 10 mm

x $\geq$ 0,32 + 0.002 · 408.71 ≙ 1.14 mm $\qquad$ x $\geq$ 1.2 mm

$a_{min} \geq 398.7$ $\qquad$ 409.9 mm $\leq a_{max}$

Values for F_v, e_v and S_a see page 28

11 $< z_{emax} \longrightarrow z_e = 11$ $\qquad z_{enom}$ round off

$$z_{enom} = \frac{25}{6}\left(3 - \frac{190.98 - 79.58}{408.71}\right) = 11.4$$

P_{spez} (T 10, 1450 min^{-1}) = 6.850 W/cm

$$b_{th} = \frac{9.0 \cdot 10000}{6.850 \cdot 1.0 \cdot 25 \cdot 11} = 47.8 \text{ mm} \qquad c_3 = 1.0$$

b_{St} = 50 mm for section T10 see page 17

Total pulley width B = 66 mm, face width b_1 = 56 mm

$$c_{2vorh} = 1.8 \frac{50}{47.8} = 1.88$$

1 Optibelt ZRM	timing belt	50 T10/1250
1 Optibelt ZRS	pulley	66 T10/25-2 Type 6F
1 Optibelt ZRS	pulley	66 T10/60-0 Type 6

* Please send for our special brochure: Centre distance values for Optibelt timing belts.

3.5 ZRM/ZRP tensioning

Calculation and setting of tension for optibelt *ZRM/ZRP* timing belt drives

Correct tensioning is of special importance for the reliable and efficient transmission of power. Proper tensioning of the stationary belt will ensure that it will run at the correct tension.

- Insufficient tension coupled to high drive loads will lead to the belt jumping teeth on the pulley and ultimately to belt breakage.
- Excessive tension under similar conditions will cause severe wear, shearing of the belt teeth, excessive running noise and bearing damage.

It is advisable therefore to calculate and set the static tension for each drive individually using the formulae below. The tensioning factor c_v takes account of the loads combined in the overall service factor c_2.

Setting the static tension

One pulley only of the drive may be fixed when the static tension is adjusted. The second pulley and the other pulleys of a multiple pulley drive must be able to rotate freely.

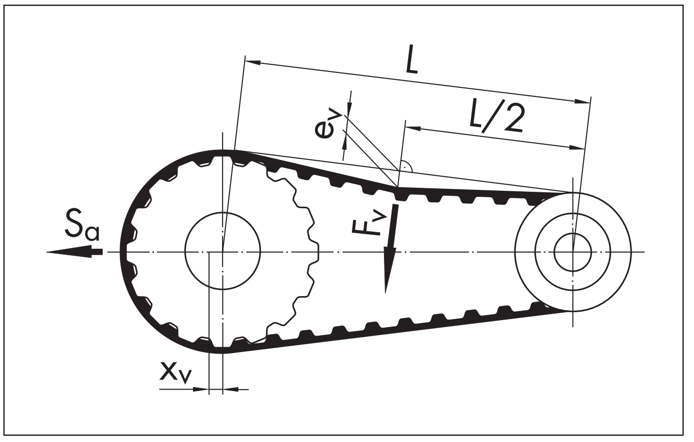
The test force F_v should be applied in the centre of the span length 'L' perpendicular to it. Sharp-edged objects MUST not be used for depressing the timing belt to avoid belt kink. Correct static tension is achieved when the deflection e_v corresponds to the calculated value.

When the drive system has more than the two pulleys shown in Figure 3.1 the tension can be measured between any two pulleys in the system provided the belt is in contact with these pulleys with the same face (top or bottom). The only difference will be e_v which will change as a function of span length.

Alternatively, the belt can be tensioned statically using the calculated static shaft load S_a.

By virtue of the zero stretch tension cord, the belt will require no further tension checks after fitting.

Figure 3.1: Adjusting belt tension



For formula symbols, see also page 14

F_v	=	load to set tension	(N)
S_{n3}	=	centrifugal force	(N)
e_v	=	span deflection under load F_v	(mm)
L	=	span length	(mm)

Formulae

Tension factor and forces

Tension factor c_v

$$c_v = \frac{c_2 - 1}{2} + 0.9 \qquad 1.05 \le c_v$$

Static shaft load S_a and centrifugal force S_{n3}

$$S_a = c_v \cdot S_{n3} \frac{L}{a_{nom}}$$ L see below

$$S_{n3} = \frac{P_{Ab} \cdot 1000}{v_{eff}} \qquad v_{eff} = \frac{d_{w1} \cdot n_1}{19100}$$ formulae page 13

Tensioning

Test force F_v and deflection e_v for span length L

$$F_v = \frac{c_v \cdot S_{n3}}{20}$$ c_v and S_{n3} see above

$$e_v = \frac{L}{50}$$ $L = a_{nom}$ for $i = 1$

$$L = \sqrt{a_{nom}^2 - \frac{(d_{wg} - d_{wk})^2}{2}}$$ for $i \neq 1$

Example (using the values from page 27)

$$c_v = \frac{1.8 - 1}{2} + 0.9 = 1.3$$

$$S_a = 1.3 \cdot 828 \, \frac{401.05}{408.71} = 1056 \text{ N}$$

$$S_{n3} = \frac{5.0 \cdot 1000}{6.04} = 828 \text{ N} \qquad v_{eff} = \frac{79.58 \cdot 1450}{19100} = 6.04 \frac{\text{m}}{\text{s}}$$

$$F_v = \frac{1.3 \cdot 828}{20} = 54 \text{ N}$$

$$e_v = \frac{401.1}{50} = 8.0 \text{ mm}$$

$$L = \sqrt{408.71^2 - \frac{(190.98 - 79.58)^2}{2}} = 401.05 \text{ mm}$$

3.6 ZRM/ZRP power rating table

Power ratings for optibelt *ZRM/ZRP* timing belts z_{emax} = 12

*Table 3.5: ZRM/ZRP power ratings**

Speed of small pulley n_k (min^{-1})	P_{spez} (W/cm)									
	MXL	**XL**	**L**	**T2.5**	**T5(D)**	**T10(D)**	**T20(D)**	**AT5**	**AT10**	**AT20**
20	0.006	0.037	0.101	0.006	0.035	0.137	0.561	0.055	0.221	0.858
40	0.012	0.074	0.201	0.012	0.069	0.273	1.113	0.109	0.440	1.705
60	0.017	0.110	0.300	0.017	0.103	0.407	1.656	0.162	0.656	2.539
80	0.023	0.146	0.397	0.023	0.137	0.539	2.191	0.215	0.870	3.361
100	0.029	0.181	0.493	0.029	0.170	0.670	2.718	0.268	1.081	4.172
200	0.057	0.351	0.953	0.057	0.331	1.302	5.230	0.524	2.101	8.052
300	0.083	0.509	1.382	0.083	0.484	1.899	7.551	0.768	3.064	11.655
400	0.109	0.658	1.782	0.109	0.629	2.462	9.693	1.002	3.972	14.995
450	0.122	0.728	1.972	0.122	0.698	2.731	10.701	1.114	4.407	16.572
500	0.134	0.797	2.156	0.134	0.766	2.993	11.670	1.224	4.829	18.088
600	0.158	0.928	2.505	0.158	0.897	3.495	13.497	1.437	5.637	20.948
700	0.181	1.052	2.832	0.181	1.022	3.970	15.186	1.641	6.400	23.590
720	0.185	1.076	2.895	0.185	1.046	4.061	15.509	1.681	6.547	24.094
800	0.203	1.169	3.139	0.203	1.140	4.418	16.752	1.836	7.120	26.029
900	0.224	1.281	3.428	0.224	1.253	4.844	18.208	2.023	7.802	28.280
950	0.235	1.336	3.567	0.235	1.307	5.048	18.899	2.113	8.128	29.340
1000	0.245	1.389	3.702	0.245	1.361	5.247	19.568	2.202	8.447	30.358
1100	0.265	1.493	3.962	0.265	1.464	5.631	20.845	2.374	9.058	32.277
1200	0.284	1.594	4.211	0.284	1.563	5.998	22.054	2.540	9.640	34.052
1300	0.303	1.694	4.451	0.303	1.659	6.349	23.207	2.700	10.194	35.699
1400	0.321	1.793	4.685	0.321	1.751	6.686	24.503	2.855	10.725	37.231
1450	0.329	1.843	4.800	0.329	1.796	6.850	25.130	2.931	10.982	37.960
1500	0.338	1.893	4.914	0.338	1.841	7.012	25.743	3.005	11.234	38.858
1600	0.355	1.993	5.141	0.355	1.928	7.328	26.927	3.151	11.726	40.469
1700	0.372	2.095	5.367	0.372	2.014	7.636	28.056	3.293	12.202	41.979
1800	0.388	2.201	5.596	0.388	2.098	7.939	29.134	3.433	12.667	43.392
1900	0.403	2.310	5.829	0.403	2.193	8.239	30.162	3.570	13.123	44.713
2000	0.419	2.424	6.068	0.419	2.290	8.537	31.142	3.705	13.573	45.944
2200	0.449	2.580	6.550	0.449	2.479	9.136	32.969	3.972	14.468	48.155
2400	0.478	2.768	6.999	0.478	2.661	9.806	34.633	4.239	15.440	50.057
2600	0.507	2.949	7.428	0.507	2.838	10.396	36.150	4.511	16.319	51.679
2800	0.535	3.124	7.837	0.535	3.008	10.957	37.539	4.759	17.146	53.053
2850	0.542	3.167	7.936	0.542	3.050	11.093	37.868	4.821	17.344	53.362
3000	0.564	3.293	8.226	0.564	3.173	11.489	38.817	5.004	17.921	54.211
3200	0.593	3.457	8.597	0.593	3.332	11.994	40.001	5.239	18.647	55.181
3400	0.623	3.614	8.950	0.623	3.486	12.473	41.110	5.464	19.325	55.997
3600	0.654	3.767	9.287	0.654	3.635	12.927	42.160	5.680	19.958	56.688
3800	0.683	3.914	9.607	0.683	3.780	13.357	43.170	5.886	20.547	57.285
4000	0.710	4.057	9.912	0.710	3.920	13.764	44.157	6.084	21.095	57.820
4200	0.735	4.195	10.203	0.735	4.055	14.150	45.139	6.273	21.604	58.323
4400	0.761	4.330	10.480	0.761	4.186	14.516	46.133	6.454	22.075	58.825
4600	0.785	4.460	10.745	0.785	4.314	14.862	47.157	6.628	22.510	59.356
4800	0.809	4.586	10.997	0.809	4.438	15.190	48.228	6.795	22.912	59.949
5000	0.832	4.710	11.238	0.832	4.558	15.502	49.364	6.955	23.282	60.633
5500	0.886	5.005	11.796	0.886	4.846	16.214		7.328	24.082	
6000	0.937	5.284	12.301	0.937	5.118	16.845		7.669	24.728	
6500	0.984	5.553	12.766	0.984	5.377	17.414		7.983	25.251	
7000	1.027	5.815	13.203	1.027	5.627	17.938		8.277	25.682	
7500	1.068	6.074	13.625	1.068	5.872	18.436		8.558	26.051	
8000	1.106	6.334	14.044	1.106	6.114	18.924		8.832	26.389	
8500	1.141	6.601	14.472	1.141	6.359	19.423		9.104	26.728	
9000	1.174	6.877	14.922	1.174	6.608	19.948		9.383	27.098	
9500	1.205	7.167	15.407	1.205	6.867	20.519		9.674	27.530	
10000	1.235	7.475	15.939	1.235	7.137	21.153		9.983	28.056	
11000	1.291			1.291						
12000	1.345			1.345						
13000	1.399			1.399						
14000	1.455			1.455						
15000	1.516			1.516						

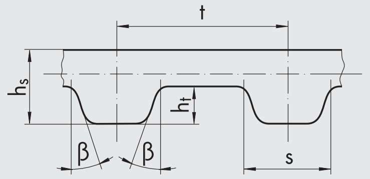
* For notes on Table 3.5, see page 25. P_{spez} per tooth in mesh, 10 mm belt width and one tooth of small pulley.

optibelt

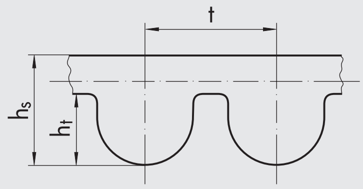
Power Transmission

4.1 ZRL timing belt range

optibelt *ZRL-M* open-ended and optibelt *ZRL-V* joined endless timing belts



XL; L; H; XH



5M; 8M; 14M

Construction: polyurethane with Aramid or steel tension cord

Section			XL	L	H	XH	5M	8M	14M
Tooth pitch	t	(mm)	5.08	9.525	12.7	22.225	5.00	8.00	14.00
Tooth angle	2 β	(°)	50	40	40	40	—	—	—
Tooth depth	h_t	(mm)	1.27	1.91	2.29	6.35	2.10	3.38	6.10
Tooth width	s	(mm)	2.57	4.65	6.12	12.57	—	—	—
Overall belt thickness	h_s	(mm)	2.30	3.60	4.30	11.20	3.60	5.60	10.00

Table 4.1: ZRL timing belt range

Aramid tension cord ZRL-M; ZRL-V**	**Geometry**		**Steel tension cord** ZRL-M; ZRL-V on request
Belt designation	Pitch t (mm)	Standard width b_{St} (mm)	Belt designation
XL 025	5.08	6.35	XL 025 - St*
XL 031	5.08	7.94	XL 031 - St*
XL 037	5.08	9.53	XL 037 - St*
XL 050	5.08	12.70	XL 050 - St*
XL 075	5.08	19.05	XL 075 - St*
XL 100*	5.08	25.40	XL 100 - St*
L 037	9.525	9.53	L 037 - St
L 050	9.525	12.70	L 050 - St
L 075	9.525	19.05	L 075 - St
L 100	9.525	25.40	L 100 - St
L 150	9.525	38.10	L 150 - St*
L 200	9.525	50.80	L 200 - St*
H 050	12.7	12.70	H 050 - St*
H 075	12.7	19.05	H 075 - St
H 100	12.7	25.40	H 100 - St
H 150	12.7	38.10	H 150 - St
H 200	12.7	50.80	H 200 - St
H 300	12.7	76.20	H 300 - St
H 400*	12.7	101.60	H 400 - St*
XH 100	22.225	25.40	XH 100 - St*
XH 200	22.225	50.80	XH 200 - St*
XH 300	22.225	76.20	XH 300 - St*
XH 400	22.225	101.60	XH 400 - St*
5M 10*	5.0	10.0	5M 10 - St
5M 15*	5.0	15.0	5M 15 - St
5M 25*	5.0	25.0	5M 25 - St
5M 50*	5.0	50.0	5M 50 - St
8M 20*	8.0	20.0	8M 20 - St
8M 25*	8.0	25.0	8M 25 - St
8M 30*	8.0	30.0	8M 30 - St
8M 50*	8.0	50.0	8M 50 - St
8M 85*	8.0	85.0	8M 85 - St
14M 25*	14.0	25.0	14M 25 - St
14M 40*	14.0	40.0	14M 40 - St
14M 55*	14.0	55.0	14M 55 - St
14M 85*	14.0	85.0	14M 85 - St

Order example ZRL-M: 50 m 8M 50 - St

- Order quantity
- Section
- Width (mm)
- Tension cord

Order example ZRL-V: 2140 H 050 - V

- Pitch length code
  Pitch length (inch x 10)
  214" = 5435.6 mm
- Section
- Width code:
  Width (inch x 100)
  0.5" = 12.7 mm
- Joined endless

Minimum length for joined endless timing belts depending on the tension cord:

Aramid	Steel
XL = 600 mm	All sections
L = 600 mm	1000 mm
H = 600 mm	
XH = 900 mm	
5M = 600 mm	
8M = 600 mm	
14M = 900 mm	

When ordering pulleys for ZRL timing belting, the type, quantity and centre distances must be specified.

* Non stock

** ZRL-V 5M, 8M, 14M on request

Further widths on request

Roll length: 50 m

Surcharge for intermediate lengths: 20 %

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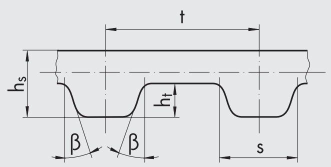
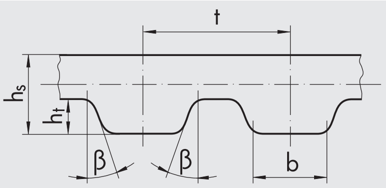
Power Transmission

4.1 ZRL timing belt range

optibelt *ZRL-M* open-ended and
optibelt *ZRL-V* joined endless timing belts



T5; T10; T20



AT5; AT10

Construction: polyurethane with Aramid or steel tension cord

Section			**T 5**	**T 10**	**T 20**	**AT 5**	**AT 10**
Tooth pitch	t	(mm)	5.0	10.0	20.0	5.0	10.0
Tooth angle	2 β	(°)	40	40	40	50	50
Tooth depth	h_t	(mm)	1.20	2.50	5.00	1.20	2.50
Tooth width	s/b	(mm)	2.65	5.30	10.15	2.50	5.00
Overall belt thickness	h_s	(mm)	2.20	4.50	8.00	2.70	5.00

Table 4.1 continued

Aramid tension cord ZRL-M; ZRL-V**	**Geometry**		**Steel tension cord** ZRL-M; ZRL-V on request
Belt designation	Pitch t (mm)	Standard width b_{St} (mm)	Belt designation
6 T5	5.0	6.0	6 T5 - St
8 T5	5.0	8.0	8 T5 - St
10 T5	5.0	10.0	10 T5 - St
12 T5	5.0	12.0	12 T5 - St
16 T5	5.0	16.0	16 T5 - St
20 T5	5.0	20.0	20 T5 - St
25 T5	5.0	25.0	25 T5 - St
32 T5	5.0	32.0	32 T5 - St*
50 T5*	5.0	50.0	50 T5 - St*
10 T10	10.0	10.0	10 T10 - St*
12 T10	10.0	12.0	12 T10 - St
16 T10	10.0	16.0	16 T10 - St
20 T10	10.0	20.0	20 T10 - St
25 T10	10.0	25.0	25 T10 - St
32 T10	10.0	32.0	32 T10 - St
40 T10	10.0	40.0	40 T10 - St
50 T10	10.0	50.0	50 T10 - St
75 T10	10.0	75.0	75 T10 - St
100 T10	10.0	100.0	100 T10 - St
25 T20	20.0	25.0	25 T20 - St
32 T20	20.0	32.0	32 T20 - St
50 T20	20.0	50.0	50 T20 - St
75 T20	20.0	75.0	75 T20 - St*
100 T20	20.0	100.0	100 T20 - St*
6 AT 5*	5.0	6.0	6 AT 5 - St
10 AT 5*	5.0	10.0	10 AT 5 - St
16 AT 5*	5.0	16.0	16 AT 5 - St
25 AT 5*	5.0	25.0	25 AT 5 - St
32 AT 5*	5.0	32.0	32 AT 5 - St
50 AT 5*	5.0	50.0	50 AT 5 - St
16 AT10*	10.0	16.0	16 AT10 - St
25 AT10*	10.0	25.0	25 AT10 - St
32 AT10*	10.0	32.0	32 AT10 - St
50 AT10*	10.0	50.0	50 AT10 - St
75 AT10*	10.0	75.0	75 AT10 - St*
100 AT10*	10.0	100.0	100 AT10 - St*

Order example ZRL-M: 50 m 32 T10 - St

Order quantity
Width (mm)
Section
Tension cord

Order example ZRL-V: 50 AT10 / 5120 - V - St

Width (mm)
Section
Pitch length (mm)
Joined endless
Tension cord

Minimum length for joined endless timing belts depending on the tension cord:

Aramid		Steel
T5; AT	= 600 mm	All sections
T 0; AT 0	= 600 mm	1000 mm
T 0	= 900 mm	

When ordering pulleys for ZRL timing belting the type, quantity and centre distances must be specified.

* Non stock

Further widths on request

Roll length: 50 m

Surcharge for intermediate lengths: 20 %

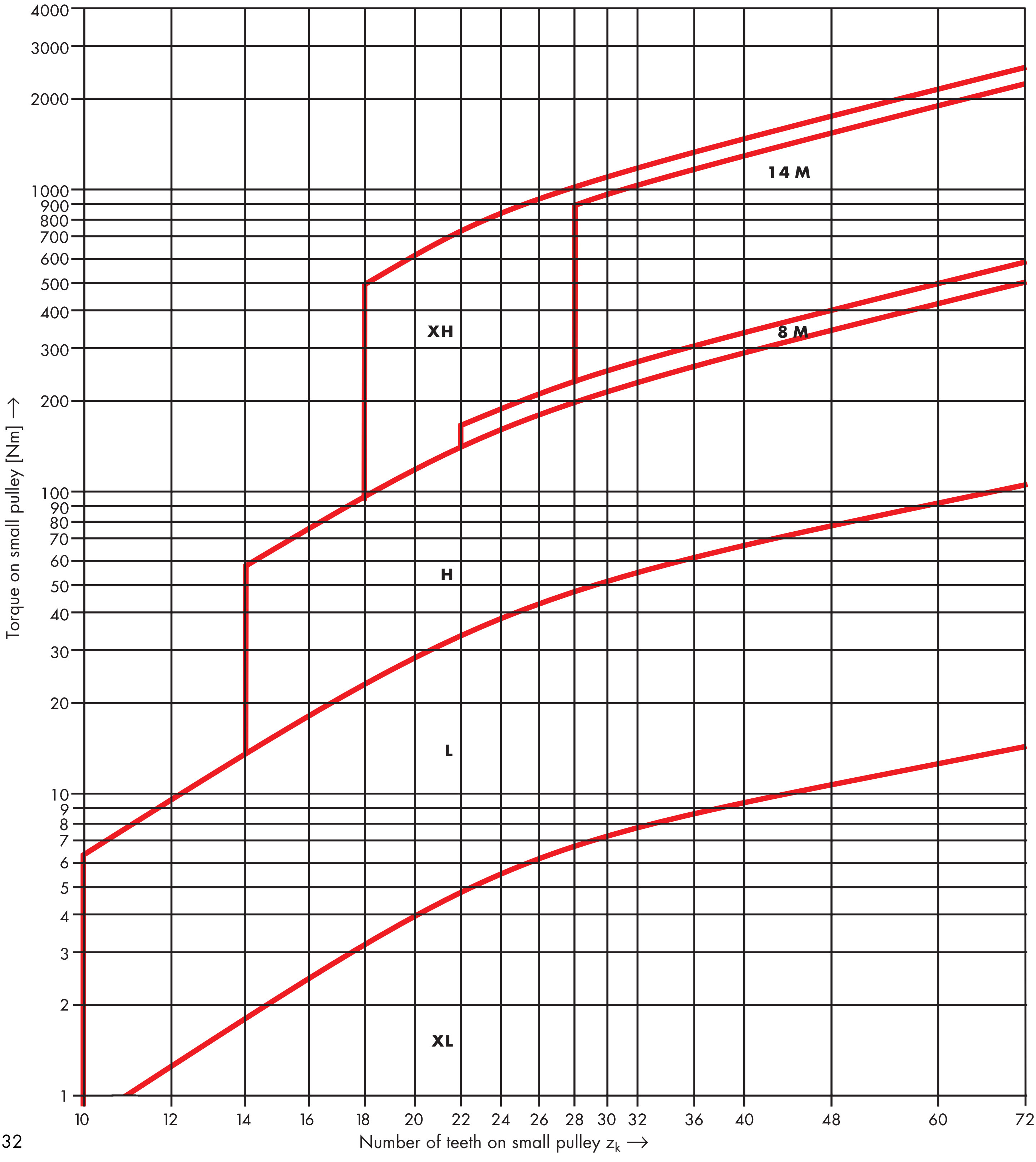
4.2 ZRL graph of torque

Torque/speed graph for section selection of open-ended optibelt *ZRL-M* (z_{emax} = 12) and joined endless optibelt *ZRL-V* timing belts (z_{emax} = 6)

A drive ratio of i = 1 has been assumed for the upper torque limit of open-ended ZRL-M timing belting. This limit is dependant on pulley diameter. Therefore with a pulley having 24 teeth the calculation can be made with a maximum of 12 teeth in mesh.

The upper torque limits of the joined endless ZRL-V timing belts, where a maximum of 6 teeth in mesh are taken into account, are **50 %** lower and have not been plotted here.

Graph 4.1: ZRL torque ranges



4.2 ZRL graph of torque

Torque/speed graph for section selection of open-ended **optibelt** *ZRL-M* (z_{emax} = 12) and **optibelt** *ZRL-V* joined endless timing belts (z_{emax} = 6)

In each case, the maximum width from the combination of standard timing belts and standard pulleys has been assumed (see Table 4.2).

The speed of the ZRL-V timing belt should not exceed 2 m/s. Further notes will be found on page 37.

Graph 4.2: ZRL torque ranges

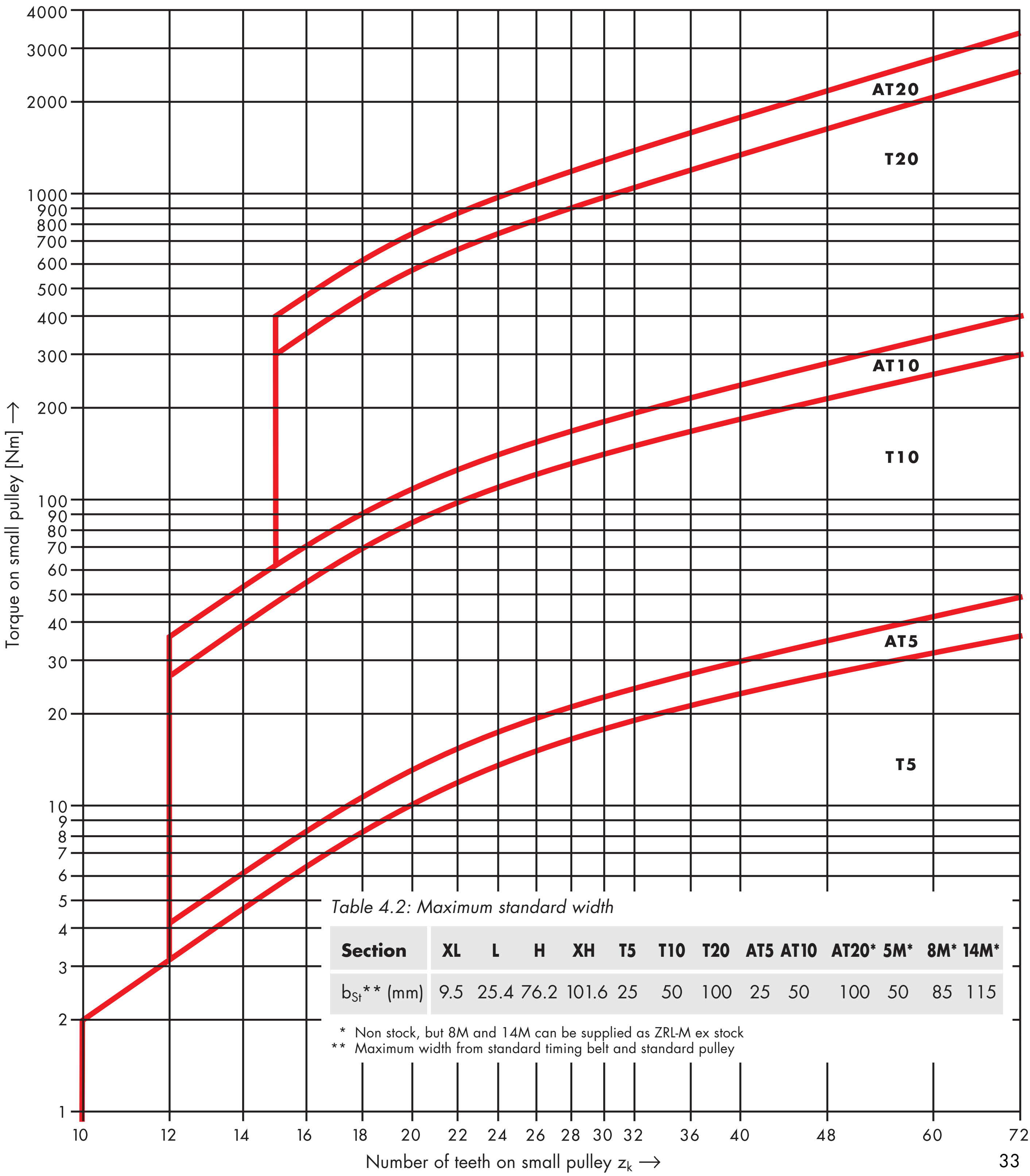


Table 4.2: Maximum standard width

Section	XL	L	H	XH	T5	T10	T20	AT5	AT10	AT20*	5M*	8M*	14M*
b_{St}** (mm)	9.5	25.4	76.2	101.6	25	50	100	25	50	100	50	85	115

* Non stock, but 8M and 14M can be supplied as ZRL-M ex stock
** Maximum width from standard timing belt and standard pulley

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4.3 ZRL-M drive design

Drive design of open-ended optibelt *ZRL-M* timing belting for linear drive systems, e_{max} = 12

Driver and driven details

Type of drive:	vertical positioning* by means of an open-ended timing belt
Mass moved:	m ≤ 8.0 kg, sliding and conveying
Required speed of travel:	v = 3.3 m/s
Starting/stopping distance:	s ≥ 320 mm
Prime mover:	DC motor
Starting torque:	$M_A = 2\ M_N$
Input drive speed:	$n_1 = 950\ min^{-1}$

Operating conditions, geometry

Daily operating time:	max. 24 hours
Starts/stops per day:	approx. 2000
Type of start:	under load
Type of load:	medium shock load
Ambient conditions:	room temperature, cutting oil contamination
Required centre distance:	a = 3236 mm
Overall width:	b_1, B as required
Clearance diameter:	≤ 90 mm

* For lifting and inclined conveyor systems where the failure of the belt could cause damage or injury due to the release of the conveyed material, special care should be taken.

Formulae	Example
Timing belt load	
Overall drive service factor c_2	
$c_2 = c_0 + c_6 + c_8$	$c_2 = 1.7 + 0 + 0.3 = 2.0$
Basic drive service factor — c_0 Table 2.1, page 12	$c_0 = 1.7$
Pulley and idler correction factor — c_6 Table 2.2, page 13	$c_6 = 0$
Start/stop under load factor — c_8 Table 2.2, page 13	$c_8 = 0.3$ extremely high start/stop frequency
Calculation using centrifugal force S_{Bn3}	
$S_{Bn3} = c_2 \cdot S_{n3}$	$S_{Bn3} = 2.0 \cdot 214.5 = 429$ N
$S_{n3} = \dfrac{S_{n3tot}}{\text{number of belts}}$	$S_{n3} = \dfrac{214.5}{1} = 214.5$ N
Force due to acceleration F_B, force due to weight G and friction force F_R	Friction can be neglected here
$S_{n3tot} = F_B + G \cdot \sin\alpha + F_R \cdot \cos\alpha$	$S_{n3tot} = 136.0 + 78.5 + 0 = 214.5$ N
$S_{n3tot} = m_{tot} \cdot a_1 + m_{tot} \cdot g \cdot \sin\alpha + \mu_{tot} \cdot m_{tot} \cdot g \cdot \cos\alpha$	$S_{n3tot} = 8.0 \cdot 17.0 + 8.0 \cdot 9.81 \cdot \sin 90° + 0 \cdot 8.0 \cdot 9.81 \cdot \cos 90°$
Total mass m_{tot}	
$m_{ges} = m_1 + m_2 + \ldots + m_n$	$m_{tot} = 8$ kg
Acceleration a_1 and g	
$a_1 = \dfrac{v^2 \cdot 10^3}{2 \cdot s}$ g = acceleration due to gravity	$a_1 = \dfrac{3.3^2 \cdot 10^3}{2 \cdot 320} = 17.0\ \dfrac{m}{s^2}$ $g = 9.81\ \dfrac{m}{s^2}$
Coefficient of friction m	For special belt constructions, see pages 9 to 11
$\mu_{ges} = \mu_1 + \mu_2$ — μ, μ_0 see Table 1.6, page 10	$\mu_{tot} = 0$
Sliding friction and frictional grip, μ_1 for belt/conveyed material	$\mu_1 = 0$
Sliding friction and frictional grip, μ_2 for belt/support rail or guide	$\mu_2 = 0$ friction of guide is neglected!
Angular deviation a from the horizontal	
$\alpha = 0°$, vertical movement, $\sin 0° = 0$, $\cos 0° = 1$	
$\alpha = 90°$, horizontal movement, $\sin 90° = 1$, $\cos 90° = 0$	$\alpha = 90°$, vertical conveyor
Alternative: calculation using torque	
Theoretical design torque M_{Bth}	
$M_{Bth} = c_2 \cdot M_{Abth}$ $M_{Abth} = \dfrac{S_{n3} \cdot d_{wth}}{2000}$	$M_{Bth} = 2.0 \cdot 7.1 = 14.2$ Nm $M_{Abth} = \dfrac{214.5 \cdot 66.4}{2000} = 7.1$ Nm
If M_{Ab} is not known: $M_B = c_2 \cdot M_{An}$ formulae see page 13	
Theoretical pitch diameter d_{w1th}	
$d_{w1th} = \dfrac{19100 \cdot v}{n_1}$	$d_{w1th} = \dfrac{19100 \cdot 3.3}{950} = 66.4$ mm

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4.3 ZRL-M drive design

Drive design of open-ended optibelt *ZRL-M* timing belting for linear drive systems, Z_{emax} = 12

Belt section and number of teeth on pulleys

Formulae	Example
Section selection using permissible circumferential force with maximum section width – see Table 4.3, page 41, z_{emax} = 12 S_{zul} (section, b_{max}) $\geq S_{Bn3}$	Section T5 S_{zul} (T5, b_{max} = 25 mm) = 720 N $\geq$ 429 N
Alternative: **Section selection using the torque/speed graph for z_{emax} = 12, p. 32, 33 with theoretical number of teeth z_1**	Section T see page 29
$z_1 = \frac{d_{w1th} \cdot \pi}{t}$ $z_1 = z_2 = z_k$ for i = 1 If z_1 ° z_2, calculate the drive layout as for ZRM/ZRP pages 22 and 23	$z_1 = \frac{66.4 \cdot \pi}{5} = 41.7$
Selection of number of teeth z_1 and z_2 from the standard pulley range, pages 50 to 82, pulley material and fitting see Table 5.3, page 44 Are clearance diameters and permissible bore sizes acceptable? Clearance diameter incl. space to fit belt > D_B (or d_a) + 2 · h_s	T5 standard pulleys see page 79 $z_1 = z_2 = 42$ $d_{w1} = d_{w2} = 66.85$ mm Diameter over flanges D_B = 71 mm, bore d from 8 to 24 mm Clearance diam. > 71 + 2 · 2.2 ≙ 75.4 mm ≤ 90 mm, h_s see page 5
Alternative: design torque M_B $M_B = c_2 \cdot M_{Ab}$ $M_{Ab} = \frac{S_{n3} \cdot d_d}{2000}$	$M_B = 2.0 \cdot 7.2 = 14.4$ Nm $M_{Ab} = \frac{214.5 \cdot 66.85}{2000} = 7.2$ Nm
Effective belt speed v_{eff} $v_{eff} = \frac{d_{w1} \cdot n_1}{19100}$	$v_{eff} = \frac{66.85 \cdot 950}{19100} = 3.33 \frac{m}{s}$

Timing belt and pulley width

Formulae	Example
Transmissible circumferential force S_{spec} see Table 4.3, page 41 per tooth in mesh and 10 mm belt width $S_{spec} = S_{spec}$ (section)	$S_{spec} = S_{spec}$ (T 5) $= 23.88 \frac{N}{cm}$
Alternative: **Transmissible torque M_{spec} see Table 4.3, page 41 per tooth in mesh and 10 mm belt width** $M_{spec} = M_{spec}$ (section, z_k)	$M_{spec} = M_{spec}$ (T5, z_1 = 42) = $0.80 \frac{Nm}{cm}$ linearly interpolated
Number of teeth z_{enom} in mesh $z_{enom} = \frac{z_k}{2}$ for i = 1, rounded down if necessary Number of teeth in mesh z_e considered z_{emax} = 12 $z_{enom} \geq z_{emax} \longrightarrow z_e = z_{emax}$ $z_{enom} < z_{emax} \longrightarrow z_e = z_{enom}$	$z_{enom} = \frac{42}{2} = 21$ $21 \geq z_{emax} \longrightarrow z_e = z_{emax} = 12$

4.3 ZRL-M Drive Design

Drive design of open-ended optibelt *ZRL-M* timing belting for linear drive systems, z_{emax} = 12

Formulae | **Example**

Timing belt and pulley width

Formulae	Example
Theoretical and standard belt width b_{th} and b_{st}	
$b_{th} = \dfrac{S_{Bn3} \cdot 10}{S_{spez} \cdot z_e}$	$b_{th} = \dfrac{429 \cdot 10}{23.88 \cdot 12} = 15.0$ mm
Alternative: $b_{th} = \dfrac{M_B \cdot 10}{M_{spez} \cdot z_e}$	$b_{th} = \dfrac{14.4 \cdot 10}{0.80 \cdot 12} = 15.0$ mm
b_{St} from belt range on pages 30 to 31, $b_{St} \geq b_{th}$ Can this belt width be accomodated?	selected b_{St} = 16 mm see page 31 Pulley width B = 27 mm, face width b_1 = 21 mm
Actual service factor c_{2vorh} $c_{2vorh} = c_2 \dfrac{b_{St}}{b_{th}}$	$c_{2vorh} = 2.0 \dfrac{16}{15.0} = 2.13$

Pitch length and drive centres with allowances

Formulae	Example
Theoretical and actual pitch lengths L_{wth}, L_{wnom}	
$L_{wth} = 2 \cdot a + z_1 \cdot t$ for i = 1	$L_{wth} = 2 \cdot 3236 + 42 \cdot 5 = 6682$ mm
$z_R = \dfrac{L_{wth}}{t}$	$z_R = \dfrac{6682}{5} = 1336$
$L_{wnom} = z_R \cdot t$	$L_{wnom} = 1336 \cdot 5 = 6680$ mm
Actual centre distance a_{nom}	
$a_{nom} = \dfrac{z_R - z_1}{2} \cdot t$ for i = 1	$a_{nom} = \dfrac{1336 - 42}{2} \cdot 5 = 3235$ mm
Centre distance allowances to be provided a_{nom} see Table 5.1, page 43; installation: allowance y (ZRL) tensioning: allowance x (ZRL)	A tensioning pulley is necessary with fixed centres, see page 45
y (ZRL) = $y_{1,2,3}$ (ZRL) depending on flanges	Flanges on both pulleys y_1 (ZRL) ≥ 18 mm
x (ZRL)	x (ZRL) ≥ 1.5 + 0.002 · 3235 ≙ 8.0 mm x (ZRL) ≥ 8 mm
Allowances acceptable? $a_{min} \leq a_{nom} - y$ $a_{nom} + x \leq a_{max}$	$a_{min} \leq 3217$ mm 3243 mm $\leq a_{max}$
Calculation and setting of tension, see page 40	Values for x_v, F_v, e_v and S_a see page 40

Order example

Formulae	Example
Timing belt and pulley designation Quantity, type, width, section, pitch length, tension cord, special construction if applicable	1 Optibelt ZRL-M timing belt 16 T5/6680 St 2 Optibelt ZRS pulleys 27 T5/42-2 Type 6F 2 Optibelt CP clamp plates CP-16 T5

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4.4 ZRL-V drive design

Drive design of optibelt *ZRL-V* joined endless timing belt for conveyor systems, $z_{emax} = 6$, $v \leq 2$ m/s

Driver and driven units

Driven unit:	horizontal accumulating conveyor system, two parallel timing belts on steel support rails
Mass moved:	three loaded wooden pallets total weight each 62.5 kg
Required conveying speed:	$v = 1.0$ m/s
Prime mover:	three-phase AC motor
Starting torque:	$M_A = 0.7\ M_N$
Driver speed:	$n_1 = 145\ \text{min}^{-1}$

Operating conditions, layout

Daily operating time:	max. 8 hours
Starts/stops per day:	2
Type of start:	under load
Type of load:	medium shock
Ambient conditions:	room temperature, no special contamination
Length of conveyor:	$a = 2478$ mm
Overall width:	$b_1, B \leq 90$ mm
Clearance diameter:	≤ 150 mm

Formulae

Timing belt load

Overall drive service factor c_2

$c_2 = c_0 + c_6 + c_8$

Basic drive service factor	c_0 Table 2.1, page 12
Pulley and idler correction factor	c_6 Table 2.2, page 13
Start/stop factor	c_8 Table 2.2, page 13

Calculation using circumferential force S_{Bn3}

$S_{Bn3} = c_2 \cdot S_{n3}$

$$S_{n3} = \frac{S_{n3tot}}{\text{number of belts}}$$

Force due to acceleration F_B, force due to weight G and friction force F_R

$S_{n3tot} = F_B + G \cdot \sin\alpha + F_R \cdot \cos\alpha$

$S_{n3tot} = m_{tot} \cdot a_1 + m_{tot} \cdot g \cdot \sin\alpha + \mu_{tot} \cdot m_{tot} \cdot g \cdot \cos\alpha$

Total mass m_{tot}

$m_{tot} = m_1 + m_2 + \ldots + m_n$

Acceleration a_1 and g

$$a_1 = \frac{v^2 \cdot 10^3}{2 \cdot s} \qquad g = \text{acceleration due to gravity}$$

Coefficient of friction m

$\mu_{tot} = \mu_1 + \mu_2$ μ, μ_0 see Table 1.6, page 10

Sliding friction and frictional grip, μ_1 for belt/conveyed material

Sliding friction and frictional grip, μ_2 for belt/support rail or guide

Angular deviation a from the horizontal

$\alpha = 0°$, vertical movement, $\sin 0° = 0$, $\cos 0° = 1$

$\alpha = 90°$, horizontal movement, $\sin 90° = 1$, $\cos 90° = 0$

Alternative: calculation using torque

Theoretical design torque M_{Bth}

$$M_{Bth} = c_2 \cdot M_{Abth} \qquad M_{Abth} = \frac{S_{n3} \cdot d_{wth}}{2000}$$

If M_{Ab} is not known: $M_B = c_2 \cdot M_{An}$ formulae see page 13

Theoretical pitch diameter d_{w1th}

$$d_{w1th} = \frac{19100 \cdot v}{n_1}$$

Example

$c_2 = 1.6 + 0 + 0 = 1.6$

$c_0 = 1.6$

$c_6 = 0$

$c_8 = 0$ few switching cycles

$S_{Bn3} = 1.6 \cdot 735.75 = 1177$ N

$$S_{n3} = \frac{1471.5}{2} = 735.75 \text{ N}$$

Friction due to acceleration can be neglected here

$S_{n3tot} = 0 + 0 + 1471.5 = 1471.5$ N

$S_{n3tot} = 187.5 \cdot 0 + 187.5 \cdot 9.81 \cdot \sin 0° + 0.8 \cdot 187.5 \cdot 9.81 \cdot \cos 0°$

$m_{tot} = 3 \cdot 62.5\ \text{kg} = 187.5\ \text{kg}$

a_1 is insignificant, as m_1 is taken into account

$$a_1 = 0 \qquad g = 9.81 \frac{m}{s^2}$$

For special belt constructions, see pages 9 to 11

$\mu_{tot} = 0.35 + 0.45 = 0.8$

Sliding friction $\mu_1 = \mu = 0.35$ for PAR/wood

Sliding friction $\mu_2 = \mu = 0.45$ for PAZ/steel

$\alpha = 0°$, horizontal conveyor

$$M_{Bth} = 1.6 \cdot 48.45 = 77.5 \text{ Nm} \qquad M_{Abth} = \frac{735.75 \cdot 131.7}{2000} = 48.45 \text{ Nm}$$

$$d_{w1th} = \frac{19100 \cdot 1.0}{145} = 131.7 \text{ mm}$$

4.4 ZRL-V drive design

Drive design of optibelt *ZRL-V* joined endless timing belts for conveyor systems, $z_{emax} = 6$, $v \leq 2$ m/s

Formulae	Example
Section and number of teeth on pulley	
Section selection using permissible circumferential force with maximum section width - see Table 4.3, page 41, $z_{emax} = 6$ S_{zul} (section, b_{max}) $\geq S_{Bn3}$	Section T10 S_{zul} (T10, b_{max} = 50 mm) = 1425 N ≥ 1177 N
Alternative: **Section selection using the torque/speed graph for $z_{emax} = 6$, page 32, 33 with theoretical z_1**	Section T10 see page 33
$z_1 = \frac{d_{w1th} \cdot \pi}{t}$ $z_1 = z_2 = z_k$ for i = 1 If $z_1 \neq z_2$, calculate the drive layout as for ZRM/ZRP p. 22 and 23	$z_1 = \frac{131.7 \cdot \pi}{10} = 41.4$
Selection of number of teeth z_1 and z_2 from the standard pulley range, pages 50 to 82, pulley material and fitting see Table 5.3, page 44 Are clearance diameters and permissible bore sizes acceptable? Clearance diameters incl. space for fitting > D_B (or d_a) + 2 · h_s	T10 standard pulleys see page 82 $z_1 = z_2 = 40$ $d_{w1} = d_{w2} = 127.32$ mm Diameter over flanges D_B = 131 mm, bore d from 16 to 40 mm Clearance diameter > 131 + 2 · 4.5 ≙ 140 mm ≤ 150 mm, h_s see page 5
Alternative: design torque M_B $M_B = c_2 \cdot M_{Ab}$ $M_{Ab} = \frac{S_{n3} \cdot d_w}{2000}$	$M_B = 1.6 \cdot 46.84 = 74.9$ Nm $M_{Ab} = \frac{735.75 \cdot 127.32}{2000} = 46.84$ Nm
Effective belt speed v_{eff} $v_{eff} = \frac{d_{w1} \cdot n_1}{19100}$	$v_{eff} = \frac{127.32 \cdot 145}{19100} = 0.97 \frac{m}{s}$

Timing belt and pulley width

Transmissible circumferential force S_{spec} see Table 4.3, page 41 per tooth in mesh 10 mm belt width $S_{spec} = S_{spec}$ (section)	$S_{spec} = S_{spec}$ (T10) $= 47.41 \frac{N}{cm}$
Alternative: **Transmissible torque M_{spec} see Table 4.3, page 41 per tooth in mesh and 10 mm belt width** $M_{spec} = M_{spec}$ (section, z_k)	$M_{spec} = M_{spec}$ (T 10, z_1 = 40) = $3.02 \frac{Nm}{cm}$
Number of teeth z_{enom} in mesh $z_{enom} = \frac{z_k}{2}$ for i = 1, rounded down if necessary Number of teeth in mesh z_e considered $z_{emax} = 6$ $z_{enom} \geq z_{emax} \longrightarrow z_e = z_{emax}$ $z_{enom} < z_{emax} \longrightarrow z_e = z_{enom}$	$z_{enom} = \frac{40}{2} = 20$ $20 \geq z_{emax} \longrightarrow z_e = z_{emax} = 6$

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4.4 ZRL-V drive design

Drive design of optibelt *ZRL-V* joined endless timing belts for conveyor systems, z_{emax} = 6, v ≤ 2 m/s

Formulae	Example
Timing belt and pulley width	
Theoretical and standard belt width b_{th} and b_{st} $b_{th} = \frac{S_{Bn3} \cdot 10}{S_{spec} \cdot z_e}$	$b_{th} = \frac{1177 \cdot 10}{47.41 \cdot 6} = 41.4$ mm
Alternative: $b_{th} = \frac{M_B \cdot 10}{M_{spec} \cdot z_e}$	$b_{th} = \frac{74.9 \cdot 10}{3.02 \cdot 6} = 41.3$ mm
b_{St} from belt range on pages 30 to 31, $b_{St} \geq b_{th}$ Can this belt width be accomodated?	selected b_{St} = 50 mm see page 27 Pulley width B = 66 mm, face width b_1 = 56 mm
Actual service factor c_{2vorh} $c_{2vorh} = c_2 \frac{b_{St}}{b_{th}}$	$c_{2vorh} = 1.6 \frac{50}{41.3} = 1.94$

Pitch length and drive centres with allowances

Formulae	Example
Theoretical and actual pitch lengths L_{wth}, L_{wnom} $L_{wth} = 2 \cdot a + z_1 \cdot t$ for i = 1 $z_R = \frac{L_{wth}}{t}$ $L_{wnom} = z_R \cdot t$	$L_{wth} = 2 \cdot 2478 + 40 \cdot 10 = 5356$ mm $z_R = \frac{5356}{10} = 536$ $L_{wnom} = 536 \cdot 10 = 5360$ mm
Actual centre distance a_{nom} $a_{nom} = \frac{z_R - z_1}{2} \cdot t$ for i = 1 Centre distance allowances to be provided a_{nom} see Table 5.1, page 41; installation: allowance y (ZRL) tensioning: allowance x (ZRL)	$a_{nom} = \frac{536 - 40}{2} \cdot 10 = 2480$ mm A tensioning pulley is necessary with fixed centres, see page 44
y (ZRL) = $y_{1,2,3}$ (ZRL) depending on flanges x (ZRL)	Flanges on both pulleys y_1 (ZRL) ≤ 25 mm x (ZRL) ≤ 3.5 + 0.002 · 2480 ≙ 8.5 mm x (ZRL) ≤ 9 mm
Allowances acceptable? $a_{min} \leq a_{nom} - y$ $a_{nom} + x \leq a_{max}$	$a_{min} \leq 2455$ mm 2489 mm $\leq a_{max}$
Calculation and setting of tension, see page 40	Values for x_v, F_v, e_v and S_a see page 36

Order example

Formulae	Example
Timing belt and pulley designation Quantity, type, width, section, pitch length, tension cord, special construction if applicable	2 Optibelt ZRL-V timing belts 50 T10/5360-V PAZ/PAR 4 Optibelt ZRS pulleys 66 T10/40-2 Type 6F

4.5 ZRL tensioning

Calculation and setting of tension for optibelt *ZRL-M* open-ended and optibelt *ZRL-V* joined endless timing belts

Correct tensioning is of special importance for the reliable and efficient transmission of power. Proper tensioning of the stationary belt will ensure that it will run at the correct tension.

- Insufficient tension coupled with high drive loads will lead to the belt jumping teeth on the pulley and ultimately to belt breakage.
- Excessive tension under similar conditions will cause severe wear, shearing of the belt teeth, excessive running noise and bearing damage.

It is advisable therefore to calculate and set the static tension for each drive individually using the formulae below. The tensioning factor c_v takes account of the loads combined in the overall service factor c_2.

Setting the static tension, Figure 3.1, page 28

One pulley of the drive only may be stationary when the static tension is adjusted. The second pulley and the other pulleys of a multiple pulley drive must be able to rotate freely.

1st method:
Controlled centre distance adjustment

Where timing belts are inaccessible tensioning can be carried out by adjusting the drive centre distance by the calculated figure x_v mean. Because of the low plastic stretch of the timing belts, this method of tensioning is recommended mainly for two pulley drives with very long centre distances.

2nd method:
Span deflection

The test force F_v should be applied to the centre of the span length L and perpendicular to it. The use of sharp-edged objects for applying the force MUST be avoided to prevent belt kink. Correct static tension is achieved when the deflection e_v corresponds to the calculated value.

When the drive system has more than the two pulleys shown in Figure 3.1 page 24 the tension can be measured between any two pulleys in the system provided the belt is in contact with these pulleys with the same face (top or bottom). The only difference will be e_v which will change as a function of span length.

3rd method:
Measurement of static shaft load

Calculate static shaft load S_a. Tension belt until the measured S_a is the same as the calculated S_a.

By virtue of the zero stretch tension cord, the belt will require no further tension checks after fitting.

Calculation of required tension, ZRL

Formulae

Tension factor c_v

$$c_v = \frac{c_2 - 1}{2} + 0.9 \qquad 1.05 \leq c_v$$

Tensioning

1st method

Tensioning distance x_v

$$x_v = \frac{c_v \cdot 0.001 \cdot L_{wnom}}{c_2 \cdot 2}$$

for i = 1

or

2nd method

Test force F_v and deflection e_v for span length L

$$F_v = \frac{c_v \cdot S_{n3}}{20}$$

S_{n3}, see earlier calculation, also formulae on page 13

$$e_v = \frac{L}{50}$$

$L = a_{nom}$ for i = 1*

or

3rd method

$S_a = c_v \cdot S_{n3}$
for i = 1*

S_{n3}, see earlier calculation, also formulae on page 13

Example, using the figures from pages 32 and 35

ZRL-M

$$c_v = \frac{2.0 - 1}{2} + 0.9 = 1.4$$

$$x_v = \frac{1.4 \cdot 0.001 \cdot 6680}{2.0 \cdot 2}$$

$x_v = 2.4$ mm

$$F_v = \frac{1.4 \cdot 214.5}{20} = 15.0 \text{ N}$$

$$e_v = \frac{3235}{50} = 64.7 \text{ mm}$$

$L = 3235$ mm

$S_a = 1.4 \cdot 214.5 = 300$ N

ZRL-V

$$c_v = \frac{1.6 - 1}{2} + 0.9 = 1.2$$

$$x_v = \frac{1.2 \cdot 0.001 \cdot 5360}{1.6 \cdot 2}$$

$x_v = 2.0$ mm

$$F_v = \frac{1.2 \cdot 736}{20} = 44.2 \text{ N}$$

$$e_v = \frac{2480}{50} = 49.6 \text{ mm}$$

$L = 2480$ mm

$S_a = 1.2 \cdot 736 = 883$ N

* For $i \neq 1$, see page 28 for the calculation of static shaft loading S_a and of span length L.

4.6 ZRL circumferential force and torque table

Circumferential force and Torque Table for optibelt *ZRL-M* open ended, z_{emax} = 12 and optibelt *ZRL-V* joined endless timing belts, z_{emax} = 6

The driven pulley is used for the calculation of linear and conveyor drives. With drive systems designed for torque transmission the calculation uses the smaller of the two pulleys. This is irrespective of its use as a driver or driven pulley.

The values for the specific torque M_{spec} (Nm/cm) relate to one tooth in mesh with the pulley and 10 mm timing belt width. The same applies to the specific circumferential force S_{spez} (N/cm).

The Table includes the transmissible circumferential forces with 6 and 12 teeth in mesh at 10 mm and maximum belt width in each case. The circumferential force S_{zul} (N) is based on the maximum width from the combination of standard timing belt and standard pulley.

The values in the Table are based not on the maximum tensile strength of the belt, but on the lower shear strength of the belt teeth.

Intermediate values should be linearly interpolated.

Table 4.3: ZRL circumferential force and torque table

Number of teeth on the small pulley z_k	M_{spec} (Nm/cm)												
	XL	L	H	XH	T5	T10	T20	AT5	AT10	AT20*	5M*	8M*	14M*
10	0.19	0.52	—	—	0.19	—	—	—	—	—	—	—	—
11	0.21	0.57	—	—	0.21	—	—	—	—	—	—	—	—
12	0.22	0.62	—	—	0.22	0.90	—	0.26	1.17	—	—	—	—
13	0.24	0.67	—	—	0.24	0.98	—	0.29	1.27	—	—	—	—
14	0.26	0.72	1.08	—	0.26	1.06	—	0.31	1.38	—	0.39	—	—
15	0.28	0.77	1.15	—	0.28	1.13	4.50	0.34	1.47	5.85	0.42	—	—
16	0.30	0.83	1.23	—	0.30	1.20	4.82	0.36	1.56	6.26	0.44	—	—
17	0.32	0.87	1.31	—	0.32	1.28	5.12	0.38	1.66	6.65	0.47	—	—
18	0.34	0.92	1.39	5.41	0.34	1.36	5.41	0.41	1.77	7.03	0.50	—	—
19	0.36	0.97	1.46	5.71	0.36	1.43	5.71	0.43	1.86	7.43	0.53	—	—
20	0.38	1.03	1.54	6.02	0.38	1.51	6.02	0.46	1.96	7.82	0.55	—	—
21	0.40	1.08	1.62	6.32	0.40	1.58	6.32	0.48	2.05	8.21	0.58	—	—
22	0.42	1.14	1.70	6.62	0.42	1.66	6.62	0.50	2.16	8.61	0.61	1.74	—
23	0.44	1.18	1.78	6.92	0.44	1.74	6.92	0.53	2.26	9.00	0.64	1.83	—
24	0.46	1.24	1.86	7.23	0.46	1.81	7.23	0.55	2.35	9.39	0.67	1.90	—
25	0.48	1.29	1.94	7.53	0.48	1.89	7.53	0.58	2.46	9.79	0.69	1.98	—
26	0.50	1.35	2.02	7.82	0.50	1.96	7.82	0.60	2.55	10.16	0.72	2.06	—
27	0.51	1.40	2.09	8.12	0.51	2.04	8.12	0.62	2.65	10.56	0.75	2.14	—
28	0.53	1.45	2.17	8.42	0.53	2.11	8.42	0.64	2.74	10.95	0.78	2.22	6.57
29	0.55	1.50	2.25	8.73	0.55	2.18	8.73	0.66	2.84	11.34	0.80	2.29	6.81
30	0.57	1.55	2.33	9.03	0.57	2.26	9.03	0.68	2.94	11.74	0.83	2.37	7.04
31	0.59	1.60	2.41	9.32	0.59	2.34	9.32	0.71	3.04	12.12	0.86	2.46	7.27
32	0.61	1.66	2.49	9.62	0.61	2.42	9.62	0.73	3.15	12.51	0.89	2.54	7.51
33	0.63	1.71	2.57	9.93	0.63	2.49	9.93	0.76	3.24	12.90	0.91	2.61	7.74
34	0.65	1.76	2.65	10.23	0.65	2.57	10.23	0.78	3.34	13.30	0.94	2.70	7.98
35	0.67	1.81	2.72	10.53	0.67	2.64	10.53	0.80	3.43	13.69	0.97	2.77	8.21
36	0.69	1.87	2.80	10.83	0.69	2.72	10.83	0.83	3.54	14.08	1.00	2.86	8.45
40	0.76	2.08	3.12	12.03	0.76	3.02	12.03	0.91	3.93	15.64	1.11	3.17	9.38
48	0.91	2.48	3.73	14.44	0.91	3.62	14.44	1.09	4.71	18.77	1.33	3.80	11.26
60	1.14	3.10	4.66	18.06	1.14	4.53	18.06	1.37	5.89	23.47	1.66	4.76	14.08
72	1.37	3.73	5.59	21.66	1.37	5.44	21.66	1.64	7.07	28.16	2.00	5.71	16.90
Number of teeth in mesh	S_{spec} (N/cm)												
z_e = 1	23.50	34.13	38.42	85.05	23.88	47.41	94.52	28.65	61.63	122.87	34.83	62.25	105.32
ZRL-V z_{emax} = 6	141.0	204.8	230.5	510.3	143.3	284.5	567.1	171.9	369.8	737.2	209.0	73.5	631.9
ZRL-M z_{emax} = 12	282.0	409.6	461.0	1020.6	286.6	567.0	1134.2	343.8	739.6	1474.4	418.0	747.0	1263.8
Number of teeth in mesh	S_{zul} (N) for maximum section width**												
Width (mm)	9.5	25.4	76.2	101.6	25	50	100	25	50	100	25	85	115
ZRL-V z_{emax} = 6	135	520	1760	5185	360	1425	5675	430	1850	7375	522.5	3175	7270
ZRL-M z_{emax} = 12	270	1040	3520	10370	720	2850	11350	860	3700	14750	1045.0	6350	14540

* Non stock, but 8M and 14M available ex stock as ZRL-M

** Maximum width from standard timing belts and standard pulleys

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4.7 ZRL, resistance to chemicals

Resistance of optibelt *ZRL-M* open-ended and optibelt *ZRL-V* joined endless timing belts

The data on the chemical resistance of Optibelt ZRL timing belting refers to the material polyurethane and is based on laboratory values which have been determined under ideal conditions.

Table 4.4: ZRL chemical resistance

Medium	Temperature (°C)	Resistance	
Acetone	20	0	Q
Ethanol	20	0	Q
Ethyl acetate	20	–	
Ethyl ether	20	+	Q
Aluminium chloride, 5% aqueous solution	20	+	
Ammonia, 10% aqueous solution	20	+	
Aniline	20	–	
ASTM oil No. 1	80	+	
ASTM oil No. 2	80	+	
ASTM oil No. 3	80	0/+	
Petrol, "regular"	20	+	Q
Petrol, "super"	20	0/+	Q
Benzol	20	0	Q
Butanol	20	0	Q
Butyl acetate	20	–	
Cyclohexanol	20	0	Q
Diesel fuel	20	+	Q
Dimethyl formamide	20	–	
Ferric chloride, 5% aqueous solution	40	0	
Acetic acid, 20% aqueous solution	20	0	
N-Heptan	20	+	Q
Iso-propanol	20	0	Q
Caustic soda, 1-N aqueous solution	20	+/0	
Kerosene	20	+	Q
Salt solution, conc.	20	+	
Methanol	20	0	Q
Methanol/petrol mixture 15 : 85	20	+/0	Q
Methylethyl ketone	20	0	Q
Methylene chloride	20	0/–	Q
N-methylpyrrolidone	20	–	
Mineral oil	80	+	
Sodium chloride solution, conc.	20	+	
Potassium hydroxide, 1-N aqueous solution	20	+/0	
Sodium soap fat	20	+	
Sodium soap fat + 20% water	80	+/0	
Sodium hydroxide solution, 1-N aqueous solution	20	+/0	
Nitric acid, 20% aqueous solution	20	–	
Hydrochloric acid, 20% aqueous solution	20	0	
Lubrication grease (sodium fat grease)	20	+	
Sulphuric acid, 20% aqueous solution	20	0	
Seawater	20	+	
Carbon tetrachloride	20	0/–	Q
Tetrahydrofuran	20	–	
Toluol	20	–	
Trichlorethylene	20	0/–	Q
Water	20	+	
Water	80	0/+	
Water	100	0	

\+ resistant: slight or no weight or dimensional changes, no damage caused by the medium.

0 conditionally resistant to non-resistant: significant weight and dimensional changes with prolonged contact; depending on marginal conditions (for example brief contact), use still possible in some cases. Practical trial under applicable conditions recommended.

– non-resistant or soluble: serious attack and damage within a short time.

Q reversible swelling: reduction of mechanical properties in swollen state.

\+ Q chemically resistant, but reversible swelling.

0 Q conditionally resistant with reversible swelling.

5 Design Hints, Dimensions and Tolerances
5.1 Allowances, length tolerances

Table 5.1: Allowances to be provided for installation and tensioning

Type of allowances	Allowances for installation, y								Allowances for tensioning, x	
	on both pulleys		on large pulleys $i_{eff} \neq 1$		on small pulleys $i_{eff} =$ or $\neq 1$		on neither pulley			
Section	Provision for installation								Provision for tensioning	
	y_1	y_1 (ZRL)	y_{2g}	y_{2g} (ZRL)	y_{2k}	y_{2k} (ZRL)	y_3	y_3 (ZRL)	x	x (ZRL)
MXL	11	12	9	10	5	6	$\lvert a_{LTol} \rvert$	0.6	$\lvert a_{LTol} \rvert$ +	$0.6 + 0.002 \cdot a_{nom}$
T2.5	16	17	12	13	7	8		0.8	0.002 ·	$0.8 + 0.002 \cdot a_{nom}$
XL; T5; AT5; 5M	17	18	13	14	8	9		1.5	a_{nom}	$1.5 + 0.002 \cdot a_{nom}$
L; H; T10; AT10	22	25	17	20	10	13		3.5		$3.5 + 0.002 \cdot a_{nom}$
8M	24	27	19	22	11	14	a_{LTol}	2.4	a_{LTol}	$2.4 + 0.002 \cdot a_{nom}$
T20; AT20	32	38	25	31	15	21	on	6.0	on	$6.0 + 0.002 \cdot a_{nom}$
14M	48	52	37	41	21	25	Table	4.2	Table	$4.2 + 0.002 \cdot a_{nom}$
XH	48	55	37	44	21	28	5.2	6.7	5.2	$6.7 + 0.002 \cdot a_{nom}$

For a two pulley drive with and without flanged pulleys Table 5.1 gives the allowances to be provided for installation y and for tensioning x. For both installation and tensioning, one pulley must be free to rotate.

y_1

The allowance y_1 permits belt installation on two pulleys, each with standard flanges.

y_2

The allowance y_{2k} ensures installation on two pulleys where the drive ratio i is not equal to 1, or the smaller pulley is provided with two standard flanges or on the installation-side with one standard flange (see Figure 5.1, page 44). The drive ratio i = 1 is also taken into account in the allowance y_{2k}.

The allowance y_{2g} refers to a similar installation-side flange arrangement on the large pulley.

y_3

The minimum allowance y_3 for installation assumes that there are no flanges on either pulley. It takes into account only the maximum possible length minus the centre distance tolerances.

The table values y_1 and y_2 are **guide values** and refer to the most unfavourable drive configuration. Dependent on the tooth depth h_t of the section, the diameter difference $D_b - d_a$ between flanges and pulleys, the drive ratio i_{eff} and the centre distance a_{nom}, the values y_1 and y_2 of Table 5.1 may be considerably lower.

x

The allowance x to be provided for tensioning of the timing belt within the permissible elastic stretch. The correct tension setting should be taken from the information on page 28 (ZRM/ZRP) or page 40 (ZRL).

The allowances x and y specified do not apply to timing belts (open-ended or joined endless) which are provided with a precisely specified number of teeth z_R for use with welded-on cleats (see page 11).

Table 5.2: Length tolerances, for standard belts see Table 5.6, page 48

ZRM	
Timing belt length	Centre distance tolerance
L_{wSt} (mm)	a_{LTol} (mm)
≤ 305	± 0.14
> 305 ≤ 390	± 0.16
> 390 ≤ 525	± 0.18
> 525 ≤ 630	± 0.21
> 630 ≤ 780	± 0.24
> 780 ≤ 990	± 0.28
> 990 ≤ 1250	± 0.32
> 1250 ≤ 1560	± 0.38
> 1560 ≤ 1960	± 0.44
> 1960 ≤ 2360	± 0.52
> 2360 ≤ 3100	± 0.61
> 3100 ≤ 3620	± 0.73

ZRP	
Timing belt length	Centre distance tolerance
L_{wSt} (mm)	a_{LTol} (mm)
> 152.4 ≤ 254.0	± 0.22
> 254.0 ≤ 381.0	± 0.23
> 381.0 ≤ 508.0	± 0.26
> 508.0 ≤ 762.0	± 0.31
> 762.0 ≤ 990.6	± 0.33
> 990.6 ≤ 1219.2	± 0.38
> 1219.2 ≤ 1524.0	± 0.41
> 1524.0 ≤ 1778.0	± 0.43
> 1778.0 ≤ 2032.0	± 0.46
> 2032.0 ≤ 2286.0	± 0.49
> 2286.0 ≤ 2540.0	± 0.51
> 2540.0 ≤ 2794.0	± 0.54
> 2794.0 ≤ 3048.0	± 0.56
> 3048.0 ≤ 3200.4	± 0.59
> 3200.4 ≤ 3556.0	± 0.61
> 3556.0 ≤ 4064.0	± 0.66
> 4064.0 ≤ 4318.0	± 0.69
> 4318.0 ≤ 4572.0	± 0.71

ZRL
Length tolerance for ZRL timing belting:
± 0.5 mm per 1000 mm length

5 Design Hints, Dimensions and Tolerances

5.2 Standard pulleys, flanged pulleys, idlers, clamping plates and minimum numbers of teeth

Standard timing belt pulleys and timing belt bars

The pulleys are produced to standard sizes (see Table 5.6, page 48). We recommend the use of standard pulleys in order to minimise cost and delivery times. If this is not possible for reasons of environmental conditions or design, special pulleys can be supplied to drawing.

Pulleys of the standard range are pilot bored and can on request be finish bored and keywayed.

As can be seen from Table 5.3, pulleys of steel or cast iron as alternative to the pilot bored version are suitable for use with taper bushes. These standard pulleys are provided with a taper bore for the appropriate taper bush. The taper bush system allows speedy delivery for standard pulleys with a specified shaft diameter as well as simple replacement of a worn pulley.

Timing belt bar availability should be checked separately.

For further information on plastic pulleys, see the pulley range on pages 76 and 77.

Table 5.3: Standard pulleys and timing belt bars

Material	Timing pulley section	Timing bar section	Pilot bore [3]	Taper bush [3]
cast iron, steel, aluminium Range pages 54 to 79	**XL**[1] **L** **H** **XH** **5M** **8M** **14M**	**XL**[1] **L**	●	● except for XL section
Aluminium; Range pages 80 to 88	**XL**[1] **T2.5**[2] **T5** **T10** **AT5** **AT10**	**MXL** **XL**[1] **T2.5** **T5** **T10**	●	

[1] Material dependent on diameter
[2] Small diameters not pilot bored
[3] Timing belt bars are not bored at all

Minimum diameter and clamping length

Pulley diameters should be maintained at or above minimum to avoid shortening belt life.

Table 5.4: Minimum diameter and the length to be clamped in clamping plates

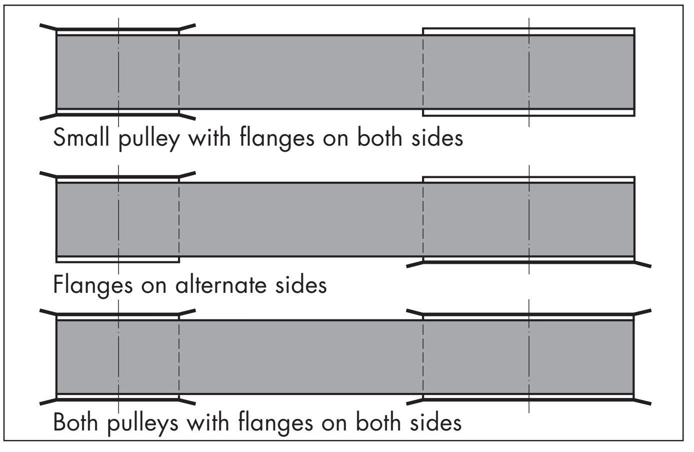
Section	Min. number of teeth on pulley z_k	Min. pitch diameter of pulley d_w (mm)	Min. diameter of idler	Min. length clamped by plate (teeth)
MXL	10	6.47	15	—
XL	10	16.17	30	8
L	10	30.32	60	6
H	14	56.60	100	6
XH	18	127.34	180	6
T2.5	10	7.96	15	—
T5	10	15.92	30	8
T10	12	38.20	60	6
T20	15	95.49	120	6
AT5	12	19.10	60	8
AT10	15	47.75	120	6
AT20	18	114.59	180	6
5M	14	21.14	60	6
8M	22	56.02	120	6
14M	28	124.78	180	6

Flanged pulleys

The timing belt must be controlled on both sides to prevent it running off the pulleys. The smallest pulley on the drive should always be flanged on both sides. When both pulleys are flanged on one side they should be arranged as shown in 5.1 so that the flanges control both sides of the belt.

With centres a > 8 d_{wk}, all pulleys should be have flanges on both sides.

Figure 5.1: Arrangement of flanges



5 Design Hints, Dimensions and Tolerances

5.2 Standard pulleys, flanged pulleys, idlers, clamping plates and minimum numbers of teeth

Idlers

Idlers are either toothed or flat pulleys and do not transmit any power within a drive system. Because of the additional flexing of the belt, their use should be avoided where possible.

Idlers are classified according to their function as guide and/or tensioning pulleys.

A damping pulley is recommended for high speed and/or continuously shock loaded drive systems. It should be set in the slack side of the drive just touching the belt. The relationship between the drive pulley diameters and the drive centres in these cases should be as follows:

$$2 \cdot (d_{wk} + d_{wg}) < a$$

The second pulley of a linear drive or conveyor system is a guide pulley.

Within a drive system, at least one shaft should be adjustable to permit installation and tensioning of the timing belt. If this is not feasible for design reasons, this function must be assumed by an adjustable tensioning pulley or idler.

Depending on the position of the idler in relation to the belt and the other pulleys, an additional distinction is drawn between external and internal idlers. An external idler can increase the number of belt teeth in mesh and possibly increase the maximum transmissible power. An idler acts in the opposite direction and can reduce the number of teeth in mesh.

Figure 5.2: Arrangement of external idler

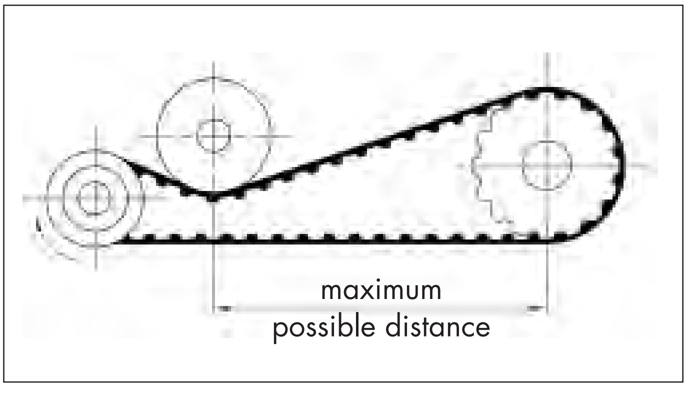
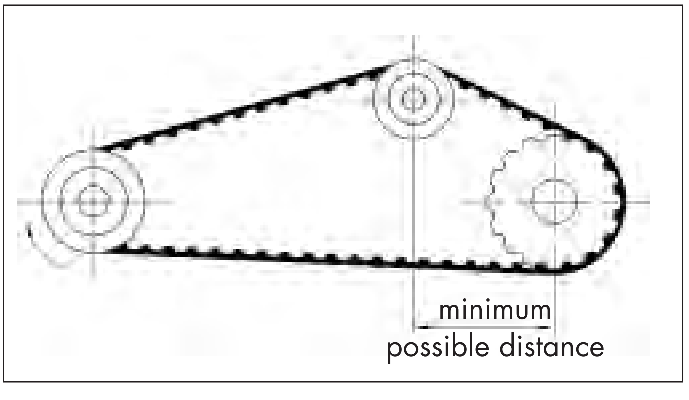


Figure 5.3: Arrangement of internal tensioning pulley



In order to minimise the additional bending stress in the timing belt resulting from the use of idlers, the following guidelines should be observed:

- Minimum diameter of the internal pulley ≥ minimum pulley diameter from Table 5.4. Preferably, idler ≥ diameter of the small pulley.
- Toothed pulleys having over approximately 41 teeth can be regarded as flat pulleys when used as internal idlers.
- Minimum diameter of the external idler: see Table 5.4
- Flat pulleys should always be used as external idlers.
- Flat pulleys must not be crowned.
- Width of the idlers ≥ face width b_1 of the drive pulleys
- If possible, always locate idlers in the slack side of the drive.
- Position external idlers so that the maximum number of teeth are in mesh on the small pulley (Figure 5.2).
- Idlers should not be spring-loaded.
- Keep the arc of contact on the idlers to a minimum

Standard clamp plates for Optibelt ZRL-M open-ended belting, for range, see page 88.

Standard aluminium clamp plates have eight teeth to accept the end of a timing belt. The belt is then sandwiched between the clamp plate and a machine part e.g. a tool slide (see Figure 1.4.2: Positioning Drive, page 7).

Clamp plates are supplied without a mating back plate. The minimum clamping lengths specified in Table 5.4 are applicable to each end of a belt.

The clamp plate should be in the same plane as the timing belt in order to prevent kinking in the transition between the slack side and the clamp. If an angular deviation cannot be avoided, provision should be made for kink free transition based on the minimum pulley diameter involved (see Table 5.4). If there is a risk of drive overload and there are strict safety requirements, e.g. a lift drive, we recommend increasing the number of teeth for the end fastening to at least twelve teeth.

Storage conditions

The cast iron and steel pulleys are protected by phosphating against rusting with normal relative humidity in enclosed areas. The rest of the range, including the clamp plates and bushes should also be stored under these conditions. In the case of timing belts, ensure storage at room temperature free from kinks.

5 Design Hints, Dimensions and Tolerances
5.3 Operating, safety and maintenance hints, installation

Correctly designed drive systems with Optibelt ZRM/ZRP/ZRL timing belts will ensure a high level of reliability and optimum service life.

It has been found in practice that unsatisfactory running time is frequently attributable to installation errors and inadmissible environmental conditions. As a precaution, we recommend observing the following:

Operating hints

Timing belt drives are sensitive to the ingress of foreign matter. If foreign material is getting into the drive then there must be a re-examination and possibly a redesign of the drive guard.

The polyurethane timing belts of the Optibelt standard range are suitable for operation in a temperature range of between –30 °C and +80 °C with normal relative humidity. Furthermore, the polyurethane timing belts are resistant to numerous corrosive chemicals (ZRM/ZRP page 15 and ZRL page 42). In the case of special ambient conditions, we recommend consulting our applications engineers.

Safety hints

Open and readily accessible drive systems should be guarded to obviate any risk of injury.

Before commencing installation, the prime mover should be stopped and secured against any possibility of accidental start up e.g. by disconnecting electric power at the mains. The driven machine should be prevented from rotating.

Installation of the drive

Installation of the drive comprises fitting the pulleys and idlers, fitting the timing belt, adjusting the tension and aligning all shafts and pulleys.

Fitting the timing belt

Before fitting, the centre distance should be reduced to enable the timing belt to be lifted over the flanges without the use of force. If insufficient adjustment has not been provided (see recommendation page 43), the timing belt may be fitted together with one or both of the pulleys. The use of force when fitting is NOT permissible in any instance, as this will damage the belt, this damage is often not apparent.

Adjusting the tension

The tension should be calculated and adjusted in accordance with the guidelines on page 28 (ZRM/ZRP) and page 40 (ZRL). By virtue of the zero stretch tension cord, no further checking of the tension will be necessary under normal operating conditions after correct adjustment.

Alignment, misalignment and angular deviation

Correct alignment of the pulleys and shafts will ensure free running between the flanges, friction-free tooth engagement and uniform load distribution over the entire width of the tooth.

The following alignment errors can occur (see Figure 5.4) and should be prevented:

Axial misalignment of the pulleys:

- Misalignment of the pulleys in axial direction is only permissible within the excess width of the pulley faces compared to the belt width. The belt must engage with the pulley across its whole width.

Horizontal and vertical angular deviation of shaft axes:

- The horizontal angular deviation α from parallel should be measured in the plane of the drive shafts.
- The vertical deviation β from parallel should be measured perpendicular to the plane of the shafts.

Horizontal and vertical angular deviation should be less than the maximum permissible value in Table 5.5.

Table 5.5: Angular deviation from parallel

Pulley outside diameter d_a (mm)	Permissible angular deviation α, β (°)
≤ 50	0.50
> 50 ≤ 100	0.25
> 100 ≤ 200	0.12
> 200	0.06

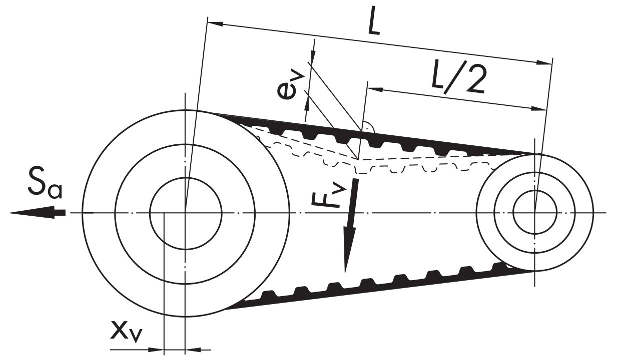
If the values listed for angular deviation are exceeded, reduced service life of the timing belts must be expected.

Even with correct alignment of the pulleys, the belt will drift sideways slightly. This is caused in the case of endless ZRM/ZRP timing belts by the helical lay of the tension cord and in the case of the ZRL open-ended belting, by the twist of the tension cord.

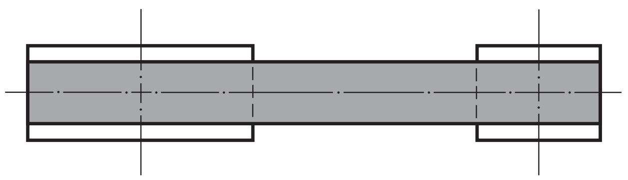
5 Design Hints, Dimensions and Tolerances

5.3 Operating, safety and maintenance hints, installation

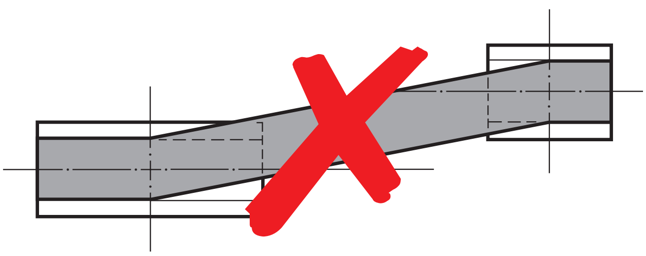
Figure 5.4: Correct and incorrect installation



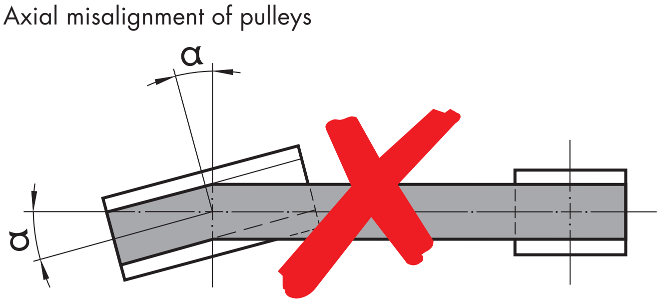
Correct tension



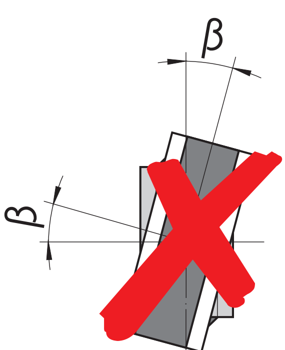
Aligned pulleys on axially parallel shafts



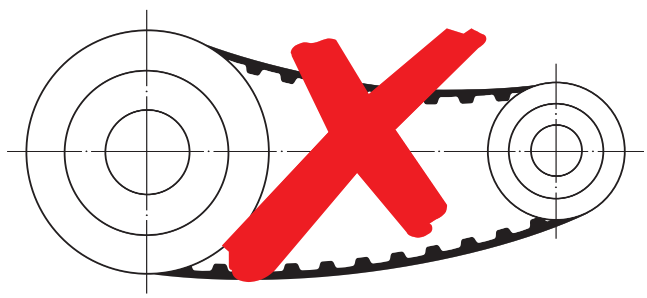
Axial misalignment of pulleys



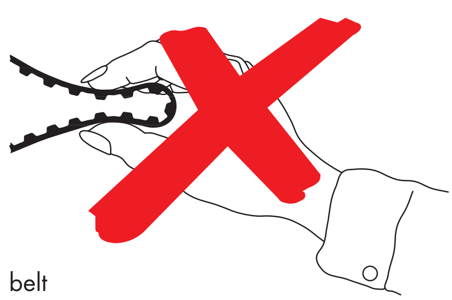
Horizontal angular deviation of shaft axes



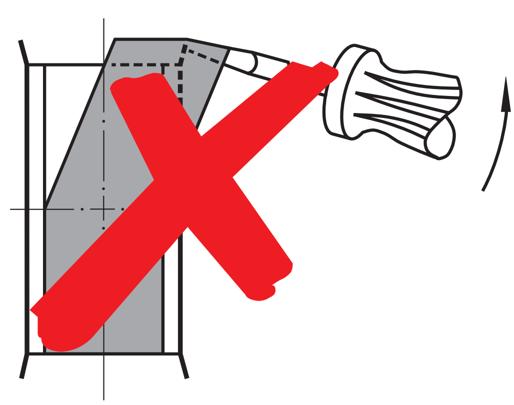
Vertical angular deviation of shaft axes



Insufficient belt tension



Kinked belt



Belt fitted with the use of force

Timing belts as sets

Timing belts which run in pairs or side-by-side MUST be ordered as a set. This ensures that all the timing belts are cut side-by-side from the same production sleeve and that their lengths are identical.

Timing belts which run side-by-side on one pulley should be protected from lateral overrun by a dividing ring.

Maintenance and inspection

Drive systems fitted with Optibelt ZRM/ZRP/ZRL timing belts are maintenance-free. Nevertheless, visual inspection of the timing belts, the pulleys and any idlers used, should be carried out regularly for early detection and rectification of possible malfunctions (see Table 5.14, page 52).

5 Design Hints, Dimensions and Tolerances
5.4 Standards, pulley tolerances

Helix angle, standards see Table 5.6

The teeth must be parallel to the axis of the bore, with a maximum deviation of 0.001 mm per millimetre of width.

For inch-dimensioned sections: 0.01 mm per 10 millimetres of width.

Draft, standards see Table 5.6

Draft may be a maximum of 0.001 mm per millimetre of face width and may not exceed the permissible outside diameter tolerance in accordance with Table 5.7.

For inch-dimensioned sections: 0.01 mm per 10 millimetres of face width.

Surface finish in accordance with ISO/R 468

The surface finish may not exceed the value R_a = 3.2 µm on tooth flanks and tops.

Table 5.6: Sections and standards

Section	Timing belt standard	Pulley standard
MXL; XL; L; H; XH	DIN ISO 5296 Part 1	DIN ISO 5294
5M	works standard	works standard
8M; 14M	ISO/DIS 13050	ISO/DIS 13050
T2.5; T5; T10; T20	DIN 7721 Part 1	DIN 7721 Part 2
AT5; AT10; AT20	based on DIN 7721 Part 1	based on DIN 7721 Part 2

Table 5.7: Outside diameter tolerances, standards see Table 5.6

Outside diameter d_a (mm)		Tolerance d_a (mm)	
Inch pitch	Metric pitch	**MXL; XL; L; H; XH; 5M; 8M; 14M**	**T2.5; T5; T10; T20; AT5; AT10; AT20**
≤ 25.40	≤ 25	+0.05 / 0	+0 / −0.05
> 25.40 ≤ 50.80	> 25 ≤ 50	+0.08 / 0	+0 / −0.05
> 50.80 ≤ 101.60	> 50 ≤ 100	+0.10 / 0	+0 / −0.08
> 101.60 ≤ 177.80	> 100 ≤ 175	+0.13 / 0	+0 / −0.08
> 177.80 ≤ 304.80	> 175 ≤ 300	+0.15 / 0	+0 / −0.10
> 304.80 ≤ 508.00	> 300 ≤ 500	+0.18 / 0	+0 / −0.10
> 508.00	> 500	+0.20 / 0	+0 / −0.15

Table 5.8: Axial runout tolerance, standards see Table 5.6

Outside diameter d_a (mm)		Total runout (mm)	
Inch pitch	Metric pitch	**MXL; XL; L; H; XH; 5M; 8M; 14M**	**T2.5; T5; T10; T20; AT5; AT10; AT 20**
≤ 101.60	≤ 100	0.1	0.1
> 101.60 ≤ 254.00	> 100 ≤ 250	0.001 per 1 mm of outside diameter (not 5M, 8M, 14M)	0.01 mm per 10 mm of outside diameter (also 5M, 8M, 14M)
> 254.00	> 250	0.25 mm and plus 0.0005 mm per 1 mm of outside diameter	0.25 mm and - plus 0.005 mm per 10 mm of outside diameter

Table 5.9: Eccentricity tolerance, standards see Table 5.6

Section	Outside diameter d_a (mm)	Maximum eccentricity (mm)
MXL; XL; L; H; XH	≤ 203.2	0.13
	> 203.2	plus 0.0005 per 1 mm of outside diameter
5M; 8M; 14M	≤ 200	0.10
	> 200 ≤ 500	0.0005 per 1 mm of outside diameter maximum 0.18
	> 500	0.20
T 2.5; T 5; T 10; T 20; AT 5; AT 10; AT 20	≤ 200	0.05
	> 200	plus 0.005 per 10 mm of outside diameter

5 Design Hints, Dimensions and Tolerances
5.4 Standards, pulley tolerances

Widths

The minimum widths b_f and b_f' for pulleys, with and without flanges, are given in Table 5.10.

When using pulleys with only one flange, the lower value b_f should be used.

The width for pulleys without flanges b_f' can be reduced if the tracking of the drive can be adjusted; it may not however be less than the value b_f specified for pulleys with flanges.

Figure 5.5: Pulley with and without flanges

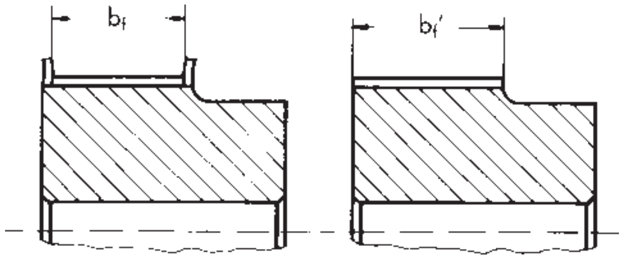


Table 5.10: Pulley widths

Section	Pulley width designation	Pulley nom. width (mm)	Mion. pulley width with flanges b_f (mm)	without flanges b_f' (mm)
MXL	012 019 025	3.2 4.8 6.4	3.8 5.3 7.1	5.6 7.1 8.9
XL	025 031 037	6.4 7.9 9.5	7.1 8.6 10.4	8.9 10.4 12.2
L	050 075 100	12.7 19.1 25.4	14.0 20.3 26.7	17.0 23.3 29.7
H	075 100 150 200 300	19.1 25.4 38.1 50.8 76.2	20.3 26.7 39.4 52.8 79.0	24.6 31.2 43.9 57.3 83.5
XH	200 300 400	50.8 76.2 101.6	56.6 83.8 110.7	62.6 89.8 116.7
T2.5	4 6 10	4.0 6.0 10.0	5.5 7.5 11.5	8.0 10.0 14.0
T5; AT 5	6 10 16 25	6.0 10.0 16.0 25.0	7.5 11.5 17.5 26.5	10.0 14.0 20.0 29.0
T10; AT10	16 25 32 50	16.0 25.0 32.0 50.0	18.0 27.0 34.0 52.0	21.0 30.0 37.0 55.0
T20; AT20	32 50 75 100	32.0 50.0 75.0 100.0	34.0 52.0 77.0 102.0	38.0 56.0 81.0 106.0
5M	10 15 25 50	10.0 15.0 25.0 50.0	12.0 17.0 27.0 52.0	15.0 19.0 29.0 56.0
8M	20 30 50 85	20.0 30.0 50.0 85.0	22.0 34.0 54.0 90.0	26.0 38.0 58.0 94.0
14M	40 55 85 115 170	40.0 55.0 85.0 115.0 170.0	47.0 63.0 95.0 126.0 180.0	54.0 70.0 102.0 133.0 187.0

5 Design Hints, Dimensions and Tolerances

5.5 Length measurement, width tolerances

The following length measurement method refers to Optibelt ZRM/ ZRP timing belts.

The timing belt should be fitted on two test pulleys of equal size of suitable section which should be free to rotate. One pulley is mounted on a fixed centre shaft, whilst the other is mounted on a parallel shaft that is able to move to vary the centre distance.

The movable test pulley should be loaded with the test force Q as shown in Figure 5.6. Test pulley dimensional tolerances and the values of force Q are shown in Tables 5.11 and 5.12.

Before measurement of the centre distance a, the loaded belt should be rotated at least twice around the test pulleys. The belt is then correctly located on the pulleys and both spans will be uniformly loaded.

The permissible length tolerance a_{LTol} in Table 5.2, page 43, refers to the centre distance and is therefore half as large as the tolerance on the pitch length. The pitch length is obtained from the following equation:

$$L_w = 2 \cdot a + U_w \qquad U_w \text{ from Table 5.11}$$

Table 5.11: Test pulleys for determining belt length, for standards see Table 5.6, page 48

Section	Number of teeth z	Effective diameter U_w (mm)	Outside diameter d_a (mm)	Eccentricity tolerance of outside diameter (mm)	Axial runout tolerance (mm)
MXL	20	40.64	12.428 ± 0.013	0.013	0.025
XL	10	50.80	15.662 ± 0.013	0.013	0.025
L	16	152.40	47.748 ± 0.013	0.013	0.025
T2.5	20	50.00	15.400	0.013	0.025
T5; AT5	20	100.00	31.000	0.013	0.025
T10; AT10	20	200.00	61.800	0.013	0.025
T20; AT20	20	400.00	124.500	0.013	0.050

Table 5.12: Test forces for determining belt length, for standards see Table 5.6, page 48

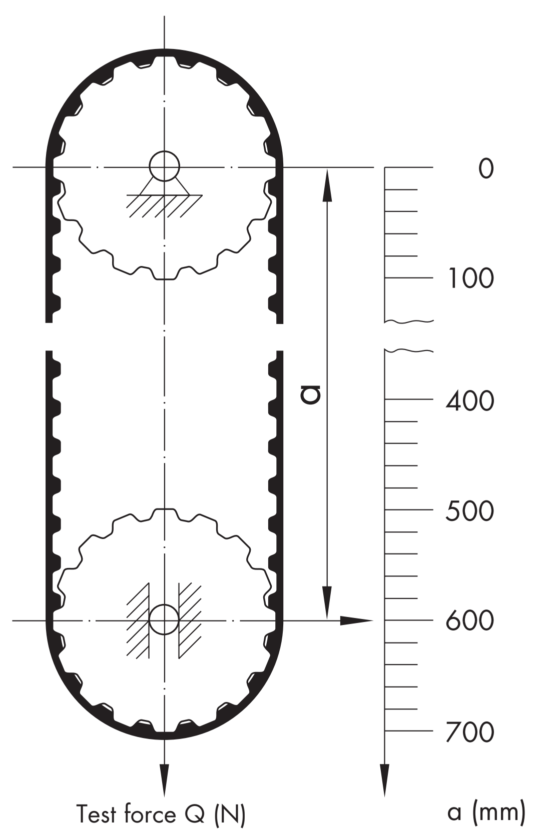
Standard belt width b_{St} (mm)	Test forces Q (N)									
	MXL	**XL**	**L**	**T2.5**	**T5**	**T10**	**T20**	**AT5**	**AT10**	**AT20**
3.2	13	—	—	—	—	—	—	—	—	—
4.0	—	—	—	6	—	—	—	—	—	—
4.8	20	—	—	—	—	—	—	—	—	—
6.0	—	—	—	10	20	—	—	25	—	—
6.4	27	36	—	—	—	—	—	—	—	—
7.9	—	44	—	—	—	—	—	—	—	—
9.5	—	53	—	—	—	—	—	—	—	—
10.0	—	—	—	20	40	—	—	50	110	—
12.7	—	—	105	—	—	—	—	—	—	—
16.0	—	—	—	—	60	90	—	80	170	250
19.1	—	—	180	—	—	—	—	—	—	—
25.0	—	—	—	—	90	140	—	125	270	400
25.4	—	—	245	—	—	—	—	—	—	—
32.0	—	—	—	—	—	170	340	160	340	500
50.0	—	—	—	—	—	270	540	250	540	800
75.0	—	—	—	—	—	—	800	—	800	1200
100.0	—	—	—	—	—	—	1100	—	1100	1600

5 Design Hints, Dimensions and Tolerances
5.5 Length measurement, width tolerances

Table 5.13: Width tolerances, for standards see Table 5.6, page 48

Section	Standard belt width		Width tolerance (mm)			
			ZRP Pitch lengths L_w (mm)			ZRL
	b_{St} (mm)	Code No.	< 838.2	> 838.2 ≤1676.4	>1676.4	
MXL	3.2 4.8 6.4	012 019 025	+ 0.5 – 0.8	—	—	—
XL	6.4 7.9 9.5	025 031 037	+ 0.5 – 0.8	—	—	+ 0.5 – 0.5
L	12.7 19.1 25.4	050 075 100	+ 0.8 – 0.8	+ 0.8 – 1.3	—	+ 0.5 – 0.5
H	19.1 50.8 76.2	075 200 300	—	—	—	+ 0.5 – 0.5
XH	50.8 76.2 101.6	200 300 400	—	—	—	+ 1.0 – 1.0

Figure 5.6: Fixture for measurement of belt length



Section	Standard belt width		Width tolerance (mm)	
			ZRP	ZRL
	b_{St} (mm)	Code No.		
T2.5	4 6 10	4 6 10	+ 0.3 – 0.3	—
T5	6 10 16 25	6 10 16 25	+ 0.5 – 0.5	+ 0.5 – 0.5
T5D	6 10 16 25	6 10 16 25	+ 0.5 – 0.5	—
T10	16 25 32 50	16 25 32 50	+ 0.5 – 0.5	+ 0.5 – 0.5
T10D	16 25 32 50	16 25 32 50	+ 0.5 – 0.5	—
T20	32 50 75 100	32 50 75 100	+ 1.0 – 1.0	+ 1.0 – 1.0
T20D	32 50 75 100	32 50 75 100	+ 1.0 – 1.0	—
AT5	6 10 16 25	6 10 16 25	+ 0.5 – 0.5	+ 0.5 – 0.5
AT10	16 25 32 50	16 25 32 50	+ 0.5 – 0.5	+ 0.5 – 0.5
AT20	32 50 75 100	32 50 75 100	+ 1.0 – 1.0	+ 1.0 – 1.0
5M	10 15 25 50	10 15 25 50	—	+ 0.5 – 0.5
8M	20 30 50 85	20 30 50 85	—	+ 1.0 – 1.0
14M	40 55 85 115	40 55 85 115	—	+ 1.0 – 1.0

optibelt

Power Transmission

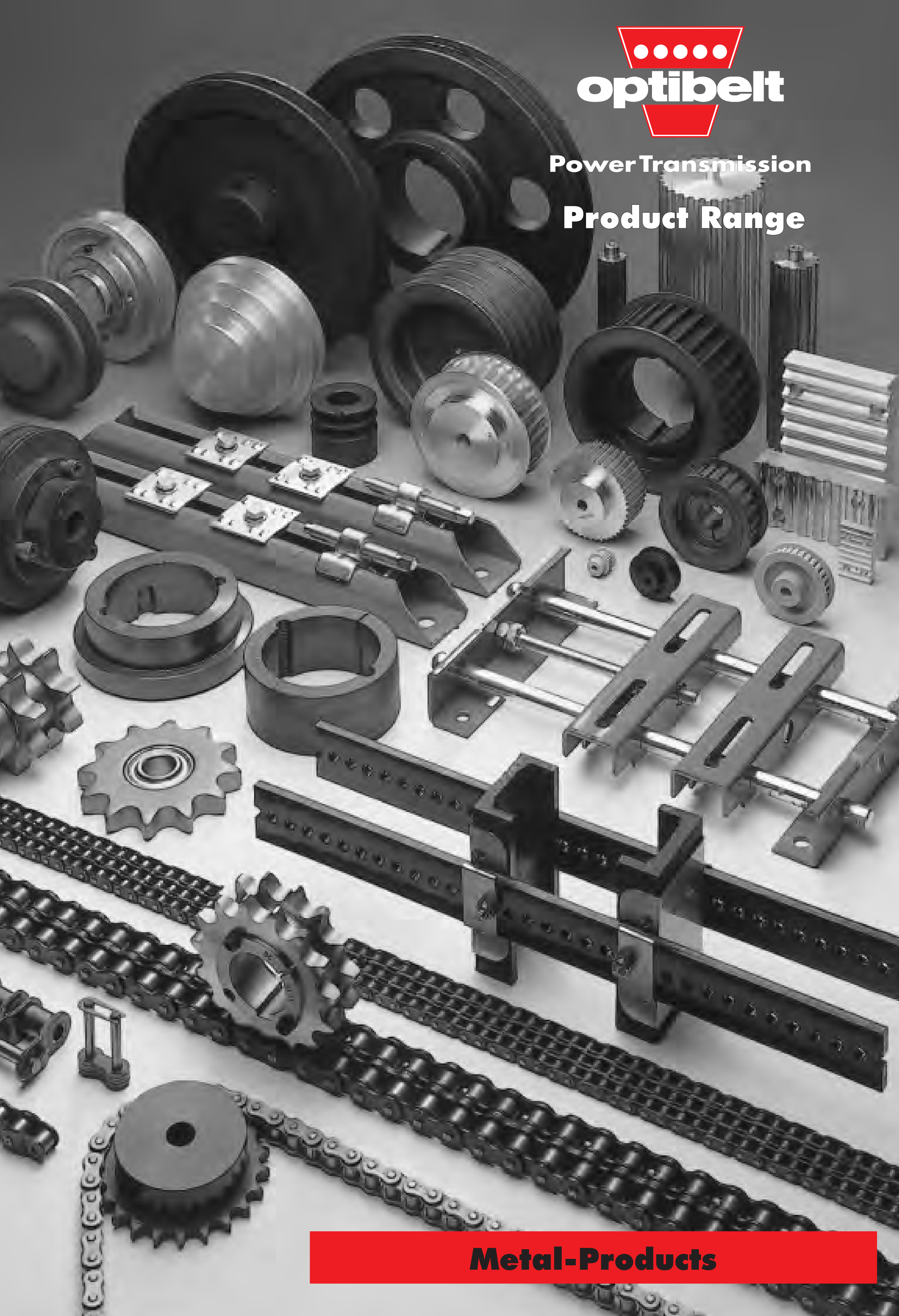
5 Design Hints, Dimensions and Tolerances

5.6 Problems, causes, remedies

Drive system problems can significantly impair the efficiency and service life of the timing belt. After correcting any problems it is advisable to replace the timing belt.

Table 5.14: Problems, causes, remedies

Problem	Cause	Remedy
Severe wear on the belt tooth flanks	Incorrect belt tension Belt geometry incorrect Pulley geometry incorrect Overload, drive underdimensioned	Recalculate belt tension and reset Use correct belt(s) Use correct pulley Reduce load or redesign drive
Excessive wear of the tops and bottoms of the belt teeth	Excessive belt tension Incorrect pulleys	Reset belt tension to calculated level Replace pulley(s)
Unusual wear on the belt sides	Unacceptable axial offset of pulleys, unacceptable horizontal and/or vertical angular alignment of shafts Motor or machine mounting too flexible Defective flange	Re-align shafts and pulleys Strengthen components and tighten mountings Replace flange
Belts jumping teeth on the pulleys	Belt tension insufficient Overload, drive underdimensioned Unacceptable horizontal and/or vertical angular deviation of shafts Foreign matter ingress	Reset belt tension to calculated level Reduce load or redesign drive Realign shafts and pulleys Remove source of contamination or redesign guards
Pulley flanges becoming detached	Incorrect installation of flange Unacceptable axial offset of pulleys, unacceptable horizontal and/or vertical angular deviation of shafts	Install flange correctly Realign shafts and pulleys
Unusual wear on pulley	Pulleys made from unsuitable material Belt geometry incorrect Pulley geometry incorrect	Use better quality pulleys Use correct belt(s) Use correct pulley(s)
Cracks in the belt top surface	Ambient temperature above +80 °C or below –30 °C	Protect belt, induce cooling air flow
Cracks in the special surface laid on top of the belt	Excessive ambient temperature (see Table 1.4, page 9)	Protect drive or remove contamination, change to another special surface
Belt swelling	Effects of contamination (see page 15 and page 42)	Protect drive, remove contamination
Swelling of the special surface laid on top of the belt	Effects of contamination (see Table 1.4, page 9)	Screen drive system, select different top surface



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Power Transmission

Product Range

Metal-Products

Taper bushes with metric bore, keyway to DIN 6885 part 1

	Taper bush															
	1008	1108	1210	1215	1310	1610	1615	2012	2517	3020	3030	3525	3535	4040	4545	5050
Bore diameter d_2 **(mm)**	10 11 12 14 16 18 19 20 22 24* 25*	10 11 12 14 16 18 19 20 22 24 25 28*	11 12 14 16 18 19 20 22 24 25 28 30 32	11 12 14 16 18 19 20 22 24 25 28 30 32	14 16 18 19 20 22 24 25 28 30 32 35	14 16 18 19 20 22 24 25 28 30 32 35 38 40 42*	14 16 18 19 20 22 24 25 28 30 32 35 38 40 42*	14 16 18 19 20 22 24 25 28 30 32 35 38 40 42 45 48 50	16 18 19 20 22 24 25 28 30 32 35 38 40 42 45 48 50 55 60	25 28 30 32 35 38 40 42 45 48 50 55 60 65 70 75	35 38 40 42 45 48 50 55 60 65 70 75	35 38 40 42 45 48 50 55 60 65 70 75 80 85 90	35 38 40 42 45 48 50 55 60 65 70 75 80 85 90	40 42 45 48 50 55 60 65 70 75 80 85 90 95 100	55 60 65 70 75 80 85 90 95 100 105 110	70 75 80 85 90 95 100 105 110 115 120 125
Tightening torque (Nm)	5.7	5.7	20	20	20	20	20	31	49	92	92	115	115	172	195	275
Bush length (mm)	22.3	22.3	25.4	38.1	25.4	25.4	38.1	31.8	44.5	50.8	76.2	63.5	88.9	101.6	114.3	127.0
Weight at $d_{2\,min}$ (≈ kg)	0.12	0.16	0.28	0.39	0.32	0.41	0.60	0.75	1.06	2.50	3.75	3.90	5.13	7.68	12.70	15.17

* This bore has a shallow keyway.

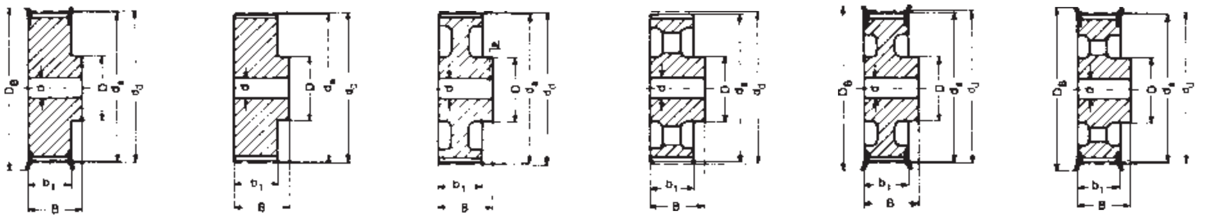
Shallow keyway for taper bushes

Bore diameter d_2 (mm)	Groove width b (mm)	Groove depth t_2 (mm)	Bore diameter d_2 (mm)	Groove width b (mm)	Groove depth t_2 (mm)
24	8	2.0	28	8	2.0
25	8	1.3	42	12	2.2

Taper bushes with inch bore, keyway to British Standard BS 46 part 1

	Taper bush															
	1008	1108	1210	1215	1310	1610	1615	2012	2517	3020	3030	3525	3535	4040	4545	5050
Bore diameter d_2 **(inch)**	3/8 1/2 5/8 3/4 7/8 1◆	3/8 1/2 5/8 3/4 7/8 1 1 1/8◆	1/2 5/8 3/4 7/8 1 1 1/8 1 1/4◆	5/8 3/4 7/8 1 1 1/8 1 1/4◆	1/2 5/8 3/4 7/8 1 1 1/8 1 1/4 1 3/8◆	1/2 5/8 3/4 7/8 1 1 1/8 1 1/4 1 3/8 1 1/2 1 5/8◆	1/2 5/8 3/4 7/8 1 1 1/8 1 1/4 1 3/8 1 1/2 1 5/8◆	5/8 3/4 7/8 1 1 1/8 1 1/4 1 3/8 1 1/2 1 5/8 1 3/4 1 7/8 2	3/4 7/8 1 1 1/8 1 1/4 1 3/8 1 1/2 1 5/8 1 3/4 1 7/8 2 2 1/8 2 1/4 2 3/8 2 1/2	1 1/4 1 3/8 1 1/2 1 5/8 1 3/4 1 7/8 2 2 1/8 2 1/4 2 3/8 2 1/2 2 5/8 2 3/4 2 7/8 3	1 1/4 1 3/8 1 1/2 1 5/8 1 3/4 1 7/8 2 2 1/8 2 1/4 2 3/8 2 1/2 2 5/8 2 3/4 2 7/8 3	1 1/2 1 5/8 1 3/4 1 7/8 2 2 1/8 2 1/4 2 3/8 2 1/2 2 5/8 2 3/4 2 7/8 3 3 1/8 3 1/4 3 3/8 3 1/2	1 1/2 1 5/8 1 3/4 1 7/8 2 2 1/8 2 1/4 2 3/8 2 1/2 2 5/8 2 3/4 2 7/8 3 3 1/8 3 1/4 3 3/8 3 1/2	1 3/4 1 7/8 2 2 1/8 2 1/4 2 3/8 2 1/2 2 5/8 2 3/4 2 7/8 3 3 1/8 3 1/4 3 3/8 3 1/2 3 3/4 4	2 1/4 2 3/8 2 1/2 2 3/4 2 7/8 3 3 1/4 3 3/8 3 1/2 3 3/4 4 4 1/4 4 1/2	3 3 1/4 3 1/2 3 3/4 4 4 1/4 4 1/2 4 3/4 5
Tightening torque (Nm)	5.7	5.7	20	20	20	20	20	31	49	92	92	115	115	172	195	275
Bush length (mm)	22.3	22.3	25.4	38.1	25.4	25.4	38.1	31.8	44.5	50.8	76.2	63.5	88.9	101.6	114.3	127.0
Weight at $d_{2\,min}$ ≈ kg)	0.12	0.16	0.28	0.39	0.32	0.41	0.60	0.75	1.06	2.50	3.75	3.90	5.13	7.68	12.70	15.17

◆ Steel



Type 6F | Type 6 | Type 6W | Type 6A | Type 6WF | Type 6AF

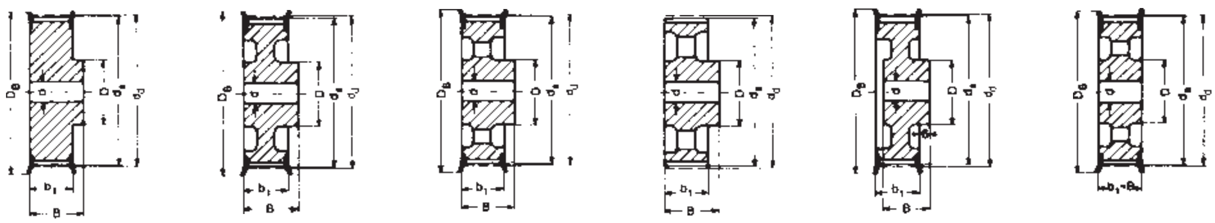
Type XL – Pitch 5.08 mm for belt width 025, 031, 037

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Grub screw	Weight (≈ kg)
10 XL 037	10	6F	St	16.17	15.66	23	14.3	19.8	9.5	5.0	6.4	M3	0.02
11 XL 037	11	6F	St	17.79	17.28	23	14.3	19.8	9.5	5.0	6.4	M3	0.02
12 XL 037	12	6F	St	19.40	18.89	25	14.3	19.8	12.7	5.0	7.9	M3	0.03
14 XL 037	14	6F	St	22.64	22.13	28	14.3	19.8	14.3	6.0	9.5	M4	0.04
15 XL 037	15	6F	St	24.26	23.75	28	14.3	19.8	15.9	6.0	11.1	M4	0.04
16 XL 037	16	6F	St	25.87	25.36	32	14.3	19.8	17.5	6.0	12.7	M4	0.05
18 XL 037	18	6F	St	29.11	28.60	36	14.3	19.8	19.0	6.0	14.3	M4	0.06
20 XL 037	20	6F	St	32.34	31.83	38	14.3	22.2	23.8	6.0	17.5	M4	0.08
21 XL 037	21	6F	St	33.96	33.45	38	14.3	22.2	23.8	6.0	17.5	M4	0.09
22 XL 037	22	6F	St	35.57	35.06	42	14.3	22.2	25.4	6.0	19.1	M4	0.10
24 XL 037	24	6F	St	38.81	38.30	44	14.3	22.2	27.0	6.0	20.6	M4	0.12
26 XL 037	26	6F	St	42.04	41.53	48	14.3	22.2	30.0	6.0	23.0	M4	0.14
28 XL 037	28	6F	St	45.28	44.77	51	14.3	22.2	30.2	6.0	23.0	M4	0.16
30 XL 037	30	6F	St	48.51	48.00	54	14.3	22.2	34.9	6.0	23.0	M4	0.19
32 XL 037	32	6	Al	51.74	51.23	—	14.3	25.4	38.0	8.0	23.0	M4	0.11
36 XL 037	36	6	Al	58.21	57.70	—	14.3	25.4	38.0	8.0	23.0	M4	0.13
40 XL 037	40	6	Al	64.68	64.17	—	14.3	25.4	38.0	8.0	23.0	M4	0.17
42 XL 037	42	6W	Al	67.91	67.40	—	14.3	25.4	38.0	8.0	23.0	M4	0.13
44 XL 037	44	6W	Al	71.15	70.64	—	14.3	25.4	38.0	8.0	23.0	M4	0.15
48 XL 037	48	6W	Al	77.62	77.11	—	14.3	25.4	38.0	8.0	23.0	M4	0.16
60 XL 037	60	6A	Al	97.02	96.51	—	14.3	25.4	38.0	8.0	23.0	M4	0.18
72 XL 037	72	6A	Al	116.43	115.92	—	14.3	25.4	38.0	8.0	23.0	M4	0.23

Type L – Pitch 9.525 mm for belt width 050

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Grub screw	Weight (≈ kg)
10 L 050	10	6F	St	30.32	29.56	36	19	26	22	6.0	13.0	—	0.11
12 L 050	12	6F	St	36.38	35.62	42	19	26	28	6.0	17.0	—	0.19
13 L 050	13	6F	St	39.41	38.65	44	19	26	30	6.0	19.0	—	0.21
14 L 050	14	6F	St	42.45	41.68	48	19	26	33	8.0	20.0	—	0.25
15 L 050	15	6F	St	45.48	44.72	51	19	26	36	8.0	23.0	—	0.30
16 L 050	16	6F	St	48.51	47.75	54	19	26	38	8.0	23.0	—	0.33
17 L 050	17	6F	St	51.54	50.78	57	19	26	40	10.0	24.0	—	0.36
18 L 050	18	6F	St	54.57	53.81	60	19	26	40	10.0	24.0	—	0.41
19 L 050	19	6F	St	57.61	56.84	60	19	26	40	10.0	24.0	—	0.45
20 L 050	20	6F	St	60.64	59.88	66	19	26	46	10.0	28.0	—	0.50
21 L 050	21	6F	St	63.67	62.91	71	19	26	46	10.0	28.0	—	0.55
22 L 050	22	6F	St	66.70	65.94	75	19	26	50	10.0	30.0	—	0.62
24 L 050	24	6F	St	72.77	72.00	79	19	26	50	12.0	30.0	—	0.68
26 L 050	26	6F	St	78.83	78.07	87	19	26	50	12.0	30.0	—	0.82
28 L 050	28	6F	St	84.89	84.13	91	19	26	50	12.0	30.0	—	0.92
30 L 050	30	6F	St	90.96	90.20	97	19	26	50	12.0	30.0	—	1.10
32 L 050	32	6F	St	97.02	96.26	103	19	26	50	12.0	30.0	—	1.20
36 L 050	36	6WF	GG	109.15	108.39	115	19	26	50	12.0	30.0	—	1.00
40 L 050	40	6WF	GG	121.28	120.51	127	19	26	50	12.0	30.0	—	1.10
44 L 050	44	6AF	GG	133.40	132.64	140	19	26	50	12.0	30.0	—	1.20
48 L 050	48	6AF	GG	145.53	144.77	152	19	26	50	12.0	30.0	—	1.30
60 L 050	60	6A	GG	181.91	181.15	—	19	28	50	15.0	30.0	—	1.30
72 L 050	72	6A	GG	218.30	217.53	—	19	28	50	15.0	30.0	—	1.70
84 L 050	84	6A	GG	254.68	253.92	—	19	28	50	15.0	30.0	—	1.90

St = Steel Al = Aluminium GG = Cast iron We reserve the right to make technical changes.



Type 6F   Type 6WF   Type 6AF   Type 6A   Type 6CWF   Type 10AF

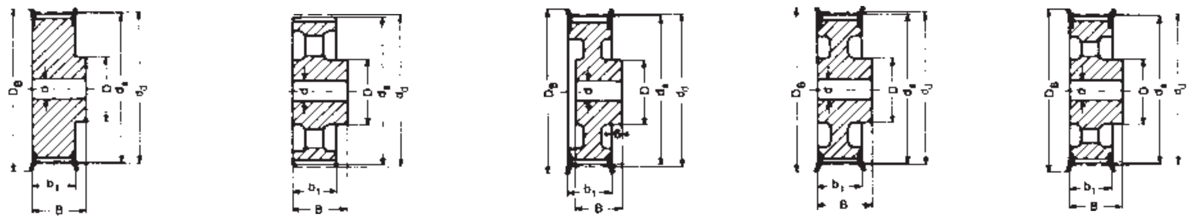
Type L – Pitch 9.525 mm for belt width 075

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
10 L 075	10	6F	St	30.32	29.56	36	25	32	22	6	13	0.15
12 L 075	12	6F	St	36.38	35.62	42	25	32	28	8	17	0.23
13 L 075	13	6F	St	39.41	38.65	44	25	32	30	8	19	0.26
14 L 075	14	6F	St	42.45	41.68	48	25	32	33	8	20	0.32
15 L 075	15	6F	St	45.48	44.72	51	25	32	36	8	23	0.35
16 L 075	16	6F	St	48.51	47.75	54	25	32	38	8	23	0.42
17 L 075	17	6F	St	51.54	50.78	57	25	32	40	10	24	0.45
18 L 075	18	6F	St	54.57	53.81	60	25	32	40	10	24	0.51
19 L 075	19	6F	St	57.61	56.84	60	25	32	40	10	24	0.57
20 L 075	20	6F	St	60.64	59.88	66	25	32	46	10	28	0.63
21 L 075	21	6F	St	63.67	62.91	71	25	32	46	10	28	0.70
22 L 075	22	6F	St	66.70	65.94	75	25	32	50	10	30	0.75
24 L 075	24	6F	St	72.77	72.00	79	25	32	50	12	30	0.85
26 L 075	26	6F	St	78.83	78.07	87	25	32	50	12	30	1.00
28 L 075	28	6F	St	84.89	84.13	91	25	32	50	12	30	1.20
30 L 075	30	6F	St	90.96	90.20	97	25	32	50	12	30	1.40
32 L 075	32	6F	St	97.02	96.26	103	25	32	50	12	30	1.50
36 L 075	36	6WF	GG	109.15	108.39	115	25	32	55	12	32	1.30
40 L 075	40	6WF	GG	121.28	120.51	127	25	32	60	12	35	1.60
44 L 075	44	6AF	GG	133.40	132.64	140	25	32	60	12	35	1.70
48 L 075	48	6AF	GG	145.53	144.77	152	25	32	60	12	35	1.90
60 L 075	60	6A	GG	181.91	181.15	—	26	35	60	15	35	1.80
72 L 075	72	6A	GG	218.30	217.53	—	26	35	60	15	35	2.30
84 L 075	84	6A	GG	254.68	253.92	—	26	35	60	15	35	2.50

Type L – Pitch 9.525 mm for belt width 100

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
10 L 100	10	6F	St	30.32	29.56	36	31	38	22	6	13	0.81
12 L 100	12	6F	St	36.38	35.62	42	31	38	28	8	17	0.29
13 L 100	13	6F	St	39.41	38.65	44	31	38	30	8	19	0.30
14 L 100	14	6F	St	42.45	41.68	48	31	38	33	8	20	0.38
15 L 100	15	6F	St	45.48	44.72	51	31	38	36	8	23	0.40
16 L 100	16	6F	St	48.51	47.75	54	31	38	38	8	23	0.51
17 L 100	17	6F	St	51.54	50.78	57	31	38	40	10	24	0.54
18 L 100	18	6F	St	54.57	53.81	60	31	38	40	10	24	0.62
19 L 100	19	6F	St	57.61	56.84	60	31	38	40	10	24	0.69
20 L 100	20	6F	St	60.64	59.88	66	31	38	46	10	28	0.76
21 L 100	21	6F	St	63.67	62.91	71	31	38	46	10	28	0.82
22 L 100	22	6F	St	66.70	65.94	75	31	38	50	10	30	0.92
24 L 100	24	6F	St	72.77	72.00	79	31	38	50	12	30	1.10
26 L 100	26	6F	St	78.83	78.07	87	31	38	50	12	30	1.30
28 L 100	28	6F	St	84.89	84.13	91	31	38	50	12	30	1.40
30 L 100	30	6F	St	90.96	90.20	97	31	38	50	12	30	1.70
32 L 100	32	6F	St	97.02	96.26	103	31	38	50	12	30	1.80
36 L 100	36	6CWF	GG	109.15	108.39	115	32	32	55	12	32	1.50
40 L 100	40	6CWF	GG	121.28	120.51	127	32	32	60	12	35	1.80
44 L 100	44	10AF	GG	133.40	132.64	140	32	32	60	12	35	1.90
48 L 100	48	10AF	GG	145.53	144.77	152	32	32	60	12	35	2.10
60 L 100	60	6A	GG	181.91	181.15	—	32	35	60	15	35	2.00
72 L 100	72	6A	GG	218.30	217.53	—	32	35	60	15	35	2.50
84 L 100	84	6A	GG	254.68	253.92	—	32	35	60	15	35	2.70

St = Steel   GG = Cast iron   We reserve the right to make technical changes.



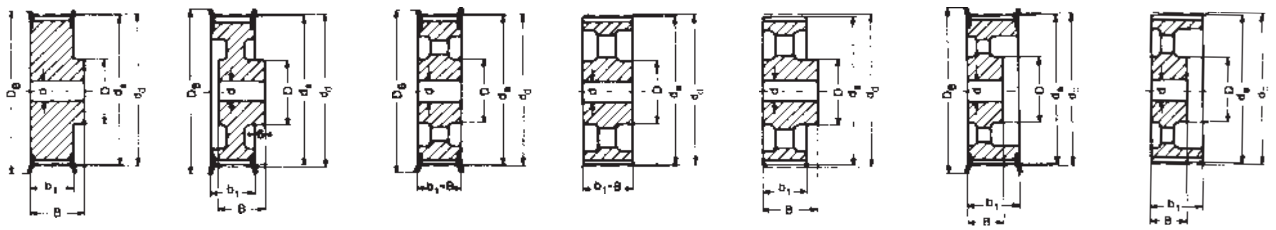
Type H – Pitch 12.7 mm for belt width 075

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
14 H 075	14	6F	St	56.60	55.22	64.0	26.4	40	40	10	24	0.50
16 H 075	16	6F	St	64.67	63.31	70.0	26.4	40	46	10	26	0.60
18 H 075	18	6F	St	72.77	71.39	79.0	26.4	40	54	12	32	0.80
19 H 075	19	6F	St	76.81	75.44	82.5	26.4	40	58	12	35	1.00
20 H 075	20	6F	St	80.85	79.48	87.0	26.4	40	62	12	35	1.10
21 H 075	21	6F	St	84.89	83.52	91.0	26.4	40	67	12	38	1.20
22 H 075	22	6F	St	88.94	87.56	94.0	26.4	40	70	12	38	1.40
24 H 075	24	6F	St	97.02	95.65	102.0	26.4	40	75	12	42	1.60
26 H 075	26	6F	St	105.11	103.73	112.0	26.4	40	80	15	45	1.80
28 H 075	28	6F	GG	113.19	111.82	120.0	26.4	40	80	15	45	2.00
30 H 075	30	6F	GG	121.28	119.90	128.0	26.4	40	80	15	45	2.10
32 H 075	32	6F	GG	129.36	127.99	135.0	27.0	40	70	15	45	2.20
36 H 075	36	6F	GG	145.53	144.16	152.0	26.4	40	80	20	45	2.40
40 H 075	40	6F	GG	161.70	160.33	168.0	26.4	40	80	20	45	2.80
44 H 075	44	6AF	GG	177.87	176.50	184.0	26.4	40	80	20	45	2.70
48 H 075	48	6AF	GG	194.04	192.67	200.0	26.4	40	90	20	50	3.00

Type H – Pitch 12.7 mm for belt width 100

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
14 H 100	14	6F	St	56.60	55.22	63	31	41	40	10	24	0.65
16 H 100	16	6F	St	64.68	63.31	71	31	41	46	10	28	0.85
18 H 100	18	6F	St	72.77	71.39	79	31	41	54	12	32	1.10
19 H 100	19	6F	St	76.81	75.44	83	31	41	58	12	34	1.20
20 H 100	20	6F	St	80.85	79.48	87	31	41	62	12	35	1.40
21 H 100	21	6F	St	84.89	83.52	91	31	41	67	12	38	1.60
22 H 100	22	6F	St	88.94	87.56	93	31	41	70	12	41	1.70
24 H 100	24	6F	St	97.02	95.65	103	31	41	75	12	45	2.00
26 H 100	26	6CWF	GG	105.11	103.73	111	32	32	55	15	32	1.40
28 H 100	28	6CWF	GG	113.19	111.82	119	32	32	60	15	35	1.60
30 H 100	30	6CWF	GG	121.28	119.90	127	32	32	60	15	35	1.70
32 H 100	32	6WF	GG	129.36	127.99	135	32	40	70	20	40	2.20
36 H 100	36	6WF	GG	145.53	144.16	152	32	40	80	20	45	3.00
40 H 100	40	6AF	GG	161.70	160.33	168	32	40	80	20	45	2.80
44 H 100	44	6AF	GG	177.87	176.50	184	32	40	80	20	45	3.10
48 H 100	48	6AF	GG	194.04	192.67	200	32	40	80	20	45	3.30
60 H 100	60	6A	GG	242.55	241.18	—	34	45	80	20	45	5.50
72 H 100	72	6A	GG	291.06	289.69	—	34	45	80	20	45	7.10
84 H 100*	84	6A	GG	339.57	338.20	—	34	45	80	20	45	8.20
96 H 100*	96	6A	GG	388.08	386.71	—	34	45	80	20	45	9.90
120 H 100*	120	6A	GG	485.10	483.73	—	34	50	90	20	50	13.10

St = Steel GG = Cast iron * Non stock items We reserve the right to make technical changes.



Type 6F | Type 6CWF | Type 10AF | Type 10A | Type 6A | Type 11AF | Type 11A

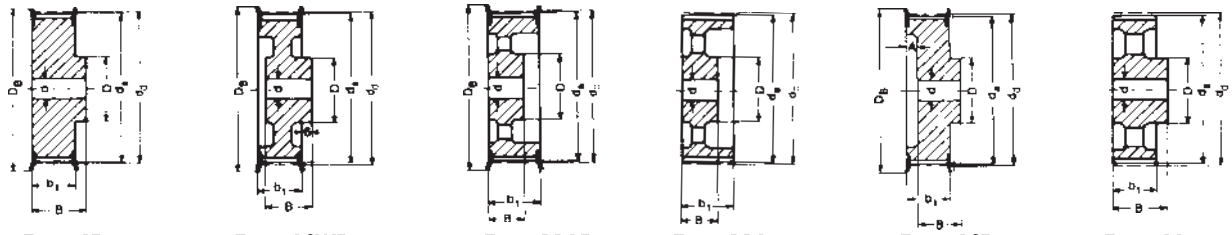
Type H – Pitch 12.7 mm for belt width 150

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
14 H 150	14	6F	St	56.60	55.22	63	44	54	40	12	24	0.82
16 H 150	16	6F	St	64.68	63.31	71	44	54	46	12	28	1.10
18 H 150	18	6F	St	72.77	71.39	79	44	54	54	12	32	1.50
19 H 150	19	6F	St	76.81	75.44	83	44	54	58	12	34	1.70
20 H 150	20	6F	St	80.85	79.48	87	44	54	62	12	35	1.80
21 H 150	21	6F	St	84.89	83.52	91	44	54	67	12	38	2.20
22 H 150	22	6F	St	88.94	87.56	93	44	54	70	12	41	2.30
24 H 150	24	6F	St	97.02	95.65	103	44	54	75	12	45	2.60
26 H 150	26	6CWF	GG	105.11	103.73	111	45	35	55	15	32	1.70
28 H 150	28	6CWF	GG	113.19	111.82	119	45	35	60	15	35	1.90
30 H 150	30	6CWF	GG	121.28	119.90	127	45	35	60	15	35	2.10
32 H 150	32	6CWF	GG	129.36	127.99	135	45	45	70	20	40	2.60
36 H 150	36	6CWF	GG	145.53	144.16	152	45	45	80	20	45	3.20
40 H 150	40	10AF	GG	161.70	160.33	168	45	45	80	20	45	3.80
44 H 150	44	10AF	GG	177.87	176.50	184	45	45	80	20	45	3.70
48 H 150	48	10AF	GG	194.04	192.67	200	45	45	80	20	45	4.00
60 H 150	60	10A	GG	242.55	241.18	—	46	46	85	20	48	5.10
72 H 150	72	10A	GG	291.06	289.69	—	46	46	85	20	48	7.90
84 H 150*	84	10A	GG	339.57	338.20	—	46	46	85	20	48	8.90
96 H 150*	96	10A	GG	388.08	386.71	—	46	46	85	20	48	10.10
120 H 150*	120	6A	GG	485.10	483.73	—	46	55	95	24	55	17.20

Type H – Pitch 12.7 mm for belt width 200

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
14 H 200	14	6F	St	56.60	55.22	63	58	68	40	12	24	1.1
16 H 200	16	6F	St	64.68	63.31	71	58	68	46	15	28	1.4
18 H 200	18	6F	St	72.77	71.39	79	58	68	54	15	32	1.8
19 H 200	19	6F	St	76.81	75.44	83	58	68	58	15	34	2.1
20 H 200	20	6F	St	80.85	79.48	87	58	68	62	15	35	2.3
21 H 200	21	6F	St	84.89	83.52	91	58	68	67	15	38	2.6
22 H 200	22	6F	St	88.94	87.56	93	58	68	70	15	41	2.8
24 H 200	24	6F	St	97.02	95.65	103	58	68	75	15	45	3.4
26 H 200	26	6CWF	GG	105.11	103.73	111	58	42	60	15	35	2.3
28 H 200	28	6CWF	GG	113.19	111.82	119	58	42	60	15	35	2.5
30 H 200	30	6CWF	GG	121.28	119.90	127	58	42	70	15	40	2.9
32 H 200	32	6CWF	GG	129.36	127.99	135	58	47	70	20	40	3.2
36 H 200	36	6CWF	GG	145.53	144.16	152	58	47	80	20	45	3.8
40 H 200	40	11AF	GG	161.70	160.33	168	58	45	80	20	45	4.1
44 H 200	44	11AF	GG	177.87	176.50	184	58	45	80	20	45	4.4
48 H 200	48	11AF	GG	194.04	192.67	200	58	45	85	20	48	5.1
60 H 200	60	11A	GG	242.55	241.18	—	60	50	90	20	50	7.1
72 H 200	72	11A	GG	291.06	289.69	—	60	50	90	20	50	8.0
84 H 200*	84	11A	GG	339.57	338.20	—	60	50	90	20	50	12.0
96 H 200*	96	11A	GG	388.08	386.71	—	60	50	90	20	50	13.6
120 H 200*	120	10A	GG	485.10	483.73	—	60	60	100	24	57	16.6

St = Steel GG = Cast iron * Non stock items We reserve the right to make technical changes.



Type 6F | Type 6CWF | Type 11AF | Type 11A | Type 6CF | Type 6A

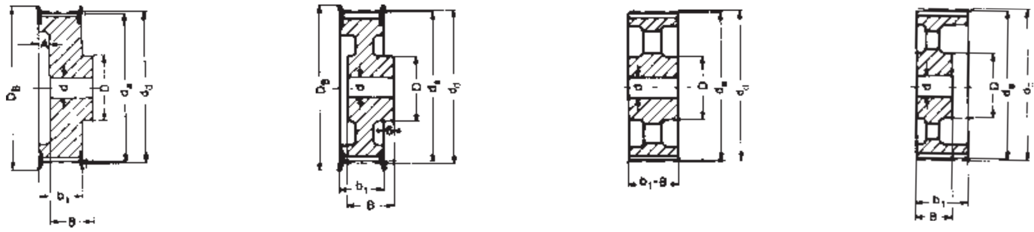
Type H – Pitch 12.7 mm for belt width 300

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	A (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
16 H 300	16	6F	St	64.68	63.31	71	84	94	46	—	15	28	2.0
18 H 300	18	6F	St	72.77	71.39	79	84	94	54	—	15	32	2.6
19 H 300	19	6F	St	76.81	75.44	83	84	94	58	—	15	34	2.9
20 H 300	20	6F	St	80.85	79.48	87	84	94	62	—	15	35	3.2
21 H 300	21	6F	St	84.89	83.52	91	84	94	67	—	15	38	3.6
22 H 300	22	6F	St	88.94	87.56	93	84	94	70	—	15	41	4.0
24 H 300	24	6F	St	97.02	95.65	103	84	94	75	—	15	45	4.7
26 H 300	26	6CWF	GG	105.11	103.73	111	84	57	60	—	15	35	3.3
28 H 300	28	6CWF	GG	113.19	111.82	119	84	57	60	—	15	35	3.6
30 H 300	30	6CWF	GG	121.28	119.90	127	84	57	70	—	15	40	4.2
32 H 300	32	6CWF	GG	129.36	127.99	135	84	57	70	—	20	40	4.3
36 H 300	36	6CWF	GG	145.53	144.16	152	84	57	80	—	20	45	5.2
40 H 300	40	11AF	GG	161.70	160.33	168	84	55	80	—	20	45	5.6
44 H 300	44	11AF	GG	177.87	176.50	184	84	55	80	—	20	45	5.9
48 H 300	48	11AF	GG	194.04	192.67	200	84	55	85	—	20	48	6.6
60 H 300	60	11A	GG	242.55	241.18	—	86	55	100	—	20	57	9.9
72 H 300	72	11A	GG	291.06	289.69	—	86	55	100	—	20	57	13.0
84 H 300*	84	11A	GG	339.57	338.20	—	86	55	100	—	20	57	15.1
96 H 300*	96	11A	GG	388.08	386.71	—	86	55	100	—	20	57	18.2
120 H 300*	120	11A	GG	485.10	483.73	—	86	65	110	—	24	62	26.0

Type XH – Pitch 22.225 mm for belt width 200

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	A (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
18 XH 200*	18	6CF	GG	127.34	124.55	142	64.4	60	85	18	20	50	5.0
20 XH 200*	20	6CF	GG	141.49	138.69	155	64.4	60	95	18	20	55	6.0
22 XH 200*	22	6CF	GG	155.64	152.84	170	64.4	60	110	18	20	65	7.2
24 XH 200*	24	6CF	GG	169.79	166.69	184	64.4	60	125	18	25	70	8.6
26 XH 200*	26	6CF	GG	183.94	181.14	198	64.4	60	140	18	25	80	10.1
28 XH 200*	28	6CWF	GG	198.08	195.29	212	64.4	60	120	18	25	70	9.6
30 XH 200*	30	6CWF	GG	212.23	209.44	227	64.4	60	120	18	25	70	10.4
32 XH 200*	32	6CWF	GG	226.38	223.59	240	64.4	60	130	18	25	75	11.2
40 XH 200*	40	6CWF	GG	282.98	280.18	297	64.4	60	140	18	25	80	16.0
48 XH 200*	48	6A	GG	339.57	336.78	—	65.0	80	150	—	30	85	18.4
60 XH 200*	60	6A	GG	424.47	421.67	—	65.0	80	150	—	30	85	24.3
72 XH 200*	72	6A	GG	509.36	506.57	—	65.0	80	150	—	40	85	28.1
84 XH 200*	84	6A	GG	594.25	591.46	—	65.0	80	160	—	40	90	31.9
96 XH 200*	96	6A	GG	679.15	676.35	—	65.0	80	160	—	40	90	37.0

St = Steel GG = Cast iron * Non stock items We reserve the right to make technical changes.



Type 6CF Type 6CWF Type 10A Type 11A

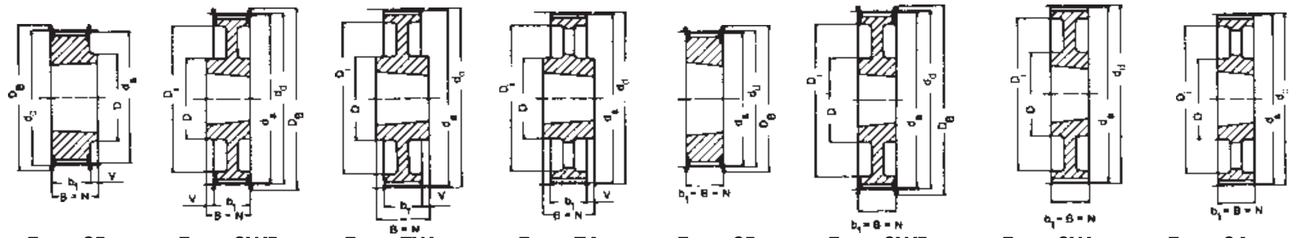
Type XH – Pitch 22.225 mm for belt width 300

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	A (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
18 XH 300*	18	6CF	GG	127.34	124.55	142	91.4	70	85	35	20	50	6.8
20 XH 300*	20	6CF	GG	141.49	138.69	155	91.4	70	95	35	20	55	7.4
22 XH 300*	22	6CF	GG	155.64	152.84	170	91.4	70	110	35	20	65	9.0
24 XH 300*	24	6CF	GG	169.79	166.69	184	91.4	70	125	35	25	70	10.6
26 XH 300*	26	6CF	GG	183.94	181.14	198	91.4	70	140	35	25	80	13.0
28 XH 300*	28	6CWF	GG	198.08	195.29	212	91.4	70	120	35	25	70	12.0
30 XH 300*	30	6CWF	GG	212.23	209.44	227	91.4	70	120	35	25	70	13.0
32 XH 300*	32	6CWF	GG	226.38	223.59	240	91.4	70	130	35	25	75	14.7
40 XH 300*	40	6CWF	GG	282.98	280.18	297	91.4	70	140	35	25	80	19.9
48 XH 300*	48	10A	GG	339.57	336.78	—	92.0	92	150	—	30	85	22.5
60 XH 300*	60	10A	GG	424.47	421.67	—	92.0	92	150	—	30	85	31.5
72 XH 300*	72	10A	GG	509.36	506.57	—	92.0	92	150	—	40	85	36.4
84 XH 300*	84	10A	GG	594.25	591.46	—	92.0	92	160	—	40	90	43.4
96 XH 300*	96	10A	GG	679.15	676.35	—	92.0	92	160	—	40	90	48.5

Type XH – Pitch 22.225 mm for belt width 400

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	A (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
18 XH 400*	18	6CF	GG	127.34	124.55	142	118.4	85	85	47	20	50	8.5
20 XH 400*	20	6CF	GG	141.49	138.69	155	118.4	85	95	47	20	55	9.4
22 XH 400*	22	6CF	GG	155.64	152.84	170	118.4	85	110	47	20	65	11.5
24 XH 400*	24	6CF	GG	169.79	166.69	184	118.4	85	125	47	25	70	13.4
26 XH 400*	26	6CF	GG	183.94	181.14	198	118.4	85	140	47	25	80	15.6
28 XH 400*	28	6CWF	GG	198.08	195.29	212	118.4	85	120	47	25	70	14.5
30 XH 400*	30	6CWF	GG	212.23	209.44	227	118.4	85	120	47	25	70	16.0
32 XH 400*	32	6CWF	GG	226.38	223.59	240	118.4	85	130	47	25	75	18.0
40 XH 400*	40	6CWF	GG	282.98	280.18	297	118.4	85	140	47	25	80	24.0
48 XH 400*	48	11A	GG	339.57	336.78	—	119.0	92	150	—	30	85	30.8
60 XH 400*	60	11A	GG	424.47	421.67	—	119.0	92	150	—	30	85	36.2
72 XH 400*	72	11A	GG	509.36	506.57	—	119.0	92	150	—	40	85	42.7
84 XH 400*	84	11A	GG	594.25	591.46	—	119.0	92	160	—	40	90	49.7
96 XH 400*	96	11A	GG	679.15	676.35	—	119.0	92	160	—	40	90	59.9

GG = Cast iron * Non stock items We reserve the right to make technical changes.



Type L – Pitch 9.525 mm for belt width 050

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 L 050	18	8F	St	54.57	53.81	60	19.0	22.0	22.0	3.0	—	44	—	1108	0.2
TB 19 L 050	19	8F	St	57.61	56.84	60	19.0	22.0	22.0	3.0	—	44	—	1108	0.2
TB 20 L 050	20	8F	St	60.64	59.88	66	19.0	22.0	22.0	3.0	—	48	—	1108	0.2
TB 21 L 050	21	8F	St	63.67	62.91	71	19.0	22.0	22.0	3.0	—	48	—	1108	0.3
TB 22 L 050	22	8F	St	66.70	65.94	75	19.0	22.0	22.0	3.0	—	51	—	1108	0.3
TB 23 L 050	23	8F	GG	69.73	68.97	79	19.0	22.0	22.0	3.0	—	54	—	1108	0.4
TB 24 L 050	24	8F	GG	72.77	72.00	79	19.0	22.0	22.0	3.0	—	54	—	1108	0.4
TB 25 L 050	25	8F	GG	75.80	75.04	83	19.0	22.0	22.0	3.0	—	56	—	1108	0.5
TB 26 L 050	26	8F	GG	78.83	78.07	87	19.0	22.0	22.0	3.0	—	60	—	1108	0.5
TB 27 L 050	27	8F	GG	81.86	81.10	87	19.0	22.0	22.0	3.0	—	65	—	1108	0.6
TB 28 L 050	28	8F	GG	84.89	84.13	91	19.0	22.0	22.0	3.0	—	65	—	1108	0.6
TB 30 L 050	30	8F	GG	90.96	90.20	97	19.0	22.0	22.0	3.0	—	70	—	1108	0.8
TB 32 L 050	32	8F	GG	97.02	96.26	103	19.0	22.0	22.0	3.0	—	74	—	1108	0.9
TB 36 L 050	36	8F	GG	109.15	108.39	115	19.0	22.0	22.0	3.0	—	87	—	1108	1.2
TB 40 L 050	40	8F	GG	121.28	120.51	127	19.0	25.0	25.0	6.0	—	97	—	1610	1.5
TB 48 L 050	48	8WF	GG	145.53	144.77	152	19.0	25.0	25.0	6.0	—	88	124	1610	2.3
TB 60 L 050	60	7W	GG	181.91	181.15	—	19.0	25.0	25.0	3.0	—	92	166	1610	2.0
TB 72 L 050	72	7A	GG	218.30	217.53	—	19.0	25.0	25.0	3.0	—	92	202	1610	3.0
TB 84 L 050	84	7A	GG	254.68	253.90	—	19.0	25.0	25.0	3.0	—	92	236	1610	4.0
TB 96 L 050	96	7A	GG	291.06	290.30	—	19.0	32.0	32.0	6.5	—	106	270	2012	5.5
TB 120 L 050	120	7A	GG	363.83	363.07	—	19.0	32.0	32.0	6.5	—	106	343	2012	6.8

Type L – Pitch 9.525 mm for belt width 075

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 L 075	18	3F	St	54.57	53.81	60	25.0	25.0	25.0	—	—	—	—	1108	0.2
TB 19 L 075	19	3F	St	57.61	56.84	60	25.0	25.0	25.0	—	—	—	—	1108	0.3
TB 20 L 075	20	3F	St	60.64	59.88	66	25.0	25.0	25.0	—	—	—	—	1108	0.3
TB 21 L 075	21	3F	St	63.67	62.91	71	25.0	25.0	25.0	—	—	—	—	1108	0.4
TB 22 L 075	22	3F	St	66.70	65.94	75	25.0	25.0	25.0	—	—	—	—	1108	0.4
TB 23 L 075	23	3F	GG	69.73	68.97	79	25.0	25.0	25.0	—	—	—	—	1108	0.4
TB 24 L 075	24	3F	GG	72.77	72.00	79	25.0	25.0	25.0	—	—	—	—	1108	0.5
TB 25 L 075	25	3F	GG	75.80	75.04	83	25.0	25.0	25.0	—	—	—	—	1108	0.6
TB 26 L 075	26	3F	GG	78.83	78.07	87	25.0	25.0	25.0	—	—	—	—	1108	0.6
TB 27 L 075	27	3F	GG	81.86	81.10	87	25.0	25.0	25.0	—	—	—	—	1108	0.7
TB 28 L 075	28	3F	GG	84.89	84.13	91	25.0	25.0	25.0	—	—	—	—	1108	0.7
TB 30 L 075	30	3F	GG	90.96	90.20	97	25.0	25.0	25.0	—	—	—	—	1108	0.9
TB 32 L 075	32	3F	GG	97.02	96.26	103	25.0	25.0	25.0	—	—	—	—	1108	1.0
TB 36 L 075	36	3F	GG	109.15	108.39	115	25.0	25.0	25.0	—	—	—	—	1610	1.2
TB 40 L 075	40	3F	GG	121.28	120.51	127	25.0	25.0	25.0	—	—	—	—	1610	1.7
TB 48 L 075	48	3WF	GG	145.53	144.77	152	25.0	25.0	25.0	—	—	92	124	1610	2.5
TB 60 L 075	60	3W	GG	181.91	181.15	—	25.0	25.0	25.0	—	—	92	166	1610	3.0
TB 72 L 075	72	3A	GG	218.30	217.53	—	25.0	25.0	25.0	—	—	92	202	1610	4.0
TB 84 L 075	84	7A	GG	254.68	253.90	—	25.0	32.0	32.0	3.5	—	106	236	2012	5.2
TB 96 L 075	96	7A	GG	291.06	290.30	—	25.0	32.0	32.0	3.5	—	106	270	2012	6.5
TB 120 L 075	120	7A	GG	363.83	363.07	—	25.0	32.0	32.0	3.5	—	106	343	2012	7.6

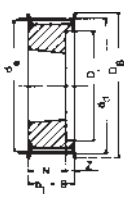
Taper bush	1108	1610	2012
Bore d_2 (mm) from ... to ...	10-28	14-42	14-50

St = Steel
GG = Cast iron

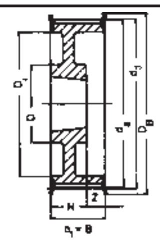
We reserve the right to make technical changes.

Bore diameters d_2 see page 54

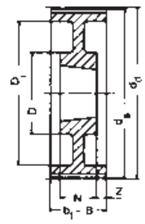
optibelt Power Transmission



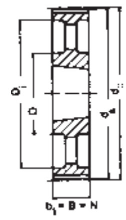
Type 5F



Type 5WF



Type 9W



Type 3A

Type L – Pitch 9.525 mm for belt width 100

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 L 100	18	5F	St	54.57	53.81	60	31.0	31.0	22.0	—	9.0	—	38	1108	0.2
TB 19 L 100	19	5F	St	57.61	56.84	60	31.0	31.0	22.0	—	9.0	—	38	1108	0.3
TB 20 L 100	20	5F	St	60.64	59.88	66	31.0	31.0	22.0	—	9.0	—	45	1108	0.4
TB 21 L 100	21	5F	St	63.67	62.91	71	31.0	31.0	22.0	—	9.0	—	47	1108	0.4
TB 22 L 100	22	5F	St	66.70	65.94	75	31.0	31.0	22.0	—	9.0	—	51	1108	0.4
TB 23 L 100	23	5F	GG	69.73	68.97	79	32.0	32.0	22.0	—	10.0	—	54	1108	0.5
TB 24 L 100	24	5F	GG	72.77	72.00	79	32.0	32.0	22.0	—	10.0	—	54	1108	0.6
TB 25 L 100	25	5F	GG	75.80	75.04	83	32.0	32.0	22.0	—	10.0	—	56	1108	0.6
TB 26 L 100	26	5F	GG	78.83	78.07	87	32.0	32.0	22.0	—	10.0	—	60	1108	0.7
TB 27 L 100	27	5F	GG	81.86	81.10	87	32.0	32.0	22.0	—	10.0	—	62	1108	0.8
TB 28 L 100	28	5F	GG	84.89	84.13	91	32.0	32.0	22.0	—	10.0	—	65	1108	0.8
TB 30 L 100	30	5F	GG	90.96	90.20	97	32.0	32.0	25.0	—	7.0	—	71	1210	0.9
TB 32 L 100	32	5F	GG	97.02	96.26	103	32.0	32.0	25.0	—	7.0	—	75	1210	1.0
TB 36 L 100	36	5F	GG	109.15	108.39	115	32.0	32.0	25.0	—	7.0	—	89	1610	1.4
TB 40 L 100	40	5F	GG	121.28	120.51	127	32.0	32.0	25.0	—	7.0	—	101	1610	1.7
TB 48 L 100	48	5WF	GG	145.53	144.77	152	32.0	32.0	25.0	—	7.0	92	124	1610	2.7
TB 60 L 100	60	9W	GG	181.91	181.15	—	32.0	32.0	25.0	—	3.5	92	166	1610	2.4
TB 72 L 100	72	3A	GG	218.30	217.53	—	32.0	32.0	32.0	—	—	106	202	2012	4.4
TB 84 L 100	84	3A	GG	254.68	253.90	—	32.0	32.0	32.0	—	—	106	236	2012	6.0
TB 96 L 100	96	3A	GG	291.06	290.30	—	32.0	32.0	32.0	—	—	106	270	2012	7.1
TB 120 L 100	120	3A	GG	363.83	363.07	—	32.0	32.0	32.0	—	—	106	343	2012	8.5

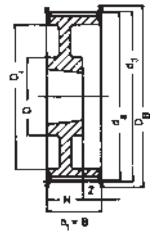
Taper bush	1108	1210	1610	2012
Bore d_2 (mm) from ... to ...	10-28	11-32	14-42	14-50

St = Steel
GG = Cast iron
We reserve the right to make technical changes.

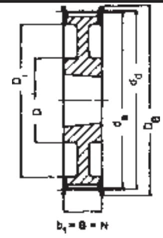
Bore diameters d_2 see page 54

optibelt Power Transmission

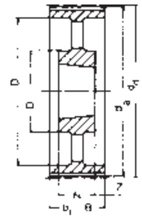
Type 5F



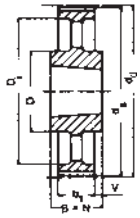
Type 5WF



Type 3WF



Type 9A



Type 7A

Type H – Pitch 12.7 mm for belt width 100

Part No.	No. of teeth	Type	Mate-rial	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 16 H 100	16	5F	St	64.68	63.31	71	31.0	31.0	22.0	—	9.0	—	45	1108	0.4
TB 18 H 100	18	5F	St	72.77	71.39	79	31.0	31.0	25.0	—	6.0	—	52	1210	0.5
TB 19 H 100	19	5F	St	76.81	75.44	83	31.0	31.0	25.0	—	6.0	—	56	1210	0.6
TB 20 H 100	20	5F	St	80.55	79.48	87	31.0	31.0	25.0	—	6.0	—	60	1210	0.7
TB 21 H 100	21	5F	GG	84.89	83.52	91	32.0	32.0	25.0	—	7.0	—	63	1210	0.8
TB 22 H 100	22	5F	GG	88.94	87.56	93	32.0	32.0	25.0	—	7.0	—	67	1210	0.9
TB 23 H 100	23	5F	GG	92.98	91.61	97	32.0	32.0	25.0	—	7.0	—	71	1610	0.9
TB 24 H 100	24	5F	GG	97.02	95.65	103	32.0	32.0	25.0	—	7.0	—	75	1610	1.0
TB 25 H 100	25	5F	GG	101.06	99.69	106	32.0	32.0	25.0	—	7.0	—	79	1610	1.0
TB 26 H 100	26	5F	GG	105.11	103.73	111	32.0	32.0	25.0	—	7.0	—	83	1610	1.2
TB 27 H 100	27	5F	GG	109.15	107.78	115	32.0	32.0	25.0	—	7.0	—	87	1610	1.3
TB 28 H 100	28	5F	GG	113.19	111.82	119	32.0	32.0	25.0	—	7.0	—	91	1610	1.5
TB 30 H 100	30	5F	GG	121.28	119.90	127	32.0	32.0	25.0	—	7.0	—	99	1610	1.7
TB 32 H 100	32	5WF	GG	129.36	127.99	135	32.0	32.0	25.0	—	7.0	92	108	1610	2.0
TB 36 H 100	36	5WF	GG	145.53	144.16	152	32.0	32.0	25.0	—	7.0	92	124	1610	2.7
TB 40 H 100	40	5WF	GG	161.70	160.33	168	32.0	32.0	25.0	—	7.0	92	140	1610	3.6
TB 44 H 100	44	3WF	GG	177.87	176.50	184	32.0	32.0	32.0	—	—	106	153	2012	3.8
TB 48 H 100	48	3WF	GG	194.04	192.67	200	32.0	32.0	32.0	—	—	106	169	2012	3.2
TB 60 H 100	60	9A	GG	242.55	241.18	—	34.0	34.0	32.0	—	1.0	106	223	2012	4.8
TB 72 H 100	72	9A	GG	291.06	289.69	—	34.0	34.0	32.0	—	1.0	106	270	2012	5.7
TB 84 H 100*	84	9A	GG	339.57	338.20	—	34.0	34.0	32.0	—	1.0	106	318	2012	6.8
TB 96 H 100*	96	7A	GG	388.08	386.71	—	34.0	45.0	45.0	5.5	—	119	366	2517	8.2
TB 120 H 100*	120	7A	GG	485.10	483.73	—	34.0	45.0	45.0	5.5	—	119	462	2517	12.1

Type H – Pitch 12.7 mm for belt width 150

Part No.	No. of teeth	Type	Mate-rial	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 H 150	18	5F	St	72.77	71.39	79	45.0	45.0	25.0	—	20.0	—	53	1210	0.6
TB 19 H 150	19	5F	St	76.81	75.44	83	45.0	45.0	25.0	—	20.0	—	56	1210	0.7
TB 20 H 150	20	5F	St	80.55	79.48	87	45.0	45.0	25.0	—	20.0	—	60	1210	0.8
TB 21 H 150	21	5F	GG	84.89	83.52	91	45.0	45.0	25.0	—	20.0	—	64	1210	1.0
TB 22 H 150	22	5F	GG	88.94	87.56	93	45.0	45.0	25.0	—	20.0	—	68	1210	1.2
TB 23 H 150	23	5F	GG	92.98	91.61	97	45.0	45.0	25.0	—	20.0	—	71	1610	1.3
TB 24 H 150	24	5F	GG	97.02	95.65	103	45.0	45.0	25.0	—	20.0	—	74	1610	1.2
TB 25 H 150	25	5F	GG	101.06	99.69	106	45.0	45.0	25.0	—	20.0	—	78	1610	1.2
TB 26 H 150	26	5F	GG	105.11	103.73	111	45.0	45.0	25.0	—	20.0	—	82	1610	1.4
TB 27 H 150	27	5F	GG	109.15	107.78	115	45.0	45.0	25.0	—	20.0	—	87	1610	1.6
TB 28 H 150	28	5F	GG	113.19	111.82	119	45.0	45.0	25.0	—	20.0	—	91	1610	1.8
TB 30 H 150	30	5F	GG	121.28	119.90	127	45.0	45.0	25.0	—	20.0	—	99	1610	2.0
TB 32 H 150	32	5WF	GG	129.36	127.99	135	45.0	45.0	25.0	—	20.0	92	108	1610	2.3
TB 36 H 150	36	5WF	GG	145.53	144.16	152	45.0	45.0	25.0	—	20.0	92	124	1610	3.1
TB 40 H 150	40	5WF	GG	161.70	160.33	168	45.0	45.0	25.0	—	20.0	92	140	1610	4.0
TB 44 H 150	44	5WF	GG	177.87	176.50	184	45.0	45.0	32.0	—	13.0	106	153	2012	4.4
TB 48 H 150	48	5WF	GG	194.04	192.67	200	45.0	45.0	32.0	—	13.0	106	169	2012	4.8
TB 60 H 150	60	9A	GG	242.55	241.18	—	46.0	46.0	32.0	—	7.0	106	223	2012	5.4
TB 72 H 150	72	9A	GG	291.06	289.69	—	46.0	46.0	32.0	—	7.0	106	270	2012	6.5
TB 84 H 150*	84	9A	GG	339.57	338.20	—	46.0	46.0	32.0	—	7.0	106	320	2012	8.4
TB 96 H 150*	96	9A	GG	388.08	386.71	—	46.0	46.0	45.0	—	0.5	119	366	2517	11.0
TB 120 H 150*	120	9A	GG	485.10	483.73	—	46.0	46.0	45.0	—	0.5	119	462	2517	14.8

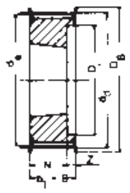
Taper bush	1108	1210	1610	2012	2517
Bore d_2 (mm) from ... to ...	10-28	11-32	14-42	14-50	16-60

St = Steel
GG = Cast iron

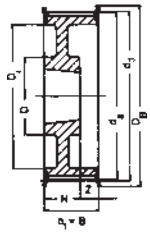
We reserve the right to make technical changes.

* Non stock items

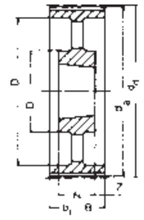
Bore diameters d_2 see page 54



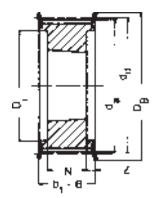
Type 5F



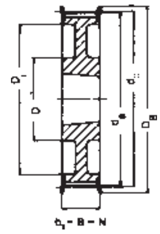
Type 5WF



Type 9A



Type 4F



Type 4WF

Type H – Pitch 12.7 mm for belt width 200

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 H 200	18	5F	St	72.77	71.39	79	58.0	58.0	25.0	—	33.0	—	52	1210	0.8
TB 19 H 200	19	5F	St	76.81	75.44	83	58.0	58.0	25.0	—	33.0	—	56	1610	0.9
TB 20 H 200	20	5F	St	80.55	79.48	87	58.0	58.0	25.0	—	33.0	—	60	1610	1.0
TB 21 H 200	21	5F	GG	84.89	83.52	91	58.0	58.0	25.0	—	33.0	—	64	1610	1.7
TB 22 H 200	22	5F	GG	88.94	87.56	93	58.0	58.0	25.0	—	33.0	—	68	1610	1.5
TB 23 H 200	23	5F	GG	92.98	91.61	97	58.0	58.0	25.0	—	33.0	—	71	1610	1.8
TB 24 H 200	24	5F	GG	97.02	95.65	103	58.0	58.0	25.0	—	33.0	—	74	1610	1.5
TB 25 H 200	25	5F	GG	101.06	99.69	106	58.0	58.0	25.0	—	33.0	—	78	1610	1.5
TB 26 H 200	26	5F	GG	105.11	103.73	111	58.0	58.0	25.0	—	33.0	—	82	1610	1.8
TB 27 H 200	27	5F	GG	109.15	107.78	115	58.0	58.0	25.0	—	33.0	—	87	1610	1.9
TB 28 H 200	28	5F	GG	113.19	111.82	119	58.0	58.0	25.0	—	33.0	—	91	1610	1.9
TB 30 H 200	30	5F	GG	121.28	119.90	127	58.0	58.0	25.0	—	33.0	—	99	1610	2.3
TB 32 H 200	32	5F	GG	129.36	127.99	135	58.0	58.0	32.0	—	26.0	—	107	2012	3.0
TB 36 H 200	36	5WF	GG	145.53	144.16	152	58.0	58.0	32.0	—	26.0	102	124	2012	3.0
TB 40 H 200	40	5WF	GG	161.70	160.33	168	58.0	58.0	32.0	—	26.0	106	140	2012	3.6
TB 44 H 200	44	5WF	GG	177.87	176.50	184	58.0	58.0	32.0	—	26.0	106	153	2012	4.5
TB 48 H 200	48	5WF	GG	194.04	192.67	200	58.0	58.0	45.0	—	13.0	119	169	2517	4.6
TB 60 H 200	60	9A	GG	242.55	241.18	—	60.0	60.0	45.0	—	7.5	119	223	2517	7.0
TB 72 H 200	72	9A	GG	291.06	289.69	—	60.0	60.0	45.0	—	7.5	119	270	2517	8.0
TB 84 H 200*	84	9A	GG	339.57	338.20	—	60.0	60.0	45.0	—	7.5	119	320	2517	9.0
TB 96 H 200*	96	9A	GG	388.08	386.71	—	60.0	60.0	45.0	—	7.5	119	366	2517	11.5
TB 120 H 200*	120	9A	GG	485.10	483.73	—	60.0	60.0	45.0	—	7.5	119	462	2517	15.4

Type H – Pitch 12.7 mm for belt width 300

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 20 H 300	20	4F	St	80.55	79.48	87	84.0	84.0	38.0	—	23.0	—	65	1615	1.5
TB 21 H 300	21	4F	GG	84.89	83.52	91	84.0	84.0	38.0	—	23.0	—	66	1615	1.2
TB 22 H 300	22	4F	GG	88.94	87.56	93	84.0	84.0	38.0	—	23.0	—	67	1615	1.6
TB 23 H 300	23	4F	GG	92.98	91.61	97	84.0	84.0	38.0	—	23.0	—	71	1615	1.8
TB 24 H 300	24	4F	GG	97.02	95.65	103	84.0	84.0	38.0	—	23.0	—	75	1615	2.1
TB 25 H 300	25	4F	GG	101.06	99.69	106	84.0	84.0	38.0	—	23.0	—	79	1615	2.0
TB 26 H 300	26	4F	GG	105.11	103.73	111	84.0	84.0	38.0	—	23.0	—	83	1615	2.7
TB 27 H 300	27	4F	GG	109.15	107.78	115	84.0	84.0	32.0	—	26.0	—	87	2012	3.0
TB 28 H 300	28	4F	GG	113.19	111.82	119	84.0	84.0	32.0	—	26.0	—	91	2012	2.4
TB 30 H 300	30	4F	GG	121.28	119.90	127	84.0	84.0	32.0	—	26.0	—	99	2012	2.9
TB 32 H 300	32	4F	GG	129.36	127.99	135	84.0	84.0	45.0	—	19.5	—	107	2517	3.3
TB 36 H 300	36	4F	GG	145.53	144.16	152	84.0	84.0	45.0	—	19.5	—	124	2517	4.5
TB 40 H 300	40	4F	GG	161.70	160.33	168	84.0	84.0	45.0	—	19.5	—	137	2517	6.0
TB 44 H 300	44	4WF	GG	177.87	176.50	184	86.0	86.0	45.0	—	20.5	119	153	2517	6.6
TB 48 H 300	48	4WF	GG	194.04	192.67	200	86.0	86.0	45.0	—	20.5	119	169	2517	7.6
TB 60 H 300	60	9A	GG	242.55	241.18	—	86.0	86.0	45.0	—	20.5	119	223	2517	8.4
TB 72 H 300	72	9A	GG	291.06	289.69	—	86.0	86.0	45.0	—	20.5	119	270	2517	10.4
TB 84 H 300*	84	9A	GG	339.57	338.20	—	86.0	86.0	45.0	—	20.5	119	320	2517	12.5
TB 96 H 300*	96	9A	GG	388.08	386.71	—	86.0	86.0	76.0	—	5.0	150	362	3030	14.2
TB 120 H 300*	120	9A	GG	485.10	483.73	—	86.0	86.0	76.0	—	5.0	150	460	3030	18.8

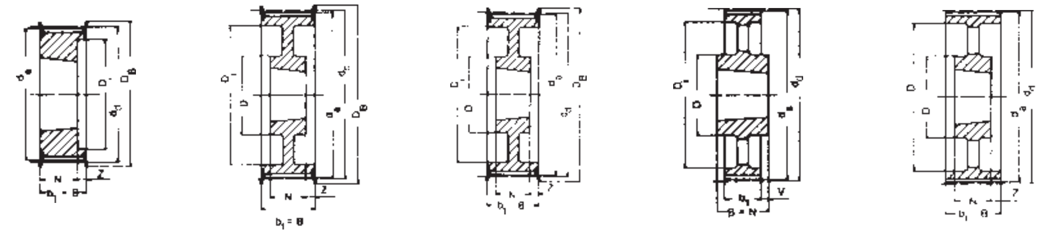
Taper bush	1210	1610	1615	2012	2517	3030
Bore d_2 (mm) from ... to ...	11-32	14-42	14-42	14-50	16-60	35-75

St = Steel
GG = Cast iron

We reserve the right to make technical changes.

* Non stock items

Bore diameters d_2 see page 54



Type 5F — Type 4WF — Type 9W — Type 7A — Type 9A

Type XH – Pitch 22.225 mm for belt width 200

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 XH 200*	18	5F	GG	127.34	124.55	138	64	64	45	—	20.0	—	95	2517	2.6
TB 20 XH 200*	20	5F	GG	141.49	138.69	154	64	64	45	—	20.0	—	110	2517	3.6
TB 22 XH 200*	22	5F	GG	155.64	152.84	168	64	64	45	—	20.0	—	120	2517	4.8
TB 24 XH 200*	24	5F	GG	169.79	166.69	183	64	64	45	—	20.0	—	135	2517	6.1
TB 26 XH 200*	26	5F	GG	183.94	181.14	198	64	64	45	—	20.0	—	150	2517	7.4
TB 28 XH 200*	28	4WF	GG	198.08	195.29	211	64	64	45	—	10.0	120	165	2517	9.0
TB 30 XH 200*	30	4WF	GG	212.23	209.44	226	64	64	45	—	10.0	120	180	2517	8.6
TB 32 XH 200*	32	4WF	GG	226.38	223.59	240	64	64	45	—	10.0	120	195	2517	9.8
TB 40 XH 200*	40	4WF	GG	282.98	280.18	296	64	64	51	—	6.5	160	245	3020	13.3
TB 48 XH 200*	48	9W	GG	339.57	336.78	—	64	64	51	—	6.5	160	300	3020	19.0

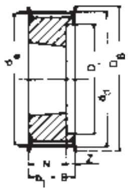
Type XH – Pitch 22.225 mm for belt width 300

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 18 XH 300*	18	5F	GG	127.34	124.55	138	90	90	45	—	45.0	—	95	2517	3.7
TB 20 XH 300*	20	5F	GG	141.49	138.69	154	90	90	45	—	45.0	—	110	2517	4.7
TB 22 XH 300*	22	5F	GG	155.64	152.84	168	90	90	45	—	45.0	—	120	2517	6.0
TB 24 XH 300*	24	5F	GG	169.79	166.69	183	90	90	45	—	45.0	—	135	2517	7.6
TB 26 XH 300*	26	5F	GG	183.94	181.14	198	90	90	45	—	45.0	—	150	2517	9.8
TB 28 XH 300*	28	5F	GG	198.08	195.29	211	90	90	51	—	39.0	—	165	3020	11.6
TB 30 XH 300*	30	5F	GG	212.23	209.44	226	90	90	51	—	39.0	—	180	3020	11.9
TB 32 XH 300*	32	5F	GG	226.38	223.59	240	90	90	51	—	39.0	—	195	3020	13.8
TB 40 XH 300*	40	4WF	GG	282.98	280.18	296	90	90	51	—	19.5	160	245	3020	19.5
TB 48 XH 300*	48	9W	GG	339.57	336.78	—	90	90	51	—	19.5	160	300	3020	27.0

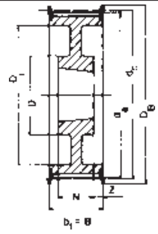
Taper bush	2517	3020	3535	4040
Bore d_2 (mm) from ... to ...	16-60	25-75	35-90	40-100

GG = Cast iron
We reserve the right to make technical changes.
* Non stock items

Bore diameters d_2 see page 54



Type 5F



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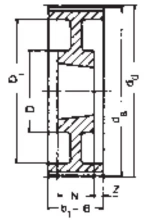
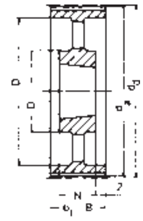


Type 9W



Type 9A

Type XH – Pitch 22.225 mm for belt width 400

Part No.	No. of teeth	Type	Mate-rial	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)		
TB 20 XH 400*	20	5F	GG	141.49	138.69	154	119	119	45	—	74.0	—	110	2517	6.0		
TB 22 XH 400*	22	5F	GG	155.64	152.84	168	119	119	45	—	74.0	—	120	2517	7.2		
TB 24 XH 400*	24	5F	GG	169.79	166.69	183	119	119	51	—	68.0	—	135	3020	8.4		
TB 26 XH 400*	26	5F	GG	183.94	181.14	198	119	119	51	—	68.0	—	150	3020	10.3		
TB 28 XH 400*	28	5F	GG	198.08	195.29	211	119	119	51	—	68.0	—	165	3020	12.3		
TB 30 XH 400*	30	5F	GG	212.23	209.44	226	119	119	51	—	68.0	—	180	3020	14.3		
TB 32 XH 400*	32	5F	GG	226.38	223.59	240	119	119	51	—	68.0	—	195	3020	19.9		
TB 40 XH 400*	40	4WF	GG	282.98	280.18	296	119	119	89	—	15.0	190	245	3535	24.6		
TB 48 XH 400*	48	9W	GG	339.57	336.78	—	119	119	89	—	15.0	190	300	3535	30.0		

Taper bush	2517	3020	3535	4040
Bore d_2 (mm) from ... to ...	16-60	25-75	35-90	40-100

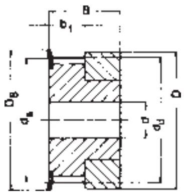
GG = Cast iron

We reserve the right to make technical changes.

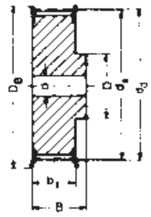
* Non stock items

Bore diameters d_2 see page 54

optibelt *ZRS* HTD® Pulleys for plain boring



Type 1F



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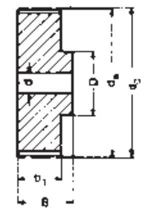


Type 6

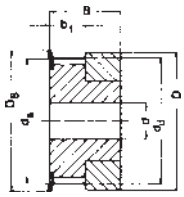
Section 3M – Pitch 3 mm for belt width 6 mm (Non stock items)

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
10-3M-6	10	1F	Al	9.55	8.79	13.0	7.2	14.5	13.0	—	3	
12-3M-6	12	1F	Al	11.46	10.70	15.0	7.2	14.5	15.0	—	5	
14-3M-6	14	1F	Al	13.37	12.61	16.0	7.2	14.5	16.0	—	6	
15-3M-6	15	1F	Al	14.32	13.56	17.5	7.2	14.5	17.5	—	6	
16-3M-6	16	6F	Al	15.28	14.52	18.0	9.8	17.5	10.0	4	7	
18-3M-6	18	6F	Al	17.19	16.43	19.5	9.8	17.5	11.0	6	8	
20-3M-6	20	6F	Al	19.10	18.34	23.0	9.8	17.5	13.0	6	9	
21-3M-6	21	6F	Al	20.05	19.29	25.0	9.8	17.5	14.0	6	9	
22-3M-6	22	6F	Al	21.01	20.25	25.0	9.8	17.5	14.0	6	9	
24-3M-6	24	6F	Al	22.92	22.16	25.0	9.8	17.5	14.0	6	9	
26-3M-6	26	6F	Al	24.83	24.07	28.0	9.8	17.5	16.0	6	11	
28-3M-6	28	6F	Al	26.74	25.98	32.0	9.8	17.5	18.0	6	12	
30-3M-6	30	6F	Al	28.65	27.89	32.0	9.8	17.5	20.0	6	14	
32-3M-6	32	6F	Al	30.56	29.80	36.0	9.8	17.5	22.0	6	15	
36-3M-6	36	6F	Al	34.38	33.62	38.0	10.3	18.0	26.0	6	16	
40-3M-6	40	6F	Al	38.20	37.44	42.0	10.3	18.0	28.0	6	18	
44-3M-6	44	6F	Al	42.02	41.26	48.0	10.3	18.0	33.0	6	20	
48-3M-6	48	6	Al	45.84	45.08	—	10.3	18.6	33.0	8	20	
60-3M-6	60	6	Al	57.30	56.54	—	10.3	18.6	33.0	8	20	
72-3M-6	72	6	Al	68.75	67.99	—	10.3	18.6	33.0	8	20	

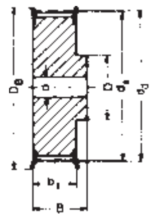
Section 3M – Pitch 3 mm for belt width 9 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
10-3M-9	10	1F	Al	9.55	8.79	13.0	10.2	17.5	13.0	—	3	0.004
12-3M-9	12	1F	Al	11.46	10.70	15.0	10.2	17.5	15.0	—	5	0.006
14-3M-9	14	1F	Al	13.37	12.61	16.0	10.2	17.5	16.0	—	6	0.007
15-3M-9	15	1F	Al	14.32	13.56	17.5	10.2	17.5	17.5	—	6	0.008
16-3M-9	16	6F	Al	15.28	14.52	18.0	12.8	20.6	10.0	4	7	0.007
18-3M-9	18	6F	Al	17.19	16.43	19.5	12.8	20.6	11.0	6	8	0.008
20-3M-9	20	6F	Al	19.10	18.34	23.0	12.8	20.6	13.0	6	9	0.010
21-3M-9	21	6F	Al	20.05	19.29	25.0	12.8	20.6	14.0	6	9	0.013
22-3M-9	22	6F	Al	21.01	20.25	25.0	12.8	20.6	14.0	6	9	0.014
24-3M-9	24	6F	Al	22.92	22.16	25.0	12.8	20.6	14.0	6	9	0.016
26-3M-9	26	6F	Al	24.83	24.07	28.0	12.8	20.6	16.0	6	11	0.018
28-3M-9	28	6F	Al	26.74	25.98	32.0	12.8	20.6	18.0	6	12	0.024
30-3M-9	30	6F	Al	28.65	27.89	32.0	12.8	20.6	20.0	6	14	0.028
32-3M-9	32	6F	Al	30.56	29.80	36.0	12.8	20.6	22.0	6	15	0.032
36-3M-9	36	6F	Al	34.38	33.62	38.0	13.4	22.2	26.0	6	16	0.045
40-3M-9	40	6F	Al	38.20	37.44	42.0	13.4	22.2	28.0	6	18	0.055
44-3M-9	44	6F	Al	42.02	41.26	48.0	13.4	22.2	33.0	6	20	0.074
48-3M-9	48	6	Al	45.84	45.08	—	13.4	22.2	33.0	8	20	0.074
60-3M-9	60	6	Al	57.30	56.54	—	13.4	22.2	33.0	8	20	0.106
72-3M-9	72	6	Al	68.75	67.99	—	13.4	22.2	33.0	8	20	0.145

Al = Aluminium   We reserve the right to make technical changes.



Type 1F



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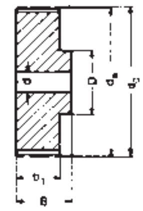
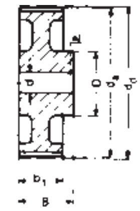


Type 6



Type 6W

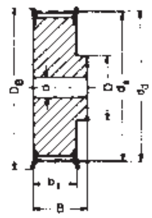
Section 3M – Pitch 3 mm for belt width 15 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
10-3M-15	10	1F	Al	9.55	8.79	13.0	17.0	26	13.0	—	3	0.006
12-3M-15	12	1F	Al	11.46	10.70	15.0	17.0	26	15.0	—	5	0.008
14-3M-15	14	1F	Al	13.37	12.61	16.0	17.0	26	16.0	—	6	0.010
15-3M-15	15	1F	Al	14.32	13.56	17.5	17.0	26	17.5	—	6	0.012
16-3M-15	16	6F	Al	15.28	14.52	18.0	19.5	26	10.0	4	7	0.010
18-3M-15	18	6F	Al	17.19	16.43	19.5	19.5	26	11.0	6	8	0.012
20-3M-15	20	6F	Al	19.10	18.34	23.0	19.5	26	13.0	6	9	0.014
21-3M-15	21	6F	Al	20.05	19.29	25.0	19.5	26	14.0	6	9	0.016
22-3M-15	22	6F	Al	21.01	20.25	25.0	19.5	26	14.0	6	9	0.018
24-3M-15	24	6F	Al	22.92	22.16	25.0	19.5	26	14.0	6	9	0.020
26-3M-15	26	6F	Al	24.83	24.07	28.0	19.5	26	16.0	6	11	0.027
28-3M-15	28	6F	Al	26.74	25.98	32.0	19.5	26	18.0	6	12	0.030
30-3M-15	30	6F	Al	28.65	27.89	32.0	19.5	26	20.0	6	14	0.035
32-3M-15	32	6F	Al	30.56	29.80	36.0	19.5	26	22.0	6	15	0.042
36-3M-15	36	6F	Al	34.38	33.62	38.0	20.0	30	26.0	6	16	0.060
40-3M-15	40	6F	Al	38.20	37.44	42.0	20.0	30	28.0	6	18	0.075
44-3M-15	44	6F	Al	42.02	41.26	48.0	20.0	30	33.0	6	20	0.100
48-3M-15	48	6	Al	45.84	45.08	—	20.0	30	33.0	8	20	0.103
60-3M-15	60	6	Al	57.30	56.54	—	20.0	30	33.0	8	20	0.150
72-3M-15	72	6	Al	68.75	67.99	—	20.0	30	33.0	8	20	0.212

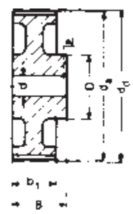
Section 5M – Pitch 5 mm for belt width 9 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
12-5M-9	12	6F	St	19.10	17.96	23	14.5	20.0	13.0	4	7	0.028
14-5M-9	14	6F	St	22.28	21.14	25	14.5	20.0	14.0	6	8	0.034
15-5M-9	15	6F	St	23.87	22.73	28	14.5	20.0	16.0	6	10	0.042
16-5M-9	16	6F	St	25.46	24.32	28	14.5	20.0	16.5	6	10	0.050
18-5M-9	18	6F	St	28.65	27.51	32	14.5	20.0	20.0	6	12	0.070
20-5M-9	20	6F	St	31.83	30.69	36	14.5	22.5	23.0	6	14	0.094
21-5M-9	21	6F	St	33.42	32.28	38	14.5	22.5	24.0	6	14	0.110
22-5M-9	22	6F	St	35.01	33.87	38	14.5	22.5	25.5	6	14	0.118
24-5M-9	24	6F	St	38.20	37.06	42	14.5	22.5	27.0	6	16	0.145
26-5M-9	26	6F	St	41.38	40.24	44	14.5	22.5	30.0	6	18	0.170
28-5M-9	28	6F	St	44.56	43.42	48	14.5	22.5	30.5	6	18	0.200
30-5M-9	30	6F	St	47.75	46.61	51	14.5	22.5	35.0	6	20	0.236
32-5M-9	32	6F	St	50.93	49.79	54	14.5	22.5	38.0	8	22	0.270
36-5M-9	36	6F	St	57.30	56.16	60	14.5	22.5	38.0	8	22	0.324
40-5M-9	40	6F	St	63.66	62.52	71	14.5	22.5	38.0	8	22	0.400
44-5M-9	44	6W	Al	70.03	68.89	—	14.5	25.5	38.0	8	22	0.170
48-5M-9	48	6W	Al	76.39	75.25	—	14.5	25.5	45.0	8	25	0.182
60-5M-9	60	6W	Al	95.49	94.35	—	14.5	25.5	45.0	8	25	0.230
72-5M-9	72	6W	Al	114.59	113.45	—	14.5	25.5	45.0	8	25	0.270

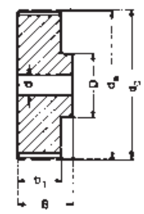
St = Steel Al = Aluminium We reserve the right to make technical changes.



Type 6F



Type 6W



Type 6

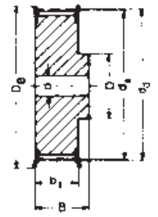
Section 5M – Pitch 5 mm for belt width 15 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
12-5M-15	12	6F	St	19.10	17.96	25	20.5	26	13.0	4	7	0.034
14-5M-15	14	6F	St	22.28	21.14	25	20.5	26	14.0	6	8	0.046
15-5M-15	15	6F	St	23.87	22.73	28	20.5	26	16.0	6	10	0.056
16-5M-15	16	6F	St	25.46	24.32	28	20.5	26	16.5	6	10	0.064
18-5M-15	18	6F	St	28.65	27.51	32	20.5	26	20.0	6	12	0.086
20-5M-15	20	6F	St	31.83	30.69	36	20.5	26	23.0	6	14	0.112
21-5M-15	21	6F	St	33.42	32.28	38	20.5	26	24.0	6	14	0.130
22-5M-15	22	6F	St	35.01	33.87	38	20.5	26	25.5	6	14	0.140
24-5M-15	24	6F	St	38.20	37.06	42	20.5	28	27.0	6	16	0.180
26-5M-15	26	6F	St	41.38	40.24	44	20.5	28	30.0	6	18	0.220
28-5M-15	28	6F	St	44.56	43.42	48	20.5	28	30.5	6	18	0.250
30-5M-15	30	6F	St	47.75	46.61	51	20.5	28	35.0	6	20	0.300
32-5M-15	32	6F	St	50.93	49.79	54	20.5	28	38.0	8	22	0.350
36-5M-15	36	6F	St	57.30	56.16	60	20.5	28	38.0	8	22	0.426
40-5M-15	40	6F	St	63.66	62.52	71	20.5	28	38.0	8	22	0.520
44-5M-15	44	6W	Al	70.03	68.89	—	20.5	30	38.0	8	22	0.225
48-5M-15	48	6W	Al	76.39	75.25	—	20.5	30	38.0	8	25	0.187
60-5M-15	60	6W	Al	95.49	94.35	—	20.5	30	50.0	8	25	0.305
72-5M-15	72	6W	Al	114.59	113.45	—	20.5	30	50.0	8	25	0.375

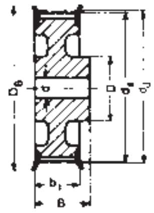
Section 5M – Pitch 5 mm for belt width 25 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
12-5M-25	12	6F	St	19.10	17.96	25	30	36	13.0	4	7	0.050
14-5M-25	14	6F	St	22.28	21.14	25	30	36	14.0	6	8	0.070
15-5M-25	15	6F	St	23.87	22.73	28	30	36	16.0	6	10	0.080
16-5M-25	16	6F	St	25.46	24.32	28	30	36	16.5	6	10	0.100
18-5M-25	18	6F	St	28.65	27.51	32	30	36	20.0	6	12	0.120
20-5M-25	20	6F	St	31.83	30.69	36	30	36	23.0	6	14	0.160
21-5M-25	21	6F	St	33.42	32.28	38	30	38	24.0	6	14	0.190
22-5M-25	22	6F	St	35.01	33.87	38	30	38	25.5	6	14	0.210
24-5M-25	24	6F	St	38.20	37.06	42	30	38	27.0	6	16	0.250
26-5M-25	26	6F	St	41.38	40.24	44	30	38	30.0	6	18	0.300
28-5M-25	28	6F	St	44.56	43.42	48	30	38	30.5	6	18	0.350
30-5M-25	30	6F	St	47.75	46.61	51	30	38	35.0	6	20	0.420
32-5M-25	32	6F	St	50.93	49.79	54	30	38	38.0	8	22	0.480
36-5M-25	36	6F	St	57.30	56.16	60	30	38	38.0	8	22	0.590
40-5M-25	40	6F	St	63.66	62.52	71	30	38	38.0	8	22	0.740
44-5M-25	44	6W	Al	70.03	68.89	—	30	40	38.0	8	22	0.320
48-5M-25	48	6W	Al	76.39	75.25	—	30	40	38.0	8	25	0.275
60-5M-25	60	6W	Al	95.49	94.35	—	30	40	50.0	8	25	0.435
72-5M-25	72	6W	Al	114.59	113.45	—	30	40	50.0	8	25	0.525

St = Steel   Al = Aluminium   We reserve the right to make technical changes.



Type 6F



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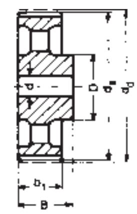


Type 6A

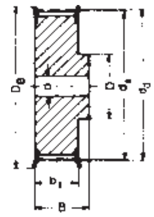
Section 8M – Pitch 8 mm for belt width 20 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
22-8M-20	22	6F	St	56.02	54.65	60.0	28	38	43	—	12	30	0.54
24-8M-20	24	6F	St	61.12	59.75	66.0	28	38	45	—	12	30	0.65
26-8M-20	26	6F	St	66.21	64.84	71.0	28	38	50	—	12	35	0.80
28-8M-20	28	6F	St	71.30	70.08	75.0	28	38	50	—	15	35	0.87
30-8M-20	30	6F	St	76.39	75.13	83.0	28	38	55	—	15	35	1.02
32-8M-20	32	6F	St	81.49	80.16	87.0	28	38	60	—	15	40	1.20
34-8M-20	34	6F	St	86.58	85.22	91.0	28	38	70	—	15	45	1.40
36-8M-20	36	6F	St	91.67	90.30	98.5	28	38	70	—	15	45	1.55
38-8M-20	38	6F	St	96.77	95.39	103.0	28	38	75	—	15	45	1.65
40-8M-20	40	6F	GG	101.86	100.49	106.0	28	38	75	—	15	45	1.80
44-8M-20	44	6F	GG	112.05	110.67	119.0	28	38	75	—	15	45	2.10
48-8M-20	48	6F	GG	122.23	120.86	127.0	28	38	75	—	15	45	2.44
56-8M-20	56	6WF	GG	142.60	141.23	148.0	28	38	80	117	15	45	2.60
64-8M-20	64	6WF	GG	162.97	161.60	168.0	28	38	80	137	15	45	2.90
72-8M-20	72	6WF	GG	183.35	181.97	192.0	28	38	80	158	15	45	3.10
80-8M-20	80	6A	GG	203.72	202.35	—	28	38	90	180	15	50	3.80
90-8M-20	90	6A	GG	229.18	227.81	—	28	38	90	204	15	50	4.20
112-8M-20	112	6A	GG	285.21	283.83	—	28	38	90	260	18	50	5.20
144-8M-20	144	6A	GG	366.69	365.32	—	28	38	90	341	20	50	7.50
168-8M-20	168	6A	GG	427.81	426.44	—	28	38	100	402	20	55	10.00
192-8M-20	192	6A	GG	488.92	487.55	—	28	38	100	463	20	55	14.40

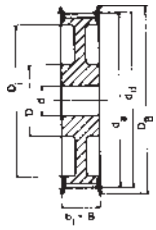
Section 8M – Pitch 8 mm for belt width 30 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
22-8M-30	22	6F	St	56.02	54.65	60.0	38	48	43	—	12	30	0.69
24-8M-30	24	6F	St	61.12	59.75	66.0	38	48	45	—	12	30	0.84
26-8M-30	26	6F	St	66.21	64.84	71.0	38	48	50	—	12	35	1.00
28-8M-30	28	6F	St	71.30	70.08	75.0	38	48	50	—	15	35	1.12
30-8M-30	30	6F	St	76.39	75.13	83.0	38	48	55	—	15	35	1.32
32-8M-30	32	6F	St	81.49	80.16	87.0	38	48	60	—	15	40	1.50
34-8M-30	34	6F	St	86.58	85.22	91.0	38	48	70	—	15	45	1.80
36-8M-30	36	6F	St	91.67	90.30	98.5	38	48	70	—	15	45	1.99
38-8M-30	38	6F	St	96.77	95.39	103.0	38	48	75	—	15	45	2.27
40-8M-30	40	6F	GG	101.86	100.49	106.0	38	48	75	—	15	45	2.40
44-8M-30	44	6F	GG	112.05	110.67	119.0	38	48	75	—	15	45	2.80
48-8M-30	48	6F	GG	122.23	120.86	127.0	38	48	75	—	15	45	3.20
56-8M-30	56	6WF	GG	142.60	141.23	148.0	38	48	90	117	15	50	3.60
64-8M-30	64	6WF	GG	162.97	161.60	168.0	38	48	90	137	15	50	4.30
72-8M-30	72	6WF	GG	183.35	181.97	192.0	38	48	95	158	15	50	4.80
80-8M-30	80	6A	GG	203.72	202.35	—	38	48	100	180	15	55	5.10
90-8M-30	90	6A	GG	229.18	227.81	—	38	48	100	204	15	55	5.70
112-8M-30	112	6A	GG	285.21	283.83	—	38	48	100	260	18	55	6.80
144-8M-30	144	6A	GG	366.69	365.32	—	38	48	100	341	20	55	9.30
168-8M-30	168	6A	GG	427.81	426.44	—	38	48	100	402	20	55	11.40
192-8M-30	192	6A	GG	488.92	487.55	—	38	48	100	463	20	55	16.00

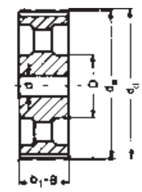
St = Steel GG = Cast iron We reserve the right to make technical changes.



Type 6F



Type 10WF



Type 10A

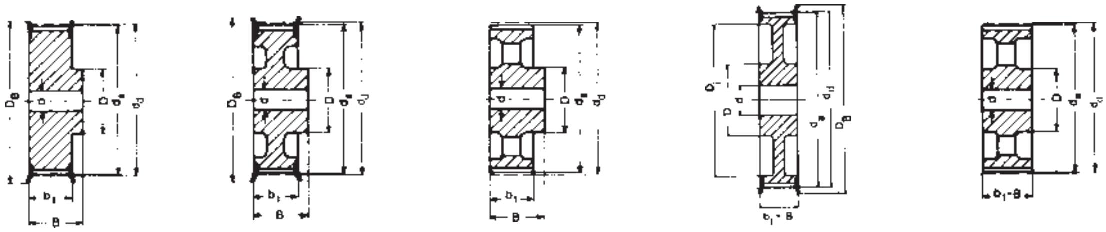
Section 8M – Pitch 8 mm for belt width 50 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
22-8M-50	22	6F	St	56.02	54.65	60.0	60	70	43	—	12	30	1.00
24-8M-50	24	6F	St	61.12	59.75	66.0	60	70	45	—	12	30	1.20
26-8M-50	26	6F	St	66.21	64.84	71.0	60	70	50	—	12	35	1.50
28-8M-50	28	6F	St	71.30	70.08	75.0	60	70	50	—	15	35	1.67
30-8M-50	30	6F	St	76.39	75.13	83.0	60	70	55	—	15	35	1.97
32-8M-50	32	6F	St	81.49	80.16	87.0	60	70	60	—	15	40	2.27
34-8M-50	34	6F	St	86.58	85.22	91.0	60	70	70	—	15	45	2.69
36-8M-50	36	6F	St	91.67	90.30	98.5	60	70	70	—	15	45	2.97
38-8M-50	38	6F	St	96.77	95.39	103.0	60	70	75	—	15	45	3.23
40-8M-50	40	6F	GG	101.86	100.49	106.0	60	70	75	—	18	45	3.50
44-8M-50	44	6F	GG	112.05	110.67	119.0	60	70	75	—	18	45	3.90
48-8M-50	48	6F	GG	122.23	120.86	127.0	60	70	80	—	18	45	4.30
56-8M-50	56	10WF	GG	142.60	141.23	148.0	60	60	90	117	18	50	5.00
64-8M-50	64	10WF	GG	162.97	161.60	168.0	60	60	100	137	18	55	5.60
72-8M-50	72	10WF	GG	183.35	181.97	192.0	60	60	100	158	18	55	6.80
80-8M-50	80	10A	GG	203.72	202.35	—	60	60	110	180	18	60	6.90
90-8M-50	90	10A	GG	229.18	227.81	—	60	60	110	204	18	60	8.60
112-8M-50	112	10A	GG	285.21	283.83	—	60	60	110	260	18	60	9.60
144-8M-50	144	10A	GG	366.69	365.32	—	60	60	110	341	20	60	13.80
168-8M-50	168	10A	GG	427.81	426.44	—	60	60	120	402	20	65	16.00
192-8M-50	192	10A	GG	488.92	487.55	—	60	60	130	463	20	70	22.40

Section 8M – Pitch 8 mm for belt width 85 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
22-8M-85	22	6F	St	56.02	54.65	60.0	95	105	43	—	12	30	1.55
24-8M-85	24	6F	St	61.12	59.75	66.0	95	105	45	—	12	30	1.90
26-8M-85	26	6F	St	66.21	64.84	71.0	95	105	50	—	12	35	2.25
28-8M-85	28	6F	St	71.30	70.08	75.0	95	105	50	—	15	35	2.55
30-8M-85	30	6F	St	76.39	75.13	83.0	95	105	55	—	15	35	3.00
32-8M-85	32	6F	St	81.49	80.16	87.0	95	105	60	—	15	40	3.57
34-8M-85	34	6F	St	86.58	85.22	91.0	95	105	70	—	15	45	4.00
36-8M-85	36	6F	St	91.67	90.30	98.5	95	105	70	—	15	45	4.50
38-8M-85	38	6F	St	96.77	95.39	103.0	95	105	75	—	15	45	4.90
40-8M-85	40	6F	GG	101.86	100.49	106.0	95	105	75	—	18	45	5.20
44-8M-85	44	6F	GG	112.05	110.67	119.0	95	105	75	—	18	45	6.60
48-8M-85	48	6F	GG	122.23	120.86	127.0	95	105	80	—	18	45	7.60
56-8M-85	56	6F	GG	142.60	141.23	148.0	95	105	80	—	20	50	9.80
64-8M-85	64	10WF	GG	162.97	161.60	168.0	95	95	100	137	20	55	10.40
72-8M-85	72	10WF	GG	183.35	181.97	192.0	95	95	110	158	20	60	11.40
80-8M-85	80	10A	GG	203.72	202.35	—	95	95	110	180	20	60	11.10
90-8M-85	90	10A	GG	229.18	227.81	—	95	95	110	204	20	60	13.20
112-8M-85	112	10A	GG	285.21	283.83	—	95	95	110	260	24	60	16.30
144-8M-85*	144	10A	GG	366.69	365.32	—	95	95	120	341	24	65	21.50
168-8M-85*	168	10A	GG	427.81	426.44	—	95	95	120	402	24	65	26.10
192-8M-85*	192	10A	GG	488.92	487.55	—	95	95	130	463	24	70	30.60

St = Steel GG = Cast iron * Non stock items We reserve the right to make technical changes.



Type 6F Type 6WF Type 6A Type 10WF Type 10A

Section 14M – Pitch 14 mm for belt width 40 mm

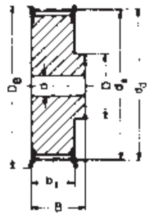
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
28-14M-40	28	6F	GG	124.78	122.12	127	54	69	100	—	24	60	4.73
29-14M-40	29	6F	GG	129.23	126.57	138	54	69	100	—	24	60	5.09
30-14M-40	30	6F	GG	133.69	130.99	138	54	69	100	—	24	60	5.45
32-14M-40	32	6F	GG	142.60	139.88	154	54	69	100	—	24	70	6.17
34-14M-40	34	6F	GG	151.52	148.79	160	54	69	100	—	24	70	6.88
36-14M-40	36	6F	GG	160.43	157.68	168	54	69	100	—	24	70	7.60
38-14M-40	38	6F	GG	169.34	166.60	183	54	69	120	—	24	70	8.28
40-14M-40	40	6F	GG	178.25	175.49	188	54	69	120	—	24	70	9.26
44-14M-40	44	6F	GG	196.08	193.28	211	54	69	120	—	24	70	10.32
48-14M-40	48	6WF	GG	213.90	211.11	226	54	69	135	172	24	70	11.50
56-14M-40	56	6WF	GG	249.55	246.76	256	54	69	135	207	28	70	13.05
64-14M-40	64	6WF	GG	285.21	282.41	296	54	69	135	242	28	70	14.40
72-14M-40	72	6A	GG	320.86	318.06	—	54	69	135	278	28	70	16.90
80-14M-40	80	6A	GG	356.51	353.71	—	54	69	135	314	28	70	18.50
90-14M-40	90	6A	GG	401.07	398.28	—	54	69	135	358	28	70	20.00
112-14M-40*	112	6A	GG	499.11	496.32	—	54	69	135	456	28	70	26.70
144-14M-40*	144	6A	GG	641.71	638.92	—	54	69	135	600	28	70	35.00
168-14M-40*	168	6A	GG	748.66	745.87	—	54	69	135	706	28	70	44.20
192-14M-40*	192	6A	GG	855.62	852.82	—	54	69	135	813	28	70	52.20
216-14M-40*	216	6A	GG	962.57	959.77	—	54	69	150	920	28	80	60.00

Section 14M – Pitch 14 mm for belt width 55 mm

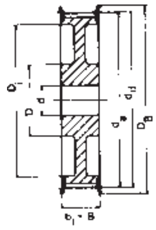
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
28-14M-55	28	6F	GG	124.78	122.12	127	70	85	100	—	24	60	5.60
29-14M-55	29	6F	GG	129.23	126.57	138	70	85	100	—	24	60	6.10
30-14M-55	30	6F	GG	133.69	130.99	138	70	85	100	—	24	60	6.60
32-14M-55	32	6F	GG	142.60	139.88	154	70	85	100	—	24	70	7.60
34-14M-55	34	6F	GG	151.52	148.79	160	70	85	100	—	24	70	8.60
36-14M-55	36	6F	GG	160.43	157.68	168	70	85	100	—	24	70	9.60
38-14M-55	38	6F	GG	169.34	166.60	183	70	85	120	—	24	70	10.80
40-14M-55	40	6F	GG	178.25	175.49	188	70	85	120	—	24	70	11.20
44-14M-55	44	6F	GG	196.08	193.28	211	70	85	120	—	24	70	12.50
48-14M-55	48	10WF	GG	213.90	211.11	226	70	70	135	172	24	70	13.70
56-14M-55	56	10WF	GG	249.55	246.76	256	70	70	135	207	28	70	14.50
64-14M-55	64	10WF	GG	285.21	282.41	296	70	70	135	242	28	70	15.60
72-14M-55	72	10A	GG	320.86	318.06	—	70	70	135	278	28	70	18.50
80-14M-55	80	10A	GG	356.51	353.71	—	70	70	135	314	28	70	20.00
90-14M-55	90	10A	GG	401.07	398.28	—	70	70	135	358	28	70	22.60
112-14M-55*	112	10A	GG	499.11	496.32	—	70	70	135	456	28	70	29.50
144-14M-55*	144	10A	GG	641.71	638.92	—	70	70	135	600	28	70	39.00
168-14M-55*	168	10A	GG	748.66	745.87	—	70	70	135	706	28	70	48.50
192-14M-55*	192	10A	GG	855.62	852.82	—	70	70	135	813	28	70	57.80
216-14M-55*	216	10A	GG	962.57	959.77	—	70	70	150	920	28	80	67.00

GG = Cast iron * Non stock items We reserve the right to make technical changes.

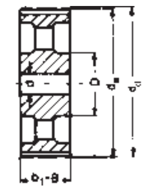
optibelt *ZRS* HTD® Pulleys for plain boring



Type 6F



Type 10WF



Type 10A

Section 14M – Pitch 14 mm for belt width 85 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
28-14M-85	28	6F	GG	124.78	122.12	127	102	117	100	—	24	60	7.70
29-14M-85	29	6F	GG	129.23	126.57	138	102	117	100	—	24	60	8.40
30-14M-85	30	6F	GG	133.69	130.99	138	102	117	100	—	24	60	9.10
32-14M-85	32	6F	GG	142.60	139.88	154	102	117	100	—	24	60	10.50
34-14M-85	34	6F	GG	151.52	148.79	160	102	117	100	—	24	70	11.90
36-14M-85	36	6F	GG	160.43	157.68	168	102	117	100	—	32	70	13.20
38-14M-85	38	6F	GG	169.34	166.60	183	102	117	120	—	32	70	15.15
40-14M-85	40	6F	GG	178.25	175.49	188	102	117	135	—	32	70	17.10
44-14M-85	44	6F	GG	196.08	193.28	211	102	117	135	—	32	70	23.30
48-14M-85	48	6F	GG	213.90	211.11	226	102	117	150	—	32	80	25.00
56-14M-85	56	10WF	GG	249.55	246.76	256	102	102	150	207	32	80	25.00
64-14M-85	64	10WF	GG	285.21	282.41	296	102	102	150	242	32	80	28.20
72-14M-85	72	10A	GG	320.86	318.06	—	102	102	150	278	32	80	28.80
80-14M-85	80	10A	GG	356.51	353.71	—	102	102	150	314	32	80	30.10
90-14M-85	90	10A	GG	401.07	398.28	—	102	102	150	358	32	80	33.00
112-14M-85*	112	10A	GG	499.11	496.32	—	102	102	150	456	32	80	41.80
144-14M-85*	144	10A	GG	641.71	638.92	—	102	102	150	600	32	80	52.40
168-14M-85*	168	10A	GG	748.66	745.87	—	102	102	150	706	32	80	60.30
192-14M-85*	192	10A	GG	855.62	852.82	—	102	102	165	813	32	90	70.20
216-14M-85*	216	10A	GG	962.57	959.77	—	102	102	165	920	32	90	81.00

Section 14M – Pitch 14 mm for belt width 115 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
28-14M-115	28	6F	GG	124.78	122.12	127	133	148	100	—	32	60	9.20
29-14M-115	29	6F	GG	129.23	126.57	138	133	148	100	—	32	60	10.20
30-14M-115	30	6F	GG	133.69	130.99	138	133	148	100	—	32	60	11.20
32-14M-115	32	6F	GG	142.60	139.88	154	133	148	100	—	32	60	13.20
34-14M-115	34	6F	GG	151.52	148.79	160	133	148	100	—	32	70	14.80
36-14M-115	36	6F	GG	160.43	157.68	168	133	148	120	—	32	70	16.60
38-14M-115	38	6F	GG	169.34	166.60	183	133	148	120	—	32	70	19.20
40-14M-115	40	6F	GG	178.25	175.49	188	133	148	135	—	32	70	22.10
44-14M-115	44	6F	GG	196.08	193.28	211	133	148	140	—	32	80	28.00
48-14M-115	48	6F	GG	213.90	211.11	226	133	148	150	—	32	80	35.00
56-14M-115	56	6F	GG	249.55	246.76	256	133	148	150	—	32	80	44.20
64-14M-115	64	10WF	GG	285.21	282.41	296	133	133	150	242	32	80	36.80
72-14M-115	72	10A	GG	320.86	318.06	—	133	133	150	278	32	80	36.10
80-14M-115	80	10A	GG	356.51	353.71	—	133	133	150	314	32	80	38.60
90-14M-115	90	10A	GG	401.07	398.28	—	133	133	150	358	32	80	41.00
112-14M-115*	112	10A	GG	499.11	496.32	—	133	133	150	456	32	80	54.40
144-14M-115*	144	10A	GG	641.71	638.92	—	133	133	165	600	32	90	67.80
168-14M-115*	168	10A	GG	748.66	745.87	—	133	133	165	706	32	90	75.80
192-14M-115*	192	10A	GG	855.62	852.82	—	133	133	165	813	32	90	88.30
216-14M-115*	216	10A	GG	962.57	959.77	—	133	133	165	920	32	90	98.00

GG = Cast iron * Non stock items We reserve the right to make technical changes.

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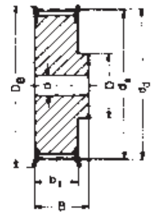
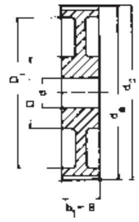
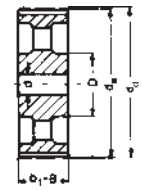
Power Transmission



Type 6F



Type 10W



Type 10A

Section 14M – Pitch 14 mm for belt width 170 mm															
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)		
28-14M-170*	28	6F	GG	124.78	122.12	127	187	202	100	—	32	60	13.80		
29-14M-170*	29	6F	GG	129.23	126.57	138	187	202	100	—	32	60	14.20		
30-14M-170*	30	6F	GG	133.69	130.99	138	187	202	100	—	32	60	15.60		
32-14M-170*	32	6F	GG	142.60	139.88	154	187	202	100	—	32	60	18.10		
34-14M-170*	34	6F	GG	151.52	148.79	160	187	202	100	—	32	60	20.40		
36-14M-170*	36	6F	GG	160.43	157.68	168	187	202	120	—	32	70	23.50		
38-14M-170*	38	6F	GG	169.34	166.60	183	187	202	135	—	32	70	26.50		
40-14M-170*	40	6F	GG	178.25	175.49	188	187	202	140	—	32	85	30.10		
44-14M-170*	44	6F	GG	196.08	193.28	211	187	202	160	—	32	85	37.80		
48-14M-170*	48	6F	GG	213.90	211.11	226	187	202	160	—	32	85	44.50		
56-14M-170*	56	6F	GG	249.55	246.76	256	187	202	160	—	32	85	61.00		
64-14M-170*	64	6F	GG	285.21	282.41	296	187	202	180	—	32	100	81.00		
72-14M-170*	72	10W	GG	320.86	318.06	—	187	187	180	278	32	100	61.40		
80-14M-170*	80	10W	GG	356.51	353.71	—	187	187	180	314	32	100	65.00		
90-14M-170*	90	10A	GG	401.07	398.28	—	187	187	180	358	38	100	68.00		
112-14M-170*	112	10A	GG	499.11	496.32	—	187	187	200	456	38	110	87.50		
144-14M-170*	144	10A	GG	641.71	638.92	—	187	187	220	600	38	120	114.80		
168-14M-170*	168	10A	GG	748.66	745.87	—	187	187	220	706	38	120	125.00		
192-14M-170*	192	10A	GG	855.62	852.82	—	187	187	220	813	38	120	136.40		
216-14M-170*	216	10A	GG	962.57	959.77	—	187	187	220	920	38	120	147.00		

HTD® Pulleys section 20M on request.

GG = Cast iron * Non stock items We reserve the right to make technical changes.

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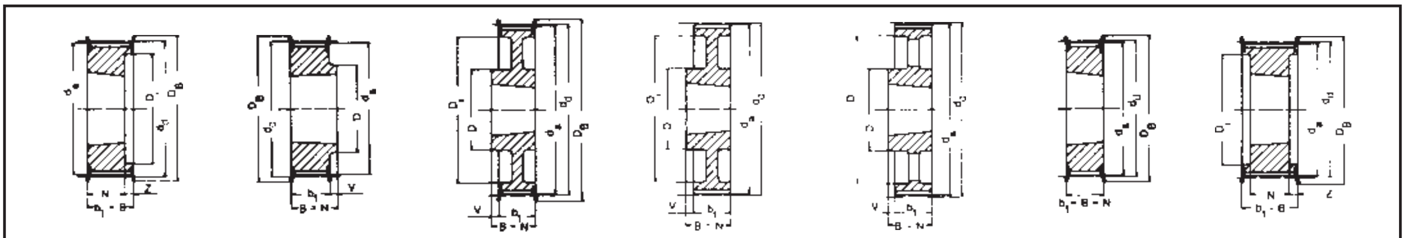
Power Transmission



Type 5F | Type 8F | Type 8WF | Type 8W | Type 8A | Type 3F | Type 4F

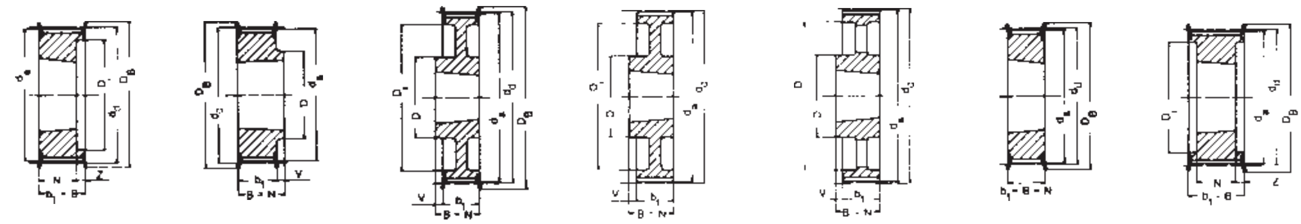
Section 5M – Pitch 5 mm for belt width 15 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 34-5M-15	34	8F	St	54.11	52.97	57.0	20.5	22	22	1.5	—	43	—	1008	0.190
TB 36-5M-15	36	8F	St	57.30	56.16	60.0	20.5	22	22	1.5	—	44	—	1108	0.200
TB 38-5M-15	38	8F	St	69.48	59.34	66.0	20.5	22	22	1.5	—	48	—	1108	0.250
TB 40-5M-15	40	8F	St	63.66	62.52	71.0	20.5	22	22	1.5	—	52	—	1108	0.310
TB 44-5M-15	44	8F	St	70.03	68.89	75.0	20.5	22	22	1.5	—	54	—	1108	0.400
TB 48-5M-15	48	8F	St	76.39	75.25	83.0	20.5	25	25	4.5	—	64	—	1210	0.450
TB 56-5M-15	56	8F	GG	89.13	87.99	93.0	20.5	25	25	4.5	—	70	—	1210	0.670
TB 64-5M-15	64	8F	GG	101.86	100.72	106.0	20.5	25	25	4.5	—	78	—	1210	0.960
TB 72-5M-15	72	8F	GG	114.59	113.45	119.0	20.5	25	25	4.5	—	90	—	1610	1.190
TB 80-5M-15	80	8F	GG	127.32	126.18	135.0	20.5	25	25	4.5	—	92	—	1610	1.570
TB 90-5M-15	90	7A	GG	143.24	142.10	—	20.5	25	25	2.3	—	92	—	1610	1.147
TB 112-5M-15	112	7A	GG	178.25	177.11	—	20.5	25	25	2.3	—	92	—	1610	1.940
TB 136-5M-15	136	7A	GG	216.45	215.31	—	20.5	32	32	5.8	—	106	—	2012	3.060
TB 150-5M-15	150	7A	GG	238.73	237.59	—	20.5	32	32	5.8	—	106	—	2012	3.900

Taper bush	1008	1108	1210	1610	2012
Bore d_2 (mm) from ... to ...	10-25	10-28	11-32	14-42	14-50

GG = Cast iron
St = Steel
We reserve the right to make technical changes.

Bore diameters d_2 see page 54



Section 8M – Pitch 8 mm for belt width 20 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 22-8M-20	22	5F	GG	56.02	54.65	60.0	28	28	22	—	6	—	41	1008	0.24
TB 24-8M-20	24	5F	GG	61.12	59.75	66.0	28	28	22	—	6	—	42	1108	0.30
TB 26-8M-20	26	5F	GG	66.21	64.84	71.0	28	28	22	—	6	—	46	1108	0.36
TB 28-8M-20	28	5F	GG	71.30	70.08	75.0	28	28	22	—	6	—	50	1108	0.44
TB 30-8M-20	30	5F	GG	76.39	75.13	83.0	28	28	22	—	6	—	58	1108	0.53
TB 32-8M-20	32	5F	GG	81.49	80.16	87.0	28	28	25	—	3	—	62	1610	0.42
TB 34-8M-20	34	5F	GG	86.58	85.22	91.0	28	28	25	—	3	—	65	1610	0.55
TB 36-8M-20	36	5F	GG	91.67	90.30	98.5	28	28	25	—	3	—	68	1610	0.68
TB 38-8M-20	38	5F	GG	96.77	95.39	103.0	28	28	25	—	3	—	72	1610	0.80
TB 40-8M-20	40	5F	GG	101.86	100.49	106.0	28	28	25	—	3	—	76	1610	1.00
TB 44-8M-20	44	8F	GG	112.05	110.67	119.0	28	32	32	4	—	93	—	2012	1.20
TB 48-8M-20	48	8F	GG	122.23	120.86	127.0	28	32	32	4	—	96	—	2012	1.60
TB 56-8M-20	56	8F	GG	142.60	141.23	148.0	28	32	32	4	—	110	—	2012	2.40
TB 64-8M-20	64	8WF	GG	162.97	161.60	168.0	28	32	32	4	—	110	137	2012	2.70
TB 72-8M-20	72	8WF	GG	183.35	181.97	192.0	28	32	32	4	—	110	158	2012	3.30
TB 80-8M-20	80	8W	GG	203.72	202.35	—	28	32	32	4	—	110	180	2012	3.50
TB 90-8M-20	90	8A	GG	229.18	227.81	—	28	32	32	4	—	110	204	2012	3.65

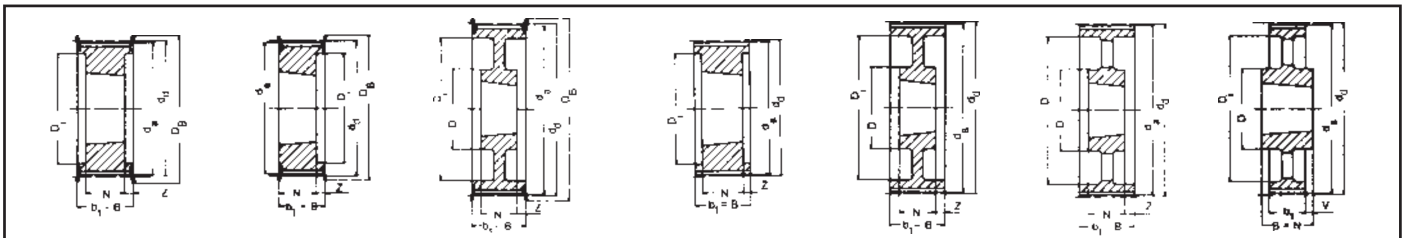
Section 8M – Pitch 8 mm for belt width 30 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 22-8M-30	22	5F	GG	56.02	54.65	60.0	38	38	22	—	16	—	41	1008	0.29
TB 24-8M-30	24	5F	GG	61.12	59.75	66.0	38	38	22	—	16	—	42	1108	0.38
TB 26-8M-30	26	5F	GG	66.21	64.84	71.0	38	38	22	—	16	—	46	1108	0.45
TB 28-8M-30	28	5F	GG	71.30	70.08	75.0	38	38	25	—	16	—	50	1210	0.50
TB 30-8M-30	30	3F	GG	76.39	75.13	83.0	38	38	38	—	—	—	—	1615	0.45
TB 32-8M-30	32	3F	GG	81.49	80.16	87.0	38	38	38	—	—	—	—	1615	0.59
TB 34-8M-30	34	3F	GG	86.58	85.22	91.0	38	38	38	—	—	—	—	1615	0.77
TB 36-8M-30	36	3F	GG	91.67	90.30	98.5	38	38	38	—	—	—	—	1615	0.96
TB 38-8M-30	38	3F	GG	96.77	95.39	103.0	38	38	38	—	—	—	—	1615	1.15
TB 40-8M-30	40	3F	GG	101.86	100.49	106.0	38	38	38	—	—	—	—	1615	1.34
TB 44-8M-30	44	4F	GG	112.05	110.67	119.0	38	38	32	—	3	—	91	2012	1.33
TB 48-8M-30	48	4F	GG	122.23	120.86	127.0	38	38	32	—	3	—	95	2012	1.78
TB 56-8M-30	56	4F	GG	142.60	141.23	148.0	38	38	32	—	3	—	117	2012	3.76
TB 64-8M-30	64	8F	GG	162.97	161.60	168.0	38	45	45	7	—	125	—	2517	4.20
TB 72-8M-30	72	8WF	GG	183.35	181.97	192.0	38	45	45	7	—	125	158	2517	4.30
TB 80-8M-30	80	8W	GG	203.72	202.35	—	38	45	45	7	—	125	180	2517	4.60
TB 90-8M-30	90	8A	GG	229.18	227.81	—	38	45	45	7	—	125	204	2517	5.00
TB 112-8M-30	112	8A	GG	285.21	283.83	—	38	45	45	7	—	125	260	2517	6.20
TB 144-8M-30	144	8A	GG	366.69	365.32	—	38	45	45	7	—	125	341	2517	9.00

Taper bush	1008	1108	1210	1610	1615	2012	2517
Bore d_2 (mm) from … to …	10-25	10-28	11-32	14-42	14-42	14-50	16-60

GG = Cast iron
We reserve the right to make technical changes.

Bore diameters d_2 see page 54



Type 4F | Type 5F | Type 9WF | Type 4 | Type 9W | Type 9A | Type 7A

Section 8M – Pitch 8 mm for belt width 50 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 28-8M-50	28	5F	GG	71.30	70.08	75.0	60	60	25	—	35.0	—	50	1210	0.60
TB 30-8M-50	30	5F	GG	76.39	75.13	83.0	60	60	38	—	22.0	—	58	1615	0.65
TB 32-8M-50	32	5F	GG	81.49	80.16	87.0	60	60	38	—	22.0	—	62	1615	0.82
TB 34-8M-50	34	5F	GG	86.58	85.22	91.0	60	60	38	—	22.0	—	65	1615	1.06
TB 36-8M-50	36	5F	GG	91.67	90.30	98.5	60	60	38	—	22.0	—	68	1615	1.30
TB 38-8M-50	38	5F	GG	96.77	95.39	103.0	60	60	38	—	22.0	—	72	1615	1.60
TB 40-8M-50	40	4F	GG	101.86	100.49	106.0	60	60	32	—	14.0	—	82	2012	1.71
TB 44-8M-50	44	4F	GG	112.05	110.67	119.0	60	60	32	—	14.0	—	91	2012	1.78
TB 48-8M-50	48	4F	GG	122.23	120.86	127.0	60	60	32	—	14.0	—	95	2012	2.30
TB 56-8M-50	56	4F	GG	142.60	141.23	148.0	60	60	45	—	7.5	—	116	2517	3.40
TB 64-8M-50	64	4F	GG	162.97	161.60	168.0	60	60	45	—	7.5	—	137	2517	5.00
TB 72-8M-50	72	9WF	GG	183.35	181.97	192.0	60	60	45	—	7.5	125	158	2517	6.70
TB 80-8M-50	80	4	GG	203.72	202.35	—	60	60	51	—	4.5	—	180	3020	8.80
TB 90-8M-50	90	9W	GG	229.18	227.81	—	60	60	51	—	4.5	170	204	3020	10.00
TB 112-8M-50	112	9W	GG	285.21	283.83	—	60	60	51	—	4.5	170	260	3020	12.00
TB 144-8M-50	144	9A	GG	366.69	365.32	—	60	60	51	—	4.5	170	341	3020	15.20
TB 168-8M-50	168	7A	GG	427.81	426.44	—	60	65	65	—	2.5	170	402	3525	16.40
TB 192-8M-50	192	7A	GG	488.92	487.55	—	60	65	65	—	2.5	170	460	3525	21.80

Section 8M – Pitch 8 mm for belt width 85 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 34-8M-85	34	4F	GG	86.58	85.22	91.0	95	95	38	—	28.5	—	65	1615	1.43
TB 36-8M-85	36	4F	GG	91.67	90.30	98.5	95	95	38	—	28.5	—	68	1615	1.87
TB 38-8M-85	38	4F	GG	96.77	95.39	103.0	95	95	38	—	28.5	—	72	1615	2.20
TB 40-8M-85	40	4F	GG	101.86	100.49	106.0	95	95	32	—	31.5	—	82	2012	1.78
TB 44-8M-85	44	4F	GG	112.05	110.67	119.0	95	95	32	—	31.5	—	91	2012	2.30
TB 48-8M-85	48	4F	GG	122.23	120.86	127.0	95	95	45	—	25.0	—	100	2517	2.66
TB 56-8M-85	56	4F	GG	142.60	141.23	148.0	95	95	45	—	25.0	—	117	2517	4.45
TB 64-8M-85	64	4F	GG	162.97	161.60	168.0	95	95	45	—	25.0	—	137	2517	6.20
TB 72-8M-85	72	4F	GG	183.35	181.97	192.0	95	95	51	—	22.0	—	158	3020	8.00
TB 80-8M-85	80	4	GG	203.72	202.35	—	95	95	51	—	22.0	—	180	3020	10.00
TB 90-8M-85	90	9W	GG	229.18	227.81	—	95	95	51	—	22.0	170	204	3020	10.80
TB 112-8M-85	112	9W	GG	285.21	283.83	—	95	95	51	—	22.0	170	260	3020	15.00
TB 144-8M-85	144	9A	GG	366.69	365.32	—	95	95	76	—	15.0	170	341	3525	20.00
TB 168-8M-85	168	9A	GG	427.81	426.44	—	95	95	76	—	15.0	170	402	3525	23.00
TB 192-8M-85	192	9A	GG	488.92	487.55	—	95	95	76	—	15.0	170	460	3525	28.50

Taper bush	1210	1615	2012	2517	3020	3525
Bore d_2 (mm) from ... to ...	11-32	14-42	14-50	16-60	25-75	35-90

GG = Cast iron

We reserve the right to make technical changes.

Bore diameters d_2 see page 54

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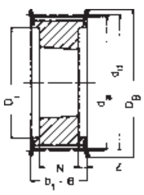
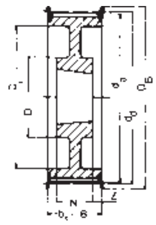
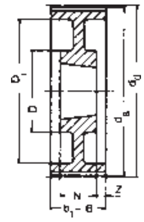


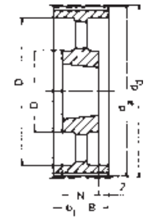
Type 4F



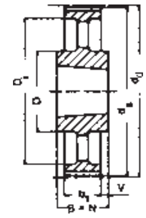
Type 9WF



Type 9W



Type 9A



Type 7A

Section 14M – Pitch 14 mm for belt width 40 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 28-14M-40	28	4F	GG	124.78	122.12	127	54	54	32	—	11.0	—	98	2012	2.00
TB 29-14M-40	29	4F	GG	129.23	126.57	138	54	54	32	—	11.0	—	100	2012	2.38
TB 30-14M-40	30	4F	GG	133.69	130.99	138	54	54	32	—	11.0	—	100	2012	2.65
TB 32-14M-40	32	4F	GG	142.60	139.88	154	54	54	32	—	11.0	—	104	2012	3.40
TB 34-14M-40	34	4F	GG	151.52	148.79	160	54	54	45	—	4.5	—	110	2517	3.87
TB 36-14M-40	36	4F	GG	160.43	157.68	168	54	54	45	—	4.5	—	120	2517	4.80
TB 38-14M-40	38	4F	GG	169.34	166.60	183	54	54	45	—	4.5	—	130	2517	5.40
TB 40-14M-40	40	4F	GG	178.25	175.49	188	54	54	45	—	4.5	—	138	2517	6.00
TB 44-14M-40	44	4F	GG	196.08	193.28	211	54	54	51	—	1.5	—	155	3020	7.80
TB 48-14M-40	48	4F	GG	213.90	211.11	226	54	54	51	—	1.5	—	170	3020	9.40
TB 56-14M-40	56	9WF	GG	249.55	246.76	256	54	54	51	—	1.5	170	208	3020	10.80
TB 64-14M-40	64	9WF	GG	285.21	282.41	296	54	54	51	—	1.5	170	242	3020	13.40
TB 72-14M-40	72	9W	GG	320.86	318.06	—	54	54	51	—	1.5	170	280	3020	15.20
TB 80-14M-40	80	9A	GG	356.51	353.71	—	54	54	51	—	1.5	170	315	3020	16.00
TB 90-14M-40	90	9A	GG	401.07	398.28	—	54	54	51	—	1.5	170	360	3020	17.80
TB 112-14M-40	112	9A	GG	499.11	496.32	—	54	54	51	—	1.5	170	457	3020	25.60
TB 144-14M-40	144	9A	GG	641.71	638.92	—	54	54	51	—	1.5	170	600	3020	32.00
TB 168-14M-40	168	9A	GG	748.66	745.87	—	54	54	51	—	1.5	170	706	3020	44.00
TB 192-14M-40	192	9A	GG	855.62	852.82	—	54	54	51	—	1.5	170	813	3020	49.00
TB 216-14M-40	216	9A	GG	962.57	959.77	—	54	54	51	—	1.5	170	920	3020	55.00

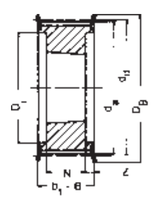
Section 14M – Pitch 14 mm for belt width 55 mm

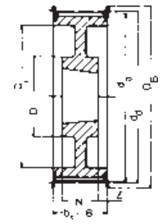
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 28-14M-55	28	4F	GG	124.78	122.12	127	70	70	32	—	19.0	—	98	2012	2.20
TB 29-14M-55	29	4F	GG	129.23	126.57	138	70	70	32	—	19.0	—	100	2012	2.74
TB 30-14M-55	30	4F	GG	133.69	130.99	138	70	70	45	—	12.5	—	100	2517	2.70
TB 32-14M-55	32	4F	GG	142.60	139.88	154	70	70	45	—	12.5	—	108	2517	3.66
TB 34-14M-55	34	4F	GG	151.52	148.79	160	70	70	45	—	12.5	—	110	2517	4.55
TB 36-14M-55	36	4F	GG	160.43	157.68	168	70	70	45	—	12.5	—	120	2517	5.20
TB 38-14M-55	38	4F	GG	169.34	166.60	183	70	70	45	—	12.5	—	130	2517	6.20
TB 40-14M-55	40	4F	GG	178.25	175.49	188	70	70	45	—	12.5	—	138	2517	7.00
TB 44-14M-55	44	4F	GG	196.08	193.28	211	70	70	51	—	9.5	—	155	3020	8.60
TB 48-14M-55	48	4F	GG	213.90	211.11	226	70	70	51	—	9.5	—	170	3020	10.40
TB 56-14M-55	56	9WF	GG	249.55	246.76	256	70	70	51	—	9.5	170	208	3020	12.00
TB 64-14M-55	64	9WF	GG	285.21	282.41	296	70	70	51	—	9.5	170	242	3020	14.50
TB 72-14M-55	72	9W	GG	320.86	318.06	—	70	70	51	—	9.5	170	280	3020	16.20
TB 80-14M-55	80	9A	GG	356.51	353.71	—	70	70	51	—	9.5	170	315	3020	17.50
TB 90-14M-55	90	9A	GG	401.07	398.28	—	70	70	51	—	9.5	170	360	3020	20.10
TB 112-14M-55	112	9A	GG	499.11	496.32	—	70	70	51	—	9.5	170	457	3020	28.40
TB 144-14M-55	144	9A	GG	641.71	638.92	—	70	70	51	—	9.5	170	600	3020	36.20
TB 168-14M-55	168	9A	GG	748.66	745.87	—	70	70	51	—	9.5	170	706	3020	49.00
TB 192-14M-55	192	9A	GG	855.62	852.82	—	70	70	51	—	9.5	170	813	3020	53.00
TB 216-14M-55	216	7A	GG	962.57	959.77	—	70	89	89	9.5	—	190	920	3535	65.80

Taper bush	2012	2517	3020	3535
Bore d_2 (mm) from ... to ...	14-50	16-60	25-75	35-90

GG = Cast iron
We reserve the right to make technical changes.

Bore diameters d_2 see page 54


Type 4F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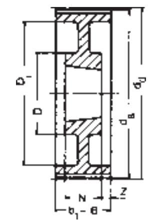
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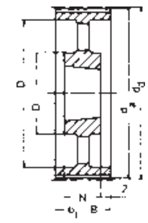
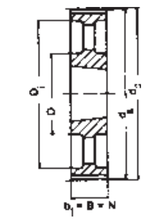

Type 9A


Type 3A

Section 14M – Pitch 14 mm for belt width 85 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 28-14M-85	28	4F	GG	124.78	122.12	127	102	102	45	—	28.5	—	98	2517	2.70
TB 29-14M-85	29	4F	GG	129.23	126.57	138	102	102	45	—	28.5	—	100	2517	3.40
TB 30-14M-85	30	4F	GG	133.69	130.99	138	102	102	45	—	28.5	—	100	2517	3.75
TB 32-14M-85	32	4F	GG	142.60	139.88	154	102	102	45	—	28.5	—	108	2517	4.80
TB 34-14M-85	34	4F	GG	151.52	148.79	160	102	102	45	—	28.5	—	110	2517	6.00
TB 36-14M-85	36	4F	GG	160.43	157.68	168	102	102	51	—	25.5	—	120	3020	5.80
TB 38-14M-85	38	4F	GG	169.34	166.60	183	102	102	51	—	25.5	—	130	3020	6.80
TB 40-14M-85	40	4F	GG	178.25	175.49	188	102	102	51	—	25.5	—	138	3020	8.00
TB 44-14M-85	44	4F	GG	196.08	193.28	211	102	102	76	—	13.0	—	155	3030	11.80
TB 48-14M-85	48	4F	GG	213.90	211.11	226	102	102	76	—	13.0	—	170	3030	15.10
TB 56-14M-85	56	4F	GG	249.55	246.76	256	102	102	65	—	18.5	190	210	3525	19.00
TB 64-14M-85	64	9WF	GG	285.21	282.41	296	102	102	65	—	18.5	190	242	3525	23.00
TB 72-14M-85	72	9W	GG	320.86	318.06	—	102	102	65	—	18.5	190	280	3525	25.00
TB 80-14M-85	80	9A	GG	356.51	353.71	—	102	102	65	—	18.5	190	315	3525	26.00
TB 90-14M-85	90	9A	GG	401.07	398.28	—	102	102	65	—	18.5	190	360	3525	27.80
TB 112-14M-85	112	9A	GG	499.11	496.32	—	102	102	65	—	18.5	190	457	3525	36.50
TB 144-14M-85	144	9A	GG	641.71	638.92	—	102	102	65	—	18.5	190	600	3525	48.00
TB 168-14M-85	168	9A	GG	748.66	745.87	—	102	102	65	—	18.5	190	706	3525	60.00
TB 192-14M-85	192	3A	GG	855.62	852.82	—	102	102	102	—	—	230	813	4040	86.00
TB 216-14M-85	216	3A	GG	962.57	959.77	—	102	102	102	—	—	230	920	4040	91.50

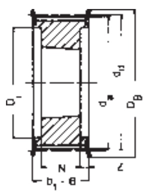
Section 14M – Pitch 14 mm for belt width 115 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 28-14M-115	28	4F	GG	124.78	122.12	127	133	133	45	—	44.0	—	98	2517	3.77
TB 29-14M-115	29	4F	GG	129.23	126.57	138	133	133	45	—	44.0	—	100	2517	4.00
TB 30-14M-115	30	4F	GG	133.69	130.99	138	133	133	45	—	44.0	—	100	2517	5.00
TB 32-14M-115	32	4F	GG	142.60	139.88	154	133	133	45	—	44.0	—	108	2517	6.80
TB 34-14M-115	34	4F	GG	151.52	148.79	160	133	133	45	—	44.0	—	110	2517	6.80
TB 36-14M-115	36	4F	GG	160.43	157.68	168	133	133	51	—	41.0	—	120	3020	7.00
TB 38-14M-115	38	4F	GG	169.34	166.60	183	133	133	51	—	41.0	—	130	3020	8.40
TB 40-14M-115	40	4F	GG	178.25	175.49	188	133	133	51	—	41.0	—	140	3020	9.20
TB 44-14M-115	44	4F	GG	196.08	193.28	211	133	133	76	—	28.5	—	155	3030	14.00
TB 48-14M-115	48	4F	GG	213.90	211.11	226	133	133	76	—	28.5	—	170	3030	17.10
TB 56-14M-115	56	4F	GG	249.55	246.76	256	133	133	89	—	22.0	—	210	3535	24.80
TB 64-14M-115	64	9WF	GG	285.21	282.41	296	133	133	89	—	22.0	190	242	3535	27.00
TB 72-14M-115	72	9W	GG	320.86	318.06	—	133	133	89	—	22.0	190	280	3535	29.00
TB 80-14M-115	80	9A	GG	356.51	353.71	—	133	133	89	—	22.0	190	315	3535	32.00
TB 90-14M-115	90	9A	GG	401.07	398.28	—	133	133	89	—	22.0	190	360	3535	36.50
TB 112-14M-115	112	9A	GG	499.11	496.32	—	133	133	89	—	22.0	190	457	3535	46.00
TB 144-14M-115	144	9A	GG	641.71	638.92	—	133	133	102	—	15.5	230	600	4040	68.00
TB 168-14M-115	168	9A	GG	748.66	745.87	—	133	133	102	—	15.5	230	706	4040	82.60
TB 192-14M-115	192	9A	GG	855.62	852.82	—	133	133	102	—	15.5	230	813	4040	96.00
TB 216-14M-115	216	9A	GG	962.57	959.77	—	133	133	102	—	15.5	230	920	4040	107.00

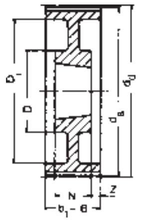
Taper bush	2517	3020	3030	3525	3535	4040
Bore d_2 (mm) from ... to ...	16-60	25-75	35-75	35-90	35-90	40-100

GG = Cast iron
We reserve the right to make technical changes.

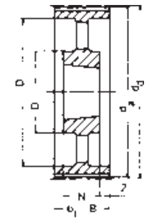
Bore diameters d_2 see page 54



Type 4F



Type 9W



Type 9A

Section 14M – Pitch 14 mm for belt width 170 mm

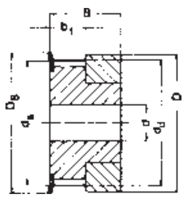
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	N (mm)	V (mm)	Z (mm)	D (mm)	D_i (mm)	Taper bush	Weight without bush (≈ kg)
TB 38-14M-170*	38	4F	GG	169.34	166.60	183	187	187	76	—	55.5	—	130	3030	11.70
TB 40-14M-170*	40	4F	GG	178.25	175.49	188	187	187	76	—	55.5	—	140	3030	13.00
TB 44-14M-170*	44	4F	GG	196.08	193.28	211	187	187	89	—	49.0	—	155	3535	15.00
TB 48-14M-170*	48	4F	GG	213.90	211.11	226	187	187	89	—	49.0	—	175	3535	19.00
TB 56-14M-170*	56	4F	GG	249.55	246.76	256	187	187	89	—	49.0	—	210	3535	28.50
TB 64-14M-170*	64	4F	GG	285.21	282.41	296	187	187	102	—	42.5	—	240	4040	41.00
TB 72-14M-170*	72	9W	GG	320.86	318.06	—	187	187	102	—	42.5	230	280	4040	46.90
TB 80-14M-170*	80	9W	GG	356.51	353.71	—	187	187	102	—	42.5	230	315	4040	48.00
TB 90-14M-170*	90	9A	GG	401.07	398.28	—	187	187	102	—	42.5	230	360	4040	52.50
TB 112-14M-170*	112	9A	GG	499.11	496.32	—	187	187	127	—	30.0	265	457	5050	74.50
TB 144-14M-170*	144	9A	GG	641.71	638.92	—	187	187	127	—	30.0	265	600	5050	91.00
TB 168-14M-170*	168	9A	GG	748.66	745.87	—	187	187	127	—	30.0	265	706	5050	116.00
TB 192-14M-170*	192	9A	GG	855.62	852.82	—	187	187	127	—	30.0	265	813	5050	134.00
TB 216-14M-170*	216	9A	GG	962.57	959.77	—	187	187	127	—	30.0	265	920	5050	146.50

HTD® Pulleys section 20M on request.

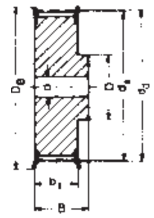
Taper bush	3030	3535	4040	5050
Bore d_2 (mm) from ... to ...	35-75	35-90	40-100	70-125

GG = Cast iron
We reserve the right to make technical changes.
* Non stock items

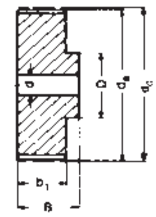
Bore diameters d_2 see page 54



Type 1F



Type 6F

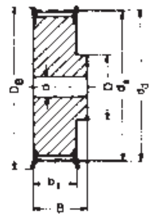


Type 6

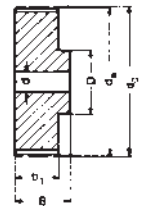
Section T2.5 – Pitch 2.5 mm for belt width 4 and 6 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
16 T2.5/12-2	12	1F	Al	9.55	9.00	13.0	9	16	12	—	—	3	0.003
16 T2.5/14-2	14	1F	Al	11.14	10.60	15.0	9	16	14	—	—	4	0.004
16 T2.5/15-2	15	1F	Al	11.94	11.40	15.0	9	16	15	—	—	4	0.005
16 T2.5/16-2	16	1F	Al	12.73	12.20	16.0	9	16	16	—	—	5	0.005
16 T2.5/18-2	18	6F	Al	14.32	13.80	17.5	10	16	9.5	—	4	6	0.006
16 T2.5/19-2	19	6F	Al	15.12	14.60	18.0	10	16	9.5	—	4	6	0.007
16 T2.5/20-2	20	6F	Al	15.92	15.40	19.5	10	16	10	—	4	6	0.008
16 T2.5/22-2	22	6F	Al	17.51	17.00	23.0	10	16	10	—	4	6	0.009
16 T2.5/24-2	24	6F	Al	19.10	18.55	23.0	10	16	12	—	4	6	0.012
16 T2.5/25-2	25	6F	Al	19.90	19.35	23.0	10	16	12	—	4	8	0.013
16 T2.5/26-2	26	6F	Al	20.70	20.15	25.0	10	16	13	—	4	8	0.014
16 T2.5/28-2	28	6F	Al	22.28	21.75	25.0	10	16	13	—	4	8	0.016
16 T2.5/30-2	30	6F	Al	23.87	23.35	28.0	10	16	16	—	6	10	0.018
16 T2.5/32-2	32	6F	Al	25.47	24.95	32.0	10	16	16	—	6	10	0.020
16 T2.5/36-2	36	6F	Al	28.65	28.10	36.0	10	16	20	—	6	12	0.026
16 T2.5/40-2	40	6F	Al	31.83	31.30	38.0	10	16	20	—	6	12	0.032
16 T2.5/44-2	44	6F	Al	35.02	34.50	42.0	10	16	24	—	6	14	0.040
16 T2.5/48-0	48	6	Al	38.20	37.70	—	10	16	26	—	6	15	0.048
16 T2.5/60-0	60	6	Al	47.75	47.25	—	10	16	34	—	8	18	0.073

Al = Aluminium   We reserve the right to make technical changes.



Type 6F



Type 6

Section T5 – Pitch 5 mm for belt width 10 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
21 T5/10-2	10	6F	Al	15.92	15.05	19.5	15	21	8	—	—	5	0.012
21 T5/12-2	12	6F	Al	19.01	18.25	23.0	15	21	10	—	—	6	0.016
21 T5/14-2	14	6F	Al	22.29	21.45	25.0	15	21	13	—	—	8	0.019
21 T5/15-2	15	6F	Al	23.88	23.05	28.0	15	21	16	—	6	10	0.021
21 T5/16-2	16	6F	Al	25.47	24.60	32.0	15	21	18	—	6	11	0.025
21 T5/18-2	18	6F	Al	28.65	27.80	32.0	15	21	19	—	6	12	0.031
21 T5/19-2	19	6F	Al	30.25	29.40	36.0	15	21	22	—	6	12	0.036
21 T5/20-2	20	6F	Al	31.83	31.00	36.0	15	21	23	—	6	14	0.038
21 T5/22-2	22	6F	Al	35.12	34.25	38.0	15	21	24	—	6	15	0.046
21 T5/24-2	24	6F	Al	38.21	37.40	42.0	15	21	26	—	6	15	0.054
21 T5/25-2	25	6F	Al	39.80	39.00	44.0	15	21	26	—	6	15	0.058
21 T5/26-2	26	6F	Al	41.47	40.60	44.0	15	21	26	—	6	16	0.062
21 T5/27-2	27	6F	Al	42.98	42.20	48.0	15	21	30	—	8	18	0.064
21 T5/28-2	28	6F	Al	44.62	43.75	48.0	15	21	32	—	8	18	0.071
21 T5/30-2	30	6F	Al	47.76	46.95	51.0	15	21	34	—	8	18	0.075
21 T5/32-2	32	6F	Al	50.94	50.10	54.0	15	21	38	—	8	22	0.088
21 T5/36-2	36	6F	Al	57.31	56.45	63.0	15	21	38	—	8	22	0.114
21 T5/40-2	40	6F	Al	63.66	62.85	66.0	15	21	40	—	8	23	0.138
21 T5/42-2	42	6F	Al	66.87	66.00	71.0	15	21	40	—	8	24	0.180
21 T5/44-0	44	6	Al	70.07	69.20	—	15	21	45	—	8	26	0.185
21 T5/48-0	48	6	Al	76.42	75.55	—	15	21	50	—	8	28	0.200
21 T5/60-0	60	6	Al	95.52	94.65	—	15	21	65	—	8	35	0.307

Section T5 – Pitch 5 mm for belt width 16 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
27 T5/10-2	10	6F	Al	15.92	15.05	19.5	21	27	8	—	—	5	0.016
27 T5/12-2	12	6F	Al	19.01	18.25	23.0	21	27	10	—	—	6	0.022
27 T5/14-2	14	6F	Al	22.29	21.45	25.0	21	27	13	—	—	8	0.026
27 T5/15-2	15	6F	Al	23.88	23.05	28.0	21	27	16	—	6	10	0.029
27 T5/16-2	16	6F	Al	25.47	24.60	32.0	21	27	18	—	6	11	0.035
27 T5/18-2	18	6F	Al	28.65	27.80	32.0	21	27	19	—	6	12	0.043
27 T5/19-2	19	6F	Al	30.25	29.40	36.0	21	27	22	—	6	12	0.049
27 T5/20-2	20	6F	Al	31.83	31.00	36.0	21	27	23	—	6	14	0.053
27 T5/22-2	22	6F	Al	35.12	34.25	38.0	21	27	24	—	6	15	0.054
27 T5/24-2	24	6F	Al	38.21	37.40	42.0	21	27	26	—	6	15	0.076
27 T5/25-2	25	6F	Al	39.80	39.00	44.0	21	27	26	—	6	15	0.081
27 T5/26-2	26	6F	Al	41.47	40.60	44.0	21	27	26	—	6	16	0.085
27 T5/27-2	27	6F	Al	42.98	42.20	48.0	21	27	30	—	8	18	0.090
27 T5/28-2	28	6F	Al	44.62	43.75	48.0	21	27	32	—	8	18	0.092
27 T5/30-2	30	6F	Al	47.76	46.95	51.0	21	27	34	—	8	18	0.105
27 T5/32-2	32	6F	Al	50.94	50.10	54.0	21	27	38	—	8	22	0.123
27 T5/36-2	36	6F	Al	57.31	56.45	63.0	21	27	38	—	8	22	0.160
27 T5/40-2	40	6F	Al	63.66	62.85	66.0	21	27	40	—	8	23	0.193
27 T5/42-2	42	6F	Al	66.87	66.00	71.0	21	27	40	—	8	24	0.205
27 T5/44-0	44	6	Al	70.07	69.20	—	21	27	45	—	8	26	0.228
27 T5/48-0	48	6	Al	76.42	75.55	—	21	27	50	—	8	28	0.280
27 T5/60-0	60	6	Al	95.52	94.65	—	21	27	65	—	8	35	0.430

Al = Aluminium

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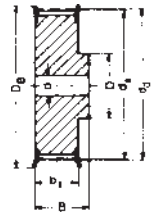

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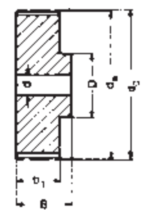

Type 6

Section T5 – Pitch 5 mm for belt width 25 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)		
36 T5/10-2	10	6F	Al	15.92	15.05	19.5	30	36	8	—	—	5	0.023		
36 T5/12-2	12	6F	Al	19.01	18.25	23.0	30	36	10	—	—	6	0.031		
36 T5/14-2	14	6F	Al	22.29	21.45	25.0	30	36	13	—	—	8	0.037		
36 T5/15-2	15	6F	Al	23.88	23.05	28.0	30	36	16	—	6	10	0.041		
36 T5/16-2	16	6F	Al	25.47	24.60	32.0	30	36	18	—	6	11	0.050		
36 T5/18-2	18	6F	Al	28.65	27.80	32.0	30	36	19	—	6	12	0.061		
36 T5/19-2	19	6F	Al	30.25	29.40	36.0	30	36	22	—	6	12	0.070		
36 T5/20-2	20	6F	Al	31.83	31.00	36.0	30	36	23	—	6	14	0.076		
36 T5/22-2	22	6F	Al	35.12	34.25	38.0	30	36	24	—	6	15	0.080		
36 T5/24-2	24	6F	Al	38.21	37.40	42.0	30	36	26	—	8	15	0.109		
36 T5/25-2	25	6F	Al	39.80	39.00	44.0	30	36	26	—	8	15	0.116		
36 T5/26-2	26	6F	Al	41.47	40.60	44.0	30	36	26	—	8	16	0.120		
36 T5/27-2	27	6F	Al	42.98	42.20	48.0	30	36	30	—	8	18	0.128		
36 T5/28-2	28	6F	Al	44.62	43.75	48.0	30	36	32	—	8	18	0.135		
36 T5/30-2	30	6F	Al	47.76	46.95	51.0	30	36	34	—	8	18	0.150		
36 T5/32-2	32	6F	Al	50.94	50.10	54.0	30	36	38	—	8	22	0.176		
36 T5/36-2	36	6F	Al	57.31	56.45	63.0	30	36	38	—	8	22	0.230		
36 T5/40-2	40	6F	Al	63.66	62.85	66.0	30	36	40	—	8	23	0.276		
36 T5/42-2	42	6F	Al	66.87	66.00	71.0	30	36	40	—	8	24	0.284		
36 T5/44-0	44	6	Al	70.07	69.20	—	30	36	45	—	8	26	0.315		
36 T5/48-0	48	6	Al	76.42	75.55	—	30	36	50	—	8	28	0.400		
36 T5/60-0	60	6	Al	95.52	94.65	—	30	36	65	—	8	35	0.614		

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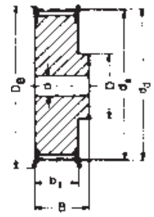

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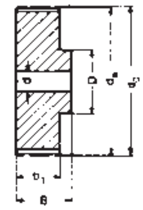

Type 6

Section T10 – Pitch 10 mm for belt width 16 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
31 T10/12-2	12	6F	Al	38.20	36.35	42	21	31	28	—	6	16	0.076
31 T10/14-2	14	6F	Al	44.56	42.70	48	21	31	32	—	8	18	0.104
31 T10/15-2	15	6F	Al	47.75	45.90	51	21	31	32	—	8	18	0.116
31 T10/16-2	16	6F	Al	50.93	49.05	54	21	31	35	—	8	20	0.134
31 T10/18-2	18	6F	Al	57.29	55.45	60	21	31	40	—	8	22	0.167
31 T10/19-2	19	6F	Al	60.48	58.60	66	21	31	44	—	8	22	0.184
31 T10/20-2	20	6F	Al	63.66	61.80	66	21	31	46	—	8	24	0.208
31 T10/22-2	22	6F	Al	70.03	68.15	75	21	31	52	—	8	28	0.253
31 T10/24-2	24	6F	Al	76.39	74.55	83	21	31	58	—	8	30	0.288
31 T10/25-2	25	6F	Al	79.58	77.70	83	21	31	60	—	8	30	0.310
31 T10/26-2	26	6F	Al	82.76	80.90	87	21	31	60	—	8	30	0.357
31 T10/27-2	27	6F	Al	85.95	84.10	91	21	31	60	—	8	30	0.364
31 T10/28-2	28	6F	Al	89.13	87.25	93	21	31	60	—	8	30	0.401
31 T10/30-2	30	6F	Al	95.49	93.65	97	21	31	60	—	8	30	0.441
31 T10/32-2	32	6F	Al	101.86	100.00	106	21	31	65	—	10	32	0.493
31 T10/36-2	36	6F	Al	114.59	112.75	119	21	31	70	—	10	35	0.623
31 T10/40-2	40	6F	Al	127.32	125.45	131	21	31	80	—	10	40	0.767
31 T10/44-0	44	6	Al	140.06	138.20	—	21	31	88	—	10	46	0.993
31 T10/48-0	48	6	Al	152.78	150.95	—	21	31	95	—	16	48	1.090
31 T10/60-0	60	6	Al	190.98	189.10	—	21	31	110	—	16	60	1.710

Section T10 – Pitch 10 mm for belt width 25 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
40 T10/12-2	12	6F	Al	38.20	36.35	42	30	40	28	—	6	16	0.099
40 T10/14-2	14	6F	Al	44.56	42.70	48	30	40	32	—	8	18	0.134
40 T10/15-2	15	6F	Al	47.75	45.90	51	30	40	32	—	8	18	0.152
40 T10/16-2	16	6F	Al	50.93	49.05	54	30	40	35	—	8	20	0.176
40 T10/18-2	18	6F	Al	57.29	55.45	60	30	40	40	—	8	22	0.224
40 T10/19-2	19	6F	Al	60.48	58.60	66	30	40	44	—	8	22	0.247
40 T10/20-2	20	6F	Al	63.66	61.80	66	30	40	46	—	8	24	0.276
40 T10/22-2	22	6F	Al	70.03	68.15	75	30	40	52	—	8	28	0.337
40 T10/24-2	24	6F	Al	76.39	74.55	83	30	40	58	—	8	30	0.392
40 T10/25-2	25	6F	Al	79.58	77.70	83	30	40	60	—	8	30	0.422
40 T10/26-2	26	6F	Al	82.76	80.90	87	30	40	60	—	8	30	0.477
40 T10/27-2	27	6F	Al	85.95	84.10	91	30	40	60	—	8	30	0.536
40 T10/28-2	28	6F	Al	89.13	87.25	93	30	40	60	—	8	30	0.540
40 T10/30-2	30	6F	Al	95.49	93.65	97	30	40	60	—	8	30	0.640
40 T10/32-2	32	6F	Al	101.86	100.00	106	30	40	65	—	10	32	0.693
40 T10/36-2	36	6F	Al	114.59	112.75	119	30	40	70	—	10	35	0.873
40 T10/40-2	40	6F	Al	127.32	125.45	131	30	40	80	—	10	40	1.067
40 T10/44-0	44	6	Al	140.06	138.20	—	30	40	88	—	10	46	1.350
40 T10/48-0	48	6	Al	152.78	150.95	—	30	40	95	—	16	48	1.516
40 T10/60-0	60	6	Al	190.98	189.10	—	30	40	110	—	16	60	2.339

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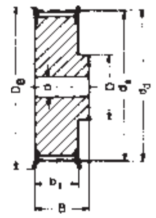

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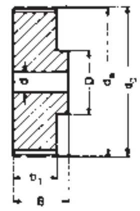

Type 6

Section T10 – Pitch 10 mm for belt width 32 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
47 T10/18-2	18	6F	Al	57.29	55.45	60	37	47	40	—	10	22	0.253
47 T10/19-2	19	6F	Al	60.48	58.60	66	37	47	44	—	10	22	0.286
47 T10/20-2	20	6F	Al	63.66	61.80	66	37	47	46	—	12	24	0.322
47 T10/22-2	22	6F	Al	70.03	68.15	75	37	47	52	—	12	28	0.393
47 T10/24-2	24	6F	Al	76.39	74.55	83	37	47	58	—	12	30	0.475
47 T10/25-2	25	6F	Al	79.58	77.70	83	37	47	60	—	12	30	0.527
47 T10/26-2	26	6F	Al	82.76	80.90	87	37	47	60	—	12	30	0.564
47 T10/27-2	27	6F	Al	85.95	84.10	91	37	47	60	—	12	30	0.602
47 T10/28-2	28	6F	Al	89.13	87.25	93	37	47	60	—	12	30	0.642
47 T10/30-2	30	6F	Al	95.49	93.65	97	37	47	60	—	12	30	0.740
47 T10/32-2	32	6F	Al	101.86	100.00	106	37	47	65	—	12	32	0.844
47 T10/36-2	36	6F	Al	114.59	112.75	119	37	47	70	—	16	35	1.083
47 T10/40-2	40	6F	Al	127.32	125.45	131	37	47	80	—	16	40	1.317
47 T10/44-0	44	6	Al	140.06	138.20	—	37	47	88	—	16	46	1.611
47 T10/48-0	48	6	Al	152.78	150.95	—	37	47	95	—	16	48	1.931
47 T10/60-0	60	6	Al	190.98	189.10	—	37	47	110	—	16	60	3.004

Section T10 – Pitch 10 mm for belt width 50 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	D_i (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
66 T10/18-2	18	6F	Al	57.29	55.45	60	56	66	40	—	10	22	0.422
66 T10/19-2	19	6F	Al	60.48	58.60	66	56	66	44	—	10	22	0.466
66 T10/20-2	20	6F	Al	63.66	61.80	66	56	66	46	—	12	24	0.520
66 T10/22-2	22	6F	Al	70.03	68.15	75	56	66	52	—	12	28	0.570
66 T10/24-2	24	6F	Al	76.39	74.55	83	56	66	58	—	12	30	0.736
66 T10/25-2	25	6F	Al	79.58	77.70	83	56	66	60	—	12	30	0.766
66 T10/26-2	26	6F	Al	82.76	80.90	87	56	66	60	—	12	30	0.816
66 T10/27-2	27	6F	Al	85.95	84.10	91	56	66	60	—	12	30	0.946
66 T10/28-2	28	6F	Al	89.13	87.25	93	56	66	60	—	12	30	0.960
66 T10/30-2	30	6F	Al	95.49	93.65	97	56	66	60	—	12	30	1.169
66 T10/32-2	32	6F	Al	101.86	100.00	106	56	66	65	—	12	32	1.300
66 T10/36-2	36	6F	Al	114.59	112.75	119	56	66	70	—	16	35	1.637
66 T10/40-2	40	6F	Al	127.32	125.45	131	56	66	80	—	16	40	1.999
66 T10/44-0	44	6	Al	140.06	138.20	—	56	66	88	—	16	46	2.357
66 T10/48-0	48	6	Al	152.78	150.95	—	56	66	95	—	16	48	2.830
66 T10/60-0	60	6	Al	190.98	189.10	—	56	66	110	—	16	60	4.366

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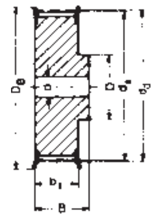

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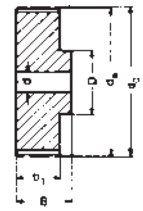


Type 6

Section AT5 – Pitch 5 mm for belt width 10 mm

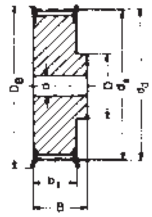
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
21 AT5/12-2	12	6F	Al	19.01	17.85	23.0	15	21	10	—	6	0.016
21 AT5/14-2	14	6F	Al	22.29	21.05	25.0	15	21	13	—	8	0.019
21 AT5/15-2	15	6F	Al	23.88	22.65	28.0	15	21	16	6	10	0.021
21 AT5/16-2	16	6F	Al	25.47	24.20	32.0	15	21	18	6	11	0.025
21 AT5/18-2	18	6F	Al	28.65	27.40	32.0	15	21	19	6	12	0.031
21 AT5/19-2	19	6F	Al	30.25	29.00	36.0	15	21	22	6	12	0.036
21 AT5/20-2	20	6F	Al	31.83	30.60	36.0	15	21	23	6	14	0.038
21 AT5/22-2	22	6F	Al	35.12	33.85	38.0	15	21	24	6	15	0.046
21 AT5/24-2	24	6F	Al	38.21	37.00	42.0	15	21	26	6	15	0.054
21 AT5/25-2	25	6F	Al	39.80	38.60	44.0	15	21	26	6	15	0.058
21 AT5/26-2	26	6F	Al	41.47	40.20	44.0	15	21	26	6	16	0.062
21 AT5/27-2	27	6F	Al	42.98	41.80	48.0	15	21	30	8	18	0.064
21 AT5/28-2	28	6F	Al	44.62	43.35	48.0	15	21	32	8	18	0.071
21 AT5/30-2	30	6F	Al	47.76	46.55	51.0	15	21	34	8	18	0.075
21 AT5/32-2	32	6F	Al	50.94	49.70	54.0	15	21	38	8	22	0.088
21 AT5/36-2	36	6F	Al	57.31	56.05	63.0	15	21	38	8	22	0.114
21 AT5/40-2	40	6F	Al	63.66	62.45	66.0	15	21	40	8	23	0.138
21 AT5/42-2	42	6F	Al	66.87	65.60	71.0	15	21	40	8	24	0.180
21 AT5/44-0	44	6	Al	70.07	68.80	—	15	21	45	8	26	0.185
21 AT5/48-0	48	6	Al	76.42	75.15	—	15	21	50	8	28	0.200
21 AT5/60-0	60	6	Al	95.52	94.25	—	15	21	65	8	35	0.307

Section AT5 – Pitch 5 mm for belt width 16 mm

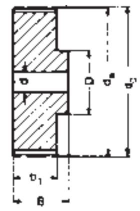
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
27 AT5/12-2	12	6F	Al	19.01	17.85	23.0	21	27	10	—	6	0.022
27 AT5/14-2	14	6F	Al	22.29	21.05	25.0	21	27	13	—	8	0.026
27 AT5/15-2	15	6F	Al	23.88	22.65	28.0	21	27	16	6	10	0.029
27 AT5/16-2	16	6F	Al	25.47	24.20	32.0	21	27	18	6	11	0.035
27 AT5/18-2	18	6F	Al	28.65	27.40	32.0	21	27	19	6	12	0.043
27 AT5/19-2	19	6F	Al	30.25	29.00	36.0	21	27	22	6	12	0.049
27 AT5/20-2	20	6F	Al	31.83	30.60	36.0	21	27	23	6	14	0.053
27 AT5/22-2	22	6F	Al	35.12	33.85	38.0	21	27	24	6	15	0.054
27 AT5/24-2	24	6F	Al	38.21	37.00	42.0	21	27	26	6	15	0.076
27 AT5/25-2	25	6F	Al	39.80	38.60	44.0	21	27	26	6	15	0.081
27 AT5/26-2	26	6F	Al	41.47	40.20	44.0	21	27	26	6	16	0.085
27 AT5/27-2	27	6F	Al	42.98	41.80	48.0	21	27	30	8	18	0.090
27 AT5/28-2	28	6F	Al	44.62	43.35	48.0	21	27	32	8	18	0.092
27 AT5/30-2	30	6F	Al	47.76	46.55	51.0	21	27	34	8	18	0.105
27 AT5/32-2	32	6F	Al	50.94	49.70	54.0	21	27	38	8	22	0.123
27 AT5/36-2	36	6F	Al	57.31	56.05	63.0	21	27	38	8	22	0.160
27 AT5/40-2	40	6F	Al	63.66	62.45	66.0	21	27	40	8	23	0.193
27 AT5/42-2	42	6F	Al	66.87	65.60	71.0	21	27	40	8	24	0.205
27 AT5/44-0	44	6	Al	70.07	68.80	—	21	27	45	8	26	0.228
27 AT5/48-0	48	6	Al	76.42	75.15	—	21	27	50	8	28	0.280
27 AT5/60-0	60	6	Al	95.52	94.25	—	21	27	65	8	35	0.430

Al = Aluminium

optibelt *ZRS* Metric timing belt pulleys for plain boring



Type 6F

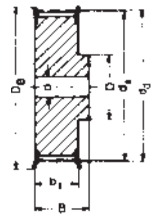


Type 6

Section AT5 – Pitch 5 mm for belt width 25 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
36 AT5/12-2	12	6F	Al	19.01	17.85	23.0	30	36	10	—	6	0.031
36 AT5/14-2	14	6F	Al	22.29	21.05	25.0	30	36	13	—	8	0.037
36 AT5/15-2	15	6F	Al	23.88	22.65	28.0	30	36	16	6	10	0.041
36 AT5/16-2	16	6F	Al	25.47	24.20	32.0	30	36	18	6	11	0.050
36 AT5/18-2	18	6F	Al	28.65	27.40	32.0	30	36	19	6	12	0.061
36 AT5/19-2	19	6F	Al	30.25	29.00	36.0	30	36	22	6	12	0.070
36 AT5/20-2	20	6F	Al	31.83	30.60	36.0	30	36	23	6	14	0.076
36 AT5/22-2	22	6F	Al	35.12	33.85	38.0	30	36	24	6	15	0.080
36 AT5/24-2	24	6F	Al	38.21	37.00	42.0	30	36	26	8	15	0.109
36 AT5/25-2	25	6F	Al	39.80	38.60	44.0	30	36	26	8	15	0.116
36 AT5/26-2	26	6F	Al	41.47	40.20	44.0	30	36	26	8	16	0.120
36 AT5/27-2	27	6F	Al	42.98	41.80	48.0	30	36	30	8	18	0.128
36 AT5/28-2	28	6F	Al	44.62	43.35	48.0	30	36	32	8	18	0.135
36 AT5/30-2	30	6F	Al	47.76	46.55	51.0	30	36	34	8	18	0.150
36 AT5/32-2	32	6F	Al	50.94	49.70	54.0	30	36	38	8	22	0.176
36 AT5/36-2	36	6F	Al	57.31	56.05	63.0	30	36	38	8	22	0.230
36 AT5/40-2	40	6F	Al	63.66	62.45	66.0	30	36	40	8	23	0.276
36 AT5/42-2	42	6F	Al	66.87	65.60	71.0	30	36	40	8	24	0.284
36 AT5/44-0	44	6	Al	70.07	68.80	—	30	36	45	8	26	0.315
36 AT5/48-0	48	6	Al	76.42	75.15	—	30	36	50	8	28	0.400
36 AT5/60-0	60	6	Al	95.52	94.25	—	30	36	65	8	35	0.614

Al = Aluminium We reserve the right to make technical changes.



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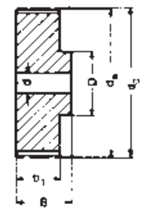


Type 6

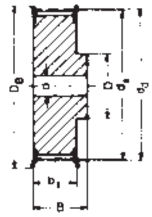
Section AT10 – Pitch 10 mm for belt width 16 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
31 AT10/15-2	15	6F	Al	47.75	45.90	51	21	31	32	8	18	0.116
31 AT10/16-2	16	6F	Al	50.93	49.05	54	21	31	35	8	20	0.134
31 AT10/18-2	18	6F	Al	57.29	55.45	60	21	31	40	8	22	0.167
31 AT10/19-2	19	6F	Al	60.48	58.60	66	21	31	44	8	22	0.184
31 AT10/20-2	20	6F	Al	63.66	61.80	66	21	31	46	8	24	0.208
31 AT10/22-2	22	6F	Al	70.03	68.15	75	21	31	52	8	28	0.253
31 AT10/24-2	24	6F	Al	76.39	74.55	83	21	31	58	8	30	0.288
31 AT10/25-2	25	6F	Al	79.58	77.70	83	21	31	60	8	30	0.310
31 AT10/26-2	26	6F	Al	82.76	80.90	87	21	31	60	8	30	0.357
31 AT10/27-2	27	6F	Al	85.95	84.10	91	21	31	60	8	30	0.364
31 AT10/28-2	28	6F	Al	89.13	87.25	93	21	31	60	8	30	0.401
31 AT10/30-2	30	6F	Al	95.49	93.65	97	21	31	60	8	30	0.441
31 AT10/32-2	32	6F	Al	101.86	100.00	106	21	31	65	10	32	0.493
31 AT10/36-2	36	6F	Al	114.59	112.75	119	21	31	70	10	35	0.623
31 AT10/40-2	40	6F	Al	127.32	125.45	131	21	31	80	10	40	0.767
31 AT10/44-0	44	6	Al	140.06	138.20	—	21	31	88	10	46	0.993
31 AT10/48-0	48	6	Al	152.78	150.95	—	21	31	95	16	48	1.090
31 AT10/60-0	60	6	Al	190.98	189.10	—	21	31	110	16	60	1.710

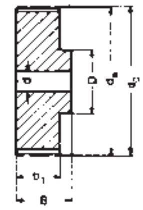
Section AT10 – Pitch 10 mm for belt width 25 mm

Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
40 AT10/15-2	15	6F	Al	47.75	45.90	51	30	40	32	8	18	0.152
40 AT10/16-2	16	6F	Al	50.93	49.05	54	30	40	35	8	20	0.176
40 AT10/18-2	18	6F	Al	57.29	55.45	60	30	40	40	8	22	0.224
40 AT10/19-2	19	6F	Al	60.48	58.60	66	30	40	44	8	22	0.247
40 AT10/20-2	20	6F	Al	63.66	61.80	66	30	40	46	8	24	0.276
40 AT10/22-2	22	6F	Al	70.03	68.15	75	30	40	52	8	28	0.337
40 AT10/24-2	24	6F	Al	76.39	74.55	83	30	40	58	8	30	0.392
40 AT10/25-2	25	6F	Al	79.58	77.70	83	30	40	60	8	30	0.422
40 AT10/26-2	26	6F	Al	82.76	80.90	87	30	40	60	8	30	0.477
40 AT10/27-2	27	6F	Al	85.95	84.10	91	30	40	60	8	30	0.536
40 AT10/28-2	28	6F	Al	89.13	87.25	93	30	40	60	8	30	0.540
40 AT10/30-2	30	6F	Al	95.49	93.65	97	30	40	60	8	30	0.640
40 AT10/32-2	32	6F	Al	101.86	100.00	106	30	40	65	10	32	0.693
40 AT10/36-2	36	6F	Al	114.59	112.75	119	30	40	70	10	35	0.873
40 AT10/40-2	40	6F	Al	127.32	125.45	131	30	40	80	10	40	1.067
40 AT10/44-0	44	6	Al	140.06	138.20	—	30	40	88	10	46	1.350
40 AT10/48-0	48	6	Al	152.78	150.95	—	30	40	95	16	48	1.516
40 AT10/60-0	60	6	Al	190.98	189.10	—	30	40	110	16	60	2.339

Al = Aluminium   We reserve the right to make technical changes.



Type 6F

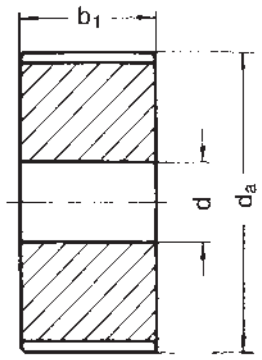


Type 6

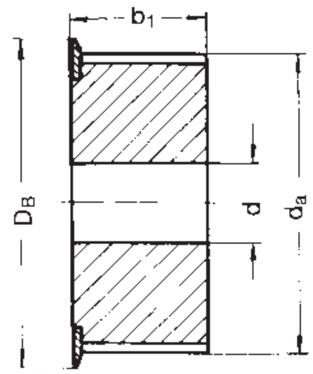
Part No.	No. of teeth	Type	Material	d_d (mm)	d_a (mm)	D_B (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot bore d (mm)	Finished bore d_{max} (mm)	Weight (≈ kg)
Section AT10 – Pitch 10 mm for belt width 32 mm												
47 AT10/18-2	18	6F	Al	57.29	55.45	60	37	47	40	10	22	0.253
47 AT10/19-2	19	6F	Al	60.48	58.60	66	37	47	44	10	22	0.286
47 AT10/20-2	20	6F	Al	63.66	61.80	66	37	47	46	12	24	0.322
47 AT10/22-2	22	6F	Al	70.03	68.15	75	37	47	52	12	28	0.393
47 AT10/24-2	24	6F	Al	76.39	74.55	83	37	47	58	12	30	0.475
47 AT10/25-2	25	6F	Al	79.58	77.70	83	37	47	60	12	30	0.527
47 AT10/26-2	26	6F	Al	82.76	80.90	87	37	47	60	12	30	0.564
47 AT10/27-2	27	6F	Al	85.95	84.10	91	37	47	60	12	30	0.602
47 AT10/28-2	28	6F	Al	89.13	87.25	93	37	47	60	12	30	0.642
47 AT10/30-2	30	6F	Al	95.49	93.65	97	37	47	60	12	30	0.740
47 AT10/32-2	32	6F	Al	101.86	100.00	106	37	47	65	12	32	0.844
47 AT10/36-2	36	6F	Al	114.59	112.75	119	37	47	70	16	35	1.083
47 AT10/40-2	40	6F	Al	127.32	125.45	131	37	47	80	16	40	1.317
47 AT10/44-0	44	6	Al	140.06	138.20	—	37	47	88	16	46	1.611
47 AT10/48-0	48	6	Al	152.78	150.95	—	37	47	95	16	48	1.931
47 AT10/60-0	60	6	Al	190.98	189.10	—	37	47	110	16	60	3.004
Section AT10 – Pitch 10 mm for belt width 50 mm												
66 AT10/18-2	18	6F	Al	57.29	55.45	60	56	66	40	10	22	0.422
66 AT10/19-2	19	6F	Al	60.48	58.60	66	56	66	44	10	22	0.466
66 AT10/20-2	20	6F	Al	63.66	61.80	66	56	66	46	12	24	0.520
66 AT10/22-2	22	6F	Al	70.03	68.15	75	56	66	52	12	28	0.570
66 AT10/24-2	24	6F	Al	76.39	74.55	83	56	66	58	12	30	0.736
66 AT10/25-2	25	6F	Al	79.58	77.70	83	56	66	60	12	30	0.766
66 AT10/26-2	26	6F	Al	82.76	80.90	87	56	66	60	12	30	0.816
66 AT10/27-2	27	6F	Al	85.95	84.10	91	56	66	60	12	30	0.946
66 AT10/28-2	28	6F	Al	89.13	87.25	93	56	66	60	12	30	0.960
66 AT10/30-2	30	6F	Al	95.49	93.65	97	56	66	60	12	30	1.169
66 AT10/32-2	32	6F	Al	101.86	100.00	106	56	66	65	12	32	1.300
66 AT10/36-2	36	6F	Al	114.59	112.75	119	56	66	70	16	35	1.637
66 AT10/40-2	40	6F	Al	127.32	125.45	131	56	66	80	16	40	1.999
66 AT10/44-0	44	6	Al	140.06	138.20	—	56	66	88	16	46	2.357
66 AT10/48-0	48	6	Al	152.78	150.95	—	56	66	95	16	48	2.830
66 AT10/60-0	60	6	Al	190.98	189.10	—	56	66	110	16	60	4.366

Al = Aluminium We reserve the right to make technical changes.

optibelt *ZRS* Recommended pulleys – special constructions



Type OB



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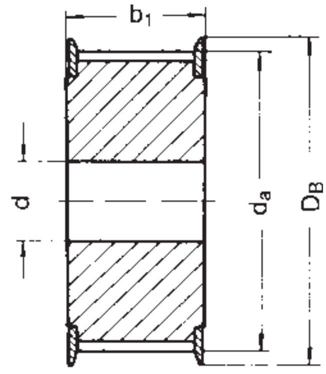

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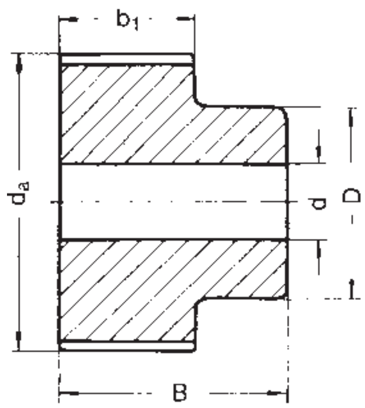

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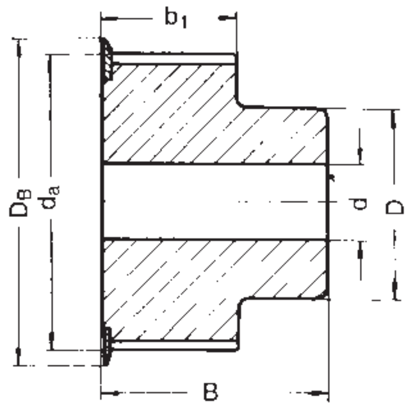

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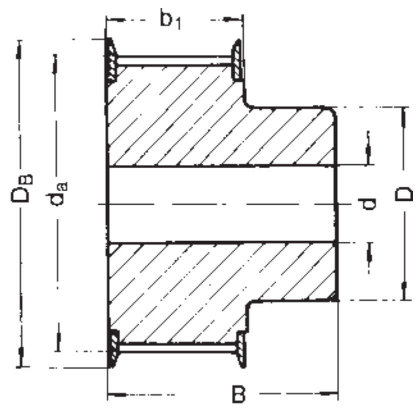


Type ZBN

Materials

Steel, cast iron, aluminium;
other materials on request.
For speeds > 30 m/s, do not use cast iron pulleys.

Bores

All pulleys are pilot bored. Finish bores when specified have H7 tolerances.

Dimensions

The dimensions should be taken from pages 48 and 49.

Explanation of abbreviations

OB = without flanges

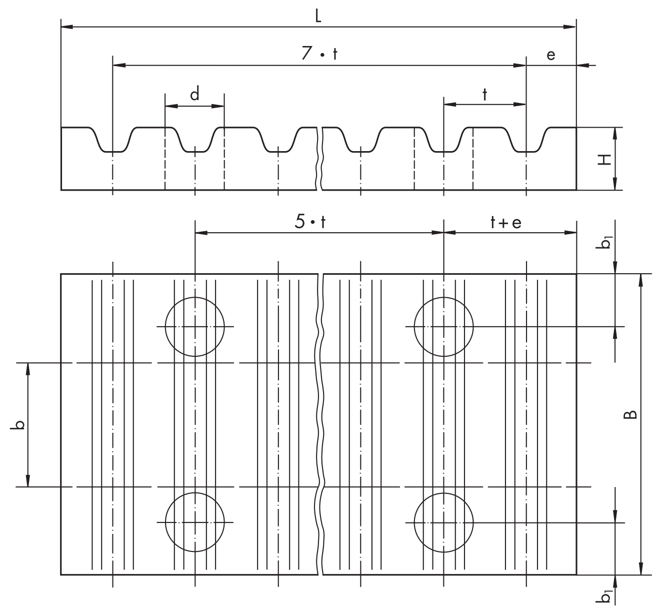
EB = one flange

ZB = two flanges

OBN = without flanges with hub

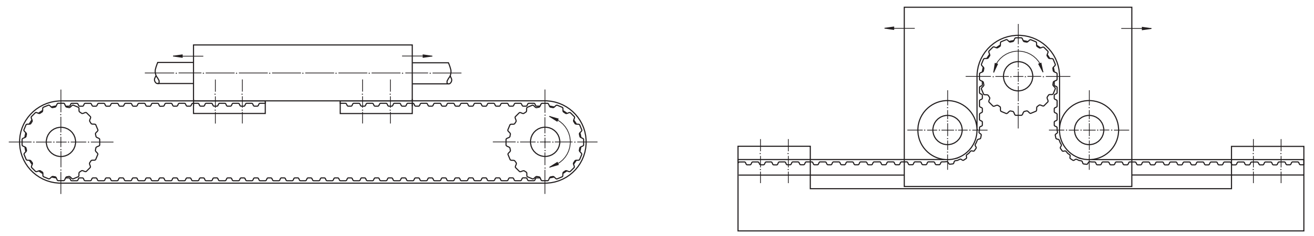
EBN = one flange with hub

ZBN = two flanges with hub



Designation	Pitch t (mm)	width b (mm)	Material	B (mm)	b_1 (mm)	L (mm)	e (mm)	H (mm)	d (mm)	Weight (≈ kg)
CP-XL 025	5.080	6.35	Al	25.5	6.0	42.5	3.5	8.0	5.5	0.020
CP-XL 037	5.080	9.53	Al	28.5	6.0	42.5	3.5	8.0	5.5	0.025
CP-XL 050	5.080	12.70	Al	32.0	6.0	42.5	3.5	8.0	5.5	0.027
CP-XL 075	5.080	19.05	Al	38.0	6.0	42.5	3.5	8.0	5.5	0.032
CP-XL 100•	5.080	25.40	Al	45.0	6.0	42.5	3.5	8.0	5.5	0.038
CP-L 037	9.525	9.53	Al	36.0	8.0	76.6	5.0	15.0	9.0	0.095
CP-L 050	9.525	12.70	Al	39.0	8.0	76.6	5.0	15.0	9.0	0.104
CP-L 075	9.525	19.05	Al	45.0	8.0	76.6	5.0	15.0	9.0	0.121
CP-L 100	9.525	25.40	Al	51.5	8.0	76.6	5.0	15.0	9.0	0.140
CP-L 150	9.525	38.10	Al	64.0	8.0	76.6	5.0	15.0	9.0	0.177
CP-L 200	9.525	50.80	Al	77.0	8.0	76.6	5.0	15.0	9.0	0.215
CP-H 050	12.700	12.70	Al	45.0	10.0	106.9	9.0	22.0	11.0	0.050
CP-H 075	12.700	19.05	Al	51.0	10.0	106.9	9.0	22.0	11.0	0.075
CP-H 100	12.700	25.40	Al	57.5	10.0	106.9	9.0	22.0	11.0	0.100
CP-H 150	12.700	38.10	Al	70.0	10.0	106.9	9.0	22.0	11.0	0.150
CP-H 200	12.700	50.80	Al	83.0	10.0	106.9	9.0	22.0	11.0	0.200
CP-H 300	12.700	76.20	Al	108.0	10.0	106.9	9.0	22.0	11.0	0.300
CP-H 400•	12.700	101.60	Al	134.0	10.0	106.9	9.0	22.0	11.0	0.400
CP-5M 06	5.000	6.00	Al	25.0	6.0	41.8	3.2	8.0	5.5	0.015
CP-5M 09	5.000	9.00	Al	28.0	6.0	41.8	3.2	8.0	5.5	0.018
CP-5M 15	5.000	15.00	Al	34.0	6.0	41.8	3.2	8.0	5.5	0.022
CP-5M 25	5.000	25.00	Al	44.0	6.0	41.8	3.2	8.0	5.5	0.030
CP-8M 10	8.000	10.00	Al	35.0	8.0	66.0	5.0	15.0	9.0	0.075
CP-8M 15	8.000	15.00	Al	40.0	8.0	66.0	5.0	15.0	9.0	0.085
CP-8M 20	8.000	20.00	Al	45.0	8.0	66.0	5.0	15.0	9.0	0.100
CP-8M 30	8.000	30.00	Al	55.0	8.0	66.0	5.0	15.0	9.0	0.120
CP-8M 50	8.000	50.00	Al	75.0	8.0	66.0	5.0	15.0	9.0	0.170
CP-8M 85	8.000	85.00	Al	110.0	8.0	66.0	5.0	15.0	9.0	0.250
CP-14M 25	14.000	25.00	Al	56.0	10.0	116.0	9.0	22.0	11.0	0.315
CP-14M 40	14.000	40.00	Al	71.0	10.0	116.0	9.0	22.0	11.0	0.405
CP-14M 55	14.000	55.00	Al	86.0	10.0	116.0	9.0	22.0	11.0	0.495
CP-14M 85	14.000	85.00	Al	116.0	10.0	116.0	9.0	22.0	11.0	0.860
CP-14M 115•	14.000	115.00	Al	146.0	10.0	116.0	9.0	22.0	11.0	1.195

Further sizes on request. • Non stock items Al = Aluminium



Designation	Pitch t (mm)	Belt width b (mm)	Material	B (mm)	b_1 (mm)	L (mm)	e (mm)	H (mm)	d (mm)	Weight (≈ kg)
CP- 6 T5	5.000	6.00	Al	25.0	6.0	41.8	3.2	8.0	5.5	0.020
CP- 10 T5	5.000	10.00	Al	29.0	6.0	41.8	3.2	8.0	5.5	0.025
CP- 16 T5	5.000	16.00	Al	35.0	6.0	41.8	3.2	8.0	5.5	0.030
CP- 25 T5	5.000	25.00	Al	44.0	6.0	41.8	3.2	8.0	5.5	0.036
CP- 32 T5	5.000	32.00	Al	51.0	6.0	41.8	3.2	8.0	5.5	0.042
CP- 50 T5 •	5.000	50.00	Al	69.0	6.0	41.8	3.2	8.0	5.5	0.051
CP- 16 T10	10.000	16.00	Al	41.0	8.0	80.0	5.0	15.0	9.0	0.115
CP- 25 T10	10.000	25.00	Al	50.0	8.0	80.0	5.0	15.0	9.0	0.140
CP- 32 T10	10.000	32.00	Al	57.0	8.0	80.0	5.0	15.0	9.0	0.160
CP- 50 T10	10.000	50.00	Al	75.0	8.0	80.0	5.0	15.0	9.0	0.215
CP- 75 T10 •	10.000	75.00	Al	100.0	8.0	80.0	5.0	15.0	9.0	0.290
CP-100 T10 •	10.000	100.00	Al	125.0	8.0	80.0	5.0	15.0	9.0	0.370
CP- 25 T20	20.000	25.00	Al	56.0	10.0	160.0	10.0	20.0	11.0	0.385
CP- 32 T20	20.000	32.00	Al	65.0	10.0	160.0	10.0	20.0	11.0	0.450
CP- 50 T20	20.000	50.00	Al	81.0	10.0	160.0	10.0	20.0	11.0	0.570
CP- 75 T20	20.000	75.00	Al	106.0	10.0	160.0	10.0	20.0	11.0	0.755
CP-100 T20 •	20.000	100.00	Al	132.0	10.0	160.0	10.0	20.0	11.0	0.940
CP- 6 AT5	5.000	6.00	Al	25.0	6.0	41.8	3.2	8.0	5.5	0.016
CP- 10 AT5	5.000	10.00	Al	29.0	6.0	41.8	3.2	8.0	5.5	0.019
CP- 16 AT5	5.000	16.00	Al	35.0	6.0	41.8	3.2	8.0	5.5	0.024
CP- 25 AT5	5.000	25.00	Al	44.0	6.0	41.8	3.2	8.0	5.5	0.031
CP- 32 AT5	5.000	32.00	Al	51.0	6.0	41.8	3.2	8.0	5.5	0.036
CP- 50 AT5 •	5.000	50.00	Al	61.0	6.0	41.8	3.2	8.0	5.5	0.043
CP- 16 AT10	10.000	16.00	Al	41.0	8.0	80.0	5.0	15.0	9.0	0.110
CP- 25 AT10	10.000	25.00	Al	50.0	8.0	80.0	5.0	15.0	9.0	0.135
CP- 32 AT10	10.000	32.00	Al	57.0	8.0	80.0	5.0	15.0	9.0	0.155
CP- 50 AT10	10.000	50.00	Al	75.0	8.0	80.0	5.0	15.0	9.0	0.205
CP- 75 AT10	10.000	75.00	Al	100.0	8.0	80.0	5.0	15.0	9.0	0.280
CP-100 AT10 •	10.000	100.00	Al	125.0	8.0	80.0	5.0	15.0	9.0	0.350
CP- 25 AT20	20.000	25.00	Al	56.0	10.0	160.0	10.0	20.0	11.0	0.385
CP- 32 AT20	20.000	32.00	Al	65.0	10.0	160.0	10.0	20.0	11.0	0.450
CP- 50 AT20	20.000	50.00	Al	81.0	10.0	160.0	10.0	20.0	11.0	0.570
CP- 75 AT20	20.000	75.00	Al	106.0	10.0	160.0	10.0	20.0	11.0	0.755
CP-100 AT20 •	20.000	100.00	Al	132.0	10.0	160.0	10.0	20.0	11.0	0.940

Further sizes on request. • Non stock items Al = Aluminium

optibelt

Power Transmission

ZRM/ZRP Data Sheet

Data for drive design

using optibelt *ZRM/ZRP* timing belts

Company: ______________________

Street address: ______________________

Town/post code: ______________________

Person to be contacted: ______________________

Department: ____________ Date: ____________

Phone: ____________ Fax: ____________

Quantity	Optibelt Type	Designation	Construction
	timing belt		
	driver pulley		
	driven pulley		

for test ☐ new drive ☐

for pilot production ☐ existing drive ☐

for series production ☐ requirement: ________ per annum

The parameters printed below in bold face are the minimum necessary for a drive design, where the other parameters cannot be determined by means of further data. Special conditions or factors should also be noted.

LOAD

DRIVER UNIT

Prime mover (e. g. 3-cyl. diesel): ______________________

Daily operating time: __________ hours

Steady running ☐ Shock or pulsating running ☐

Number of starts/stops per hour ☐

and/or reverses under load: ____________________ per day ☐

Full load starting torque M_A = ________ M_N oder M_A = ________ Nm

Correction factor for starts/stops/reverses under load c_8 = ________

Max. driver power $\mathbf{P_{An}}$ **= _____ kW at $\mathbf{n_1}$ = _____ $\mathbf{min^{-1}}$**

or max. driver torque M_{An} = ______ Nm at n = ______ min^{-1}

DRIVEN UNIT

Driven machine (e. g. milling machine): ______________________

Light duty drive, shock-free and steady running ☐

Medium duty drive, intermittent operation with low to medium shock load ☐

Heavy duty drive, intermittent operation with medium to high shock load ☐

Very heavy duty drive, continuous operation with high shock load ☐

Basic drive service factor c_0 = __________

Max. input drive power P_{Ab} = _____ kW at n_2 = _______ min^{-1}

or max. output drive torque M_{Ab} = _____ Nm at n = _______ min^{-1}

max./min.

driven speed $\mathbf{n_{2max}}$ = _____ min^{-1} / $\mathbf{n_{2min}}$ = _______ min^{-1}

GEOMETRY

Pitch diameter d_{w1} or number of teeth z_1 of driver

pulley d_{w1} = ______ mm or z_1 = ______

Max. o/a width B = ______ mm max. clearance dia. = ______ mm

pilot bored ☐ finish bored with keyway ☐ taper bushed ☐

Bore diameter d = ________ mm Tolerance range: __________

Max. static shaft loading S_a = ________ N

Pitch diameter d_{w2} or number of teeth z_2 of driven

pulley d_{w2} = ______ mm or z_2 = ______

Max. o/a width B = ______ mm max. clearance dia. = ______ mm

pilot bored ☐ finish bored with keyway ☐ taper bushed ☐

Bore diameter d = ________ mm Tolerance range: __________

Max. static shaft loading S_a = ________ N

Drive ratio i = __________ i_{min} = ____________ i_{max} = ____________

Centre distance a = __________ mm a_{min} = ____________ mm a_{max} = ____________ mm

Centres adjustable ☐ or centres not adjustable ☐ then

Tension or guide pulley: inside ☐ Arrangement: slack side ☐

outside ☐ tight side ☐

Pulley d_w = ______________ mm idler and pulley correction factor c_6 = _______

or flat pulley d_a = ______________ mm

OPERATING CONDITIONS

Arrangement of shafts: horizontal ☐ or vertical ☐

Ambient temperature ☐ T = ________ °C T_{min} = ________ °C T_{max} = ________ °C

Normal air humidity ☐ Relative humidity: ________ %

Contaminant (if any): solid ☐ material (e. g. dust, swarf): __________________

liquid ☐ material (e. g. water, oil): __________________

gas ☐ material (e. g. sulphur vapour): __________________

For the design of multiple drive systems, please let us have a sketch with the coordinates of the shafts and the load information for each pulley and idler.

ZRM/ZRP Data Sheet

Notes

optibelt

Power Transmission

ZRL Data Sheet

Data for drive design

with optibelt *ZRL-M* open-ended and optibelt *ZRL-V* joined endless timing belts

Company:

Street address:

Town/post code:

Person to be contacted:

Department: Date:

Phone: Fax:

Quantity	Optibelt Type	Designation	Construction
	timing belt		
	driver pulley		
	guide/idler pulleys		

for test ☐ new drive ☐

for pilot production ☐ existing drive ☐

for series production ☐ requirement: ________ per annum

The parameters printed below in bold face are the minimum necessary for a drive design, where the other parameters cannot be determined by means of further data. Special conditions or factors should also be noted.

LOADS

DRIVER UNIT

Prime mover (e. g. 3-cyl. diesel): ______________________

Daily operating time: ___________ hours

Steady running ☐ shock or pulsating running ☐

Number of starts/stops per hour ☐

and/or reverses under load: per day ☐

Full load starting torque M_A = ________ M_N or M_A = __________ Nm

Correction factor for starts/stops/reverses und load c_8 = ___________

DRIVEN UNIT

Driven machine (e. g. milling machine): ______________________

Light duty drive, shock free and steady running ☐

Medium duty drive, intermittent operation with low to medium shock load ☐

Heavy duty drive, intermittent operation with medium to high shock load ☐

Very heavy duty drive, continuous operation with high shock load ☐

Basic drive service factor c_0 = ___________

Conveyor system ☐

or linear drive system ☐

Direction of motion

horizontal (0°) ☐ vertical (90°) ☐ inclined: __________ °

Circumferential force $\mathbf{S_{n3}}$ = ______ **N** or

Output drive torque M_{Ab} = ______ Nm at d_w = __________ mm

Mass moved m_{tot} = ______ kg

Material conveyed (e. g. workpiece on wood pallet): ______________________

Belt type: Optibelt ZRL-V joined endless timing belt

Optibelt ZRL-M open-ended timing belting

Acceleration/ a_1 = + _____ m/s² Accel. travel s_1 = ______ mm

Deceleration a_2 = – _____ m/s² decel. travel s_2 = ______ mm

Acceleration time t_1 = ______ s decel. time t_2 = ______ s

Conveyor speed v = ______ m/s speed n_1 = _____ min^{-1}

with accumulating conveyor: coeff. of friction, material/belt μ_1 = __________

with conveyor system: coeff. of friction, support or guide rail/belt μ_2 = __________

with linear drive: coeff. of friction, guides μ_2 = __________

GEOMETRY

Pitch diameter d_{w1} or number of teeth z_1 of driver pulley d_{w1} = ______ mm or z_1 = ______

Max. o/a width B = ______ mm max. clearance dia. = ______ mm

pilot bored ☐ finish bored with keyway ☐ taper bushed ☐

Bore diameter d = ______ mm Tolerance range: ___________

Max. static shaft loading S_a = ________ N

Pitch diameter d_{w2} or number of teeth z_2 of driven pulley d_{w2} = ______ mm or z_2 = ______

Max. o/a width B = ______ mm max. clearance dia. = ______ mm

pilot bored ☐ finish bored with keyway ☐ taper bushed ☐

Bore diameter d = ________ mm Tolerance range: ___________

Max. static shaft loading S_a = ________ N

Drive ratio i = ___________ i_{min} = ____________ i_{max} = ___________

Centre distance a = ___________ **mm** a_{min} = ____________ mm a_{max} = ___________ mm

Centres adjustable ☐ or centres not adjustable ☐ then

Tension or guide pulley: inside ☐ Arrangement: slack side ☐

outside ☐ tight side ☐

Pulley d_w = ________________ mm idler and pulley correction factor c_6 = _______

or flat pulley d_a = ________________ mm

OPERATING CONDITIONS

Arrangement of shafts: horizontal ☐ or vertical ☐

Ambient temperature ☐ T = _________ °C T_{min} = _________ °C T_{max} = _________ °C

Normal air humidity ☐ Relative humidity: ________ %

Contaminant (if any): solid ☐ material (e. g. dust, swarf): ______________

liquid ☐ material (e. g. water, oil): ______________

gas ☐ material (e. g. sulphur vapour): ______________

For the design of multiple-pulley drive systems, please let us have a sketch with the coordinates of the shafts and the load information for each pulley and idler.

Power Transmission

ZRL Data Sheet
Notes

The Optibelt offer is aimed exclusively at specialist distributors. Optibelt recommends that its products be used exclusively according to the instructions in the Optibelt documentations. Optibelt will not be held responsible if the products are used in any application for which it was not designed or manufactured. Optibelt would also like to point out its General Terms of Business.

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optibelt
Power Transmission

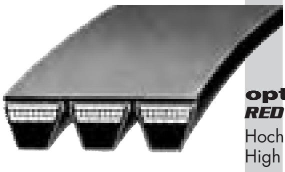
optibelt *VB*
Klassische Keilriemen
Classical V-belts

optibelt *SK*
Schmalkeilriemen
Wedge belts

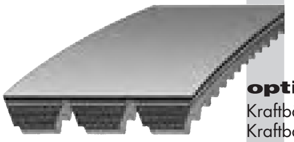
optibelt *RED POWER II*
Hochleistungs-Schmalkeilriemen, wartungsfrei
High performance wedge belts, service-free

optibelt *Super X-POWER M=S*
Keilriemen, flankenoffen, formgezahnt
V-belts, raw edge, moulded cogged

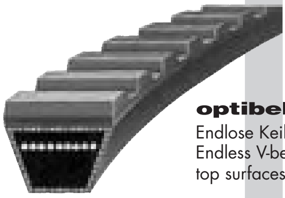
optibelt *KB*
Kraftbänder
Kraftbands



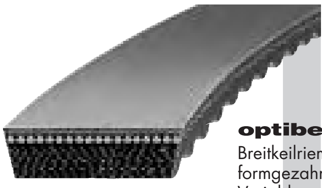
optibelt *KB*
RED POWER II
Hochleistungs-Kraftbänder
High performance kraftbands



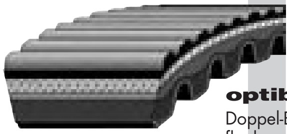
optibelt *KBX*
Kraftbänder, flankenoffen
Kraftbands, raw edge



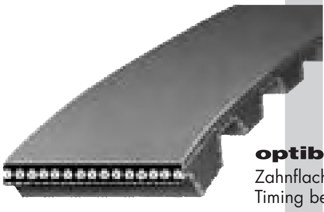
optibelt *PKR*
Endlose Keilriemen mit Auflage
Endless V-belts with special top surfaces



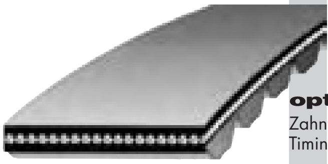
optibelt *SUPER VX*
Breitkeilriemen, flankenoffen, formgezahnt
Variable speed belts, raw edge, moulded cogged



optibelt *SUPER DVX*
Doppel-Breitkeilriemen, flankenoffen, formgezahnt
Double section variable speed belts, raw edge, moulded cogged

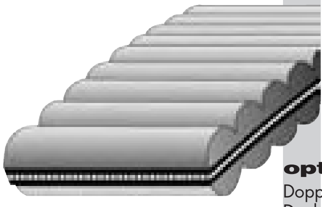


optibelt *ZR*
Zahnflachriemen
Timing belts

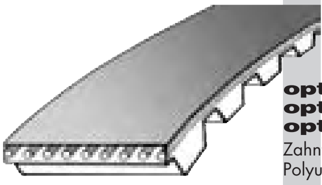


optibelt *OMEGA*
Zahnflachriemen, wartungsfrei
Timing belts, service-free

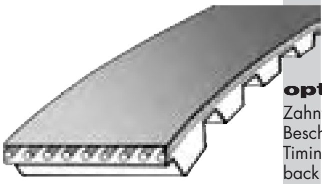
optibelt *OMEGA HL*
optibelt *OMEGA HP*
Hochleistungs-Zahnflachriemen, wartungsfrei
High performance timing belts, service-free



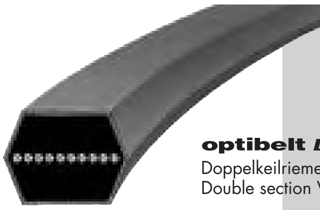
optibelt *HTD® D*
Doppel-Zahnflachriemen
Double section timing belts



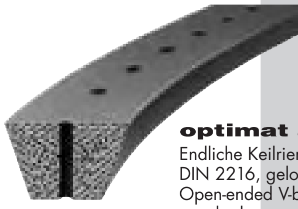
optibelt *ALPHA*
optibelt *ALPHA linear/V*
optibelt *ALPHAflex*
Zahnflachriemen aus Polyurethan
Polyurethane timing belts



optibelt *ALPHA Spezial*
Zahnflachriemen mit Nocken und Beschichtungen
Timing belts with cleats and back coverings



optibelt *DK*
Doppelkeilriemen
Double section V-belts



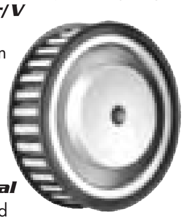
optimat *OE*
Endliche Keilriemen DIN 2216, gelocht
Open-ended V-belting, punched

optibelt *RR*
Kunststoffrundriemen
Plastic round section belting

optibelt *RB*
Rippenbänder
Ribbed belts

optibelt *KK*
Kunststoffkeilriemen
Plastic V-belting

optibelt *KS*
Keilrillenscheiben
V-grooved pulleys



optibelt *ZRS*
Zahnriemenscheiben
Timing belt pulleys

optibelt *RBS*
Rippenbandscheiben
Ribbed belt pulleys

Optibelt GmbH
Postfach 10 01 32 · D-37669 Höxter/Germany · Tel. +49 (0) 52 71 - 6 21 · Fax +49 (0) 52 71 - 97 62 00
info@optibelt.com · www.optibelt.com
Ein Unternehmen der Arntz Optibelt Gruppe · A member of the Arntz Optibelt Group