

Overall catalog



BRECO® - BRECOFLEX® - TIMING BELTS
SYNCHROFLEX® - TIMING BELTS
COMPONENTS



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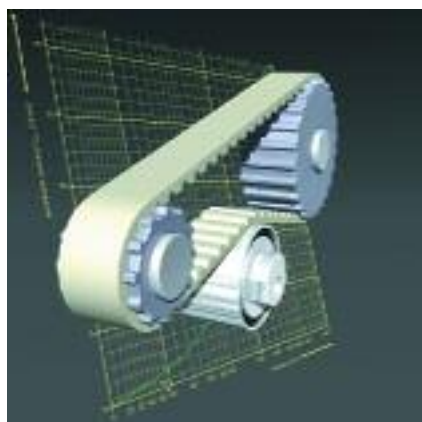
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(BFX = endless BRECOFLEX® TIMING BELTS)
(SFX = endless SYNCHROFLEX® TIMING BELTS)

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(BRECO M = BRECO open length)
(SFX = SYNCHROFLEX® TIMING BELTS)



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(BRECO M = BRECO open length, joined)
 (BFX = endless BRECOFLEX® TIMING BELTS)
 (SFX = endless SYNCHROFLEX® TIMING BELTS)

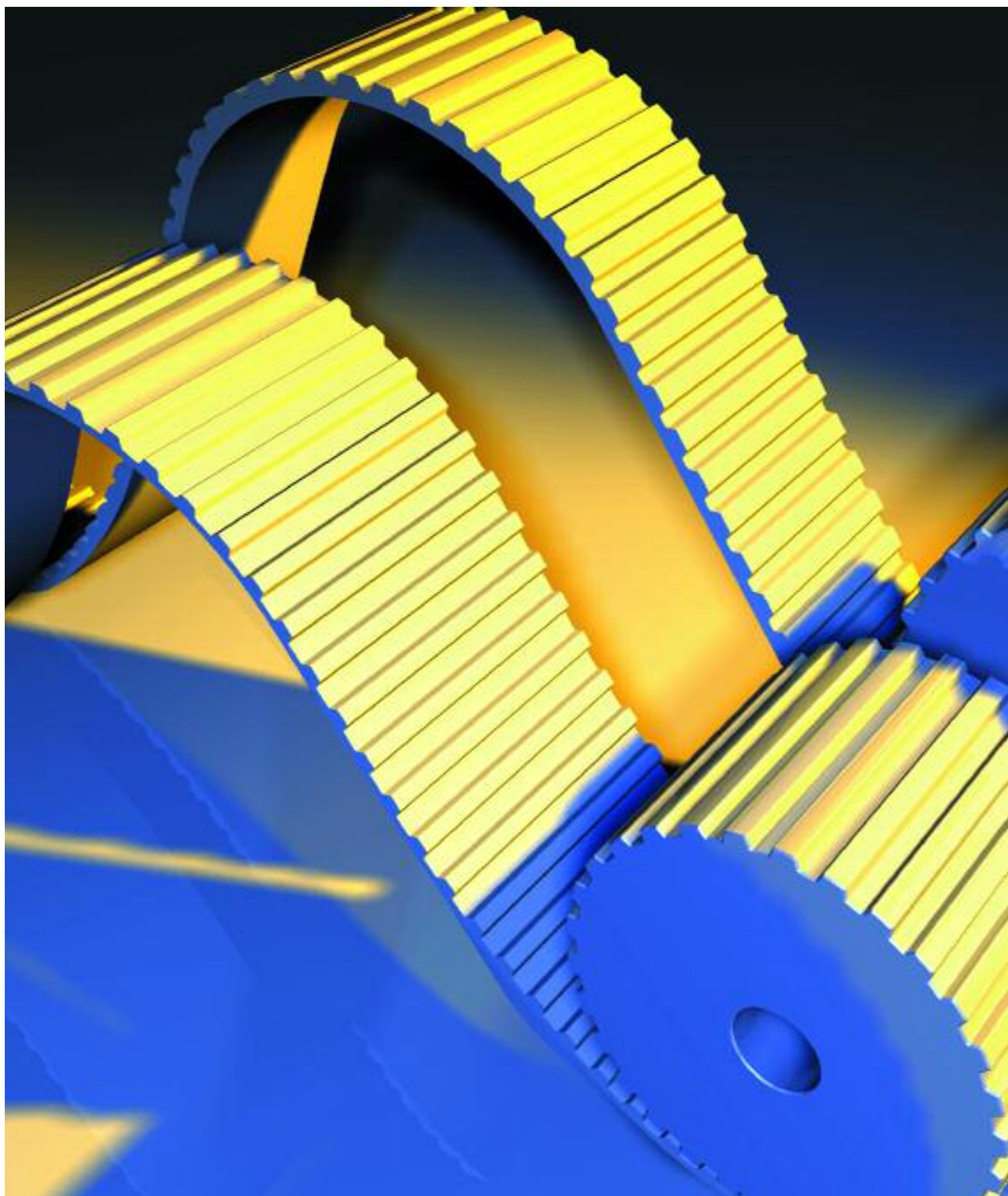
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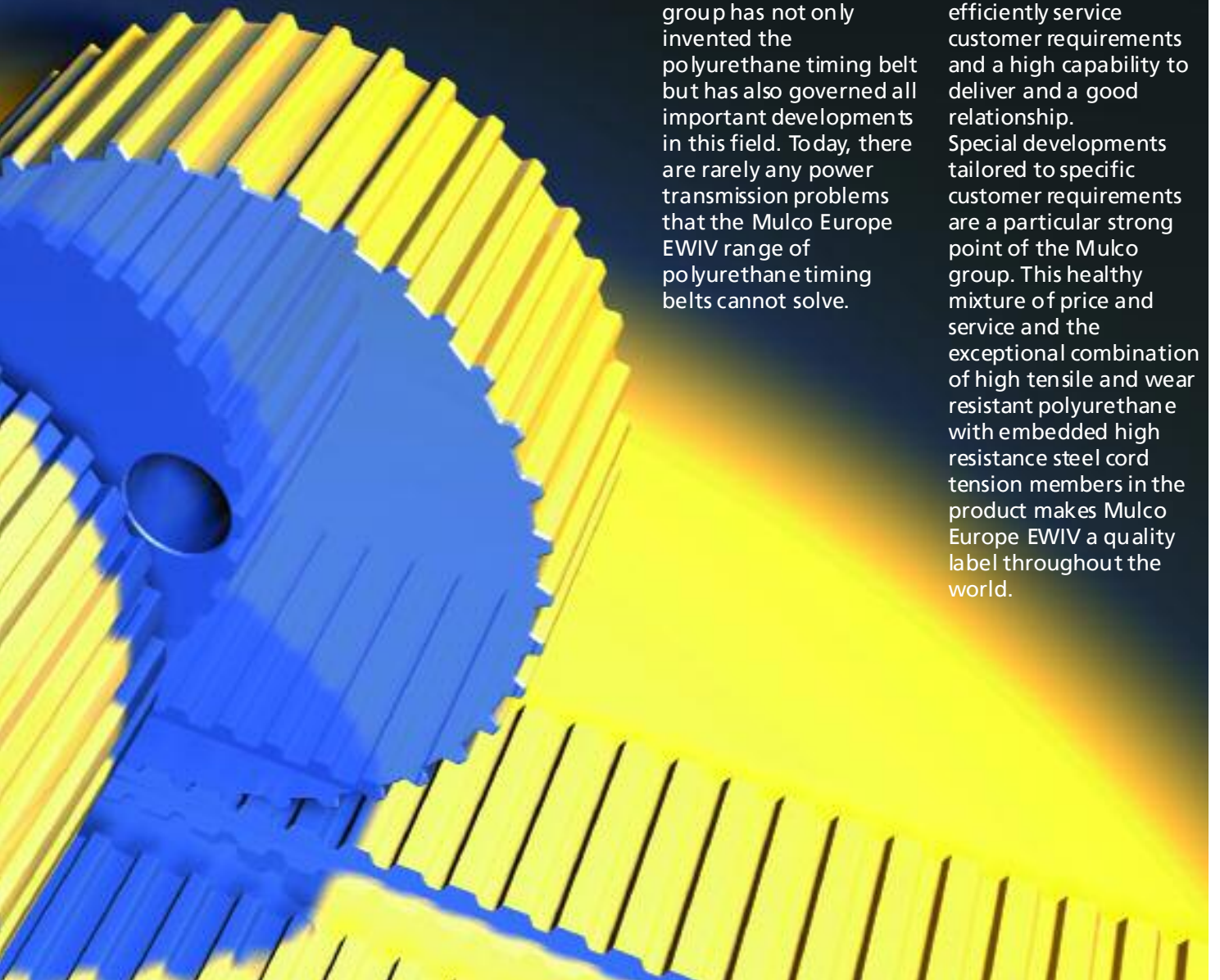
Mulco perfection is our drive.

Continuity, technical know-how and a convincing concept are the characteristics of Mulco-Europe EWIV, Europe's leading group in the field of polyurethane timing belt technology consisting of reputable manufacturers and important sales organisations.

What started as a joint venture, has today become a constructive intermeshed European Interest Association, being one of the most important partners in power transmission solutions for general mechanical engineering worldwide due to high quality, innovational ability and leading technology.

The reputation, enjoyed by the Mulco group of being one of the most innovative and inventive developers in the field of power transmission technology is clearly underlined by the currently 17 European partners, over 600 employees, sales figure of hundreds of millions and a market share of approx. 50%. The Mulco group has not only invented the polyurethane timing belt but has also governed all important developments in this field. Today, there are rarely any power transmission problems that the Mulco Europe EWIV range of polyurethane timing belts cannot solve.

The working principle „from the market for the market“, the focus on first class consultancy and the philosophy of a close relationship to the customer have been successfully established. Perfect logistics, a comprehensive range of accessories and a wide range of standard sizes held in stock are the ideal prerequisites to efficiently service customer requirements and a high capability to deliver and a good relationship. Special developments tailored to specific customer requirements are a particular strong point of the Mulco group. This healthy mixture of price and service and the exceptional combination of high tensile and wear resistant polyurethane with embedded high resistance steel cord tension members in the product makes Mulco Europe EWIV a quality label throughout the world.





Mulco belt-pilot - the online support at www.mulco.de

Many people talk about being close to the customer, but we are there. Consulting before the start of design has always been a major part of the secret of Mulco-Europe EWIV's success. Now this customer-oriented approach has been taken a decisial step further with the Mulco belt-pilot. As from now, the interactive Internet service will enable you to process customized design solutions online - round the clock the whole year through.



The Mulco belt-pilot product catalog

Whether drive, linear or transport technology or components are concerned, the Mulco belt-pilot gives you access to all necessary product information in every field.



The Mulco belt-pilot CAD download

The use of our CAD download is free of charge and allows you to copy our timing belts and components into your CAD system.

Calculation using the Mulco belt-pilot

Determining the number of teeth, configuring the belt width or calculating the diameter of pulleys - the versatile Mulco belt-pilot calculation options will help you quickly find the right answers.



E-Mail enquiries using the Mulco belt-pilot

Do you need any more information about products or calculations? In this case, just contact us by e-mail. Your e-mail enquiries will be immediately forwarded to a Mulco partner in your region.



Mulco belt-pilot - informative, easy and quick

The use of all program components are free of charge. The easy system operation supports you in quickly finding the correct timing belt and the corresponding components such as pulleys. A video animation provides you with an overview of the system and explains all program functions.

The manufacturers

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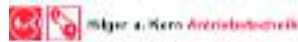


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BRECO Antriebstechnik Breher GmbH & Co.

Innovation is our drive - this principle marks BRECO Antriebstechnik Breher GmbH & Co., manufacturer of BRECO®-and BRECOFLEX®-TIMING BELTS as the most innovative producer in the field of polyurethane timing belt technology worldwide. The basis for a high-quality and reliable product is provided by wear resistant polyurethane for the belt body and high tensile steel cord tension members.

The name BRECO became the synonym for polyurethane timing belts resulting from years of experience in the field of thermoplastic polyurethane, the development of BRECO® and BRECOFLEX® manufacturing processes and their application.

Close co-operation with all Mulco Europe EWIV partners forms the basis for individual technical application solutions.

Over 220 employees in Porta Westfalica produce timing belts, transport V-belts, flat and special belts together with pulleys and attendant components. One strong point is the development and production of special belts for various application fields. The large number of belt coatings and the most varied shape of flights open up an extremely broad application field for BRECO®- and BRECOFLEX®- TIMING BELTS.

Our target is to meet the requirements of our customers.



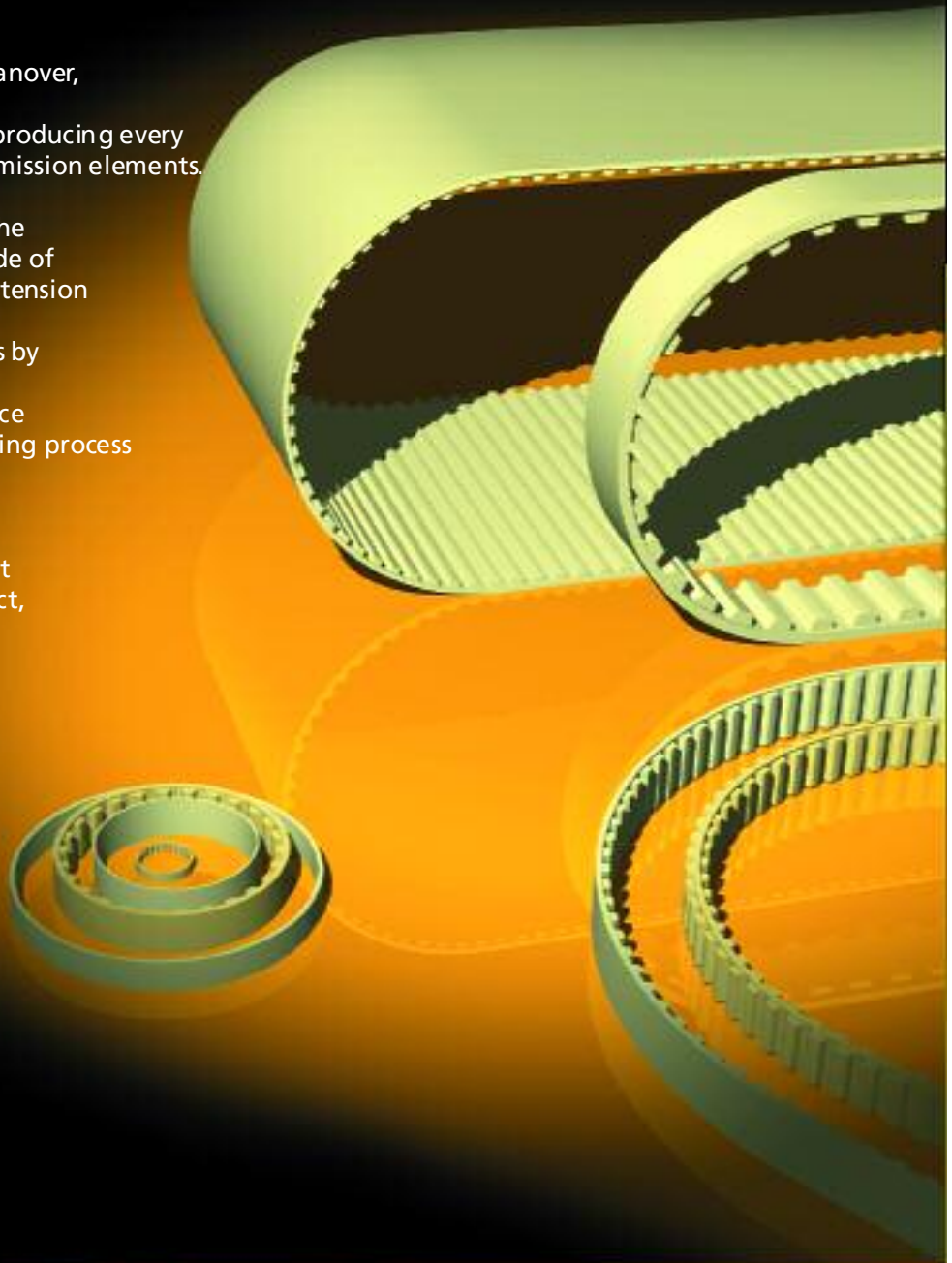
ContiTech Antriebssysteme GmbH

The SYNCHROFLEX[®] TIMING BELT reflects the competency of the ContiTech business field of power transmission systems providing a complete range of power transmission belts made of rubber as well as polyurethane and counting among the leading development partners for notable companies worldwide.

In the production plants in Hanover, Dannenberg and Wigan (GB) approx. 1200 employees are producing every day over 250000 power transmission elements.

Continental AG has marked the origin for the timing belt made of polyurethane with steel cord tension members. This timing belt still convinces by its high technological standard. The quality assurance integrated in the manufacturing process ensures reproducible high processing quality.

Ongoing further development of the SYNCHROFLEX[®] product, the quality assurance system according to DIN EN ISO 9001 and the manufacturing process in moulds true to the model guarantees quality enhanced by the close cooperation with the sales partners in the Mulco group and our mutual customers.



Polyurethane timing belts



Construction

BRECO®, BRECOFLEX® AND SYNCHROFLEX® TIMING BELTS are manufactured of wear resistant polyurethane and high tensile steel cord tension members. Both high quality materials combined form the basis for dimensionally stable and high resistance polyurethane timing belts. Polyurethane timing belts have a very high span rigidity. No post-elongation of the tension members is to be expected in continuous operation. Only under extreme load and after a short run-in time, the pre-tension of the belts might slightly reduce by the tension members settling, making a once-only re-tensioning of the timing belt unavoidable.

The timing belts are temperature resistant with ambient temperatures from -30°C to +80°C.

Applications close to the limit temperatures (<-10°C and >50°C), however, might require adapted dimensioning. For specific temperature ranges various belt materials are available, e.g. the SYNCHROFLEX® TIMING BELT GEN III is temperature resistant up to 100°C. Please contact your Mulco partner for this type of application.

The production methods according to which BRECO®, BRECOFLEX® and SYNCHROFLEX® TIMING BELTS are produced, allow keeping within tight tolerances which guarantee a uniform load distribution during power transmission. These polyurethane-timing belts are suitable for the transmission of high torques as well as the precise positioning and transport of various goods.

Properties

mechanical

- positive fit, synchronous run
- constant length, no post-elongation
- low noise
- wear resistant
- low-maintenance
- highly flexible
- positional and angular accuracy
- can be crossed (see chapter „Angular drives“)
- fatigue resistant, low extension steelcord tension members
- Beltspeed up to 80 ms⁻¹
- small build sizes
- favourable power-to-weight ratio
- low pre-tension
- low bearing load
- permits large centre distances
- permits large transmission ratios
- high degree of efficiency, max. 98 %

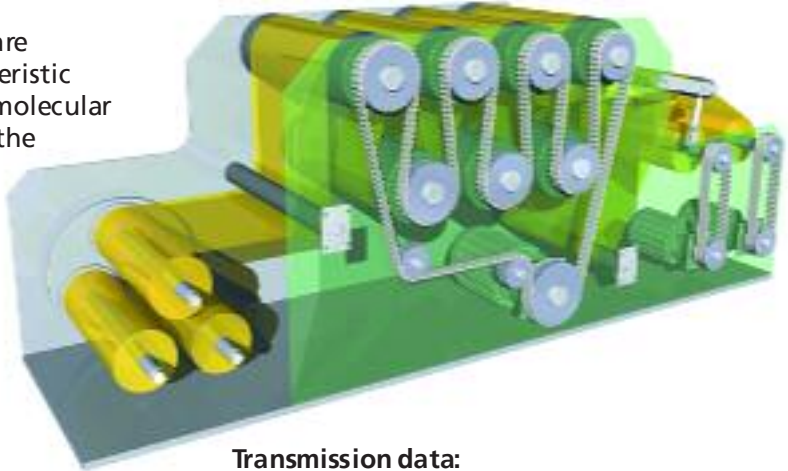
chemical:

- hydrolysis resistant
- resistant to aging
- temperature resistant from -30° to +80°C, design SYNCHROFLEX® TIMING BELT GEN III up to 100°C (see information in the text „Construction“)
- tropical climate resistant
- resistant against simple oils, fats and petrol
- resistant to some acids and lyes

For further information about the resistance of polyurethane timing belts please contact your Mulco partner.

Film stretching unit

In a film stretching unit the films and belts are subject to targeted changes to their characteristic features. Due to the stretching process the molecular chains are aligning in pulling direction and the tensile strength is increased. The stretching process is carried out using heated rollers. The change in speed of each follow-up roller should be 3 to 3.5 %.



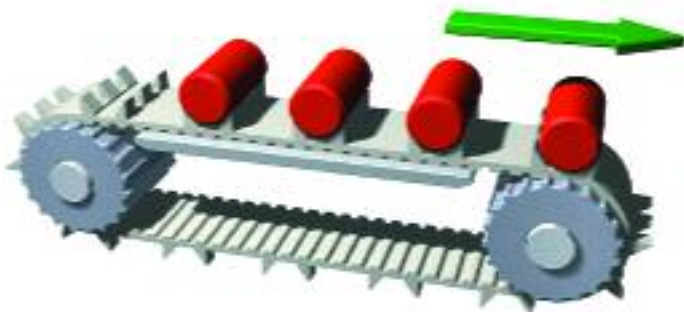
Design characteristics:

The rollers on the drive side are equipped with over-mounted pulleys. The number of teeth of pulleys arranged one after the other is reduced by 1: $z = 33/32/31$ etc. The belt arrangement of the double-sided endless belt is similar to the film routing.

Transmission data:

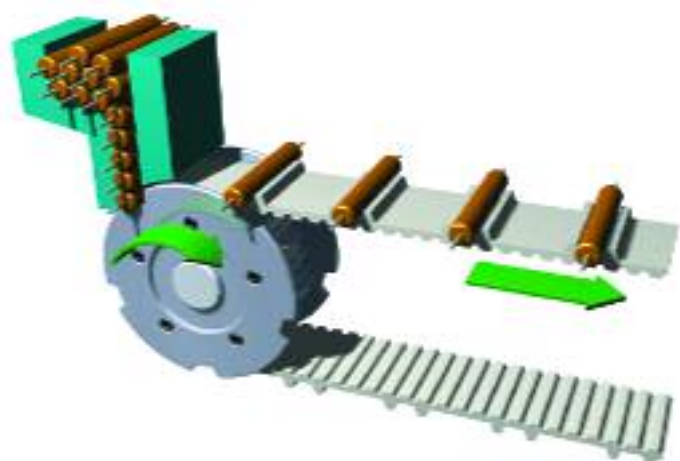
BRECOFLEX® TIMING BELT 50 T 20 /7500 DL			
Rotational speed	n_1	=	400 rpm
Transmission power	P	=	12 kW
Drive pulley assembly	z_1	=	36

Assembly belt



SYNCHROFLEX® TIMING BELTS with casted flights/profiles, post-manufacture mechanical reworked

Product separation



BRECO® TIMING BELTS with welded flights/profiles

BRECO®, BRECOFLEX® manufacturing processes

BRECO® TIMING BELTS

BRECO M: Open length
BRECO V: Joined belts



BRECO M: The BRECO® TIMING BELT is manufactured in open length. The tension members are always arranged with parallel edges. Open length is required e.g. in linear transmissions. All tension members assume part of the load.

BRECO V: BRECO® TIMING BELTS are manufactured from open length material welded to endless belts. In the join area the half number of tension members assume part of the load. The use of endless joined BRECO® TIMING BELTS is preferred in the conveying technology to handle any centre distance.

Application areas

Open length for linear transmissions

Rotary movements are converted into linear movements by linear transmissions. The BRECO® TIMING BELT in its open length delivery form is preferably fitted to the machine part to be moved.

Joined belts for conveying drives

Endless joined timing belts without length limitation are available. The minimum length for various belt profiles, however, is to be taken into consideration. For special requirements in transportation timing belts are coated or manufactured with flights/profiles.

BRECOFLEX® TIMING BELTS

Endless timing belts
with a full length tension member



BRECOFLEX: The BRECOFLEX® TIMING BELT is manufactured in endless lengths without tension member interruption. The tension member is spirally coiled. BRECOFLEX® TIMING BELTS are universal applicable for all tasks in the drive technology up to 10000 rpm.

Application areas

Endless timing belts for power transmissions

All drives designed for a high performance should preferably be produced as BRECOFLEX® TIMING BELTS with a full length steel cord tension member. They can be subjected to both permanent operation or for a start-brake characteristic. They operate in a rotational speed range of up to 10000 rpm.

Endless timing belts are available in preferred catalog lengths. Our production range also permits the supply of intermediate lengths up to a maximum endless length of 20000 mm.

Materials

BRECO®- and BRECOFLEX®-TIMING BELTS are manufactured according to standard in the material with the designation TPU-ST1 and steel cord tension members. Other materials e.g. for low or high temperature or for contact with food are possible. Likewise high flexible tension members (E) and tension members in stainless-steel are available. Your Mulco-partner advises you regarding our possibilities.

SYNCHROFLEX® TIMING BELTS

SYNCHROFLEX® TIMING BELTS consist of 2 components, the wear resistant contilan, a polyurethane, and a high grade steel cord tension member. The excellent bond between the two materials results in high power transmission capacity.

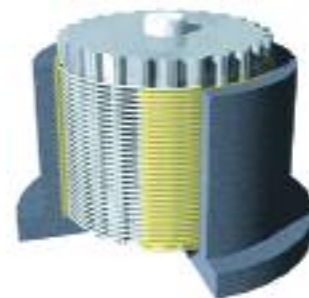
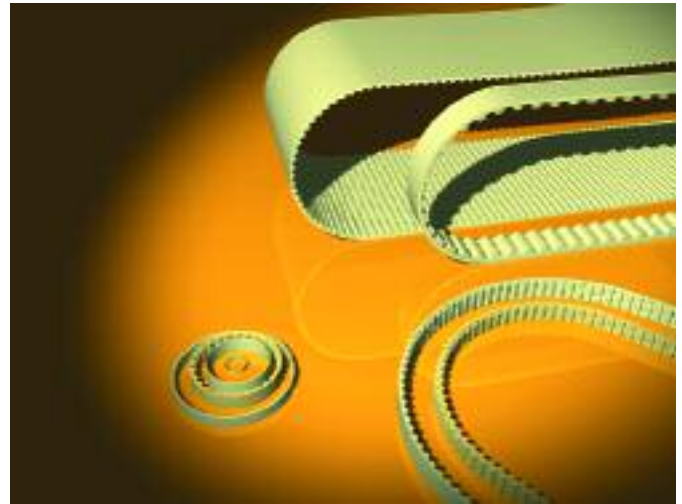
The manufacturing process in moulds - the displacement injection moulding - combines the following advantages:

- The cast polyurethane timing belt is a precise image of its shape. A high pitch accuracy is reached for the whole belt. For this reason, it is particularly suitable for angular accuracy, smooth running and high rotational speeds.
- Low length tolerance. The tolerance situation can be influenced by changing the coiling tension.
- Due to the casting method and because of the capillary effect, good bonding with the steel cord tension members.
- High image quality of the cast polyurethane. Fine contours can be moulded exactly. Especially suitable for small pitches. DL meshing and profile flights on the back of the belt can be moulded at the same time.
- The de-moulded timing belt coil has a mould-related overall useful width of up to 300 mm.
- **Belt lengths from 55 to 6000 mm endless length**

SYNCHROFLEX® POLYURETHANE TIMING BELTS are used in all technical fields where synchronous transmission of a rotary movement is required. Independent, whether power transmission, servo control functions or switching and conveying tasks are required. They operate in a rotational speed range of up to 20000 rpm.

Preferred application fields:

- Office machinery
- EDP equipment
- Textile machinery
- Wood processing machinery
- Machine tools
- Printing machinery
- Pumps
- Compressors
- Building machinery



Casting mould, illustrated with a spirally coiled tension member on the mould core



Ready de-moulded timing belt coil, part of it separated into individual belts



AT High capacity profile

Further development of the T profile resulted in the AT profile. This type of belt is characterised by the larger tooth shear strength resulting from the larger tooth volume and the stronger tension members.

Further advantages:

- favourable tooth mesh
- strengthened tension members for constant pitch
- Improved performance up to 50 % as compared to the T profile
- precise transmission of movement in conjunction with synchronous pulleys with reduced or zero backlash
- reduction of meshing impacts or shocks
- favourable mass or build space relationship (also available in the GEN III version)



ATP High capacity profile

Further increased performance, noise reduction and extension of the belts useful life led to the development of the ATP timing belt in 1993. At the time, the main interest was focussed on the optimum tooth form. The basic concept of the new ATP profile provides the division of the trapezoidal tooth into two individual and load bearing teeth.

Performance increase up to 60 %, running noise reduced by up to 10 db(A) and an increased longevity by:

- tooth surface area increased by 70 %
- uniform load/tension distribution
- improved power dispersion
- reduced polygon effect
- small construction width
- optimised tooth mesh

(also available in the GEN III version)



BAT Curved teeth

As a logical consequence in reducing running noise, a profile was developed which does without the conventional polygon effect. In addition to smooth running, the profile has, in comparison to the AT, a larger tooth face and is self-guiding in the preferred running direction.

Preferred use:

- special demands regarding smooth running properties and transmission precision
- tight assembly dimensions
- transport and transmission tasks



BATK Curved teeth with guiding track

The BATK has ensued from the BAT. The timing belt is self-tracking in both running directions due to the integrated guiding track.

Preferred use:

- Applications in the field of the linear and power transmission technology
- tight assembly dimensions

ATN

the ATN timing belt is especially designed for the application in the transport technology. The flight fastening system in the belt tooth permits fast fitting and replacement of the flights individually manufactured for the conveying application concerned.

ATN



ATN with V-groove

The ATN timing belt is especially designed for the application in the transport technology and applied where no flanges on the pulleys and other guiding elements are possible for constructional reasons.

ATN with V-groove



AT in DL version

The DL timing belt (the belt is double-sided) is applied in the power transmission and transport technology. Multiple-shaft drives with different rotational directions can be realised with this timing belt. Full loadability on both tooth sides.

Version DL



Self-tracking belts

Self-tracking belts are a combined construction of synchronous belts and V-belts with straight running characteristics. The performance range is that of the standard T or AT profiles minus the non toothed belt width.

Preferred use:

- where large lateral forces apply
- running on synchronous pulleys without flanges

**ATK
TK**



Timing belt types



SFAT Offset teeth

AT performance profile with two toothed tracks with a belt designed as SFAT. These toothed tracks are offset by half a tooth pitch in relation to each other. In combination with the accompanying synchronous pulleys, the SFAT is self-guiding. No flanges are required.

Preferred use:

- running on synchronous pulleys without flanges
- where low noise is of the essence (reduced polygon effect)



T Standard profile

The timing belt with a trapezoidal profile according to DIN 7721 is regarded as the classical standard timing belt.

Preferred use:

- for standard drive tasks
- transmission tasks with double-sided belts
- for high bending stress
- Load case „with contraflexure“



Imperial Imperial profile

Imperial pitches according to DIN/ISO 5296 are available in the following sizes:

M (MXL) = 2.032 mm

XL = 5.08 mm L = 9.525 mm

H = 12.70 mm XH = 22.225 mm

Preferred use:

- Applications in imperial units



F Flat belts

Preferred use:

- Tension belts (open length and endless)
- high-speed drives (SYNCHROFLEX BELT)
- drives without synchronous transmission of movement

K

Notched profile with a metric pitch.
Preferred use:

- Fine mechanical technology requiring small dimensions

K



V

The development of the PU timing belt started in 1954
with pitches other than standard.

Preferred use:

- tasks requiring special pitches
- replacement supplies

V



Available versions

Standard version, single-sided



The standard version of the SYNCHROFLEX®, BRECO® and BRECOFLEX® TIMING BELT is a combined construction of the two materials: wear resistant polyurethane and high tensile steel cord tension members. The standard version is universal applicable for all tasks in the drive and conveying technology. Now, the new SYNCHROFLEX® TIMING BELTS GEN III are available with a new polyurethane mixture and two-filament tension member arrangement.

Ordering code: without resp. GEN III

Available for all pitches
SYNCHROFLEX GEN III only with pitches AT3, AT5, AT10 and ATP10.

Standard version, double-sided

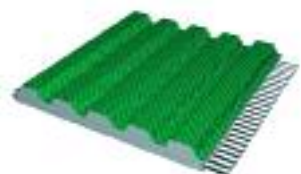


The standard version of the double-sided SYNCHROFLEX®, BRECO® and BRECOFLEX® TIMING BELT is a combined construction of the two materials: wear resistant polyurethane and high tensile steel cord tension members. Full loadability on both tooth sides. The standard version of the DL timing belts are universal applicable for all tasks in the drive and conveying technology.

Ordering code: DL

Available for
AT5-DL only BRECOFLEX®
AT 10-DL only BRECOFLEX®
T 5-DL, T 10-DL, T 20-DL,
H-DL only BRECOFLEX®
ATP 10-DL only BRECOFLEX®
ATP 15-DL only BRECOFLEX®
ATP 10 K6-DL only
BRECOFLEX®

Nylon tooth facing

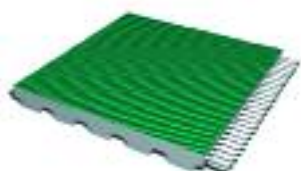


The belt base corresponds the standard version. An additional nylon tooth facing causes a lower friction coefficient, lightens the tooth mesh in the pulley and reduces noise. Transport belts on bed plates running easier and are wear resistant.

Ordering code: PAZ

Available for all pitches but T 2.5

Nylon facing on the back of the belt



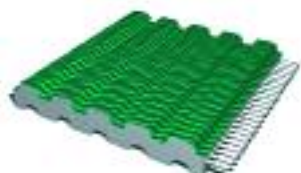
The belt base corresponds the standard version. An additional nylon tooth facing causes a lower friction coefficient. Application area in the conveying technology: e.g. for accumulation conveyor (back of the belt runs easier and is wear resistant).

Ordering code: PAR

Ordering code: PAZ-PAR (both sides coated)

Available for all pitches, only BRECO M and V, but AT 3 and T2.5

Nylon facing on double-sided belts



The belt base corresponds the double-sided standard version. An additional nylon tooth facing causes a lower friction coefficient, lightens the tooth mesh in the pulley and reduces noise. Transport belts on bed plates running easier and are wear resistant.

Ordering code: PAZ (coating only possible on inner side)

Available for
AT 5-DL only BRECOFLEX®
AT 10-DL only BRECOFLEX®
T 5-DL, T 10-DL, T 20-DL,
T 1/2"-DL only
BRECOFLEX®

SYNCHROFLEX® TIMING BELTS antistatic

The antistatic properties of SYNCHROFLEX® TIMING BELTS are achieved by:

1. post-process application of an electrically conductive coat on all sides of the belts with and without textile facing
2. a special conductive polyurethane mix (max. belt length 700 mm)

Colour of antistatic timing belts: black.

Surface resistance $R \leq 10^6 \Omega$

Application / Use

Antistatic SYNCHROFLEX® TIMING BELTS find their application where electrostatic charges are not desired or inadmissible, e.g. for the transport of electronic components, drives and/or conveying equipment in an inflammable environment.

Electrostatic charges

Electric charges due to the continual separation of two contact surfaces can be expected where timing belts are involved, e.g. pulley and timing belt. This electric charge can be considerable and as high as implying the danger of ignition at the moment of its discharge.

The value of the electric charge depends on the materials out of which timing belt, synchronous pulley, tension roller and/or support roller are manufactured. It rises as the belt speed, belt pre-tension and the contact surface width increase.

Antistatic properties

Antistatic SYNCHROFLEX® TIMING BELTS reliably avoid the formation of electric charges. According to DIN 22104 „Antistatic conveyor belts“, the surface resistance must be below $3 \cdot 10^8 \Omega$. Antistatic Synchroflex® timing belts feature a surface resistance of $R \leq 10^6 \Omega$.

Quality assurance

Conductivity is measured using flexible tongue electrodes meeting DIN 53482 or DIN 53596 requirements.

Upon request, the wear resistance of the antistatic layer is checked on a test belt for timing belts with antistatic facing. If the wear resistance test reveals a surface resistance of $R \leq 10^6 \Omega$, a sufficiently high wear resistance and/or conductivity are guaranteed. Due to the fact that during extended operation and possible wear the conductivity of the antistatic timing belts can deteriorate, regular checks of the resistance values are indispensable.

When belts are to be used in explosion endangered environments, please contact our technical support for advice.

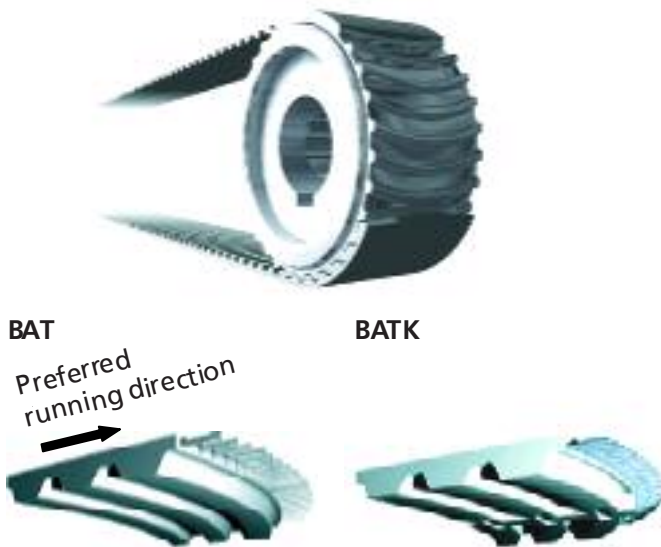
Ordering examples

SYNCHROFLEX® TIMING BELT 25 T 5/630 antistatical coated

For available lengths, please ask for our technical support

Characteristics BAT profile / BATK profile

The curved teeth timing belt BAT/BATK



„New profile shapes result in improved performance features“, this comment often describes the development possibilities of polyurethane timing belts. The curved tooth based on the proven AT profile forms the basis for the new BRECO® and BRECOFLEX® TIMING BELTS with curved teeth. The unique curved teeth guarantee notably improved transmission and running properties. On the one hand the BAT tooth has an increased load bearing capacity, on the other hand it does not abruptly run into the pulley gap but perfectly timed. Both features combined lead to an increased performance, clearly reduced running noise as well as a higher transmission precision and a lower vibration tendency. The belt centers itself on the pulleys in the stated preferred running direction due to the curved shape of the tooth which produces the self-guiding effect.

BATK timing belts

The **BATK timing belt** has ensued from the BAT timing belt. Compared to the BAT the BATK is provided with a guiding track resulting in a timing belt self-guiding in both running directions.

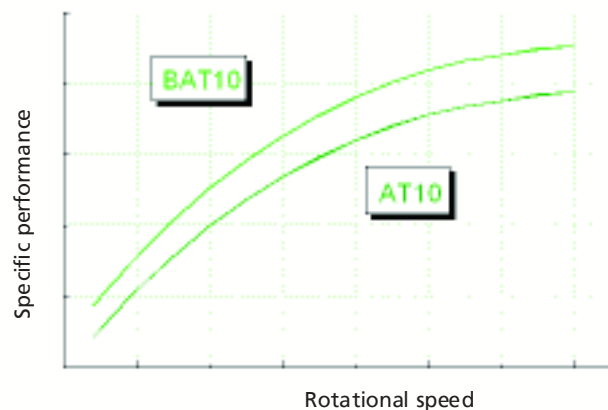
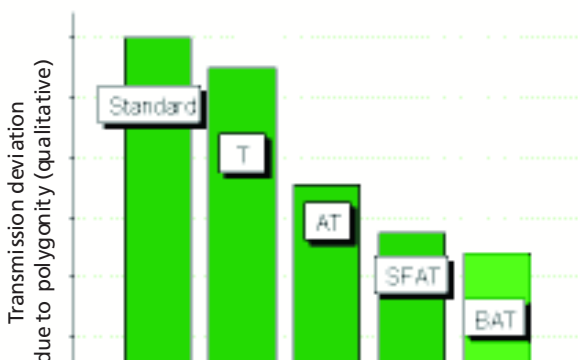
The special characteristics

- increased tooth load resulting from the tooth curve
- clearly reduced running noise due to a time elongated tooth mesh
- higher power transmission precision and lower vibration tendency due to a reduced polygon effect
- the BAT is self-guiding in the **preferred running direction**, no flanges are required
- the BATK is self-guiding in both running directions due to the integrated guiding track making flanges obsolete
- length constant belts due to the application of high tensile steel cord tension members

Application fields

The BRECO® and BRECOFLEX® TIMING BELTS type **BAT** are suitable for all areas of the power transmission and transport technology, where high transmission precision, low variation tendency, smooth running and only one running direction are required. The BAT timing belt is self-guiding in its preferred running direction, thus, no guiding elements are required.

The **BATK timing belt** is mainly designed for application in the linear and power transmission technology.



BAT / BATK

Timing belt guide of the BAT timing belt

The BRECO® and BRECOFLEX® TIMING BELTS with curved teeth have only one preferred running direction. In this direction the convex side of the tooth curve points in running direction of the drive. When observing this running direction the teeth laterally guide the belt also with large span lengths for which reason flanges are not required.

Even if the pulleys, tension and return rollers as well as their axes are perfectly aligned, we recommend a minimum span length of 5 times the belt width (see graphic) between the elements. This results in reduced lateral forces and the respective friction.

If tension and return rollers running on the teeth have a distance to their upstream pulley or roller exceeding 5 times the belt width (b), these rollers should be designed with teeth. If these elements are running on the back of the belt without teeth, flanges must be used (see graphic). Both measures lead to a better belt guidance and result in a high running performance.



BATK timing belts

For the BATK timing belt guidance by flanges is not required due to the teeth design. A wandering-off effect from the pulleys is excluded due to the guiding track.

Tolerances

1. Length tolerances for standard SYNCHROFLEX[®] TIMING BELTS

The belt measuring is performed according to DIN 7721, referred to the **centre distance**.

Belt length [mm] over	to	Length tolerance in relation to centre distance [mm]	permitted length tolerance* [mm]
	320	± 0,15	0,10
320	630	± 0,18	0,12
630	1000	± 0,25	0,15
1000	1960	± 0,40	0,20
1960	3500	± 0,50	0,25
3500	4500	± 0,80	0,30
4500	6000	± 1,20	0,50

*does not apply for double-sided belts

2. Width tolerances for standard SYNCHROFLEX[®] TIMING BELTS

Type group	Width tolerance for belt width in relation to standard coiling		
	up to 50mm [mm]	50-100 mm [mm]	over 100 mm [in % of the belt width]
K 1	± 0,3	± 0,5	± 0,5
K 1,5	± 0,3	± 0,5	± 0,5
T 2	± 0,3	± 0,5	± 0,5
M	± 0,3	± 0,5	± 0,5
T 2,5	± 0,3	± 0,5	± 0,5
T 5	± 0,3	± 0,5	± 0,5
T 5-DL	± 0,3	± 0,5	± 0,5
T 10	± 0,5	± 0,5	± 0,5
T 10-DL	± 0,5	± 0,5	± 0,5
T 20	± 1,0	± 1,0	± 1,0
T 20-DL	± 1,0	± 1,0	± 1,0
AT 3	± 0,3	± 0,5	± 0,5
AT 5	± 0,5	± 0,5	± 0,5
AT 10	± 1,0	± 1,0	± 1,0
ATP 10 / ATP 15	± 1,0	± 1,0	± 1,0
AT 20	± 1,0	± 1,0	± 1,0

Remark:

Upon special statements smaller tolerances are possible.
Please ask for tolerances for special coiling.

Length tolerances for BRECOFLEX®-TIMING BELTS

Stated dimensions in mm, referred to the belt length.

	Belt length [mm]	Length tolerance [mm]		Belt length [mm]	Length tolerance [mm]
to	300	± 0,41	to	4000	± 2,11
	500	± 0,53		4250	± 2,24
	700	± 0,64		4500	± 2,32
	900	± 0,75		4750	± 2,40
	1 100	± 0,85		5000	± 2,52
	1300	± 0,95		5300	± 2,64
	1500	± 1,04		5600	± 2,72
	1700	± 1,13		6000	± 2,92
	1900	± 1,22		6300	± 3,04
	2120	± 1,31		6700	± 3,19
	2240	± 1,36		7100	± 3,35
	2360	± 1,44		7500	± 3,51
	2500	± 1,49		8000	± 3,70
	2650	± 1,57		9000	± 4,09
	2800	± 1,61			
	3000	± 1,70			
	3150	± 1,74			
	3350	± 1,82			
	3550	± 1,91			
	3750	± 2,03			

Length tolerances for BRECO®-TIMING BELTS ± 0,8 mm/m

Width tolerance for BRECOFLEX®- and BRECO®- TIMING BELTS M/V

Pitch	AT 3	AT 5	ATP 10	AT 20	
	T 2,5	T 5	BAT 10	SFAT 15	
		XL	BATK 10	SFAT 20	
			AT 10	T 20	
			SFAT 10	ATP 15	
			ATK 10	XH	
			T 10		
			L		
			H		
	Tolerance	± 0,5 mm	± 0,5 mm	± 0,5 mm	± 1,0 mm

Angular drives

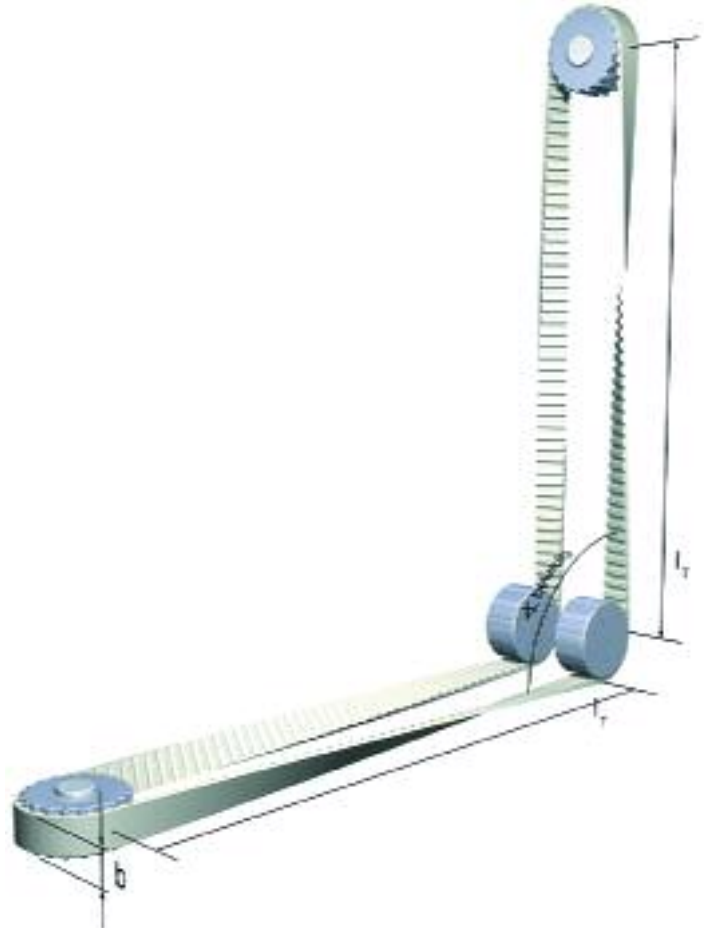
BRECOFLEX® and SYNCHROFLEX® TIMING BELTS can be applied as angular drives. Take into consideration that the timing belt can only be crossed (twisted). Eliminate the wandering-off effect.

General section

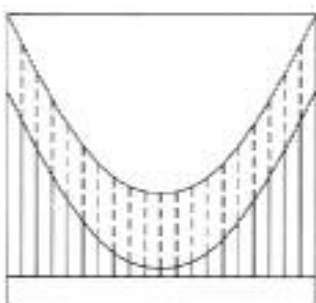
$$\begin{aligned} l_T/b &\geq 20 \\ b &= \text{Belt width} \\ l_T &= \text{span length} \end{aligned}$$



Angular drive with 2 axes



Angular drive with 3 axes



F_{adm} admissible tensile force

F_U For the drive remaining circumferential force

F_S Tensile force due to crossing

With crossed timing belt applications the outer tension members suffer a higher elongation as the inner ones. Due to the larger elongation in the edge zone the permitted proportional circumferential force for the belt in the tension members is reduced. No power reductions or constructive special means are necessary at a ratio of $l_T/b \geq 20$. At a required ratio of $l_T/b < 20$ please contact our technical department for advise.

Timing belt guidance by flanges

Timing belts must be guided to eliminate the lateral wandering-off effect. This is normally done by flanges.

Minimum lateral forces and low frictional losses can be resulted by the optimum arrangement of the belt guidance.

For this purpose, the following possibilities are available:

- Timing belt guidance downstream of a large free span length (infeed length (a) should not remain under 5 times belt width)
- Guidance at the drive pulley (to prefer for two shaft drives with short axis distance)
- Guidance of the pulleys with low Führung an Scheiben mit geringer power transmission (to prefer for multi shaft drives)



- Guidance on the tension rollers
 - Tension roller arrangement in the slack span side
 - With arrangement on the flush belt side: consider minimum diameter with contraflexure
 - With arrangement on the meshed belt side: Length of angle of wrap, min. 3 teeth
 - with changing rotational direction preferable in the span length centre
 - **Condition:** Minimum span length (a) between tension roller and pulley should not remain under 5 times belt width
- Ensure high axis parallelity and flush alignment of all pulleys to achieve optimum guiding features.
- For cost reasons it is possible to fit flanges also to the smaller pulley taking the functional reliability into consideration.

The application of BRECO®, BRECOFLEX® and SYNCHROFLEX® TIMING BELTS in two-filament arrangement is the ideal prerequisite for an optimum belt guidance.

Tooth gap shapes

Timing belts are positive fitted drive elements. They work slippage-free with the respective synchronising pulleys. BRECO®, BRECOFLEX® and SYNCHROFLEX® timing belt drives can be optimised additionally for a movement transmission with a low flank backlash.

For some profiles and pitches, the SE or zero gap can be used for especially high requirements on the precision of the movement transmission. Please contact us for technical advice.

Tooth gap shapes, see example T10



Normal gap



SE gap



0 gap (low-backlash)

- Prerequisites for the application: Pitch matching between timing belts and pulley.
- Influencing factors of the pitch matching:
 - Pre-tension force
 - Meshing distance (z_e)
 - Load rate (rotational speed, dynamic behaviour...)
 - Manufacturing tolerances

Bases of calculation

Providing the following conditions of tooth strength (1st), tension member tensile strength (2nd) and flexibility (3rd) are met, then a maintenance-free timing belt operation can be expected.

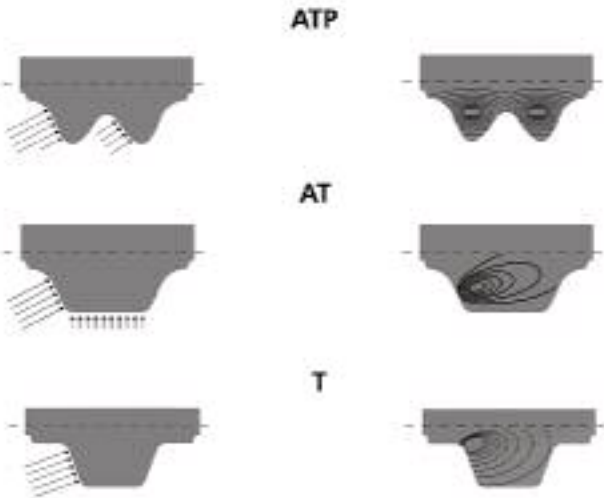
Basis of calculation

1. Tooth shear strength

specific tooth shear strength

Force distribution

Load distribution

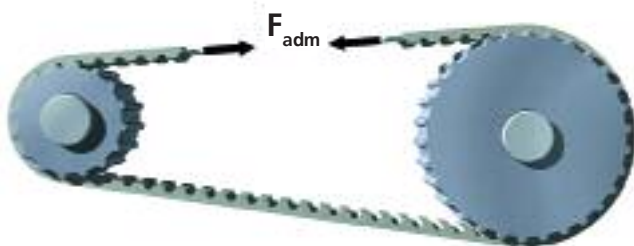


The specific tooth shear strength depends on the rotational speed. The maximum specific tooth shear strength is the limit load the belt tooth can bear in continuous operation. The values are stated in tables for each timing belt type. The timing belt drive is correctly designed, when not exceeding the admissible tooth shear strength. Generally, a special safety surplus is not necessary, see chapter „Safety factors“.

The high specific tooth shear strength of the ATP profile, for example, is achieved by the optimised force and load distribution. The effective force is distributed to two tooth faces.

The working loads can be distributed the more effective the more belt teeth are meshing in the pulley

Due to the high pitch accuracy of BRECOFLEX® and SYNCHROFLEX® TIMING BELTS, generally, it can be calculated with 12 belt teeth in mesh, should the number of teeth in mesh be respectively high enough.



The timing belt is designed correctly, when the maximum admissible tensile load in the steel cord tension members is not exceeded under operation conditions. The table values for F_{adm} refer to the constant loading.

3. Flexibility

Minimum number of teeth, minimum diameter



Drive layout without contraflexure

Drive layout with contraflexure

The recommended minimum number of teeth and/or the minimum diameter for a malfunction-free operation depends on the selected belt type. Take especially into consideration that the minimum number of teeth and/or the minimum diameter is higher when using a belt arrangement „with contraflexure“ (e. g. due to a tension roller).

Safety factors

The width of a timing belt is correct when the permissible values for tooth shear strength, tension cord strength and flexibility are not exceeded under unfavourable operating conditions. In our catalog, load limits are stated which have been reliably proven and confirmed by bench tests and results obtained in practice. A safety factor is only required for drives with transmission into higher speed.

It is important, that the unfavourable load types occurring in the drive are known resp. correctly estimated by the engineer. With a positive fit transmission, even short-period overloads act via the timing belt being the drive member. Some instructions to this issue:

Rated operation

Design timing belts for the operating condition of the rated load. The rated load is the operating condition at which the drive should transmit the torque or the power at rated speeds under normal conditions.

Start-up characteristics

- a) Drive side: The max. torque of the drive machine under start-up conditions is to be taken into consideration. The start-up torque, e.g. for three-phase squirrel cage motors amounts to 2 to 2.5 times the rated value.
- b) On the drive side: If necessary, „initial torques“ affective to the drive part timing belt are to be taken into consideration under start-up characteristics.

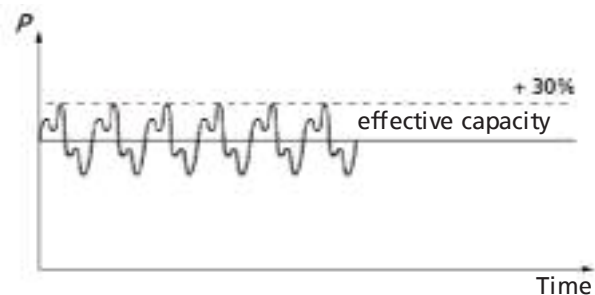
Check load case a) or b) with rotational speed $n=0$.

Brakes

It might have to be defined whether braking leads to loads which fully act via the timing belt and possibly exceed the type of load produced by the rated operation or the start-up characteristics. In the braking operation the torque reversal is to be taken into consideration.

Unevennesses (variations, impact shocks)

In addition to the rated load, superimposed vibration and impact shocks could act on the timing belt as the transmission member. For the illustrated example, increase the calculated belt width by the factor of 1.3.



Moments of inertia

Moments of inertia and/or centrifugal masses in the drives generally create a uniform running behaviour. Depending on the acceleration and deceleration characteristic it has to be differentiated and checked whether the moments of inertia create an additional load on the timing belt.

Step-up transmission

The following safety factors are to be applied for step-up transmissions:

$i = 0,66 \text{ bis } 1,00$	$S = 1,1$
$i = 0,40 \text{ bis } 0,66$	$S = 1,2$
$i < 0,40$	$S = 1,3$

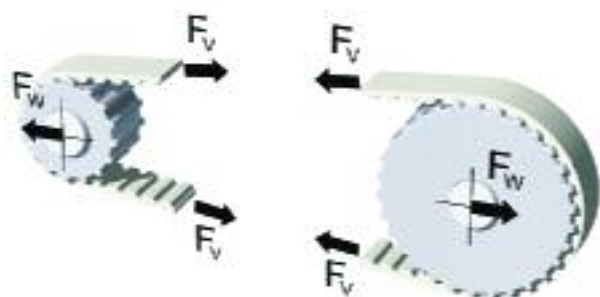
In the braking operation may occur a torque reversal and the reduction can change into a step-up transmission.

Pre-tension force

Pre-tension force

Pre-tension is intended to guarantee a minimum tensioning force at the slack span side to ensure smooth tooth meshing into the driven pulley.

Generally, the pre-tension should only be set as high as necessary. The necessary pretension force of the spans F_V depends on the max. circumferential force F_U , the belt length L_B (number of teeth Z_B) and the drive configuration.



The recommendations shown in the table refer to the pre-tension force setting per span.

Drive configuration		Pre-tension force of each individual span
Two-shaft drive	$Z_B < 60$	$F_V = 1/3 F_U$
	$60 \leq Z_B < 150$	$F_V = 1/2 F_U$
	$Z_B > 150$	$F_V = 2/3 F_U$
Multiple-shaft drive	$l_{Load\ span} \leq l_{Slack\ span}$	$F_V = F_U$
	$l_{Load\ span} > l_{Slack\ span}$	$F_V > F_U$
Linear drive		$F_V \geq F_U$

In every case, the tension cord strength is the top limit of the span load. Take into consideration that especially with multiple-shaft and linear drives, an addition of the pre-tension force and the circumferential force in relation to the load span force is to be expected.

Influence variables

Stiffness of the belt

Friction forces created by the interaction of the tooth mesh (especially at the slack span) intensify the span forces, which in turn increase the degree of elongation. This influence may lead to the slack span tooth mesh butting against the driven pulley, thereby causing the belt to jump.

Elongation being directly depending on the belt stiffness, the high stiffness of the steel cord tension members permits a comparably low pre-tension.

Circumferential force

The circumferential force acts in proportion to the elongation of the load span, i.e. excessive slackening of the slack span can be counter-acted by a pre-tension matched to the circumferential force.

Belt length

Belt elongation resulting from the effect of the circumferential force and the friction forces is also approximately in proportion to the belt length. Therefore, the tendency of running up or jumping is considerably influenced by the belt length. Even under high circumferential forces with the resulting friction forces, a very short timing belt will elongate to only a small degree, so that even when subject to low pre-tension forces there will be no danger of running up or jumping of teeth. On the contrary, with short timing belts circumferential deviations of the pulleys could cause heavy pre-tension fluctuations and, as a result, extreme peak values.

Proportion of the span lengths

Especially with multiple-shaft drives the load span is often markedly longer than the slack span side. For this reason, a slight elongation of the load span results in a very unfavourable slack on the span side. Therefore, the pre-tension force of spans of such gearings should be higher than the circumferential force.

Precise transmission of movement

There is a high transmission accuracy possible in the reverse operation with BRECO®, BRECOFLEX® and SYNCHROFLEX® TIMING BELTS, when the span pre-tension forces are selected in the same size of the circumferential force.

Consequences of faulty pre-tension setting:

too low pre-tension

- the teeth of the slack span side run up on or override the teeth of the driven pulley
- Wear on the faces caused by the friction force during meshing
- Forced breakage by excessive elongation due to full overriding

excessive pre-tension

- high bearing load of the shafts
- Reduction of the transmissible power
- Wear and tear at the belt tooth

General informations

Design

- In the transmission configuration, design at least one adjustable axis, plan one adjustable tension roller (not spring-loaded) for fix centre distances
- the bearing has to be absolutely rigid
- Note the importance of a parallel run and flush alignment of the synchronising pulleys

Transport/storing

- Upon receipt, unpack the timing belt immediately and store in circular position (SYNCHROFLEX[®] TIMING BELTS) in a dry place at room temperature
- Do not bend

Measuring with frequency measuring meter

The intrinsic frequency of a vibrating belt span can be measured by means of various Mulco belt tension measuring meters. The pre-tension force of the span can be calculated from the measured intrinsic frequency:

$$F_v = 4 \cdot m \cdot l_T^2 \cdot f^2$$

The corresponding intrinsic frequency can be calculated, if the pre-tension is preset:

$$f = \sqrt{\frac{F_v}{4 \cdot m \cdot l_T^2}}$$

- f: Frequency of the variations in hertz:
m: Mass of the belt per meter length in kg/m
l: drum span length subject to vibration in m
F_v: Span force in N

Please contact your Mulco partner for the various measuring meters

Mounting

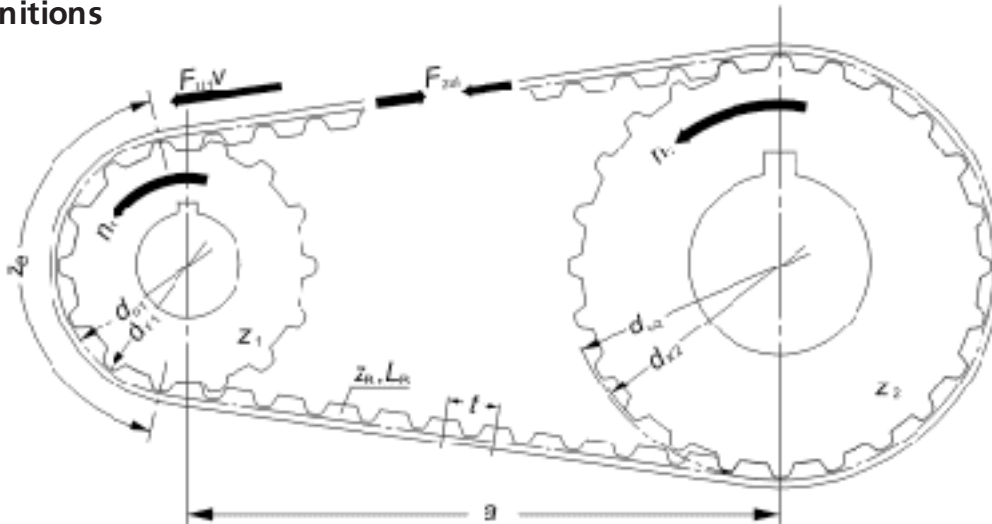
- Fit timing belts on the pulleys when slack without exerting any force
- Exert no force when fitting with fix centre distances (SYNCHROFLEX[®] TIMING BELTS) if necessary, fit together with synchronising pulleys
- Apply pre-tensioning force according to the chapter „Pre-tension“
- secure adjustable axis against sliding
- Do not clamp the timing belt between the flanges

Operation

- Protect the drives against dust, dirt, hot surrounding media as well as acids and lyes
- Take into consideration the ambient temperatures (see Characteristics of polyurethane timing belts)

List of formulae

Terms, definitions



Circumferential force	F_U	[N]	Centre distance	a	[mm]
specific tooth force	$F_{U\text{spec}}$	[N/cm]	Belt length	L_B	[mm]
admissible tensile load	F_{adm}	[N]	Belt width	b	[mm]
Pre-tension force	F_v	[N]	Pulley width	B	[mm]
Shaft force	F_w	[N]	Bore, pulley	d	[mm]
Torque	M	[Nm]	Pitch circle diameter	d_o	[mm]
Acceleration torque	M_B	[Nm]	Crown diameter	d_k	[mm]
specific torque	M_{spec}	[Ncm/cm]	Span length	L_T	[mm]
Power	P	[kW]	Pitch	t	[mm]
specific power	P_{spec}	[W/cm]	Number of belt teeth	z_B	
Load bearing torque	J	[kgm ²]	Number of teeth with $i = 1$	z	
Load	m	[kg]	Number of teeth in mesh	z_e	
Density	ρ	[kg/dm ³]	No. of teeth, small pulley	z_1	
Speed	v	[m/s]	No. of teeth, large pulley	z_2	
Rotational speed	n	[min ⁻¹]	Transmission	i	
Angular speed	ω	[s ⁻¹]	Acceleration time	t_b	[s]
Frequency	f_e	[s ⁻¹]			

Circumferential force

$$F_U = \frac{2 \cdot 10^3 \cdot M}{d_o}$$

$$= \frac{19.1 \cdot 10^6 \cdot P}{n \cdot d_o}$$

$$= \frac{10^3 \cdot P}{v}$$

Torque

$$M = \frac{d_o \cdot F_U}{2 \cdot 10^3}$$

$$= \frac{9.55 \cdot 10^3 \cdot P}{n}$$

$$= \frac{d_o \cdot P}{2 \cdot v}$$

Power

$$P = \frac{M \cdot n}{9.55 \cdot 10^3}$$

$$= \frac{F_U \cdot d_o \cdot n}{19.1 \cdot 10^6}$$

$$= \frac{F_U \cdot v}{10^3}$$

Belt length for $i = 1$

$$L_B = 2a + \pi \cdot d_o$$

$$= 2a + z \cdot t$$

Pitch circle diameter

$$d_o = \frac{z \cdot t}{\pi}$$

Angular speed

$$\omega = \frac{\pi \cdot n}{30}$$

Rotational speed

$$n = \frac{19.1 \cdot 10^3 \cdot v}{d_o}$$

Peripheral speed

$$v = \frac{d_o \cdot n}{19.1 \cdot 10^3}$$

Apply all equations with the dimensions mentioned here.

Acceleration torque

$$M_B = \frac{J \cdot \Delta n}{9.55 \cdot t_b}$$

Load bearing torque

$$J = 98.2 \cdot 10^{-15} \cdot B \cdot \rho \cdot (d_k^4 - d^4)$$