TIMING BELT TENSIONER

ROLL-RING®

OPTIMUM ELEMENT

≡ EFFECT ≡ STRUCTURE ≡

Rolls hard-elastically
Torque proportional
Reversible
Automatic
Self-holding
Maintenance-free

TÜV SÜD ISO 9001

Area of Application

Development, Manufacture and Distribution of Tensioning and Damping Elements for Chain Drives and Equivalent Drives

ROLL-RING® is the internat.
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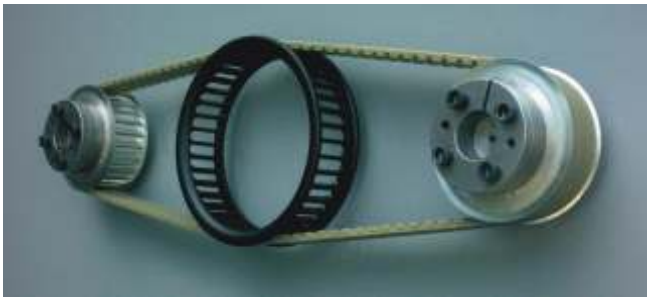
EBERT

ROLL-RING®

The rotational elastic principle

Novel principles, realised in elementary mechanisms, are seldom in technology. The patented rotational elastic ROLL-RING tensioning and damping elements by the EBERT Kettenspanntechnik GmbH are such an elementary mechanism.
They integrate benefits and a multitude of technical functions into one single element:

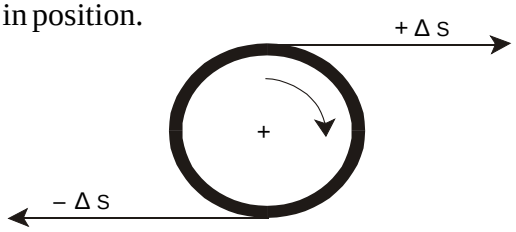
- self holding between the strands of the transmission
- click into place within seconds and without any tools or further adjustment
- independent concerning vertical, diagonal or horizontal arranged strands
- independent of the rotation direction of the transmission
- Tensioning and damping function
- torque-proportional tensioning force between the strands



The important practical benefits are the improvement of the precision, wear resistance and noise emission of the transmission.
As result of continuos product development by the EBERT Kettenspanntechnik GmbH, the tensioning and damping elements for synchronous belt drives according the new principle are created.

The principle of ROLL-RING belt tensioners is based on two simple effects:

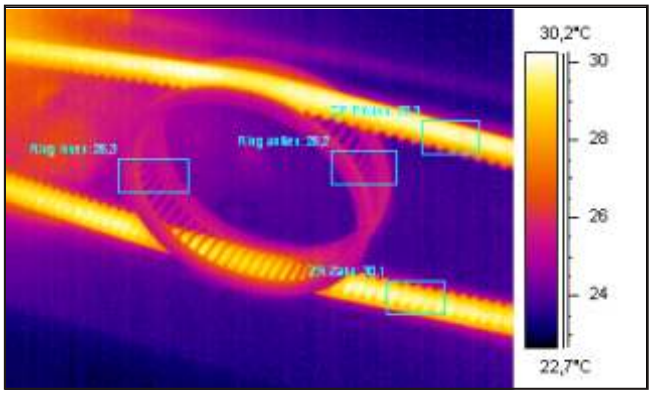
The elastic ring engages with the belt strands and rolls between them in a pre-stressed condition taking up the shape of an ellipse.
The constantly opposing movements of the load and un-load strands cancel each other out, to the ”zero sum movement”, thereby holding the ROLL-RING in position.



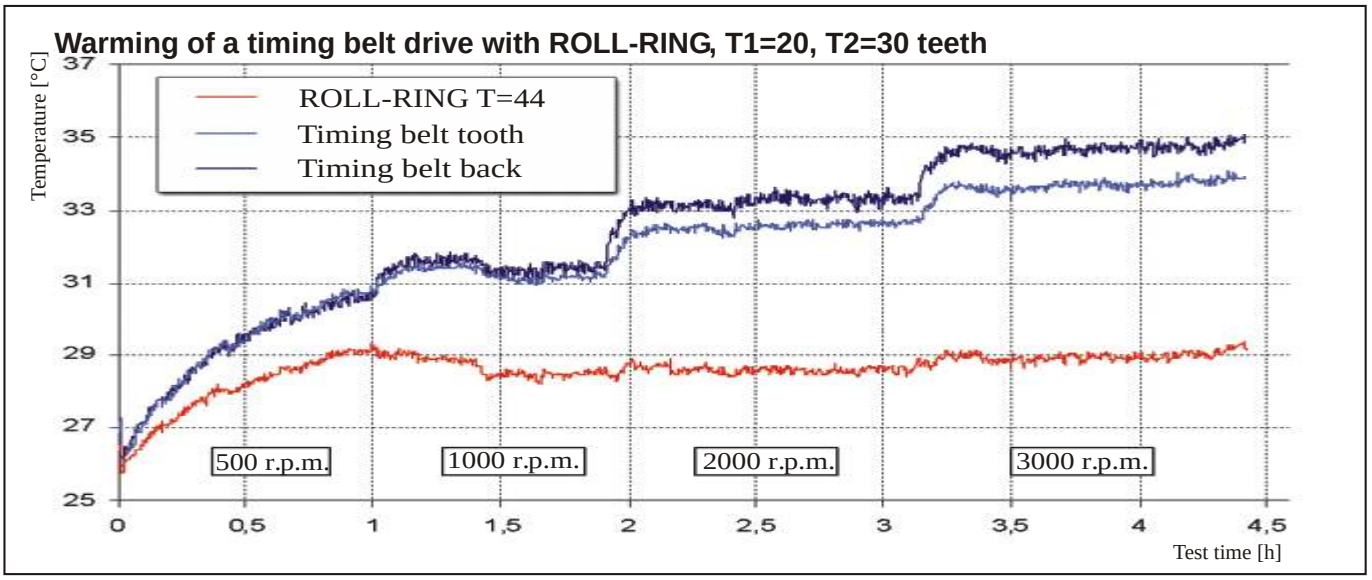
The geometric base of the ROLL-RING is the ring part. A characteristic distribution of tension force exists for this ring part:
A change of pressure and tensible force of the bending stress occurs after all 90° of phase angle, with a minimal upset and extension of the outside fibre in the ROLL-RING belt tensioner. So the deformations and their returns are held in the elastic area of the material mainly.
Only if the r.p.m. are very high, time dependent viscous elastic deformations and warming up, caused by deformation performance, must be taken into account. Additional there are the plastic deformations during every rotation of the ROLL-RING.
The deformation performance and the comprising of the time and the single influence factors r.p.m., deformation (tensioning distance), tension force, damping are significant for the assessment of the real tensile and pressure strength of the material during operation, as well as of the fatigue and the prospective wear performance of the ROLL-RING.

Minimum Energy Level, High R.P.M.

The tensioning and damping function of the ROLL-RING is based on deformation. At high tension force, high deformation and high r.p.m. a noteworthy warmth results from it.
The warming is reduced effectively by the structure of the material and with distance radially arranged working rings, thereby forming cross ventilation tunnels. The tooth bridges are shaped like wind paddles and generate a radial cooling stream, similar a ventilation wheel, through the gaps between the tooth bridges. The resulting warmth balance effects, that the ROLL-RING have a lower operation temperature than the timing belt. So high r.p.m. are possible.



Thermal photography of a ROLL-RING under normal load (Upset 4,7%, Ring Tension Force F_R =35 N, 3000 r.p.m.)
Ring: 27°C, timing belt: >32°C

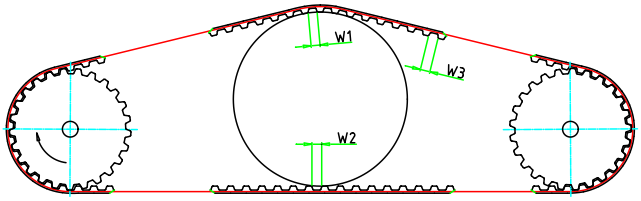


Drive and position holding function in the tooth profile

The position holding is provided by the tooth profile. In difference to the chain a typical problem of the synchronous belt must be solved:
The tooth distance varies temporary during the revolution of the belt onto the belt pulleys, through the load strand and through the unload strand at very small contact angles round the tensioning and damping element.

The tooth bridges come on both sides harmonic of the ring profiles and pretend the “wobble” of the only a little enlaced tensioning and damping element.

For the optimised ROLL-RING the neutral bend fibre is adopted to the neutral bend fibre of the belt. In this case the gaps between the teeth of the belt are varied as well as the distances between the tooth heads of the ring, so always both profiles match each other exactly.



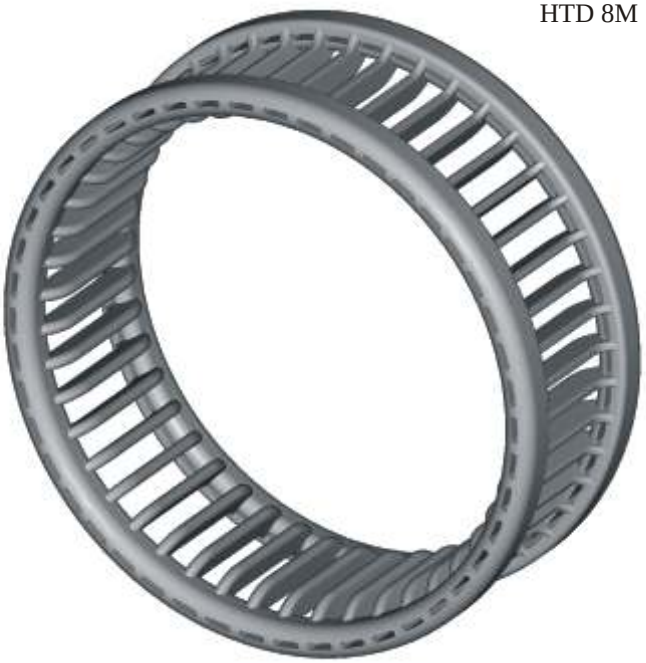
Different tooth distances $W_1 < W_2 \leq W_3$
at the wrapped angle

For self holding, the tensioning and damping element is able to engage the different wide tooth gaps (W1, W2, W3)of both belt strands - even if the bow of the unload strand is changing during operation.

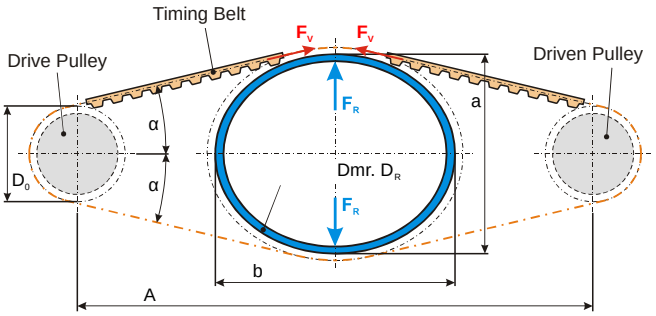
Minimum structure, universal function

The ROLL-RING profile has the geometric form of a cylinder, made as an elastic ductile wheel with outer rings at the distance of the belt width and with parallel tooth bridges, which are arranged between the rings.

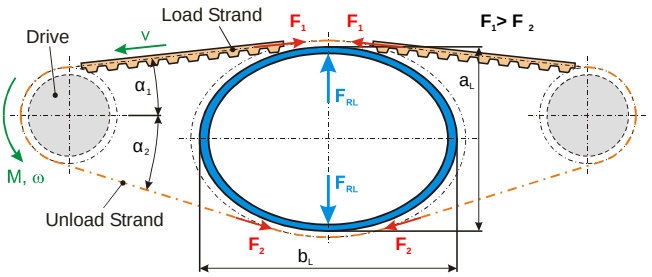
ROLL-RING for
timing belt type
HTD 8M



The load-dependent tension force relieves all trasmission elements

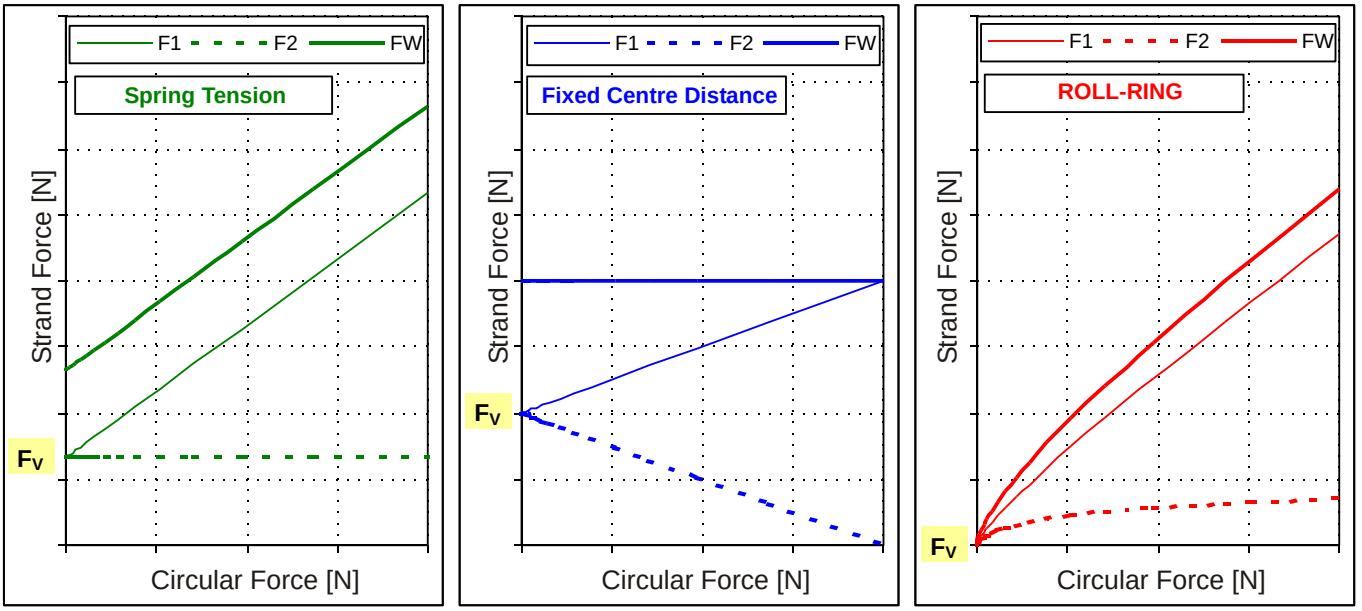


Transmission with ROLL-RING in fitted condition (Torque M=0 Nm)



Transmission with ROLL-RING in operating condition (Torque M>0 Nm)

An energetic minimum is achieved during installation of the ring-shaped tensioning and damping element in a transmission with two shafts, if the centre of the ring is based on one line with the centres of the shafts.
According this, the ring place itself automatically between the shafts during operation, but is deflected vertically in direction to the unload strand, if the load and unload strands are formed. In this condition the distance between the strands (a_L<a) is reduced, so the ring provides a higher tension force during operation (F_{RL}>F_R) and therefore a degressiv rising force in the unload strand is given by the circular force.

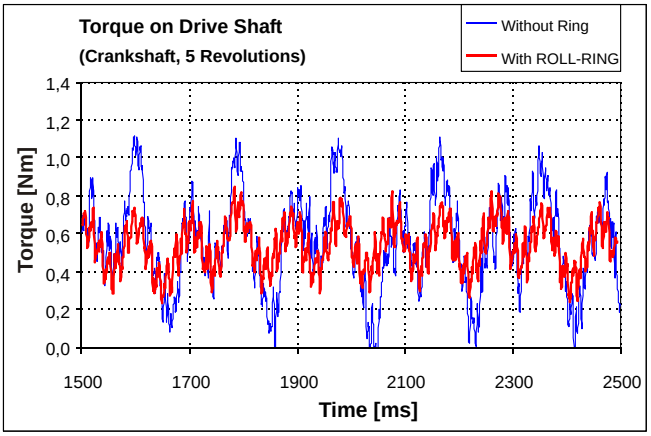


F1: Load Strand Force F2: Unload Strand Force FW: Shaft Force

The strand- and shaft-force developments at different tensioning methods are shown in the above pictures, in particular the high value of the pre-tensioning in the unload condition as well as the development of the tension in the unload strand are interesting.
Especially in the compare with the fixed centre distance, where the pre-tensioning force is adjusted at 1/3...2/3, in special cases up to 100%, of the circular force according the manufacturers advise, the benefit of the new tensioning and damping element comes out. The pre-tensioning in the unload condition almost can be dropped completely, which provides a significant relief of all transmission elements.
In contrast to the fixed centre distance the danger, that the tooth slip over the driven pulley during overload, is prevented by the "adjustment" of the unload strand tension at the circular force (The unload strand force is always >0).

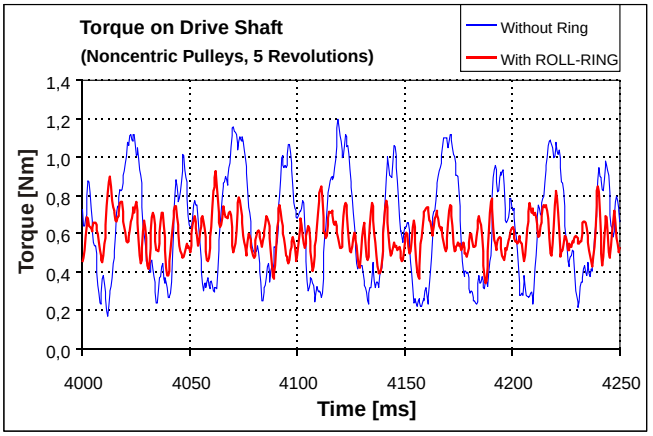
Damping

In many applications the driven torque is very uneven or rapid torques occur during operation. The ROLL-RING absorbs this unevenesses because of the deflection of the strands, what plays a decisive role in saving the whole transmission, especially for strong torque shocks.



Drive torque at torque vatiations, caused specifically by a crankshaft

The similar case are the normal belt drives, where the ROLL-RING provides an effective damping of the strand shocks.
The Measurements, shown at the pictures below, confirm that the drive torque can be smoothed substantially.
(Blue: tension by fixed centre distance, Red: tension with ROLL-RING

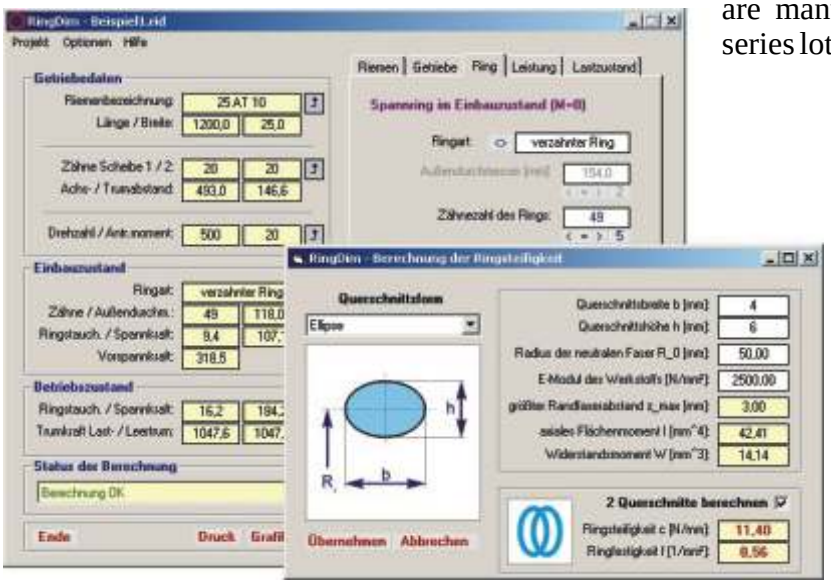


Drive torque at torque vatiations, caused by noncircular pulleys

Fields of application

The tensioning and damping elements with tooth profile are usable in lubricated or not lubricated belt drives, also with transmission ratio $i \neq 1$.
Preferred sizes are the polyurethane belts of the types T5, T10, AT5, AT10 and the chloroprene belts of the type HTD 8M with the belt width from 10mm to 50 mm and diameters of the belt pulleys from 30mm to 150mm. However, other sizes are practicable too.

Input of the Software



Free Service

The tensioning and damping elements are constructed for the specific parameters of the belt drive according the demands of the customer. The values, which are needed for the calculation, are summarized at the form sheet on the last page of this brochure.
The tensioning and damping elements are constructed from these custom-specific data on base of our expert system and with modern CAD /CAM technologies and manufactured immediately. Because of this specific, the products are manufactured economically for OEMs with series lots above 10 pieces in particular.

E B E R T
KETTENSPANNTECHNIK GmbH

ROLL-RING®
Internat. Reg. No. 641683 from EBERT

Any further cases of application? Have you got a form copy for further cases of application? Have you already got a form copy?

Fax - Service

We calculate according your specifications and give a proposal for a ROLL-RING belt tensioner

Ebert Kettenspanntechnik GmbH

Our fax-No.:

++49(0) 34 20 76 93 93

Sender:

Our officer:

Phone:

Your officer:

Phone:

Fax:

Belt type: .....
Manufacturer: .....
Pitch: .....mm
Width: .....mm
Belt length: .....mm
Tolerance: +.....mm -.....mm
Material ☐ Chloroprene
☐ PUR

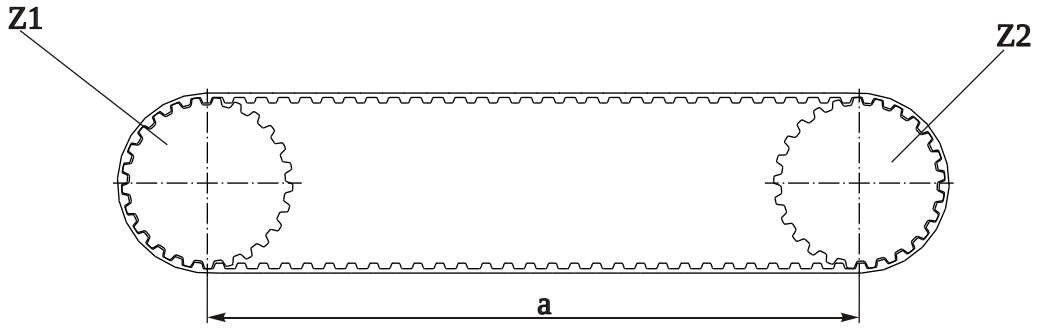
Pulley
Driving Z1= .....Teeth
Driven Z2= .....Teeth
Centre distance a= .....mm
Tolerance: +.....mm -.....mm

Driving R.P.M
n= .....min^{-1}
Transmitting torque
M= ..... Nm

Requested volume ..... Pcs.
Special environmental influences
.....
.....
.....
.....
.....
.....
.....

Reversible Mode: ☐ none ☐ occasional ☐ periodical

Please make complete specifications.



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