



A Tenneco Company

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# 032

17/12/2009

# Technical Bulletin

## Premature Failure of Accessory Drive Belts

<b>GATES REFERENCE :</b>	<b>All V-and Micro-V® XF belts</b>
<b>MAKE :</b>	
<b>MODEL :</b>	
<b>ENGINE :</b>	
<b>ENGINE CODE :</b>	



As some accessory drive systems still suffer from premature wear/noise/failure of the belt, we feel it might be useful to look at the main reasons for this non-performance.

The 2 main causes of premature failure are wrong belt tension and misalignment.

### Belt tension

There are 3 different tensioning systems for accessory belt drives:

- Manual/fixed tensioner
- Automatic tensioner (see also TB 011 on hydraulic tensioners)
- Stretch Fit™ belts - elastic belts without a tensioner

In this bulletin, we will concentrate on the first tensioning system, since this requires the intervention from a mechanic to determine the correct tension. With the other systems the mechanic also has to strictly follow the set-up procedure, but he can not **directly** determine the tension level.

As there is no automatic tensioner to control the tension of the belt over its expected lifetime, the installation tension on fixed systems has to take into account the initial tension drop over the first days of functioning on the drive (Fig. 1).

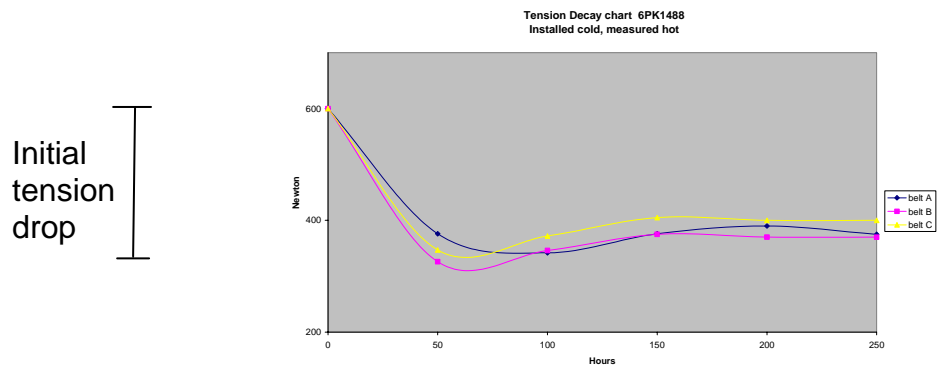


Fig. 1



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An additional issue is that our replacement belts are, in many cases, used on engines with worn or contaminated pulleys. This will be the reason for bigger tension drop of a newly installed belt compared to a new belt in new pulleys. Worn pulleys can also lead to premature wear/noise/failure.

Pulley replacement may be necessary.

It is very important that this initial tension setting is correct, in order to prevent premature wear/noise/failure.

Both too high and too low belt tension will lead to problems:

- Too high tension will lead to abnormal wear, extreme heat build up, rubber hardening and cracks (Fig. 2), premature cord break and noise.
- Too low tension will lead to slippage (insufficient tension to drive the different components), noise, extreme heat build-up, rubber hardening/cracks, belt rupture and pulley wear. Belts which have been slipping will show shiny flanks, on both sides of the belt/rib (Fig. 3).



Fig. 2



Fig. 3

Recommended static installation tension:

	New belt	Used belt
AV10	350N (35 Kg)	270N (27 Kg)
AV13	500N (50 Kg)	350N (35 Kg)
Micro-V <sup>®</sup> XF	100N (10 Kg) / rib	60N (6 Kg) / rib

The values under “New” are the tensions needed when we install a new belt on the drive. The values under “Used” are the tensions needed if one re-installs a used belt on its application.

**ATTENTION:** if a Micro-V<sup>®</sup> XF belt needs to be re-installed, one should make sure it runs in the same direction as before; otherwise the ribs, already adapted to the profile of their grooves, will have to adapt to the profile/wear pattern of other grooves; causing a new tension drop.

Certain applications may need a higher tension because of specific designs:

- Highly loaded drives
- Small belt/pulley contact angle
- Severe shock loads



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In order to measure/check the tension, Gates supplies the following professional tools:

- Kriket I (7401-00071) (Fig. 4) is ideal for measuring the tension of V-belts, this tool can also handle narrow Micro-V<sup>®</sup> XF belts
- Kriket II (7401-00072) (Fig. 5) is a simple tool for measuring tension of wider Micro-V<sup>®</sup> XF belts.
- However, for vehicles with a more sophisticated drive on modern engines, Gates offers the Sonic Tension Tester STT-1 (7420-00301) (Fig. 6), which was initially developed for checking the tension of Timing Belts. This very accurate tool can also be used for checking the tension of all Micro-V<sup>®</sup> XF belts tensioned with a manual tensioner. It allows to make a distinction between new and used (run in) belts.



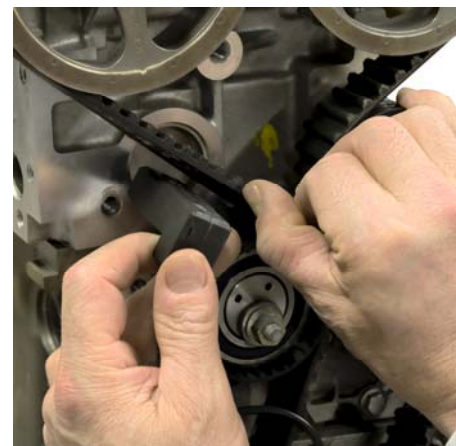
Fig. 4



Fig. 5



Fig. 6







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## Misalignment

Another problem which occurs more and more is pulley misalignment. Multi-ribbed belts are more sensitive to misalignment than V-belts.

In general we can say misalignment above 1 degree can lead to problems such as:

- Pilling:  
As the ribs do not enter perfectly into the pulley grooves, particles of rubber are worn away from the rib sides. These particles are pushed together in the belt grooves, forming little rubber balls which will create noise (Fig. 7).
- Damaged outside ribs:  
The outside rib which is running into the pulley flange gets damaged and can come loose (Fig. 8). Also the tensile cord could be pulled out of the belt. These loose ribs/cords create a very dangerous situation: they could enter into the timing belt system resulting in an engine breakdown.
- Noise:  
The ribs not entering straight into the pulley grooves can lead to belt noise.

Belts which have been running under misalignment will have a shiny aspect on one side of the ribs.



Fig. 7



Fig. 8

If misalignment is the problem, our DriveAlign® laser (7468-00113) (Fig. 9) will allow you to determine which pulley is misaligned.

It is clear the alignment problem should be solved before installing a new Micro-V® XF belt!



Fig. 9





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## Noise diagnostics

### Spray test

If a multi-ribbed belt makes noise, it is important to determine the cause of the noise in order to solve the issue. A singing/whistling noise means the belt is over-tensioned.

A chirping/squealing noise is the result of under-tensioning or misalignment. One can easily determine the exact reason of this kind of noise with the following handy method: spray some (clean) water on the ribbed side of the belt while the engine is running at idle speed.

If the noise level increases immediately and returns to the starting level, the problem is under-tensioning. If the noise goes away for a few seconds and then returns, the cause is misalignment.

### Grid

Little stones in between the belt ribs (Fig. 10) can be another reason for noise. These can be found via a visual inspection.

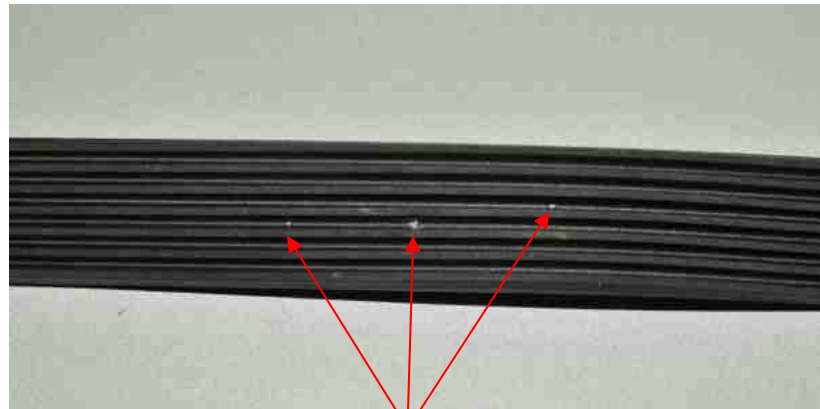


Fig. 10

Grid

### Complete drive inspection

Apart from the 2 main causes of premature failures, the condition of the other components will sometimes lead to belt noise:

- A worn crankshaft damping pulley, also called Torsional Vibration Damper (TVD) can lead to a serious belt noise. Replacement of the TVD is needed in order to cure the problem.
- Overrunning alternator pulleys (OAP), also known as “free-running” alternator pulleys often create severe belt vibrations and noise problems once they do not function properly anymore.

For further information on troubleshooting, please see our brochure E/70407.

Visit our web catalogue : [www.gatesautocat.com](http://www.gatesautocat.com)

