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Technical Bulletin

Hydraulic Tensioners

GATES REFERENCE : MAKE : MODEL : MOTOR : MOTOR CODE :	**Hydraulic Tensioners** FORD / OPEL / VOLKSWAGEN GROUP MULTIPLE	 

Introduction

Belt drive systems for both timing and accessory drive can have different tensioning systems.
In the past, engines used a manual tensioner (or eccentric pulley) for the drives, which had to be installed and then locked in place. Over time, the belt tension would change as there is no adjustment of the tensioner, after the initial installation.

Nowadays, and for many years already, automatic tensioners are being used to control belt tension and dynamic behaviour of the drive system. An automatic tensioner optimises the belt tension in function of the change in the belt and engine characteristics.

Engineers have designed 2 main systems to ensure optimal belt tension at all times.
The first one is the “traditional” and most commonly used design, where a springloaded mechanical tensioner (Fig. 1) controls the belt tension.
The second system, less popular and more expensive, consists of a hydraulic tensioner set-up (Fig. 2).

In this technical bulletin, we will concentrate on that last system and we will highlight some key points in the functioning and installation of the hydraulic tensioning method for both timing and accessory belt drives.

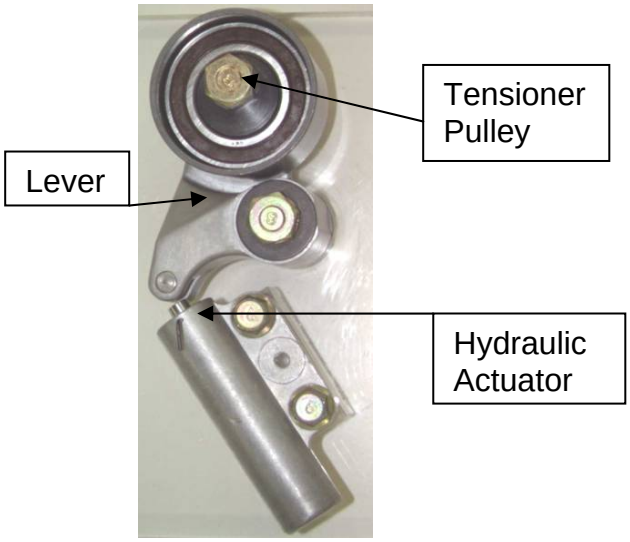
What is it ?

The hydraulic system is mainly used on applications with high loads and/or angular vibrations, where a mechanical automatic tensioner can not provide sufficient damping or tensioner movement. In general, the hydraulic tensioner units need more engine space.

A hydraulic tensioner system consists of an hydraulic actuator in combination with a tensioner pulley (Fig. 2). The movement of the piston rod of the actuator is transmitted to the tensioner pulley via an integrated or separate lever.

Fig. 1

Fig. 2



How does it work?

The hydraulic actuator works like a shock absorber, where a spring in combination with the damping feature of the oil, will keep the wheel in contact with the road. In this case, the hydraulic actuator controls the dynamic belt forces, while it also maintains a +/- constant belt tension, and compensates for length changes due to thermal expansion etc.

A hydraulic actuator typically consists of the following parts (Fig. 3) : an aluminium housing (cylinder), the piston rod, the piston, the oil, the air, the spring, the one way valve, and the retaining pin.

The piston rod can move easily in one direction (piston rod moving outward) due to the oil flowing from one side of the piston to the other, via the one way valve. High dynamic belt loads are controlled by the hydraulic damping, which is created as the oil is forced to flow between the piston and the cylinder, when the piston rod is forced to move inwards.
The damping is optimised for each application and is dependent on the gap between the piston and the cylinder, and the viscosity of the oil.

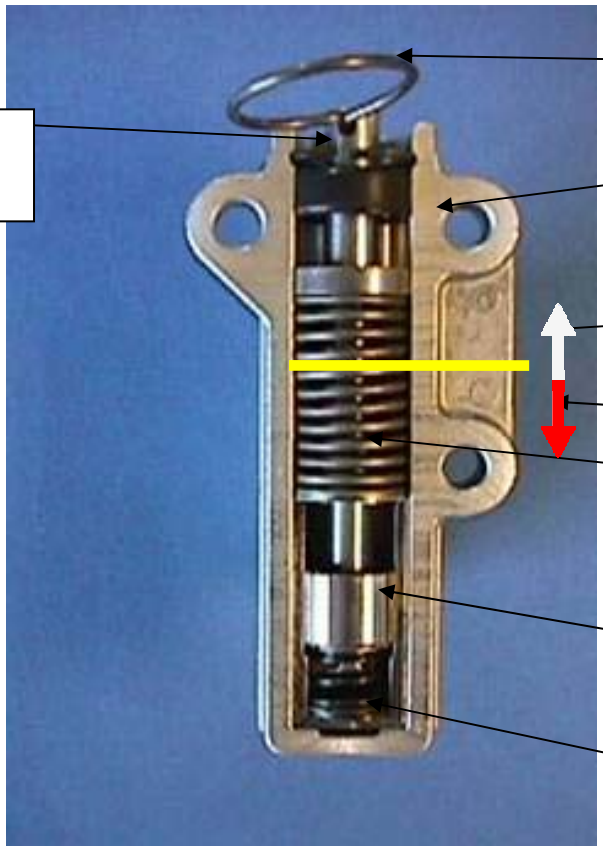


Fig. 3

Storage

Hydraulic actuators should be stored upright (visible part of the piston rod to the top) to prevent leakage and to avoid oil mixing with the air. Air bubbles in the oil could lead to a “non-damping” situation, which can result in tooth jump or tooth shear (in case of timing belt drives).
Please note that all our PowerGrip® Kits containing these hydraulic actuators have a “this side up arrow” on the packaging.

Installation

The retaining pin should only be removed after the installation of all components : new belt, pulley, (lever), hydraulic actuator.
The reason for this guideline is that, once installed, the hydraulic actuator is in a vertical position and there is no risk of mixing air into the oil.
Obviously, the installer should always refer to the OE recommendations when doing belt system replacement.

If the pin is accidentally removed, in horizontal or inverted tensioner position, it is STRONGLY recommended to compress the piston rod gently while in the upright position and then install the part. The engine should be rotated a few revolutions by hand, in order to separate oil and air again before engine start up.

Advantages

Because the hydraulic tensioner can operate with a larger range of dynamic belt lengths than a mechanical tensioner and due to the length of stroke of the actuator and the lever design, the hydraulic tensioner system is particularly suitable for large V6/V8 engines (amongst others). The high, unidirectional damping characteristics make it suitable for controlling the dynamic belt behaviour on applications with high dynamic loads.

Why replace ?

Apart from the normal bearing wear on the tensioner pulley, also the actuator can start showing indications of wear. After a period of time, oil leaks can occur due to a leaking seal which can suffer from any kind of contamination. Even the smallest leak in the actuator can have incorrect damping as result.
Also, as a result of the constant movement parts will wear out (normal wear), possibly resulting in a complete system failure.

Applications

In Europe, mainly Audi/VW vehicles are using this type of tensioner.

Hydraulic Tensioners can be found in the following kits:

K015491XS : VAG 1.8 1996 ->	K045520XS : Audi A6 2.5 Tdi 1999 - 2004
K025491XS : VAG 1.8 1996 ->	K025557XS : VAG 2.5 Tdi 1998 ->
K025492XS : VAG 1.8 1994 - 2000	K025569XS : VAG 1.9 Tdi 1998 ->
K015493XS : Audi 2.8 1995 - 2001	K045569XS : Galaxy/Sharan 1.9 Tdi 1999 ->
K025493XS : VAG 2.4/2.7/2.8 1996 ->	K025601XS : VAG 1.2 Tdi 1999 - 2005
K025520XS : VAG 2.5 Tdi 1997 - 2003	
K016PK1803 : Opel Vectra 2.0 DTI 1996 - 2003	K016PK1903 : Opel Vectra 2.0 DTI 1996 - 2003

Please consult our catalogues for more detailed application information.

