

How does an automatic transmission work ?

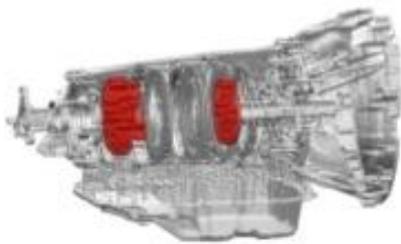
- **What is an automatic transmission used for ?**

An automatic transmission allows the engine torque to be transmitted to the vehicle wheels while adapting the engine characteristics to the traffic conditions and driving style.

By means of the automatic system, it is the vehicle which operates the gear shifting according to parameters such as engine speed, position of the accelerator pedal and vehicle speed. The automatic transmission has the main advantage of being very comfortable for the driver, especially in town and in traffic jams where gear changes are frequent.

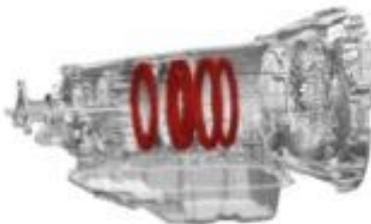
- **What makes up an automatic transmission ?**

Gears



Gears are the core elements of the transmission. They make it possible to obtain the torque ratios. In an automatic transmission, gears are arranged in epicyclic gear sets, also referred to as planetary gear sets. These planetary gear sets allow multiple ratios to be selected by blocking one of their single components. An ingenious combination of several planetary gear sets will therefore enable to reach a wide range of highly efficient speed ratios while optimizing the size and weight of the transmission. The Punch Powerglide 6 speeds offers six forward speeds and one reverse speed by combining three planetary gear sets only.

Clutches



Some multi plate wet clutches, actuated by hydraulic pistons, make it possible to block or interconnect some of the elements of the different planetary gear sets. In the Punch Powerglide 6L transmission, two clutches need to be engaged to obtain a speed ratio. The design of the clutch packs is optimized in order to minimize the drag torque resulting from the friction between the plates, when the clutches are disengaged; thus improving the efficiency of the transmission while keeping the vehicle fuel consumption and CO2 emissions at the lowest possible level.

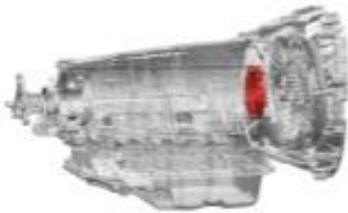
Torque Converter



An automatic transmission is not provided with a starting clutch. The starting function is ensured by a torque converter. It consists of a hydraulic coupling device: two impellers, one connected to the engine and the other to the transmission input, rotate in front of each other inside a housing filled with oil, and allow therefore the engine torque to be transmitted. An additional device is also used to multiply the engine starting torque, thus allowing good acceleration performance. Some integrated spring

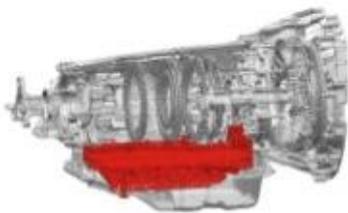
systems reduce the engine vibrations, especially at very low rotating speeds (rpm). A lock-up clutch is applied once the vehicle is started, in order to prevent torque converter slippage and power losses due to hydraulic frictions.

Hydraulic Pump



An oil pump provides all the hydraulic flow and pressure needed to control and lubricate various mechanical transmission parts. It is designed to deliver a pressure up to 20 bars. This pump may be of a vane-type, or of a gear-type, located on the axis of the transmission, or off-axis located and chain driven. The Punch Powerglide 6L transmission is equipped with a variable displacement vane pump which automatically adapts to the instantaneous requirements of the transmission, thus avoiding power losses.

Electro-hydraulic Module



An electro-hydraulic module, usually located in the lower part of the transmission, controls all the transmission hardware. It consists of hydraulic valves, operated by solenoids, that send oil pressure and flow to the clutch pistons or to the lubricating circuit. The whole process is managed by an electronic control module which constantly interacts with the engine controller. This module monitors the gear shifting and regulates the oil pressures by sending electric signals to the solenoids. It may be located outside the transmission, or, like for the Punch

Powerglide 6L, inside the electro-hydraulic module.

- How does it work when driving a vehicle ?



A gear shift lever enables the driver to select the desired driving mode. This lever can be operated using at least four different positions, identified by the letters P,R,N,D (**P**ark, **R**everse, **N**eutral, **D**rive). In case of shift levers equipped with a manual mode M (**M**anual), the driver is given the ability to shift manually by pressing the "+" button for upshifts and the "-" button for downshifts.

In Drive mode, the gear shifts are automatically controlled by an electronic control unit with respect to the vehicle speed and the gas pedal position.