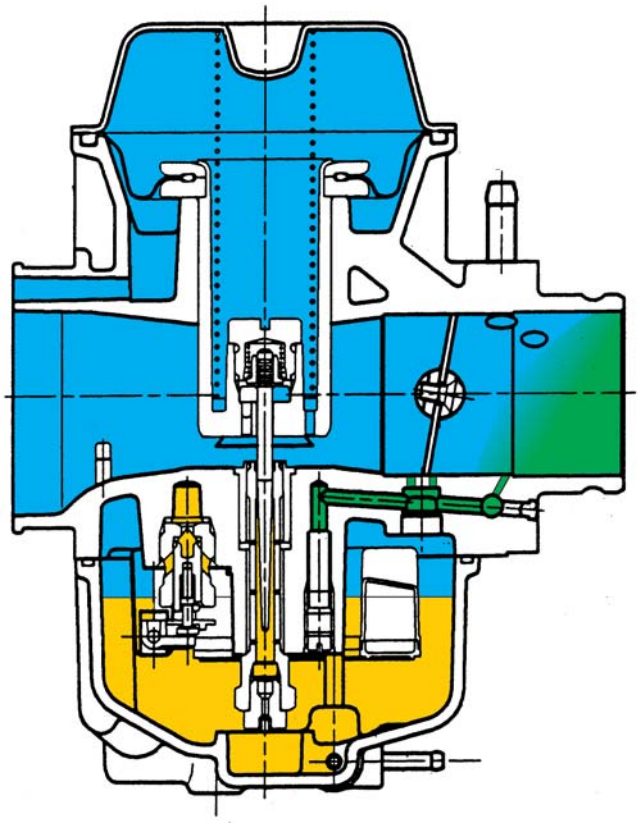
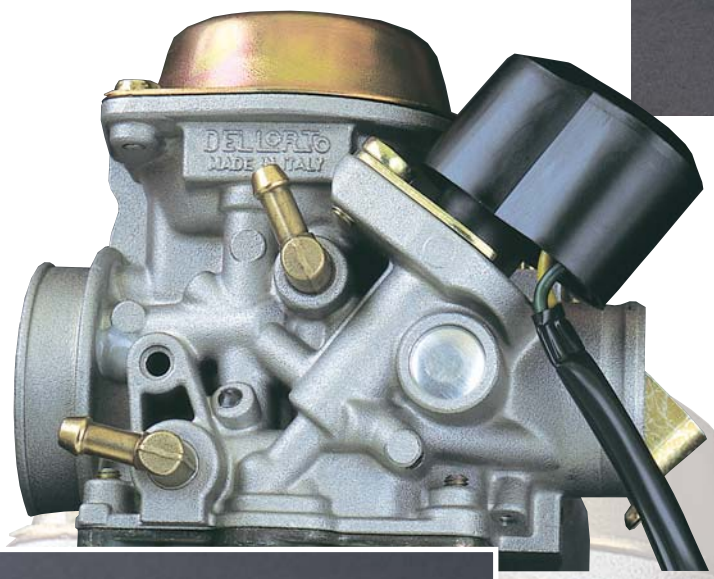
THE VACUUM CARBURETOR

The operating principles and the constructive aspects of the fuel supply system, universally widespread on 4 stroke engines

This kind of carburetor is called "constant vacuum" but that does not mean that the absolute vacuum is really constant.
The modulation problem of the carburetor, meaning the response of the engine which is function of the throttle opening, is constrained as a matter of fact to the vacuum value which controls aspiration of fuel from the main circuit.
In a traditional carburetor, when the throttle opens wide quickly (without "following" the engine progression with the throttle opening) the venturi area increases suddenly. At the same time, the rate of flow induced by the engine has not increased proportionally, since the engine rpm does not increase as quickly.
By increasing the area exposed to a virtually constant rate of flow, the flow speed decreases and therefore the pressure increases.
That is why the vacuum signal on the fuel circuit is missing, the signal which is needed to draw fuel past the atomizer in increasing quantities necessary to feed the engine.
The result is that this vacuum signal is weak or is missing so that we must often return to part throttle to get a decent progression.
With the vacuum carburetor we have two elements to adjust the rate of flow: the throttle valve, of automotive type, driven by the driver, and the traditional piston valve, with conical needle actuated by the vacuum system.
This valve is connected to a vacuum chamber by means of a flexible diaphragm.
The vacuum chamber is connected by one or more passages with the narrow section of the venturi, under the piston valve.

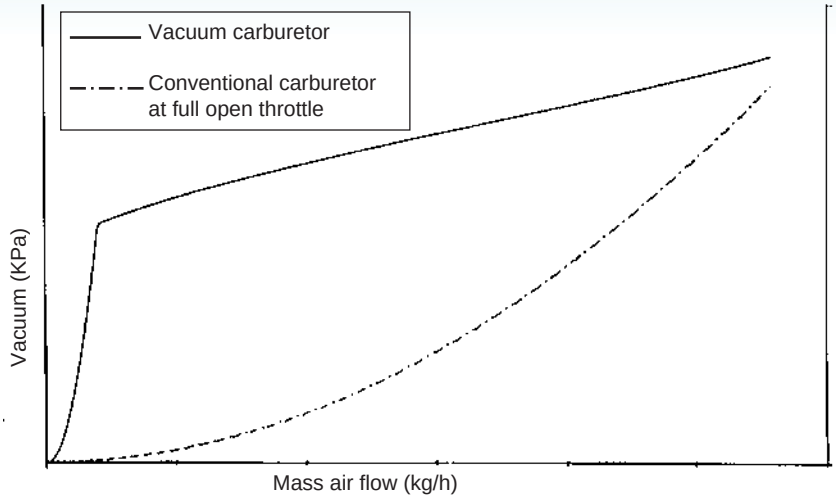


This is the area where the vacuum needed to draw fuel through the nozzle is generated. In our case the vacuum communicates with the chamber which oversees the valve through a passage.
The lower part of the chamber is exposed to atmospheric pressure because it's connected to the air intake of the carburetor.
The venturi vacuum pulls the valve towards the top by overcoming the contrast spring. This spring becomes an adjustment component, just as the diameter of the holes of the valve's vacuum intake which influence the transient response of the piston valve.
As the vacuum increases, the piston valve will be lifted higher.



Three views of the Dell'Orto vacuum carburetor: we can see the piston accelerator pump assembled in the float chamber and the automatic starting system with the compact type actuator shorter than the traditional ones.

At partial throttle and closed throttle, the vacuum under the piston valve is low and therefore the valve is lifted only slightly.
When the throttle opens wide, the speed of the inducted flow increases and the valve starts to lift proportionally.
If the throttle is suddenly wide-open, the guillotine doesn't lift equally, but follows on its own the effective progression of the engine, making it independent of the driver's action. With this device the engine is always fed always with an optimum rate of flow, because the same aspiration signal actuates the fuel circuit and modulates the



In the middle, the valve that affects the aspiration under the driver's control, while the actual inducted rate of flow is adjusted by the piston valve actuated by a barometric capsule. Below, the air intake with the section that feeds the barometric capsule on the high portion and the sprayer of the acceleration pump. Left, a comparative chart where we see the vacuum value present in the venturi (wide open) according to the airflow inducted by the engine. In the vacuum carburetor, the venturi vacuum that activates the fuel delivery circuit remains more or less constant as the flow changes, since the flow depends only on the engine speed. In a traditional carburetor, on the contrary, the vacuum is very low at small flow rates, then increases proportionally.

power.
If we wish to think of this in a simplified analytical approach, we can demonstrate that the height (h) of the valve (that we have to distinguish from the throttle) in a vacuum carburetor is dependent on just a couple of variables.
One variable is the rotation angle of the throttle (a) and the other is the engine speed (n). This means that the lifting of the valve, and therefore the action of the main circuit, is a function of the same parameters that determine the delivery in an electronic injection device (a-n).
Depending on these two parameters, the passage areas both of the air (venturi) and of the fuel (conical needle) are managed, by letting the mixture ratio change according to the operating condition.
It is then clear how the vacuum carburetor operates independently from the throttle opening set by the driver.
The fuel delivery and the air passage are not only functions of the throttle opening, but of the engine speed, while in a traditional carburetor the only control parameter is the throttle stroke and the engine speed has no effect.