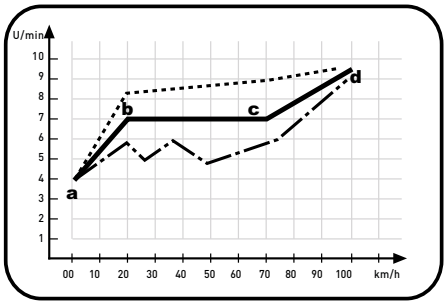
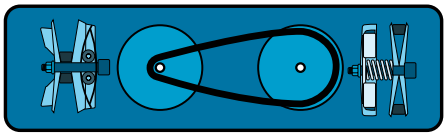
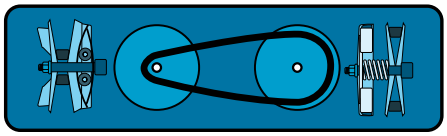
VARIATOR SET-UP

The aim is to adjust the complete variomatic (consisting of the front variator with roller weights, rear converter, torque spring and clutch) so that it changes the transmission ratio whenever the engine's power band is reached. This is the only way to achieve an optimal acceleration. Adjusting the variomatic is mainly done by inserting the right roller weights into the front variator. Note that there is only one set of weights that will make the variomatic run perfectly. If the weights are too heavy or too light (already half a gram makes a difference), the engine performance cannot be used optimally. Heavy weights rise FASTER in the variator, i.e. the variator „shifts" earlier into a longer transmission ratio. Lighter weights on the other hand rise MORE SLOWLY, the variator therefore remains longer in a shorter transmission ratio.

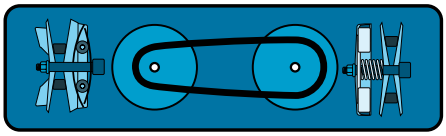




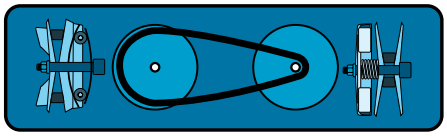
a Engine at idle, the clutch is not engaged. The variator is at the lowest transmission ratio.



b The engine has reached 4000 rpm, the clutch connects engine and gearing, the engine revs up till it reaches the ideal rpm.



b-c The roller weights are pushed out by centrifugal force and at 7000 rpm the variator starts to change transmission ratios from short to long.



c-d The variator has reached its highest gear ratio. The rpm now rises higher than the ideal power band and the engine reaches its top speed.

The graph on the left shows 3 differently adjusted variators. The solid line depicts a correctly adjusted engine; the clutch engages at about 4000 rpm (a), the engine revs up until it reaches its power band of 7000 rpm (b) and accelerates to 20 km/h. Now the variomatic starts to "shift", continuously keeping the engine in its power band of 7000 rpm up to 70 km/h (c). This is when the variator has reached its highest gear ratio and the engine now revs up until 9500 rpm (d), reaching its top speed of 100 km/h.

The dashed line depicts a variator with weights that are too light; the engine runs at above the ideal rpm range, which decreases the acceleration. Just imagine you are constantly riding at first gear on your bike. Despite pedalling away like mad, it will take you forever to get somewhere.

The dashed/ dotted line depicts an engine with weights that are too heavy. The engine has no chance to even reach the rpm where it creates the most horsepower, but instead permanently changes transmission ratio, slowly struggling to reach a higher ratio. Here again it is helpful to compare your scooter to a bicycle: it's just like trying to drive up a hill while using a gear that is too high.

Now the question is how to set up your transmission properly if you don't happen to store a dyno in your garage. A good method is to employ a tachometer. At first, you insert very heavy weights into your variator (10 – 12 g). This will cause your engine to struggle desperately at the beginning, but then it will manage to get out of this hole and will start to accelerate. This moment can easily be recognized. Do a few test rides and note at which rpm your scooter seems to be accelerating the smoothest. Now swap the roller weights for lighter ones and again go for a test ride. While the transmission changes gear ratios, the tachometer should always show the rpm that you have discovered. Only when the transmission has reached its highest gear ratio should the rpm rise higher than the ideal range. If the rpm is higher than your value, the weights are too light. If it is lower and keeps changing a lot, the weights are still too heavy. If the drive belt slips while moving off from a standstill, or if you have to use weights so light that the top speed cannot be reached, then you will have to go for a stiffer contra spring.

The second way to set up your transmission takes a bit of experience and feel for the engine's rpm. First, use heavy weights that will cause the engine to restlessly change transmission ratios while driving. Now, step by step use lighter weights until the engine accelerates smoothly at the same rpm (with a bit of exercise, you can easily hear that from the constant engine sound). When driving up a hill, the scooter shouldn't reduce rpms either.