

Cambridge Lambretta Workshops

Making Your Lambretta Go Faster

Trying to make your Lambretta go faster? Well unfortunately for you there are 1001 and probably more ways to make this happen, and even more variations on costs, what to use and what not to use! You might even look at this page and think we have over complicated or gone into too much detail, all we can say is to make your Lambretta perform, and perform properly and reliably, please do read on!

Topics, what you can do, people's advice, the ways to achieve things are so varied, different and contradictory who is right. The short answer is no one person knows every thing on tuning; there is still very much a black science when it comes to tuning two strokes. For example what works on a small light weight big wheeled motorbike, won't necessarily work on a small wheeled heavy and un aerodynamic Lambretta!

Another important point about tuning, especially with carburettors and jetting, is that while you may be able to get expert advice, on the whole this advice is just a starting point to which you are responsible for the correct operation and reliability of, don't take Mr X's word for it that setting Y is correct, you need to make sure yourself. While some will not agree with me, I would say that if a shop sets your scooter up fine, they are responsible, but as with most things Lambretta, riders always want to tinker and adjust, fit themselves and maintain things, fine but get it wrong and then people will start to tell you Vespas are more reliable!

Also just stating the question I want to go faster, does not always help the tuner or parts supplier, they really need to know, what you expect to achieve, the use you give your scooter. For instance if you primarily use your scooter for short round town trips, then you may want to opt for a more revving set up. If you use your scooter over long distances, carrying passengers etc, then a torquey set up would be better. There is no set up on the market, and nor will there ever be that will be perfect in all instances of use, what you have to try to achieve is the best all round performance for your use. Another important question for you in any case, how much are you willing to spend in your quest for speed! For example if your only occasionally use your scooter, do you really want to spend £1000+ on the engine alone, or if you use your scooter daily and for every rally, you will want to spend more for reliability as well as performance.

So what to do? Well first things first, ANY performance upgrade whether it gives you 1hp, one mile and hour or one hundred will mean more stress and strain on the existing components of your engine. So before you start budgeting, don't forget those all important items such as bearings, clutch, crank condition, oil seals, and all other components in your engine need to be checked, replaced and or upgraded before carrying out any form of tuning. It is highly unlikely that by fitting just a kit or tuning part to a standard Lambretta engine you could expect trouble free running, please seek further advice at the time of purchasing any products.

Briefly below are the main topics that can and will help in way your Lambretta performs.

Exhausts



99% of all two stroke tuners will agree with biggest gains or losses for that matter can be made with exhausts. The exhaust really controls where how and when power is made, from a low revving exhaust that makes lots of torque (pulling power) to a high revving exhaust that makes lots of peak power (speed). For instance using a high revving kit or port timings, but bolting on a low range powered exhaust probably isn't the best idea as one is fighting the other in terms of the way they work. Although having just made that statement there are certain instances where you could do such a thing and it would work well! Building the perfect exhaust depends on what you use your scooter for, many exhausts exist on the market for Lambrettas, and they work in different ways. Low revving exhausts tend to be good for touring, and longer distance work, they will restrict top speed to a certain degree because of this. It is important to remember that the fitting of an expansion or performance type exhaust normally requires at the least a change of the main jet, you should ask the supplier for details for your exact specification of scooter and what is required.

Low revving Exhausts on the market. Good for touring, gearing can also be kept taller.

Taffspeed
JL Road
Big bore

Mid range exhausts are generally used for all round use, bit of acceleration, plus a bit of touring.

PM tuning
JL Race

Higher revving exhausts give good acceleration and top speed, but tend not to be as good for touring as the scooter is revving higher to achieve the same speed. The engine revs need to be kept higher to achieve the performance, best to use low gearing.

Imola snail
Scorpion
NK



Carburettors



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Tuning theories differ greatly on carbs, in the past the theory big is best with carburation is not always the case. Smaller carbs tend to promote torque and cleaner running, larger carbs tend to promote more top speed, at the expense of bottom end power. You can as with everything in life go to small or to large, either starving the engine, or flooding it, again you need a happy medium.

Many tuners of two strokes have started using simple carburettor designs of smaller diameters, as getting the jetting correct on a two stroke can be the difference between an engine performing to its full potential, or being 4 or 5 hp down on well tuned engines. In general size of carb needs to be chosen by the cc of your scooter, level of tune, the air intake system and the exhaust, not just one factor.

The most common carbs on Lambretta are Dell'Orto, both in terms of standard and bolt on performance types. But there are increasingly more and more different makes entering the market for use with Lambrettas, so again the choice is wide and varied.

Standard items are for all Series 3 Lambretta machines from the SH range of Dell'Orto carburettors. Although no longer manufactured a huge amount of spares both new and second hand are still available. The smallest bore on the S3 Lambretta is the 18mm. then going up to 22. After market and bolt on carbs can go from 22 right up to 34, although you can and there are larger carbs then this, in general larger carbs tend to be too much for the humble Lambretta!

Carburettor sizes and recommendations vary from tuner to tuner, it is probably best to speak to your chosen supplier and see what they recommend. Roughly speaking

125 to 150cc keep the original carb, possibly go to a 22mm

175 (tuned) 22 to 28

200 + (tuned) 25 to 30

When the mention tuned, we mean by means of porting, exhaust, etc.

On more exotic kits such as the GT, Imola, TS1 etc, you need to follow your suppliers' recommendations, as they tend to run on differing carbs.

Inlet Manifolds



The problem with most Lambretta sets up is to gain the best possible inlet of fuel; you would not start of with the inlet area of the cylinder where it is. A direct route for the fuel/oil/air mix will give the best results, but most inlet manifolds feature some form or curve or slight bend. Some of the early CDC type manifolds for large PHBH Dell'Orto cars we amongst the most direct on the market, but their draw back was they would not be able to run through a standard Lambretta air box. Also being solid mount, with vibrations this caused problems with the fuel in the float bowl, and supply of fuel to the engine. There are and have been quite a few manifolds on the market that while also being direct, also allow the use of the air filter box, but they tend to depend on application or parts used. This last statement also pretty much holds true as to what you can use, as your cylinder and carburettor dictate what can and can not be fitted, again speak to your supplier if there is a choice! Using a rubber manifold, or at least at manifold capable of using a rubber mount between the manifold and carburettor is quite important on a Lambretta. This is due to Lambrettas vibrate, rubber mounting the carb helps cut vibration down, which can lean to fuel throffing.

Air Intake



The basic Lambretta air filter is quite basically designed for basic engines; any increase in performance can cause restriction in air flow. Although there are a number of ways to help this, such as drilling air boxes, widening the air scoop and neck, the basic make up of a paper air filter can still restrict air flow. This will cause problems in getting jetting correct as well as restricting performance. The main problem with the air filter box, is that air needs to be held in reserve, look at it as a being like a fuel tank, if there is not enough air in the box, when your engine needs maximum air, the air filter system cannot keep up and runs dry for want of a better word. We all fit fast flow fuel taps, but then neglect the air system. Also the nature of the paper air filter element is not the best method of allowing high air flow,

There are two other filters on the market other than the standard type. The first is a high flow item, still looking like the original filter, and still fitting within the standard Lambretta air box. The second is a remote filter; this normally involves using a Lambretta carb to air box rubber and bonding on a general purpose after market filter from companies such as K&N or RamAir etc to improve flow. Depending on your set up, jetting etc etc, tests we have done can see any thing from 1/2 to 2bhp more by switching air filter systems.

Ignition



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Ignition systems can also play a part in power, where it is made, and how well. Static timing on an original points and condenser system can only really cope with a certain amount of revolutions per minute, before the points cannot keep up. They have to open and close, being a mechanical part, they can "bounce" at high revs, meaning they do not spark when they are supposed to. Changing to an electronic ignition is one of the single best upgrades you can make to your Lambretta. One word of warning though, is that almost all systems made on the market today, bar far the most available are made in India, and quality can be at best described as erratic. Poor quality of parts and workmanship can some time determine if you get a kit that will last, let alone work at all. Many suppliers re-manufacture and upgrade kits before selling to the public, so check with your supplier.

There are now alternatives coming on to the market, lighter flywheels, differing timing, but the progress is slow. One such kit called the Varitronic, improves quality and performance to what is currently available from India. The Varitronic features an advance and retard feature, a pre-programmed power curve. The advantages of running an advance/retard system is that you can change the timing to suit the speed you are running at. For example if you run advanced timing gives so much more power but at high revs because the spark is so advanced, it will cause too much heat and burn a hole in your piston. Static timing as found on most electronic kits really is a happy medium, you have to set your kits timing at a figure that still gives power, but on the other hand can also be run safely. With the variable timing kits, these allow the use of running advanced timing, and then when the revs rise the timing retards making it run not only at its best, but also its safest. Flywheel weight also comes into play; most standard or electronic flywheels can weigh between 2.5 to 3 and above kgs. This heavy weight has its good and its bad points, the heavy weight helps to produce torque once the speed is obtained, plus allowing a slower tick over without the engine stalling. New lighter flywheels are now on the market which greatly helps in terms of acceleration, but need a higher tick over. Too light or too heavy can also put strain and stress on your crankshaft, in certain circumstances cranks are not unknown to twist or snap under load. Ideally a Lambretta flywheel should be around 1.80 to 2.00 kg.

Body



Body work, in reality the Lambretta is a brick in terms of weight and design of bodywork. Not only is the Lambretta not aerodynamic, but also heavy as well. Weight in terms of speed and acceleration also is a big deal in how well your scooter performs. There are many fibreglass, Kevlar and other such exotic panels appearing on the market that if you want to gain speed by saving weight, you can do so. The old joke that if you want to improve performance simply go on a diet is quite true!

Gearing



On the face of it gearing seems pretty simple. As CCs increase, the gear ratios become higher (lower number), i.e. 4th gear ratios: LI125 = 5.65, LI150 = 5.22, TV175 = 4.82, TV200 = 4.46. Unfortunately, this rule seldom works with tuned engines and commonly leads to people making the wrong choice of gearing for their machine, resulting in disappointing performance.

Gearing application is closely related to the rev range that a specific set-up produces power at. If the 4th gear ratio is too high (low number) then the scooter will struggle up hills, or into a headwind, and frequently need changing down into 3rd gear to gain the extra revs that it needs to get back into the 'power band'. If the 4th gear ratio is too low (high number) then it will limit the speed the scooter can achieve. Like all aspects of tuning, gearing must be in harmony with the rest of the tuning components and suit the application for which the scooter is being used.

Cylinder porting and exhaust characteristics greatly effect the power/rev range relationship and in doing so greatly effect the gearing required to work in harmony with them. If you change either of these elements then you can throw the earlier rule out of the window! E.g. a highly tuned TS1 225 with a 'revving' expansion pipe may require the same 4th gear ratio as an LI150. This example shows that although the tuned TS1 may be capable of producing 4 times the bhp of the standard LI150, they both need the same gear ratio to get into the rev range that will produce power to compliment the tuning employed. Please note, the TS1 and other kits will also be capable of much higher speeds because of its ability to 'rev on'.

Innocenti provide us with wonderful examples of how gearing ratios need changing to suit differing set-up for the same CC. Taking the 200cc models as an example, although the 150cc models illustrate the same trend, it is easy to see that Innocenti altered gear ratios to compliment other changes within their engines. The first 200cc model, the TV (GT) 200, had a gearbox specifically designed for it and so can be thought of as the initial 200cc gearbox. The SX200 differed from the GT by adopting the same gearbox as previous 175cc models. The GP200 continued the trend of lowering the 4th gear ratio, whilst maintaining the same CC, by adopting the overall final ratio of the earlier LI150 model. Like the earlier TS1/LI150 example, the GP200 and LI150 may be using the same gear ratio but the GP has the ability to 'rev on' and produces its peak power of 11.7bhp @ 6200rpm, whereas the LI150 produces only 6.6bhp @ 5300rpm. To compare like for like, the GT200 produces 10.7bhp @ 5700 which when compared with the GP200 figures (11.7bhp @ 6200) show how different the power characteristics of the engines are. If you were to simply swap the gear ratios between the two models then the GT would 'rev out' on the GP's lower ratio and the GP would not be capable of 'pulling' the GT's higher ratio in anything other than favourable conditions, both bikes would probably suffer performance loss in 4th gear.

So to recap, if you simply increase cc you are likely to need to raise your gearing to suit. If, however, you fit any tuning components which push the 'power band' further up the rev range then you are likely to need to lower your gearing to suit. If you are really lucky, or fairly clever, you can tune you scooter without needing to change your gearing at all! A perfect example of this is that AF Rayspeed (originator of the TS1 kit) suggests that if you fit a TS1 225 cylinder, 34mm carb, and NK expansion exhaust to a GP then the 4th gear ratio that you require to get the whole thing working in harmony is... yes, you guessed it... GP200 with 5.22 ratio (standard).

As explained, hopefully, there are a number of factors effecting what gearing will compliment an engine's power/rev range specifications. It is very easy to get the required ratio wrong. Don't simply pick up the phone and buy any tuning 'goodie', from a kit to an exhaust, without asking the supplier of choice to give you advice on how fitting the component may affect other aspects of the engine's performance, including gearing.

By changing the front sprocket to a higher number of teeth, you will raise the gearing. This generally increases the final ratios by a big amount. By changing the rear sprocket to one with a higher amount of teeth, the final ratio is lowered. The rear sprocket is less of a jump and can be used to fine tune ratios, so with one type of gearbox and adjusting front and rear sprockets, the amount of ratios you can have is very large.



Cylinder Tuning and kits



Although this topic should be at the top,

Increasing CC by Re-bore



Performance can either be gained by increasing the CC of your scooter, or by tuning the ports to give more power. With the arrival of cheap cylinders from India, it has become no longer viable to tune or increase the cc of your original cylinder. 125 cylinders can be taken out to 150, 150 cylinders to 175, 175 to 200 and 200 to 225. You can in certain instances increase cc further beyond these guides, but in general the cylinder walls become dangerously thin, and the cost outweighs the gains you would get. As we said, it has now become pretty much as cheap just to buy a complete bolt on kit.

One thing to note with the wave of cylinders coming in from India, although they are on the whole good quality, and most can be bolted on straight from the box to give some form of improvement, you can make further gains with some simple tuning and modifications. One point to note is that many of the 175 cylinders can in fact give poor performance, as these have small inlet, exhaust and transfer timings. Bolting one of these cylinders on such machines as SX150, GP125 or 150 can sometimes see no or very little gain due to the porting.

Porting



Porting your cylinder or as most call it "stage tuning" can be an effective way of gaining speed. Porting normally involves making the inlet, exhaust and transfers larger, a word of caution though, you cannot just open them willy nilly to what you think will be correct! If you are considering carrying out such work, we would suggest you either have this carried out professionally, or at least seek to purchase a tuning manual to guide you.

Cylinders Kits



By far the easiest and most effective way of increasing performance is to use one of a whole host of bolt on kits that exist on the market today. As well as the Indian 175 & 200cc kits already mentioned, you can choose from iron, alloy with a cast liner, or alloy with internal plating.

For the 125/150/175 cylinders, currently there is a choice of :-
SR175 or 190cc kits. These are an alloy cylinder with a steel liner.
Mugello 185cc. Alloy cylinder with nicasil lining.

GT185cc Iron cylinder with reed valve

Imola 185cc Alloy cylinder with reed valve

For 200 engine casings, there is equally a large choice to ponder.

Rapido 200, 225 & 250cc. Alloy cylinder with iron liner.

Mugello 200, 225 & 240cc. Alloy cylinder nicasil lined.

TS1 200 & 225cc Alloy cylinder with reed Valve.

Monza 200, 215, 225, 240cc. Alloy cylinder with reed valve

So now you have read through this, it is time to consider what to purchase. One thing to re cap on all of this is the quality of the complete engine, not just the parts you are fitting. In general we would suspect with a well built engine, performance kit, exhaust, carburettor and electronic ignition you are probably

looking at a minimum of around a £1000.

In general we would recommend the following, but please feel free to contact us so we can discuss your specific needs :- General all round use, still retaining reliability, but with a good turn or speed for cruising and touring :- Mugello 186 or 200 kit, with 22mm carburettor and Clubman exhaust. Extra power can be gained from opting for the JL road expansion. For more power still you can add a larger 26/28mm carburettor and JL race expansion. With further tuning the Mugello kits can be made nearly as fast as the standard Imola/Monza cylinders. Fast road use the Imola or Monza kits would be more suited. Again you can use these kits with a clubman or JL road exhaust to give good touring results, but ideally they are suited to the JL race for a good spread of power. Larger 28 or 30mm carbs need to be fitted as standard.

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