



SCOOTER CENTER

LAMBRETTA

Jetting Guide



This is a small guide to get the jetting of the carb on your Lambretta right. The basic principles work on all 2 stroke engines with a carb though. First we show you the basic principles how the carb works and what part on your carb does what. Just in the case you don't know already. We have then collected some data of carb setups used on different engines. These are good starting points to get the engine running and then dial the carb in from there. We will also show you what effect a proper carb setting has on power and why this guide and the starting points for jetting come in so handy.

Setting the carburetor

The main reasons for unreliable engines and seizures are not mechanical failures but incorrect ignition timing and badly set-up carburetors. There is no such thing as a touring or in-town setting, only a correct one.

A typical indicator for the setting is the spark plug colour. The problem with this is that unleaded fuel and fully-synthetic two-stroke oils make this much harder to see than in the old days. However as a rough guide it is still a worthwhile check. You will have to do this directly after a run on full throttle, ideally switch the ignition off while you are still on full throttle (and pull the clutch of course). A very light colour (grey or white) indicates that the engine runs lean. A black or even oil-covered spark plug shows that the mixture is too rich. The classic recommendation is that the spark plug colour should be a dark chocolate brown colour.

The theory

All carbs work with atmospheric pressure which makes air and petrol flow through the carburettor. We can now try to influence this pressure by altering the different jets, to get the mixture of petrol and air right.

This mixture is generally influenced by the diameter of the carb. If the carburettor is opened by the throttle, air is sucked into the engine. At the same time, a conic needle, which is connected to the slide, is pulled out of the atomiser, opening the main jet and adding fuel to the mix. The shape of the needle and the height at which it sits in the slide will determine the mixture from lower throttle settings right up to near full-throttle. The float will provide an even level of fuel for the main jet. Just over the main-jet, the bypass for the idle-setting is cast into the carb, which can be adjusted by the idle mixture screw from the outside of the carb. A second screw forms an adjustable stop for the slide, so that the tick-over speed can be set.

The preparation

On to the actual setting, beyond very basic setting you will definitely need a suitable selection of jets to play with. If you don't have a dyno available, you will have to set the carb on the open road. The easiest way to do this is to use an open stretch of road where you can repeat the same testing procedure several times. After you have got the basic setting to a point where the engine is ticking over and responds to the throttle, you start setting the lower and middle range of throttle openings. The main jet can be left at an estimated and rather rich

setting, as it only comes into effect when the throttle is nearly opened up completely (see illustration). Always keep in mind that the setting depends on the throttle opening and not on the speed. The following components of the carb are responsible for the setting in the individual stages of throttle opening.

To find out which part of the throttle range you are trying to set up, it is a good idea to mark the throttle opening. This can be done by sticking tape on your throttle grip and handlebar and mark the stages of throttle opening as listed.

Throttle opening



Starting the engine: Starter jet
Pickup from tick-over: Slide cutaway
Mixture screw



→ 1/3: Idle mixture screw
Pilot jet



1/3-2/3: Atomizer
Jet needle



2/3-3/3: Atomizer
Needle
Main jet

Setting the tick-over

Tick-over should be set to an even and steady pace using the tick-over screw which is going horizontally into the carb body at the middle of the slide. If an even tick-over can't be achieved, the mixture is either lean or rich. This has to be adjusted using the idle mixture screw.

Adjusting the mixture at tick-over

If the engine is running uneven and noisy, the mixture at tick-over is weak. This is also the case if the engine seems to run fine for a few seconds, just to cut out the moment after. If the engine splutters when opening the throttle from tick-over or smokes badly, the tick-over mixture is rich.

The idle mixing screw also goes into the side of the carb, either in front or at the rear of the slide. If it sits in front of the slide, it adjusts the amount of air available at tick-over. Screwing it in will therefore result in a rich mixture. If it sits behind the slide, it is responsible for the amount of fuel and will work just the other way round.

If you are not sure about the behaviour of your engine, do the following: Set the engine to a quick tick-over (1300-1400 rpm). Now start setting the mixture screw increasingly richer, until the engine starts to run significantly slower. Now turn back the mixture screw for $\frac{1}{4}$ turn, and there you are. Connected to the function of the mixture screw is the pilot jet. If no suitable setting can be achieved by adjusting the screw, a different pilot jet has to be used.



Mixture screw *in front of slide*
PWK, Polini, Mikuni, Dellorto VHS

screw inwards -> rich mixture
screw outwards -> lean mixture



Mixture screw *behind of slide*
Dellorto PHBH/L

screw inwards -> lean mixture
screw outwards -> rich mixture

Here the setting is rather simple: a larger jet will richen the mixture, a smaller one will weaken it. A good set-up is found when your engine picks up revs easily from tick-over and settles back to an even idling pace afterwards. If the idling pace needs some time to settle back or keeps revving erratically, this is again a sign for a weak mixture. On some types of carbs the slowly coming back to idle speed can be an indication of too rich as well. If it's reluctant to pick up revs or splutters, it's rich again.

After the setting is right, you can finally re-adjust tick-over speed, which will be somewhere between 1000 and 2000 rpm.

The cutaway

The cutaway of the slide has a decisive influence on how the engine responds to the throttle. This works according to a simple rule: the larger the cutaway, the smaller the depression which sucks fuel up into the atomizer, hence a weaker mixture at acceleration. If the engine does not respond to the throttle properly when pulling away, a weak or rich cutaway setting can be the reason. If the engine coughs when opening the throttle, the cutaway is too big and the engine runs weak. If it is spluttering and slow taking up speed, the cutaway is too small and the engine has to burn off the superfluous fuel before it can accelerate properly.

Needle and atomiser

If the carb now responds well to the throttle in the first quarter of the throttle range, it is time to think about the needle and the atomizer. Those two parts always work in conjunction and limit fuel flow from the main jet to the carb venturi at mid-throttle openings. This is because the engine does not need all the fuel the main jet could deliver if the carb is not completely open. You could say that together they work as a variable jet. This amount of fuel is determined by the circular gap between the needle and the atomizer. As the needle has always the same thickness in its cylindrical part, the size of the gap is varied by different diameters of atomizer tubes. A larger atomizer will produce a richer mixture, as more fuel can flow through the gap. This is especially crucial with Dellorto carbs, which you could theoretically run without a main jet. As the engine will need more and more fuel the more the throttle is opened up, the needle has a conical part as well, which will allow for a steady increase of fuel delivered. The needles are available with different shapes of these cones, so that you can adjust the amount of fuel available at every stage of throttle opening. The general principle however is always the same: the larger the gap between the needle and the atomizer tube, the richer the setting.

So if the engine is not running well in the mid-range of throttle opening, you can both alter the size of the atomizer and the shape of the needle for adjustment. Also, there are locating grooves for the circlip, which holds the needle in the slide. By changing the circlip position, you can raise or lower the needle, which will alter the range of the cone of the needle (the higher the clip, the weaker the mixture and vice-versa). If this doesn't help, different shaped needles or other atomizers are needed.

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Finding the right combination of needle and atomizer is probably the most complicated part of setting the carb. It also is the most crucial one, as the setting will influence the way the engine behaves where it is used most of the time. However this is normally the case only with Dellorto carbs as the areas of the different setting components of the carb overlap slightly. In any case, getting the midrange setting right on a these carbs will require a lot of effort, as there is nearly an infinite number of possible combinations. Keihin, Mikuni and Polini are much easier and quicker to set up here.

To start with, you can try just altering the clip setting of the needle. If you raise the needle by using a lower clip setting, this will give a richer mixture and vice versa. If you find that this is not sufficient, you will have to change the needle or atomizer.

Carb internals



Atomizer



Needle & atomizer



Main jet



Idle jet

Too weak?

If you can accelerate well when opening the throttle, but suddenly lose power between 1/3 to 2/3 of the throttle range, the setting is weak.

Too rich?

If the engine is spluttering with the throttle opened in this area, the setting is rich.

Rule of thumb

As a rule of thumb, you should use a smaller diameter atomizer if the needle is in the lowest setting (clip in highest slot), while you should use a larger diameter atomizer when the needle is in the highest setting (circlip in lowest position).

Main jet

If the setting is alright up to $\frac{3}{4}$ of the throttle opening, you can finally select the main jet. This is a rather easy pick. You should use a long straight piece of road, then choose a main jet which will be too big in any case, so that the engine is spluttering (four-stroking) at high revs. Then you gradually select smaller jets until the engine responds well. This is rather easy to do if you always use the same stretch of road. The jet you will end up with using this method is still rather rich and will provide a good safety margin to avoid a lean mixture.

Too weak?

If you pull the choke and the engine runs better then, the setting is weak. Also if the engine accelerates when closing the throttle a little bit, this is a clear sign of a weak setting.

Too rich?

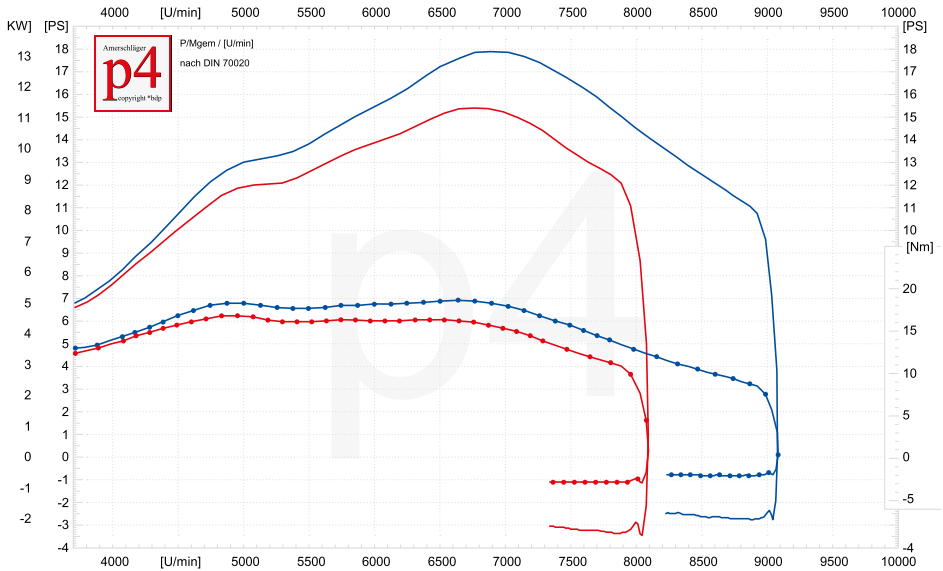
If on the other hand, the engine starts to splutter badly when pulling the choke, it is rather rich.

Here are a few jetting examples. These are a good starting point to dial your carb in properly. Please note these are starting points only and as explained you should richen the carb settings and then jet down accordingly.

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engine	carb	main	idle	atomizer	needle	clip pos.	power jet	slide
Mugello 225, JL KRP3, foam filter	PHBH 30	138	54	AS262	X13	2	-	std.
RT 195, Big Box, foam filter	PHBH 30	125	40	AV264	X7	2	none	40
RT 230, Big Box, foam filter	PHBH 30	115	58	AV264	X2	2	none	40
TS1 225, Taffspeed MK4, foam filter	PHBH 30	128	55	AV266	X2	2	-	40
GT 186, Clubman, std. air filter box	PHBL 25	95	50	AQ264	D22	3	none	40
RT 195, Big Box, std. air filter box	PHBL 25	95	48	AQ262	D22	3	none	40
RT 195, KRP1, foam filter	PHBL 25	100	50	AQ266	D22	2	none	40
200 cc standard, Clubman, air filter box	PHBL 25	87	44	AQ264	D22	2	-	40
RT 195, Taffspeed Mk4, foam filter	Polini 30	122	38	std.	JJK	3	none	3,5
RT 200, Big Box, Taffspeed MK4	Polini 30	122	38	std.	JJH	3	none	std.
RT 225, Big Box, std. air filter box	PWK 28	118	35	std.	JJK	2	none	3,5
RT 230, Big Box, bgm air filter box	PWK 28	125	38	std.	JJK	2	none	3,5
175 cc, Clubman, air filter box	SH 20	115	45	5899-2	-	-	-	5914-1
175 cc, Clubman, air filter box	SH22/ Jetex	123	std.	std.	-	-	-	std.
200 Stage4, Clubman, air filter box	SH22/ Jetex	126	std.	std.	-	-	-	std.
175 cc Stage4, Clubman, foam filter	TM 24	155	15	std.	4DH7	3	-	std.
200 Stage4, Clubman, air filter box	TM 24	175	17.5	std.	4DH7	2	-	std.
TS1 225, Clubman, w/o filter	TM 30	300	27.5	fixed	5EL68	3	30	4
TS1 225, TSR evo, foam filter	TMX 35	290	22.5	fixed	6EN11-56	2	none	6

The right carb setting is not only important for the reliability, smoothness of engine running and fuel consumption, it effects also the power output massively. Here you see an engine coming in with too less power on a RT 195 kit with PHBH 28 mm carb and Big Box Clubman. The red line shows the engine running too rich and the blue line a clean running engine with a properly set up jetting. The result is nearly 3 hp more, but much more important a much better power spread that transformed the engine literally.



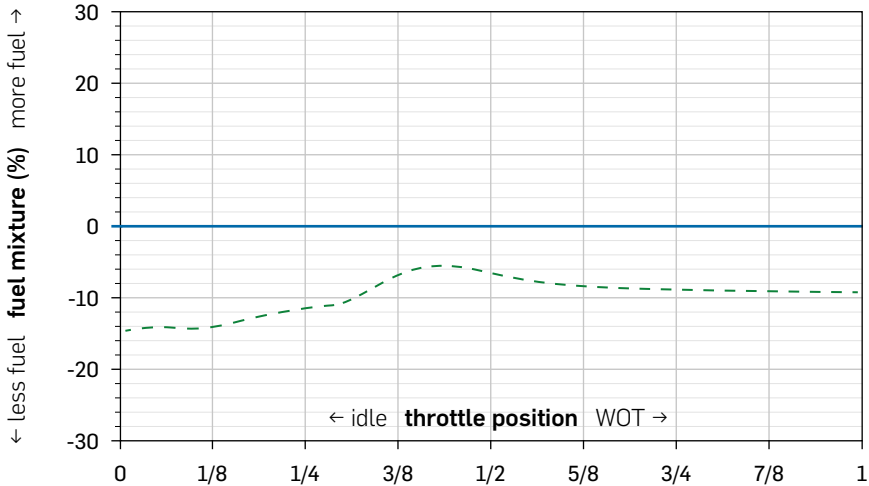
After we have given you some basic jetting info, we need to point out that these are starting points for the jetting only. These are starting points to get the engine running. From that point you should check all the slide openings and the respective parts. Ideally you over rich the setting and then jet down until the engines runs clear.

We have a small example as food for your brain on the next pages. Our starting jetting for the RT kits with a PWK 28 mm carb and the Clubman exhaust and no filter or foam filter has proved itself reliable. And customers from all over the world have used that as a starting point and – to our knowledge until this point at least – are very happy and had the carb dialed in very quickly. The jetting is the 45 idle, JJH on 2nd clip from top and 125 main jet. We use this in four examples to compare it with starting points for jetting given by someone else. This were a range of: 50-58 idle, JJK, JKL, JJM or JJN needle and 145-155 main jet.

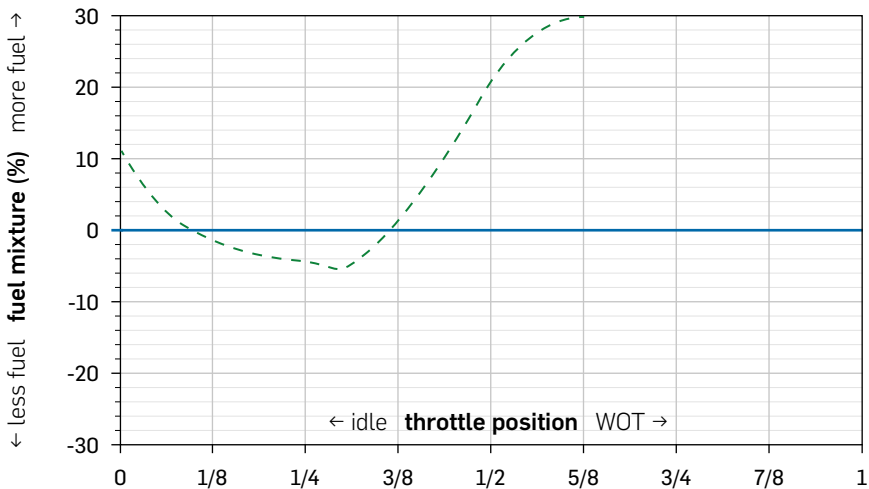
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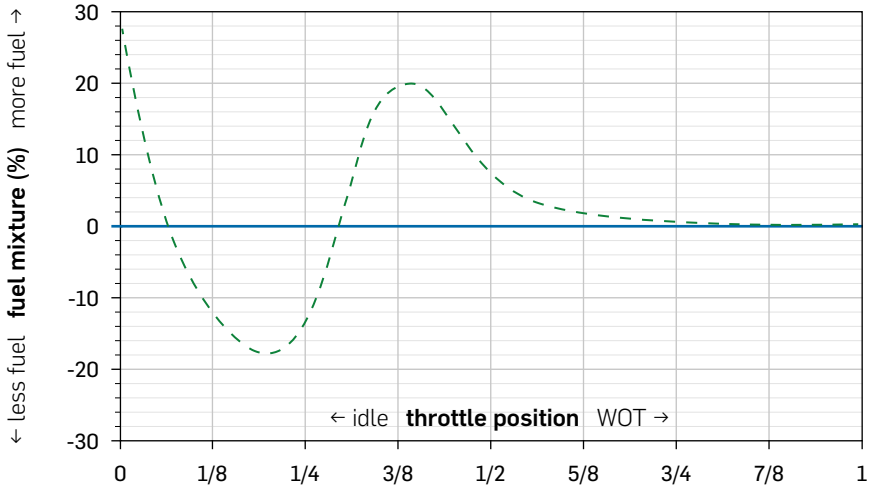
Relative change in fuel mixture relative to setup #1



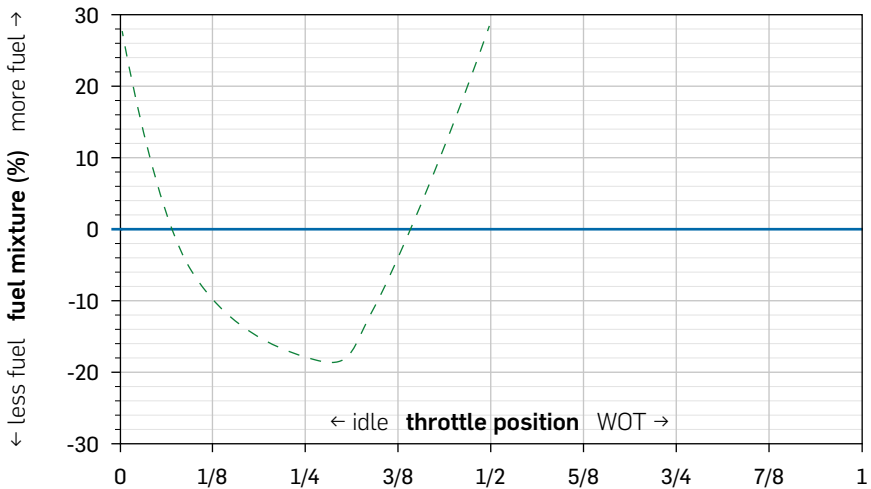
The blue baseline (Y-axis of coordinates) is the magic 45 idle, JJH on 2nd clip from top and 125 main. The green dotted line is the change in the fuel mixture ratio with the different setting. The green line on this is the weaker jetting that we recommend for the bgm engine used with the modified bgm airbox (40 idle, JJK 2nd from top, 120 main). So you see that the restriction of power with the airbox also needs a slightly weaker setting to compensate this.



Baseline again the bgm RT setting this against the setting of the combination of 155-145/JJK, L, M, N/58-50 set in a way to get as close to the bgm RT jetting. As you see the massive main jet makes it very rich in comparison. Without having tried it, we are very much in doubt that this would give a clear and smooth running engine. The result should be massive power loss, hard to start, lots of spit back and very bad on fuel.



Baseline again the bgm RT setting here. The given jetting from the previous picture, but tried here to see what happens with a smaller main jet. As you see this could give an erratic to run engine. With a weak running engine at the important closed throttle slide. This can kill an engine, if you slow down after a longer full throttle running period.



Again bgm RT jetting as baseline. Against the jetting hints from somewhere else. This time with the biggest main jet recommended. We are in doubt that this engine would start at all.



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