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# How to jet your Weber carburettor(s)

From [www.aircooled.net](http://www.aircooled.net)

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People often go right ahead and spend \$500+ for a set of carburettors, bolt them on, and seem "pleased" with the results. Others are upset by a backfiring or smoke-belching monster. In either case, spending the time to properly jet a set of dual (or single) carburettors is a very worthwhile task, since receiving a "perfect out-of-the-box" carburettors is one of the biggest myths in the VW industry!

For emissions and power, the engine has to have a certain amount of VAPORIZED fuel (liquid fuel doesn't burn) for a certain amount of air. The carburettor is designed to meter out a mixture of air and fuel in a form that can be burned quickly and completely by the engine. This is rarely done properly! For complete combustion, the air/fuel mixture must be supplied in a VAPOR, and not with liquid droplets (remember, liquid fuel won't burn). So, besides metering how much fuel the engine gets, the carburettor is also responsible to atomise the fuel and mix it with the air entering the engine.

In addition, proper jetting is different depending on the size engine, elevation, cam overlap, etc. I have even seen the SAME engine combination require different jetting (same carbs) on two different engines! So, for someone to say "this is what you need" is ridiculous. They can get you CLOSE, but not exact. To get exact you need to spend time and patience, and dial it in. It IS worth it too!

Carburettors are simply devices that meter fuel depending on the amount of air that is entering the engine. There are a couple problems though! Air and fuel have different viscosities, and since air and fuel do not flow the same, the metering of fuel is NOT LINEAR. What this means (if this didn't make sense to you) is that you can have a correct metering for a while, and then at certain RPMs it goes off. So, you have another set of jets to "correct" it and one more set to correct the correction!

Idle jets operate from idle to 2500-3000rpms or so. Main jets are primarily from 2500-4500rpms, and Air jets affect the engine from 3500/4000 on up. Lastly, you have emulsion tubes to change "where" it's rich, lean, etc. The complexity of jetting is that the operating range of the carburettor's jets OVERLAP, so a change in one area often MUST be accompanied by another change somewhere else, or you have problems! It makes it seem very complicated if you start at the middle. It also makes it imperative to start at the right point (our beginning), and then it's a straightforward process and will yield top-notch results!

I'm not going to bore you with too many details on carb theory (I've done enough boring you already). What I am going to spend time on now is what YOU can do to optimise what you have!

One last check: you MUST have your engine in top mechanical shape (no leaky valves, etc), no vacuum leaks, and a good ignition system (no fouled plugs) or you are simply wasting your time messing with the carbs. Read our How to Synchronise your Dual Carburettors too, before doing jetting!

## JETTING PROCEDURE

Sizes: One "size" change on an idle or main jet is "5". So to go richer one size from a 55 idle jet, we would choose a 60. When I say "one size" on the air jet, it means 15-20 if you look at the numbers! So, one "change" in air jet size would be from 200 to a 180 or 220.

First, we need to figure out if you have the proper sized carburettor to begin with! Bigger is NOT necessarily better. Carburettors come "out of the box" with specific venturi (also called a choke tube) sizes depending on the size carb BODY you have. Example: 40mm (signifying a 40mm BODY) Dellorto carbs usually come with a 34mm venturi. The venturi is stamped with a number, and it's the narrowest channel in the body of the carb. You can see the number on it (it's usually even) if you look down the top of the carb throat. Ideally, you would use a chart to find out if the venturi size is correct.

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It's dependent on max RPMs, and engine displacement. I'll leave this topic here, since venturi changing is not cheap. If your engine (after jetting) has no power at the top end ("lays down"), or has no power until 2500 RPMs (no low end), there is a good chance your carbs are too small or too big for your application (respectively). If this is the case, then you should consider changing venturi sizes or go to larger/smaller carbs!

Why Jet? If it's too rich, the extra fuel will wash the fuel off your cylinders and wear out your pistons, cylinders, and rings quickly (no oil), in addition to building up deposits on your valves, heads, and piston tops. If it's too lean, the engine will run very hot, misfire, and can eventually lead to a burnt valve(s). Get it right!

Idle circuit: The idle circuit is the device that controls how much fuel you have at idle and it also sends fuel to the progression circuits. Where many people run into problems is that they don't understand that the IDLE JET IS THE CIRCUIT THAT THEY DO MOST OF THEIR DRIVING ON. So, this jet is critical in engine flexibility and economy. The idle jet affects engine operation up to about 2500-3000 RPMs!

Almost every dual carb application I have seen with VW engines uses a 55-60 idle jet. Centre-mounted carbs need a RICHER (larger) idle jet, since the carb is so far from the cylinders and the fuel condenses on the way there (keep your manifold pre-heater).

What you want to do is this: get the engine fully warmed up. Now, with synchronised carbs (remember?), turn the idle mixture screw on one cylinder in until you hear the engine misfire. It means THAT CYLINDER is too lean, and it doesn't have enough gas to run properly. Turn the mixture screw back out until the engine idle smooths out again, and then go out another ½-1 full turn. Repeat for the other 3 cylinders.

Idle jets ARE available in small increments. Normally, shops stock them in round sizes of "5"s, like 50, 55, 60, etc. You can find 57s, etc if you look around to REALLY get it right on! If you have a significantly larger idle jet (48 IDAs usually come with a 70!), I recommend going down until you can NOT get a good engine response with the mixture screws anymore. Idle jet sizes of 70 or so will "run" on anything, but they don't run WELL (unless fouled plugs or 12mpg are your idea of "well"). In addition, if you have a problem with a 55/60 idle jet, and you have the right main jet, and STILL have a hesitation regardless of accelerator pump adjustment, you need to play with your idle air bleed (what the idle jet fuel mixes with)! This is a much-needed modification to 48 IDAs on the VW street engine, and is beyond the scope of this article, and you best leave that modification to an expert. Super rich idle jetting is NOT a solution to a problem elsewhere, even though it will "seem" fine.

Once you find the idle jet size (around 55-60), you are done there! They are easy.

Main Jets: The next jet to dial in is your main jet. As a starting point, choose a main jet size about 4.1 - 4.3 X Venturi Size (mm). Simple! We are only trying to get in the ballpark! If you live at a high elevation, go down one size ("5") from what you come up with. If I have a 34 venturi, my main jet size should be around  $34 \times 4.2 = 142.8$ . A 140-145 is where I want to be. It's usually best to start rich and go leaner as we learn, so we'll choose a 145. 4-5000 foot elevation would choose 140 (one size down).

Now, you need to DRIVE the car. Drive it hard! You really have to pay attention to how the engine is running (turn off the radio).

Spitting/sputtering/cracking is an indication of being too LEAN. Now, what RPMs that it's doing this tells you which jet you need to change! 2000 RPMs and lower, and you need to richen up your idle jet (go bigger). 2500-4000 RPMs and you need to richen up your main jet!

**Do NOT confuse accelerator pump adjustments with main jet adjustments!** If the engine stumbles when you open the throttle, it could be a pump adjustment, but it could also mean a main jet change.

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Pay attention to STEADY throttle position when testing in these areas! It's easy to confuse the two. If the main jet doesn't solve it, try the pump. If it runs good at 3000-4000 RPMs and stumbles elsewhere, your main is right and the problem is somewhere else. Try to do main jet testing from 1000 RPMs up to 4000 or so. This eliminates the accelerator pump issue from your testing!

If the engine pulls "OK", but doesn't sound CRISP (it feels "heavy"), it's too rich! Try to go DOWN on your main jet one size, and try again. They are very easy to change, and this is one of the beauties of Weber/Dellorto carburetors! Once you get used to it, it goes very quickly! Whatever you do, do NOT drop a jet down the carb throat, or you have to remove the carb or fish it out (they are brass, so a magnet is of no help!). To get the engine EXACTLY right, I recommend going down on your main jets until it sputters/spits, and that means it's too lean! Go back up on the mains until it smooths out, and you are done on the main jets!

**Air Corrector Jet:** The air jet jets AIR, not fuel! So, if you want to lean it out, you go BIGGER on the air jet, and smaller on the air jet if you want to richen it up! The air jet affects the engine from about 4000rpm up. You really have to wind it out to use this one, so be careful! Start with a baseline jet of 200. If it starts spitting and sputtering at high RPMs, you need to richen it up, so change it to a 180 air jet. You are following the same procedure as the main jet, but your "operating window" is now 4000 RPMs up instead of the main jet's 2500-4500. I have seen air jets in the range of 160-240. If you are out of this range, you need to go back to the 200 air jet, and change emulsion tubes.

**Emulsion Tubes:** The Emulsion Tube mixes air from the air corrector jet with fuel from the main jet, and controls the mixture from the discharge nozzle at all engine speeds that the main jet is working! Basically, the Emulsion Tube changes the diameter and location of small holes in its body. For Weber IDF carbs, the F7 or F11 is usually what you need. The F "series" has no rhyme nor reason to the numbering system, so you can't tell anything by the number unless you look it up! But, with these two examples, the F7 richens the mixture up at the bottom of the RPM range and under acceleration, while the F11 leans the mixture out on the top end a little bit, and is usually used (high RPMs) when you use air jets larger than 200.

**Accelerator Pump:** Remember from the beginning of this article, that air and fuel have different viscosities. They also have different densities! Since fuel is much heavier than the same "amount" of air, when you open/close the throttle, the air will change speed MUCH faster than the fuel will (think of a heavy car vs. a light one). When you open the throttle quickly, the air INSTANTLY speeds up to fill the engine. The fuel responds TO the air volume, so it has to react. In addition, it's heavier so it can't change "speed" as quickly. The result is that the engine has a lot of air, and NOT ENOUGH FUEL. It leans out! So, almost all carburetors have an accelerator pump that adds fuel when you open the throttle. This gives the main jet time to start metering the right amount of fuel to the engine.

We want as little accelerator pump squirt as possible to remove the stumble from the engine. Too much gas as it's washing our oil off the cylinder walls (wearing out our pistons and rings) as well as lowering our MPG. Basically, turning the pump screw in adds more fuel shot to the engine as the throttle is opened up. Be conservative!

Hopefully you now have tools and confidence to jet your carburetors, and can stop listening to guys who are only tuning carbs by doing what everyone else is doing, instead of LISTENING TO WHAT THEIR ENGINE NEEDS.