

## Notes On Rebuilding the Amal Mark 1 Concentric Carburetor

The Amal Mark 1 Concentric carburetor was introduced onto motorcycles during the 1967 model year. A lighter and more compact carburetor than the preceding Monobloc the name derives from the design of the float chamber around the main jet, an arrangement intended to reduce the effect of fuel surge in the float bowl under cornering and transient throttle conditions.

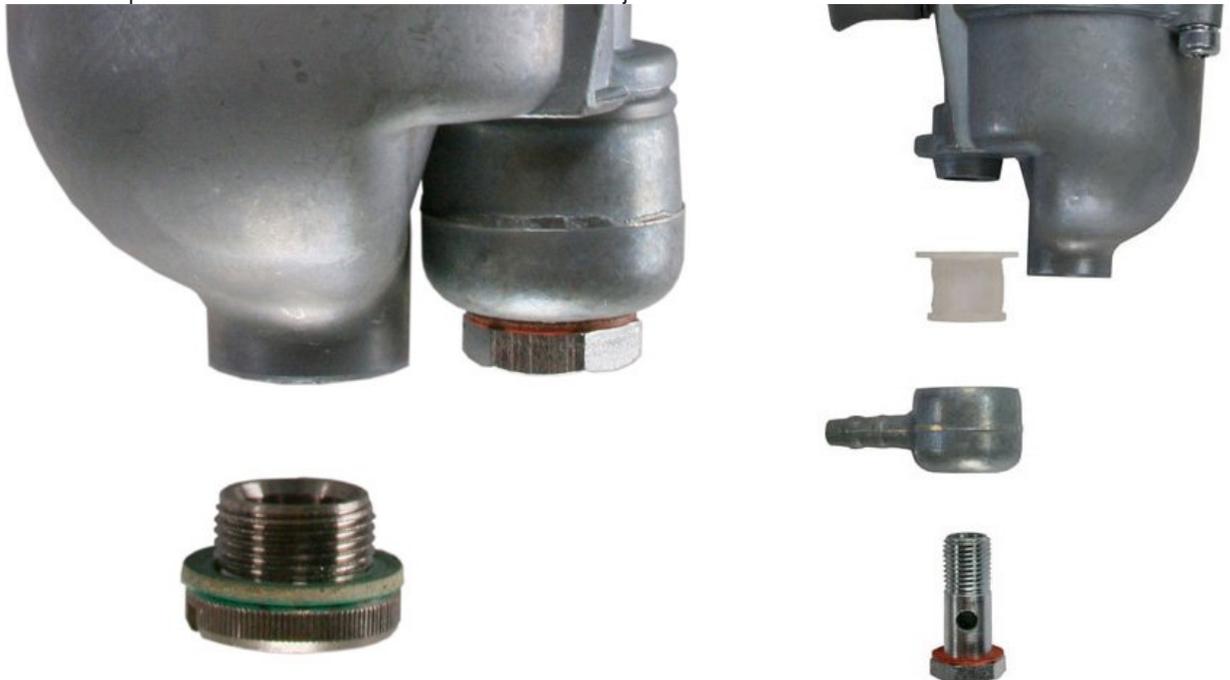
The carburetor is currently available in two body sizes; the 600 Series in 22mm, 24mm, 26mm and 27mm bore sizes and the 900 Series in 28mm, 30mm, and 32mm bore sizes. A 1000 Series Concentric in 34mm, 36mm, and 38mm bore sizes was dis-continued during the 1970s.

Mark 1 Concentric carburetors are available in 4 Stroke and 2 Stroke configurations and can be left or right handed depending on the position of the tickler mechanism and adjusting screws.

### Removing Carburetor

Carburetors should be removed and replaced onto the bike as complete units, with mixing chamber tops and float chambers attached. Failure to do so increases the possibility of warping of the carburetor flange and body.

- (a) Run the engine with the fuel taps closed to empty the fuel from the carburetor, or drain the float bowl by removing the float chamber drain plug.
- (b) Loosen the fuel banjo bolts and remove the banjos.
- (c) Remove the plastic or bronze fuel filters from inside the banjo.



- (d) Loosen the carburetor mounting nuts evenly. Take care not to jam or stress the flange on the studs by turning the nut on the tickler side of the body back too far in relation to the other nut.
- (e) Remove the nuts and slide the carburetor off the mounting studs.

Dismantling

### Mixing Chamber Top and Throttle Slide

- (a) Thoroughly clean the outside of the carburetor
- (b) Undo the two screws securing the mixing chamber top and withdraw the throttle valve and needle.



- (c) Compress the throttle spring drawing it out of the slide. Holding the spring and top to one side to gain clearance, remove the needle and its securing clip.



(d) Unhook the throttle cable from the slide once the needle is removed.

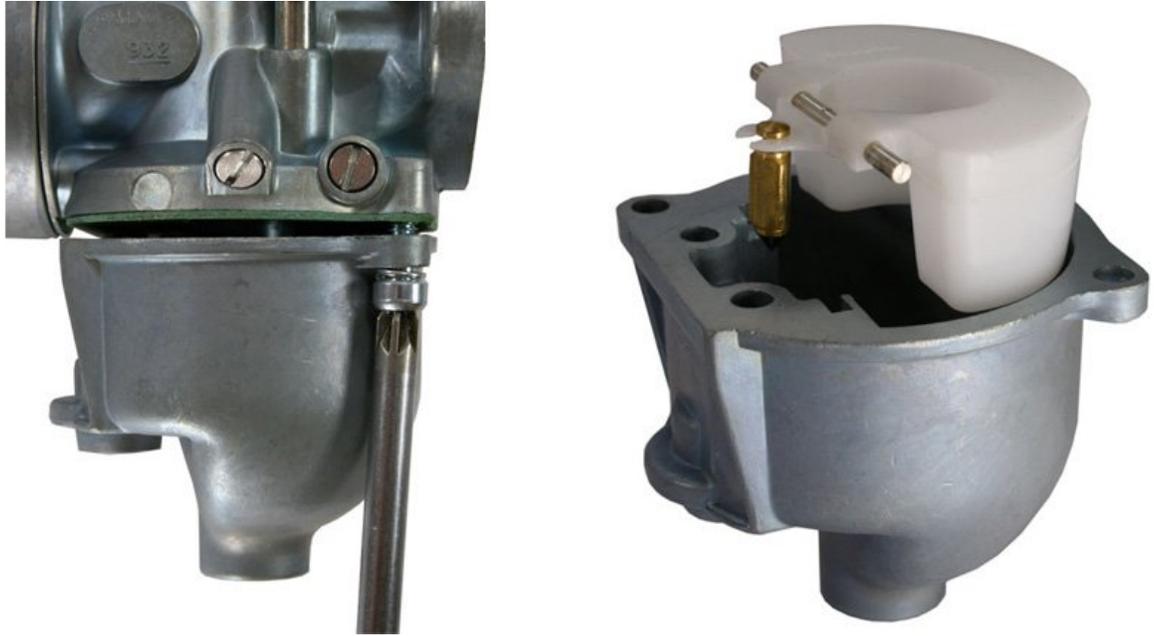


(e) Compress the air valve spring and unhook the cable to release the air slide, spring and brass tube.



## Float Chamber

- (a) Loosen the screws securing the float chamber ensuring that the float chamber will not drop once the screws are removed. If necessary tap the float chamber lightly with the handle of the screwdriver to break the gasket seal. Keep the float chamber level as you remove it to stop the float mechanism from falling out.
- (b) Carefully separate the float chamber gasket from the body or float chamber.



(c) Lift the float assembly from the float chamber and slide the float needle out of the float tabs.

(d) Slide the float spindle out of the float.

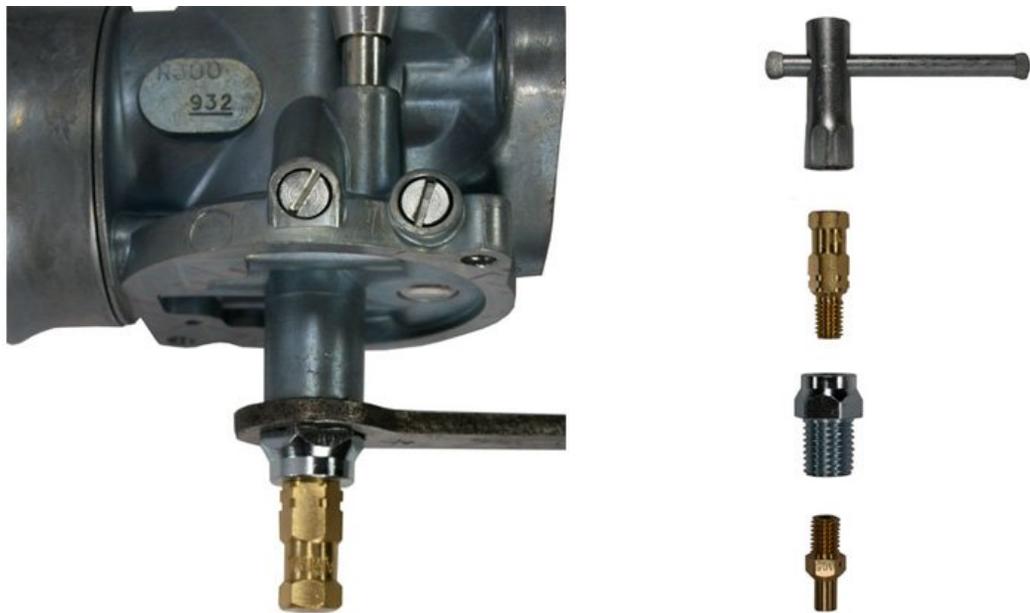
(e) Unscrew and remove the float chamber drain plug.

## Mixing Chamber and Jets

Care should be taken when undoing brass jets. They are soft and easy to damage.

(a) A 5/16 BSF or 1/4 Whitworth spanner is required to undo and remove the jet holder from the bottom of the carburetor body.

(b) Use the Amal Jet Key (P/N 622/104) to undo and remove the Main Jet and Needle Jet from the Jet holder.



(c) Unscrew the Pilot Jet (if fitted) from the bottom of the Mixing Chamber.



(d) Unscrew and remove the Pilot Air Screw. If you wish to replicate the setting on re-assembly, screw the screw fully home and make a note of the number of turns required, before removing it.

(e) Unscrew and remove the Throttle Stop Screw.



## Cleaning And Inspection

### Banjo and Filter

Clean and inspect banjos and filters. Plastic banjos should be replaced with metal banjos as they tend to harden and crack with age. Carefully inspect the filter and replace if torn or if there are deposits on the mesh that can't be removed. Rust fragments in the filter may indicate a problem in the petrol tank that can cause carburation problems in the future.



## Float Chamber

Inspect the gasket surface of the float chamber carefully for damage. The gasket surface should also be inspected for flatness. Light damage and irregularities can be remedied by dressing the surface using fine abrasive paper on a flat surface, or fine grinding paste on a plate of glass. If the surface is reduced too far however, the depth of the slot for the float spindle will become too shallow and may cause difficulties with the operation of the float. Over-tightened Allen bolts, which are a popular modification, can bend the lugs and cause an air leak within the float chamber into the idle circuit. If the lugs are bent the float chamber should be replaced.



Ensure the two galleries in the casting are thoroughly clean.



Clean and inspect the float chamber drain plug which acts as a sump for the float chamber. Replace it if it shows signs of hardening with age. Early versions of the Mark 1 carburetor were not fitted with drain plugs. These carburetors were fitted with a brass mesh sleeve filter fitted around the Main Jet and replacement with the later type of float chamber is recommended.



The float needle bears against the seat at the bottom of the brass seating bush. If the seat is damaged the float chamber will have to be replaced. Early models of the Concentric were fitted with plastic float needles which should be replaced as a matter of course with the current Viton tipped float needles. Viton tipped needle valves are much more resistant to wear but should be replaced if there are visible signs of wear, contamination, or damage.

If a punctured float is suspected, submerge the float completely in fuel for 15 minutes and shake it to see if any fuel has leaked into it. Check the float tabs for signs of distortion, and check that the float spindle is an easy rotating fit in the float with no stiffness or excessive play.



## The All New AMAL Concentric StayUp Float

The AMAL Carburetor Company, (Burlen Fuel Systems Ltd) manufacturers of all genuine new AMAL Carburetors and spares Worldwide, have introduced a revolutionary new float for Mk1, Mk1.5 and Mk2 Concentric AMAL carburetors.

The new adjustable height StayUp float is resistant to modern ethanol based fuels and has a military spec closed cell construction making it puncture proof. The ability to adjust the float arm allows for quick and easy minor alterations to float levels where required.

The material specified was used by the S.U Carburetor Company for military installations in the 1980s, where a guaranteed fail safe operation was critical. Due to the close link between S.U and AMAL today (both owned by Burlen Fuel Systems Ltd), the secret behind the material has been released and upgraded for the manufacture of this float, making it virtually unsinkable.



## Fuel Level

Although the Concentric carburetor will function across a wide range of fuel levels, an accurate fuel level is the foundation of the overall jetting of the carburetor and makes a significant contribution to the smoothness and performance of an engine

The fuel level is determined during manufacture by the position of the float needle valve seat and should not require adjustment under normal circumstances. For performance tuning or where a carburetor runs consistently rich or weak despite being fitted with the correct jetting, it may be desirable to check the fuel level to establish a calibrated basis for tuning, or re-establish the carburetor within the correct parameters.

Because there have been changes to the float chamber since the Concentric carburetor was introduced, and because there is no way of knowing what alterations may have been made by a previous owner, measuring the fuel level is the best way of setting up the float chamber..

The correct fuel level for all Mark 1 Concentric carburetors is 0.21" plus or minus 0.040" below the top edge of the float bowl. Thus when the needle valve is being held shut by the tangs of the float, the level of the fuel will be between 0.017" to 0.25" (4.33mm to 6.35mm) from the top of the bowl.

The fuel level can be checked by removing the float chamber and observing fuel running into it. The fuel flow should be sufficient to hold the needle valve open until closed by the action of the float. Insufficient fuel flow will cause the needle valve to seal under its own weight before the float rises far enough to press the valve shut. The level of the fuel can then be measured down from the top surface of the float chamber.

The fuel level can also be checked by attaching a piece of clear tubing to the bottom of the float chamber. A plastic float chamber drain plug can be modified to mount a suitable spigot, such as an old jet, to attach the tubing. Route the tubing in a vertical position alongside the float chamber. Open the petrol tap and fill the float chamber with fuel. If the fuel level is in the correct range the fuel will rise in the tube to a point between 0.170" and 0.240" below the top edge of the float bowl. Start the engine and ensure the fuel level remains within the correct parameters.

The new Amal "Stay Up" float has stainless steel tangs which can be bent to alter the fuel level. The tangs can be easily adjusted by clamping the float in a vice up to the spindle hooks and tapping the body of the float gently in the direction required until the required level is achieved.

#### Needle Valve

If your float chamber is fitted with a brass needle valve you may find the valve sealing under its own weight before the float has risen far enough to press it shut. Symptoms of this problem can be that the carburetor takes a long time to tickle, hesitates on pickup, and does not idle reliably. A Viton-tipped aluminum needle valve is now available that overcomes this problem. It is being fitted as standard equipment to all new Mark 1 Concentric carburetors.

## Mixing chamber

Check and clean all threads in the mixing chamber. If no choke is fitted ensure the opening for the choke cable is sealed with a bolt, (P/N 4/137A) . Replace worn screws and ensure they are correctly fitted with spring washers.

Check the manifold flange against a flat surface to determine if it has been distorted by over-tightening or tightening to an uneven surface. If there is distortion so that the throttle slide jams when the carburetor is bolted to the inlet manifold then the carburetor needs to be replaced. Replace the O ring if there is any signs of hardening or damage.



The free length of the throttle spring should be 3". Replace if corroded, damaged or compressed. Inspect the air valve components for excessive wear or damage.

Inspect the throttle slide for excessive wear. If the wear pattern on the engine side of the slide is visible as a series of furrows or waves in the metal or the step or groove at the top of the slide on the engine side has been worn away then the slide requires replacement. Eventually the mixing chamber body will also wear to the point where the amount of air leaking around the throttle slide prevents accurate tuning of the carburetor and a replacement carburetor will be required. Wear to the carburetor will be much reduced by ensuring that an effective air filter is always fitted.



Check the tickler mechanism to ensure it moves smoothly. An upgrade kit is available to convert earlier ticklers to the later version with the large button.

## Sleeving the Carburetor

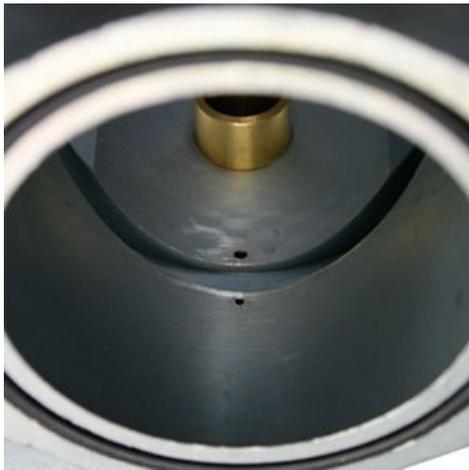
There are solutions available to address body and slide wear which involve boring the mixing chamber body and fitting a brass, steel or aluminum sleeve to either the body or the slide. sleeving is not recommended for the following reasons;

- (a) Thinning the walls of the mixing chamber makes the carburetor more prone to warping when the flange bolts are being tightened.
- (b) Sleeving the carburetor to an incorrect clearance between slide and body will make the carburetor difficult or impossible to tune correctly.
- (c) Inadequate wall strength and tight clearances can cause the slide to stick dangerously.
- (d) Poorly executed sleeving can dislodge or damage the spray tube.
- (e) Slides in bored mixing chambers can only be replaced with a further sleeved slide.
- (f) Poorly sleeved carburetors can have the slide locating lug masked to the point where the slide can override the locating slot and jam.

## Pilot Circuit

Mark 1 Concentrics are equipped with two types of pilot jets. 2 Strokes use a removable pilot jet which should be replaced if it is damaged or shows signs of oxidisation. 4 Strokes generally use a pressed in bush pilot jet in the gallery behind the pilot air screw.

Fuel residues and oxidisation can cause problems with the pilot circuit, particularly in bikes that have been left standing with fuel in the carburetors for several months or more. It may be sufficient to clean the pilot circuit with an aerosol carburetor cleaner, stopping the various outlets selectively to ensure the entire system is clear. Do not forget to inspect the two pilot circuit outlet holes either side of the slide location slot in the bottom of the carburetor bore. If necessary the pilot bush can be cleaned by removing the pilot air screw and using a No 78 or 0.016" drill, held securely in a suitable extension, rotated lightly in the bush to remove encrusted deposits.



## Jets

Needle Jets are best replaced as a matter of course especially if the age of the jet is unknown. They are the most vulnerable of the jets to wear with only .001" between sizes and a worn jet will cause very rich running between 1/4 and 3/4 throttle opening.

Replace the needle if there are signs of wear or corrosion, particularly on the parallel section. Check that the needle clip grips the needle securely and is not distorted in any way. The split in the clip is part of the design.



Main jets are resilient to wear but old jets showing signs of oxidation or any etched deposits should be replaced as their ability to pass fuel may be affected.

In 1966 it was decided to standardise the 376/100 type jet for use in Monobloc, Concentric, GP and TT carburetors and changes were made to the jet to ensure compatibility. The groove machined across the hexagon of the jet on the right indicates that it incorporates the modifications. New jets without the groove are not genuine, and are often extremely inaccurate.



## Gaskets

Always use new genuine Amal gaskets and O rings to prevent leaks.



## Checking the Specification

Manufacturer's original standard carburetor settings are available in the Amal Catalogue and on the Amal Website. However unless a bike has retained absolute originality any changes to the engine, air filtration or exhaust arrangements (including modern replicas of original exhausts) may require adjustments to the carburetor.

If you are not sure that you have a suitable carburetor the numbers on the raised pad on the side of the carburetor can be used to identify it. "R" or "L" stamped on the pad indicates a left or right handed carburetor. A "B" originally indicated that the carburetor contained the upgraded needle and needle jet parts.

A three digit number beginning with a 6 or a 9 indicates the Series and bore size of the carburetor e.g. 624 indicates a 24mm 600 Series carburetor, 928 indicates a 28mm 900 Series carburetor.

The Specification Number stamped below the three digit number identifies the jetting and the original model of bike the carburetor was fitted to, e.g. 62 below 930, read as 930/62 identifies a 30mm 900 Series carburetor for a 1971-72 BSA B50SS.



It is also important to ensure that all the parts in your carburetor are correct for the engine type. The original Concentric carburetors used the same components for 4 Stroke and 2 Stroke and carburetors are often found to contain a mismatch of components.

## Interchangeable Parts

### Spray Tubes

4 Stroke



2 Stroke



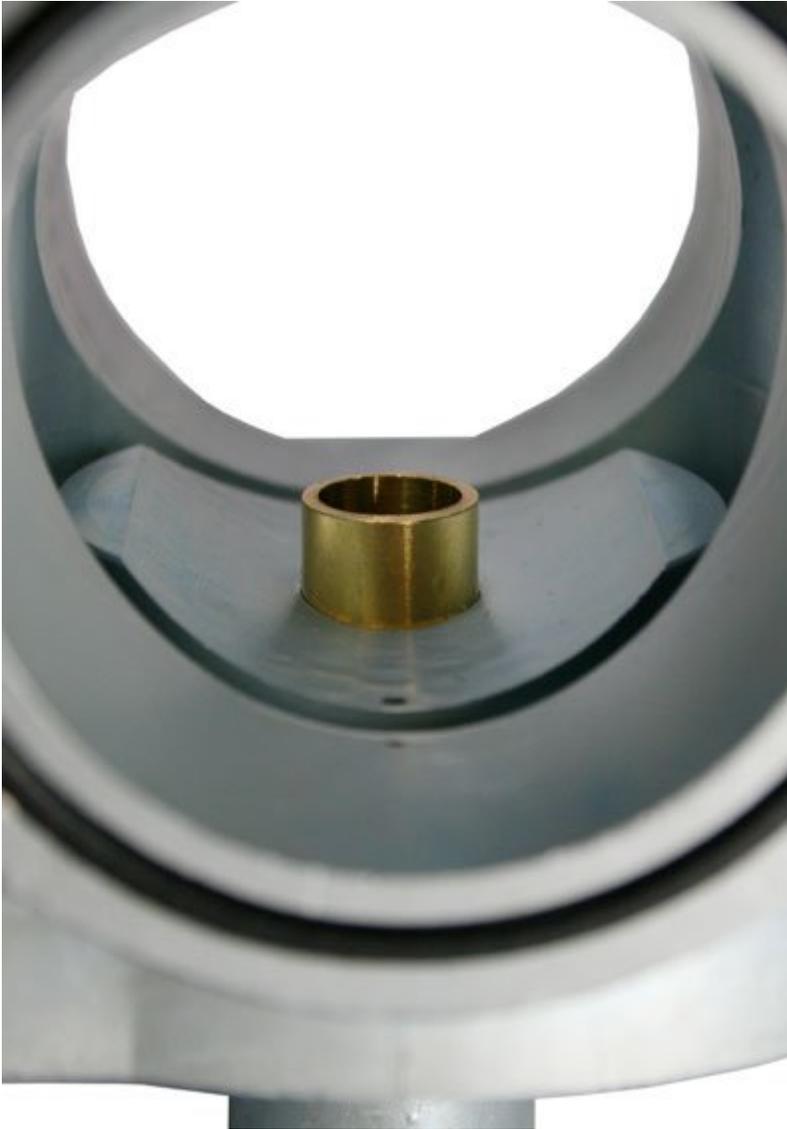
Norton



Triumph



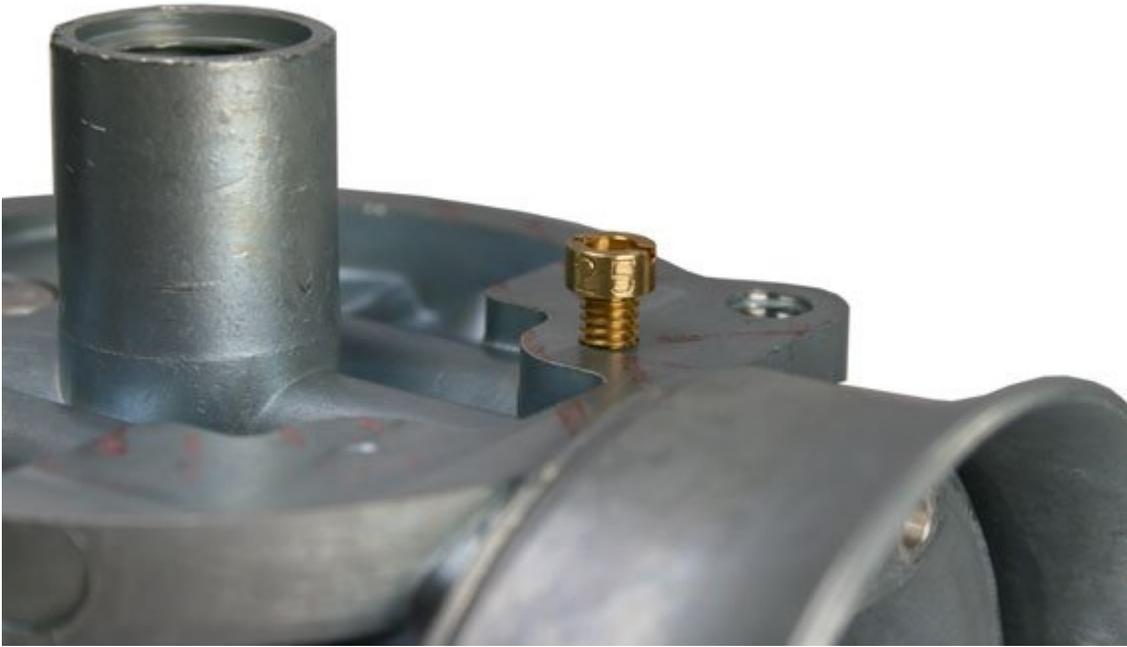
As a general rule the most noticeable difference between a 2 Stroke and 4 Stroke carburetor is the spray tube, the brass tube visible as you look through the carburetor bore. 4 Stroke spray tubes are cut off straight, 2 Stroke spray tubes are cut off at an angle sloping towards the mounting flange. Some later 850cc Norton Commandos use a spray tube with a square cutaway step while Triumph Triples use an angled spray tube cutaway from the mid point of the spray tube rather than right across as in the 2 stroke version. 2 Stroke and 4 Stroke bodies are not interchangeable and will not run correctly if used on the wrong type of engine.



## Pilot Jets

When first introduced all carburetors were fitted with a detachable pilot jet screwed into a threaded hole in the bottom of the carburetor body. This arrangement is retained for 2 strokes but from 1968 was replaced for 4 strokes by a bush pressed into the gallery behind the pilot air screw.

The detachable pilot jet caused problems with some 4 Stroke engines. The remoteness of the jet from the two pilot circuit outlet holes caused starting and idling problems on bikes with lower manifold vacuums, and could cause stalling during deceleration due to a weak mixture. The introduction of the pilot bush moved the pilot jet nearer to the outlet holes to overcome these problems. The bush has a flow rate of equivalent to 20cc/min. Carburetors fitted with a bush retain the threads originally used to fit the removable pilot jet.



The removable two stroke pilot jet is stamped with a number from 15 to 200 indicating its flow rate in cc/min.

## Needle Jets

In 1969 a new needle jet, needle jet holder and needle designed specifically for 4 stroke carburetors was introduced to improve low to mid-range performance. The differences between the parts are;



	New	Old
<b>Needle</b>	2 21/32" (6.74cm) long - 2 identifying rings	2 9/32" (5.79cm) long - 1 identifying ring
<b>Needle Jet</b>	13/16" (2.06cm) long cross-drilled	11/16" (1.74cm) long
<b>Jet Holder</b>	7/8" (2.2cm) long	3/4" (1.9cm) long

Check to ensure that the parts in your carburetor are a matched set as above. A conversion kit (622/235) is available to update to the new parts.

2 Stroke and 4 Stroke needle jets are stamped to show their sizes in inches from 0.105 to 0.125. Four stroke needle jets have an air bleed hole drilled through the hexagon section. Two stroke jets have no cross-drilling.

### Needle Markings. (600 and 900 Series Concentrics)

Needles have inscribed rings or letters stamped at the head of the needle above the clip grooves. All needles use a constant diameter down to the head of the tapered section. The taper helps to manage the transition from the Needle jet to the Main Jet and varies according to the type of engine or fuel.



Markings	Where used	Part No:
1 inscribed ring	2 Stoke, 600 Series	622/063
2 inscribed rings or 'U1'	4 Stroke, 600/900 Series	622/124
3 inscribed rings or 'X'	2 Stroke, 900 Series	928/063
4 inscribed rings	Norton 850, Triumph 250cc	928/104
5 inscribed rings	Triumph T160	622/278
Y	Alcohol, 600 Series	622/099
Z	Alcohol, 900 Series	928/099

## Throttle Slides

Throttles Slides are stamped with their identifying size on the bottom surface. Typical markings will be either 622 for a 600 Series slide, 928 for a 900 Series slide, an MB number which is a foundry mark, and a stamped number from 2 to 5 indicating the height of the cutaway on the inlet side of the slide.

The angled cutaway on the slide manages the transition from the pilot circuit to the needle jet when the bike is running. Smaller cutaways will richen the mixture, larger cutaways weaken it.



600 Series P/N	900 Series P/N	Stamped as	Height of cutaway
622/0602	928/0602	2	1/8" <b>RICH</b>
622/06025	928/06025	2 1/2	5/32"
622/0603	928/0603	3	3/16"
622/06035	928/06035	3 1/2	7/32"
622/0604	928/0604	4	1/4"
622/06045	928/06045	4 1/2	9/32"
622/0605	928/0605	5	5/16" <b>LEAN</b>

Main Jets are calibrated and numbered according to the rate of flow in cc/min which is stamped on the side to identify them. Jets cannot be reamed but must be replaced if a larger size is required

## Genuine Spares

Many Amal parts are easy to copy but difficult to replicate. The simplicity of tuning and proper operation of the carburetor reflects the subtleties of the design. There are many crude and poor quality copies of Amal parts available, made from incorrect, rapid wearing materials, which will cause difficulties in the tuning and

operation of the carburetor. All genuine Amal parts are now individually packaged and sealed for easier identification and are carry a 12 month warranty from the date of purchase.

## Re-assembling the Carburetor

### Mixing Chamber

- (a) Fit a new O ring to the throttle stop screw and install the screw.
- (b) Fit a new O ring to the Pilot Air Screw. Screw the screw fully home then back it out between 1 ¼ and 1 ½ turns for an initial setting.
- (c) Using the Amal Jet Key install the Needle Jet in top of the Needle Jet holder and tighten it securely. Take care not to over-tighten brass jets as they can break.
- (d) Using the Amal Jet Key install the Main Jet into the bottom of the Needle Jet Holder and tighten it securely.
- (e) Install the jet assembly into the bottom of the Mixing Chamber and tighten to a torque of 10lb/ft.
- (f) For Two Strokes carefully install the Pilot Jet into the bottom of the Mixing Chamber.

### Float Chamber

- (a) Fit the spindle and Needle Valve to the Float and lower the assembly into the float chamber.
- (b) Fit a new gasket to the float chamber, slide the securing screws through the holes and gasket to align the gasket and check that no part of the gasket interrupts the movement of the float.
- (c) Lower the Mixing Chamber onto the Float Chamber, ensuring the float chamber is the correct way round and the pilot jet (if fitted) is aligned with the recess in the Float Chamber. Ensure the float assembly does not become dislodged.
- (d) Tighten the Float Chamber screws securely.
- (e) Install the Float Chamber Drain Plug with a new fibre washer.

### Throttle Slide and Top

- (a) Insert the choke cable into the Mixing Chamber Top and assemble onto it the brass choke tube, the spring and the alloy air slide. Compress the spring and hook the cable nipple into its recess in the end of the air slide. Fit the Air Slide into the Throttle Slide.
- (b) Insert the throttle cable into the Mixing Chamber Top and slide the Throttle Spring over it. Compressing the Throttle Spring, hook the cable nipple into its recess in the Throttle Slide.
- (c) Assemble the Needle with the Needle Clip in the required groove.
- (d) Compress the Throttle Spring, drawing it out of the Throttle Slide and to one side. Drop the needle into the slide, engaging the end with the central hole and drawing it down so that the needle clip sits in the circular recess. Lower the spring carefully so that it does not disturb the needle.
- (e) Fit the Throttle Slide into the Mixing Chamber body. Watch to ensure that the end of the needle enters the needle jet and does not become snagged on the side, dislodging the needle clip. Engage the lug on the slide with the slot in the body and lower it home.
- (f) Ensure the lid is fitted correctly with the pip on the side of the lid pointing to the rear of the carburetor and securely tighten the screws.
- (g) Adjust the Throttle Stop Screw so that it just begins to engage against the slide when the slide is closed.
- (h) Fit a new O ring into the recess in the manifold flange.
- (i) Open and close the throttle to ensure that the slide moves smoothly in the body and returns sharply when the throttle is released.

### Replacing the carburetor

Always replace the carburetor fully assembled with the float chamber and mixing chamber top attached. The manifold flange and any heat reducing spacers should be carefully checked and dressed if necessary to ensure they are flat. Bolting the carburetor to a distorted flange or uneven spacer increases the risk of carburetor body or flange distortion.

Mark 1 carburetors are not designed to bolt tightly to the intake flange and may distort if over tightened. It is only necessary to compress the O ring seal to ensure air tightness. When correctly tightened the carburetor flange and engine manifold should be just touching. Nyloc nuts should always be used to mount Amal Mark 1 carburetors and should be tightened to no more than 4 ft lb.

Ensure that throttle and choke cables are able to open and shut freely when the petrol tank is replaced on the bike, and are not affected by moving the handlebars from side to side.