Fitting, Engines – Tuned Cylinders

CYLINDER FITTING INSTRUCTIONS

These are fitting and setting up instructions for mainly new MB Lambretta cylinder kits but the same information applies to any old kit whoever has done it and any two-stroke cylinder including Vespas so we've tried to cover all bases.

Before fitting the kit, all con rods and bearings should be in perfect condition. If not, you must change any parts being suspect, including drive chain, clutch, etc. It is worth at this point to replace with, up rated or high load parts. It is beneficial in the long run as a faulty bearing can damage your new cylinder kit, costing you twice as much in the long run. Providing your bottom end is perfect then assembly can take place, but remember cleanliness is essential. Fitting a cylinder can be quite easy whether the engine is still in the scooter or not. MB recommend you assemble your cylinder with the engine out of the frame. This way you can assemble the cylinder kit with the engine vertical, this is easier to set up gaskets and usually keeps the head centralised. Whichever way you prefer follow these instructions and you shouldn't have a problem later on.

Whether it's a new kit or a new rebore or an existing engine always inspect your ring gap! Don't just presume we have checked it, there's a need for some input from the customer with their own engine if you are going to attempt an engine rebuild.

CHECKING RING GAP BEFORE ASSEMBLY

Remove the rings from the piston if fitted, to do this spread the rings using both inner edges of your thumb nails and gently open the rings over the top of the piston. Be very careful with cast iron rings as fitted to genuine and some pattern Lambretta and Vespa pistons, these are very brittle. When refitting the rings do so in the same manner. To check your ring gap fit one ring at a time into the top of your cylinder, push it down about 10 – 15mm then use the piston to square it up in the bore and use feeler gauges to check the size. I say 10 – 15mm below the top of the cylinder because on old bores the cylinder gets a lip at the top where the rings don't run and doesn't wear the bore.

- The gap from new should be no LESS than .008'' (.220mm) for smaller pistons to .012" (.305mm)
- And should not exceed .025'' (.60mm)

Lightly file the rings with a diamond file or oil stone to adjust the gap and chamfer off any burrs before fitting.

- Too tight a gap can, once running give excessive bore wear or a tight gap can cause ring seizure rather than piston seizure!

- Too large a ring gap can cause lack of compression and power or bad starting

All MB cylinder kits from new or a new rebore will come with these piston to bore clearances and getting a ring gap as suggested should be no problem

- Alloy cylinders .0015 – .002″
- Alloy with cast iron cylinders .002 – .0025″
- Cast cylinders .003 – .004″

If a cylinder goes beyond these clearances either from new or old the ring gap will increase especially on some Yamaha pistons where the gap maybe at the upper limit as standard.

With modern day fuels ring wear has become excessive due to lack of lubrication and oil break down in high wear and hot areas. It is not uncommon to see engines when stripped to find an excessive ring gap even after only a few hundred miles. You will see rings turning blue/black, gudgeon pins will be tighter in the piston and turning blue/black, small end bearings and top half of the con rods are turning blue as with big end bearing area. Any hardened metal part or bearing area turning blue/black is overheating and will be becoming soft.

We also find certain sinthetic and semi sinthetic oils do not work as good as others. If you strip down your engine and the crown is Blackened with wet soot and the underside of the piston is the same, this soot turns to grit also causing high ring and piston wear.

We are seeing this as a big problem with rings in all pistons! If the rings wear then it’s possible for the ring to move over the ring peg with some pistons, which in turn knocks at the peg loosening it where it either comes out or is stuck into the piston and the customer goes on a forum to say ‘my pegs come out of a certain piston has anyone ever come across it’? And everyone then says faulty piston when it is not! ……. If you get a loose peg check your ring gap we have seen 6mm gaps and rings wear from 3.5mm to 1mm thick! 90% of the time it’s the worn ring which loosens a peg.

Update on ring wear – for many years this happened, we did a lot of research into the issues. We think fuel companies but additives into the fuel after 4 star was removed to keep 4 stroke engines clean. This we think washed the oil away from the rings and pistons. 20 years later these additives seem to be removed – except in super unleaded where there is additives are still used. Yes you get higher octane but you get this washing effect with your 2 stroke oil.

Whilst we are at it, over sized exhaust ports and boost ports too close to ring pegs loosen pegs as well.

Part of the problem these days with rings and bore wear can come down to how people ride their bikes in the running in period and when run in. Most over do it and stick to the old manual speeds. This today is totally wrong, if set up right you can do much faster running in procedures.

Most put far too much oil in the petrol, at low speeds the engines can not burn off the oil causing this carbon build up eventually causing the ring/bore wear and sometimes becoming a fatal breakdown. The answer is use a very good oil, mixed at 30-40:1, and now and then make the motor work and give it some fist.

From new it's always best long term to check ring gaps as the engine is run in at around 1000 miles and replace them if worn. We always found Honda MTX pistons would wear at 1000 – 1500 miles, the bore and piston would be fine, change the rings and they would last thousands of miles afterwards. Worn rings usually show black blow past down the side of the top half of the piston below the rings. The classic symptom of worn rings is lower compression to when the engine was first built and bad starting. But as a warning we have seen rings wear so much that they have spun over the pegs and blown up at 600 miles!

Worn bores will effect ring gap so always check the rings if your compression is low or you have bad starting, if you can not get a good ring gap it's possible the bore has worn usually shown with a rattling piston.

Always oil the piston ring grooves with 2-stroke oil once fitting the rings.

We've tried many oils over the years today we only recommend Maxima oils as these we have found to work better with modern fuels.

RING TYPES

All pistons have different types, styles and thickness of rings. Beware, only use the correct rings for the piston used, some may look the same but are not interchangeable! There is no need to file either the ring or its groove to make a ring fit! Only file the ring gap. If you need to file the groove or ring something is seriously wrong don't do it.

When fitting pistons and cylinders hammers are not needed, if there is, something is wrong check it out. Some cylinders can be tight on the spigot as it leads into the casings, always do a dry fit first as it's is not uncommon to have to file the cylinder spigot or slightly open out the casings. This is common on mismatched Spanish or Indian casings. Nicasil and re-plated cylinders can get plating deposits on the sharp edges of the spigot, this area may need dressing up if tight, we always dress replated cylinders, others don't.

LAMBRETTA PISTONS

There are two types of rings used for all Lambretta pistons.

Genuine types of pistons use grey cast iron rings, these are prone to break when fitting to the piston and when fitting into the cylinder and are not very good in a tuned cylinder. Be very careful handling these rings. There has been two thickness's used 2mm and 2.5mm thick. These rings can only be fitted one way depending on the ring peg, this is obvious if you study the piston peg.

Apart from our MB RT pistons in the past the best replacement budget piston to the genuine types are the Vertex or Asso 2 ring pistons, these use cast chrome rings which are thinner and are not interchangeable with early pistons. These rings can also break if mistreated but this is rare. Because the ring peg design is different these rings can be fitted either way round. Beware there are copy Indian pistons replacing the Genuine Italian Asso or Vertex pistons these have poor rings and break not only in fitting them but when the cylinder is running after low mileage.

TS1 pistons have 2 types of rings the most common is the same as the Asso rings but are not chrome plated, the most common pistons uses the same thickness' top and bottom. But another piston was introduced which is quite rare this uses a 1.5mm bottom ring as normal and a thinner 1mm top ring, these are not interchangeable at all! Later TS1/RB pistons now use 1mm rings.

Race-Tour, Wiseco, Wossner, Casa, Sacchi, bgm Meteor pistons

When I designed the spec of our RT pistons I wanted the same ring design to run from the smallest size 64mm to the largest at 72mm including half sizes. The only rings we could find out of all the pistons available were the 1mm thick Wiseco rings which could do all our sizes.

Regardless of piston model or make the rings are the same to look at and are the same design in Wiseco 2 – stroke pistons. These are made of drawn wire and are chrome plated, these don't break and you can tie knots in them. Because of the ring / ring peg design the rings can be fitted either way round. These rings have a size printed on the rings top edge, MB fit them with this number pointing towards the crown of the piston as this is how most manufacturers want rings fitting. Today after market bike piston manufacturer Wossner use the same rings, others have also gone onto the 1mm ring design including Casa, TS1, RB, Imola, Monza, Super Monza and Avanti. Rings are now interchangeable between pistons so at least there is some standardisation to help customers. But beware there are some very inferior Far East copy pistons of our Mk1 RT pistons made by KHC who also make them for other cylinder manufacturers who pass them off for Mitaka pistons, these rings are nothing like our wire rings and have no spring steel in them and the pistons weigh a ton.

MB Scooters have made RT pistons to suit all cylinder kits on the market both in standard and low compression heights in Reed and Piston port design from 64 to 72mm in 0.5mm increments. We even make oddball pistons for old Honda and Suzuki conversions and can make one off pistons to order. Today through difficult supplys we stopped making these pistons!

Suzuki pistons

Genuine, Japanese and Far East pattern pistons are available. These usually use a keystone or wedge shape ring, this means if you look at its cross section shape, one edge is sloping down. These can seem to fit either way round BUT can not. The size or the letter R is etched to the upper edge of the ring. These rings are usually drawn wire and chrome plated and tend not to break and are commonly used with the TS185, TS250, PE250 in the Suzuki

190, 200 and 225 conversions of old! Some pattern pistons are of low quality, pegs come out and they expand incorrectly. GT 240 Iron kit uses a Suzuki TS250 which is a piston ported piston but machined for reed valving. We stopped using this piston in the 1980s as a reed piston as it is weak and they do break, as does pegs come loose as the pegs are near the boost ports.

Honda pistons

The most common Honda piston is the 205cc conversion which uses the MTX 200 piston. This piston uses a rectangle shaped bottom ring this is not as wide as the top ring and an expander wavy ring fits into the groove before the ring. This ring will not fit into the top ring groove. The top ring is the Keystone wedge type and can fit into the bottom groove, again the size is marked on the ring and fits towards the top. Today these pistons and the conversion is very rare.

We make our own MB Honda pistons to resurrect old conversions in sizes from 67 -69mm in 0.5mm increments.

Yamaha pistons

The most common pistons used are the Yamaha Reed pistons, these were used in older TS1 200 using a 115mm rod kit or TS1 225/230 conversions used with either piston bushes or with MB con rod conversions. These pistons came from DT, IT or YZ off road bikes, there has been various models some are interchangeable some are not. Some were good and some were not and are now rare these days but there are still some around. Rings did vary in design and thicknesses so always check to make sure you get the right rings. Today the GT190 kit uses the Yamaha YPVS 350 64mm piston, rings have changed so check these out. The RB20 for some reason moved away from a standardised Lambretta piston design as with the TS1 or RB kits and used the Yamaha Blaster 66mm piston and requires the long 115/116mm con rod.

Kawasaki pistons

These are rarely used these days. In the old days the KH400/500 was used in 150 kits and the KH750 was used in the 230/240 kits but pistons are hard to get. There’s no call for the 150 kits and there are RT and Wiseco pistons which can replace the 750 piston. Genuine pistons usually have an expander ring on the bottom ring groove the same as the Honda MTX 200 piston.

Other Pistons

There are other types of pistons used but are uncommon. Check out the ring groove, peg type and shape of ring, most are as described above. Most of these pistons require cylinders machined or con rods conversions to make them work.

BEFORE FITTING THE CYLINDER KIT

Before the piston is to be fitted you must make sure the con rod and crankshaft are in good order. For the price always renew the small end bearing. Choose a good quality small end bearing as cheap ones can go wrong.

There are a lot of small end bearings available all in different qualitys. Beware they all look good in your hands but we have known some to fail including Jap small ends. MB recommends a INA German small end whenever possible, to date we have never had a failure, but they stopped making them – so we did.

At this point it's worth fitting the exhaust and short inlet studs, we supply two types with our MB kits the short cast type and the longer TS1 type. Care should be taken to check which way round the stud goes as one side is shorter than the other. Fit the studs using two nuts locked together on the opposite threads and use a small amount of loctite to stop them vibrating out.

Exhaust studs have never been a problem for me. If fitted correctly with a decent loctite they never come loose I don't understand why so many complain on forums or why people have made special locking nut, strange!

If a thread is worn or stud is loose in a cylinder then you can use an insert or stepped studs which MB make.

CHECKING A SMALL END BEARING

Small end bearings can get a little confusing but it must be looked into. There are a few rules, which makes life easier. Ask yourself these questions.

- What type of con rod is used on the crankshaft?
- Does it have shims either side of the con rod and big end bearing, or does it run without shims.

Modern designed crankshafts usually shim up the con rod at its big end area by using either .5mm or 1mm shims, these shims keep the con rod floating inline as the engine runs. This method lets the small end bearing float around safely.

Without the shims – the con rod wears to one side of the crank and overheats with friction and a big end will fail. Original Lambretta crankshafts never had these crank shims and Lambretta in their wisdom let the big end area float about. To stop the rod wearing into the crank webs the con rod was shimmed up at the small end area.

This was done in two ways

- The piston casting was just wide enough to fit a standard 20mm wide small end eye of the con rod. This lets the piston keep the con rod central
- The casting in the piston was made wider or machined to use 1mm steel piston shims either side of the con rods small end eye

If you are still using an original style crankshaft with no shims at the big end then it is very important that you get the small end / piston combination correct. Measure the piston where the small end fits, if it measures 20 – 20.5mm then it uses a standard width small end bearing at 20mm, with NO side shims. If the measurement measures 22 – 22.5mm then this leaves room for 2 x 1mm shims to be fitted either side of a standard 20mm bearing.

Either way the piston / bearing and or shims should move freely and have approximately .015’’ gap. If not lightly file the inner edge of the piston to loosen it all up.

Having said this most people these days are using modern crankshafts with big end shims, this is the best way to go if using a tuned cylinder kit.

There are still rules to follow

- If using a shimmed crankshaft always measure the small end width of the piston. As before pistons have 20 – 22.5mm widths. Although a 20mm small end bearing will float around OK in a piston at 20.5mm another bearing is available with a width of 22mm therefore taking out the play in a piston with a gap of 22.5mm!

No one with a tuned kit should be using an original style crankshaft and con rod these days, spend the extra money and get a good crankshaft. Standard con rods tend to get big end failures and they can also snap the con rod.

Always check the measurements as some seemingly same pistons come with different small end widths from different manufacturing batches. Always check these common pistons for small end widths: TS1, Asso, Vertex, Escorts, Mugello, Imola and RB pistons.

Going away from non Lambretta pistons they were all designed to use con rods that were shimmed at the big end. Each piston should be looked at and the appropriate small end bearing used. Normally the small end bearing is a separate part to a cylinder or piston kit.

Throughout the 1980’s and 1990’s some dealers did piston conversions with 18mm gudgeon pins, normal Lambretta con rods are 16mm, so piston bushes were employed to sleeve the pistons down to 16mm. MB found these failed in any thing other than race engines, unless the motor was stripped regularly. These could fail after a short time i.e. 1000 miles from MB’s point of view this was unacceptable.

The pistons were good, but to use them we invented different con rods that fitted the Lambretta crankshaft and had 18mm small end bearings. Most con rods other than Lambrettas had smaller con rod eye widths so shimming up with Lambretta piston shims is not an option, always choose the correct small end bearing. Once the correct small end bearing is chosen make sure it fits into the con rod eye. Some bearings come with different outer diameters. A standard Lambretta small end eye is 20mm with a width of 20mm and uses a 16mm gudgeon pin, shown as 16 x 20 x20mm.

These bearings are available to work with different pistons and con rods.

- Standard Lambretta small end bearings are 16 x 20 x 20mm
- Wider Lambretta small ends are 16 x 20 x 22mm these can be used in pistons which originally was designed for small end shims
- Some Yamaha con rods used an over sized small end eye so used a bearing 16 x 21 x 20 or 22mm
- Con rod conversions for pistons with 18mm gudgeon pins used various

bearings depending on piston and rod used 18 x 22 x 22mm 18 x 22 x 24mm 18 x 23 x 22mm

If your small end bearing fits in the con rod and fits the piston gap then fit the bearing and lubricate it with your preferred 2 – stroke oil.

GUDGEON PIN

Always check that the gudgeon pin (sometimes called the wrist or piston pin) is the correct one for the job. The pin should slide easily through the piston, sometimes a little effort may be required. Older pistons may need putting in a jug of boiling water or warmed with a hot air gun to expand it. Occasionally a light persuasion with a hammer and drift may be needed on very stubborn pistons. Old Lambretta pistons are like this as standard but are quite rare these days. We have found no need to use a piston pin extractor when fitting a piston. If the piston and pin is tight then we suggest lightly honing or reaming out the piston hole to let the pin fit nicely.

It’s preferred to use a piston where the gudgeon pin easily slides through. We suggest to ream or polish the inside of the piston. If the pin is tight long term you can have problems with it becoming tight or seizing, the confirmation on a strip down is the pin is purple or blue.

If the pin slides in easily then check that it is the correct length, this means the pin should be slightly shorter than the two circlip grooves, anything up to 6mm shorter is usually OK, but normally 0.5 – 2mm shorter is normal. Our RT pistons are designed to be perfect with no gap this helps not to wear circlips, all MB pistons come with a piston pin.

When fitting the gudgeon pin always apply oil inside the piston and on the pin. It has been known for gudgeon pins to seize up in running, so always make sure the pin is free especially these days with poor fuel. Poor fuels are not helping with lubricating piston pins and as said some turn blue/black where it moves in the piston, in worst cases alloy picks up on the pin. Beware with some modern pistons, some don’t have lubricating slots or holes to let oil onto the pin! All MB RT piston have multi drill holes and grooves in the piston and gudgeon pin area to improve our pistons long term.

FITTING THE PISTON TO THE CON ROD

There is only one way to fit a 2 – stroke piston, fitting a piston the wrong way round results in total disaster! 2 – stroke pistons have piston ring pegs to stop the ring spinning and running over the ports. In most circumstances ring pegs don’t run over cylinder ports but can do in some oddball TS1 Jap conversions where they run into the extra boost ports. Swapping a different piston could mean a peg runs into ports so is always best using the piston the kit was intended.

Old style pistons, which include genuine Lambretta pistons, had the ring peg position located between the exhaust port and the transfer ports. Modern pistons usually have the peg positions on the inlet port side. The reason the pegs were moved was to stop rings expanding into the bigger exhaust port and

eventually breaking. If using the old style Lambretta piston with cast rings, in a tuned cylinder that has a wide exhaust port, the ring has no support and tends to flex out into the port. Then in the case of brittle cast iron rings the ring breaks called a ring dropper! But if the piston was swapped for a modern one with ring pegs on the inlet i.e. a Vertex or Asso 2 ring piston then this would reduce the ring-dropping problem but can still break. If the piston was swapped for a modern piston with drawn wire rings i.e. a Race-Tour piston then it may totally cure the problem.

In a modern tuned cylinder used with a modern piston exhaust port widths can get very wide indeed.

For example a 200cc cylinder with a bore of 66mm and an exhaust width of 46mm would after some miles (i.e. 2-3000 miles) eventually drop a ring. Early Gt/Tv cylinders were that wide as standard and were known to drop rings.

Go a step further and raise the exhaust port to tune it and the ring may drop much earlier. Widen the exhaust port to 48mm and the ring would let go in less than a 1000 miles. Fit a modern piston in these cylinders and the ring would not go. All MB tuned cylinders come with 46 – 48mm wide exhaust ports and we have very little problems. Today the modern RT 225 kit come with a 50mm port and with modern rings there are no issues at all. Others have increased to 55mm but this is excessive and you see nothing but problems!

Using excessive exhaust port widths in a cylinder with a modern piston can go terminally wrong, they usually don’t break a ring but wear rings out quickly then the ring can expand into the exhaust port and eventually the ring will snap off the top of the piston around the grooves or the ring spins over the peg knocking it loose.

A tell tail sign of a wide exhaust port, or a cylinder that is over tuned, or a cylinder surface that is soft is after some miles a chamfer appears at the top the exhaust port increasing it’s size. If left to run or a ring pegs stops working and the ring spins, a square groove appears top and bottom of the exhaust port.

The peg position governs which way round the piston is to be fitted. As a rule MOST pistons have an arrow either stamped or raised on the dome of the piston, this point’s towards the exhaust port. It has been known for usually Indian manufacturers to put this arrow in the wrong place (this is very uncommon) so its always worth a check. The exception to this is the old Honda MTX 200 piston as used in the Lambretta Honda 205 conversion. The only mark on the top of the piston (except its size) is IN, this points towards the Inlet port. Based with this knowledge always check where the ring pegs are located and check this corresponds with the arrow or IN mark.

Whatever you do, don’t fit the piston with ring pegs that enter the exhaust port it will go very wrong.

FITTING THE GUDGEON PIN

Some people find this very difficult, it’s not if everything is checked and

fits as described, genuine Lambretta pistons are the worse. Even new pistons are usually tight when fitting the pin, if you spend a little time honing out the hole then fitting becomes much easier. This problem hardly ever occurs with modern pistons and is not such a worry. Presuming the pin is free then offer up the piston the correct way round to the con rod with small end bearing fitted. Hold the piston in place at the same time as holding the con rod in place. This sounds hard but it's not. You should be able to slide the pin through the piston and feel its way through the small end bearing. Some times a slightly smaller bar helps to locate it all. MB make a universal 8mm T handle designed also to help fit pins to pistons. The hardest pistons are the ones using the extra piston shims, these require a little more patience and sometimes a little grease helps to hold the shims in position.

When the piston is fitted with the gudgeon pin, turn over the engine by hand and at bottom dead center check the piston will clear the crankcase. Normally this is not a problem, but casings are machined different. This problem has come to light over the years, mainly with Suzuki 190 pistons, Honda 205 pistons, TS1 and RB pistons. Especially check the piston is not touching the mag housing where the cut outs are for the transfer ports, this can happen if your using a 150 mag housing in a 200 casings.

With standard 107mm con rods the Suzuki and Honda pistons will need shortening before fitting if this is not done the piston can lock up on the casing. TS1 225 pistons are quite long and can slightly touch some mag housings, if this is the case once run after only a few miles the piston shatters, the tell tail sign on stripping the engine is a very small polished area where the skirt has hit the mag housing. The only cure with these engines is to either grind away the mag housing or remove it from the piston skirt. If you take the metal off the piston skirt and you forget the next time a piston is replaced things may go wrong again, so MB recommend the metal is removed from the mag housing.

FITTING THE CIRCLIPS

There are two types of circlips used in 2 – stroke pistons.

- The Seeger type, these are made from black spring steel and have two eyelets for internal circlip pliers. This type is fitted to genuine and cheaper style pistons, the circlip groove is machined to suit this type of circlip and wire clips shouldn't really be used as they sometimes don't fit in the smaller groove. This type of circlip has been known to shatter in tuned engines and MB only use them if necessary.
- The second type is the most common, this is the wire type and comes in 4 styles. Plain wire with no tags as used in most modern pistons, these are for pistons with single or double cut outs. Single cut out types are the most common in Japanese and Wiseco pistons as they are the safest to use in tuned engines, but mean it's difficult to get circlips out as the circlip can be fitted without been exposed and you can not get to it, drilling a hole helps if this happens. MB RT pistons go one step further and I designed them to have double cut outs to make circlip removal easier. Other variations to this clip may have one or two tags so pliers can remove them. These types are used with Asso / Vertex, TS1 and RB

pistons. Honda 205 pistons use a slightly fatter wire circlip it has one tag but is bent a little. This bend locates in a cut out in the piston and is very important to get it right or they come out.

Whatever circlip is used always check to fit it into its groove, if you can give it a spin do so to make sure. Be careful that you keep hold of the clip as they tend to spring off and some are so strong they are difficult to fit. Other make a tool to fit the circlips – I've never needed done.

FITTING THE CYLINDER

Before you fit the cylinder, gaskets need to be checked. There are machining height differences between casings. This is more common with Indian and Spanish engine casings as they are higher. This can throw out the squish clearance and port timings if you use standard gaskets supplied with the kit. This is not a great problem as there are different thickness gaskets for both cylinder base and head gaskets. In some circumstances no base gasket or head gasket are required to get the best squish clearance which is the important thing.

BASE GASKET

There are a variety of fibre base gaskets;

- Lambretta small block base gaskets come in two thickness' .5mm and 1mm
- Lambretta large block base gaskets only come in .5mm thickness. It is possible to double up on the gasket but is not recommended, large block base gaskets can fail as there is little area to seal on the cylinder and casing so we supply an alloy ones in .5mm – 0.7mm.

There are a variety of cylinder pack plates available if a cylinder kit is used in conjunction with a improved long rod or long stroke crankshafts.

- Small block: 0.30, 0.50, 0.70, 1.00, 1.20, 1.50, 1.80, 2.00, 2.50, 3.00, 3.50, 4.00mm
- Large block: 0.30, 0.50, 0.70, 1.00, 1.20, 1.50, 1.80, 2.00, 2.50, 3.00, 3.50, 4.0mm and 8mm

If fitting a cylinder with a packer or without a gasket then use a good petrol resistant instant gasket to seal the surface, this is normal if done correctly. Just slightly rough each side with Scotch Brite or emery cloth. If you are using a base gasket or packer trim the transfer cut outs with a knife or scissors to make sure the gasket doesn't interrupt gas flow, if using a packer then it may require the transfer area grinding to suit.

At this point it would be best to rebuild your cylinder kit dry to get the correct squish clearance. The squish clearance is very important to how your cylinder kit will run and instructions can be found elsewhere.

FITTING THE CYLINDER

With the piston fitted with rings, gudgeon pin and circlips and oiled, use instant gasket sealer on both sides of any base gasket or packing plate or

just lightly smear around the base gasket area of the casing, no need to over do it. Offer up the cylinder to the cylinder studs, slide it down the studs to meet the piston. All MB cylinder kits have a chamfer/leading edge at its bores base, this is to make fitting the piston with rings fitted easier to do. Line up the rings with the ring pegs, compress the rings with your fingers, a handy hint is to use a blunt object or two to compress the rings into the groove as you gently slide down the cylinder. Slightly rocking the cylinder makes the cylinder and rings fit easier, DON'T BE ROUGH THERE IS NO NEED TO USE A HAMMER. Once the cylinder has just slid on the piston push it down with a taps from your hand, this helps rings pass through the ports. Cylinders with big inlet ports and boost ports may have the rings pop out and lock on the top of the inlet port, so be careful just gently push the ring back in. With the cylinder fitted down on its base face, now be a good time to check your ignition timing marks for this, refer to fitting instructions for electronic ignition systems by MB.

HEAD GASKET

There are a variety of head gaskets available to suit different kits and hopefully achieve correct squish clearance

- 125 0.5mm, 150 0.5mm, 175 0.5mm
- 190 0.5, 1mm
- 200 0.5, 1.00, 1.20, and 1.50mm
- 225 0.5, 0.7, 1.00, 1.20, 1.50, 2.00 and 2.50mm
- 230 / 240 0.5, 0.7, 1.00, 1.20, 1.50 and 2.00mm

These are not exact figures so always measure them, occasionally some oddball thickness gaskets turn up. Head gaskets can be modified and opened up by hand using a sharp knife, scissors or a file. Sometimes no head gasket is required, if this is the case as with fitting a gasket use a good fuel resistant gasket sealer on final assembly but don't over do it you don't want this in your rings. Make sure the head gasket doesn't drop across the bore, as the piston may hit it.

Ideally the engine should be built with the cylinder-pointing vertical. Doing it this way makes sure the gasket can not drop down on the studs! Once the gasket is fitted then its time to fit the cylinder head and double check squish clearance.

CYLINDER HEAD

Most MB kits come with a new or modified cylinder head. This cylinder head has been re machined on a lathe to suit the profile of the piston being used. In most circumstances the combustion chamber has been modified so the engine will run on the low octane fuels.

Different piston manufacturers use different dome heights, for this reason MB use different cutters to suit these pistons and gain a perfect squish band across the profile of whatever piston is used. MB Race-Tour cylinder heads are machined to drop into the bore to centrally locate the head and make setting up squish clearances easier. You can fit these heads with or without

a head gasket. Fit the head, washers and nuts, tighten the nuts by hand using a socket. Then using a torque wrench tighten diagonally set at 10 lbs ft, then 15 lbs ft and finally 18/20 lbs ft, DON'T be tempted to over tighten the head nuts as this creates four high spots in the cylinder and if you seize up the chances are its at the four points where the stud holes are.

Once the head is torqued down then check the squish clearance again, hopefully all is well. If not check the squish clearance in four points equally around the cylinder and head, this would show you that the head is not bolted down central to its bore. This is uncommon with our heads and our cylinder kits, but can happen. If it does, then undo the head nuts until you can push the head in the correct direction to gain a better squish clearance and tighten the head back up and recheck.

MANIFOLDS

With the engine out of the frame it is much easier to fit both inlet and exhaust manifolds. If you are using a stub type exhaust manifold then fit it now before the head cowling. Use the correct exhaust gasket for a round flange and an oval flange, there should be no need to use an exhaust sealer as most big bore exhaust gaskets are made from thicker materials compared to standard. The exception is – if a stub adapter flange has been made from thin metal and has warped. This is quite common these days so beware! Some can take been filed flat, others can not. These may need some high temperature exhaust sealer to seal them, ideally a new flange would be needed.

The same procedure is required for Clubman type U bends, but first make sure a cowling can fit once tightened down. It maybe with all cylinder kits with after market exhaust and inlet manifolds that a cowling will need cutting/grinding to suit. It maybe both inlet and exhaust side will need modifying, do it so the cowling is clear of the manifold by a few millimeters so the cowling doesn't vibrate against it. Ideally a cowling can be cut to have easy access to the screws for easy maintenance.

Exhaust pipes tend to rattle loose so use a 7mm flat and spring washer along with new brass or steel nuts, use some loctite to stop them coming loose, with new studs this method works well and I've never needed any other method like special nuts or locking wire to stop nuts coming loose.

With piston ported cylinders or MB reed conversions there are various ways to bolt down an inlet manifold, you can use a gasket but usually this will need trimming the same as a base gasket. Some MB tuned kits with large manifolds may have had the manifold bolted to the cylinder as it was tuned, in this case sometimes a gasket was used and sometimes no gasket was used.

No gaskets are fine, it gives a smoother flow from manifold to inlet port, always use a instant gasket sealer either side of the gasket or flange joint to seal it. Use 7mm flat or wavy washers with nyloc nuts on the studs or spring, plain or wavy washers with the long inlet screw MBFH7X42.

With TS1 inlet manifolds always use a gasket at every joint and use a fuel resistant silicone sealer. Loctite studs when used and use nyloc nuts.

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SETTING UP COMMON MB CYLINDER KITS

MBgm RACE-TOUR CYLINDER KITS

To get the best from the MBgm Race-Tour cylinder kit follow these simple instructions.

MBgm Race-Tour 195 and 225 cylinder kits are the latest touring cylinder kits on the market, with many benefits offered over other cylinders! They can use any carb from 18 – 35mm and any exhaust within reason. MB recommends 25, 28, 30mm carbs and Clubman exhausts for low down touring and 30, 32, 34 and 35mm carbs and touring exhausts for quicker road – race touring. The new cylinder uses a new improved 4 stud exhaust port layout, you can use the normal positioned 2 studs or have your exhaust modified with a 4 stud exhaust flange (MB sell the flange separate).

The Race-Tour kit comes boxed with RT cylinder, RT piston kit, RT CNC head, MBgm studs, fasteners and gaskets/packers.

Fitting procedure is the same as above.

We recommend that an inlet manifold is matched to the inlet port, MB can do this if required.

MB also recommends using crankshafts fitted with 110mm con-rods this allows the Race-Tour kit to become fully adjustable to suit all engine casings, as they all alter in machined heights. You can use a standard type crankshaft with a 107mm rod but these have limitations based on the only adjustment is using a base gasket or not, only allowing raising the cylinder and port timings by 0.4 – 0.5mm which can limit adjustment on the squish clearance. With all cylinder kits we recommend using our high tensile cylinder stud kit, or our relived cylinder stud kit. MBgm cylinder stud kits come with the MBgm Race-Tour cylinder kit, if you do not use these could face problems later on with stretched or snapped studs.

You can use any combination of 58, 60, 61, 62, 63 or 64mm crankshaft with the Race-Tour kits, using either 107, 110mm or 115mm con-rods used in conjunction with our long or short crown height RT pistons to develop the cylinder kits even further. Unlike all other kits no extra machining or mods are required to set up the Race-Tour cylinder kit (except the exhaust port needs raising on longer 61, 62, 63 and 64mm stroke crankshafts and maybe a head may need machining to suit these longer cranks)

To set port timings correctly use what ever combination of cylinder base gaskets or alloy cylinder packers to get the piston level with the lower edge of the transfer port at BDC (bottom dead centre) this should set the piston 0.5 – 1.00mm above the lower edge of the exhaust port. This is where the port timings are designed to work for all round road touring. You can adjust the cylinder by raising it so the exhaust port is level at BDC with the piston this will improve higher end power and increased revs. If you do this then the difference needs removing from piston inlet skirt.

PISTON

UK cylinder kits use our MB forged Race-Tour piston design. Early MBgm kits came with the MBgm copy of the MB RT piston, these are identified with MRB Race-Tour and BGM on the crown, there was a recall on these pistons and are now replaced with Black coated Meteor pistons marked with bgm. All these pistons use the standard 20mm width small end bearing. We recommend the INA small end bearing which doesn't come with the cylinder kit. Piston rings are the same as already explained, all Race-Tour pistons use the same length gudgeon pin and uses the same non tag wire circlips. Mgm Meteor pistons use a different length gudgeon pin. Race-Tour pistons come with the added benefit of having two unique cut out slots to remove these circlips what ever position the circlips are in. Always oil the gudgeon pin, rings and piston upon assembly and make sure the piston is fitted the correct way round…… arrow to the exhaust port…….. ring pegs to the inlet side of the cylinder.

CYLINDER HEAD

The Race-Tour cylinder is designed to use a head that is specially machined to DROP into the cylinders bore. This locates the head and centralises the squish and prevents head gasket leakage problems. The new MBgm kit comes with a CNC billet head which improve things even further over the early UK version as they now come with the extra 4 holes as standard. These dropped heads without the extra studs/screws work using any standard head gasket from 0.5 – 2.0mm if required depending on casing heights. We can also machine side plug heads for odd set up motors with long stroke 61 – 64mm cranks, this is the only modification ever required with our RT kits and long strokes except the exhaust port will need raising to suit the longer cranks. We can also machine special one off center plug heads if required.

Once the cylinder height is set to the transfer port then set the squish clearance using any combination of, ideally no head gasket or with any head gaskets. Aim for 1.00mm for best results or up to – 1.50mm squish clearance as explained in the squish set up.

The new MBgm Race-Tour cylinder kit comes with a new CNC billet head, these are machined with extra 4 holes as standard to further improve the effectiveness of the cylinder head design. With the new kits they are supplied with 8mm high tensile screws and washers, you can go one step further and also fit our MB stud and nut kits for these extra holes. Cylinder stud nuts need torquing down to 18 – 20lbs ft.

MB FACTORY KITS

As with all these instructions the same applies to our Indian modified factory stage 4 kits all you have to watch is getting the squish clearance correct, as explained this always depends on the engine casing heights. Set up correctly with a standard crankshaft and 107mm rod they would use a standard base gasket and a thin 0.5 – 0.7mm head gasket. You can either remove the head or base gasket or both to get the clearance correct. If using a 60mm crankshaft set it up to use a 1.5mm head gasket and get the correct squish clearance this should gave good port timings that work, occasionally a

recessed head maybe required.

TS1 KITS

As with all kits spend the time on squish clearances, but also look at port timings to make them work right. There are different ways to get port timings where you want them.

- 58 x 107mm, 0.5 – 1.00mm machined off the base, this should put the piston level with the bottom of the transfers at BDC which will give a better spread of power from low transfer timings. You should need a 1.50mm head gasket to get the squish clearance. You may need to use a base gasket or not
- As above but set with no machining and using a 0.5 – 0.7mm head gasket, this lifts port timings to around standard which will lift mid to upper power but you will find low down power is reduced and the engine is harder to ride
- As above but set up with no head gasket, this is considered a race set up, transfer and exhaust port timings are increased away from a good road motor
- As above but with a 60mm crankshaft, ideally use no base gasket, ideally the cylinder needs machining at its base to get the transfers level at BDC because of the stroke, the piston ideally needs to be level with the transfers at BDC, this ways gets port timings correct but will need a 1.50mm head gasket as the piston will stick out of the top of the cylinder a bit further and the head will need recessing either 1.00 or 1.50mm.
- The same applies if a 110mm rod is used but the beauty of this is you can use different cylinder base packers to tweak the timings and heights so is much easier.
- With a 62/64mm crankshaft you run into problems, the same applies to above but because of the longer stroke you will need to set it up for the piston to stick out of the cylinder more. Its no problem with our RT cylinder but with other cylinders we would use an iron liner to extend the top of the cylinder or add extra welded fins with a ceramic conversion. We would only do this to exotic cylinder conversions because the fat head gasket and head recessing is not a good idea, do anything other and port timings are all over the place and you get more power from smaller crankshaft strokes.

IGNITION TIMING

As explained in the ignition section ignition timing is very important especially these days with poor fuels. We’ve found for many years even with our heads set with correct squish bands and compression ratios the ignition timing need retarding to be safe and reliable. Whats best? Well it does depend on many factors as explained. With fixed ignition timing it is always a compromise! Set the ignition to be reliable flat out and you can suffer with low down power!

Ideally we always suggest as standard 17 degrees BTDC for 99% MB motors.

Higher spec and more highly strung motors that may have a higher compression ratio you could set to set static timing at say 15 – 13 degrees, this helps race type engines revving flat out all the time!

To improve the compromise to get better lower down power and keeping the motor cool at higher rpm’s is to fit either a Kytronic, M Tech or Agusto advance retard ignition boxes on bgm ignitions, Indian and Vespa converted ignitions. Or use the Varitronic system.

FINAL SETTING UP

Once the cylinder is set up as described, fit the head cowling and tighten screws using loctite. The engine can be fitted as normal or carb and exhaust added and started as per running in instructions.

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