

mugello



Dear Customer,

Thank you for purchasing your new cylinder performance kit from the Imola/Monza/Mugello range of kits.

The kit should consist of the following parts:

- 1 x Alloy Barrel (Mugello/Imola/Monza, as appropriate).
- 1 x Machined and dowelled cylinder head (186 kits manufactured post-Winter 2005)
- 1 x Piston
- 1 x Gudgeon pin
- 2 x Piston circlips
- 2 x Inlet manifold studs, 1 x gasket
- 2 x Exhaust studs, nuts, 1 x gasket
- Base and head gaskets (of differing thickness, to aid the setting up of the correct squish clearance)
- And for the reed-valve type kits, 1 x Inlet manifold assembly

Other parts available from us for the benefit and ease of fitting of these kits include:

- Fully machined cylinder heads, available on an outright or exchange basis (Mugello kits; Inlet manifolds to enable easy fitting of larger carburettors)
- Dellorto PHBH (round slide) Carburettors
- Longer throttle cables
- High flow air filter options for both standard (Dellorto SH type) and larger bodied carburettors
- Fast-flow fuel tap; also our exclusive version with low-level warning light
- High specification crankshafts
- High load engine bearings
- 'Rolf' brand oil seals
- High load bearings
- Clutch kits
- The technically unrivalled Varitronic Electronic Ignition kits
- 'JL' type expansion exhaust pipes
- 42mm Clubman-type exhaust

And a full spares back up for all of the above!

These instructions are intended to assist you in the fitting and setting up of the kit to give added performance and reliability to your Lambretta, (but are not necessarily an exhaustive list of instructions and we cannot be held responsible for damage to you or your machine through following these instructions!). They do not cover subjects such as gearing and individual machine jettings, which are subjects on their own. If you are in any doubt about fitting the kit, please follow the instructions of a detailed manual or seek the assistance of an experienced engine builder and/or as a customer of The Cambridge Lambretta Workshop, please feel free to contact us and we will endeavour to help you. Please take your time with the fitting and set-up of your kit, it will pay dividends in producing a reliable and quick engine. Ensure that the tools and other hardware (including other components of your Lambretta!) used are not prone to 'bodging' the job and do it all with the safety of yourself and those around you in mind.

Food for Thought:

This assembly is intended as a 'bolt-on' kit, but it is only sensible to follow the advice in the following paragraphs; It is imperative that on fitting the performance kit of your choice to your engine the 'bottom-end' of the engine (crankshaft and bearings) is in a strong state, as must be the gearbox and transmission. Remember; your engine is only as strong as the weakest link! Please bear in mind that a standard Lambretta engine is fairly low powered by modern standards and if you are planning to extract more power from this engine then it may be that the basic engine and transmission unit will need upgrading to cope with a significant increase in power, i.e. an engine that was a 6 brake horsepower unit having it's power raised perhaps to over double this may not cope with such an increase without an overhaul to complete engine. If you are in any doubt about the strength of the unit, then it is only sensible to strip and check it as necessary, or seek professional advice to confirm the soundness of the unit or components.

Points worth considering in the base unit at this stage include:

Crankshaft. The use of a good GP-type crankshaft, which are generally of stronger construction than a basic Li/SX unit or a crankshaft of dubious condition. Also, if a TV-type crankshaft is fitted, this will only match a TV style piston.

Bearings and oil seals. When were these last thoroughly checked or replaced? Race-type bearings are available at reasonable cost.

Ignition system. Any higher revving engine will struggle with a standard points system, which tend not to cope with the demands of the extra speeds the engine works at.

Clutch. What state might this be in? Will it cope with any extra power? Standard clutch units in top condition using 'Sufflex' B-type clutch corks, steels in good condition and uprated springs are generally sufficient to cope with these kits in a mild tune stage. Heavy use, e.g., further tuning, riding hard and mainly '2-up' may require further upgrades.

Gearbox. Whichever gearbox you are using it should be in good condition. The final drive ratios can usually be altered to one near to that of your requirements by changing the primary sprockets. The gear selector dog, which operates on the layshaft, must be in top condition so as not to allow the engine to jump out of gear.

Fuel system. The use of a fast-flow fuel tap is advisable with any performance kit Engine casing. The casing should be clean, (internally at least) free of grit and grime. The threads on the casing should all be sound and crack free, as should the dowel holes. Most damaged threads can be repaired, but the amount of work required to do so does vary.

Also, Last but definitely not least! Are your brakes and suspension in top condition? Good sense says these should be. With the increased performance that these kits will bring, this must be reiterated. Upgrades from standard are available

The Strip of the 'top-end'

It may be that you already have the engine unit out of the machine, which makes the fitting easier, but let us assume that you are fitting the kit with the engine in-situ.

- Remove bridge piece and rear runners to get access around the engine
- Remove HT cap and spark plug
- Remove exhaust silencer
- Remove carburettor.
- Remove the rubber bump stop from the engine casing to improve clearance.
- Loosen bolts holding head cowling to the engine
- Remove rear shock absorber mounting nuts and washers, ready to drop the rear of the engine.
- Possibly with an assistant steadying and taking the weight of the rear of the machine, remove the rear shock altogether and lower the frame down gently
- You should now see that the nose of the engine is sitting at a different angle to the frame. Once the head cowling bolts have been removed entirely and the head cowling itself loosened, this affords better (albeit limited) access to the exhaust down pipe mounting nuts.
- Preferably using a small drive socket set (11mm socket), remove the chain case side down pipe mounting nut. Then using an 11mm spanner remove the mag side down pipe mounting nut. Wiggling the down pipe free of the studs, remove this along with the head cowling.
- Remove the inlet manifold from the cylinder barrel (N.B it may be that this will not clear the gap between the barrel and frame until the barrel itself is halfway off)
- Loosen the cylinder assembly by removing the M8 nuts holding the cylinder head (4 of, 1 elongated).
- The head should now be removed. This should leave the barrel fairly free to slide away from the main casing spigot. This can sometimes stick, so some gentle wiggling while pushing the barrel may help Before removing the barrel altogether, rotate the crankshaft to the piston top-dead-centre (TDC) position. Slide the barrel assembly away from the main casing until such a point that it possible to access both ends of the piston gudgeon pin.
- With access to the gudgeon pin ends, remove both of the retaining circlips and with the piston top supported still inside the barrel walls, push or gently tap (with a suitable drift punch) the gudgeon pin through so that it will clear the sides of the crankshaft conrod. This should now enable the removal of the cylinder barrel and piston assembly by continuing to separate it from the main engine casing!!

Preparation to fit the performance kit

By this stage you will have decided whether or not you need to strip any more of the engine for your upgrade. These instructions will not cover further 'bottom end' engine and gearbox work and will assume that you are ready to prepare for the 'top end' rebuild.

- While doing the prep-work, place some rag in the mouth of the crankcase so as not to get any debris into the crankshaft assembly.
- It is recommended to remove the main cylinder retaining studs and replace these with longer items. These studs do stretch over time and numerous engine rebuilds, so unless you can be sure yours are in tip-top shape replace with top quality slightly longer items (the longer studs can utilise longer nuts, thus increasing the clamping force of the joint). Remove by means of a stud extractor, or the tried and tested 'double-nut' method; that is 2x M8 nuts tightened together at the base of the threading of the stud that you are trying to remove, then turning the bottom nut in an anti-clockwise direction should release the stud from its casing.
- Remove all traces of the old cylinder base gasket from the engine casing whilst trying not to damage the even surface of the crankcase cylinder joint. Favoured methods include the careful use of a Stanley knife type blade.
- Depending on the set-up combination you have selected and your performance aspirations, you may wish to externally match your inlet and exhaust manifolds to your barrel. This is generally pretty straightforward as the metal is aluminium alloy and it is soft to work with tools such as Dremel multitools, drill attachments and small files. Unless you are a professional tuning skills please do not try to alter the porting inside the barrels; they are nicasil lined and there must be no discontinuation of the lining in the barrel as this will result in flaking of the lining and serious damage will almost certainly result.
- Before commencing fitting the top-end assembly it is worth spending a few minutes running an appropriate M7 tap through the external threads on the cylinder assembly so as to ensure satisfactory installation of the manifold studs to the cylinder assembly. These can then be fitted in a similar way to stud removal, using a small amount of thread sealing compound to the threads on assembly. Please be aware that it is often possible to over-insert the exhaust studs so as to foul the main cylinder fitting stud holes; so observe carefully the depths these

are inserted relative to the main cylinder stud holes.

- Also ensure that the M8 threads for the main cylinder-mounting studs are sound and clean (using a tap for their cleaning is also recommended). As previously mentioned replacement items are frequently advisable. You can now fit the cylinder studs you have deemed acceptable.
- Finally, ensure all assemblies are scrupulously clean before fitting

Fitting the top-end

- Of the cylinder base gaskets that are in your kit, (a good starting point being the thickest gasket) fit this over the main cylinder studs to the crankcase mouth. Gasket sealant is not recommended for this joint; it will be a nightmare to remove in the future. Try using a thin coating of grease on the gasket to help it seal
- Fit the piston rings to the piston by gently stretching the rings over the piston crown and locate the rings in the ring grooves. The ring ends will locate around a peg in the grooves.
- With the subsequent assembly of moving parts it is strongly recommended to use a lubricant such as 2-stroke oil around the bore and bearings.
- It is advisable to be fitting a new high quality small-end bearing to the crankshaft / piston gudgeon pin at this stage of the fitting of the kit.
- The easiest way to fit the barrel and piston assembly to the crankcase is in the reverse of the removal process, which was outlined in guide for the strip down. (i.e. fit them to the crankcase together, the piston top already inside the barrel spigot). Note! The piston will have an arrow marked on the crown; this MUST face the exhaust port of the barrel. Always use new 'wire type' circlips to secure the piston gudgeon pin
- Once the barrel is in place over the main studs it should be possible to push this gently towards the engine casing spigot. As you are doing so it is necessary to observe the piston ring ends through the inlet port and assist these to clear the port edge towards the barrel top.
- (Mugello kits: If the engine is being worked on with the engine still in your Lambretta it is during the next stage of fitting the barrel to the engine that you may find it easiest to fit the inlet manifold to the barrel)
- As the barrel is pushed further towards the casing spigot and pushed home into the engine case it should be possible to rotate the engine in the direction of rotation (DOR; clockwise at the flywheel / anti-clockwise at the front sprocket). It should do so with relative ease. Any harshness or signs of locking should be investigated.
- Once you are happy that the barrel and piston are working nicely you can begin to fit the cylinder head. Assuming you have bought a kit complete with a cylinder head, this head has been reworked for the specific kit you have bought, in terms of bore size, compression ratio and the 'squish band' matching the piston crown profile. (Post Winter 2005 kits may well have heads supplied with locating dowels, to ensure consistency in head location. If so, fit the dowels snug into the recesses in the cylinder barrel, these will protrude and also locate in the head.) The kit should have been supplied with head gaskets of various thickness for the purposes of achieving the correct 'squish' clearance (that is the working clearance between the piston crown and cylinder head; necessary for efficient running of the engine). Starting with the thickest head gasket followed by the cylinder head itself, place this over the cylinder-mounting studs and push it home to the barrel joint. This should then be secured by strong plain M8 washers, followed ideally by our extra length M8 cylinder nuts (including the elongated nut for the purposes of securing the head cowling and as referred to previously). If you are re-fitting the kit after it having been run, the cylinder head joint should be checked for flatness; best achieved by a self adhesive sanding disc (fine grade) stuck to a small sheet of glass or a flat tile and the head worked in a circular motion over this flat surface. Observing the face of the head will show highspots, which must be worked down to achieve a flat surface if an efficient seal is to be maintained at the joint. The cylinder mounting nuts should be tightened down gradually and in an order of diagonal opposites by means of a torque wrench to a torque of 18 to 20 lb/ft. Rotate the engine very carefully in the direction of rotation, checking carefully for any signs of engine locking.
- Checking of squish clearance can now be carried out. The clearance is easiest checked by using a length of solder (thickness around 1.5mm) and vernier calipers. This is achieved by inserting the solder into the spark plug hole while the piston is below TDC. The solder should be inserted deep enough to reach the farthest reach of the head combustion chamber (the edge of the squish-band where it meets the head gasket joint). When the engine is then rotated in the direction of rotation (several times), a measurable imprint may then be left on the solder: this is the clearance we are looking to measure. An ideal squish clearance is between 1.0 and 1.3mm thick (nearer to 1.0mm is ideal, i.e. 1.1 to 1.2mm). If there is no imprint, that is OK, all it means is that the clearance is too large. This can be reduced by repeating the same steps as above with progressively thinner head gaskets (or even no head gasket) (although if using no gasket then it is advisable to use a silicon-based sealer on the joint). Be confident that the measurement is consistent by repeating the check several times.
- With the reed-valve kits, fitting of the reed assembly and manifold. This is fitted on current versions with a gasket between the barrel and the reed-block, followed by the rubber manifold. The rubber manifold is fixed by four bolts to the barrel. Often, the outboard bolt (engine sidecase side) will need to be shorter than the other three to avoid it bottoming out.
- We are now at the stage where the 'setting-up' and top end build is complete and the remaining build up is pretty much a reverse of the initial strip down work as outlined previously in terms of fitting the cowlings and bodywork etc.

Jetting and Timing

- Final ignition timing should **always** be checked by strobe light no matter which system you run. On a static system this should run at 17-18 degrees before top-dead centre (BTDC). On Varitronic, by it's nature the timing is variable and should be set to achieve a retarded setting of 15-17 degrees BTDC (i.e its advanced setting will start at at around 26-20 degrees, depending which version of the kit you have)
- It is near impossible to quote jetting details for any given set up, due to the nature of no two engine builds / set ups are ever the same. The following figures are recommended as a base setting to begin.

For further information and to correct jetting details, please read our "How to jet a carburettor guide".

Mugello 186 & 200

Pilot	Slide	Atomiser	Needle	Main Jet Clubman	Main Jet Expansion
-------	-------	----------	--------	------------------	--------------------

SH	55-60	Number 1	Number 2	N/A	18mm 105 20mm 108 22mm 110	110 - 135
PHBH	55	40	AS266 AS264	X7 2nd clip	90-100	120 - 150

Imola 186

	Pilot	Slide	Atomiser	Needle	Main Clubman	Main Expansion
PHBH	55	30	AS266 AS268	X7 2nd clip	115 118 Series 1 & 2	130 - 160
PHBH PowerJet	55	40	AS266 AS264	X7 2nd clip	85 40 Powerjet	120 - 150 30 - 30 powerjet

Monza 225

	Pilot	Slide	Atomiser	Needle	Main Clubman	Main Expansion
PHBH	55	30	AS268 AS266	X7 or X2	125 130 Series 1 & 2	130 - 160
PHBH PowerJet	55	40	AS266 AS264	X7 2nd clip	90 40 Powerjet	130 - 160 30 - 30 powerjet

Some guidelines for start up and early 'running-in'

- All being well and having taken your time to ensure a good build up your engine should be ready to run
- Use good quality (synthetic) 2-stroke oil, trying to keep as near as possible to a 3% mix (running a "higher" percentage of oil does not aid running in and seriously affects jetting), preferably with high octane fuel (unleaded is fine, but try to use premium brands and their premium products, e.g Shell Optimax, BP Ultimate; their higher octane rating will burn cooler in your engine)
- Running in is a quicker process than with those quaint 'olde-worlde' iron barrels. The Nicasil bore of the kit is very hard and wear very little and with the use of alloy for the barrel construction the heat expansion differential between the barrel and piston is much less than those iron barrels. It is effectively the piston rings that need the running in and that should be completed within about 300 miles. If you have rebuilt other parts of your engine, you will also need to consider this, but nevertheless the process is far less painful! So, no full throttle or full load running (e.g. consider restricting your two-up riding) for the early part of this period (e.g 100 miles), then gradually increase the use of the throttle allowing for the fact that you still have a new engine. It is worth bearing in mind that invariably it is safer to run an engine slightly on the rich side jet wise, (a two-stroke will run differently under different conditions, different days). The jetting requirements for your engine will quite possibly change over this early running-in period also.