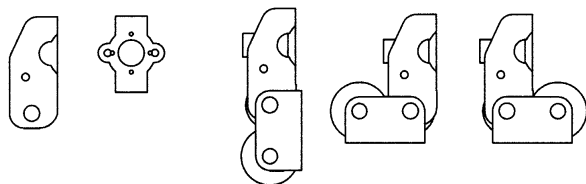
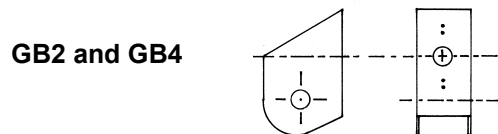
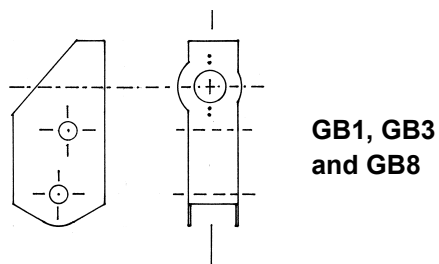


A GUIDE TO



GEARBOXES



GB5 and Drive Extender

Comet Models produce five different gearboxes and we aim here to explain the differences and benefits of the designs.

Working in stages

In all the Comet gearboxes a worm gear is fitted to the motor shaft, and that worm then engages with another gear to turn the rotation of the motor by 90°. If that gear is on the driving wheel axle then the gearbox is single stage, but if that gear in turn drives another gear then it is a two stage gearbox. In the Comet range, GB1, GB3, GB5 and GB8 are two stage gearboxes and GB2 and GB4 are single stage.

Single stage simplicity

The simplest arrangement is a single stage gearbox. This is ideal when space is limited or when the builder requires an easy and quick solution to their drive problem. The gears in both GB2 and GB4 are 38:1 ratio, which means that the motor shaft has to rotate 38 times to produce one rotation of the driving axle.

The GB2 gearbox has half-etched dimples at both 8mm and 10mm centres, which allows the gearbox to be fitted with a Mashima MH16xx series motor in two configurations. The GB4 gearbox has half-etched dimples at 8.5mm centres which are required to match up with the Mashima MHK10xx series motors.

In both gearboxes the builder has to ream out the holes in the gearbox sides to take the supplied axle bearings, and these are then soldered in place with the flanges on the inside. If space between the loco frames is limited then it is possible to file down the protruding bearings flush with the outside face.

The builder also drills through the half-etched dimples to suit whichever motor they are going to use. The aim is to give enough clearance for the fixing screws, but if the holes are too large then the motor could be mounted such that the mesh between the worm and the gear is adversely affected.

The shaft diameter of the Mashima MHK10xx motors is 1.5mm, so the GB4 is only supplied with a 1.5mm bore worm, but the GB2 can be supplied with either a 2.0mm bore worm (suitable for use with the Mashima MH16xx motors) or a 1.5mm. Be sure to specify the correct one when ordering. The /15 suffix to the gearbox code indicates a 1.5mm bore worm and /20 a 2.0mm bore worm.

Adding the second stage

Two stage gearboxes are more complicated and more expensive, so why would anybody want one? One reason is that in 00 gauge a Mashima MH16xx motor is too wide to fit

between the loco drivers and so when the loco has large driving wheels the motor needs to be raised higher than with a single stage gearbox. GB1, GB3 and GB8 will lift the motor high enough to clear the driving wheels even in such locos as the LMS 2P and Royal Scot (6'9" diameter).

Another reason for using a two stage gearbox is to enable higher gearing. Although it is possible to obtain a reduction of 50:1 or even higher with a single stage worm and gear reduction, the angle of the teeth used would mean that there is a lot of friction for the motor to overcome. By using a two stage gearbox the gear tooth angles do not have to be so acute so there is less friction. It is also generally accepted that a two stage gearbox will give smoother running than a single stage one.

GB1 and GB8 give a 50:1 reduction and a GB3 gives a 38:1 reduction, but they are similar in appearance and overall size. During construction the builder has to ream out four holes for the axle bearings to be fitted to the gearbox sides, and they are then soldered in place. The motor is secured to the endplate of the gearbox with its own fixing screws. The gears used in these gearboxes are helically cut, which means that they do not have to be directly in line with each other to ensure a perfect mesh, but the gearbox frets include etched washers which are used to limit the sideplay of the gears. Again it is important not to make the motor fixing holes too large and to specify a 1.5 or 2.0mm worm when you order.

GB8 is only available with a 1.5mm bore worm to suit the fixing holes on the Canon CA1620 motor.

A special case - GB5

Our GB5 gearbox is smaller in size than our other two stage gearboxes, and has several unusual features. Firstly it has fixing holes at 8.0, 8.5 and 10.00mm centres, and so can be used with a wide range of Mashima motors. The 8.5mm holes are aligned vertically on the endplate, and so fixing a Mashima MHK10xx motor will result in the motor having its flat sides vertical and thus the body need only have a 10mm aperture to allow it to sit down on the chassis. This is useful when modelling small prototypes.

If you mount a MH16xx Mashima motor using the mounting screws supplied with the motor and fitted into the 10mm spaced holes then the motor will have its flat surfaces on the top and bottom and the body will need a 16mm aperture. Whilst this will be satisfactory for some locos, if the firebox is narrow then it would be better to mount the motor with its flat faces on the sides, and thus reduce the body opening size to 14mm. This is achieved by using the 8mm mounting holes on the motor and the gearbox. These holes are smaller on the motor than the 10mm holes, so the supplied fixing screws won't fit, but we can supply suitable replacements ones (code MFS10).

The first gear in the GB5 is a small 22 tooth gear that has no boss on the side but has a fixing screw actually in the tooth face. This obviously reduces the amount of tooth surface that can engage with the worm, and so it is essential that the chassis is free running before fitting the gearbox, or the steel worm will grind away the teeth on the 22 tooth gear.

As with the other gearboxes, the gears are helically cut and so do not have to be directly in line. Again etched washers are provided to reduce the sideplay of the gears, and by altering the fitting of these it will be possible to vary the contact point between the worm and the 22 tooth gear.

The GB5 provides the builder with a compact two stage 38:1 gearbox and is ideal for use in models where there is not enough room for a GB1 or GB3, but are not so small that only a GB2 or GB4 will fit. It is available with either a 1.5 or 2.0mm worm.

The main benefit of a GB5 is that it is the only gearbox in our range that can be fitted with one of the range of Drive Extenders. This is a simple fold up etch that locates over the axle bearings in the sides of the gearbox and is fitted with one of three gears to give an overall 38, 46 or 50:1 ratio. The Drive Extender can be rotated about the axle bearing to achieve the angle required and if it is secured vertically below the main gearbox it positions the motor further from the driven axle than the GB1 or GB3, and so is ideal for use in the BR Standards, especially the 9F.

Why Five?

The main benefit of the GB5/Drive Extender combination is when the DE is angled either forwards or backwards, by up to 90°, to suit the particular application. It can, for example, be used to drive the third axle of an 0-6-0T with the motor sitting above the middle axle and pointing towards the smokebox, or perhaps with the DE tucked underneath the motor as the motor sits over the middle axle and leaves the cab clear.

Planning

As an aid to planning your motor and gearbox installation there is a full size diagram available for downloading from our website which shows all combinations of motors and gearboxes in our range. If you print this out on an A4 sized overhead transparency sheet you will be able to lay it on top of a scale drawing of your model and decide which option will be best. GB8 is equivalent to the GB1/MH1620 combination.

Decisions, decisions

The modeller has many choices to make during the construction of a model, and we will deal with just two : what size motor and what ratio gearbox?

The motor question is the easy one. Always fit the biggest motor that you can. Although power does not strictly rise in proportion with increased size, a bigger motor will always be more powerful than a smaller one, and that extra power may be useful on your layout.

The trickier question is the one concerning gearbox choice. Sometimes limitations of space will mean that you have no choice but to go for a small single stage gearbox such as the GB2 or GB4. If you use either of these then there is no choice of overall gear ratio: it is 38:1.

On the other hand if you are building a large heavy model such as a whitmetal kit then choose one of the two larger two stage gearboxes, the GB1 and GB3. If even those two would leave the motor showing under the boiler then consider a GB5 fitted with a Drive Extender which will raise the motor even higher. When it comes to choosing the overall gear ratio a lot will depend on where and how you expect to run your completed loco.

Scale speed?

Although it is possible to do calculations involving the speed of the motor and the diameter of the loco driving wheels to determine what ratio is required to give the scale speed of the loco, most people simply want a loco that will perform well on their layout. If their layout is one that allows trains to run at high speed, then a 38:1 ratio will probably be the better choice. On the hand, if the layout is small and speeds are low then a 50:1 ratio will give maximum controllability, but it will have more torque and so is worth considering if the loco will be required to pull heavy trains. A 46:1 ratio will obviously be between the other two ratios in both speed and torque.

Fitting a flywheel

We can supply flywheels to fit both the Mashima MHK10xx and MH16xx motors. They are available in two sizes: the width across the motor flats (FL1, FL3) and the width across the curved sides of the motor can (FL2, FL4). A flywheel can help keep the chassis running over a small break in pickup, such as over a dead frog point, but should not be used to try and compensate for an unevenly running chassis. As for the choice of motor, if you are going to fit a flywheel then always fit the largest one that will fit in your model.

Summary

Comet Models produce a range of gearboxes and accessories that provide solutions to all your loco and chassis building problems. If you have any more questions then look at the information on our website, and then if your questions are still unanswered, please get in touch with us by phone or email.

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