



WORDS/PHOTOS: Mark haycock



The Knowledge

Setscrew or bolt? Stainless or zinc plate? Our technical boffin Mark Haycock gets to grips with screws, bolts and nuts; and advises what you should be using, where and why.



I grabbed this handful of fasteners at random from my workshop, and you can see that even in this little sample there is quite a choice of head forms.



The word 'bolt' is widely misused: the uppermost fastener is one, the other is not – it is a setscrew.

Last time we looked at thread forms for fasteners, so now we shall follow on by considering the fasteners themselves. Apart from different thread sizes and pitches which we have already discussed, there is the length, the head style and the material to consider. Picture 1 shows a handful of assorted fasteners I grabbed from my workshop: quite a variety of styles.

When we consider the length, we need to introduce a little terminology. The term bolt is widely misused and Picture 2 shows what is actually meant by 'bolt' and 'setscrew'. It is possible to use a setscrew as a bolt, and sometimes the other way round, but this is not recommended. An engineer will tell you that the joint between components should be on the unthreaded part of the bolt. When you fit a setscrew, you only have to consider the total length (see Picture 3) but a bolt is defined by the lengths of both the threaded and unthreaded parts.

How do you know what length to use if you are replacing a fastener? Usually it is fairly obvious but occasionally the difference of a small amount is crucial. The most obvious way is to measure what is already there, but quite often it is wrong anyway because the previous mechanic was not quite as conscientious as you are! Too short can result in the thread being over stressed and thus stripping, and too long can make a fastener bottom in a blind hole leading to it shearing off if you are a little over-enthusiastic with the spanner. It is considered good practice, by the way, to have at least two thread pitches exposed beyond a nut. The best approach is to use the bike manufacturer's parts list if you can find it and it is helpful with descriptions.

The subject of head styles can be quite controversial. Picture 4 shows the type of Phillips-head setscrews very commonly used on older Japanese bikes, this example from a



This is how to measure the length of a setscrew: from the extreme point of the thread to under the head.



A typical Phillips-headed setscrew, this on a carburettor top. So convenient for the factory to fit, but often so inconvenient to remove thirty years later.



Phillips heads have mostly been replaced these days. This is a modern crankcase cover, held on with ordinary hex-headed setscrews.



Here we see a comparison between Phillips (left) and Prodrive heads. The latter is much less likely to slip. You might be able to see a tiny cross on the Phillips fastener; this indicates that the thread form is ISO not JIS.



Another type of head used on modern bikes, this is Torx on a fuel injection component – in a way an up-to-date version of Picture 4. I am quite keen on these as they provide a very positive and slip-proof drive.

carburettor top. What you need to bear in mind is that they were used because they were cheap and convenient for rapid assembly. Neither of these qualities (within reason) will be of concern to us, and what is more, the Phillips head is very easily damaged. Manufacturers have moved away from Phillips heads and they tend not to be used on modern machines: see Picture 5.

If you wish to retain the look of the original with less likelihood of slipping, a Supadriv or Pozidriv head might be the answer. This looks very similar to a Phillips head but with revised angles. (Picture 6) Note that although you can use a Phillips driver on a Supadriv head or vice versa, clearly you should not!

Slot heads (ie those for use with a normal flat-bladed screwdriver) are not very commonly used on Japanese bikes, and where they are it is probably best to substitute socket heads, which are tightened with a hexagonal Allen key. However, even better is the Torx head (Picture 7), which has more driving points and is thus less likely to slip. These have been used on German-made products (not just bikes) for many years but are now becoming more popular with good reason.

On hexagonal heads make sure that the spanner fits correctly: if it slips once you can ruin the bolt head. Many sockets are of 'bi-hex' (bi-hexagonal) design, with twelve points to drive the corners of the bolt head. Hexagonal sockets give a better purchase, and the best sockets are designed not to make contact with the tips of the hexagon at all, but engage with

the flats instead. These are known as 'flank-drive' and will sometimes get a good purchase on bolts which otherwise are dismissed as hopelessly rounded off.

What about materials? You will find that carbon steel is used for most fasteners, though this is available in a number of grades. You will often find markings on bolt heads which tell you what grade of steel has been used, eg 8.8 (Picture 8). This is the so-called property class and it indicates how strong and hard the bolt is. The figure before the point is of most use to us as it gives the ultimate tensile strength of the material, in hundreds of Newtons per square millimetre. (The second figure indicates what is called the yield stress, but don't worry about that for now). The classes run from 3.6 to 12.9, with the 8.8 being commonly sold as 'high-tensile grade' and quite good enough for our sort of application. However, if you are in doubt you should use the original manufacturer's part.

Carbon steel is not very corrosion resistant and consequently it is usually plated to improve its durability. The most common coating is bright zinc plate (known as BZP) and this does provide a fair degree of protection. These fasteners are very cheap and thus can be changed without too much bother when they rust. (Picture 9)

Sometimes heads are chrome plated for applications such as suspension and handlebar fixings and again this can be quite long lasting if it is done properly (ie better than the original!). However, the best solution for a

durable finish is stainless steel. This is generally available in two grades known as A2 and A4. The former is by far the most common and is sufficiently corrosion resistant for use on a bike. A4 tends to be used for marine applications. Picture 10 shows a typical A2 bolt head and nut. The material can be polished well and is then very similar in appearance to chrome plating, but far more durable.

Aluminium is becoming more common for fasteners as it is possible to use a process called anodising to give a coloured finish, which it has to be said does look pretty. However, the finish can be not particularly long lasting and aluminium alloy is not as strong as high-tensile steel. The fasteners are also rather expensive.

Finally, the latest trend is towards using titanium fasteners. This is a material which is both strong and light, though the finished products are far from cheap as the material itself is expensive and it is very difficult to machine. I think there's a little one-upmanship involved with fitting titanium fasteners to a bike as the saving in weight (the only real benefit) is absolutely minimal. You choose!

CONTACTS

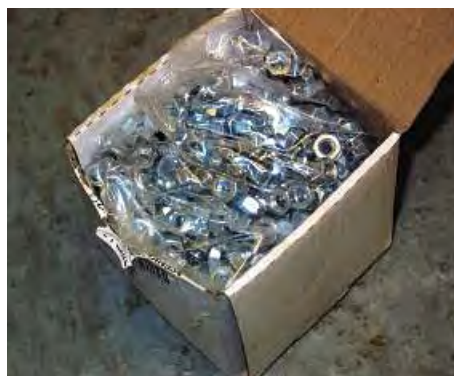
www.screwfix.com Mostly parts for building projects, but also many keenly priced components and tools suitable for bike renovations.

www.inoxbolt.co.uk Specialising in stainless steel individual components and kits of fasteners specific to particular bikes.

www.phildentonengineering.com Hand-made replica stainless steel fasteners for Japanese motorcycles. Wheel spacers, spindles etc also available from stock.



GFD is the manufacturer and M means metric, but what is 8.8 a measure of? Read on...



Plain BZP components are cheap. This is a box of 1000 M6 nuts bought from Screwfix for the princely sum of £5.39.



The A2 on these components tells us that they are stainless steel. Attractive, corrosion-proof and really not too expensive at around twice the price of BZP fasteners.