

## Bolt Preparation

It is very important to have proper preparation of your bolt. Non parallel or rough surfaces will not work.

### Transducer Contact

The transducer contact area determines the amount of signal coupled from the transducer to the bolt.

In the case of hand placing the transducer, the flatness and surface are very important.

The optimum situation is to have a very flat spot on the end of the bolt large enough for the transducer to sit perfectly flat. It is extremely important that the transducer not rock or tilt. A small high point in the center of a lathe turning makes it impossible to get any signal at all into the bolt.

Grade markings are also no good. Sometimes the grade marks are on the outside perimeter and there is room in the center for a transducer. Often, they will have to be ground off on the end that is used for the transducer contact.

Beware of saw cut bolts and bolts that are sanded flat with a hand grinder. They are not flat and will give you very bad results.

The bolt transducer contact area doesn't always have to cover the entire transducer. Small recessed lathe turning holes on the bolt ends can be measured "around" as long as the contact area between the flat bolt and the transducer is sufficient. If two thirds (2/3) of the transducer is not covered, get a smaller transducer.

Couplant is important as well. Too thick of a couplant will contribute to errors because of layer of it will remain between the bolt and the transducer. The velocity in couplant is much lower than steel, as a result even a small difference in the couplant thickness will make for a large error.

### Reflector Surface

In pulse echo mode, the ultrasound travels from the transducer, down the length of the bolt, and reflects back when it reaches the end. The part of the bolt that reflects the sound back is called the reflector surface. Some bolts have easier to measure reflector surfaces than others.

A flat smooth surface is generally the best, although if it is not parallel, a whole series of problems arise, described under transducer selection, below. Grade markings are generally not a problem, as are centering marks, or small slots.

A curved surface can be terrible. For example, a typical aerospace bolt, measured from the thread end yields two echoes, one from the doughnut shaped ring, and another from the very bottom of the spherical indentation. It is sometimes possible to make measurements from one or the other point, but the echoes are poor in quality compared to what can be achieved by straightening out and making the indentation have a flat bottom.

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