
figure 1


figure 2

The Nuts and Bolts of Self-Locking Nuts and Bolts

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BOLTS KEEP PARTS TOGETHER, whether they are used in Tension (where the bolt holds something together with the head and the nut) or in Shear (where the bolt stops movement of something 90 degrees to itself). Structural bolts are display certain characteristics – they are stronger in shear than in tension; they are strongest when properly tensioned (torqued); and their size is determined by strength requirements for where the bolt is intended to be used.

Bolts, nuts and washers wear out over time and with use. Washers are the softest parts of the assembly. Never reuse washers in critical applications after torque has been applied. Nuts are designed to wear faster than bolts. For self locking nuts, it is acceptable to reuse them as long as there is still some locking action. Bolts are meant to last the longest and can be re-used as long as they have not experienced over-heating, have not been over torqued, have not been subjected to bending, have not had their threads bottomed out, or have any visible damage or corrosion.

MS20365 (AN365) low-temperature self-locking nuts are used on bolts or machine screws, and are prevented from vibrating loose by an elastic insert. This plastic insert has a hole slightly smaller than the diameter of the threads on which it fits. When the bolt enters the insert, it tries to force it out of the nut. Because the nut insert hole is smaller than the bolt it creates so much friction between all of the threads that are in contact that the nut cannot vibrate loose. Self-locking nuts should not be used in any location where the nut or the bolt is subject to rotation.

The bolt does not actually cut threads into the insert, but rather forces its way into the resilient material. Since no permanent threads are made in the insert, these nuts may be reused many times. They are reusable as long as there is enough friction between the nut and the bolt that the nut cannot be turned down by hand, requiring

a wrench instead. A tap must never be run through a self-locking nut to make it easier to screw onto the bolt because this will destroy the locking ability of the nut.

Nuts must be screwed down onto the bolt until at least all of the chamfer on the end of the bolt protrudes through the insert (fig. 1). If the bolt is not chamfered, at least one thread and not more than three threads should protrude through the nut (fig. 2).

Should there be more than three threads exposed (fig. 3), there is danger of "bottoming out" the nut and under-torqueing the assembly, as well as creating a stress point that may fail. If more than three threads are exposed, either use the correct length bolt or install a washer.

Low-temperature nuts should not be used in any location where the temperature will exceed 250* F. In applications where temperatures exceed 250* F high-temperature lock nuts, such as the MS21045 (AN363), can be used up to 450* F, or MS21046 can be used up to 800* F.

Rather than using a plastic insert to provide the locking action, there are several ways that the nut can be made to grip the bolt. Some nuts have a portion of the end slotted and the slots squeezed together. This gives the end of the nut a slightly smaller diameter than the body, and the


figure 3

threads will grip the bolt. Others have the end of the nut squeezed into a slightly oval shape, and as the bolt screws up through the threads it must make the hole round. This provides gripping action.

Shear self-locking nuts such as the MS20346A (AN364) resemble the MS20365 self-locking nut, but they are thin and approved only for shear loads. They are made to be used on clevis bolts that do not have drilled shanks.