

How to design assemblies that use coiled pins for locating and alignment

By Christie Jones, market development manager, Spirol International Corporation

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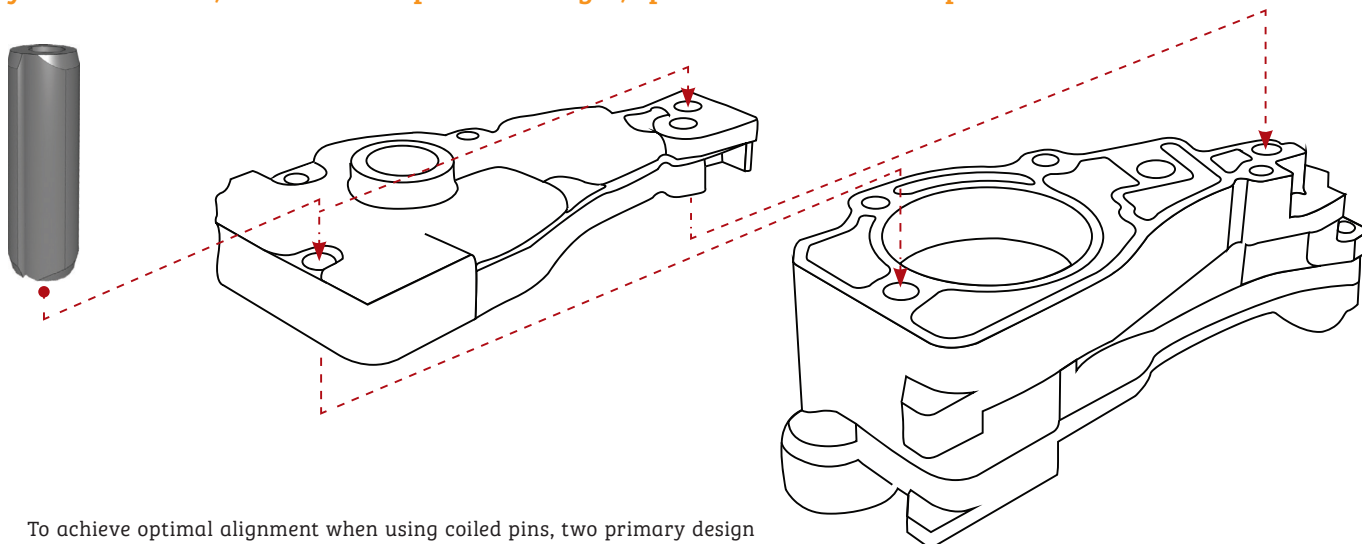
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How to design assemblies that use coiled pins for locating and alignment

By Christie Jones, market development manager, Spirol International Corporation



To achieve optimal alignment when using coiled pins, two primary design elements must be adhered to:

1. The hole diameters in the host and mating component must be correctly sized to achieve the desired interference and accuracy of alignment.
2. The engagement length of the coiled pin in the component providing primary retention must be no less than 60% of the pin's overall length. The remaining protruding length will align with the mating component. Increasing the initial length of engagement is recommended in thru-hole applications; however, the coiled pin still has to protrude in order to align the mating component (Figure 1).

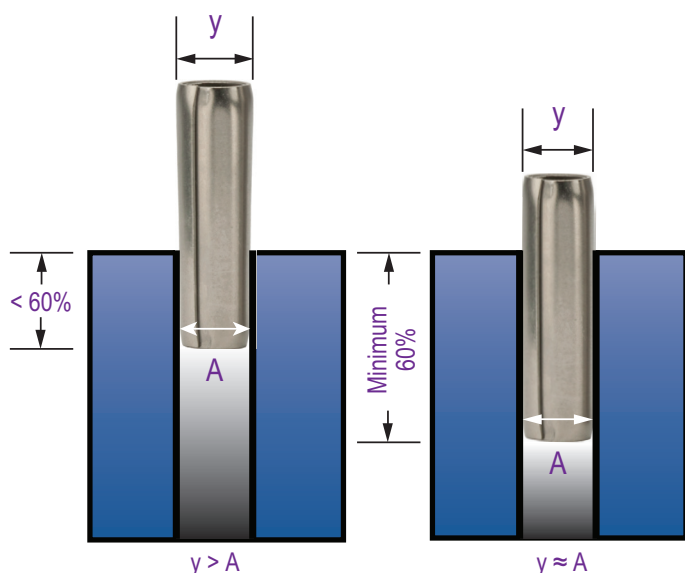


Figure 1: This diagram demonstrates proper installation depth. When a coiled pin is installed less than 60% of its overall length two conditions may occur:

- + (y) or the free end diameter will not be properly controlled creating inconsistent 'fit' when parts are mated downstream in the production process.
- + The pin may not maintain position in the component in which it is intended to be retained during future disassembly. This is of greatest importance when multiple alignment pins are utilised between components.

Interference fit for maximum alignment accuracy

Coiled pins are functional springs that conform to the holes into which they are installed. The assembly force to achieve maximum accuracy in alignment should not exceed a 'light' press to seat mating components. Depending upon the coiled pin's duty, quantity of alignment pins, and host material, this may be as little as a tap with the palm of a hand or a mallet. An interference fit must not be confused with that of a traditional solid dowel, which typically requires seating with pneumatic or hydraulic presses. This is a primary benefit of the coiled pin.

To ensure a light press fit, ideally, the hole size in both the host and mating components should be precision matched within the recommended tolerance range. This may not be practical if holes are not drilled together as an assembly.

In situations where holes cannot be precision matched or where the cost of honing/reaming is prohibitive, a significant benefit of the coiled pin is its ability to compensate for larger hole tolerances. The recommended tolerance range may be divided between components as demonstrated in Figure 2. (Note: Utilising less of the allowable manufacturing tolerance will further improve the fit and alignment of the assembly.)

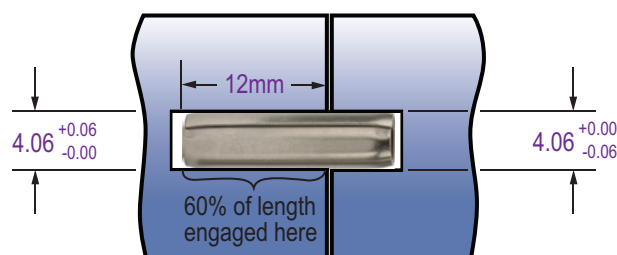


Figure 2: Recommended hole size and pin depth for interference fit of CLDP 4 x 20 LBK

Assigning the larger tolerance to the 60% retention location ensures interference between the free end of the pin and the opposing hole that is prepared at the lower half of the tolerance. Where there is interference there is no clearance, thus ensuring proper projection of the primary hole's position.

Clearance fit for course alignment and ease of assembly

If a clearance fit over the pin is desired for ease of assembly, it will be necessary to compensate for spring recovery at the pin's free end. To determine the maximum diameter of the free end of the pin, install the pin to 60% of the pin's length into the maximum hole size of the primary retention host and measure the exposed diameter. A 0.025mm (0.001 inch) to 0.05mm (0.002 inch) clearance factor should be added to the free end of the pin depending upon desired alignment accuracy (Figure 3).

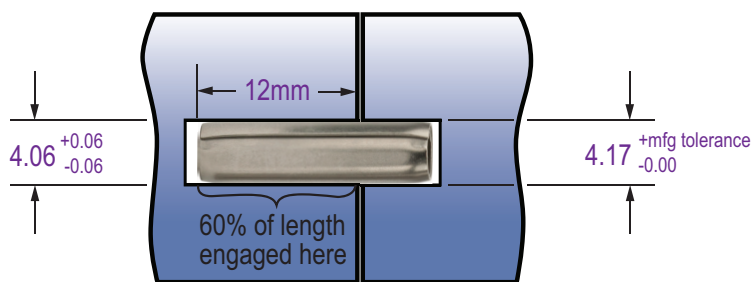


Figure 3: Recommended hole size for clearance fit with CLDP 4 x 20 LBK

When used as a free fit alignment dowel, assembly force is not a consideration; although it is important to note that consideration should be given to using the coiled pin as an interference fit solution. As outlined previously, coiled pins provide the benefit of a zero clearance fit without the added complexity of high insertion force.

Selecting the appropriate duty for alignment

The coiled pin is available in three 'duties' to enable the designer to choose the optimum combination of strength, flexibility and diameter to suit different host materials and application requirements. Light duty pins are recommended for soft (aluminium, plastic), brittle (ceramic) or thin materials and where holes are close to an edge. In most alignment applications, the pins are not typically subjected to significant loads. In these instances, light duty pins are often used since installation is easy as a result from lower insertion force used. Standard duty pins were designed for use in non-ferrous and mild steel components. Heavy-duty pins should only be used in hardened materials where space or design limitations rule out a larger diameter standard duty pin.

Although this article offers general design guidelines, it is recommended that application engineers who specialise in fastening and joining be consulted to ensure the components are properly designed and the proper coiled pin is selected for each specific assembly. +

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