

Custom Nozzles for Selective Soldering - When are they Needed?

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Even with the wide range of nozzles available for the selective soldering user to choose from, there are still times when an off-the-shelf nozzle won't do the job. This is not surprising, since the selective soldering process itself is often the process chosen when something needs to be soldered that just can't be soldered any other way.

In terms of off-the-shelf standard nozzles, there are generally two (2) basic nozzle design types. One is the 'round' nozzle, also known as a 'bullet' or universal nozzle. The other type is a component-specific 'wave' nozzle or 'letter-slot' nozzle, and its design is better suited to soldering rows of pins, such as one would find on an array. Often, these two types are used in tandem in a machine with a dual nozzle configuration. In this case, the smallest nozzle is the smallest one needed to solder the tiniest components and tightest areas on a given PCB, while the larger nozzle, no matter which type, is the largest one needed for that particular PCB.

Occasionally, a custom-designed nozzle is needed. One instance is when you have a small board in a relatively large panel, with specific solder sites on that small board that could possibly be clustered together for processing. Perhaps you have ten (10) solder sites on that specific board, all fairly close in proximity, and you want to speed production by soldering them all at once, rather than individually cycling through them. A special nozzle can be designed and fabricated that will solder this group of sites on each panelized assembly all at once, in one upward motion, thus cutting down the processing time for each assembly (and the entire panel, by extension) to 1/10th of the time that it would take to solder each site individually or singularly. In summary, one important use of custom nozzles is to increase productivity on high run products.

The second instance is when you have sites to be soldered that are up inside of a housing, or surrounded by very low hanging components such as electrolytic capacitors, a toroid, or power supplies, and as a consequence, a

standard-length nozzle simply won't reach up there, or it would hit the nitrogen shroud. In such an instance, it is necessary to design and fabricate extended length nozzles. If you have to consider obstacle avoidance, you might end up making nozzles not only of custom length, but even of custom diameters. Or, one may design rectangular nozzles of irregular shapes specifically configured to avoid contacting other components on a board with tight topography, whereas these adjacent components would otherwise be in the way and prevent effective soldering.

The third instance of the need for custom nozzles is when you have very specific, tight keep-away conditions where you have, perhaps, a connector, or a row of header pins that are extremely close, right adjacent to surface mount components. In such an instance, it might be necessary to use a special letter-slot nozzle that is designed to specifically guide the solder away from the surface mount chips.



Custom nozzle with two orifices, designed to solder two connections at once.

These are the three primary instances where one would want to use custom or specific custom-designed nozzles for particular or particularly challenging applications. It's a common occurrence; in the past month, we have done approximately 10 jobs that benefited greatly from the use of custom-designed nozzles. Generally, you don't use custom-designed nozzles by themselves. Often, unique fixturing or location fixturing is used in conjunction

with the custom nozzles and generally, this is all put together in 3-D modeling, which is instrumental in 'putting it all together' to make sure that it all works properly in advance.

In summary, it's essential for the custom nozzle designer and fabricator to fully understand the task at hand, whether or not it falls under any of these particular categories, and to use 3-D modeling to design and generate the fixturing that locates the product and the nozzle that supports the process. In this way, one can deliver a 'turnkey solution' to a specific selective soldering challenge. Every board is different, though, having its own needs and its own character, and one has to handle each board, each challenge on a one-up basis.