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Compliant Tail (Press-Fit) Contacts in Mil Circular Connectors

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The commercial world has long utilized compliant pin technologies to insert connectors on to printed circuit boards. These connectors were designed for ease assembly and to reduce the need for fluxes required during soldering. The technology was typically confined to rectangular high-density motherboard to daughter card styles. Conesys, Inc. has taken this technology and applied it to the military and commercial aviation world to design, manufacture and deliver compliant tail circular connectors.

Conesys' technology can be applied to most versions of mil circular connectors, including MIL-DTL-38999, MIL-DTL-83723, MIL-C-5015 and MIL-DTL-26482, among others. This now allows the OEM to continue to use mil-circular connectors but take advantage of the same advantages offered in the commercial world with rectangular connectors.

However, in order to meet the requirements of the military market, the design of compliant contacts is slightly different than the commercial versions. The commercial world, as an inexpensive way to make the compliant contact, used a pressed and formed style contact with minimal gold flash. In military applications, where machined contacts, radius tips and 50µin gold plate are required, the design and manufacture of the compliant pin is a little more in depth. The military contact is a hybrid of stamping and machining operations to achieve a compliant design that maintains a radius tip.

The contact used by Conesys is the "eye of the needle" design, which looks like its name suggests. The eye is designed to be a critical dimension to fit a specific PCB hole diameter. Matching these dimensions allows the correct deformation to occur to create the required press fit for military applications.

As the connector is pressed into the PCB the contact deforms to create a gastight seal with the i.d. of the PCB hole. This seal is maintained to a level that meets the various military specifications for vibration and mechanical shock.



The pressure required to press the contact into the PCB is about 10 lbs per contact (*e.g.*, 1280 lbs for a 128 pin D38999 connector). For this reason, to exert the correct pressure an arbor press should be used with an appropriate fixture to press evenly on the shell mating face or the peripheral seal on the mating face.

One of the advantages of the compliant tail is that if rework is necessary the connector can be pushed back out of the PCB without affecting the reliability of the board, allowing another connector to be installed. Many LRU's in the aviation world now have many I/O connectors, all terminating to a PCB inside the box. Some applications have as many as 6 or 8 connectors with each having up to 128 contacts. Using solder PC Tails, these connectors represent a tremendous heat sink on the PCB, making soldering to the board difficult. Once soldered, it becomes a near impossible task to remove one connector, if required, without damaging the board. A compliant tail connector, however, can be pressed back out of the board using about 4 lbs of force per contact.

One concern often expressed is whether the compliant tail contact has equivalent electrical properties as the soldered PC Tail contact. Conesys has tested this and found that compliant tails have electrical properties similar to their PC Tail cousins.

A current rating test was performed in April 2001 by the Conesys Tustin, California facility (since moved to Torrance, California). This test compared the current carrying capability of Conesys press fit contacts versus equivalent solder tail contacts. The Conesys press fit tail performed identically to the solder tail contacts and conformed to relevant MIL-C-39029 requirements.

Test Summary

The following is a summary of the Conesys test lab measurements for the current carrying capacity of the Conesys compliant pin and comparable solder contact terminations to PCB plated thru holes.

TEST SAMPLE: The following is a brief description of the test samples and procedure.

A.) Compliant Pin Test Sample: A test sample consisted of two Conesys "eye of the needle" compliant pin contacts installed in a pc board. One contact was identified as the 'input" contact and the other as the "output contact. The pc board was .080 inches thick with .041 to .042 in diameter plated thru holes. A ground plane internal to the board connected the two contacts. Three test samples (three pairs of contacts) were tested.

B.) Solder Pin Test Sample: This test sample was identical to the compliant pin test sample except the contacts were soldered to the plated thru holes.

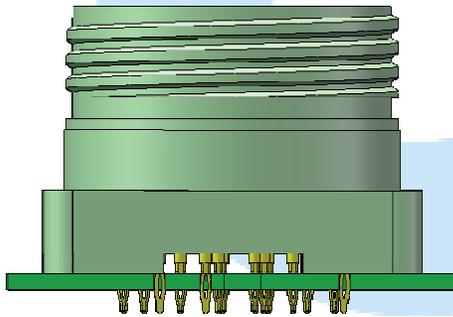
MILLIVOLT DROP TEST METHOD: Current was applied to the contacts in increments up to six amps. The millivolt drop was measured at a point along the body of the contacts. The following test data is for compliant pin sample "A1" (PIN 5374D1-22.22) and for solder pin sample "B"

Compliant Pin Sample "A1"

Current (Amps)	Voltage Drop (Millivolts)
0.14	0.4
0.22	0.7
0.53	1.7
1.03	3.3
2.02	6.3
3.04	9.6
4.02	12.6
5.06	15.9
6.04	19.1

Solder Pin Sample "B"

Current (Amps)	Voltage Drop (Millivolts)
0.11	0.4
0.23	0.6
0.51	1.6
1.07	3.3
2.01	6.1
3.04	9.4
4.07	12.7
5.11	15.8
6.03	19.0



The compliant pin connectors offered by Conesys show the ruggedness and versatility of any standard MIL qualified product from the same connector family. Our ability to adjust the design to suit our customers' engineering requirements makes this product the easiest to design in the military connector arena. Conesys will manufacture these connectors to meet additional customer requirements, including EMI Filtering, Transient Protection, Special mounting Flanges, etc. Please contact Conesys customer service for more information regarding the compliant pin connector family of products at aero-electric@conesys.com.