Connectors

The Nordson DAGE micro-mechanical systems enable connectors such as USB, HDMI and Ethernet to be tested. Insertion forces, lifetime testing and individual pins can be investigated using a sinle machine. Forces from a few grams (mN) to 100 kg (1000 N) can be applied.

Connectors have a limited insertion life due to contact wear. Repeated insertion and retraction wears away coatings with consequent corrosion of the plating and base metal. Cyclic loading not only provides useful information on connector lifetime, but is also a means of testing design changes, such **pin shape**, **spring force**, **coatings** and **lubrication**. Test standards covering connectors include IPC-TM-650, EIA-364,09C, MIL-STD-1344A.

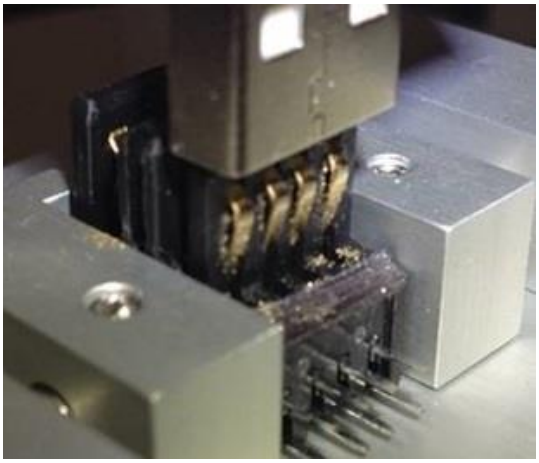
What can be tested?

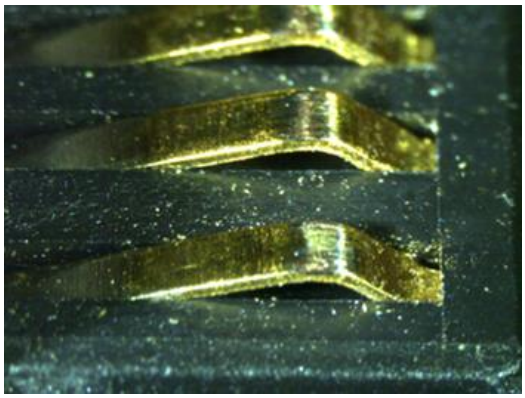
- Insertion Force – The maximum push force required to push the two halves of the connector together.
- Withdrawal Force – The maximum pull force required to pull the connector apart.
- Contact Resistance – The electrical resistance associated with the point of contact. Typically around 10-30mΩ.
- Fretting – small rubbing movement between surfaces that are forced together.
- Fretting Corrosion – Oxidation of contacts due to fretting.
- Spring Constant – Stiffness of the contact. Stiff contacts create high friction forces which can reduce fretting and contact resistance, but result in higher insertion and withdrawal forces.
- Force measurements - individual contacts can be used to measure their spring constant.
- Electrical Resistance - assess the damage done by small repeated movements (Fretting).

Connector Testing

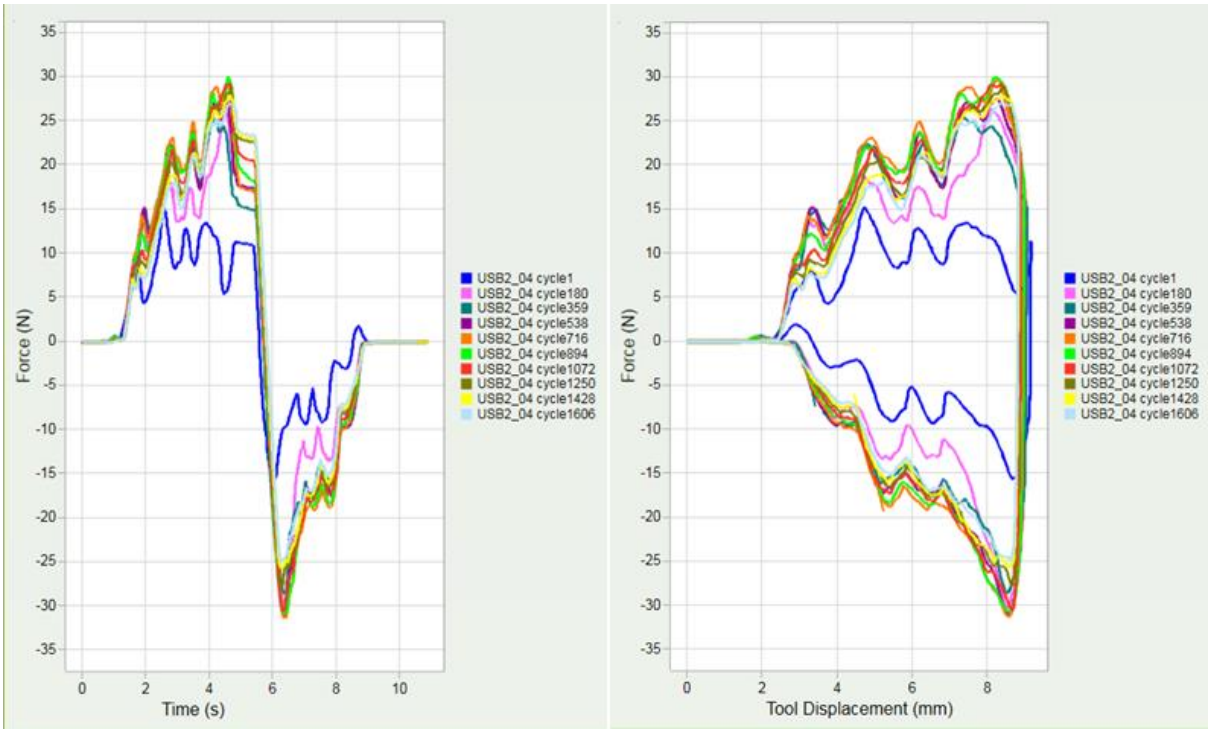
USB connectors now live up to their name of being a truly universal serial lead. USB connectors are expected to reliably work for several years, despite regular insertion and withdrawals that can add up to hundreds of cycles. Some connectors may suffer from wear due to these repeated operations, so it is important to know how many cycles of insertion and withdrawal a USB connector design can sustain without a degradation in its electrical or mechanical performance.

Cyclic loading not only provides useful information on connector lifetime, but is also a means of testing design changes, such pin shape, spring force, coatings and lubrication.
Complete connectors or individual pins can be tested and electrical Resistance measurements can be used to assess the damage done by small repeated movements (Fretting), Figure 1.





In **Paragon Materials** it is possible to view and compare insertion and retraction forces over multiple cycles. A relative drop in force over cycle time would suggest the connector is degrading. Most connector suppliers will supply a typical number of mating cycles that a connector should operate over.

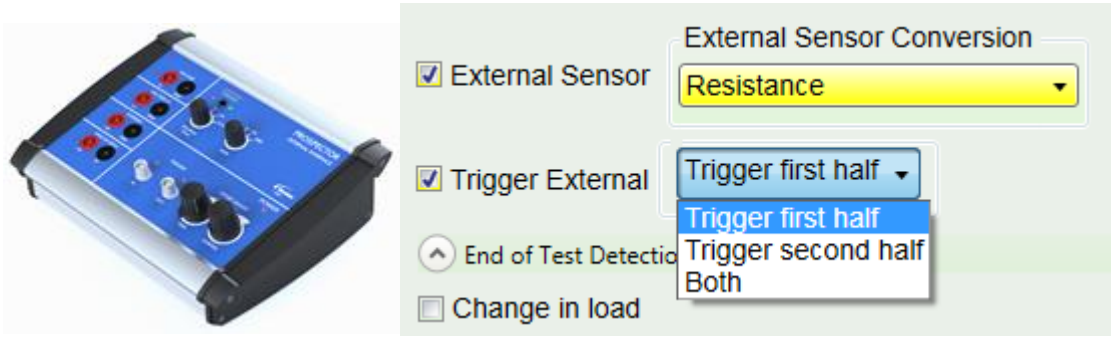


Fretting

Tin plated contacts are cheaper and used extensively in the automotive industry but they are vulnerable to fretting corrosion. Fretting is wear caused by small repetitive movements in an apparently stationary situation and occurs when a connector is exposed to vibration or changes in temperature.The effects of fretting are best measured by monitoring the electrical resistance of the contact.

Electrical resistance can be measured using Prospectors External Interface. Resistance can be measured in both two and four wire mode. Typically it is performed by passing a constant current

through the sample and measuring the potential drop. The External Interface can provide three fixed currents 1, 10 and 100mA. It is also possible to trigger the recording of signals at different points during the test, depending on what the point of interest is.



The test data is displayed in live graphs in **Paragon Materials**. Force data and electrical resistance can be viewed simultaneously. The maximum and minimum forces are also plotted per cycle so trends can be observed during the experiment.