Falex Tribology Case Study 5

Quality
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Electrical Connectors

Reliability in Fretting Conditions

- Electrical connections in moving equipment may fail from fretting damage
- Compare different solutions to the problem by a **Falex Fretting Wear test**

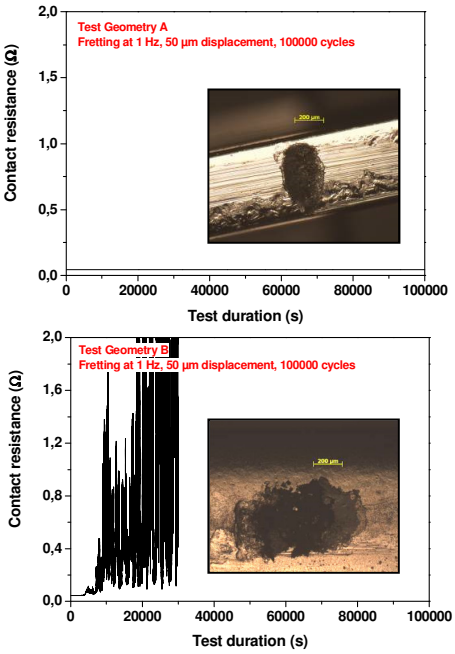
Today, electrical connectors are present in many products from cars to mobile phones and other portable electronics. Because the product moves, the connectors slide over very small displacements and generate damage that blocks the electrical connection. Such small displacements are hard to lubricate and damage must be avoided in another way. The geometry of the connector can be changed, to reduce mechanical pressure, or wear resistant coatings can be applied, or a suitable grease can be used to avoid the fatal fretting damage. The different approaches can be tested by a **Falex fretting wear test**.

Simulate the fretting wear motion on the real components (or models)

Less than 100 µm displacement

Compare useful lifetime of the electrical contact or low electrical contact resistance

Compare designs or materials, or the effect of lubrication or coatings



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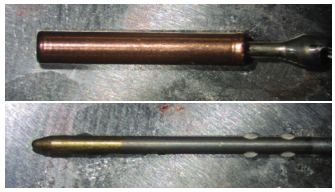
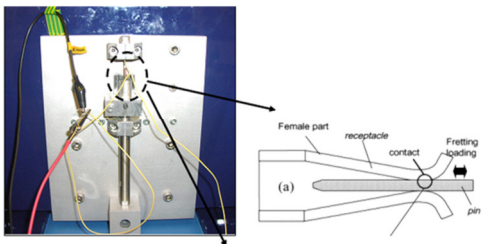
Introduction

The reliability of electrical contacts is essential in many applications but the mechanical parts are often subjected to vibrations and small displacements during their use.



This may cause fretting damage and this damage in turn may create wear particles that isolate the electrical contact, or damage an electrically conductive coating, like gold.

To ensure correlation between the lab simulation and the application, we use the real components (small electrical connectors) in our test equipment.



Objective

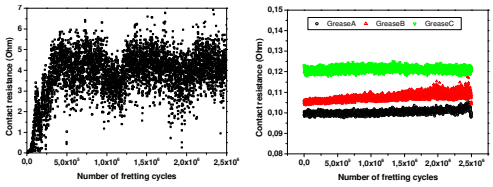
In an unlubricated contact, fretting in ambient conditions leads to severe fretting corrosion which ultimately results in connector electrical failure.

By applying the right grease, this can be avoided or delayed. To test the durability of the electrical contact, we combine a Falex high frequency fretting wear test with an electrical conductivity measurement of the contact.

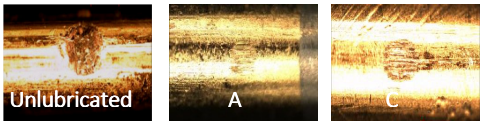
We also evaluate the effect on the friction force, by performing insertion tests and friction tests with the Falex MUST microtribometer.

Results

Without lubrication, electrical resistance increases due to the fretting damage.

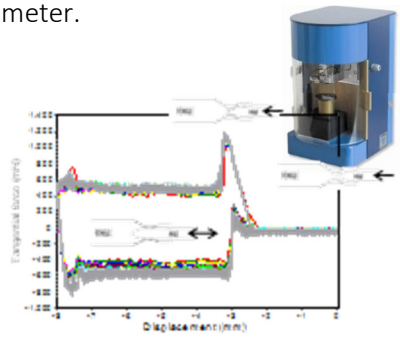


Greases A, B and C prevent this increase. Further distinction is visible in the wear tracks : grease C is more effective in reducing the total wear than grease A.



CONTACT	PROJECTED AREA (µm²)
Unlubricated	296.753
With Grease A	159.326
With Grease C	46.783

This way, a relative comparison can easily be made of the anti-wear properties of the greases.
The insertion force and sliding friction force of the electrical connectors can be measured with a MUST Micro Tribometer.



Conclusion

The anti-wear and friction reducing properties of special greases for electrical contacts can be quantitatively evaluated by laboratory simulations.

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