

LEONI Performs Cable Failure Analysis on Hybrid Round Cable

Cable failures belong to the most common challenges among cable users. These malfunctions can result in costly machine downtime, reputation and profit losses. One of LEONI's largest customers approached the company to perform a failure analysis on a hybrid round cable expecting it to be rugged and easily repairable. After samples of the existing strain relief fittings (cord grips) were received, LEONI performed several tests emphasizing on the continuity of the conductors (individual wires) and both continuity and impedance measurement for the coaxial wire.

Test Procedure

The cable with/without the strain relief mechanism was put to rugged testing during the following conditions:

- Continuous flexing at very tight bend radii,
- Applying high torsional force at normal operation radii and very tight bend radii, and
- Overtightening the strain relief grip cord during both the scenarios mentioned above.

The cable testing without any strain relief showed a pretty robust construction without significant change in the electrical characteristics. When the strain relief mechanism was installed at the tightness level described in the assembly instructions and tested for the conditions a, b and c, there was no change in the wires' continuity. Still, there was a noticeable change in the impedance of the coax during tight bend radii. The same tests were performed with an overtightened strain relief mechanism again, showing a significant change in the coax impedance at very tight bend radii. This implied that the wires were under tensile force, causing strain in the conductors, which increases with tighter bend radii.

With the overtightened strain relief being uninstalled, the cable alone was tested again for conditions a) and b). Two different test samples were considered: a cable that was flexed only for a limited time with very tight strain relief and another cable flexed for a very long time with a very tight strain relief installed. The overtightened strain relief left a noticeable dent on the jacket insulation of both the cables. When tested, the first sample did not show a significant change in the electrical characteristics, but the impedance of the coax in the second sample seemed to have changed.

Inference

The cable design standalone appeared sturdy, but the strain relief mechanism and the cable did not seem to cooperate. The strain relief mechanism was not able to prevent the cable from bending below the specified limit. The strain relief cord grips were not very easy to overtighten, but force is subjective to a person's strength. Using a termination spacer would help prevent overtightening, but it is still prone to happen.

Suggestions and Mitigation Methods

LEONI's experienced Engineering team concluded that some of the following methods would help prevent premature cable failures:

- Proper installation of existing strain relief,
- Introducing a new strain relief and
- Adequate training at the user's end.

The customer gratefully accepted the test results and will increasingly rely on LEONI's extensive Engineering knowledge and expertise.