

Connection technology for improved electromagnetic compatibility of overall systems

Interferers don't stand a chance

A well-screened cable connection does not let interfering signals bother it. Sensitive points that are often forgotten about include cable glands and connectors. A large contact area and low electrical resistance to ground are critical here. The Lapp Group offers not only cables, but also cable glands and connectors that combine optimum electromagnetic compatibility and easy assembly.

By definition, an overall system is electromagnetically compatible when its functions are not affected by other systems' electronic or electromagnetic fields. Poorly shielded connections, especially around cable glands or in the connector, are often gateways for such interferences. Which makes it even stranger that although there are standards, legal requirements and even an EMC directive regulating many areas of cable and connection technology, these do not regulate cabling. According to the EMC legislation, connectors and cables are components with no direct function. However, this does not mean that each manufacturer can define the EMC features of its components as they please. Instead, EMC-related requirements for some shielded cable types, such as the ÖLFLEX® 140CY are part of the European or national cable design standards.

Low resistance

What constitutes the ideal connection between cable and connector from an EMC perspective? Most important requirement: The electrical resistance between the cable shield and ground potential must be as low as possible. For this, the contact area must be as large as possible. A braided shield that is twisted into a sausage shape and only secured to a point in the connector housing by a few fine strands might suffice for an amateur craftsman, but other standards should apply for the area of increasingly sensitive electronic devices. In fact, the cable shield should be complete and gap-free at the transition from the cable gland to the connector. Only then can the connector housing act as a Faraday cage and keep external interfering signals at bay. It is also important

U.I. Lapp GmbH
Schulze-Delitzsch-Straße 25
D-70565 Stuttgart

A Lapp Group company
www.lappkabel.com

Press contact:
Dr. Markus Müller
Tel.: +49(0)711/7838-5170
Mobile: +49(0)172/1022713
markus.j.mueller@lappgroup.com

Irmgard Nille
Tel.: +49(0)711/78 38-2490
Mobile: +49(0)160/97346822
irmgard.nille@in-press.de

that this optimum screen contact takes place on both ends of the cable and is connected to the ground potential as it is the weakest link that determines how effective the screening is.

Large metallic areas and integrated electrical connections with high conductivity improve screening. A prime example is the EPIC® ULTRA rectangular connector. The metal housing is nickel-plated with the seal on the inside, meaning that the two metallic housing parts have a large contact area. The SKINTOP® MS-M BRUSH cable gland goes perfectly with this, as a well-screened overall system also needs the transition from the connector to the cable to provide a tight seal. "While the screen is usually secured with a spring, on the BRUSH this function is performed by thousands of bristles arranged in a ring. The advantage: The large, variable clamping range makes assembly, dismantling and allocation quicker and easier. The cable is centred, attached, strain relieved and hermetically sealed in a single operation. Currents that are induced through interfering signals from outside are efficiently diverted by the highly conductive 360° brush screen. This is especially important when transmitting sensitive signals", explains Cornelia Kuntzer, product manager at Lapp.

Insufficient shielding - a common problem

When the Lapp experts open a control cabinet, they can often see immediately whether there might be EMC problems. For example, if there are no ground straps on the doors, the screening suffers. If there is little space in the control cabinet, the recommended cable bending radii are often not achieved, meaning that the cables are bent immediately after the cable outlet which can result in it not being 100 percent guaranteed that the shielding braid is really mounted over a large area. If power cables with high currents are then routed directly beside this, the strong electromagnetic pulses may disperse into the poorly shielded cable and result in interferences in the entire plant. "This explains why sometimes a robot suddenly stops for no apparent reason and everyone searches desperately for the fault until someone finds the unprofessional installation", says Cornelia Kuntzer.

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The SKINTOP® MS-M BRUSH is a solution for critical applications such as this. Regardless of how you turn or bend the connectors and cables, the contact area between the cable's screening braid and the cable gland's brush insert is always good. This is useful, both for the fixed assembly on the housing and for moving applications, such as on a robot's arm where several power and data network cables are routed in a very small space.

Patches for screening

Lapp uses a cleverly-devised design to develop its cable glands so that the overall system is electromagnetically compatible and functional to the greatest possible extent. However, you can never be completely certain. A classic case is that the technician accidentally cuts too deep when stripping and damages the shielding, affecting the screening. This also cannot be ruled out completely during automatic stripping as the components used have certain production tolerances.

If the fitters are aware of the issue, this type of error can be almost completely eliminated. This is why Lapp has produced a webinar ¹on the topic of EMC and cable glands, and training videos will be appearing on YouTube soon. If, as described above, something should happen to go wrong, the damaged area can be repaired using a conductive self-adhesive screening tape. This is especially useful in the event of a window cut. For certain connection types, only a narrow hole is cut in the sheath to expose the shielding underneath rather than the whole cable end being stripped. If something goes wrong here, the cable has to be cut off and reworked, however there is often not enough length left any more.

Inadequate EMC screening is a common cause for machinery failures and the EMC institute has confirmed that the screening of EMC-optimised cable glands such as SKINTOP® MS-M BRUSH is considerably better than that of conventional solutions. As a result, the user has fewer EMC-related interferences to worry about. The assembly also saves time and money, plenty of reason to look closely at the components used and the installation.

¹ <http://www.lappkabel.de/service/wissenscenter/emv.html>

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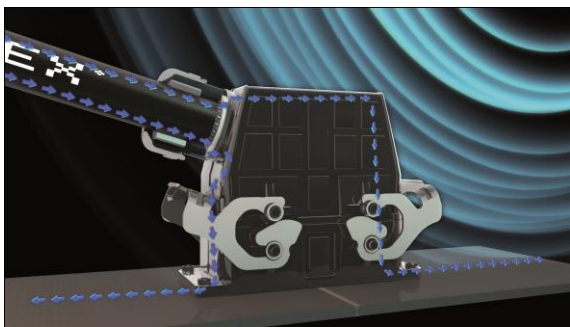
With the SKINTOP® MS-M BRUSH, thousands of bristles arranged in a ring secure the screening



The screen is usually secured using a spring



A cross-section of the SKINTOP® MS-M BRUSH



Connectors such as the EPIC® ULTRA with large metallic areas and integrated electrical connections provide outstanding screening

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