Advanced Shielding Technology

The new dimension of shielding for assembled circular connectors in M8 and M12 format

As new dimensions are constantly being added for assembled circular connectors in industrial communication and data transmission, greater demands are also being placed on the shielding. Advanced Shielding Technology from Phoenix Contact enables a new form of shield connection using liquid metal – traditional zinc die-casting with crimp sleeves will soon be relegated to the past. The assembled mating area is bonded to the single wires by a special pre-moulding process – the polyamide increases the mechanical robustness and prevents short circuits between the shield moulding and contact carrier. The material bonding between the cable shielding and special tin creates a 360° shield connection at the M8/M12 head.

Advanced Shielding Technology - Innovative shielding concept for sensor/actuator cabling

Increasing requirements for M8 and M12 connectors and cabling solutions in IP-protected areas go hand in hand with the growing demands in factory automation. Whether transmission properties, mechanical robustness or application-specific requirements – connection technology is getting better and better. As already witnessed with the improvement of transmission properties to 10 Gbps and the integration of new pin connector
patterns for industrial use – as in the case of X-coded M12 or miniaturised D-coded M8 connectors – the technologies used inside the connector also need to be optimised. Advanced Shielding Technology from Phoenix Contact does not simply represent a further development of existing technology, it completely revolutionises the shield connection of circular connectors like the M8 and M12.

The conventional method, which stipulates the use of zinc die-cast crimp sleeves or stainless steel as a shielding element, results in high material variance in the production process. This variance is due to differences in the cable diameter and in the characteristics of the shielding, as well as specific requirements placed on the shield connection to be implemented. In recent years, the technology for shielding sleeves as the crimp version has become increasingly sophisticated and optimised. New materials have been tested to determine whether they have better properties, and the production processes have also been optimised. The challenge here was not to simply add another, only slightly better, version of existing crimp sleeve technology. The real challenge was to create a shield connection that remains secure even under extreme mechanical strain and to overcome the known weaknesses of crimp sleeves.

**Particularly suitable for harsh environments**

Whether in applications with drag chains, in environments with extreme weather conditions or in robotics applications with high demands on the mechanical connection – ever-growing requirements are being placed on standardised industrial connectors. This is where the new technology featuring special polyamide pre-moulding comes in. The innovative pre-moulding protects the single wires and provides mechanical robustness. The pre-moulding ensures that the contact carrier is held securely in place while also preventing the ingress of moisture. The actual quantum leap, i.e., what makes this method so innovative compared to existing concepts, is the metal moulding using special tin. It completely encloses the polyamide pre-moulding and provides material bonding between the braided shield and the head of the M8/M12 connector. This 360° shield connection is totally protected and is even able to withstand current peaks of up to 20 kA, such as those generated by lightning. This property
in particular means that the product ranges that use Advanced Shielding Technology are ideal for outdoor applications, such as wind turbine generators (Figure 1).

The improved resilience with regard to micro shield interruptions also extends the scope of the connectors to include applications involving intensive shock and vibrations, such as those in the field of robotics. These applications demand solutions that are not only suitable for drag chain applications, but also demonstrate a high level of resistance to different combinations of mechanical stresses such as torsion. It is here that the new connectors perform much better than conventional products. The excellent robustness already achieved by the pre-moulding and metal moulding can be further perfected by moulding the body of the connector. The compact design of the circular connectors also supports the miniaturisation requirements imposed by Industry 4.0 applications (Figure 2).

**Data, signal, and power transmission**

Many users rely not only on assembled shielded M8 and M12 data cables, but also on shielded solutions for the power and signal cabling in their industrial applications. Here again the new technology performs better than other shielding concepts, offering considerably higher heat dissipation in the event of a short circuit thanks to the combination of the specially developed tin and the pre-moulding (Figure 3). Electromagnetic compatibility (EMC), which is particularly relevant for data cables, is improved by up to 60 percent compared to conventional crimp sleeves.

This significant improvement is achieved by the material bonding between the cable shielding and the connector head – in this case M8 and M12. This means that future applications could achieve data transmission rates of up to 40 Gbps, ensuring that this technology is future-proof even for high-performance systems in the high-speed data range or for real-time communication. In addition, the low ohmic resistance of the bonding between
the metal moulding and the cable shielding has a positive influence on the electrical properties. This also makes the new technology ideal for Industry 4.0 projects.

**Production is the critical factor for the user**

Some of the difficulties encountered when using crimp sleeves are not caused by the material or the crimp sleeve itself - the challenges are more to do with the production process. Incorrect sleeve diameters, risk of damage due to too tight a connection with the cable, shield contacting not achieved – there are several process parameters to consider here. This is why manual or semi-automated processes are still the norm for shielded products. As a consequence, time-consuming quality assurance and control procedures are required. Furthermore, time and again users experience problems with shield connections breaking near to the crimped zone on the cable sheath – a fault that is particularly common in moving applications and is ultimately caused by the mechanical strain exerted on the cable at the point of connection with the crimp sleeve. In addition, greater logistics outlay is required for the wide range of individual parts involved, which in turn makes availability more difficult for the user. Advanced Shielding Technology is designed to solve these problems once and for all, as zero mechanical strain is exerted on the braided shield during production. This highly automated production method increases process reliability significantly and there is no longer any dependence on materials and suppliers.

**Summary: Quantum leap in shield connection technology**

Connectors are constantly having to keep pace with the ever-growing demands being placed on field cabling – especially when it comes to the shield connection. The new Advanced Shielding Technology from Phoenix Contact represents an important step in the further optimisation of M8 and M12 connectors, making them robust, highly available, durable, and resilient even in the event of overload. This technology lays the foundations for future cabling – with regard to the requirements of Industry 4.0 and the Industrial Internet of Things. The
new technology is available for data, signal, and power transmission. It is also future-proof thanks to its optimised EMC and transmission properties, and because it supports the growing trend of miniaturisation in field and device cabling.

Further information www.phoenixcontact.net/webcode/#2253

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Advanced Shielding Technology – The advantages at a glance:

Advanced Shielding Technology from Phoenix Contact is the innovative shielding concept for sensor/actuator cabling. The large-area, material-bonding 360° shield connection is unique on the market and optimises the manufacturing process of M8 and M12 connectors. The advantages in detail:

- Reliable even when subjected to high levels of mechanical strain, such as shock and vibrations
- Resistant to transient over-voltages caused by the switching processes of inductive loads
- Minimal heating and secure current flow in the event of a short circuit
- Future-proof transmission of high data volumes and continuously increasing transmission rates in environments subject to high levels of electromagnetic interference
- Robust and secure – even when exposed to extreme environmental influences such as a lightning strike

Liquid metal that completely encloses the cable shielding during the manufacturing process protects the shield connection enabling the reliable and interference-free transmission of data, signals, and power in factory automation. Advanced Shielding Technology makes cabling future-proof.