MCON 8:
NEW INTERCONNECTION SYSTEM FOR CURRENT REQUIREMENTS OF VEHICLE ELECTRIFICATION

Author:
Waldemar Stabroth
Director Technical Marketing

Contact:
Thorsten Eisele
Product Manager EMEA
Email teisele@te.com

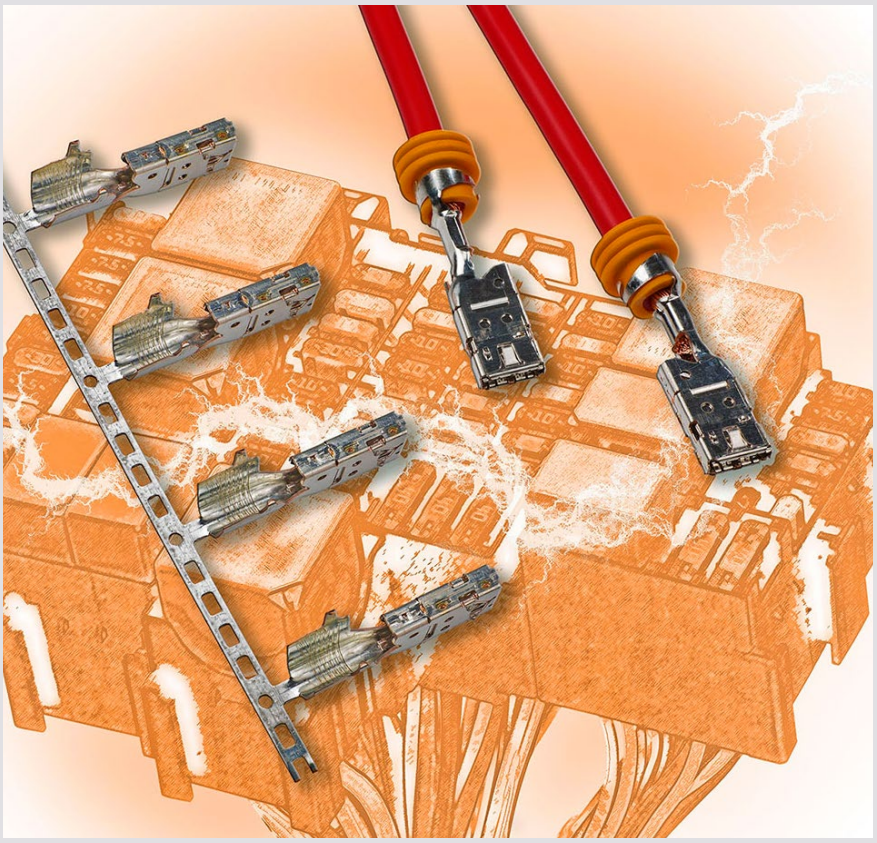
Svenja Kunz
Product Manager EMEA
Phone +49 (0)6251 133-3199

MCON 8: NEW INTERCONNECTION SYSTEM FOR CURRENT REQUIREMENTS OF VEHICLE ELECTRIFICATION

ELECTRICAL ENERGY IS OF GROWING IMPORTANCE IN MOTOR VEHICLES AS THEY BECOME SMARTER, SAFER, GREENER AND MORE CONNECTED. ON TOP OF FACILITATING CONTROL FUNCTIONS, ELECTRICAL ENERGY IS EVER MORE FREQUENTLY USED AS A POWER SOURCE FOR COMPONENTS AND FUNCTIONS.

Ancillary components and actuators, for instance, which may previously have been powered by hydraulics or were part of the belt drive, are now increasingly electrified. This trend of vehicle electrification is increasing the number of electrical interfaces. TE Connectivity (TE) has long been supporting this trend through innovation and collaboration as the company is one of the biggest global solution providers of interconnection systems for all types of motor vehicles.

To supply power to the many functions often requires terminals that can carry medium currents of ≤80 amps. A work group of leading OEMs has therefore specified a standardized contact cavity as a uniform basis. TE has developed a compatible contact system, called MCON 8, for this cavity and its geometry. The receptacle contact was specially designed for ruggedness, temperature and vibration resistance, plus excellent electrical and mechanical integrity. This white paper introduces the structural design of the new MCON 8 terminal system and explains its benefits for vehicle use.



CONTENTS

1 | INTRODUCTION

The MCON contact family from TE is a vibration-proof connection system for the universal transmission of signals and power in vehicles, *Fig. 1*.

The success of the MCON 1.2 version, for instance, is due to the long-term safety of its electrical connections. In this receptacle contact, each of the four independent lamellar contact springs in the polarized contact establishes two contact points to the tab contact, so that eight electrical contact points are created in one MCON 1.2 contact. This design stabilizes the position of the tab contact against rotary movements.

Fig. 1 MCON contact family

The lamellar contact springs inside the contact system are protected against plastic deformation by the closed housing. The function of the two-part contact is ensured by the use of materials which each interact to create optimum electrical and mechanical characteristics.

The MCON contact family comprises the MCON 0.5, MCON 1.2, MCON 2.8, and MCON 6.3 *(Fig. 2)*. The number of lamellar contact springs is higher in the larger models, resulting in even more contact points.

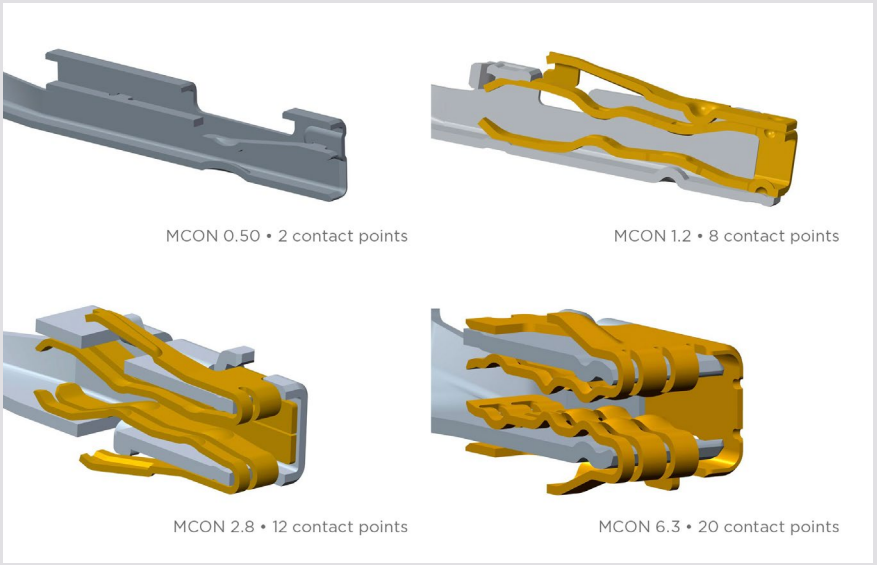


Fig. 2 Two-part design of the MCON receptacle contacts

2 |MCON 8 CONTACT SYSTEM

The development goal of the MCON 8 contact system was to construct a particularly rugged and reliable product using the prescribed cavity, at the same time implementing innovative design features characteristic of an efficient TE contact system.

A specific requirement was for the new contact system to demonstrate a high current carrying capacity at high ambient temperatures of up to 180° C, very low contact resistance and at the same time high vibration resistance. This is based on the observation that an increasing packing density of electrical and electronic components, for instance in an engine compartment, coupled with diminishing distances between them, results in intensive heat sources and consequently more stringent requirements imposed on the connection technology.

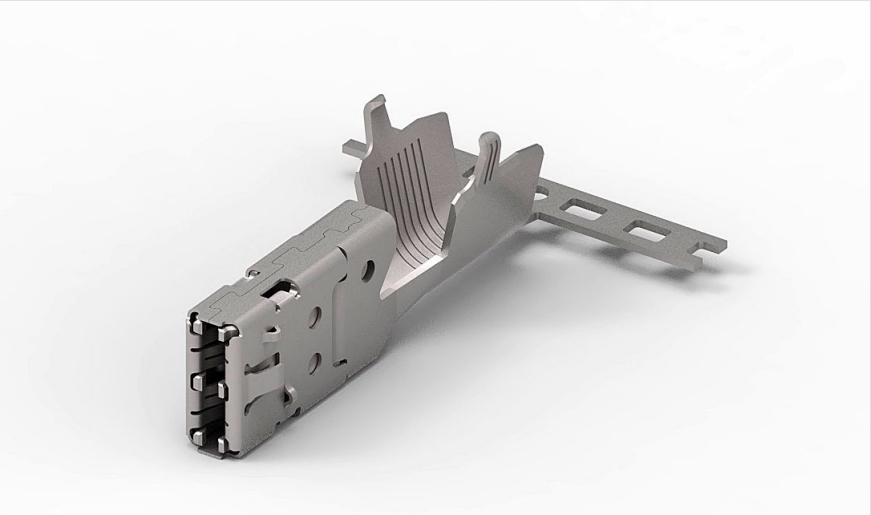


Fig. 3 MCON 8 receptacle contact

The MCON 8 contact system was therefore developed, in terms of both its design and its materials, for electrical connections which would specifically offer long-term stability under the challenging environmental conditions described.

Structural design

The MCON 8 contact system is an extension of the MCON family whose design strengths were selectively further developed for this type of cavity-compatible contact. Its 12 wave-shaped lamellar contacts are integrated in the spring, as well as the locking lance to secure the primary contact for locking in the contact cavity. Because of their wave shape, these 12 lamellar contact springs create a total of 24 redundant contact points and consequently a high degree of contact security. Another striking characteristic is that the contact points of the lamellar contact springs are positioned on two levels.

The four outer lamellar contact springs as contact points to the tab contact are located further back into the inside of the receptacle. These outer lamellar contact springs are somewhat wider and longer in dimension than the internal lamellar contact springs, so that the same normal force is achieved despite the longer bending path at the outer lamellar contact springs.

In the case of the eight inner lamellar contact springs, conversely, the level of the contact points moves out in front of the outer lamellar contact springs. This design feature offers three important benefits:

1. By separating the contact levels, there is no need for the entire insertion force to be exerted at once. Instead, the second contact level is only reached during insertion when the peak force value has already been overcome at the first level following insertion and the force drops again.
2. The two contact levels each mutually stabilize each other's position. This ensures improved protection of the tab contact against rotary movements, and effectively prevents a tilting movement over the transverse axis.
3. As each of the two contact levels has a different resonance frequency under the influence of vibration, the two contact levels impact positively on vibration resistance. This additional protection is particularly beneficial for use in vehicles.

One of the most important protection functions are the protective lugs on the front. These protect against unintentional plastic deformation (or even breakage) of the lamellar contact springs as a result of incorrect insertion. The inward bent lugs located on the inside of the housing provide additional overstretching protection. These wave shaped lugs under the lamellar contact springs serve as a stop which limits the maximum downward deformation of the relevant spring. The MCON 8 contact system is designed for two different tab contact thicknesses, 8.0/9.5 mm x 0.8 mm and 8.0/9.5 mm x 1.2 mm in accordance with TE specification 114-94201.

The MCON 8 contact system is available as an unsealed version with a cable cross-section of up to 16 mm^2. In the sealed version with single wire seal, the MCON 8 can be used with cable cross-sections of up to 10 mm^2.

Material concept

Given the high temperature resistance requirement and the need to supply medium to high current levels, for instance in the engine compartment, the contact materials and coatings used are highly significant. Optimization of the material used for the contact body concentrates rather on its electronic characteristics. The beneficial fundamental principle used throughout the MCON family of ensuring electrical and mechanical characteristics through the selective use of individually optimized materials in each case was also applied during development.

A newly developed silver plating with a low contact resistance has extended the limiting temperature of the MCON 8 to as high as 180° C without resulting in the familiar delamination effects encountered in standard silver plating types at higher temperatures.

As the MCON 8 is a product for medium to high electrical output levels, because of its high limiting temperature this galvanic silver plating appears to be a logical adjustment to the intended purpose of the contact system.

3 | SUMMARY

The development of the MCON 8 contact system has implemented the stringent demands made on power transmission in a way that is both innovative and constructive based on detailed knowledge of contact physics. The design and material concept of the MCON 8 contact system permit the transmission of high levels of current at high temperatures with a consistently low contact resistance.

The high number of contact points and division into two contact levels have made the MCON 8 extremely resistant to vibration and ensured extremely reliable behavior thanks to its electrical characteristics. The contact design prevents any tilting movement around the transverse axis of the tab contact in the receptacle.

At the same time, the MCON 8 contact system is easy to operate due to equalization of the necessary insertion forces, and offers reliable protection against overstretching of the lamellar contact springs.

ABOUT TE CONNECTIVITY

TE Connectivity (NYSE: TEL) is a $12 billion global technology leader. Our connectivity and sensor solutions are essential in today's increasingly connected world. We collaborate with engineers to transform their concepts into creations – redefining what's possible using intelligent, efficient and high-performing TE products and solutions proven in harsh environments.

Our 72,000 people, including over 7,000 engineers, partner with customers in close to 150 countries across a wide range of industries. We believe EVERY CONNECTION COUNTS – www.TE.com.

TE Connectivity Germany GmbH
Ampèrestrasse 12-14
64625 Bensheim | Germany

www.TE.com