



SOLDERLESS MAGNET WIRE SOLUTIONS FOR HEAT PUMP COMPRESSORS

With increased focus on a more sustainable future, industries around the world are scaling up production of energy efficient, low carbon footprint technologies and they require electrical components that can keep pace with this growth. One bottleneck in the push for more efficient electric motor manufacturing is the limitation of magnet wire soldering and welding processes. These processes can be time-consuming, costly and difficult.

SOLDERING AND WELDING CHALLENGES

Workspace Constraints

Soldering or welding small diameter wire in tight spaces can make it difficult to avoid bridging connections or overheating sensitive components.

Insulation Removal

Removing the thin layer of enamel insulation without damaging the wire requires time-consuming precision and care.

Joint Reliability

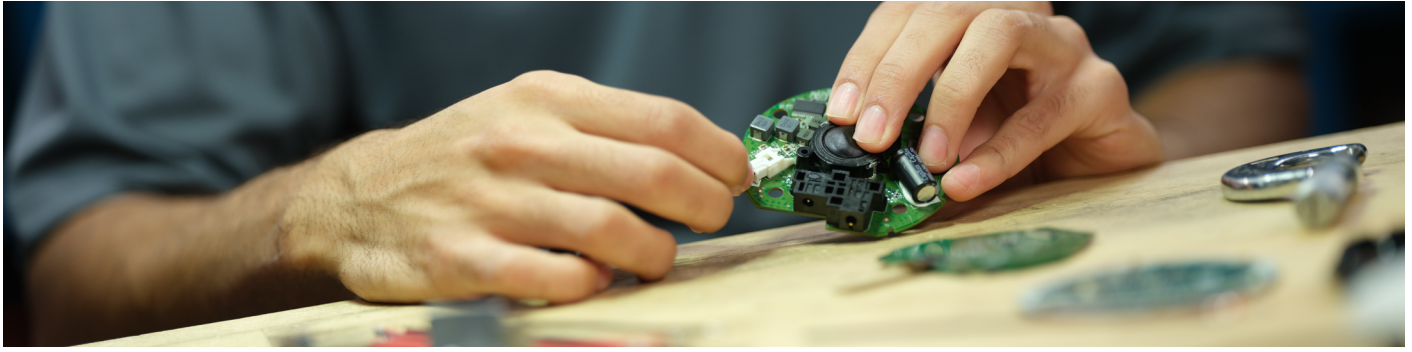
Strong and reliable joints may be challenging with thin diameter wire that has limited surface area. This can affect the reliability of motors.

Heat Sensitivity

Excessive heat may reduce insulation effectiveness near solder joints and may embrittle the copper or aluminum wire. This can reduce the life expectancy and performance of motors.

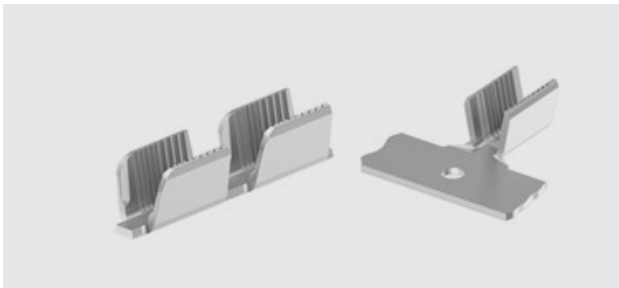
Flux Compatibility

Connection reliability challenges due to adhesion and conductivity issues may occur if flux is not properly matched with the magnet wire.



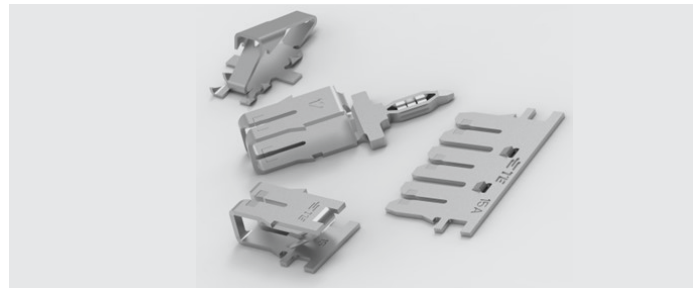
TE Solderless Solutions

For engineers working to streamline electric motor manufacturing processes, TE Connectivity (TE) offers a portfolio of solderless magnet wire solutions and low applied cost tooling options designed for copper and/or aluminum magnet wire. The products listed below are designed to help reduce cost while improving repeatability and manufacturability.



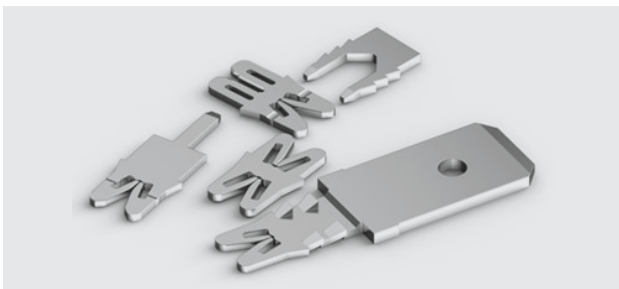
AMPLIVAR Terminals

Developed in 1953, these terminals and splices feature a serrated barrel design to pierce and displace magnet wire insulation, producing superior metal-to-metal compression crimp joints with excellent strength and reliability. With new application tooling, splices can be bussed together in virtually infinite combinations.



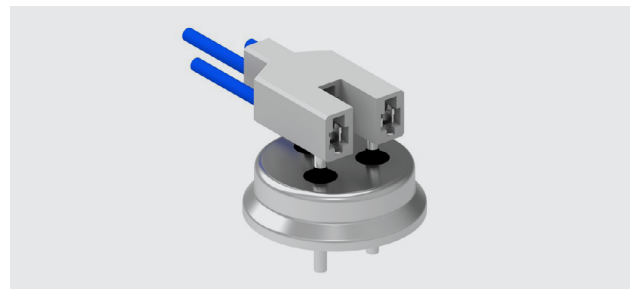
MAG-MATE Terminals

Introduced in 1975, these terminals feature an insulation displacement contact (IDC) that creates a gas-tight magnet wire termination. Standard MAG-MATE terminals support 34-12 AWG magnet wires and smaller versions are available for fine gauge wire. They are available in a variety of styles including poke-in, poke-in tab, splice, crimp wire barrel, solder post and others. TE provides specifications to incorporate cavities for these unique terminations into coil bodies or other custom housings.



SIAMEZE Terminals

Like MAG-MATE terminals, the versatile SIAMEZE terminal system features IDC technology to achieve a secure metal-to-metal interface without stripping magnet wire. The SIAMEZE terminal has a compact design intended for more space constrained motor systems and features an optional Lead Lok to secure lead wires with high retention force.



Hermetic Cluster Blocks

Cluster blocks are an insulated quick-connect solution for mating to the hermetic header pins used as pass-through connectors in compressor systems. Cluster block housings are available for both the interior and exterior of the compressor and are designed to resist mechanical impact and chemical exposure to oils and refrigerants. Cluster block terminals are available for either lead wire or magnet wire connections.



Solderless Solutions for Heat Pump Compressors

The trend away from fossil fuels has made heat pumps a popular alternative in the heating industry. These products, along with air conditioners and refrigerators, rely on electrically powered compressors to transfer heat energy. Compressors must maintain a seal between the inside (refrigerant side), where the motor is typically located, and the outside of the compressor, where it connects to the power supply. The electrical pass-through connector provides a hermetic seal between the motor and the external power supply.

This case study will show how solderless solutions can be used to improve the performance of both internal and external connections to this device.

Internal Connection Solution: TE has a variety of solutions for attaching the motor's internal wires to the pass-through connector. This example features MAG-MATE poke-in terminals for connection to the motor magnet wires in the compressor housing, MAG-MATE poke-in tab terminals for connection to the lead wires in the harness housing and a cluster block housing to connect to the pass-through connector. Figure 1 shows the configuration including a compressor housing that incorporates MAG-MATE cavities to TE specifications.

Three MAG-MATE poke-in terminals are inserted for the magnet wire connections to the lead wires and three more are used for the terminal bridge. Incoming power is then connected via a harness with poke-in tab terminations mounted in the harness housing. The harness, in turn, connects directly to the pass-through connector (Figure 2) using TE's cost effective, fully insulated cluster block termination (Figure 3).

This solution provides manufacturers with easily automated motor connections and a simple harness that connects the motor to the pass-through link. The connector materials offer exceptional performance in the presence of oils and refrigerants.

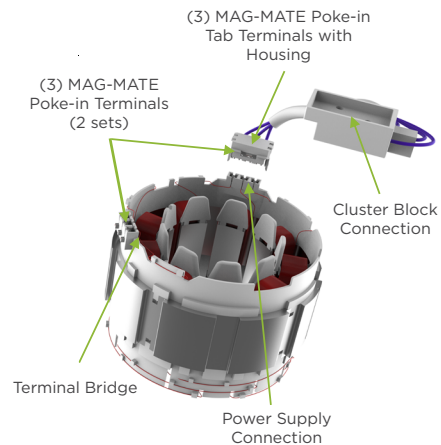


FIGURE 1 - COMPRESSOR INTERIOR TERMINATIONS

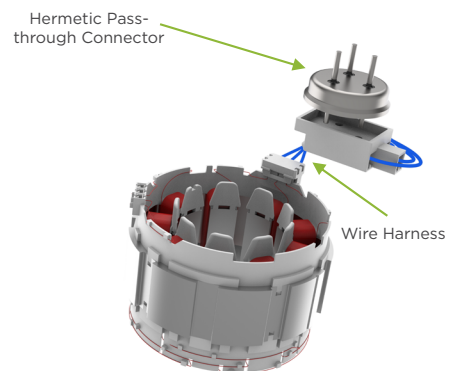


FIGURE 2 - COMPRESSOR INTERIOR WIRING HARNESS

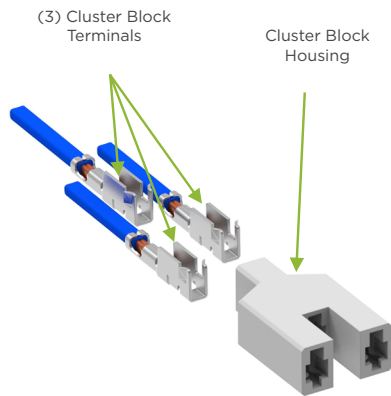


FIGURE 3 - CLUSTER BLOCK ASSEMBLY

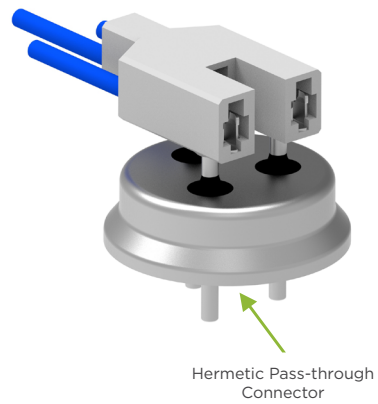


FIGURE 4 - CLUSTER BLOCK CONNECTION

External Connection Solution: The external compressor connection relies on another TE cluster block housing (Figure 4) connecting the incoming power wires to the outside of the pass-through connection.

The cluster block housing provides mistake-proof power to the compressor with high performance, low resistance connections that minimize temperature rise, while maximizing energy transfer. This easily automated solution can help save time and money.



Find Your Solderless Solution with TE Connectivity

TE Connectivity remains committed to developing and improving magnet wire solderless solutions for our manufacturing partners. Providing cost effective, sustainable connection solutions with automated assembly tools allows our customers to reduce labor costs while increasing productivity and minimizing human error. Our broad portfolio of magnet wire solutions and ability to support custom connector development let these solderless solutions fit in almost any electric motor system.

Contact our team to learn how our magnet wire solutions can help you.

Connect With Us

We make it easy to connect with our experts and are ready to provide all the support you need.

Visit www.te.com/support to chat with a Product Information Specialist.



Trevis L. Benchoff
Director Engineering



Alvin Wang
Product Manager



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