

EVERY CONNECTION COUNTS



WHITE PAPER

***MAGNET  
WIRE  
SOLDERLESS  
SOLUTIONS  
FOR FAN  
MOTORS***

# INTRODUCTION

Fan motors are essential components across diverse climate solutions applications, including cooling systems, industrial and residential ventilation systems, and consumer appliances such as ceiling and desk fans.



**Cooling Systems**



**Ventilation Systems**



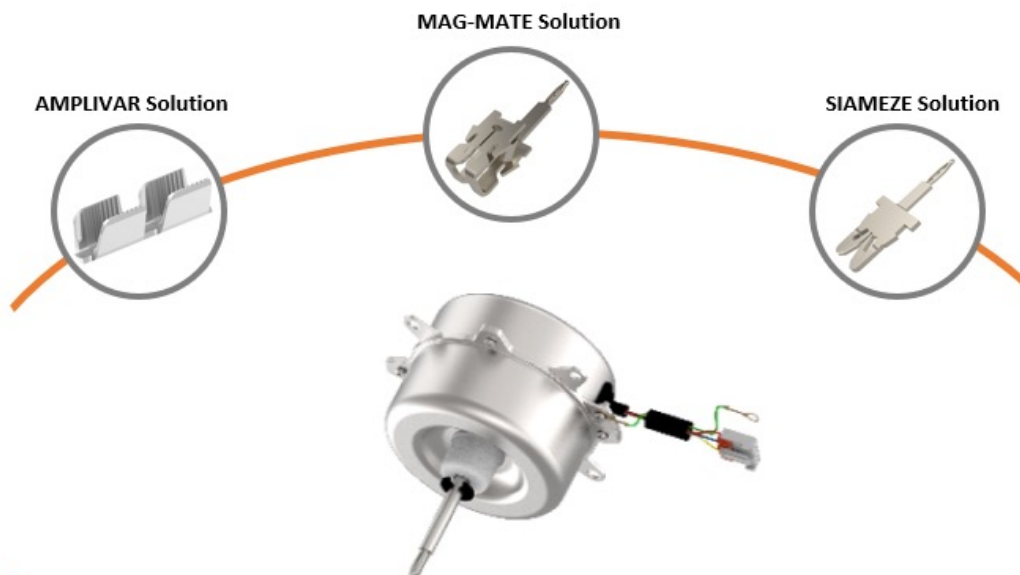
**Household Ceiling Fans**

The fan motor industry is experiencing a significant transformation driven by cost pressures and evolving technological requirements, particularly as manufacturers transition from traditional copper to aluminum magnet wire.

This process change presents substantial challenges for manufacturers, especially when they need to combine reliable aluminum wire connections in demanding manufacturing environments, such as Bulk Molding Compound (BMC) processes, and space-constraint applications.

This trend paper examines the current market dynamics, analyzes the specific manufacturing challenges confronting the industry, and explores solderless connection technologies that are fundamentally reshaping fan motor design methodologies, and production processes.

This article will analyze how advanced insulation displacement contact (IDC) and crimp termination solutions for magnet wire can help manufacturers overcome traditional barriers while achieving cost reduction objectives and maintaining reliability standards.



# MARKET LANDSCAPE AND INDUSTRY DRIVERS



The global fan motor market is experiencing substantial growth across multiple sectors, including household appliances, diverse climate solutions applications and even automotive, and aviation. DC fan motors have gained particular prominence due to their superior efficiency characteristics and reduced noise profiles compared to traditional AC alternatives, making them increasingly preferred for residential and commercial applications. Several market forces are creating challenges for manufacturers, and are driving innovation in fan motor technology:



**Miniaturization Demands:** Space constraints in modern appliances and electronic systems require increasingly compact motor designs while maintaining performance standards



**Material Cost Optimization:** The transition from copper to aluminum magnet wire represents a significant cost-reduction strategy, though it introduces unique connection challenges for the traditional soldering and welding processes



**Energy efficiency regulations:** Standards are becoming increasingly stringent, creating challenges for manufacturers to design fan motors that comply with them, while remaining cost-effective. As a result, many manufacturers are expanding their DC fan motor offerings, as these motors deliver superior energy efficiency and help meet evolving regulatory requirements



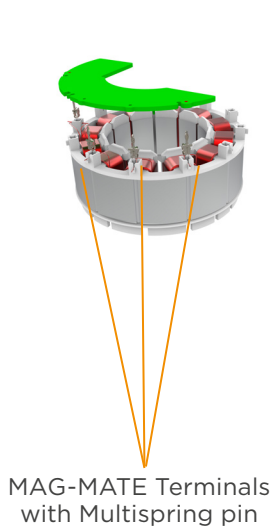
**Environmental Sustainability:** The fan motor industry faces escalating regulatory and market pressures to develop environmentally sustainable products that minimize lifecycle environmental impact. Manufacturers are compelled to invest substantially in eco-friendly technologies and materials, needing significant research and development expenditures. The adoption of solderless connection technologies help enhance process efficiency and reduce environmental footprint

**Successfully addressing these challenges necessitates strategic innovation, production process optimization, and investment in sustainable, eco-friendly technologies that meet both performance and regulatory requirements.**

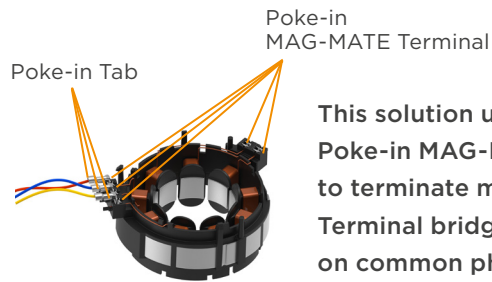
Here is where TE Connectivity (TE), as one of the global industrial technology leaders in advanced solderless connection solutions, can help manufacturers overcoming these obstacles.

[MAG-MATE Terminals](#) with Multispring pin for bulk molding compound (BMC) / Non-BMC Fan Motor:

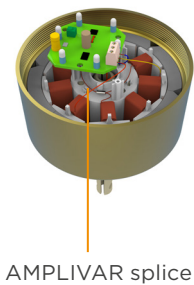
Utilizing IDC technology, these terminals help create gas-tight connections without requiring insulation stripping. Standard MAG-MATE terminals support 34-12 AWG magnet wires, and smaller versions are available for fine gauge wire. They come in a variety of styles including Multispring pin, poke-in, 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.



**Multispring MAG-MATE** provides a solderless solution that connects magnet wires using IDC technology and connect the printed circuit board (PCB) through an advanced Multispring connection solution. This solution is implemented using automated tooling.



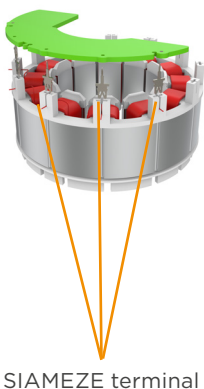
**This solution uses 300BOX Poke-in MAG-MATE terminal** to terminate magnet wires. Terminal bridges are used on common phase. Other 3 MAG-MATE terminals are mating with Poke-in tab which can crimp lead wire for power input. This solution is implemented using automated tooling.



[AMPLIVAR Terminals](#) for BMC/ Non-BMC Fan Motor:

These terminals and splices feature a serrated barrel design to pierce and displace magnet wire insulation, producing high performance metal-to-metal compression crimp joints with excellent strength and reliability. With the use of a dedicated application tooling, splices can be bussed together in virtually multiple combinations.

**AMPLIVAR splice in ceiling fan motor is used to connect multiple copper magnet wires to the power input. Splices are applied using semi-automated tooling.**



[SIAMEZE Terminals](#) for Non-BMC Fan Motor:

Like MAG-MATE terminals, the versatile SIAMEZE terminal system uses IDC technology to help create a secure metal-to-metal connection without the need to strip magnet wire. Designed for space-constrained motor systems, the SIAMEZE terminal offers a compact footprint and includes an optional lead lock feature to provide high-retention force for securing lead wires.

**This solution used SIAMEZE terminal with Multispring pin. It is better for small space application. This is a solderless solution that connects magnet wires by IDC technology, and connects the PCB through a Multispring pin solution. It is applied using automated tooling.**

# APPLICATION TOOLING

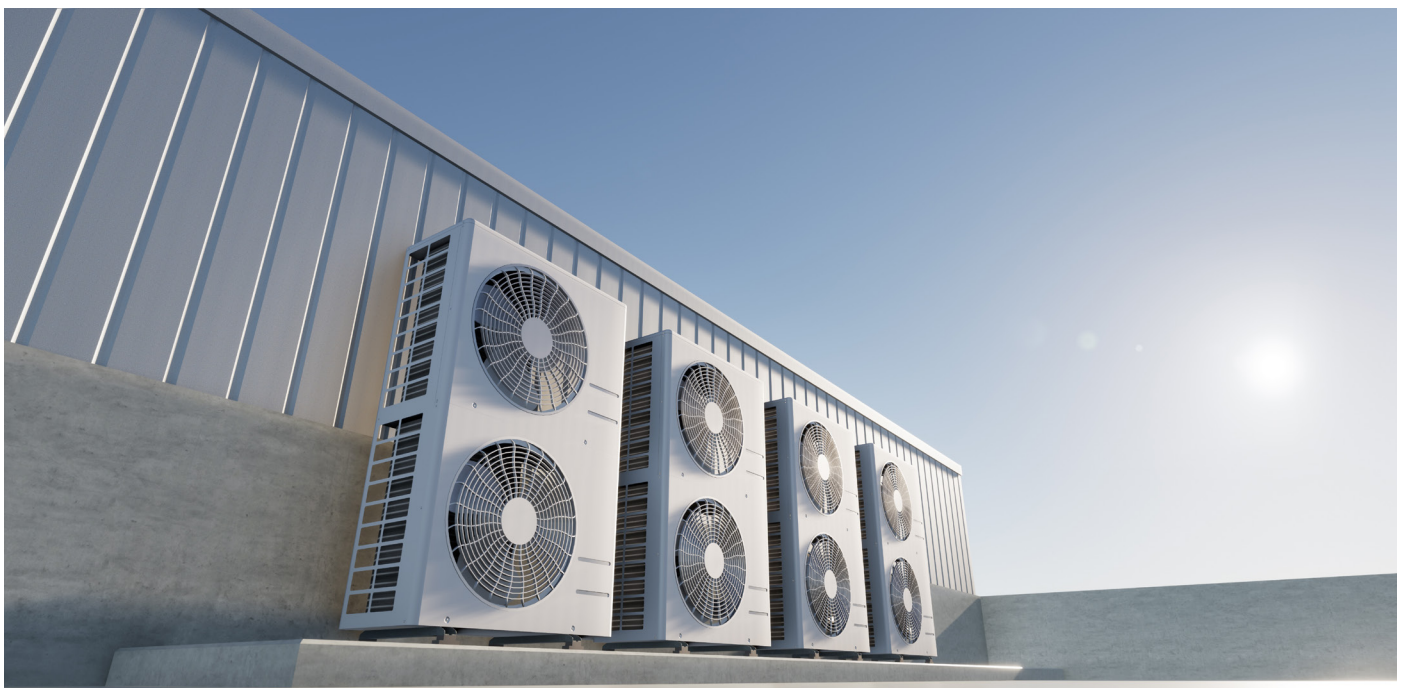
TE offers a full line of wire termination machines from entry level loose terminations to time-saving automated assembly line equipment. Whether you need hand tools, benchtop, or high-volume applicators, TE has the relevant product.



## CONCLUSION

The adoption of solderless connection technologies represents a significant step toward addressing the evolving requirements of fan motor manufacturing. As the industry prioritizes efficiency, cost reduction, and environmental sustainability, these solutions enable manufacturers to overcome traditional technical limitations while achieving increasingly stringent performance standards.

At TE Connectivity, we remain committed to keep developing cost-effective and sustainable solderless magnet wire connection solutions. Our extensive standard portfolio, combined with the ability to support customized designs, helps to allow these solutions to integrate seamlessly into virtually any electric motor system.



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**Trevis L Benchoff**  
Senior Director  
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