

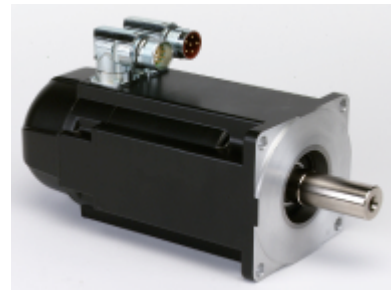
## New servomotor connector technology enables miniaturization, increases integrity

Servomotors are an integral part of today's automation industry, but traditional circular connectors prohibit the miniaturization of such motors due to connector size and the need to isolate power from signal lines. ITT, Electronic Components has developed innovative technology in the CmX connector series to address industry concerns and enable further miniaturization of servomotors.

### What is a servomotor?

Servomotors are constructed from three basic parts: a motor, a rotation management device that is connected to the output shaft, and a control board. The rotation management device consists of encoders or resolvers that monitor the angle of the servomotor shaft and make adjustments as needed.

Servomotors are small and extremely powerful for their size. They draw power proportional to the mechanical load, typically with a range of less than 5A to 60A. Therefore a lightly loaded servo does not consume much energy.



*Figure 1: Servomotor with traditional circular connector termination.*

A typical servomotor looks like a rectangular box with a motor shaft coming out of one end and two connectors out of the other end. One connector contains the power, control and ground wires, and the other contains the brake, thermo sensor and the encoder or resolver wires. Most servos work with voltages between 4V and 6V.

### Challenges of traditional circular connectors

As electronics has evolved and components have become smaller and smaller, servomotors have followed suit. But miniaturization in the field has been limited by the size of circular connectors needed to link the motor to the power source. Traditionally, two circular connectors are attached to the top of the servomotor housing, but even the smallest-profile circular connector limits the use of servomotors in space-sensitive applications.

Traditional circular connectors raise concerns with their large mass and its effect on vibration and shock. Since servomotors run at high speeds, higher mass contributes more to jostling and vibration, potentially compromising the integrity of the connection. Signal strength can be affected by limited shielding from the exposed connectors' insulation and the limitations of connector diameter, which dictates the number of wires it contains.

Installation of circular connectors allows contact only at two opposing points, while slotted and pinched sockets offer limited spring force, further challenging the connector mating in high shock and vibration applications. Circular connectors also present the need for additional strain relief parts, since the coupling is exposed to outside forces and is not secured to the servomotor housing by any means other than the connector lug nut.

### ITT's innovative servomotor connector solution

Servomotor manufacturers and circular connector companies began exploring ways to address sizing and other concerns while reducing costs for the cable-to-motor interface. ITT, Electronic Components worked closely with major servomotor companies and soon discovered that there was an opportunity for connector miniaturization in new servomotor applications – particularly motors with a flange size of 100cm or smaller.

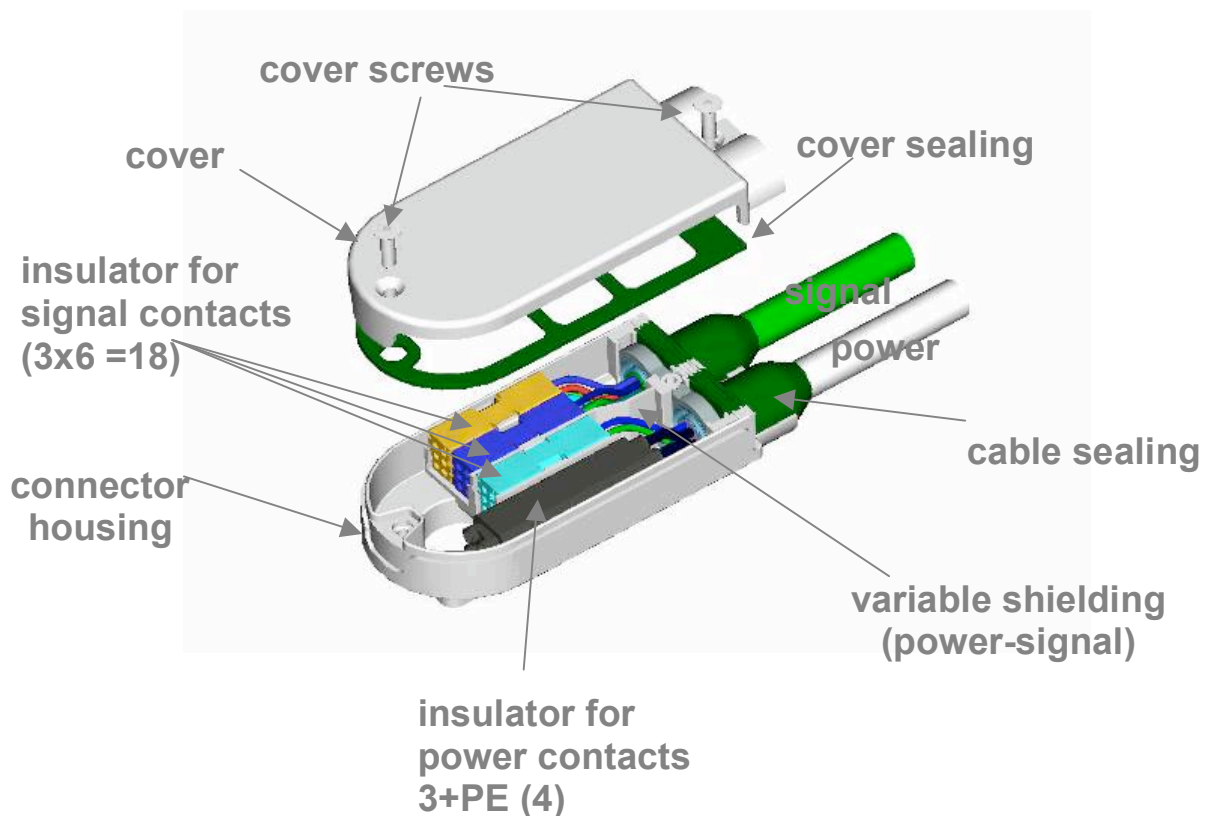


Figure 2: Standard version of the CmX servomotor connector.

ITT developed the concept for a line of smaller-sized servomotor connectors, which addressed the growing need for small connectors on smaller servomotors, but was also scalable for larger applications. The CmX connector series would replace a number of various-sized conventional circular connectors – connectors that require at least twice the length and four times the diameter to house the same components as CmX connectors.

The CmX Series connectors feature IP67 sealing, a housing that contains a single power insulator and three feedback insulators. Each feedback insulator has six signal contacts, separated by metal shielded walls, two sealed entries for power and feedback cables and a first-make/last-break power ground contact electrically linked to the shell.

Traditional circular connectors require a number of tools and extended clearance around the servomotor for installation. The CmX Series connectors replace two bulkier circular connectors and its simple harnessing reduces servomotor connection to four steps, simplifying the process and reducing assembly and installation time.

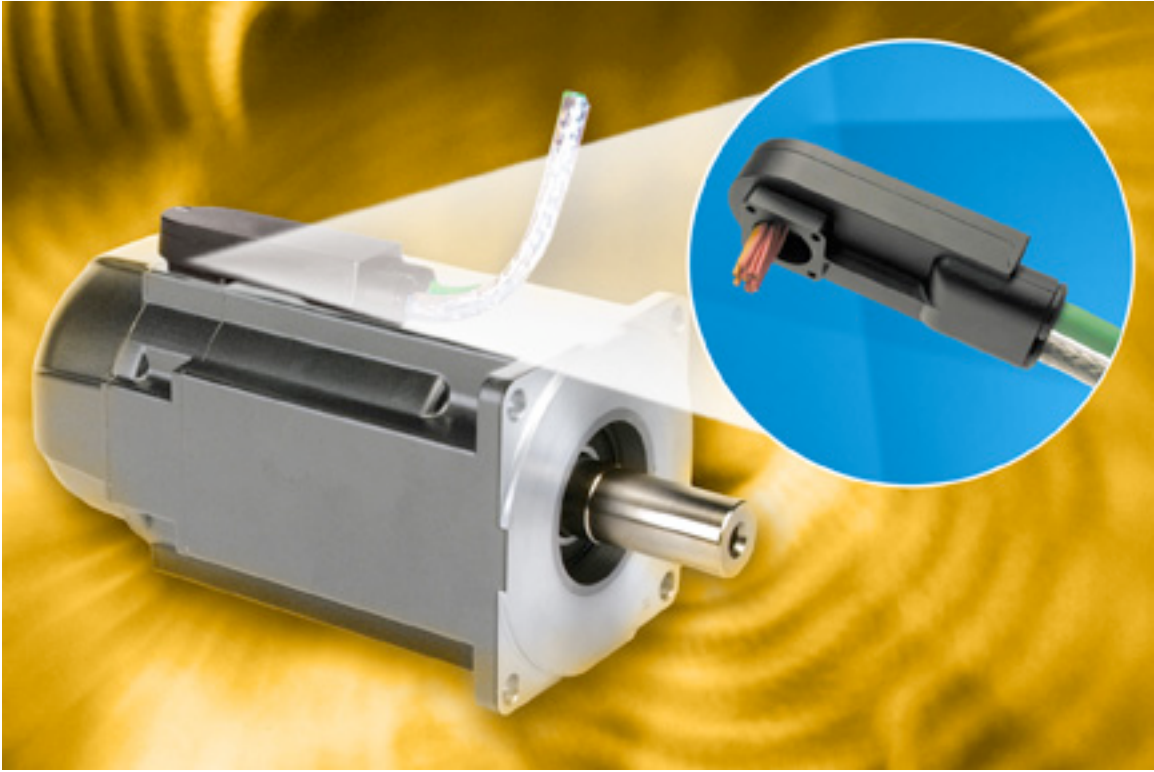
Costs of the circular connectors were prohibitive in the adoption of servomotors. The connectors require a number of parts for proper installation, driving up manufacturing and installation costs. ITT simplified the connection design in its CmX Series connector, reducing the number of parts and lowering the cost by 50 percent, a key benefit to those using servomotors in miniaturized applications.

The size and mass reduction ITT achieved helps reduce the vibration and shock effects on the connectors. Circular connectors sit directly on the servomotor housing, and the vibration caused by the running speed of the motors can create an intermittent connection condition. A high connector mass combined with a right angle mounting can increase the chances of intermittent performance. The lower mass and smaller size of the CmX Series connectors help maintain strong coupling and signal strength.

The CmX connector series is completely sealed and shielded for high reliability. Internal shielding within the CmX connector preserves signal integrity even though the connector can mix up to four power circuits at 12A and 18 signal lines at 3A. With traditional circular connectors, two separate connectors are needed to keep power and signal lines isolated. The CmX connector meets IP67 ratings, meaning that the assembly is protected from dust and can be submerged in water to 1 m (3ft) for up to 30 minutes without any leakage. Operating temperature for the CmX connectors range from -40°C to 125°C.

The CmX connector design eliminates the need for strain relief parts, as assembling and installing the connector secures the internal wiring and provides sufficient resistance to external strain forces.

CmX Series connectors are installed directly onto the servomotor housing, with the wires from the motor terminating within the cable assembly itself. OEMs can purchase CmX connectors with one part number as opposed to two with traditional circular connectors, simplifying on-hand inventory and ordering. Fewer parts increase part integrity and reliability.



*Figure 3: The Cm3™ connector from ITT installed on a servomotor.*

The CmX Series connectors' simplified design enables easier motor testing. Now, the wires terminating from the motor are exposed and can easily be plugged into a test board.

The first offering in ITT's CmX connector line is the Cm3™ connector, designed for servomotors with a flange size of 100mm x 100mm or less. The Cm3 connector meets all requirements for DIN EN61984 safety compliance and has a 48V signal rating, operating voltage of up to 630V, and current ratings of 2A for signal and 18A for power. A zinc die cast shell, Fluor rubber sealing parts, high temperature insulator material and high quality contacts ensure a rugged, reliable design.

ITT is currently developing the Cm5 connector for larger flanges and higher-powered motors and a smaller Cm2 connector for servomotors with a flange size of 40mm x 40mm. When completed, the full CmX line will include connectors for all sizes of servomotors.

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