The Toughest Yet – A new, compact electric linear actuator that can easily handle harsh off-highway environments

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Electromechanical actuation systems are driven by an electric motor and provide a simple, reliable solution, which offers high precision, rapid movement and is easy to design into a machine. Unlike hydraulic systems, which require regular checks to oil pressure, they offer a fully encapsulated, permanently lubricated solution that significantly reduces maintenance requirements and costs as well as protecting the environment from oil leaks and spillages. They provide smooth, quiet and efficient operation with high accuracy and complete control over the motion profile, including the velocity and position. The cost, design and environmental benefits of these devices mean they are becoming increasingly popular in wide-ranging mobile applications in areas such as agriculture, marine, military, construction, utility, road maintenance and rail.

The latest electric linear actuator from Thomson, the Max Jac®, is designed to withstand the harshest of conditions and provide reliable, long-life performance in the toughest of conditions. It was created based on specific customer demands for an actuator that operates in highly demanding applications from both a performance and environmental standpoint and provides highly efficient, high speed linear motion without the need for any significant maintenance. It is provided in an exceptionally compact package that has a short total length compared with the stroke for easy installation into the tightest of spaces.

**Highly automated, advanced vehicles**

The benefits of advanced automation and control are being realized in off-highway vehicles where electromechanical actuators such as the Max Jac enable easy implementation of computer generated physical movement instructions. The units have built in position feedback, which is contact-free to ensure no wear or re-calibration is necessary over the lifetime of the actuator, and enable easy implementation of the mid-range positioning required for more sophisticated operation. The simple yet robust construction of these actuators is easy to integrate into machinery design and there is no need for valves or fluid
reservoir required by a hydraulic system. Max Jac provides a real opportunity for OEMs to reduce manufacturing and operational costs while increasing performance and reliability.

**Tough design for tough environments**

The Max Jac actuator is manufactured from high quality materials with stainless steel components and a hard coat anodized aluminum cover tube, which has been designed and tested for use in corrosive environments. The robust unit is rated to IP 66 with additional testing to IP 69K, which ensures the actuator not only handles dust and dirt effectively but is also suitable for high pressure, high temperature wash down. Minimum backlash and a vibration resistant design further make it ideal for mobile off-highway and other harsh environment applications.

The Max Jac actuator’s resistance to corrosion makes it ideal for use on utility vehicles in applications such as adjusting the chute opening for road salt spreading. Accurate and fast operation of the actuator along with non-contact position feedback enables a high degree of consistency to be achieved in the volume of salt relative to the speed of the vehicle. The non-contact position sensors maintain the high accuracy and precision of the actuator. The unit is also designed to operate in extreme temperatures, from -40 to +85 °C, and ensures reliable and consistent operation even in exceptionally cold weather. In all spreading applications the greater accuracy in control offered from an electromechanical actuator offers the potential to reduce ongoing costs and make sure of correct coverage.

The Max Jac is tolerant of dust, dirt, mud and water as well as more aggressive substances such as fertilizers, acid, oil and cleaning agents. Its true off-road design makes it ideal in agricultural applications such as the precise adjustment of harvesting systems on combines or intelligent fertilizer spreading systems. For fertilizer spreading, for example, it provides the vital robustness and reliability required but also the speed and precision to enable exact coverage and boundary spreading without slowing the speed of operation. Its tolerance to the corrosion of seawater also makes Max Jac perfect for marine and offshore applications where the control of hatches, doors, operator chairs and remote movement of devices such as antennae or radar is required.

Another application where the Max Jac can provide superior performance and reliability is in vehicle throttle control. Again the unit can be placed for easy installation with no direct
access needed for maintenance. It offers a long-life solution that is tolerant to heat, vibration, moisture and oil within the engine compartment. It gives a wide operating range and provides a robust, reliable and compact alternative to large bend radius, wire-wound throttle cables.

**Giving engineers freedom in design**
The compact design of the Max Jac actuator gives designer’s greater freedom and flexibility in machine design. There is no need for regular maintenance access so these units can be best applied to optimize functionality and performance without compromising on vehicle or system design. It requires only electrical energy to operate and has no need for the additional connection or complexity of hydraulic or pneumatic alternatives. The reduced number of components and straightforward design enables easier installation as well as increasing reliability.

Max Jac is available with worm or ball screw technology to best suit application needs in terms of duty and load. The worm screw version is self-locking and will not back drive on power-off while the ball screw offers faster operation, will take higher loads and can operate at higher duty cycles. To exactly match design and application requirements Thomson also offers an efficient customization service for its linear actuators.

The Max Jac offers flexible operation and installation with stroke lengths from 50 to 300 mm achieved with the ball screw variant (50 to 200 mm with the worm screw) and a retracted length of just 156 mm longer than the stroke length. Dependent on load, the duty cycle can be 25% to 100% with a life of 500,000 cycles for a ball screw actuator with 100 mm stroke, average load of 500 N and changing load direction. The worm screw actuator has a maximum dynamic load of 500 N (static load 2,000 N) and the ball screw 800 N. Operating speeds of up to 60 mm/s with no load (30 mm/s full load) can be achieved with the Max Jac ball screw actuator.

**Summary**
The development of the Max Jac has come from in-depth understanding of linear motion technology, the needs of mobile, off-highway applications and rigorous testing to give a solution that provides long, trouble free operation in extremely harsh environments. It is designed specifically for OEMs who are looking to install reliable, high performing and efficient components. Its compact size and virtually maintenance free operation further give
engineers a greater freedom of design to achieve competitive advantage from their equipment.

Thomson has taken its leading expertise in motion control and vast experience of harsh, off-highway applications to produce an actuator that is designed to give advanced performance and long, reliable service. Overall the Max Jac offers an exceptionally tough, extremely compact solution that has the potential to reduce installation and running costs in a wide range of applications.

Image captions:

![Image 1](image1.jpg)

The robust Thomson Max Jac is rated to IP 66 with additional testing to IP 69K, which ensures the actuator not only handles dust and dirt effectively but is also suitable for high pressure, high temperature wash down.

![Image 2](image2.jpg)

The compact design of the Thomson Max Jac actuator gives more freedom in design for engineers, especially in a mobile off-highway environment.
The new Max Jac actuator from Thomson is tolerant of dust, dirt, mud, water and ice, as well as more aggressive substances such as fertilizers, acid, oil, and cleaning agents.