

Linear technology for joining

We pioneer motion

**SCHAEFFLER**

# Electrification in the automotive

All industries are adopting solutions that reduce environmental impact and leverage new technology.

Schaeffler provides technical expertise to overcome customers' challenges, providing components for the development of more efficient automotive manufacturing equipment.

Electrification is a macro-trend across the automotive industry, from car production to the vehicle itself. The technology shift from internal combustion engine to electric powertrain has accelerated over the last decade, supported by stringent regulations on CO<sub>2</sub> emissions and by government's incentives.

Automakers are strategically pursuing vehicle weight reduction to meet regulatory and market goals, and this is mainly achieved through a combination of design optimization, downsizing, and lower weight materials. As a result, new generations of automobiles are expected to contain an increasingly larger quantity and diversity of innovative materials.

This significant change requires new flexible production lines and it necessitates the evolution of joining technologies such as dispensing, welding, riveting, clinching.

With decades of automation experience, Schaeffler has a unique understanding of linear motion and how it is integrated into customers' applications to provide the best performance and greater machine efficiency: We assist our customers by creating equipment that runs faster, longer and safer and that is sustainable.



## The evolution of joining technologies

Incorporating different materials into a vehicle is one of the greatest challenges that the automotive industry faces. Dissimilar materials require various joining technologies such as resistance spot welding, self-piercing riveting, and a variety of fast-cure adhesive bonding processes incorporated into flexible assembly lines that meet vehicle production rates. OEM's must consider several factors when selecting joining technologies in the body shop.

For example:

- Accessibility
- Technology maturity
- Number of joints per minute and cycle time
- Joint performance and strength
- Cost-effective joining techniques
- Multi-material compatibility
- Automated or manual process
- Removing design limitations

Electrical systems in automation lines help improve assembly processes and follow market trends, thanks to flexibility and programmability. The average automotive production line consists of hundreds of robots for welding, gluing and riveting. Electro-mechanical actuation is more reliable and more energy-efficient than pneumatic actuation. Schaeffler's mechatronic solutions integrated in automotive assembly lines reduce downtime, maintenance operations and total cost of ownership.



## Quest for reliability and sustainability in automotive assembly

A relevant example of the need for reliability is EV battery assembly, where quality control is essential. Once the enclosure is sealed, failures are difficult and costly to correct.

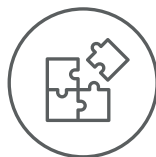
Consequently, assembly processes require precision and repeatability. Following the rapid growth in battery production, new assembly solutions are emerging with key challenges. Bonding with accurately dispensing and applying adhesives, self-piercing riveting with high quality and repeatability.

Automotive manufacturers strive to cut production costs through increased process speed, shortened cycle time, while increasing quality and performance. Assembly cells with EWELLIX electromechanical actuators offered by Schaeffler and compact linear motion products can be downsized to a smaller footprint.

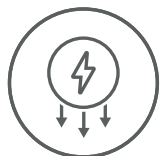
### General features



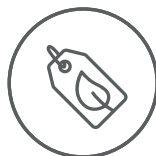
**Better productivity**



**Flexibility and programmability**











**Lower cost with energy savings**

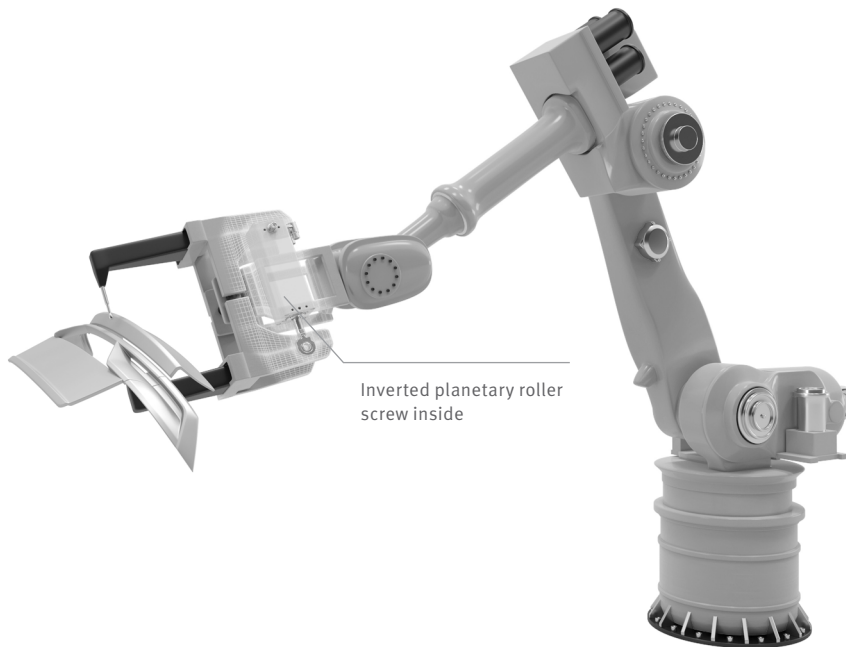


**Environmentally friendly**

### Electrification is the smart solution

Features		Electric systems value proposition
	Environmental pollution risk	None
	Energy consumption while not in use	Close to zero
	Safety in operation	Very easy
	Positioning precision	High
	Controlled speed	Easy
	Maintenance	Seldom
	Cost of maintenance	Very low
	Remote monitoring	Easy

# Resistance spot welding



## Features

- Very compact, fully integrated design
- Reduced number of components to minimize weight
- High efficiency and robustness
- High-speed and acceleration capabilities
- Low maintenance requirements

## Benefits

- Modularity for easy integration in equipment
- Lightweight reducing welding robot power and size
- High number of welding spots with roller screw technology
- Minimized downtime thanks to roller screw reliability

Electric systems are ideal for making many welded joints quickly, precisely, cleanly, economically and with consistent quality. Whatever the weld gun design (direct-acting known as “C” gun, “L” or “X” also known as scissor, or pinch gun), the requirements are very similar.

EWELLIX electromechanical actuators offered by Schaeffler are fast to install and maintain their settings throughout the entire production process. Welding equipment runs continuously under the same optimum conditions.

Our planetary roller screws and dedicated actuators respond to the welding market needs and challenges and offer the best-in-class performance in the field.

## Roller screws

## EWELLIX High performance actuators



Planetary roller screws

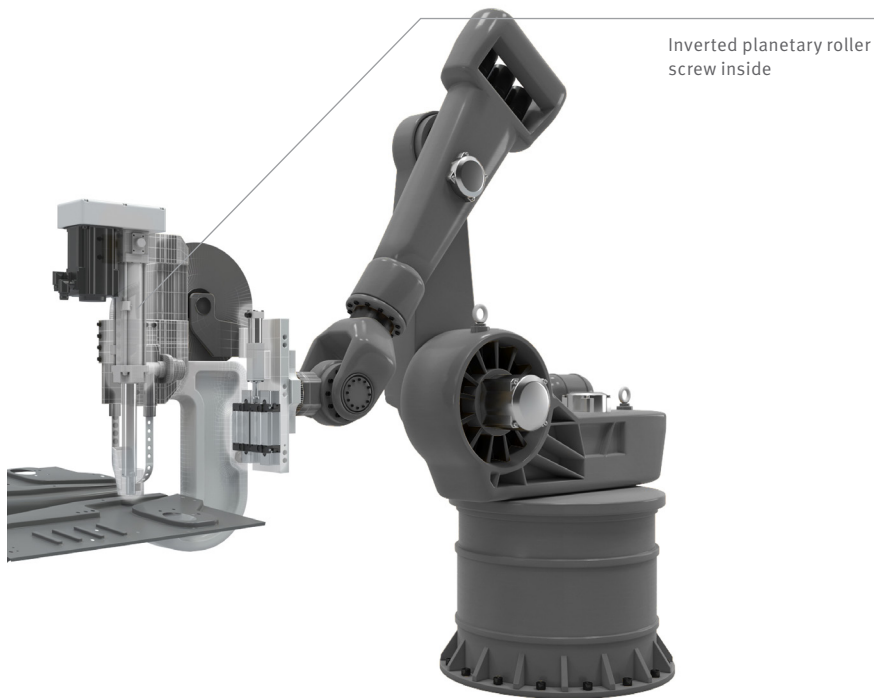


Inverted planetary roller screw



CEMC

# Mechanical fastening



## Features

- Very compact, fully integrated design
- High efficiency and robustness
- High-speed and acceleration capabilities

## Benefits

- Modularity for easy integration in the equipment
- Long service life with roller screw technology
- High force capability with roller screw technology
- Minimized downtime thanks to roller screw reliability

## Mechanical fastening technologies

- Self Piercing Riveting
- Blind rivet
- Flow drill reliability

In the coming years, mechanical joining technologies such as riveting are expected to experience significant developments driven by the electrification of the automotive industry. For instance, self-piercing riveting is very adaptable to join mixed lightweight materials such as high-grade steel or aluminum alloys. The industry is demanding robust, reliable and cost-effective joints accomplished with repeatable, fast and easy to apply processes. EWELLIX linear actuators with roller screw drive offered by Schaeffler provide customers with high power density actuation for heavy duty applications, while performing quality joints.

## Precision ball screws



Miniature ball screws

## Roller screws

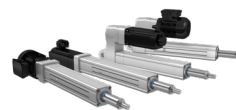


Planetary roller screws



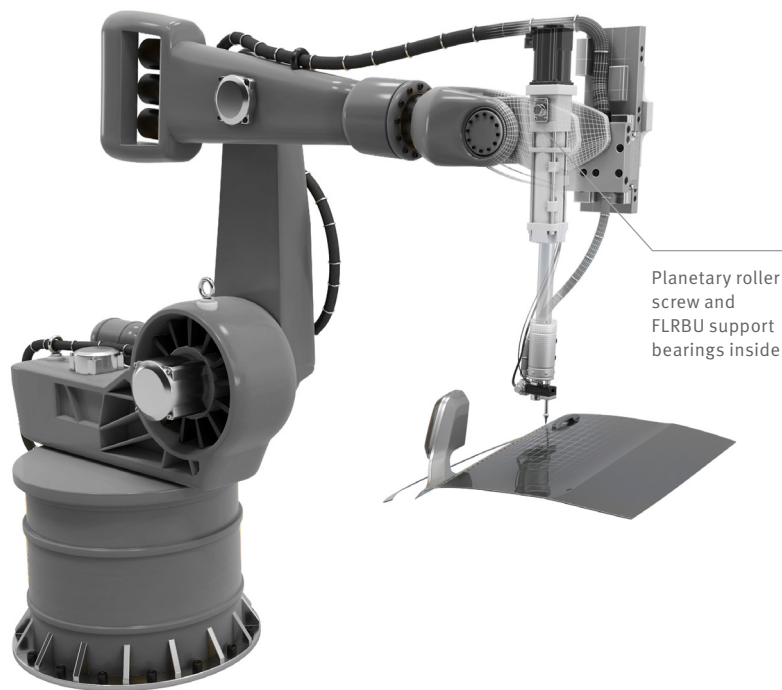
Inverted planetary roller screw

## EWELLIX High performance actuators



EMA-100

# Dispensing



## Features

- Controllability with precise speed and acceleration control
- Repeatability
- High efficiency and robustness
- Cleanliness

## Benefits

- Modularity for easy integration in the equipment
- Long service life with roller screw technology
- Minimized downtime thanks to roller screw reliability

The automotive industry is increasingly relying on adhesive bonds and sealing to make vehicles lighter, safer and more economical. The application of these highly engineered adhesives and seals requires the most precise, robust and dynamic metering systems.

Shear sensitive and abrasive material make the use of linear servo shot meters mandatory. Stitch bead application for structural bonding requires a highly dynamic drive at the end of the robotic arm. Two-components metering needs perfect synchronization of two meters with the same or with different flow rates. Our roller screws and the EWELLIX high-performance actuators offered by Schaeffler provide the best in their class compacity and lifetime for dispensing system manufacturers for all these applications, proven in the field for many years.

## Roller screws

## EWELLIX High performance actuators

## Supporting bearings



Planetary roller screws



EMA-100



CEMC

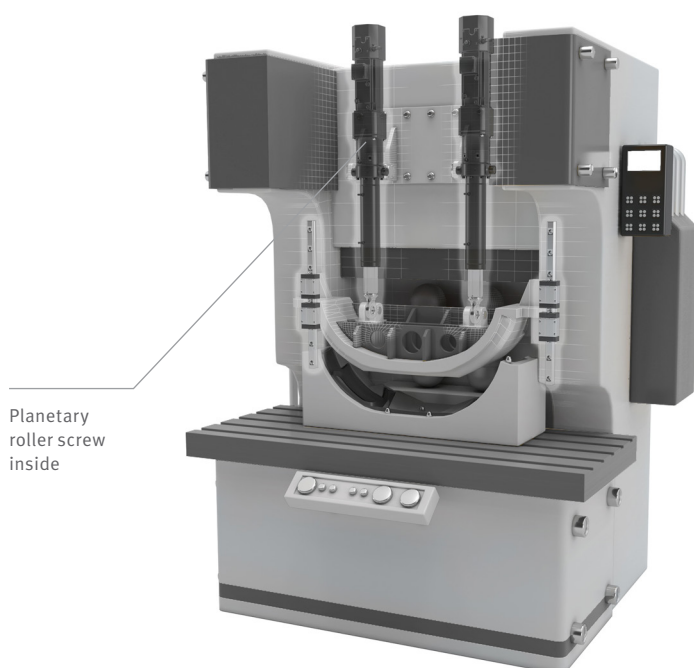


SRSA



FLRBU

# Press forming



Planetary  
roller screw  
inside

## Features

- Reduced joining time
- Cleanliness
- Repeatability
- Flexibility
- High efficiency and robustness

## Benefits

- Long service life with roller screw technology
- Ability to withstand peak load over short stroke with roller screw technology
- Minimized downtime thanks to roller screw reliability

Press forming solutions including clinching and hemming are established technologies accomplished by forming metal sheets together. Clinching technology is a highly reliable process for joining thin metal sheets without additional components, using special tools to form an interlock between multiple sheets through plastic deformation. The key advantage is that a wide range of materials can be joined together without damaging the metal surface. Hemming is a process of joining metal sheets through rolling or press forming and is mainly used for car closures with decades of successful application. For press applications, we offer a wide assortment of planetary roller screws and heavy-duty EWELLIX actuators incorporating such screws. Planetary roller screws are available with various combinations of size and lead to best match customer's requirements in terms of force capacity, robustness and speed.

## Roller screws

## EWELLIX High performance actuators

## Supporting bearings



Planetary roller screws



Inverted planetary  
roller screw



CEMC



SRSA



FLRBU

# Planetary roller screw

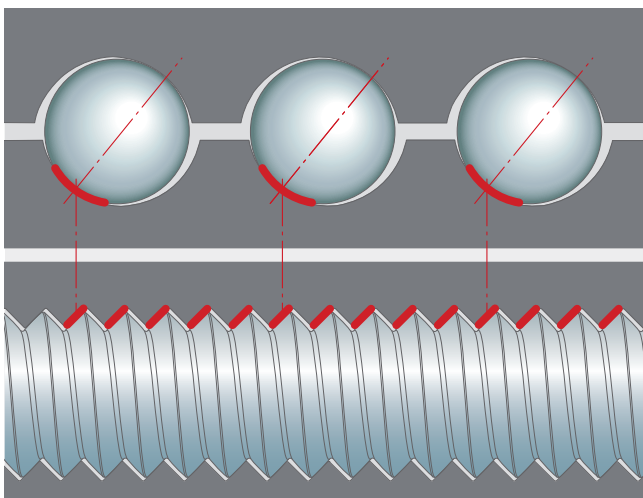
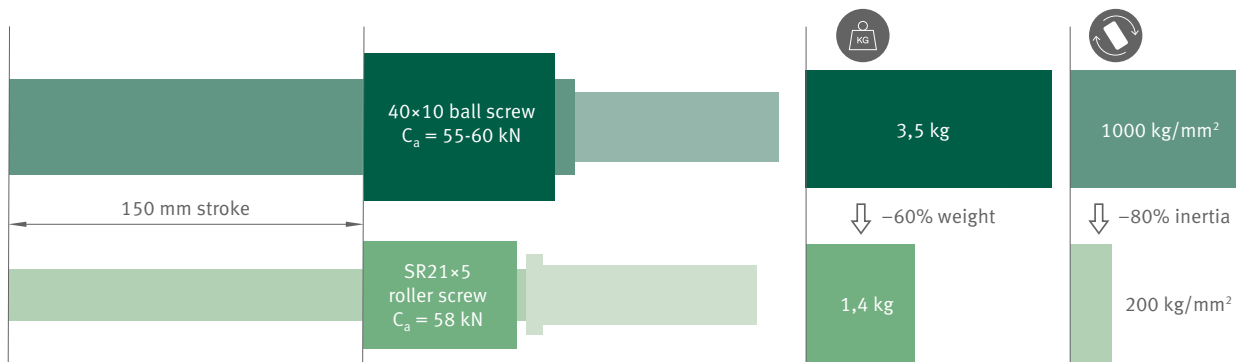
## Core technology for assembly automation

The planetary roller screw technology presents numerous advantages for joining applications that require high load rating, very long service life and extreme reliability.

With planetary roller screws, the application load is transmitted from the nut to the shaft through the barrel-shaped surfaces of the rollers. The number of contacts and the total surface area of the connections between the shaft, the rollers and the nut is substantially increased compared to the ball screw design, resulting in larger dynamic and static load carrying capacities.

The absence of recirculating element embodies the fundamental conceptual advantage of the planetary roller screws. Toothed rings and guides ensure the even circumferential position of the rollers without friction. The satellite rollers remain equally spaced and orbit continuously within the planetary mechanism. This is a significant advantage of this product over most ball screw designs.

### Mass and inertia saving on an equivalent dynamic capacity screw technology

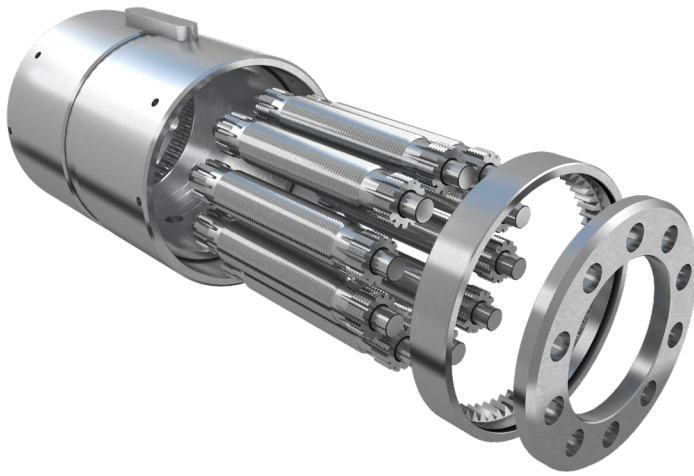


Comparison of ball screws and roller screws contact area



The inverted planetary roller screw provides powerful electro-mechanical actuation when compactness, low torque and high load capabilities are prerequisites. The rollers are synchronized with the threaded shaft and translate along the nut. Due to the screw shaft being threaded only where the rollers orbit, the screw shaft can incorporate a smooth surface for bushings and seals

# Roller screw high performances vs. ball screw technology

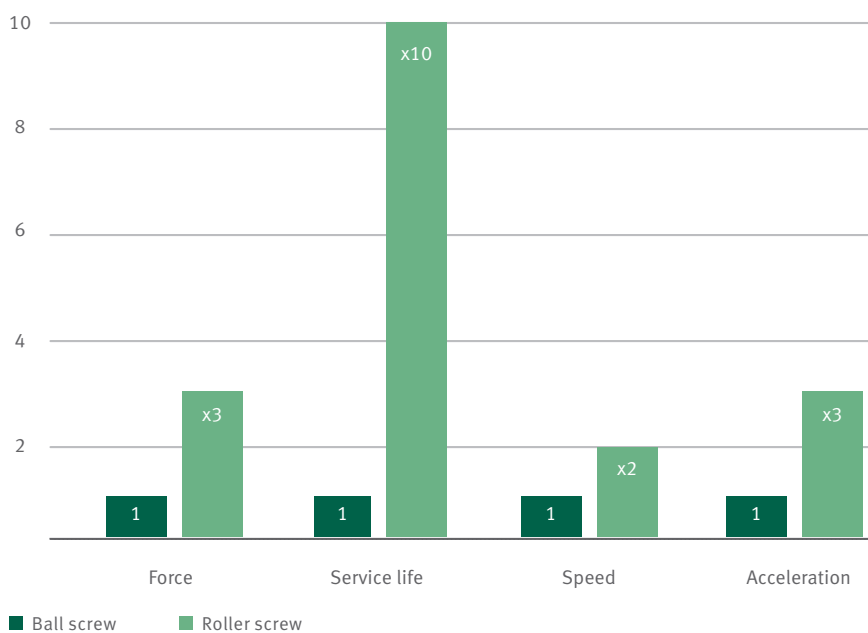


We are pioneers in the technology of roller screws and offers high quality, high performance and the widest assortment of roller screws available on the market. The planetary technology helps to improve screw performances to follow market needs in power density.

## Features

- Large number of contact points
- Planetary roller screw concept without recirculation with increased thread strength for a given pitch
- Satellite rollers concept with speeds up to 50% higher vs ball screw, and screw acceleration capability up to 3 times higher
- Either nut or shaft can be driven, the non-rotating and translating component acting directly as the push tube
- Customized screw-to-motor attachments for easy integration

## Comparison of ball screws and roller screws performances

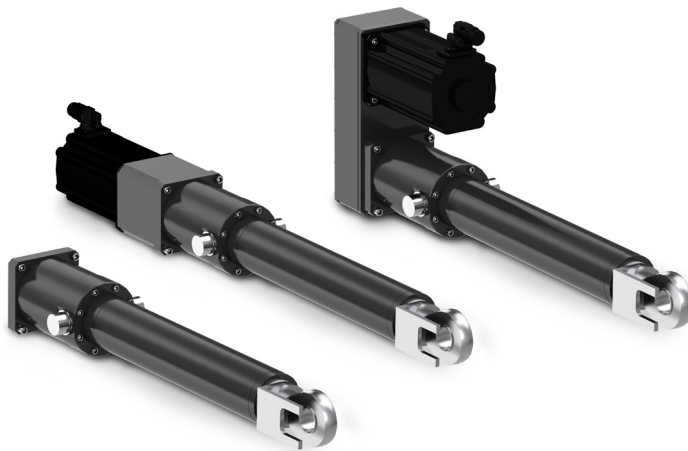


Calculated on an equivalent screw diameter

## Benefits

- High load carrying capacity and up to 10 times longer service life vs. ball screw
- Long service life and reliability
- Increased speed in operation leading to higher productivity
- Design flexibility, easier to seal the shaft (with turning nut)
- Compact, lightweight solution with fewer parts for easy installation

# EWELLIX high performances actuators offering superior power density



## Features

- High-performance planetary roller screw
- Modular concept
- Robust design
- Options of servo motors and customized motor adapters
- Direct access to roller screw nut for relubrication

## Benefits

- High load capacity and long service life
- High level of design flexibility for easy integration
- High reliability
- High acceleration/ deceleration rate and high speed capacity
- Easy and efficient way to relubricate the actuator

Schaeffler offers a complete assortment of EWELLIX actuators with the planetary roller screw as the core technology, to provide the best performance and productivity in the field. Our extensive experience and knowledge of actuation systems satisfy the most demanding requirements. Providing a wide variety of electromechanical actuators, we help customers reduce the machinery footprint, energy use and maintenance, while improving performance and reliability in the field.



Force capability up to 450 kN



Stroke up to 1500 mm

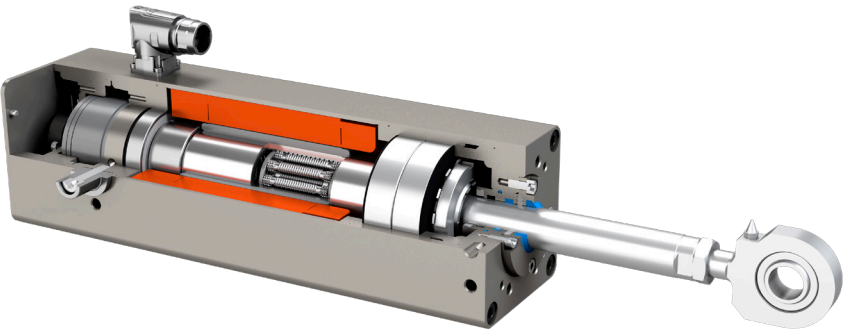


Linear speed up to 1100 mm/s



Options of servo motors to meet application requirements

# Compact EWELLIX Electro-Mechanical Cylinder for space and weight savings

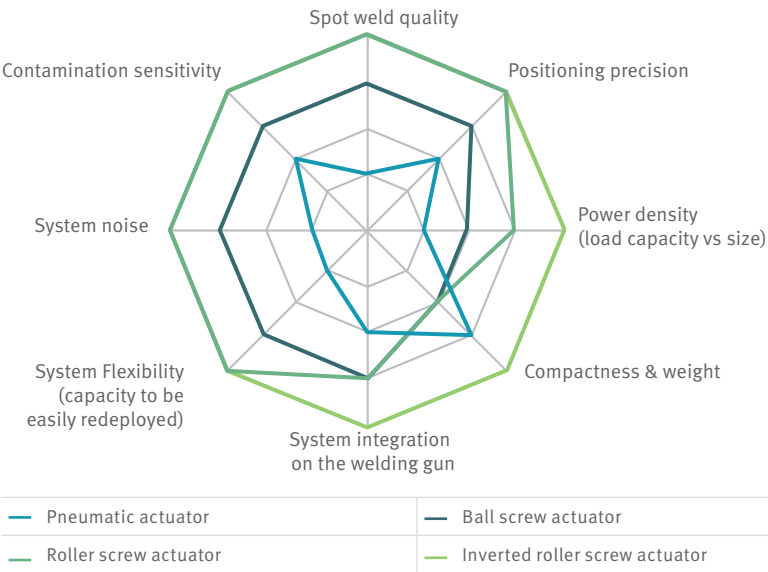


The EWELLIX Compact Electro-Mechanical Cylinder (CEMC) offered by Schaeffler is the perfect example of know-how that meets market demands. The inverted planetary roller screw technology allows the integration of hollow shaft motors directly onto the roller screw nut, resulting in a very compact yet powerful solution. The CEMC combines multiple tried and tested technologies and is the ideal solution to provide best-in-class performances for resistance spot welding, where high force, robustness and productivity are essential.

**Features**

- Compact design within 100 mm square frame, fitting in small spaces while offering high power density and force up to 25 kN
- Aluminum housing and reduced number of components resulting in low weight and easy integration in automation equipment
- High reliability of inverted roller screw technology for long service life
- Construction with individual modules and options for more than 300 possible configurations to match customer application requirements

## Performance comparison for welding function\*



\* Based on our experience over years in Automotive applications

# Products overview



Roller screws	Planetary roller screw	Inverted planetary roller screw*
Dynamic load carrying capacity	Up to 4000 kN	Up to 260 kN
Linear speed	Up to 1800 mm/s	Up to 500 mm/s
Screw shaft nominal diameter	From 8 to 240 mm	From 18 to 48 mm
Screw lead	From 5 to 50 mm	From 2,4 To 6 mm
Additional features	Cylindrical nut, flanged nut, off-centered flange nut	Stroke up to max 200 mm

\* Please contact Schaeffler for detailed information



Support bearings	FLRBU support bearings for roller screws
Bearing load carrying capacity	Matching roller screws sizes 15 to 80 mm
Angular contact ball bearings arrangement	<ul style="list-style-type: none"> <li>• 1+1 (for smaller sizes)</li> <li>• 2+2 or 1+3 or 3+1 (for bigger sizes)</li> </ul>
Additional features	<ul style="list-style-type: none"> <li>• Bearings assembled with preload</li> <li>• Precision locknut (KMT)</li> <li>• Greased for life</li> </ul>



EWELLIX High performance actuators	CEMC	EMA-100	SRSA
Max axial force	Up to 25 kN	Up to 80 kN	Up to 450 kN
Dynamic load capacity	59 kN	Up to 145 kN	Up to 572 kN
Speed	Up to 300 mm/s	Up to 1000 mm/s	Up to 1100 mm/s
Stroke	180 mm	Up to 1300 mm	Up to 1500 mm
Additional features	Integrated servo motor	Linear unit only, or option for attached servo motor	Linear unit only, or option for attached servo motor

# Your engineering partner

## Customization

Our extensive product knowledge, combined with engineering expertise, transforms customer needs into tailored solutions.

Focusing on client-specific requests, our engineers help customers develop and implement cost-effective solutions for niche markets and for high-volume applications. Our strong understanding of linear and actuation technologies enables us to create new innovative solutions.

Schaeffler can offer new EWELLIX actuators based on the roller screw technology, integrating additional mechanical functions, special materials or increased load carrying capacity. We also have an extensive customization program to meet unique application requirements.

### Actuator and roller screw customization capabilities

- Materials
- Housing
- Guiding system
- Screw (lead, heat-treatment, etc.)
- Screw nut design
- Stroke
- Mounting attachments
- Motor/gearbox attachment

### Complete customization

If the standard assortment cannot fulfill specific technical requirements, we can offer completely customized solutions tailored for each customer.



Customized solution for resistance spot welding



EWELLIX CEMC lab testing

# Supporting tool

## Digital

Schaeffler has developed a portfolio of tool to support customers in easy selection and calculation the right Schaeffler product for their application.

### EWELLIX Actuator select

- Product selection
- Performance calculator
- Cost saving calculator

### Ball and Roller Screw select

- Product selection
- Product calculator
- Product verification



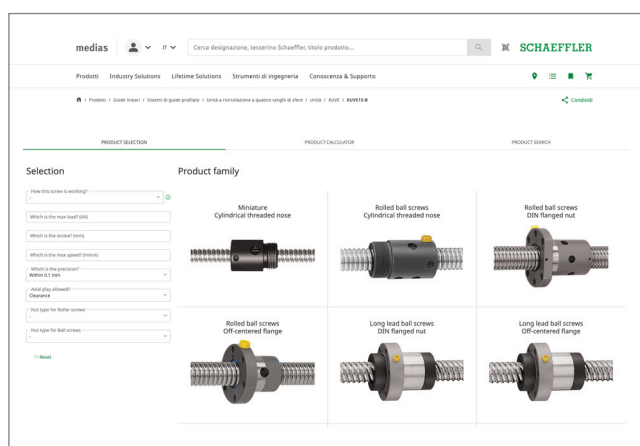
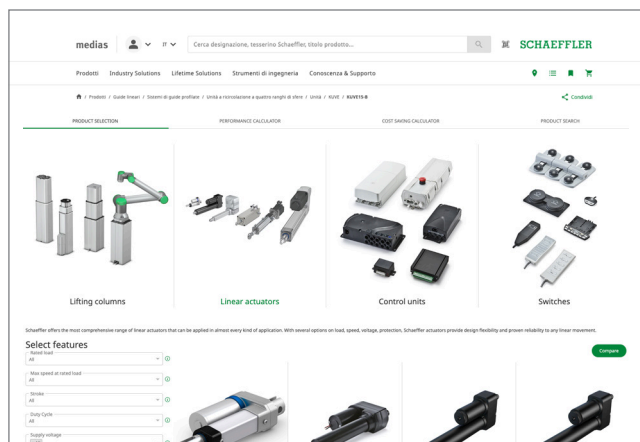
#### EWELLIX Actuator select

- › Scan QR code
- › Click on [link](#)



#### Ball and Roller Screw select

- › Scan QR code
- › Click on [link](#)



## Publications

Supporting documents are available for downloading on Schaeffler.com in each product page under technical data section:

- Operating manual
- Mounting instruction



#### Roller screw

- › Scan QR code
- › Click on [link](#)



#### EWELLIX High performance actuator EMA-100

- › Scan QR code
- › Click on [link](#)



#### EWELLIX High performance actuator CEMC

- › Scan QR code
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#### EWELLIX High performance actuator SRSA and SVSA

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