Linear technology for flexible assembly lines

We pioneer motion

SCHAEFFLER

Increase flexibility in automotive production lines with modular design

In a rapidly evolving industry, automotive production lines must be highly flexible to adapt to new technologies, electrification, and embedded software, ensuring competitiveness and efficiency.

Automakers and assembly solutions suppliers have traditionally evolved cautiously, through evolutionary steps. The enormous investment associated with vehicle manufacturing has always made prudence a basis for new models and plant planning.

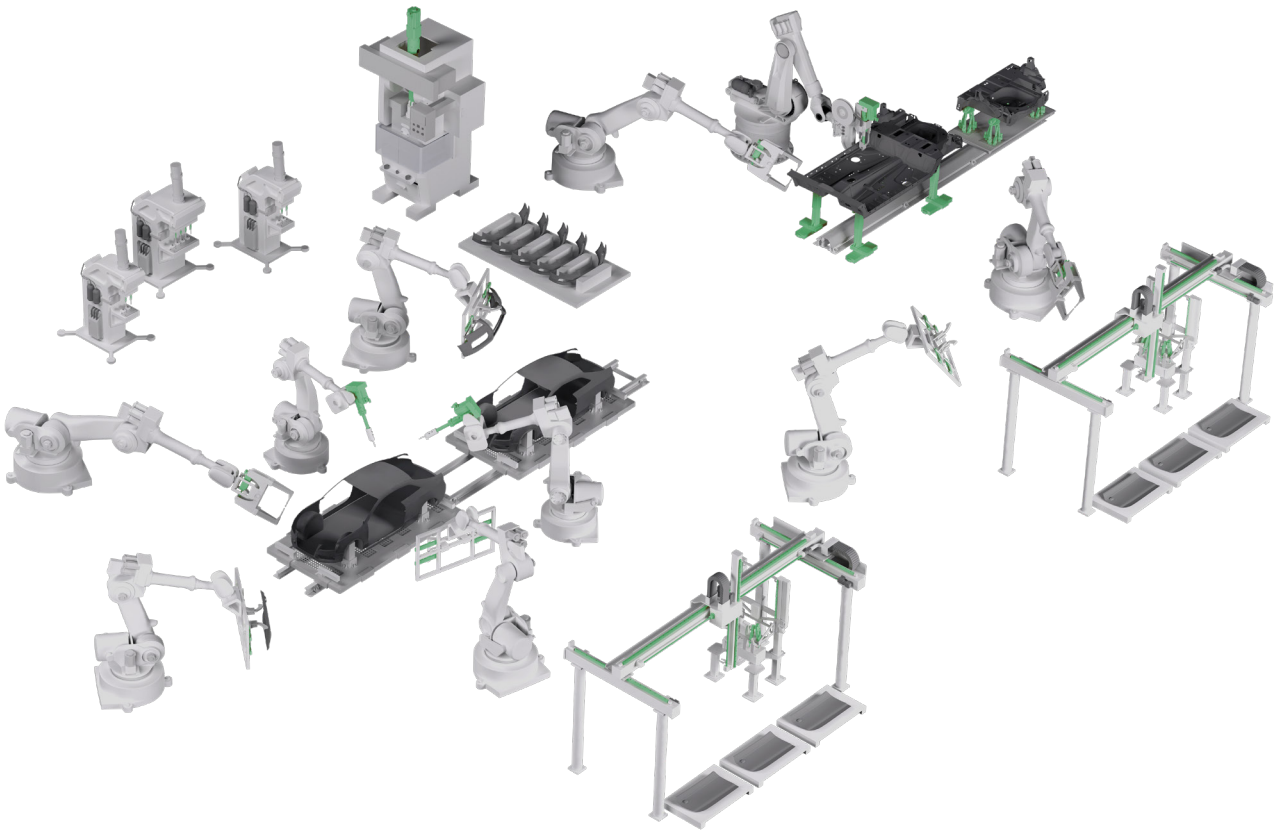
Until last decade, the established model for mass-production, with dedicated facilities producing maximum production with consistent quality at the lowest costs, worked fine for stable product lines and predictable future demand. However, today, the automotive industry is looking to integrate modularity in its production to support the speed of market change. The most effective way to accommodate uncertainty is to switch from conventional ‘long line’ production to manufacturing cells, which can be quickly reconfigured and repurposed to adapt to fluctuations in demand. The traditional line may still be suitable for final assembly but would be supported by flexible cells that do not require changes to the overall facility and can be repurposed without loss of manufacturing output. The goal is to have lean production lines that can produce various models while limiting the footprint and downtime in resetting the line. This means a more adaptable, easier to install and space-saving line with practical and flexible solutions for optimum results.

For electric vehicles and hybrids, technology is changing so rapidly that equipment is expected not to be suitable after 10 years vs 15 to 20 years in the past. Consequently, it is essential to build in flexibility: equipment needs to be repurposed with minimal changes or additional investment costs because as well as shortening model cycles, customers’ cars are becoming more customised.

Enhanced productivity, increased flexibility

Technological advancements, emerging competitors, global sourcing, and industrial restructuring are significant challenges for the automotive industry.

The main challenge is agility with greater capacity to rapidly switch production volumes and product mix while remaining cost-competitive. To succeed, synergies and long-term technical partnerships are essential.
Every process will become fully automated in the future, and the key is a good R&D partnership to support systems with the market's needs.



Return of Investment with flexible production lines

Many variables can impact the return on investment from robotics and automation, however, flexibility in production is essential

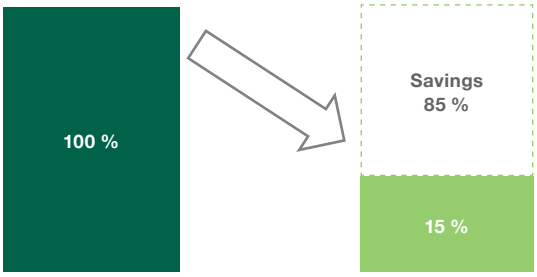
How can different components be produced on the same system? How can production be stepped up at short notice? For example, how can changing one model to another be executed quickly on the same system?

What is necessary are smart production and logistics systems that combine modularity and intelligent automation to allow maximum flexibility. The main goal is to quickly adapt production to evolving requirements and increasing demands for greater variety, coupled with frequent model changes and fluctuating batch sizes.
Focusing on flexibility allows companies to adapt continuously, leading to cost-efficient production cells and significant savings.

Main parameters driving the result:

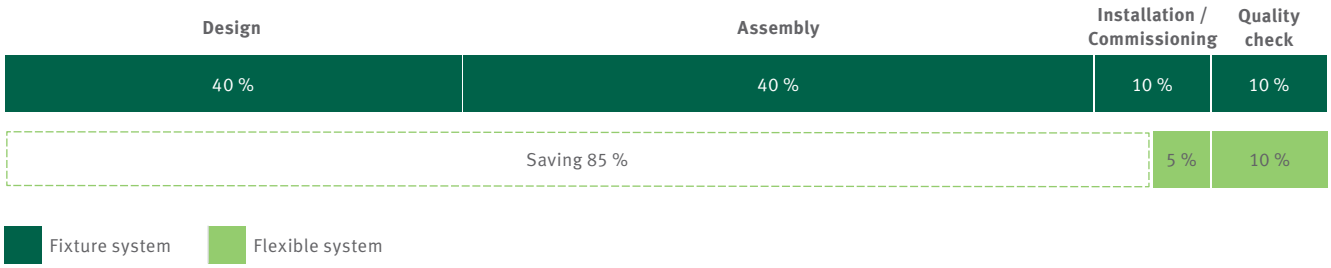
- Quantity of flexible systems
- Investment per flexible system
- Number of car models produced over 15 years

Besides cost savings, flexible systems lead to time-saving when resetting an assembly cell from one car model to another.



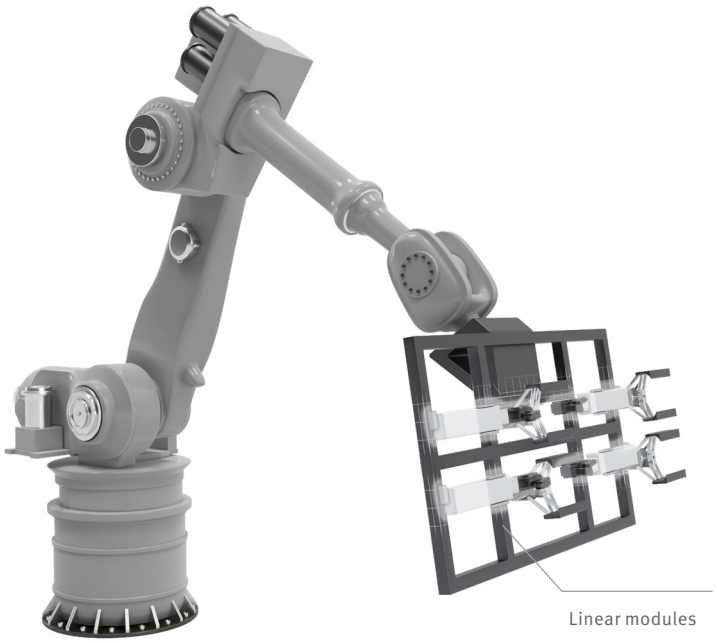
Potential global cost savings, covering design optimisation with flexible tooling, assembly and installation of the tooling, and commissioning.

Standard fixture vs flexible system: assembly cell resetting optimisation



Body-in-white grippers (end effectors)

with EWELLIX Linear modules



Features

- Compact design
- High load capacity
- Greater positioning accuracy and repeatability with precision ball screw
- Stainless steel cover for anti-spatter
- External mechanical brake option

Benefits

- Heavy load carrying capabilities and long service life
- Easy integration in the machine design
- Designed and validated for demanding automotive applications
- Precision alignment and secure clamping
- Easy maintenance through outside lubrication port
- Fit most brushless DC motors and servomotors
- Customisable according to customer needs

To cover a broader market and grow sales, manufacturers need to design significantly more new models as demand increases. Furthermore, factories must produce these new models on cost-effective assembly lines that can switch quickly from one model to another seamlessly.
We offer robust linear modules for flexible gripper (end effector) systems suitable for robots with a heavy load capacity, durability and continual use.
A gripper is a device that enables the holding of an object, such as a door panel, that needs manipulation. It allows holding, tightening, handling, and releasing, just like a human hand. There is a significant trend in the electrification of grippers throughout the industry and the removal of old pneumatic systems, thereby optimising power and maximising savings.

Linear modules*

CLSM-92

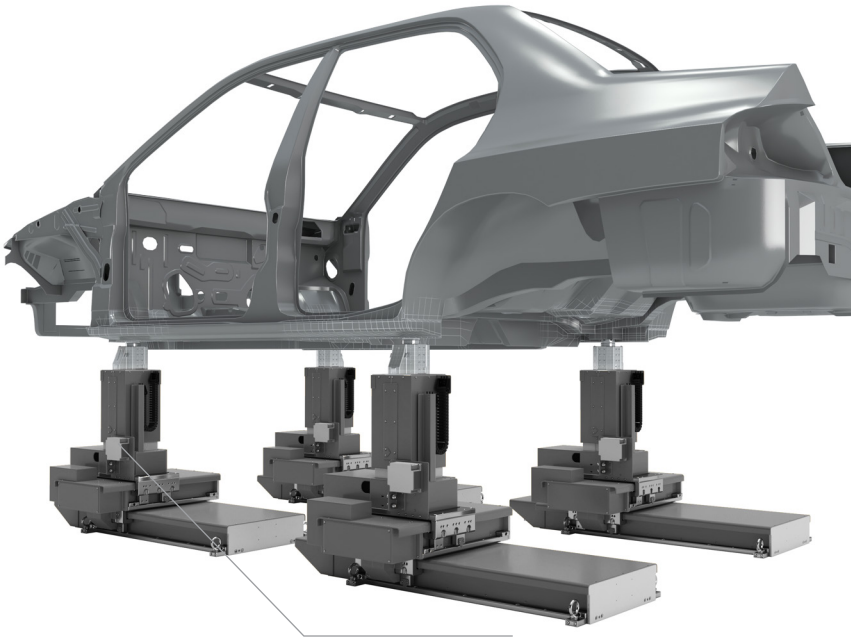
CLSM-120

CLSM-150

* EWELLIX CLSM offered by Schaeffler

Car transfer unit

with EWELLIX Positioning systems



Positioning system Car Transfer Unit (CTU)

Features

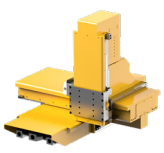
- Compact design
- Various sizes for load capacity
- Multi axes options
- Greater positioning accuracy and repeatability with precision ball screw
- Steel cover and inner mounted cableveyor for anti-spatter
- Integrated motor, controller, cables, mechanical brake and shock absorber

Benefits

- Designed for long service life and high loads
- Easy maintenance through outside-point lubrication
- Precise alignment and secure fastening of attachments

Handling different car chassis, Body in White (BIW) on the same line requires a flexible system that allows quick resetting with precise positioning.
Transfer units can be quickly and efficiently reconfigured to transport different car models on a single assembly line. In addition, in comparison with conventional assembly equipment and tooling, using a Car Transfer Unit (CTU) reduces the amount of re-programming and commissioning needed to move between the production of different models.
Optional linear module for the vertical axis provides high speed from precision ball screws. In addition, integrated dampening systems protect the lifting column from mechanical shocks during the loading and unloading phases, ensuring reliability and a longer lifetime in operation.
The use of customer-defined servo motors allows for easier integration into the control network, reducing the commissioning time of the transfer unit.

Positioning systems*



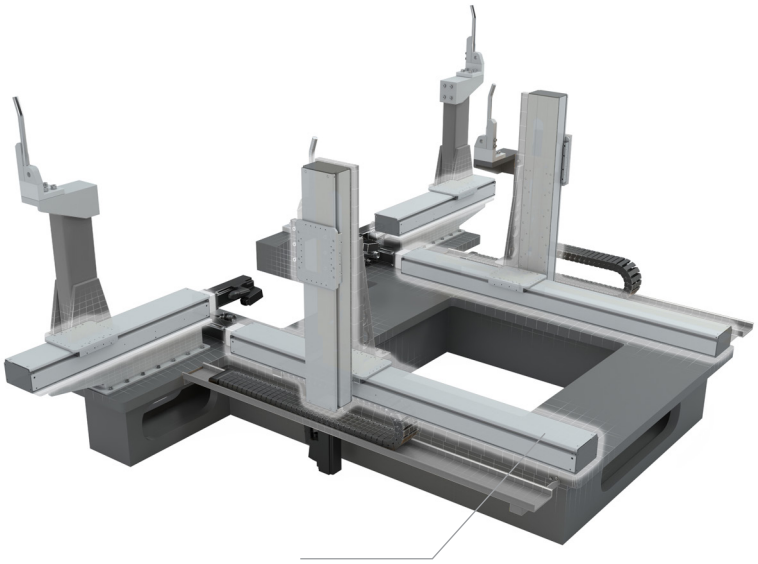
LCU

HCTU

* EWELLIX LCU, HTCU offered by Schaeffler

Jig (Geo-set)

with EWELLIX Linear modules



Features

- Compact design
- High load capacity
- Greater positioning accuracy and repeatability with precision ball screw
- Easy maintenance
- Stainless steel cover for anti-spatter
- External mechanical brake option

Benefits

- Heavy load carrying capabilities and long service life
- Easy integration in the machine design
- Designed and validated for demanding automotive applications
- Precision alignment and secure clamping
- Easy maintenance through outside lubrication port as option
- Fit most brushless DC motors and servomotors
- Customisable according to customer needs

A Jig or fixture is a device that holds, supports or places a piece to be machined or welded. It is a manufacturing tool designed to locate and hold the workpiece and guide the tool as the operation is performed.
We can provide robust linear modules for flexible Jig (Geo set) systems with heavy load capacity, repeatability and longer working life.
As for the gripper application, Jig or fixture helps support the automotive industry looking for flexible assembly cells to minimise resetting time and efficiently adapt production from one model to another.

Linear modules*

CLSM-92

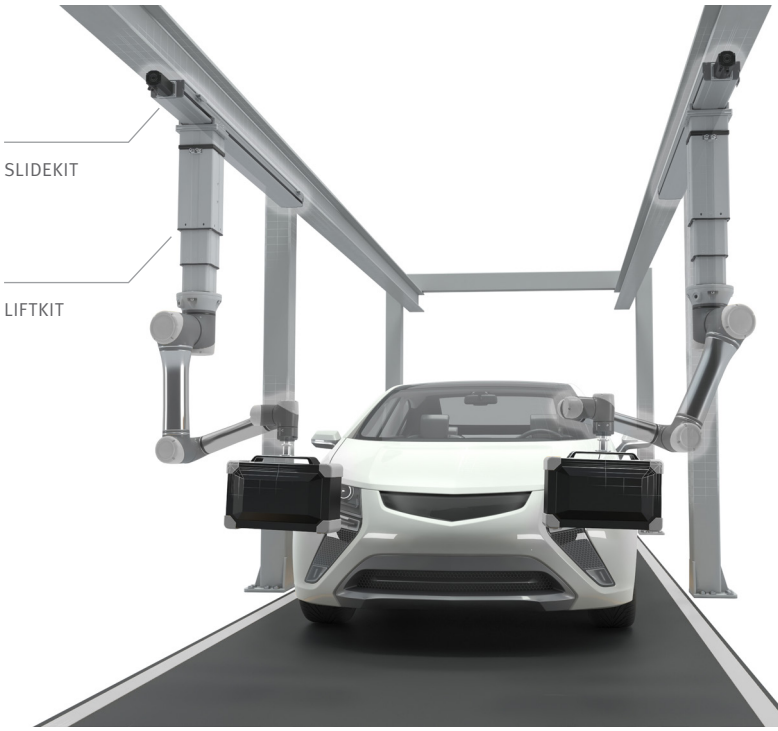
CLSM-120

CLSM-150

* EWELLIX CLSM offered by Schaeffler

Final inspection processes

with EWELLIX 7th axis solutions



We provide practical solutions to complete vertical and horizontal adjustments smartly. In addition, we offer a wide range of ‘ready to mount’ additional linear axis solutions. They are designed for different applications, giving your robot an extended operating range to perform manufacturing processes like finishing and parts inspection.
Whenever you need a repetitive operation usually done manually that are time consuming and with low added value for the operators, such as the end of line quality inspection, our LIFTKIT and SLIDEKIT can guarantee precision and reliability to maximise your results and automate these processes.
Below is an application example in automotive assembly lines, with custom LIFTKIT and SLIDEKIT axes for ceiling mount installation.

7th axis for robots*

LIFTKIT

SLIDEKIT

* EWELLIX LIFTKIT/SLIDEKIT offered by Schaeffler

LIFTKIT Features

- Vertical lifting of the cobot by up to 900 mm (1400 mm on request) with compact retracted height
- Robust column design for industrial use, vibration free motion and virtually maintenance-free
- Hardware interface compatible with any robots
- LIFTKIT control through TCP/IP

LIFTKIT Benefits

- Operating range extension
- Plug-and-play solution
- Cost savings and higher productivity
- Improved performances

SLIDEKIT Features

- Horizontal sliding of the cobot by up to 3000 mm with a compact height
- Heavy load and moment carrying capabilities and long service life
- Precision alignment and high level of accuracy and repeatability
- Easy maintenance through outside lubrication port
- Hardware interface compatible with any robots
- SLIDEKIT control through CANOpen

SLIDEKIT Benefits

- Operating range extension
- Plug-and-play solution
- Cost savings and higher productivity
- Improved performances

Core technologies for assembly automation

Reduced downtime for greater productivity

Greater flexibility and higher performance in production operations are essential to automotive manufacturers.

However, the challenge to achieve this is frequently linked to production facilities, and many were built to support a market-driven high-volume production of a select number of top models.

Nowadays, the request for increased functionality and versatility of body welding and assembly processes is applicable. This has led to innovative manufacturing solutions that can be easily integrated within existing facilities while meeting or exceeding the highest requirements concerning flexibility, quality, speed and reliability.

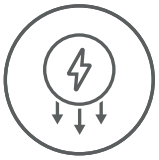
Electrical systems in automation lines help improve assembly processes and follow market trends, thanks to flexibility and ease in programmability. Additionally, electro-mechanical actuation is more reliable and more energy-efficient than pneumatic actuation.

Our mechatronic solutions understand market needs. Our robust, high-power density, accurate and efficient systems help reduce downtime, maintenance operations and total cost of ownership. In addition, we support our customer's evolution with state-of-the-art linear technology, i.e., powerful ball and roller screws and high-quality linear guides integrated with engineered systems.

- Improve asset reliability
- Increase productivity
- Optimised design
- Improve energy efficiency
- Decrease maintenance costs

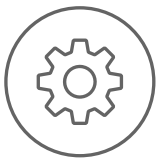
Reduced System Footprint
Space and weight reductions

Performance and Programmability
Precise, predictable and repeatable motion



Efficiency
Lower energy consumption.

Downtime
Reduced installation time



Configurability
Several options including manual overrides

EWELLIX CLSM linear modules

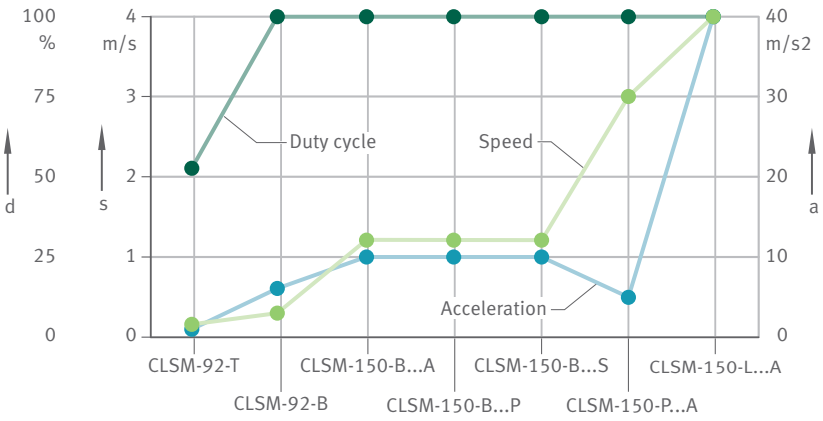
Features

- Compact design with lead or ball screws or linear motors
- Aluminium or steel as the base material option
- External mechanical brake option
- Inline and parallel (belt) gear boxes
- Customised motor adapter
- Different cover options for most applications

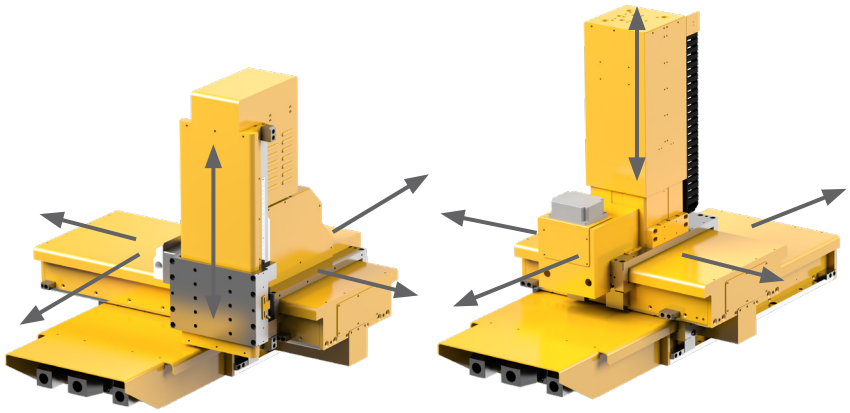
Benefits

- Heavy load carrying capabilities
- Long service life
- Precision alignment and secure clamping
- High level of accuracy and repeatability
- Fits most brushless DC motors and servo- motors
- Easy maintenance

Our linear modules are specially designed for automation and automotive applications to follow industry needs in robust, adaptable and flexible systems. They are equipped with a pair of profile rail guides, each with two carriages designed for maximum rigidity and stability.
In the EWELLIX CLSM linear modules offered by Schaeffler, a wide selection of ball or lead screw, linear motor and belt drive options are available to ensure a high level of speed, and positioning accuracy to perfectly meet automotive requirements.



EWELLIX Multi axis transfer units



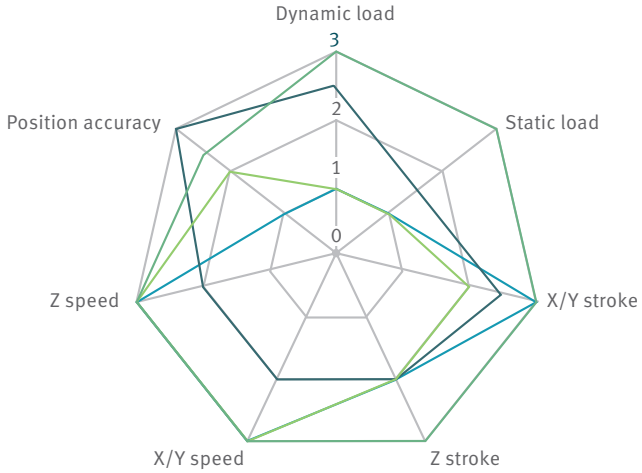
Features

- Compact design aluminium or steel as the base material
- Integrated motor, controller, cables, mechanical brake and shock absorber
- Lifting column or linear module as option of vertical axis
- Inline and right-angle gearboxes with customised motor adapter

EWELLIX Car Transfer Unit (CTU) positioning systems offered by Schaeffler are specifically designed for the automotive industry.
They are equipped with a pair of profile rail guides with two carriages each and provide high performance in terms of guiding accuracy and stiffness. The profile rail guide system has a wide range of ball screws to match high dynamics and positioning accuracy. EWELLIX CTU systems have integrated motors, controllers, cables, mechanical brakes, shock absorbers and steel covers. They are available with lifting columns or linear modules for the additional vertical axis.
EWELLIX Light Car Transfer Unit (LCTU) with linear module for the Z-axis provides high speed and high dynamic load capacity for lifting BIW. Typically, LCTU is used for the welding process on the BIW shuttle line and is located outside the shuttle.
Heavy Car Transfer Unit (HCTU) with a lifting column for Z-axis provides low retracted length and high static load capacity for BIW assembly. Usually, HCTU is used for the welding process on BIW pallets and is located on a moving pallet (under BIW).

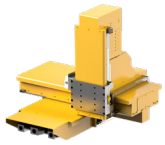
Benefits

- Made for long service life and high loads
- Easy maintenance through outside lubrication port
- Precise alignment and secure fastening of attachments
- High precision in positioning and repeatability



Manufacturer #1	Manufacturer #2
Manufacturer #3	Schaeffler

Products overview


EWELLIX Linear modules and systems	CLSM	LCTU	HCTU
Max linear speed	Up to 4000 mm/s	Up to 300 mm/s	Up to 300 mm/s
Dynamic load carrying capacity	Up to 41 kN	Up to 62 kN	Up to 21 kN
Max stroke (mm)	Up to 3000 mm	Up to 700 mm	Up to 700 mm



EWELLIX High performance actuators	CASM-32-40-63	EMA-100	CPSM
Max axial force	Up to 5,4 kN	Up to 80 kN	5 kN
Dynamic load carrying capacity	Up to 21 kN	Up to 145 kN	21 kN
Speed	Up to 1067 mm/s	Up to 890 mm/s	100 m/s
Stroke	Up to 800 mm	Up to 2000 mm	Up to 700 mm


EWELLIX 7th axis for robots	SLIDEKIT	LIFTKIT
Max dynamic payload	Up to 10,9 kN	Up to 1,5 kN
Speed	Up to 1000 mm/s	Up to 80 mm/s
Stroke	Up to 3000 mm	Up to 900 mm

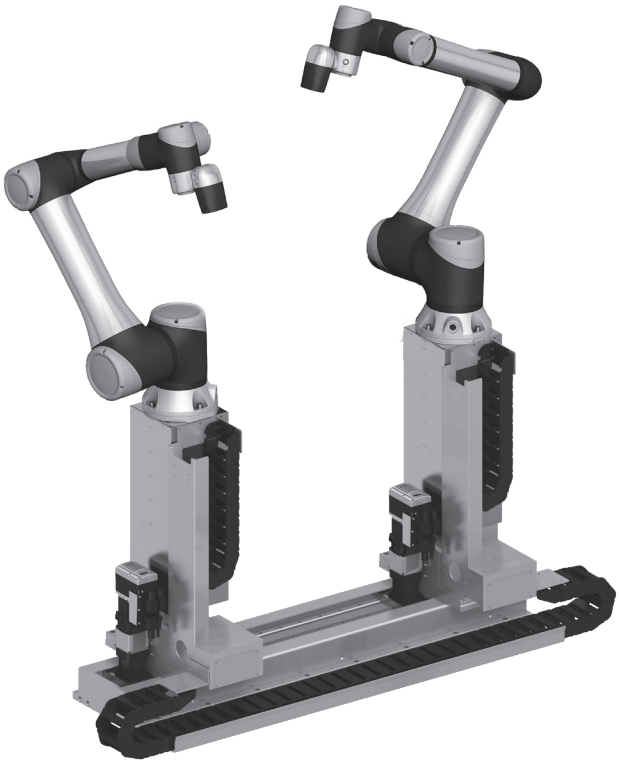

Precision ball screws	Precision rolled ball screws
Dynamic load carrying capacity	Up to 92,9 kN
Max speed	1500 mm/s
Nominal diameter	From 6 to 63 mm
Screw lead	From 2 to 50 mm

Profile rail guides	KLLT
Dynamic load carrying capacity	Up to 59,2 kN
Linear speed	Up to 5 m/s
Size and range	15 to 45
Acceleration	Up to 75 m/ sec^2

Your engineering partner

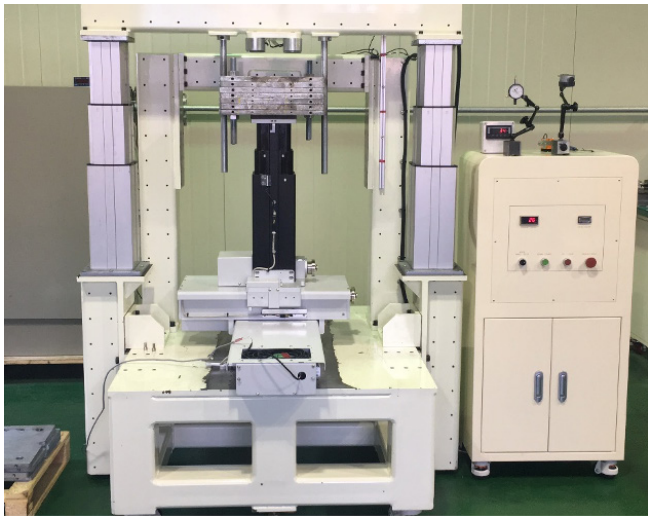
Customisation

Schaeffler has many years of expertise in realising powerful linear modules that fit customer needs.
Over the decades, we have developed multiple solutions that have been successfully used across different industries and applications.
Our various designs and features are suitable for virtually all machine applications regarding cost, size, accuracy and motion patterns. Our expertise in standard and custom linear systems is based on engineering and design know-how of processes and precision parts.

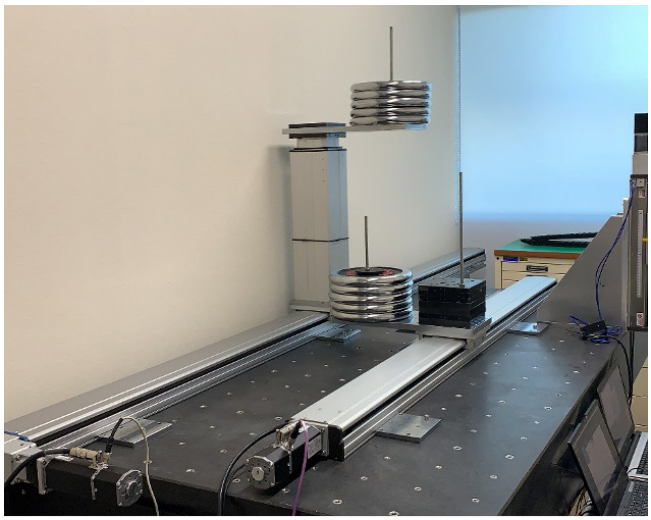


Tested for your environment

Our expertise in mechanics and electronics and specific application requirements contribute to developing solutions to meet customers' expectations. In addition, we verify our products by a comprehensive test plan to guarantee performance.



CTU shock testing machine



EWELLIX SLIDEKIT 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

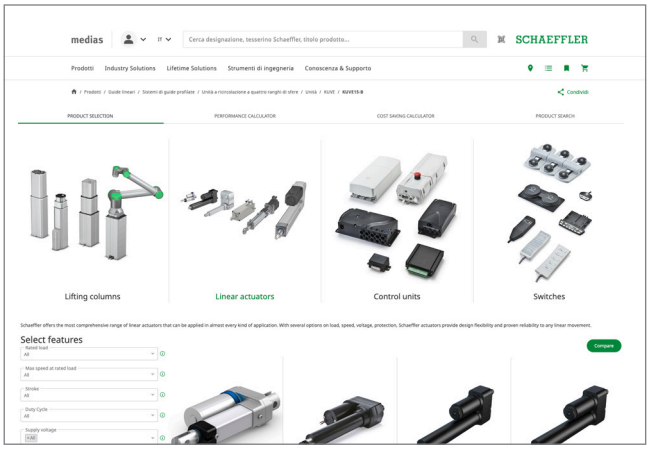
- Product selection
- Performance calculator
- Cost saving calculator

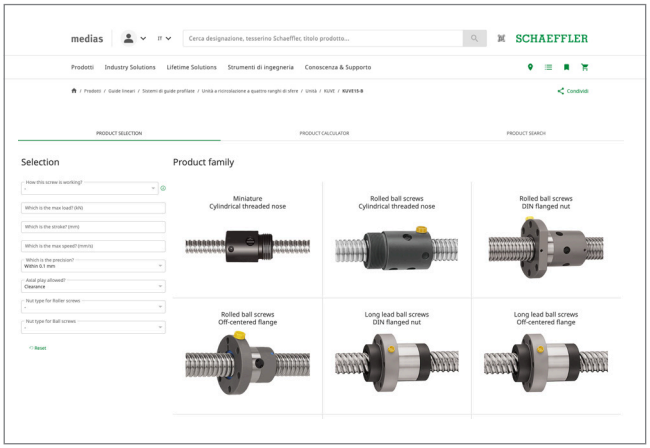
Ball and Roller Screw select

- Product selection
- Product calculator
- Product verification

Linear guides select

- Product selection
- Product calculator
- Cross reference





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

EWELLIX CLSM
› Scan QR code
› Click on link

EWELLIX High performance actuator CASM-32/40/63
› Scan QR code
› Click on link

EWELLIX High performance actuator EMA-100
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EWELLIX CPSM
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EWELLIX SLIDEKIT
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EWELLIX LIFTKIT
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Precision rolled ball screws
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KLLT
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