

Hand in hand for tomorrow



SCHUNK

Product and process knowledge



COMPONENTS



SOLUTION



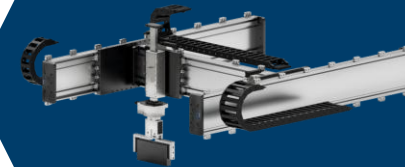
BODY



BATTERY



E-DRIVE



SYSTEMS

1. SCHUNK PRODUCT OVERVIEW

2. APPLICATION SPECIFIC KNOWLEDGE – BATTERY

- JELLY ROLL
- ROUND CELLS
- PRISMATIC
- POUCH CELLS

3. APPLICATION SPECIFIC KNOWLEDGE – E-Drive

- ELECTRIC SHEET
- ASSEMBLY

COMPONENTS

PORTFOLIO



COMPENSATION UNITS

- Screwdriving process
- Joining operation
- Tolerance compensation
- Measuring Stations



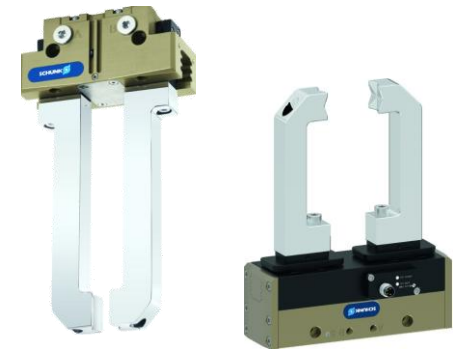
TOOLCHANGER

- Changing of gripping units
- Assembly operations
- Material handling
- Gluing operations
- Palett automation



ZERO-POINT CLAMPING

- Clamping operations
- Transport
- Assembly
- Framing



GRIPPING

- EOA Tools
- Magnetic gripping solutions
- Handling solutions

COMPONENTS

PORTFOLIO



LINEAR UNITS

- High speed assembly
- Transfer solution
- Customized single axis and gantry systems



SWIVEL UNITS

- Index table
- Re orientation
- Assembly



HANDLING ACCESSORIES

- Enhancing automation
- Flexible automation
- Function blocks

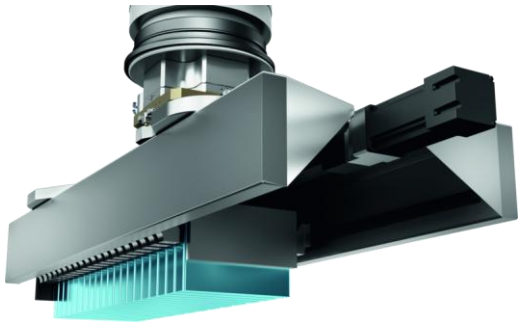


SENSING

- Assembly applications
- Joining
- Mounting applications

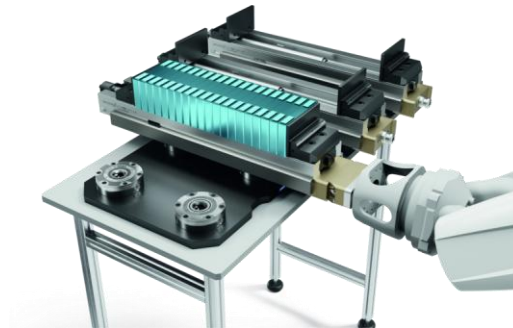
SOLUTIONS

PORTFOLIO



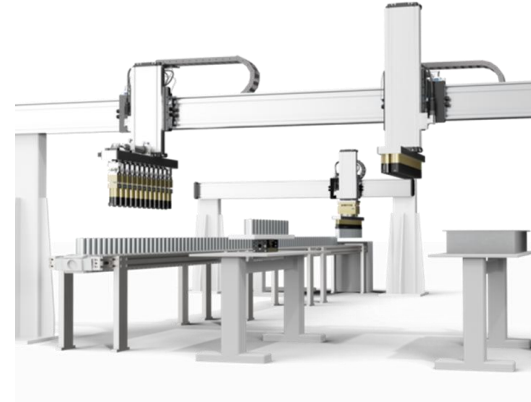
GRIPPING SYSTEMS

- Cells I Modules I Packs
- Stacks I multiple cells
- Pitch Adjustment
- Stacking
- Recycling



STACKING DEVICES

- Robot interfaces
- Position measuring system
- Force control
- RFID Chip
- For length up to 2m



HANDLING SYSTEMS

- Loading applications
- Cleaning I gluing
- Stacking
- Z-folding



SOLUTIONS

- Tray Lifting station
- Unpacking operations
- OCV Test
- Weight check station

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APPLICATION SPECIFIC KNOWLEDGE – BATTERY JELLY ROLL

- Most sensitive part
- Jelly roll must never be moved without being compressed
 - Miss alignment of sheets can produce faulty cells
- Maximum gripping surface during handling
 - Reducing force per mm²
- Focus on cleanliness and material during handling
 - Fingertips with pads to increase friction and prevent damage
- Grippers must be designed according to workpiece carrier



a) Single sheet stacking



b) Z-stacking



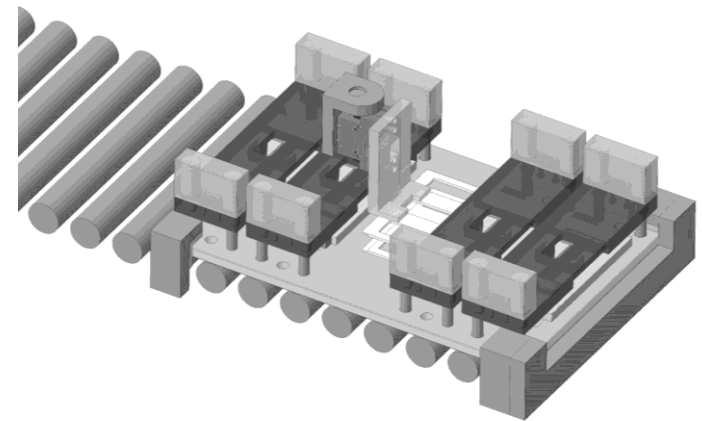
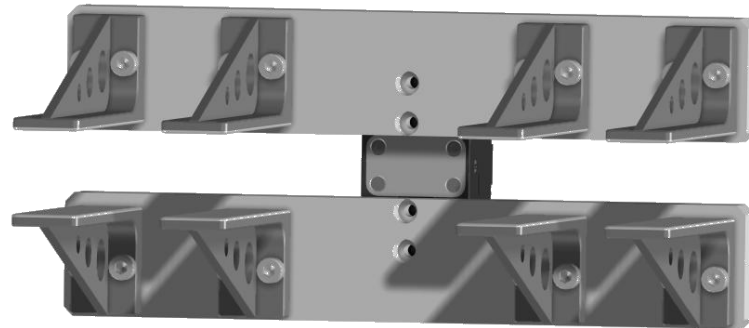
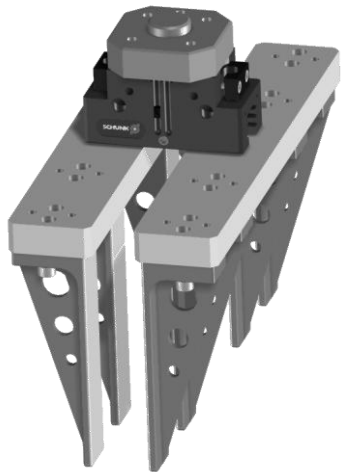
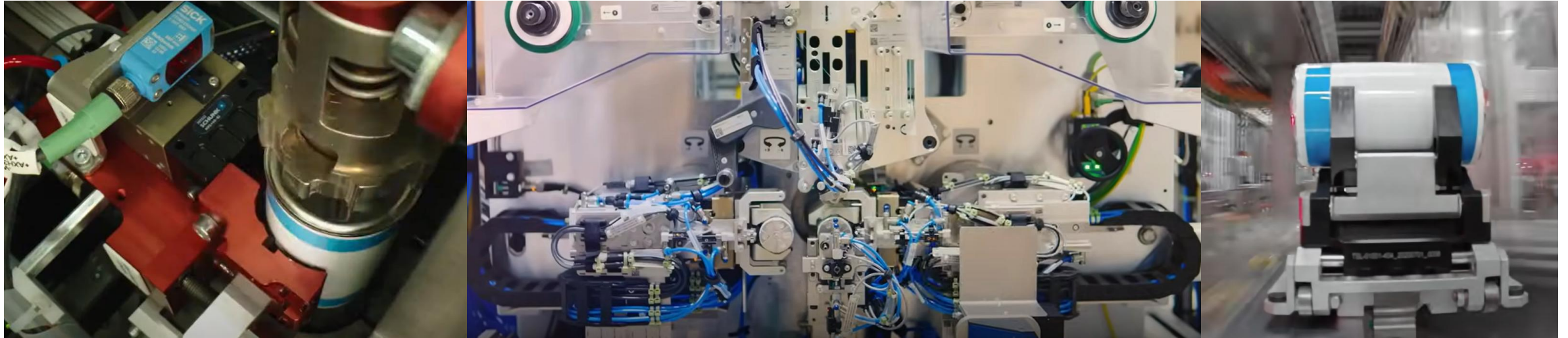
c) Cylindrical winding



d) Prismatic winding



SOLUTIONS



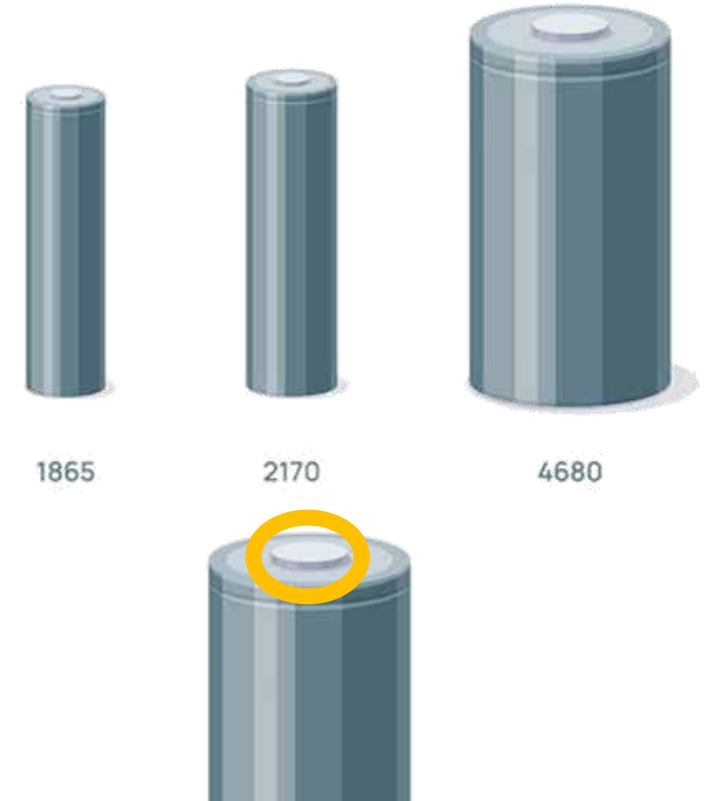
APPLICATION SPECIFIC KNOWLEDGE – BATTERY ROUND CELL

- Name includes diameter and length

46

80

- 1865; 2170; 2680; ...
- Most cells magnetic, magnetic handling solutions preferred
 - Depending on cell design
 - Positive terminal design as well as material can greatly effect the magnetic holding force that can be generated on a cell
 - Must be verified during project via testing
- Aluminum round cell are also on the market
 - SCHUNK has developed a mechanical gripper for tight packaging applications



LUCID



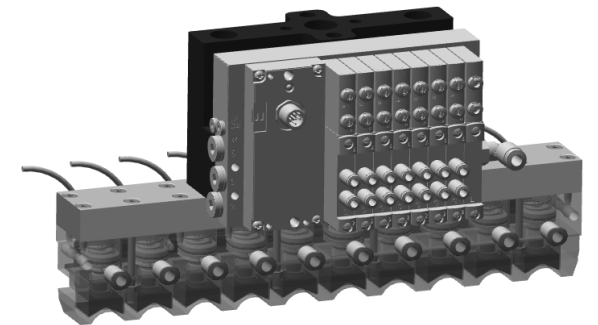
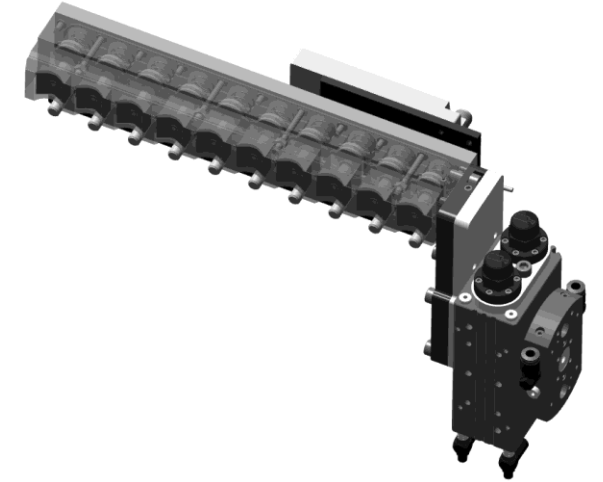
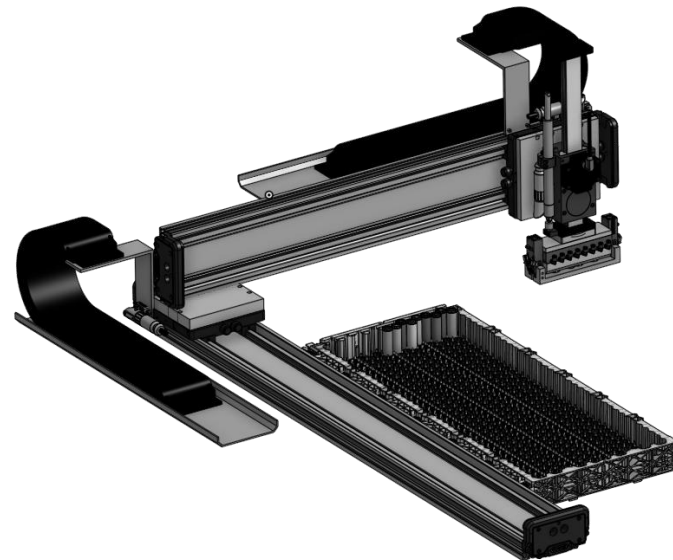
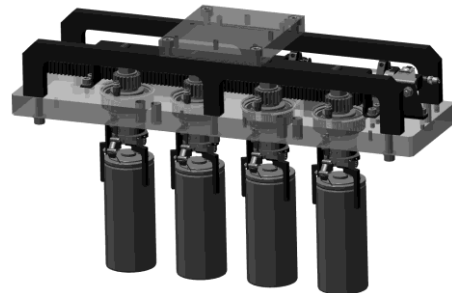
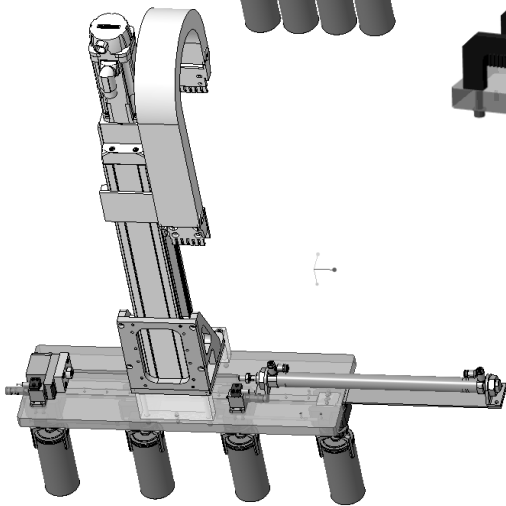
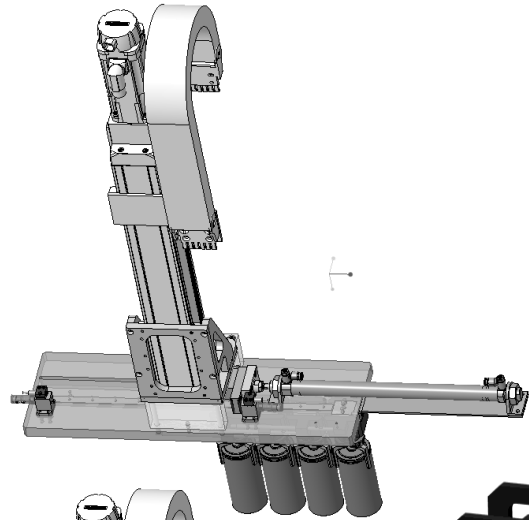
APPLICATION SPECIFIC KNOWLEDGE – BATTERY

ROUND CELL

- Loading & unloading
 - Minimal available space, magnetic solution preferred
- Flipping stations for transport
- Assembly
 - Spacing is often required changing the distance between cells
- Module assembly
 - Cells are either assembled into cell holders or next to cooling tubes
 - Sometimes the mounting logic doesnt allow for space of a mechanical gripper to hold the cell and push it into position
 - Magnetic gripper solution possible
 - Mechanic gripper with ejector possible
- SCHUNK RCG for 46mm round cell
 - Products is more standardized than the smaller diameters

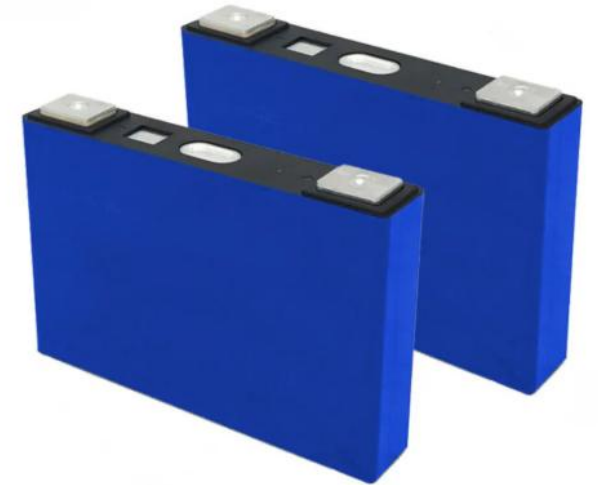


SOLUTIONS

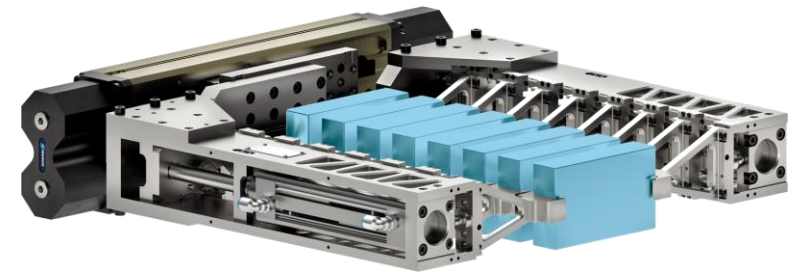
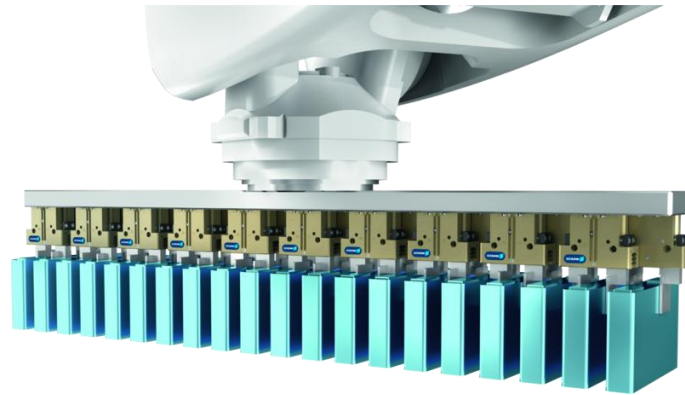
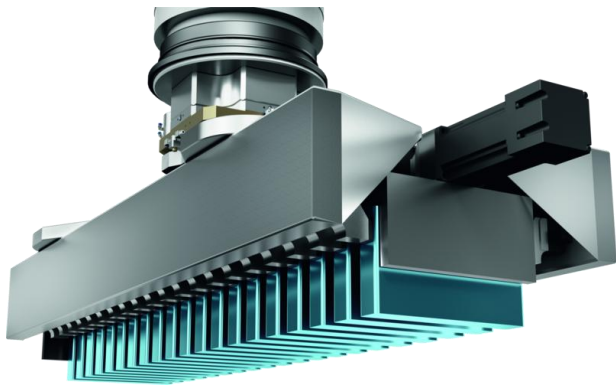
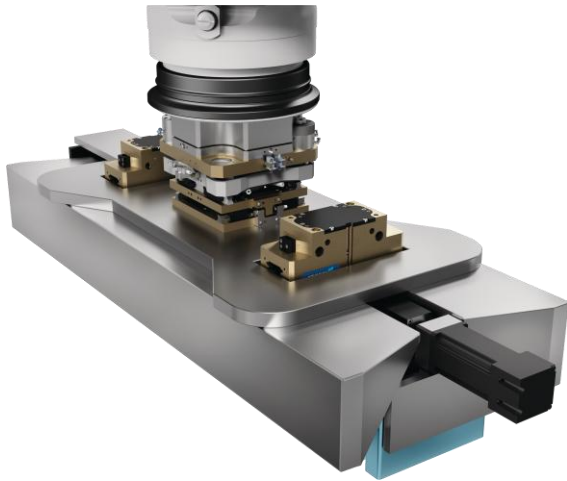


APPLICATION SPECIFIC KNOWLEDGE – BATTERY PRISMATIC CELL

- External force on the cell during assembly must be reduced
 - Coated fingers of gripper allow a reduction of gripping force
 - Too much pressure can destroy the internals of the battery
 - Force must be defined by cell manufacturer
- Spacing applications possible during assembly
- Multi grippers for loading and unloading



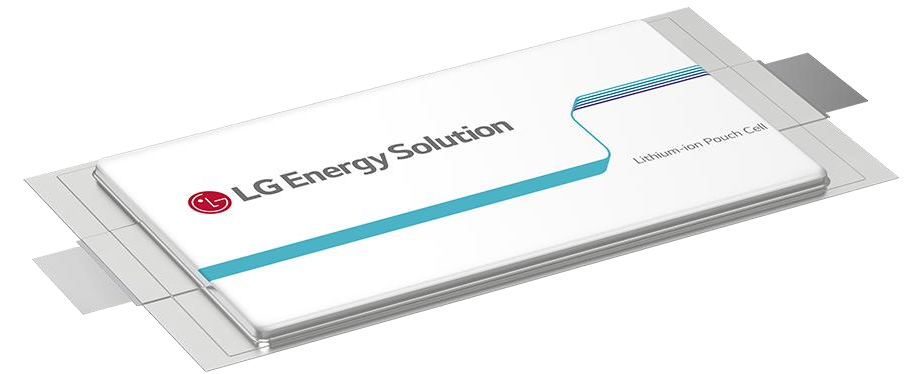
SOLUTIONS



APPLICATION SPECIFIC KNOWLEDGE – BATTERY

POUCH CELL

- Most fragile battery format, currently rarely used in automotive applications
- Gripping units with coated fingers
- Reduction of gripping force per mm²
- Handling via Vacuum grippers also possible
- Might regain popularity if the development of solid state batteries makes them viable

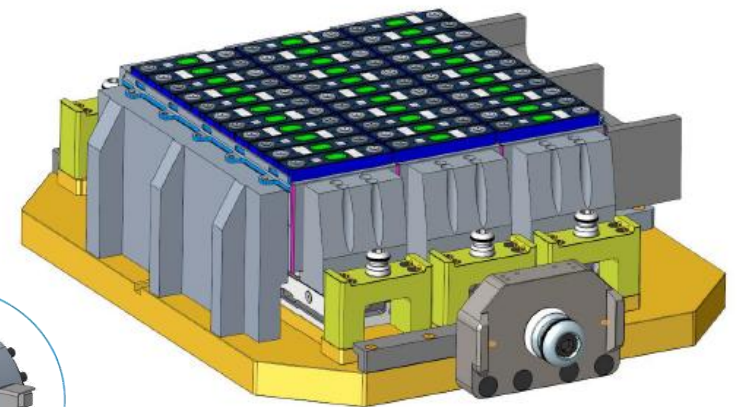
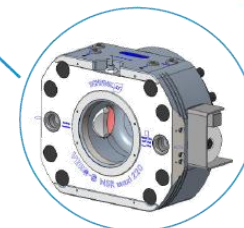
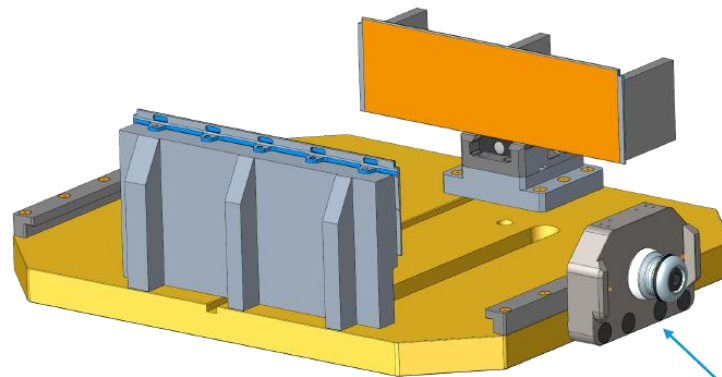
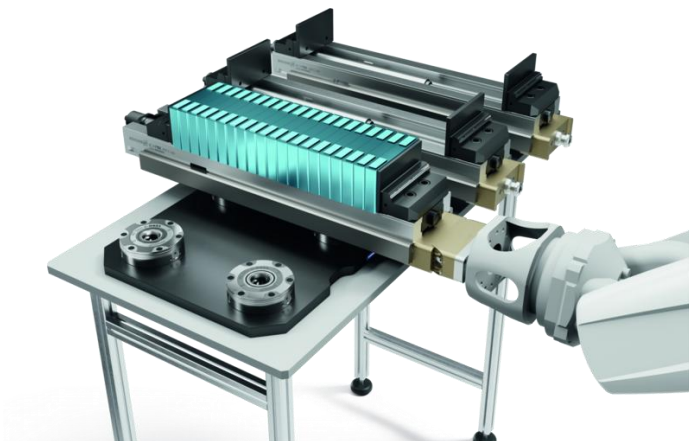
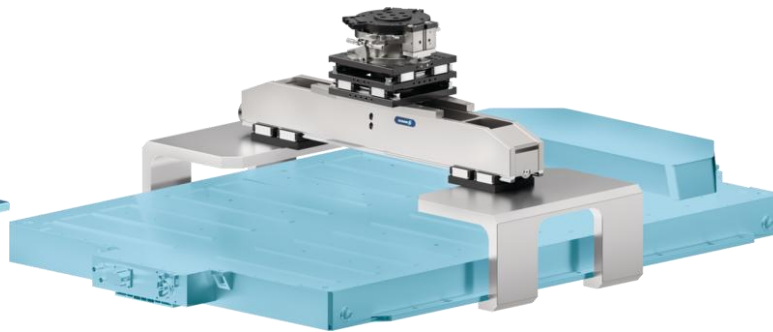
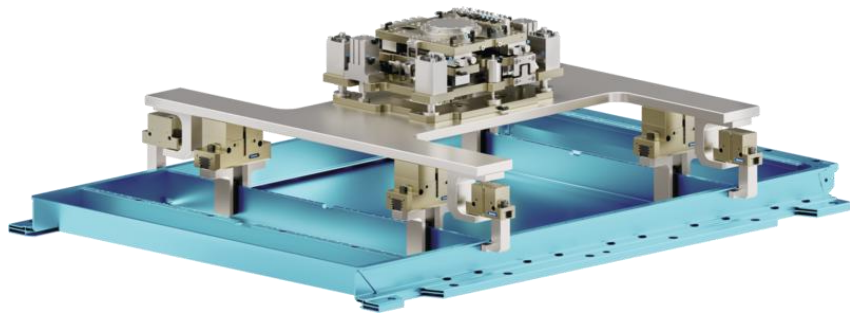


APPLICATION SPECIFIC KNOWLEDGE – BATTERY MODULE & PACK

- High weight parts 100kg – 1200kg
- Handling and assembly tasks
- Compression solutions for prismatic cells
- Screw driving and dispensing
- EOL-Test application



SOLUTIONS



1. SCHUNK PRODUCT OVERVIEW

2. APPLICATION SPECIFIC KNOWLEDGE – BATTERY

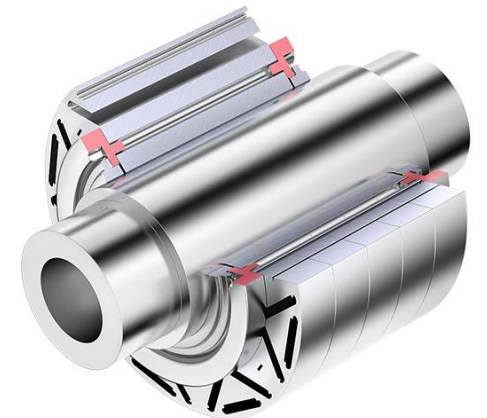
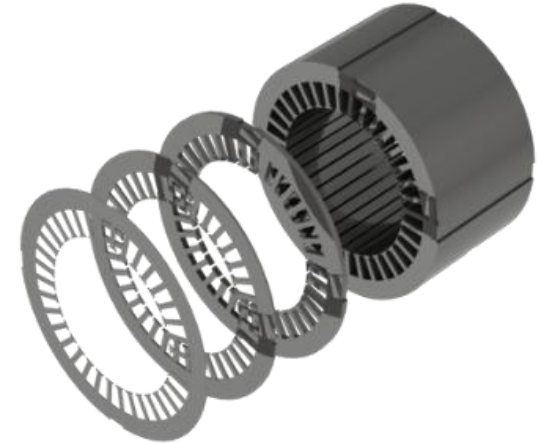
- JELLY ROLL
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3. APPLICATION SPECIFIC KNOWLEDGE – E-Drive

- ELECTRIC SHEET
- ASSEMBLY

APPLICATION SPECIFIC KNOWLEDGE – E-Drive ELECTRIC SHEET & ROTOR

- Necessary to reduce force per mm² to prevent delamination
- Increasing of friction level
- High temperature applications possible

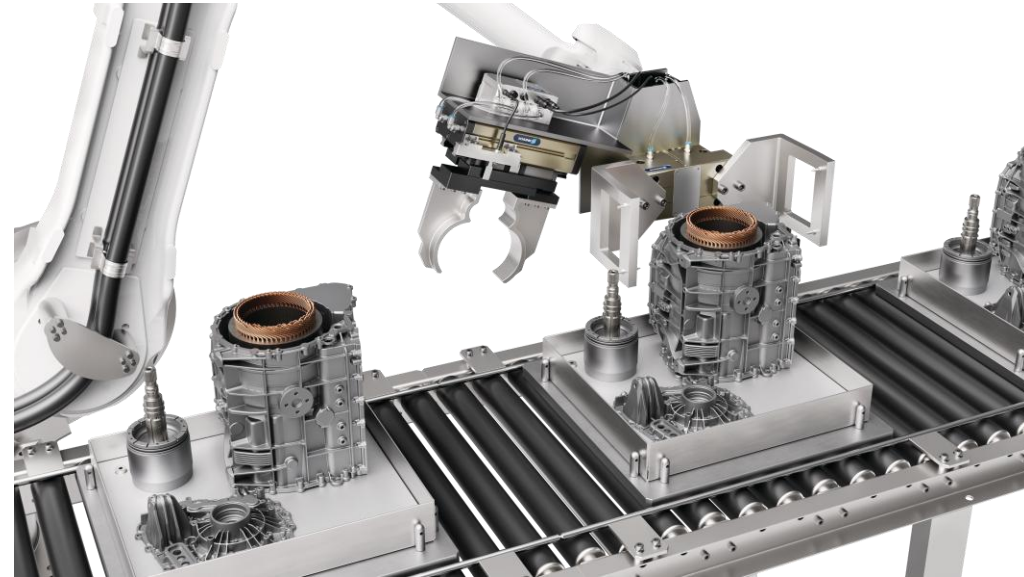


SOLUTIONS

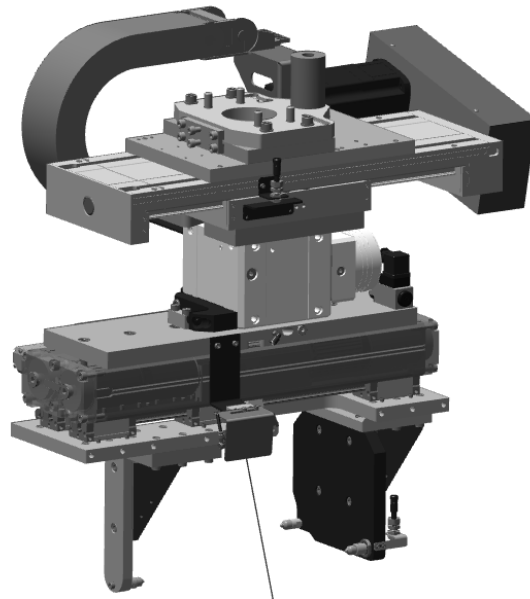
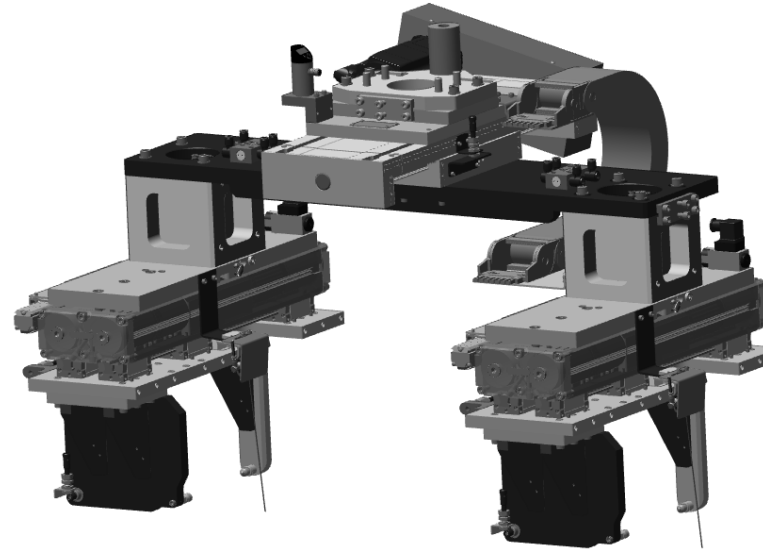
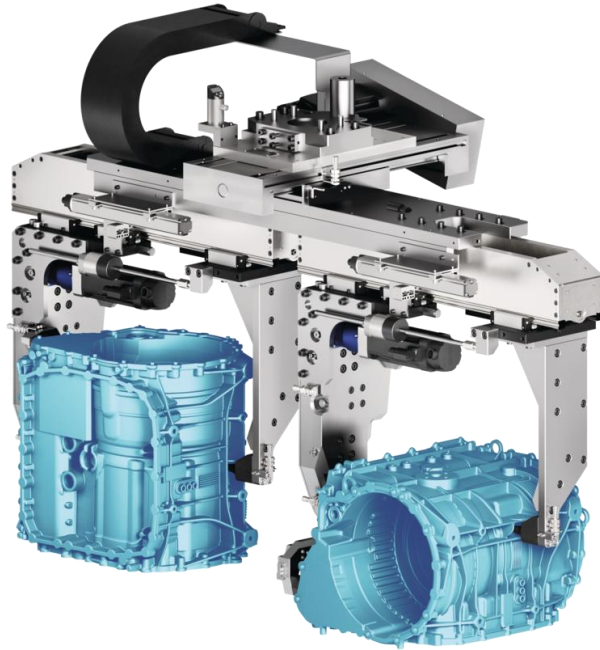


APPLICATION SPECIFIC KNOWLEDGE – E-Drive ASSEMBLY

- Higher load applications
- High temperature environment during joining of stator and housing
- Compensation unit for joining applications
- Possible applications for workpiece carriers and pallet changing systems



SOLUTIONS



1. SPECIAL SOLUTION – REQUIRED INPUT

- SPACER
- MULTI GRIPPER
- COMPENSATION UNITS
- GANTRY SYSTEMS
- HANDLING
- COMPRESSION SOLUTION

SPACING SOLUTIONS

PRICE INDICATION



- Workpiece
 - Weight
 - Dimension
- Spacing
 - Pick-up spacing
 - Drop-of spacing
 - Number of parts
 - Number of different spacings positions
- Activation of spacing
 - Electric
 - Pneumatic
- Handling
 - Acceleration
 - Orientation

MAGNETIC GRIPPING

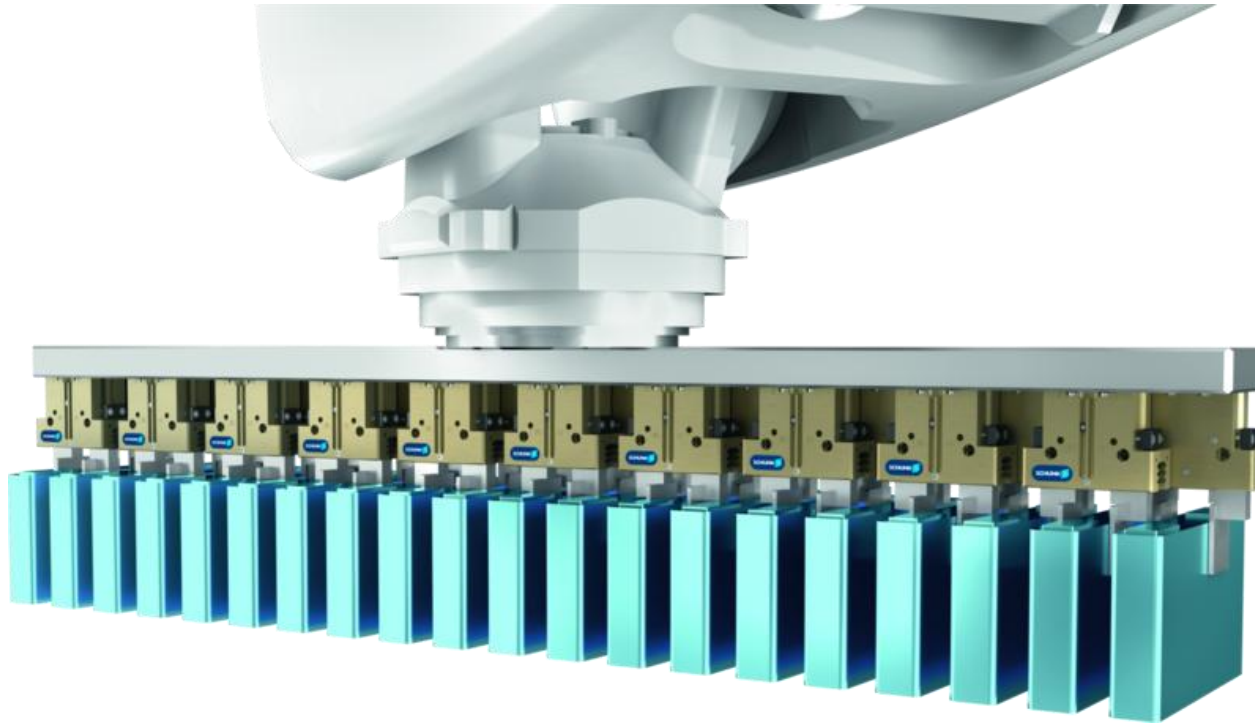
PRICE INDICATION



- Workpiece
 - Weight
 - Dimension
 - Material
 - Cell design
- Spacing
 - Pick-up spacing
- Activation
 - Single piston
 - All at the same time
- Handling
 - Acceleration
 - Orientation during movement

MULTI GRIPPERS

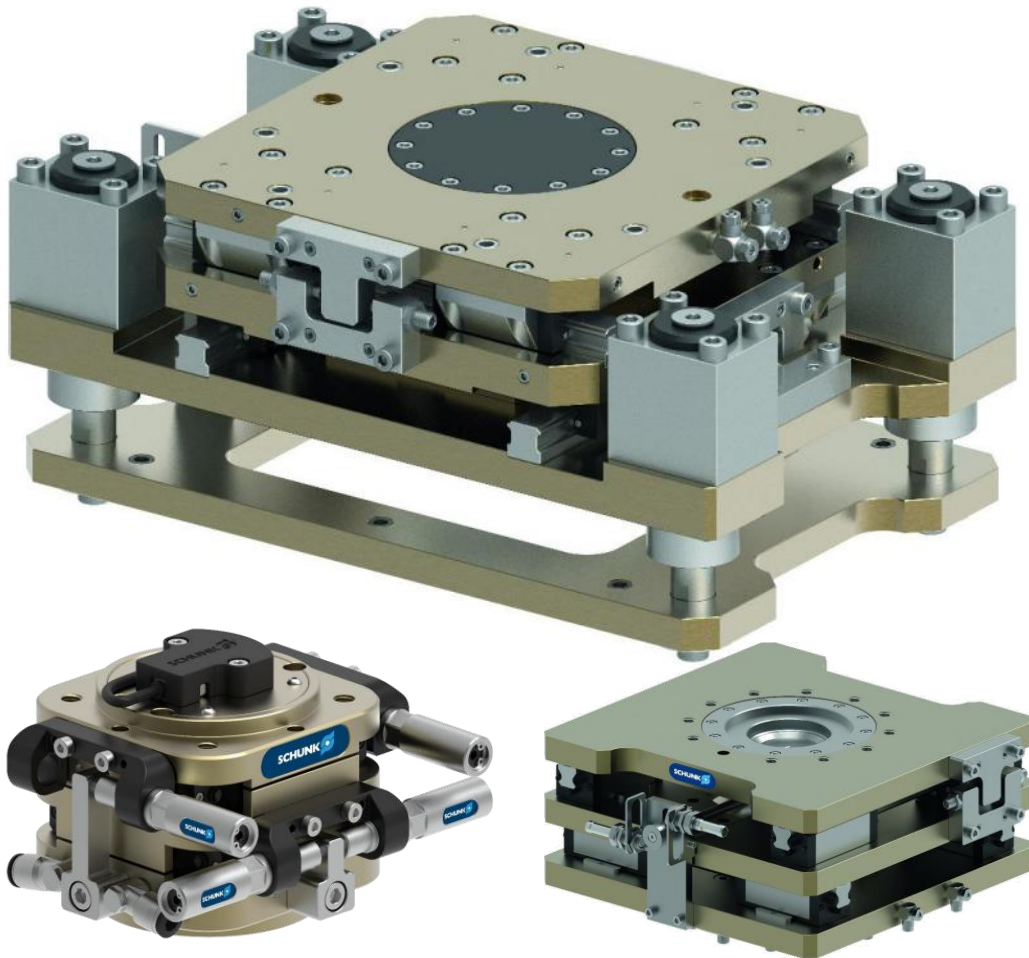
PRICE INDICATION



- Workpiece
 - Weight
 - Dimension
- Spacing of parts
- Number of parts
- Tolerancing part/blister
 - Optional requirements for compensation unit or centering function
- Gripping surface
 - centering function
- Handling
 - Acceleration
 - Orientation

COMPENSATION UNITS

PRICE INDICATION



- Workpiece weight
- Tooling weight
- Center of gravity
- Pick-up position
 - Locked/unlocked during task
- Drop-off position
 - Locked/unlocked during task
- Handling
 - Acceleration
 - Orientation

SEE AVAILABLE CHECKLIST ON STB

GANTRY SYSTEMS

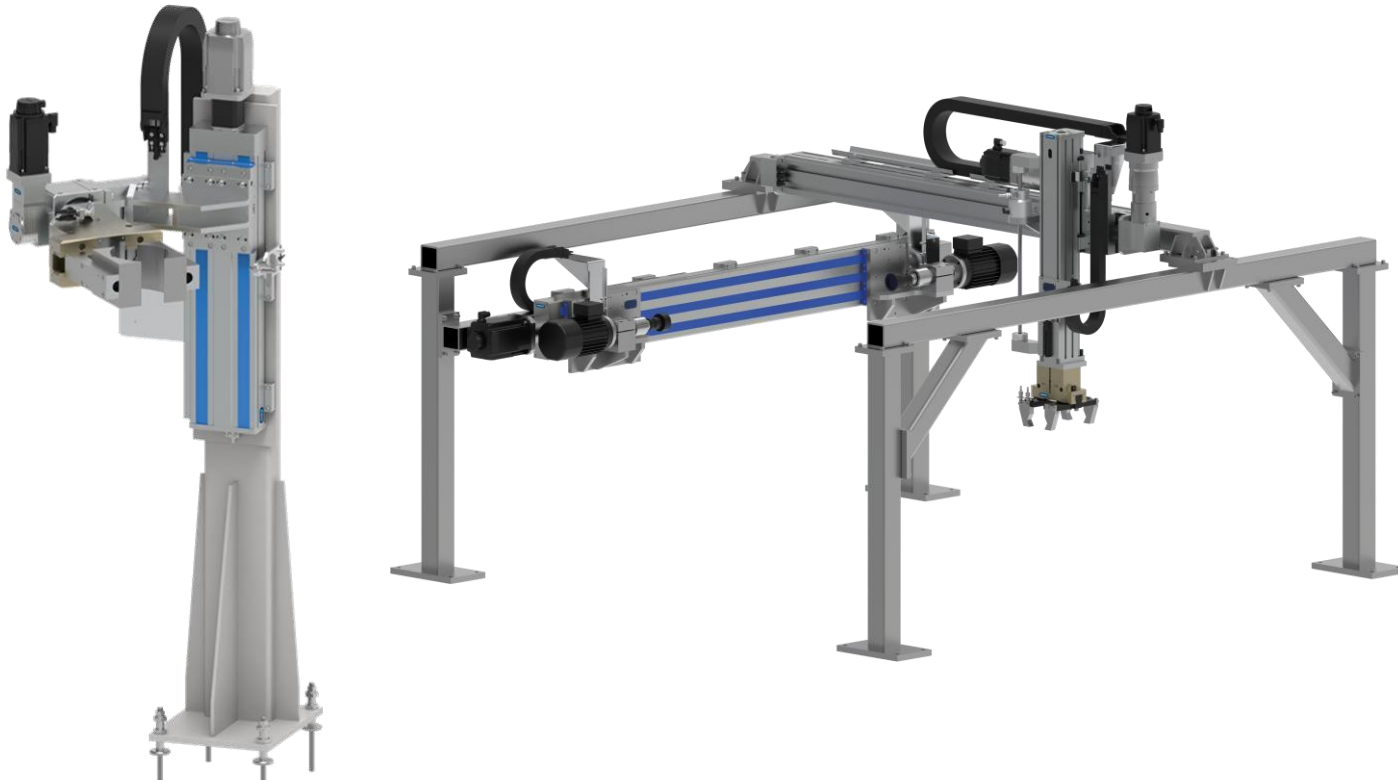
PRICE INDICATION



- Workpiece weight
 - Optional COG
- Cycle time
 - Move sequence if available
- Stroke requirements
 - X
 - Y
 - Z
- Accuracy requirement

HANDLING

PRICE INDICATION



- Workpiece
 - COG (optional)
 - Weight
- Cycle time
 - Sequence description
- Required motor drive
- Accuracy requirements
- Dimension of station
- Connection interface



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