

**stein® | link**



**PRODUCT TRANSPORT.**  
**Smart, simple and fast...**

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FOR OVER

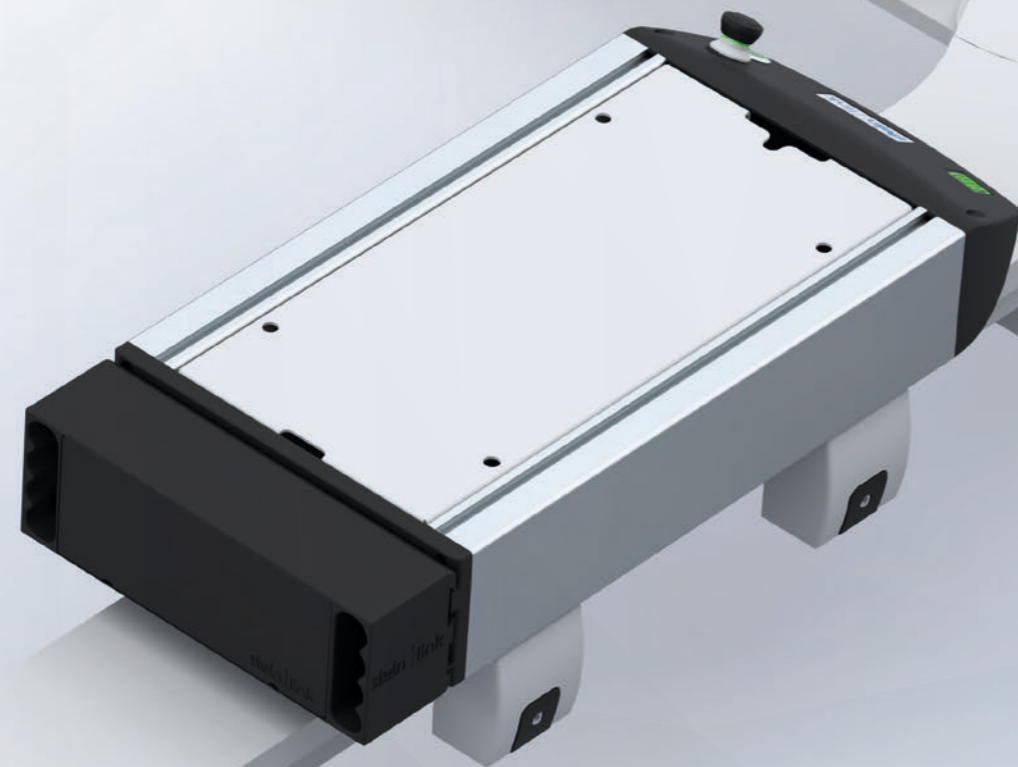
# 30 YEARS

EXPERTS IN ASSEMBLY LOGISTICS!

How can transfer technology best support the manufacturing process? This question has been at the forefront of STEIN's thinking ever since the development of the first transfer system in the early 1990s. Through thousands of customer projects over the decades, we have become true masters of transfer technology and assembly logistics. We always put ourselves in our customers' shoes and have designed our systems so that they can be adapted perfectly, easily and quickly to the individual requirements of each and every customer.

It was this customer focus that led to the development of STEIN link®. Our decades of practical experience have taught us that automation needs in production do not end at the assembly line, but that the upstream and downstream transport tasks also offer significant potential for improving efficiency. This is precisely why STEIN Automation developed the STEIN link® system. The missing link in automation, from the warehouse through production to the dispatch of the finished product.

Thanks to the experience we have gained on-site with our customers, we know what they expect from a system like STEIN link® and have thus succeeded in developing a product that uniquely combines intralogistics requirements with assembly processes.





## PRODUCT TRANSPORT. SMART, SIMPLE AND FAST...

### THE STEIN LINK® SHUTTLE

At the heart of the system are the STEIN link® shuttles. They transport your product gently and reliably to its destination. You have complete freedom to choose what and how you wish to transport it – directly on the shuttle, on a workpiece carrier or in transport boxes. Two T-slots on the shuttle provide the ideal way to secure your product holder. An integrated 24 V power supply on the shuttle also allows active accessories, such as a conveyor belt or a tilting unit, to provide additional functionality.

Because the shuttle fully encloses the track profile, even off-centre loads do not throw it off balance. The shuttle thus transports up to 80 kg of payload safely to its destination. The integrated sensor reliably detects obstacles in front of the shuttle, ensuring it can always brake and stop safely. This enables safe routes and smooth transport.

### BATTERY-POWERED

Every STEIN link® shuttle is equipped with a rechargeable battery, which powers the shuttle. Thanks to an intelligent battery management system, the charge status of all shuttles in the system is constantly monitored, ensuring that the shuttles head to the battery exchange station in good time.

The battery change itself can be carried out manually or automatically, depending on customer requirements.

As the battery is replaced quickly, the charging time has no impact on the cycle time of the overall system.



### SIMPLE TRACK FOR LONG DISTANCES

As the system uses swappable batteries, no power supply is required for the track, making it particularly simple and cost-effective to service. The simple track design makes it possible to cover long distances efficiently and keeps the system extremely low maintenance. Furthermore, it makes it much easier to install the track on the floor, ceiling or wall.

Extremely low friction coefficients and a flat, even track surface make the STEIN link® system low-wear, clean and easy to maintain. The slim design offers plenty of legroom at manual workstations and a space-saving, tidy layout.

### FLEXIBLE AND EASILY ADAPTABLE

The entire STEIN link® system is designed so that it can be easily adapted to changing conditions. The purely mechanical track can be extended or modified with minimal effort. Corners and track switches can be swapped one-to-one thanks to identical external dimensions. Changes in the required transport volume can be achieved by adding or removing shuttles. STEIN link® thus offers you maximum flexibility for your transport requirements.

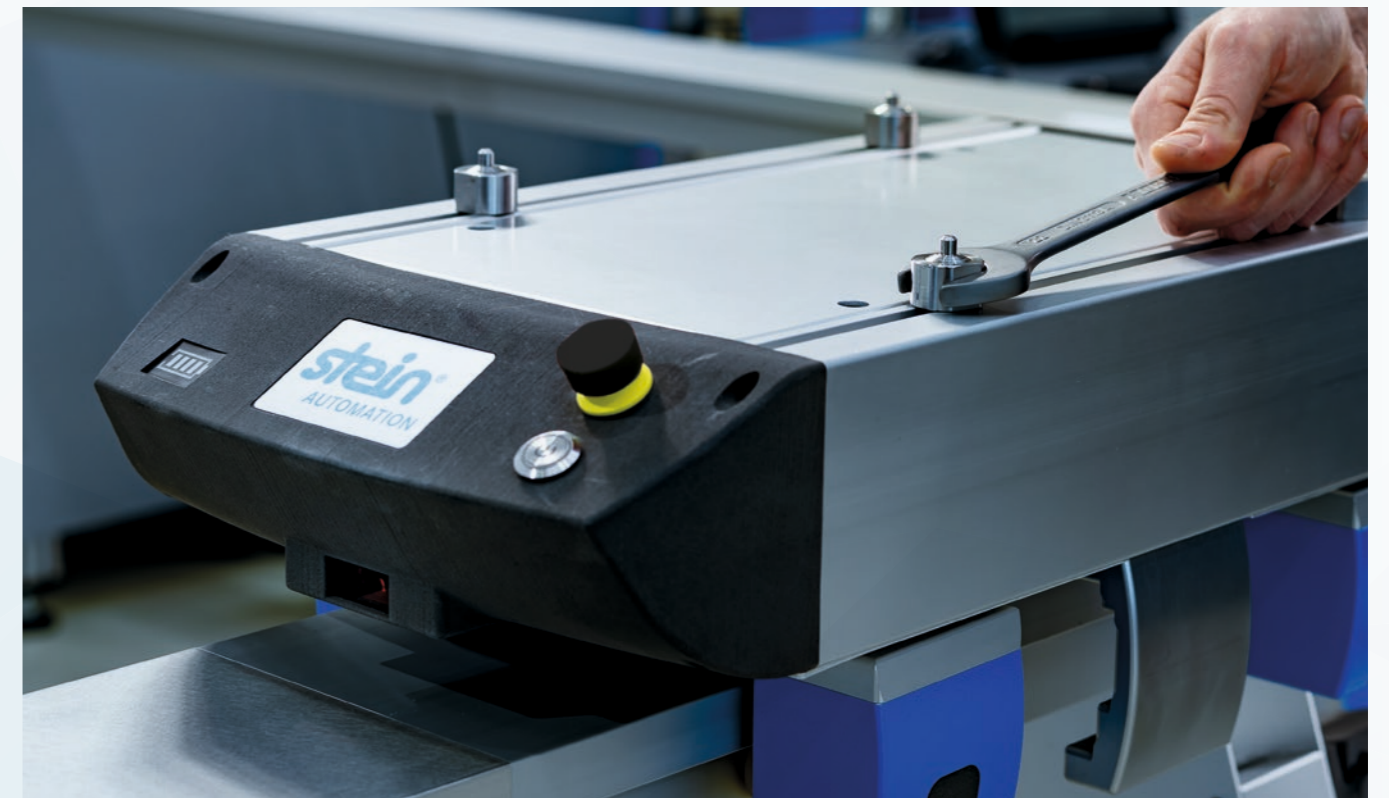
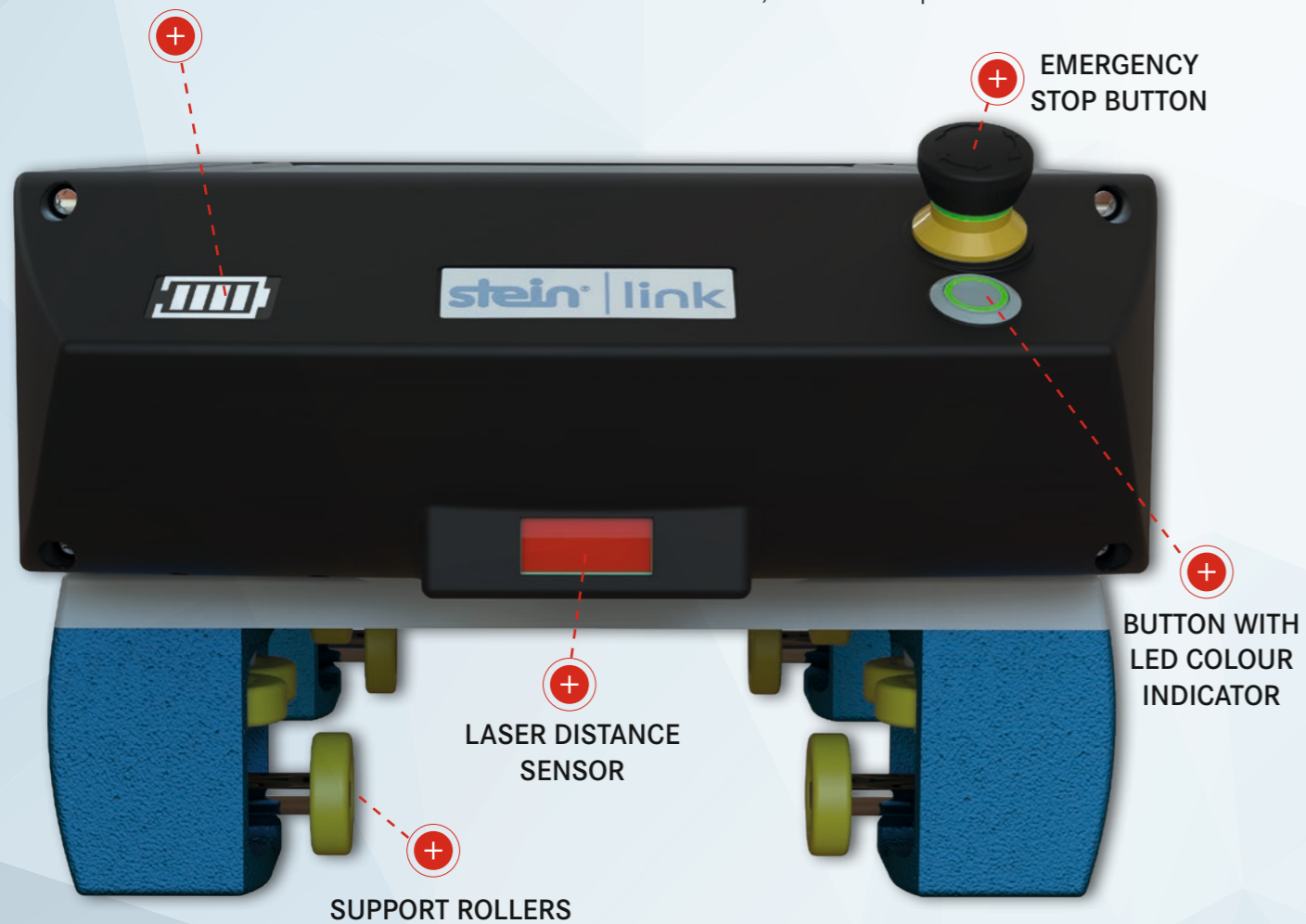
### The advantages of STEIN link®:

- Cost-effective transport from A to B
- No cabling along the route, very simple installation
- Flexibility: simply add shuttles for higher output
- Stable and collision-free transport
- Transport over long distances – on the floor, under the ceiling or even on the wall
- Combines intralogistics and assembly processes in a single solution
- Fully automated battery management
- Intelligent routing, programmable schedules and order management
- Can be combined with STEIN transfer systems

## SHUTTLE – THE HEART OF THE SYSTEM.

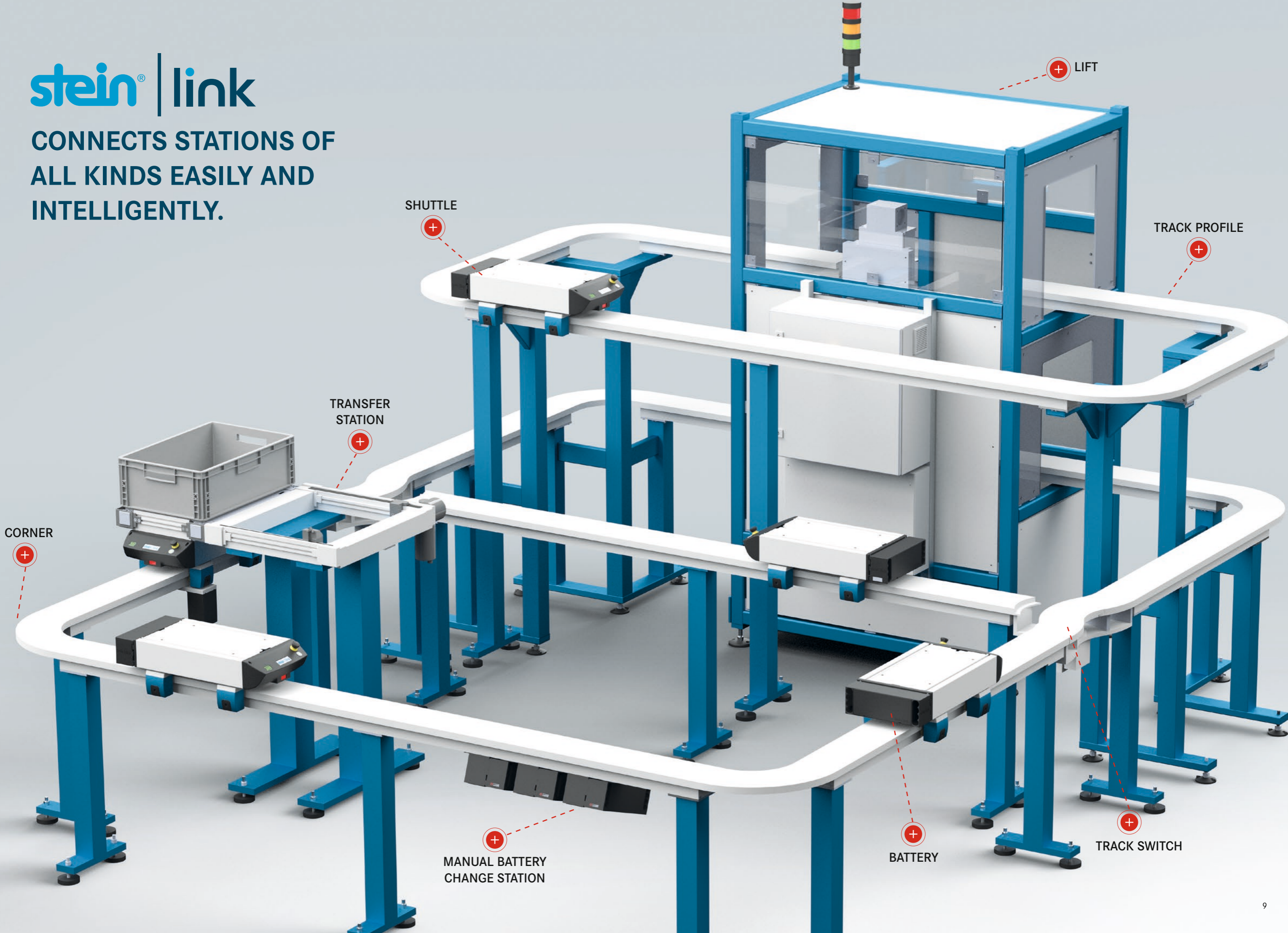
- 80 kg (176 lbs) payload per shuttle
- Up to 50 m/min transport speed
- Material transport
  - directly on the shuttle (2 T-slots for mounting)
  - on a workpiece carrier
  - or in transport boxes (e.g. bulk goods)
  - the goods may protrude
- Each shuttle is equipped with an intelligent distance measurement system:
  - Distance measurement is carried out using a built-in Class 1 laser
  - Several different safety distances can be easily configured
- Shuttle dimensions L x W x H: 647 (25.5") x 292 (11.5") x 201.5 mm (7.9") (H: lower edge of profile to upper edge of shuttle without emergency-stop!)
- 24 V/2.5 A power supply and digital I/Os on the shuttle available for active accessories (e.g. conveyor belt, tipping unit, power supply for products)
- Battery level indicator on the front of the shuttle and directly on the battery
- Emergency stop button
- Shuttle status indicator via colour LED flashing codes
- Reverse movement is possible to a limited extent:
  - Only on branch lines
  - Only one shuttle per authorised section of track permitted
  - At times, with reduced speed

### BATTERY LEVEL INDICATOR



# stein® | link

CONNECTS STATIONS OF ALL KINDS EASILY AND INTELLIGENTLY.



LIFT

SHUTTLE

TRACK PROFILE

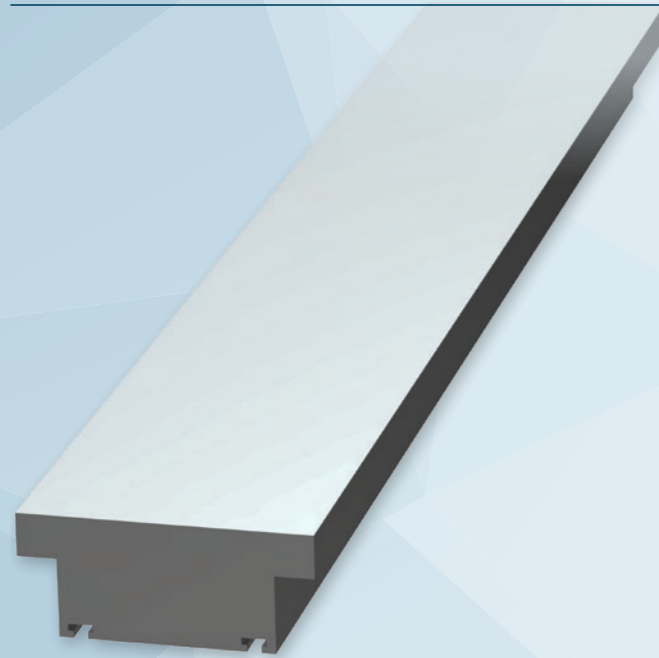
TRANSFER STATION

CORNER

MANUAL BATTERY CHANGE STATION

BATTERY

TRACK SWITCH



### TRACK PROFILE

- Extruded aluminium profile:
  - T-shape: The shuttle is stable, even with off-centre weight
- Dimensions:
  - Width 164 mm (6.5") x Height 70 mm (2.8")
  - Max. element length: 5,000 mm (197")
  - The section height is freely scalable
- Ceiling or wall mounting possible (in combination with the STEIN Lift)
- No obstructions beneath the track – maximum legroom at manual workstations
- Easy to clean, as the top surface is completely enclosed
- Accessories can be mounted on the continuous T-slots on the underside of the track



90° angle



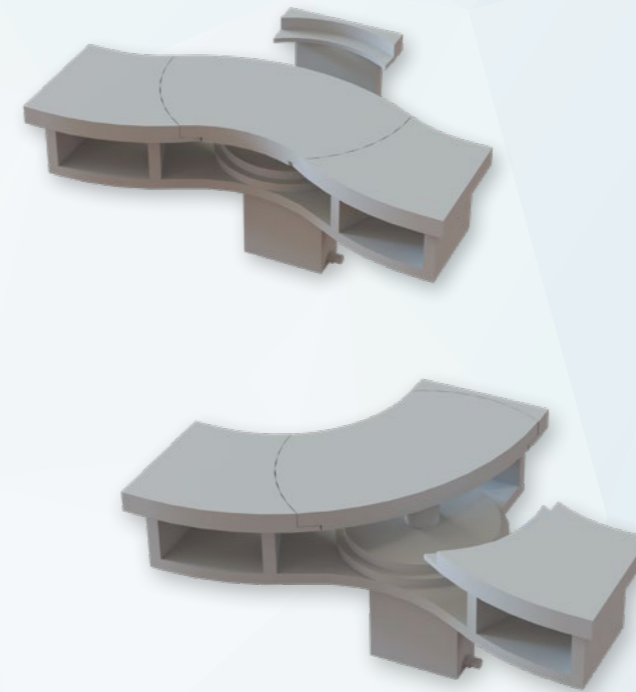
60° angle



45° angle

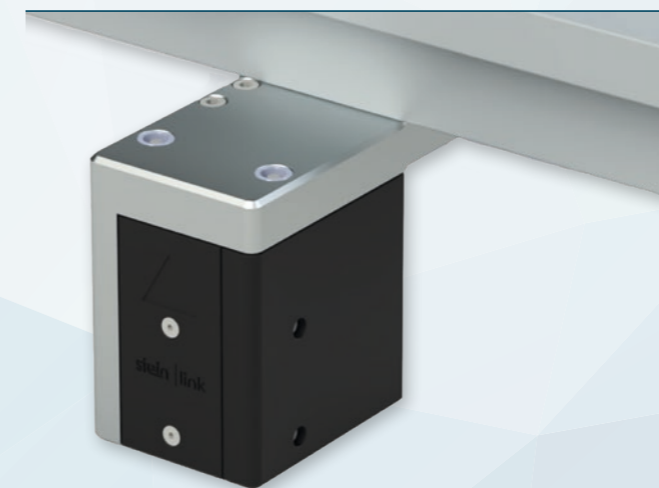
### CORNER

- Radius: 250 mm (9.8")
- Purely mechanical – no electronics
- Standard angle: 90°
  - A 180° corner can easily be achieved by joining two corners together
  - Custom angles are available
- Simple installation, requires only a few screws
- Fully interchangeable with other components, such as a track switch or rotary unit



### TRACK SWITCH

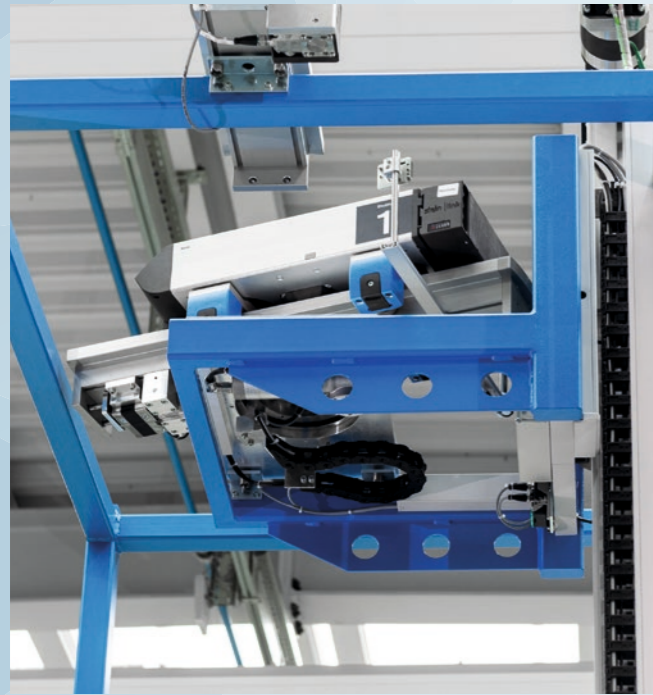
- Entry and exit onto and from the track
  - Splitting from one track to two
  - Collecting from two tracks to one
- Radius: 250 mm (9.8")
- Active component: the track switch requires a STEIN Control Box for control, communication and power supply
- The broker allows software-based configuration whether it is a splitter or a collector
- When rotating, the motor current is limited to prevent injury. Similar function to that of a car window or tailgate



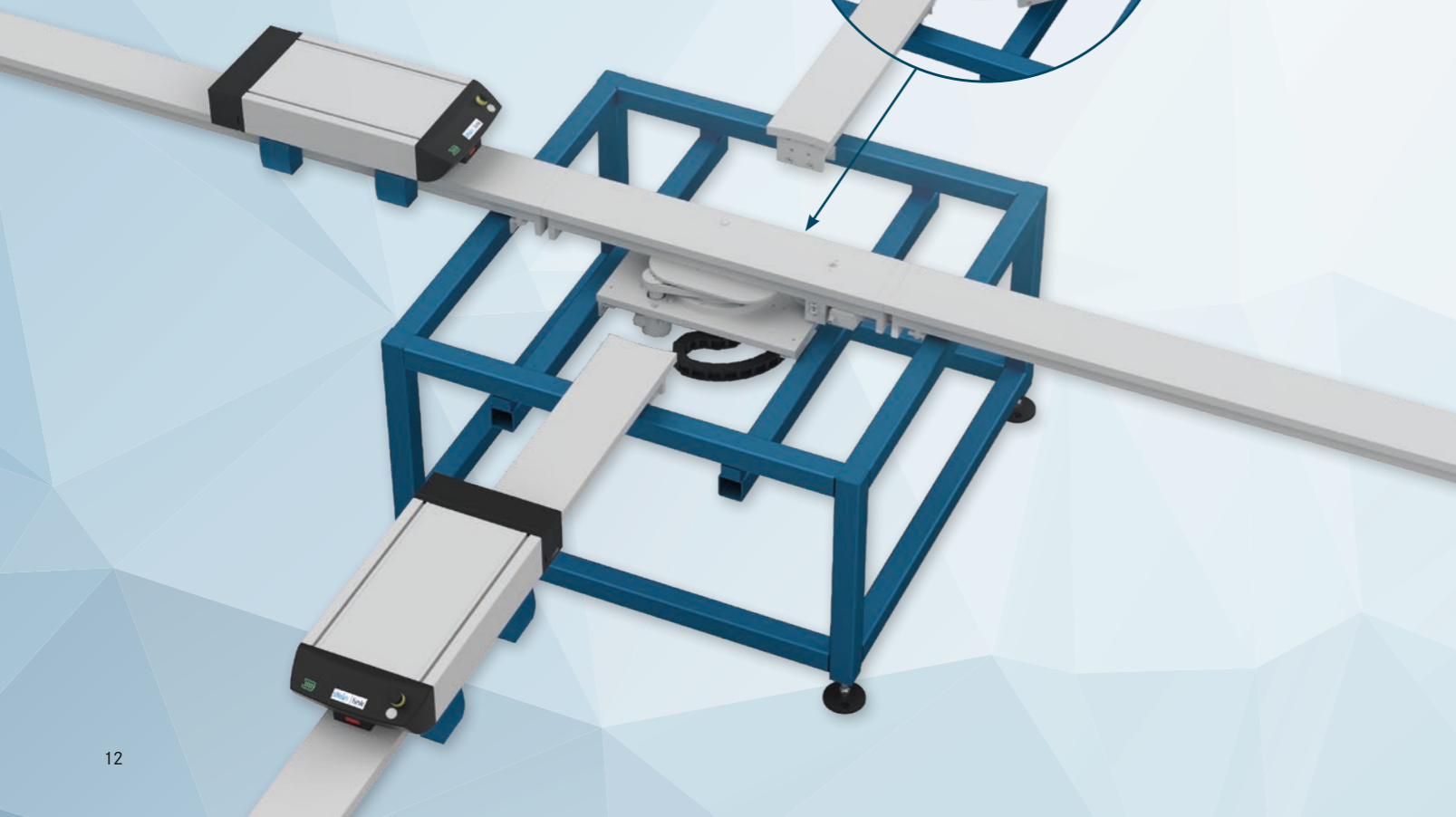
### LOCKING UNIT

- Locking Unit for the shuttle, e.g. at manual workstations
- Positioning accuracy from +/- 0.5 mm
- Positioning accuracy of +/- 3 mm with a payload of up to 80 kg
- The locking unit is an active component and requires a STEIN Control Box for control, communication and power supply

## TURNING UNIT

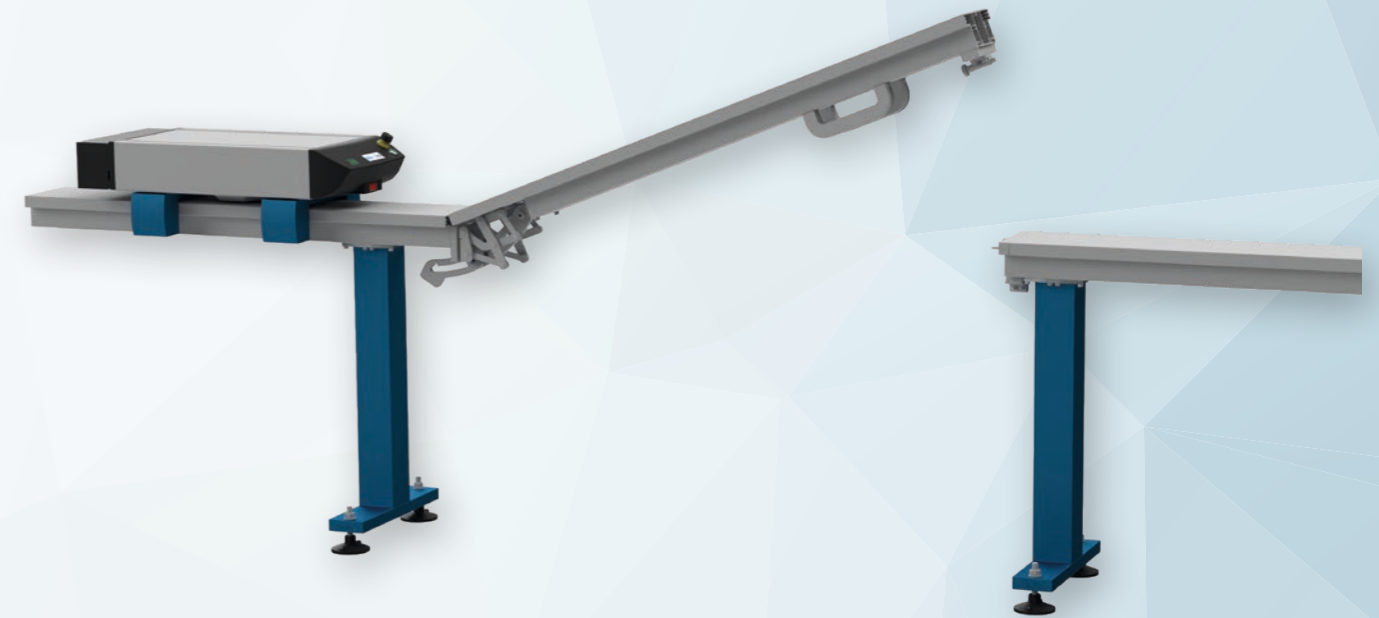


- The turning unit enables shuttles to enter from any direction and to continue moving flexibly to continue in any desired direction
- The turning unit enables reverse operation
- This component enables the shuttles to change direction
- Active component: the turning unit requires a STEIN Control Box for control, communication and power supply



## GATE ELEMENT

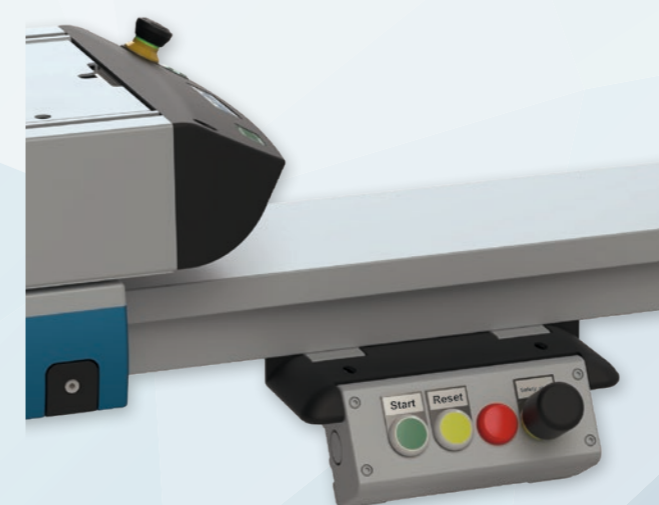
- To improve accessibility, individual sections of the track can be designed to be foldable
- As a passive component: The track is unfolded against the direction of travel. The distance sensor on the shuttle detects the rail and stops automatically
- As an active component: The shuttle stops in response to a control command. The gate element is then authorised to open



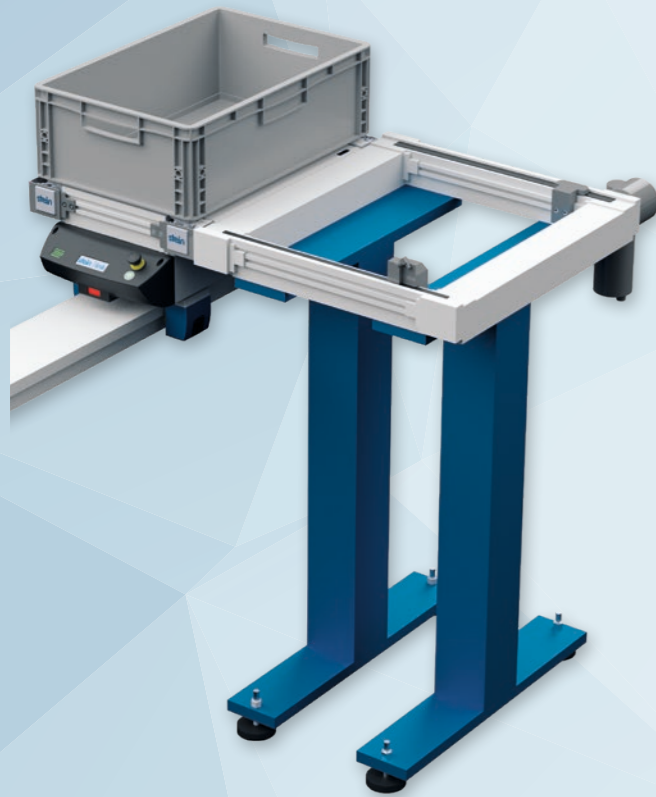
## CONTROL PANEL

The main control panel is an active component and is always connected to a STEIN Control Box. It can be used to start, stop and reset the entire system. In addition, the Safety Stop sends a stop signal to all shuttles, immediately bringing them to a halt.

- **Start:** Starts the system; the button then lights up
- **Reset:** Acknowledges faults; the button flashes yellow when a fault is active
- **Stop:** Shuttles stop at the next RFID unit; the button then lights up
- **Safety-Stop:** All shuttles stop immediately; the Stop button flashes



## TRANSFER STATION



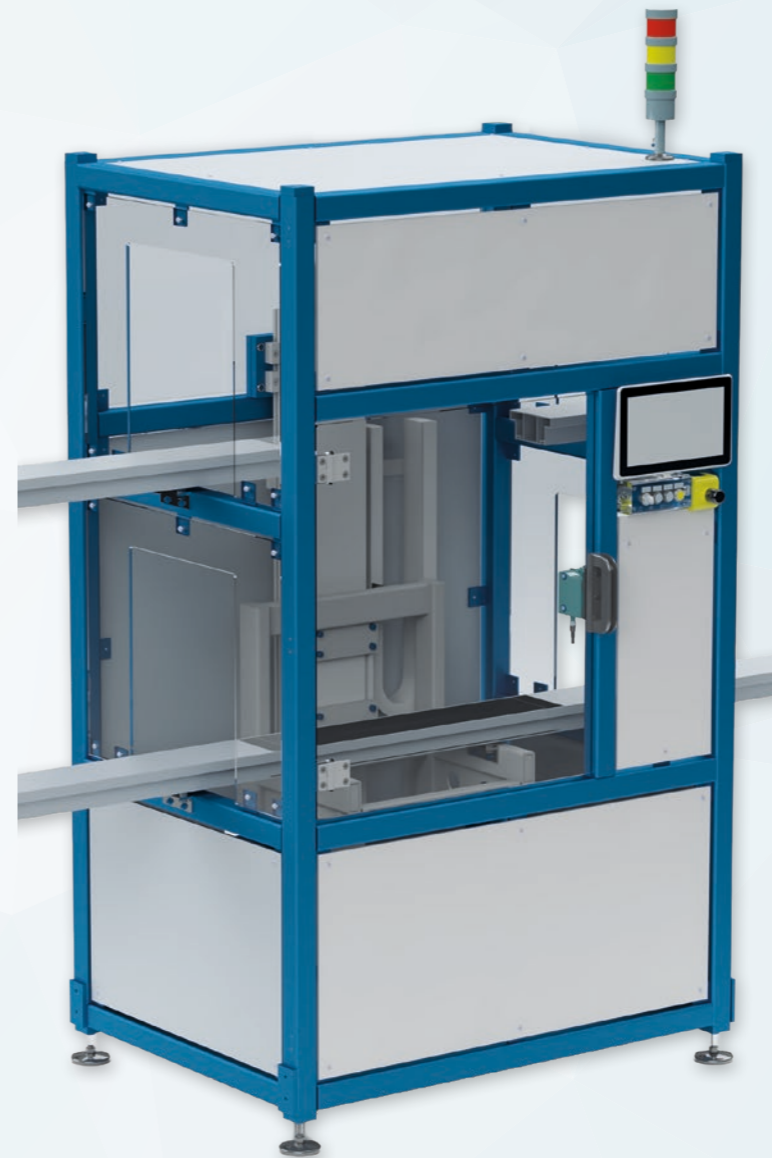
- Option to transfer from the shuttle to an existing system or vice versa
- Transfer of a workpiece carrier from the shuttle to a conveyor system or vice versa
- Transfer of a KLT from the shuttle to a rack or vice versa
- Combination of STEIN link® with STEIN 300, STEIN 300e or STEIN 400, or vice versa
- Any conveyor system (24 V) can be integrated onto the shuttle
- Active component: the transfer station requires a STEIN Control Box for control, communication and power supply

## SYSTEM COMPUTER



- Available in two versions
- As a PC in a lockable cabinet with monitor and keyboard
- As an all-in-one unit mounted on the stand base via a support arm

## LIFT - ACTIVE COMPONENT



- Modular design: Instead of the Conveyor element, the Link track profile can be integrated into the standard STEIN Lift
- Transports shuttles from one transport level to another, e.g. for transport beneath the ceiling. The height is individually adjustable
- The lift is treated as a stand-alone machine
- Intelligent sequence control integrated into the lift
- Communication with the broker via MQTT
- Installation of a turntable, track switch and a corner is possible
- Bulkheads and tunnels still available
- Proven and space-saving STEIN technology
- Up to three entry and exit directions possible
- Service door always included in the design





## MANUAL

- Can be mounted directly on the underside of the track
- The number of charging points is individually adapted to the number of batteries required
- Easy removal and insertion of the battery with just one hand
- Power supply: One integrated power supply unit per charging bay
  - Where there are few charging bays: Each charging bay is connected individually via a bare plug to a 230 V Schuko extension socket
  - For many charging bays: Depending on customer requirements, it may make sense to use a small control cabinet and wire the charging bays to it.

### The advantages of a replaceable battery for power supply:

- The shuttle is independent of a charging station
- Quick & easy battery replacement
- Charging time has no impact on cycle time
- Low-maintenance power supply
- Reduced installation effort (no cabling)




## AUTOMATIC

- Automated replacement of the shuttle battery using a robot
- At the stop position, the robot remove and inserts a fully charged battery from one of the charging bays into the shuttle

- Particularly recommended when there are a large number of shuttles on the route

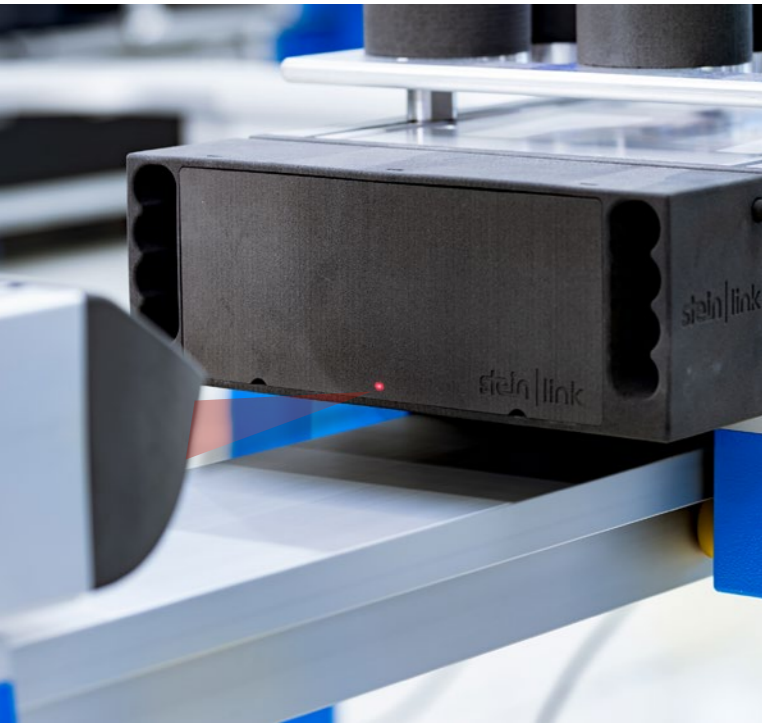


Charge level indicator 

## BATTERY

- 7S2P Li-ion battery pack (25.41 V / 9.8 Ah / 249 Wh)
- Charge level indicator on the shuttle and via the central control unit
- Integrated battery management:
  - Charging status is constantly monitored centrally
  - The shuttle is guided to the battery exchange station in good time
- Battery runtime is over 8 hours:
  - The exact battery runtime depends on the load, speed and layout of the system. This must be determined on a case-by-case basis
  - When the battery is fully charged, the shuttle can up to 14 days in standby mode.

# stein® | link - CONTROL AND COMMUNICATION



## CENTRAL CONTROL AND COMMUNICATION

- All STEIN link® shuttles and other active system components communicate with the central, PC-based control software via their own internal network
- The control software acts as the heart of the system and manages:
  - The routes of all shuttles
  - Travel orders
  - Current statuses of all active components
- Journey order-based control with communication via OPC UA
- Each shuttle can be selected individually in the software
- Possible functions per shuttle:
  - Status query
  - Configuration
  - Activation or switching to sleep mode
- Examples of configurable parameters:
  - Distance sensor ranges
  - Maximum speed
- Connection to higher-level systems (e.g. control systems) is also possible



## RFID TAGS FOR SIMPLE, FLEXIBLE COMMUNICATION

- Each section of track is equipped with an RFID tag and a metal coin
- Easy installation by sticking on using a template
- The shuttle recognises the section via the RFID tag and receives specific section information
- Central control assigns a suitable speed to each section, for example
  - Reduced speed on corners or track switch
  - Maximum speed on long straights
- Centralised monitoring of how many shuttles are in each section to ensure a constant flow of transport
- Metal coin + RFID tag enable mutual sensor interrogation for secure communication
- A combination of RFID tag and metal coins also serve as stop positions, e.g. for precise positioning at work-stations

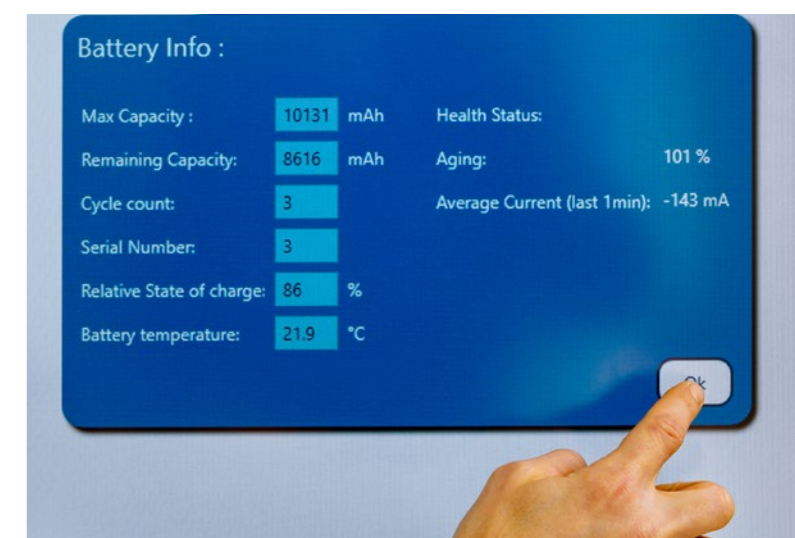


## INTELLIGENT BATTERY MANAGEMENT

- The central control unit monitors the batteries of all shuttles in the system
- You can freely define the charge level at which a shuttle automatically heads to the battery exchange station
- Monitoring of:
  - State of charge, number of charge cycles, condition of the battery
- Ensures high availability and trouble-free operation of the shuttles

## INTERFACES

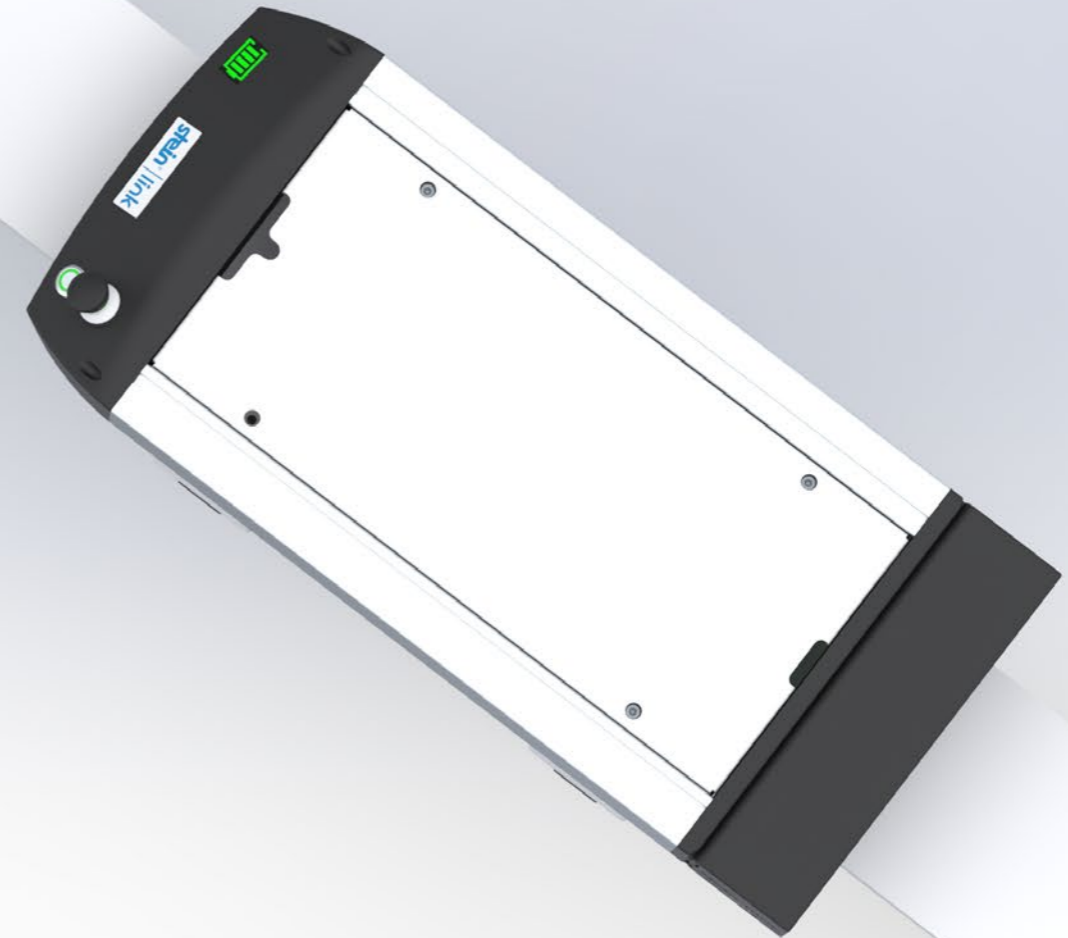
- For easy communication with external systems, e.g. industrial robots at loading and unloading stations, digital 24 V I/Os are available
- OPC UA
- REST-API



*Movement with a system.*

- **Entry-level automation solution:**  
Small systems for internal transport or the interlinking of simple assembly processes.
- **Material handling** on injection moulding machines, stamping machines, etc. (bulk material in transport boxes)
- Addition to STEIN transfer systems:  
**Material feeding to the transfer system**  
→ STEIN as a provider of complete solutions
- **In-house transport / intralogistics:**
  - Pure material transport
  - Long distances
  - Tracks can also be mounted on the ceiling or wall
  - Shuttles travel at high speed

The STEIN link® shuttle system is currently being tested for use in cleanroom environments and validated in accordance with applicable cleanroom classifications.



## TECHNICAL DATA stein | link

<b>Shuttle dimensions</b>	L x W x H: 647 (25.5") x 292 (11.5") x 201.5 mm, (7.9"), (H: lower edge of profile to upper edge of shuttle without emergency-stop!)
<b>Flexible loading surface</b>	Pallet size, transport box, product holder (dimensions freely scalable)
<b>Max. load capacity per shuttle</b>	80 kg (176 lbs)
<b>Transport speed</b>	max. 50 m/min
<b>Acceleration</b>	up to 1m/sec <sup>2</sup>
<b>Exchangeable battery</b>	7S2P Li-Ion battery (25,83 V / 9,6 Ah / 248 Wh)
<b>Power supply</b>	24 V / 2.5 A power supply on the shuttle for active accessories (conveyor belt, tilting unit, etc.) Includes customer interface via digital inputs/outputs.

# stein® | link - YOUR VISION. OUR IMPLEMENTATION.

**CUSTOMER INSTALLATION: HELMHOLTZ INSTITUTE FREIBERG FOR RESOURCE TECHNOLOGY AT THE HELMHOLTZ CENTRE DRESDEN-ROSSENDORF**

**HZDR**  
HELMHOLTZ ZENTRUM  
DRESDEN ROSSENDORF

**HIF**  
HELMHOLTZ-INSTITUT FREIBERG  
FÜR RESSOURCENTECHNOLOGIE

**GENERAL OBJECTIVES**

- Identification of various processing routes for the concentration and recovery of technology metals from electronic scrap
- Networking of digitised and automated machines via central predictive control
- Extended data collection for model development within the department → Identification of recycling potential through material flow characterisation

**REQUIREMENTS FOR THE STEIN LINK® SHUTTLE SYSTEM**

- 50 kg (110 lbs) payload
- Mobile power supply directly on the shuttle
- Travel on two levels: at approx. 0.5 and 4 m
- Flexible stopping points
- Communication via OPC UA
- Job-based
- Flexibly expandable: capacity and coverage
- Additional loads on the stud



„STEIN link® was the missing link for our vision of the future flexible and economical processing of electronic scrap.“

Dr.-Ing. Florian Rau

Height at bottom	700 mm	Number of workstations	59 St.
Height at top	4500 mm	Lift stations with turning unit	3 Stk.
Total length	~ 370 m	Total length	~ 62 m
Number of track switches	48 Stk.	Total width	~ 13 m
Number of corners	48 Stk.	Area	~ 800 m <sup>2</sup>

max. capacity  
80 kg

max. speed  
50 m/min

stein | link



**STEIN Automation GmbH & Co. KG**  
**Headquarters GERMANY**  
Johann-Liesenberger-Str. 7  
78078 Niedereschach

Phone +49 7728 64485-0  
[info@stein-automation.de](mailto:info@stein-automation.de)  
[www.stein-automation.de](http://www.stein-automation.de)

**STEIN Automation ITALY**  
Bologna

Phone +39 335 640 6900  
[italy@stein-automation.com](mailto:italy@stein-automation.com)  
[www.stein-automation.de](http://www.stein-automation.de)

**STEIN Automation NORTH AMERICA**  
Pittsburgh

Phone +1 724-554-2020  
[northamerica@stein-automation.com](mailto:northamerica@stein-automation.com)  
[www.stein-automation.de](http://www.stein-automation.de)