Linear Transport Systems Revolutionize Intralogistics Operations

Presented by:

Jeff Johnson

BECKHOFF

MODEX 2020
GEORGIA WORLD CONGRESS CENTER
ATLANTA | MARCH 9-12
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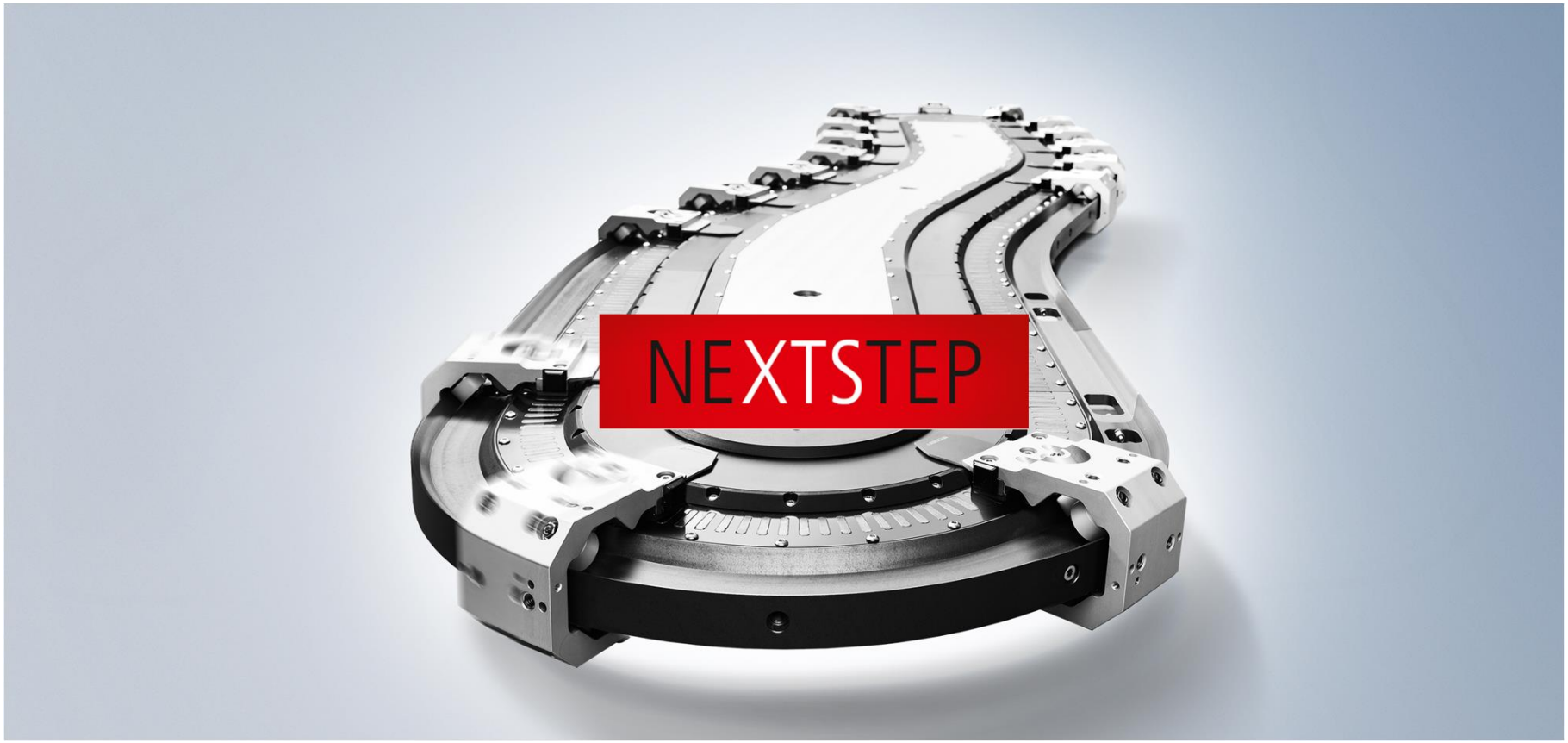
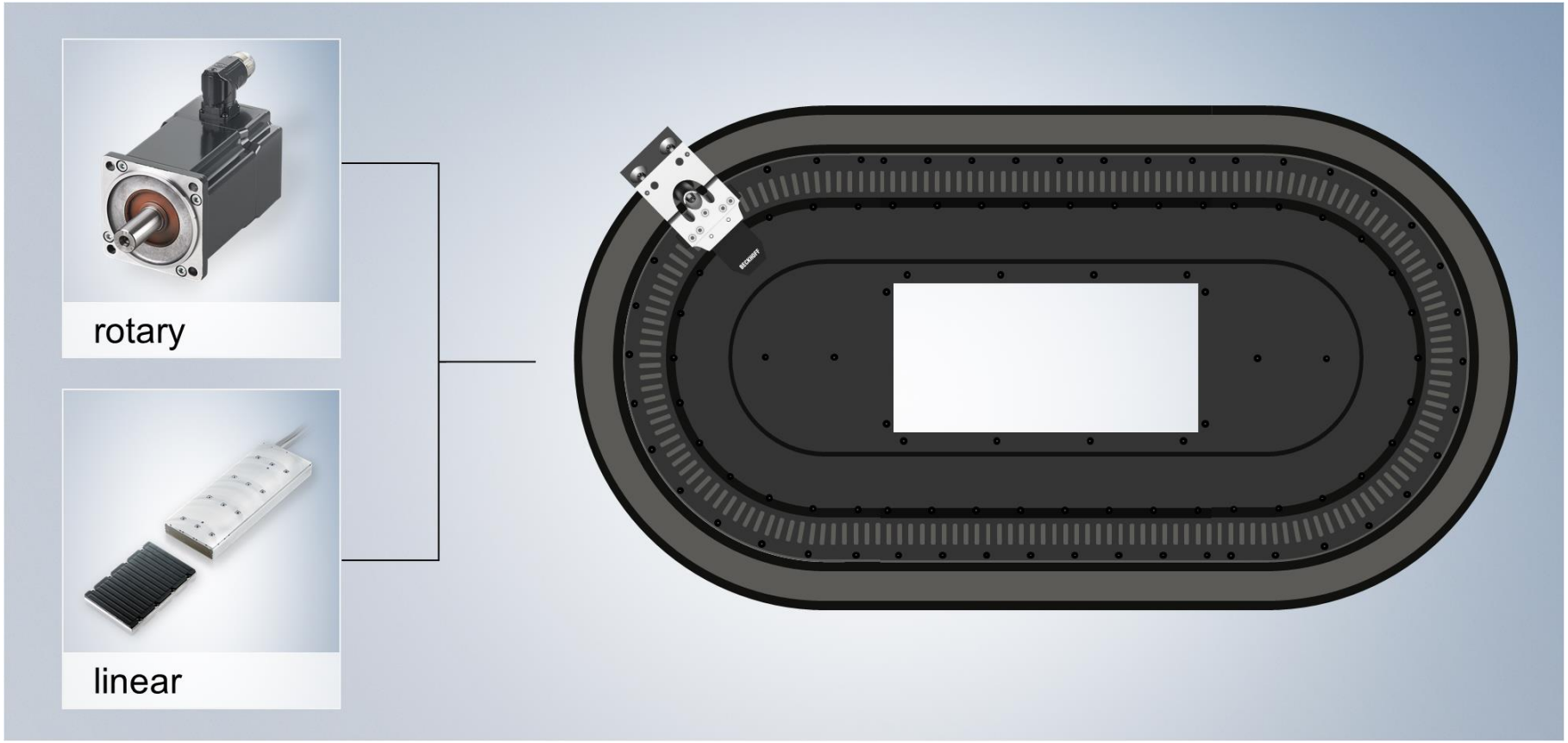
Linear Transport Systems



Linear Transport Systems – combine rotary and linear technology



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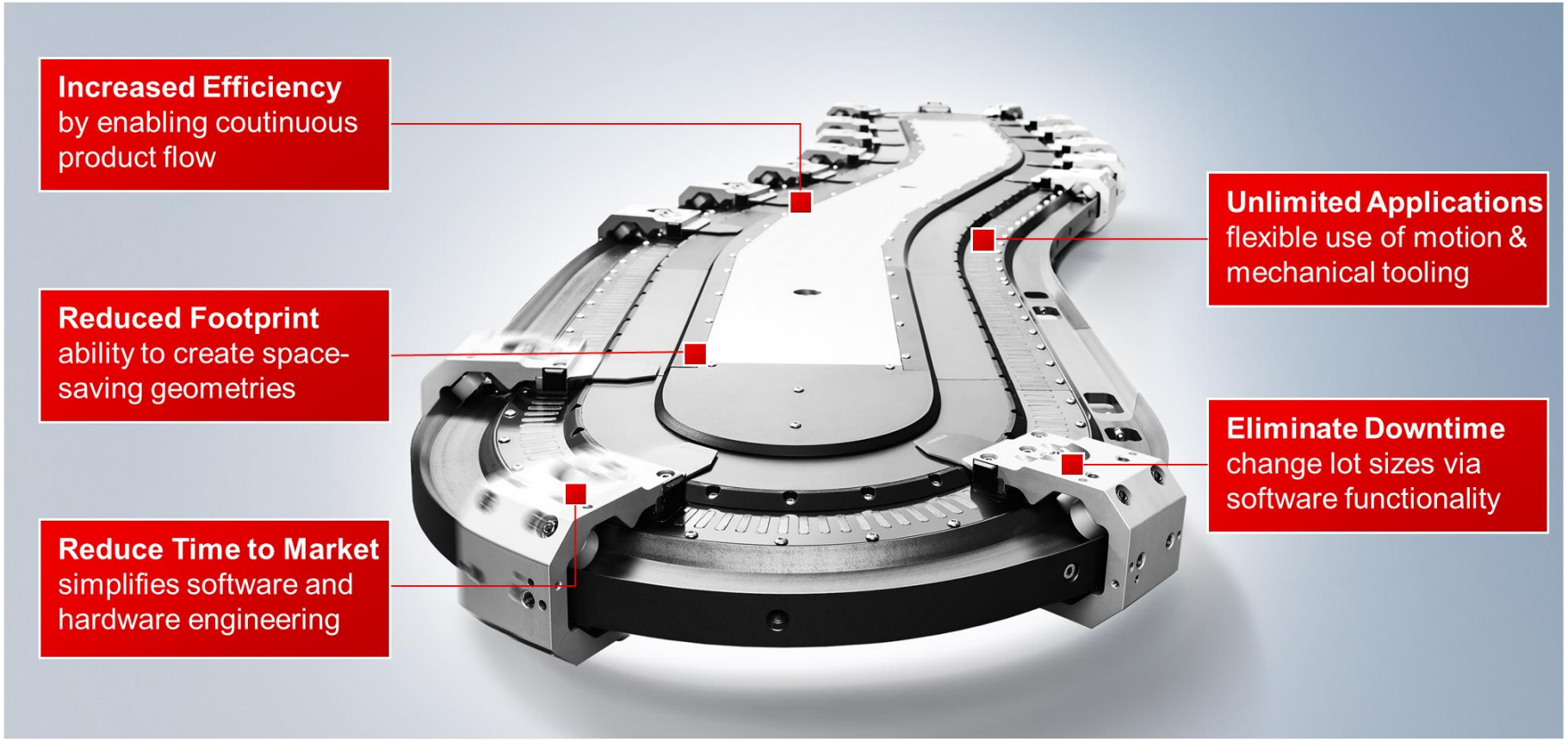
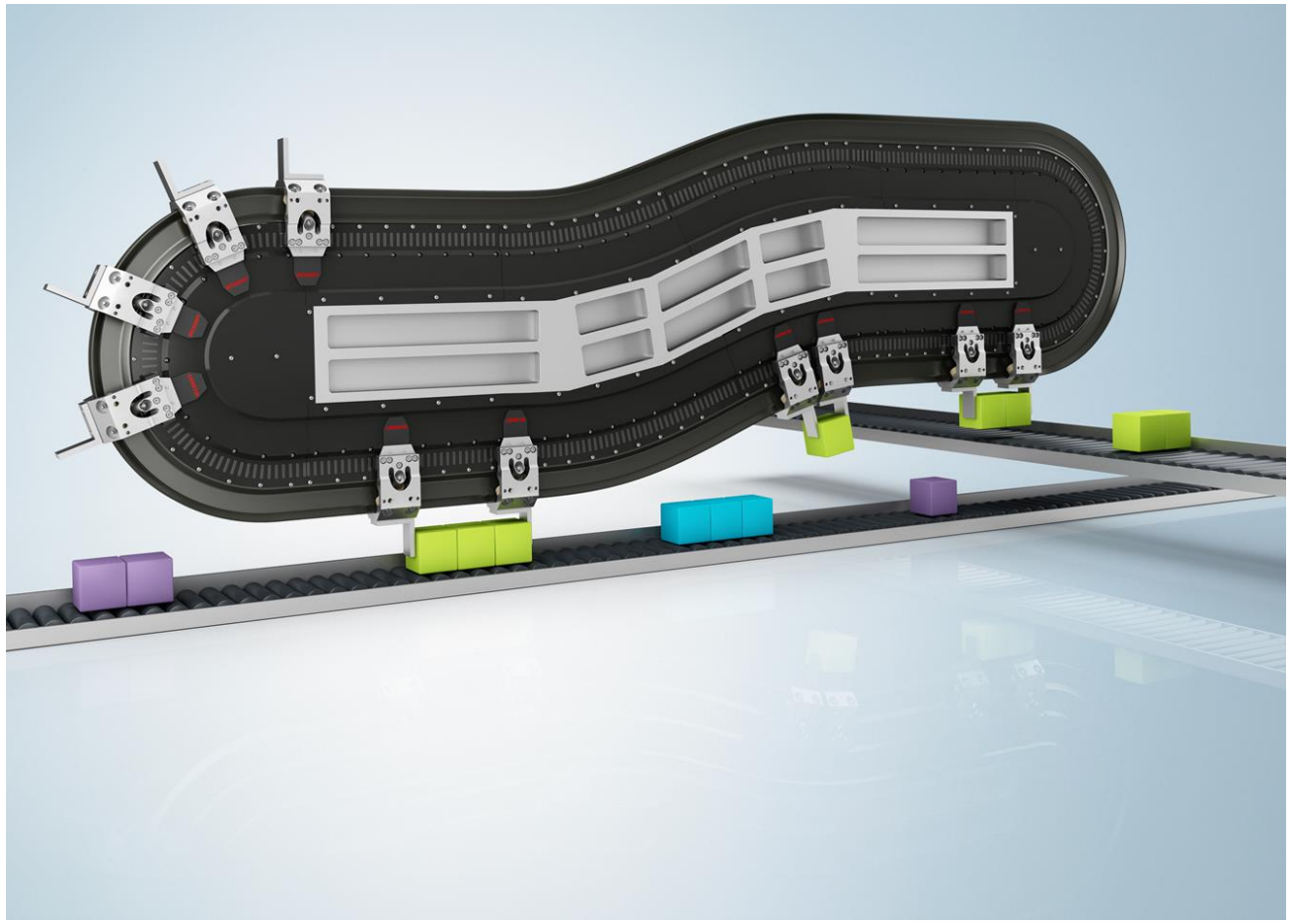
Linear Transport Systems – benefits

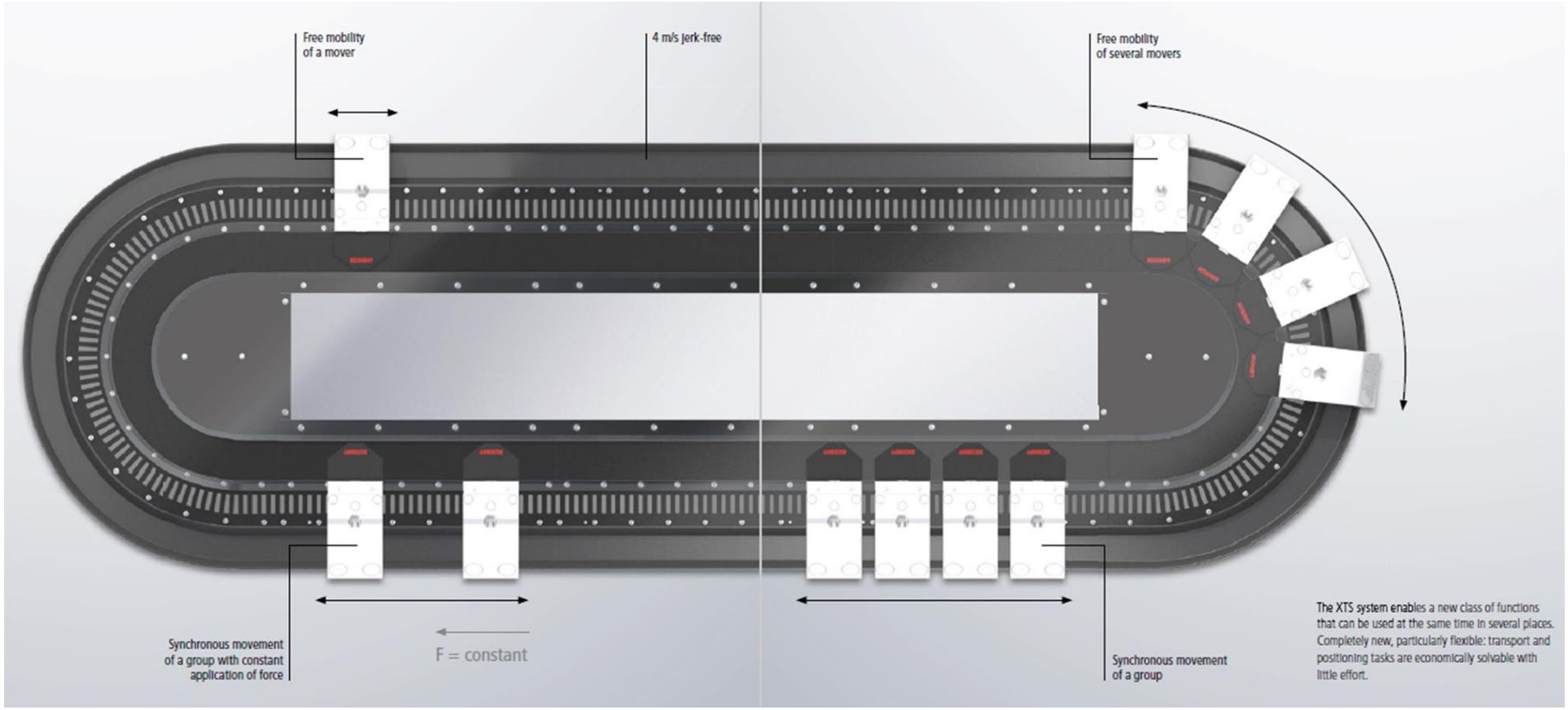


A revolutionary distribution system

- Outstanding dynamics allows selective processing without interrupting coutinuous product flow.
- Individual movers can work independently on multiple products.
- Products can be transported individually or in groups.
- Synchronization with selective stopping and starting at any position.
- Maximum positioning accuracy and jerk-free accelerations.



Linear Transport Systems – basic functions



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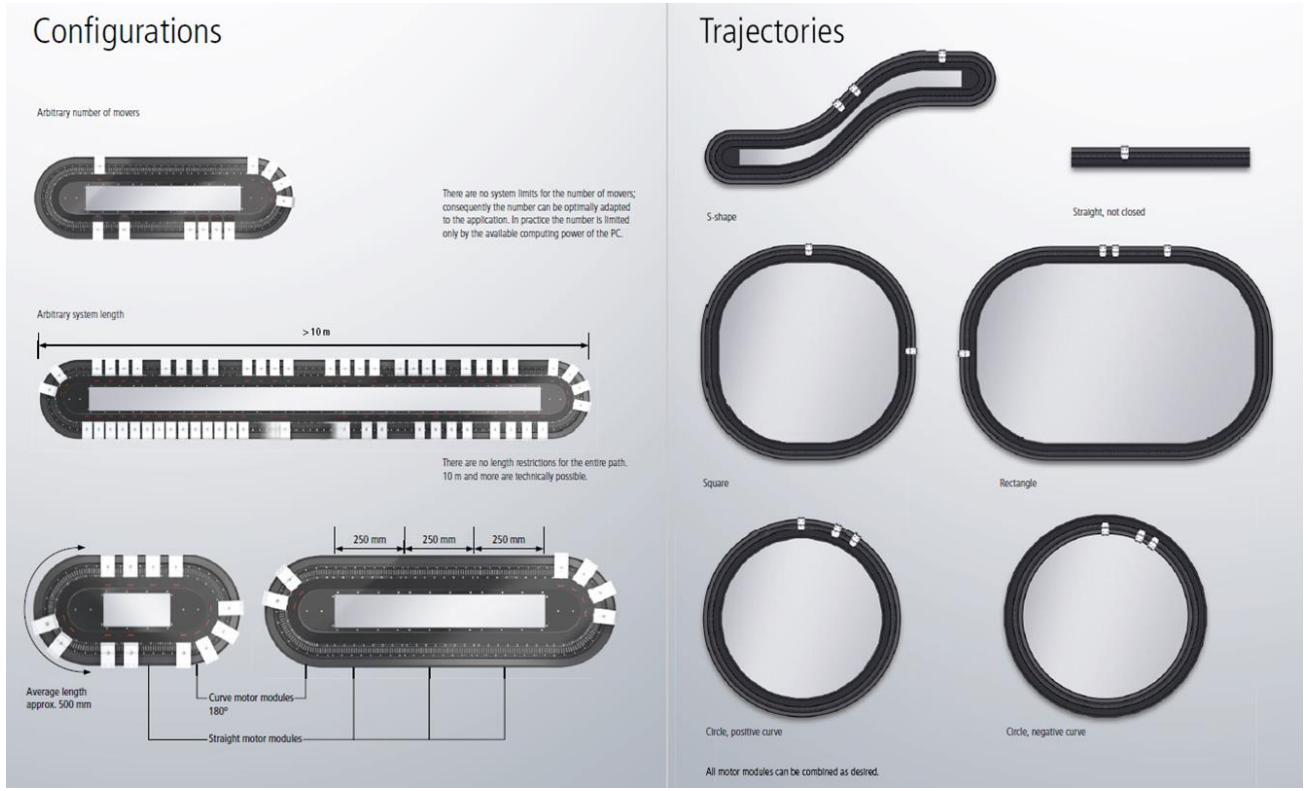
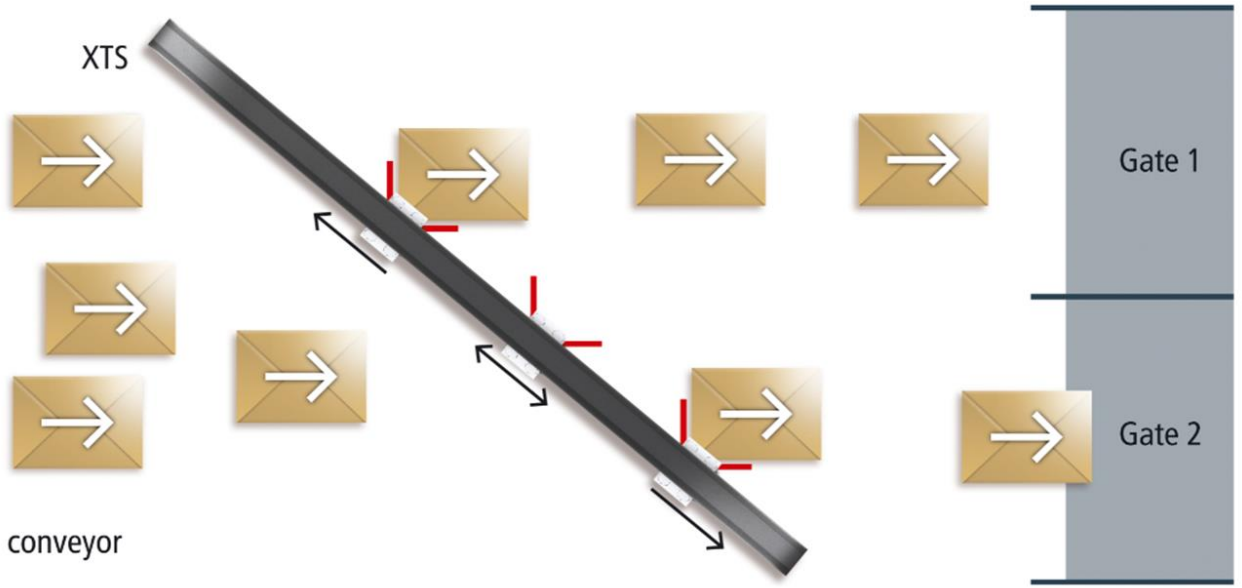
Functioning as a distribution system

- Freely-selectable track layouts and number of movers.
- Individual and group controllability.
- Ease of integration into existing environments.
- Implementation of motion and handling tasks to allow new and innovative mechanical designs.



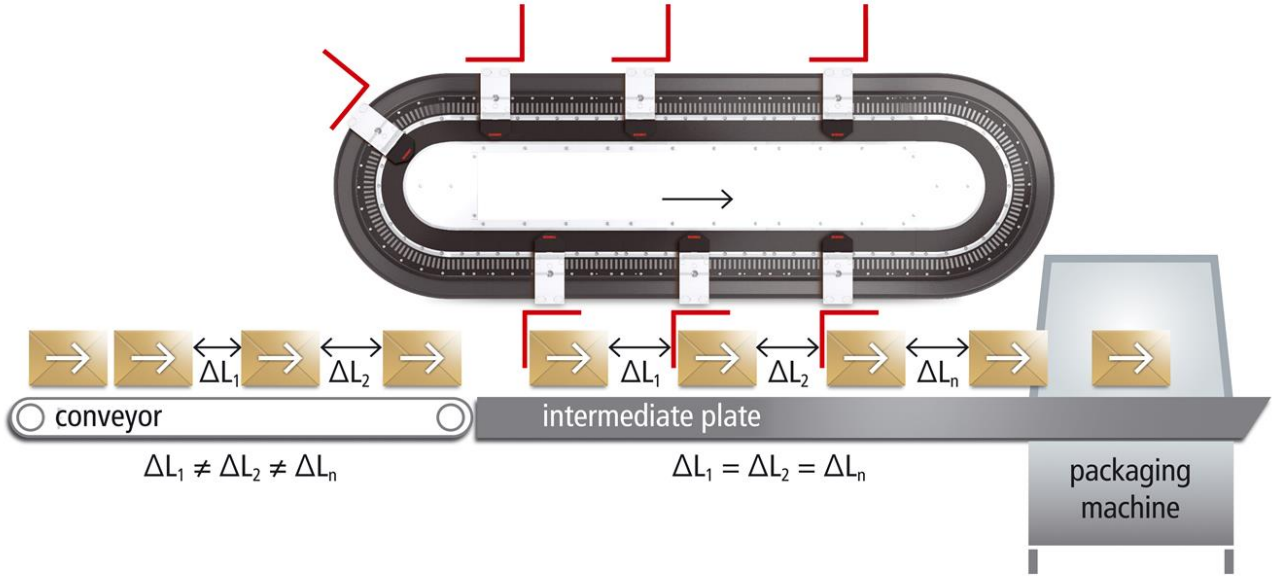
A distribution system for product sortation

- Functions as a distribution system.
- XTS splits incoming product stream into multiple lanes.
- Flexibility, with lanes easily added or removed.



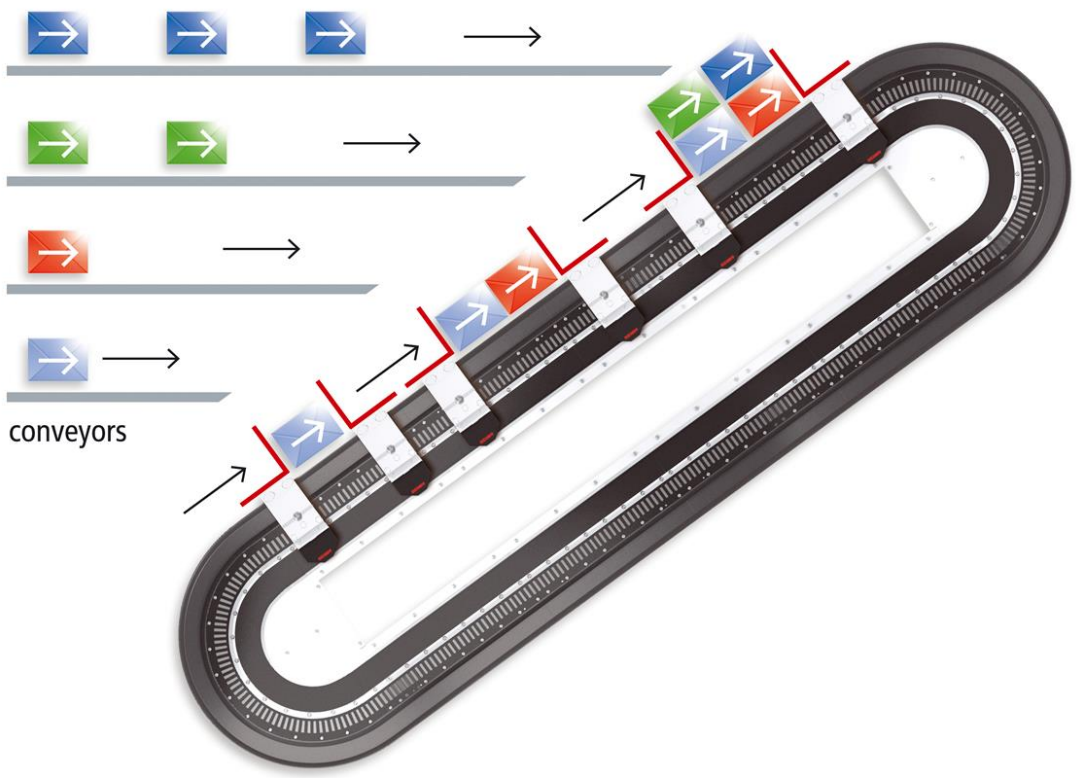
Gapping asynchronious product flow

- XTS makes it easy to implement gap control.
- Uses distance adjustments that synchronize product arrviving at different intervals.
- Creates consistent gap of product to downstream process.



Grouping products

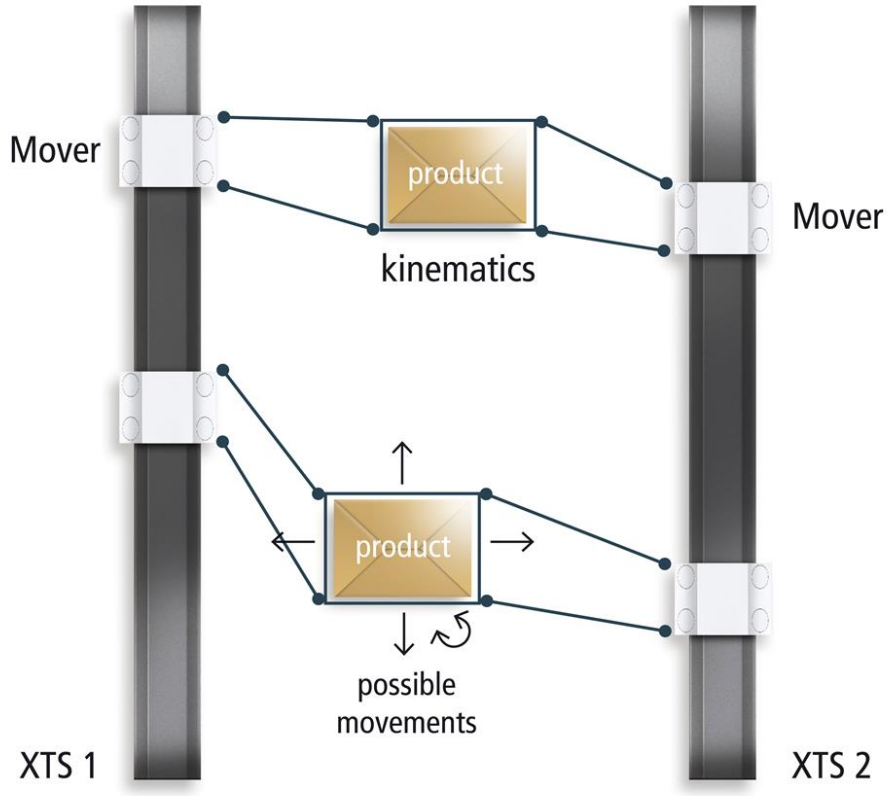
- Multiple movers can work together to clamp or hold products.
- XTS can combine multiple products arriving on multiple conveyors into predefined and easily changeable groups and move them to the next station.
- Operations can adapt to product width, stack height and number of stacks without manual changeover.
- Distance between movers and motion profile can be changed on the fly without stopping.




Worldwide Presence on all Continents
Scientific Automation

Rotating product with kinematics

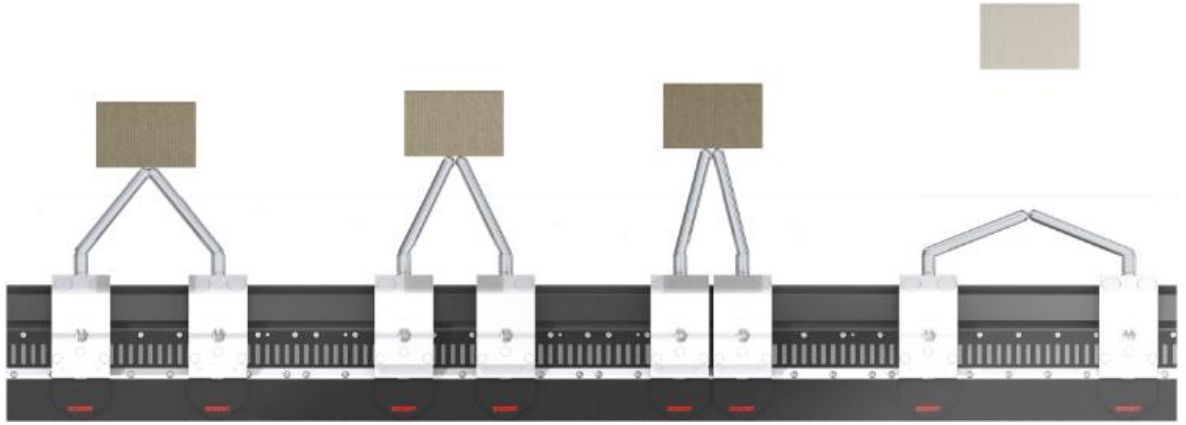
- With circulating kinematics, the transported product can be influenced in X and Y directions.
- With two XTS sytems arranged in parallel, the manipulator is synchronized to the product and shifts it on the belt at full speed.
- Product can even be rotated slightly using appropriate kinematics.



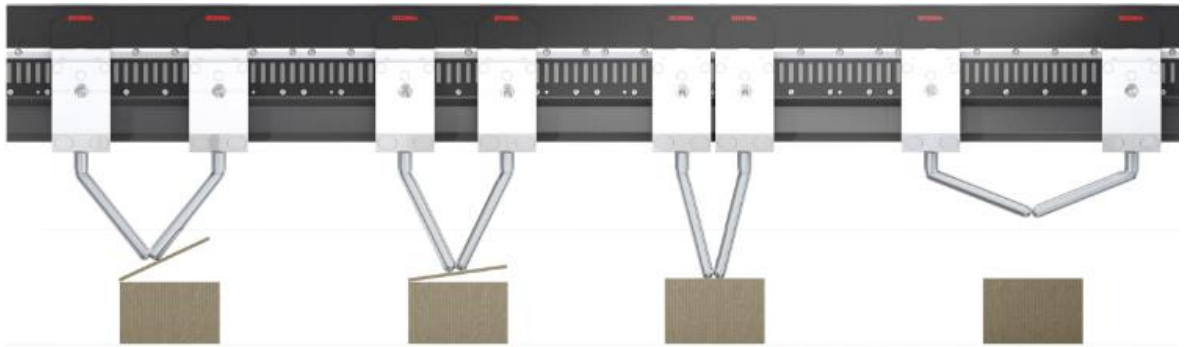
Unlimited application possibilities

Push product or change spacing.
Reduce or increase product speed.

Clamp and move product.

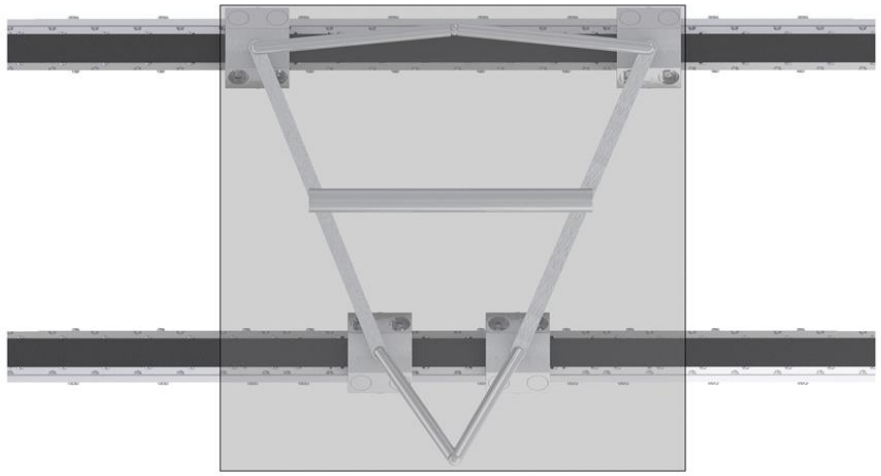


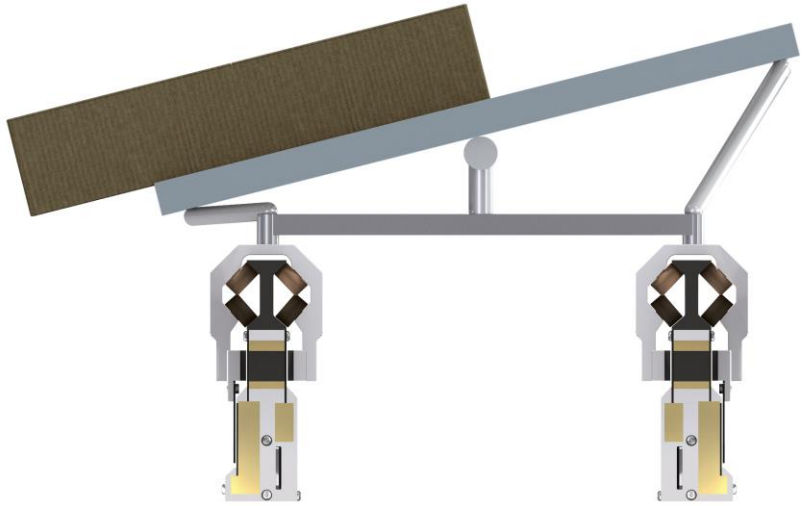
Apply kinematics in linear motion for lifting or pressing.

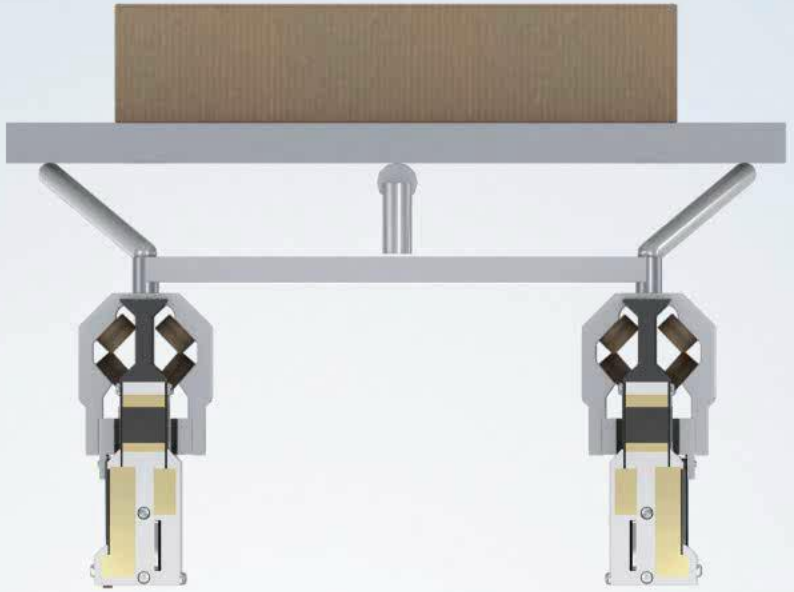


Unlimited application possibilities

- With multiple movers and innovative tooling, XTS can also transport and discharge product.

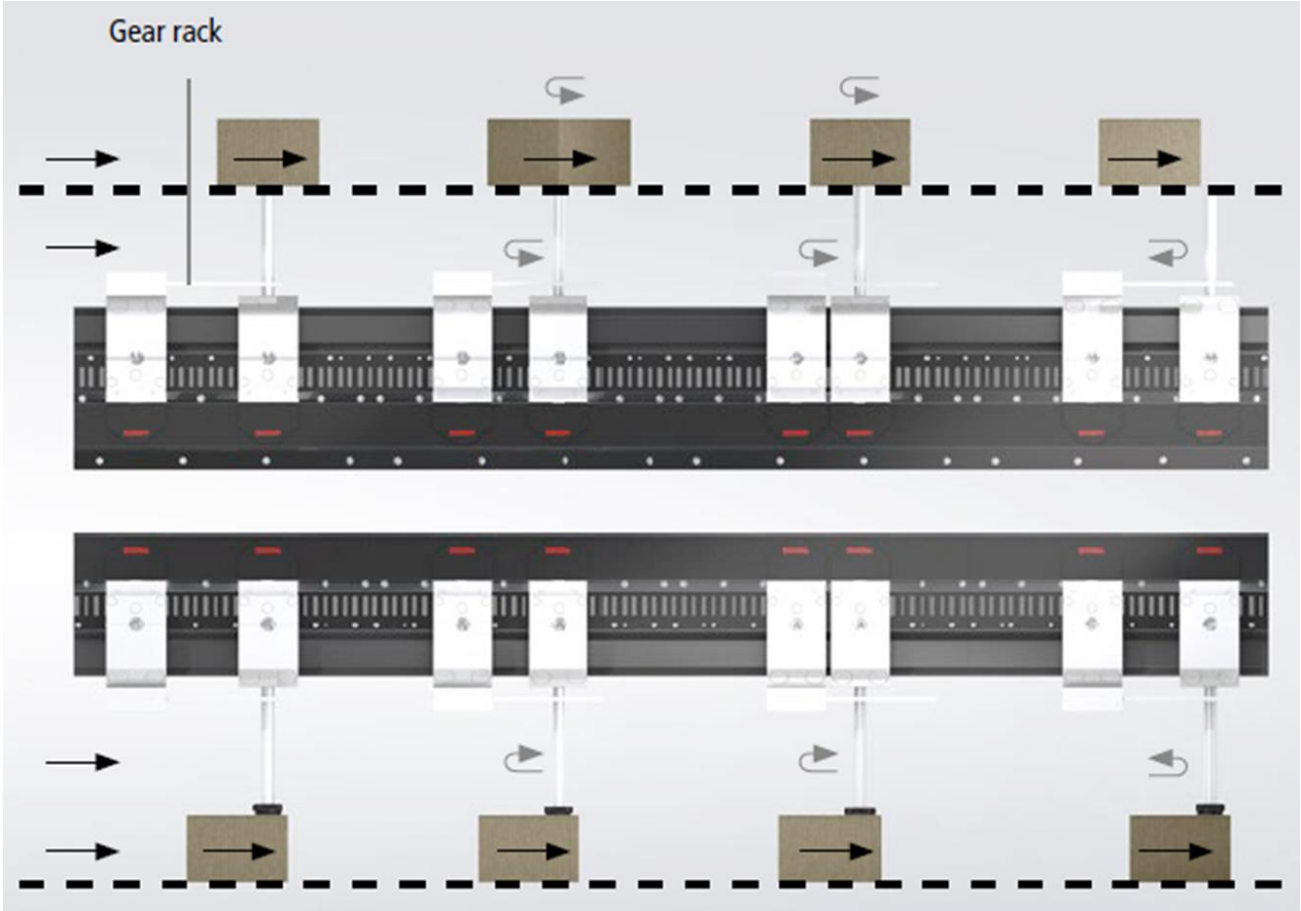


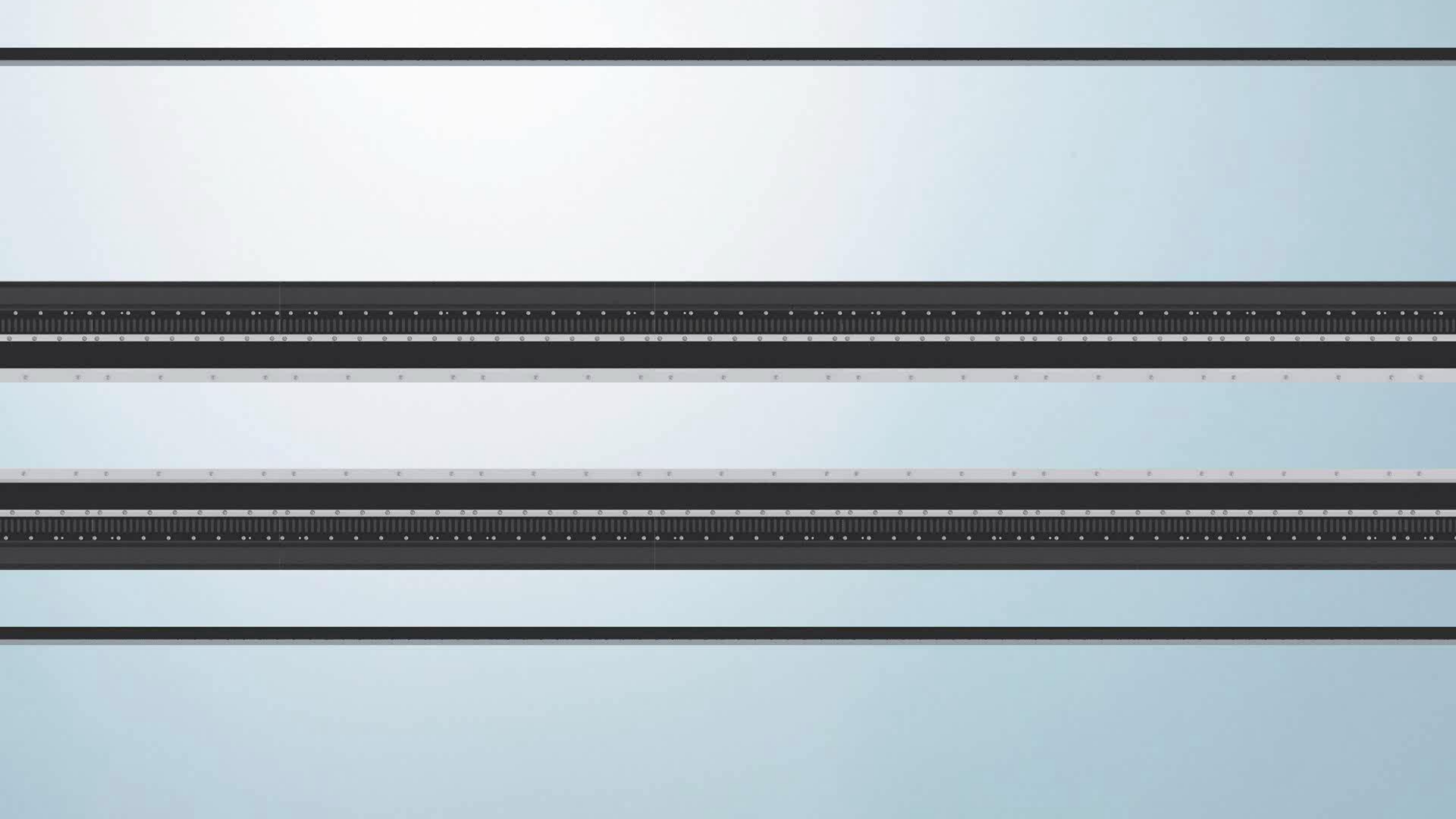




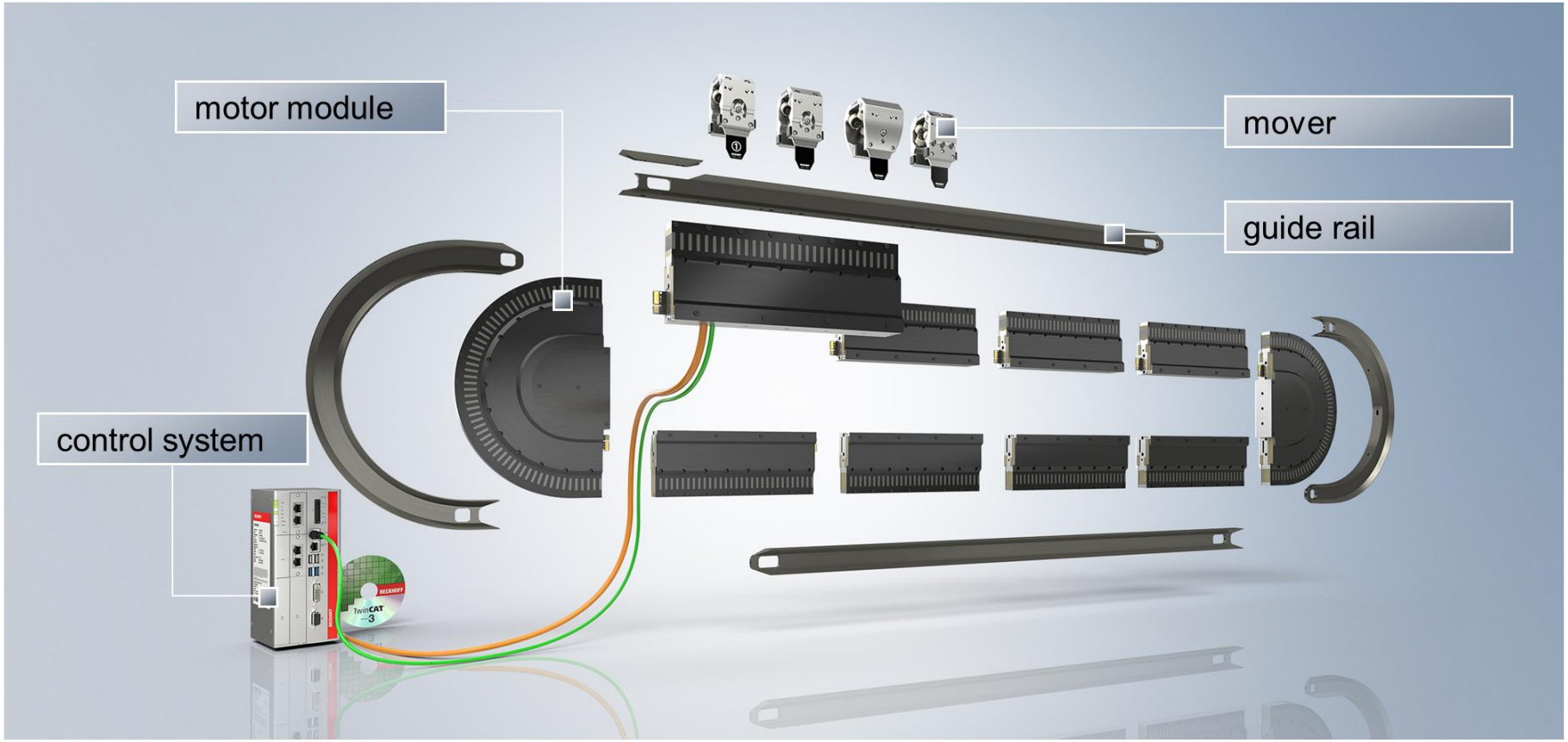
Unlimited application possibilities

- Kinematics in linear motion for turning product or closing a cap.





The modular XTS system: reduces time to market



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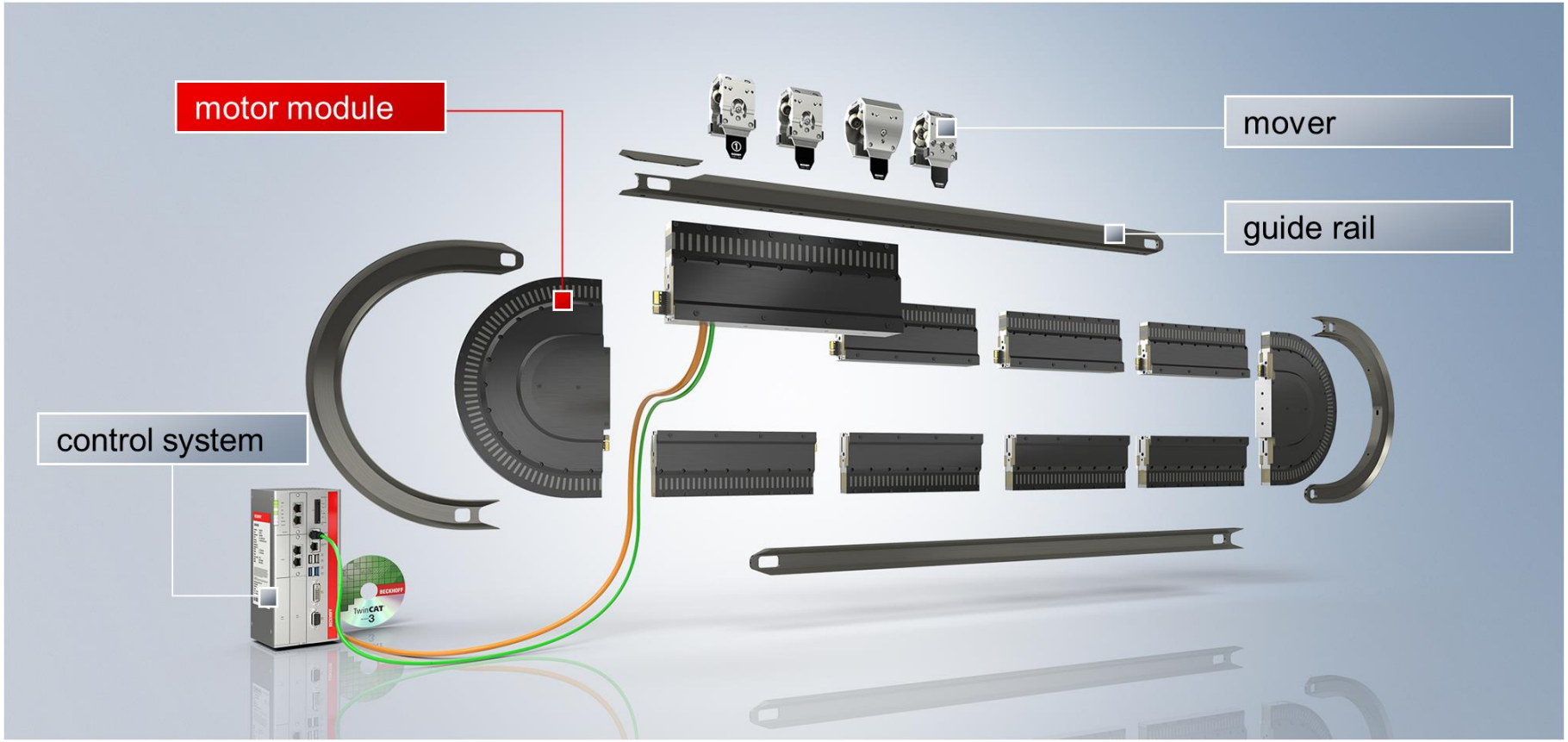
The modular XTS system: motor modules



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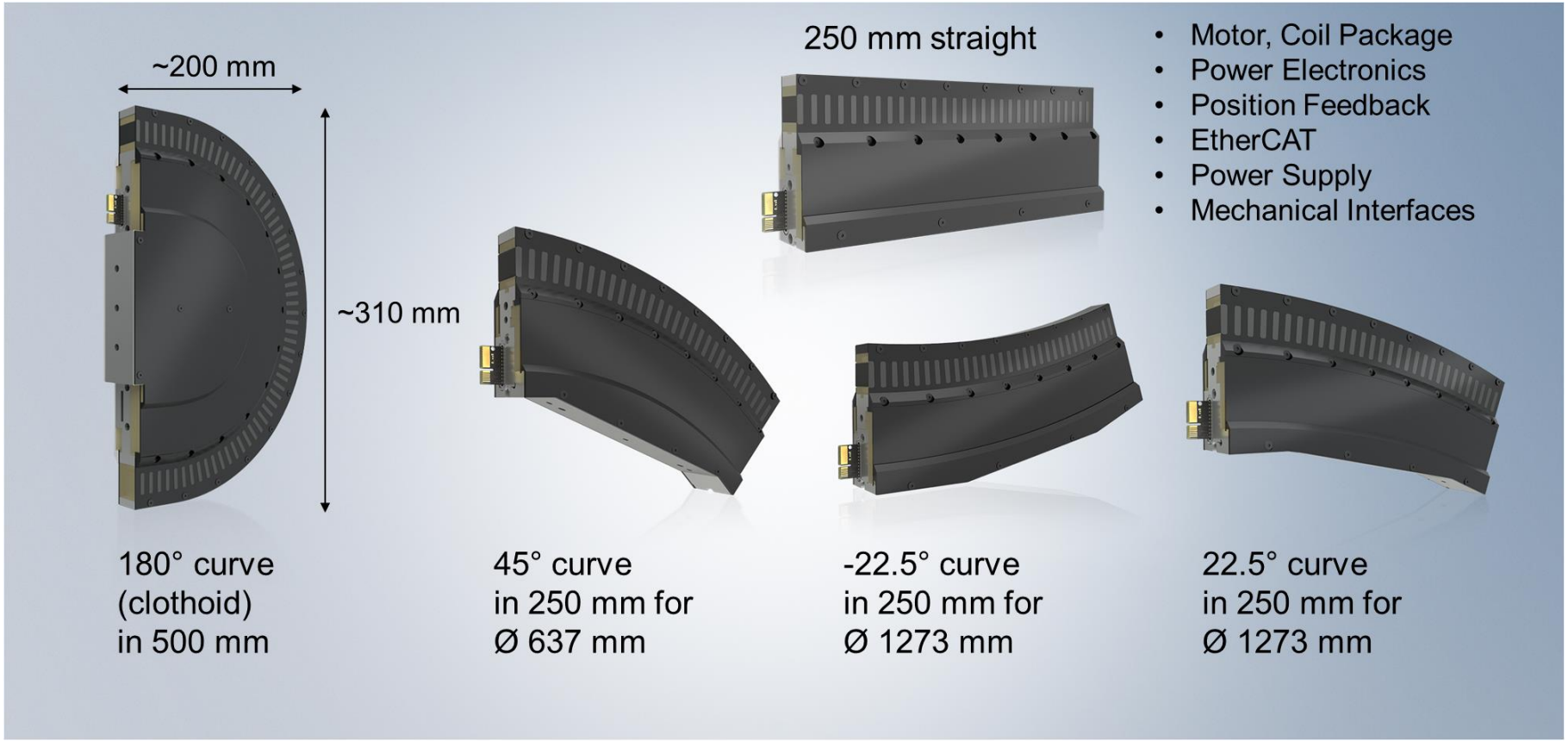
XTS motor modules: everything incorporated in a single mechatronic component

System properties		
Max. force	100 N 80 N	at standstill at 2 m/s
Continuous force	30 N	(at < 30 °C temperature increase in the motor compared to mounting frame)
Speed	4 m/s	at 48 V DC supply
Acceleration	> 100 m/s²	(without payload)
Positioning accuracy	< ±0.15 mm	at 1.5 m/s possible within a straight module
Absolute accuracy	< ±0.25 mm	possible within a straight module
Repeatability	< ± 10 µm	(stillstand unidirectional)
Max. system length	> 100 m	(dependent on computing power, no system limit)
Power consumption per motor module at 24 V DC	30 W/m	for communication, electronics, position feedback
Length per infeed	max. 3 m	voltage supply, EtherCAT
Protection rating	motor modules:	IP 65
Approvals	CE, UL	

XTS motor modules: everything incorporated in a single mechatronic component



XTS motor modules: flexible track layouts

S-shape

Rectangle

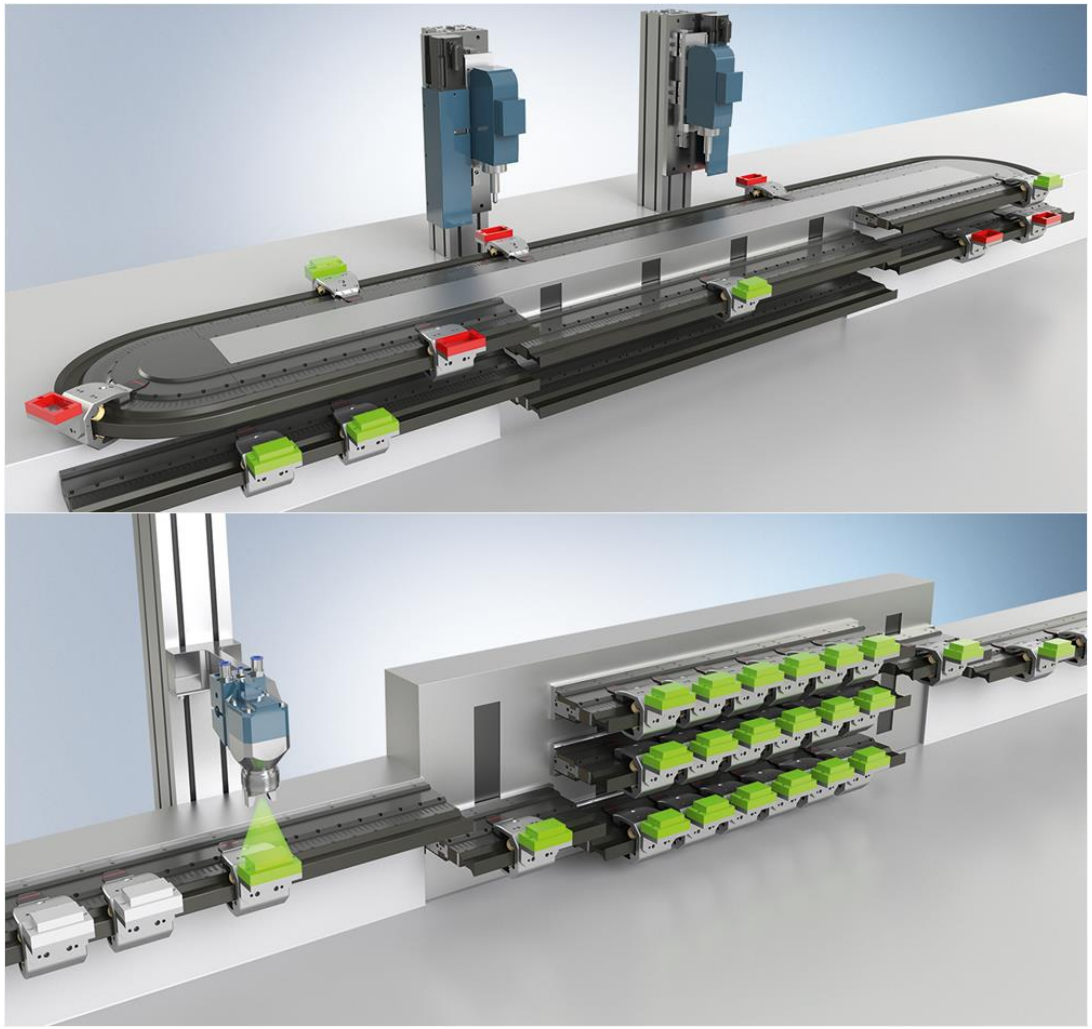
Square

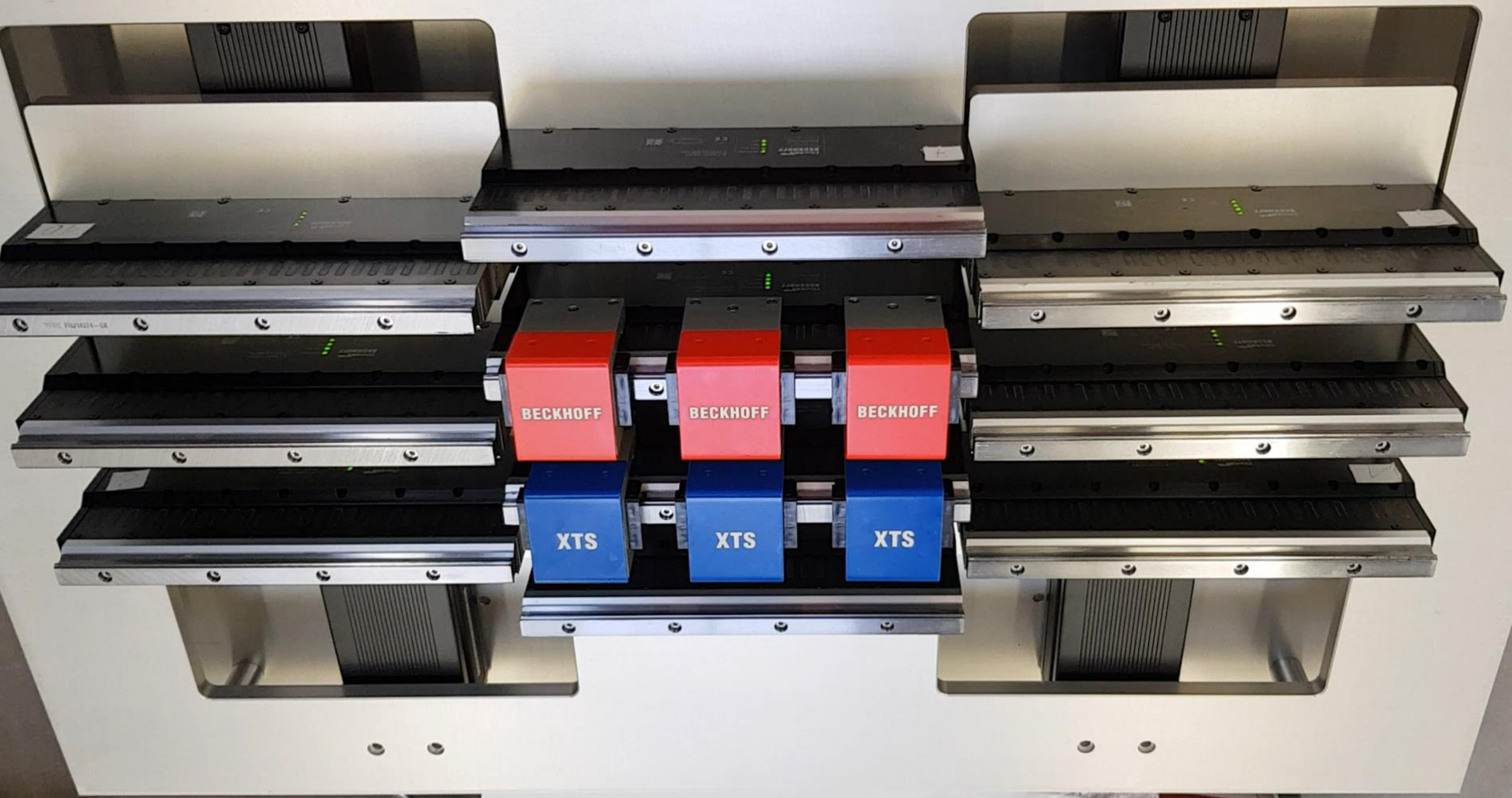
Straight, open track

… and others

XTS Track Management: new flexibility in motion control

- Track sections can be moved.
- Exchange movers between tracks.
- Motor modules and movers remain fully operational at all times.
- Maximum flexibility without downtime.
- Small footprint combined with maximum parts buffer capacity.

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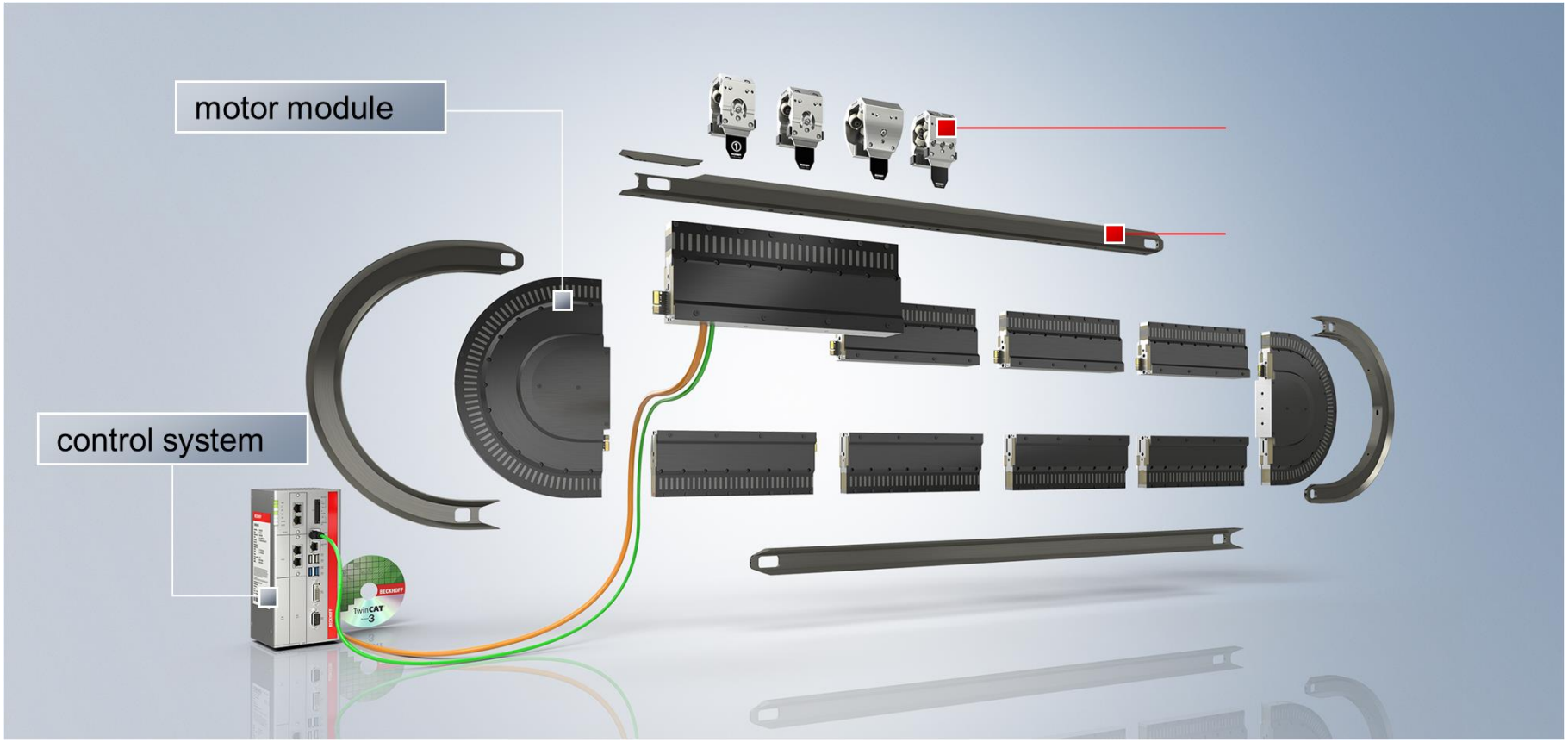
The modular XTS system: guide rails and movers



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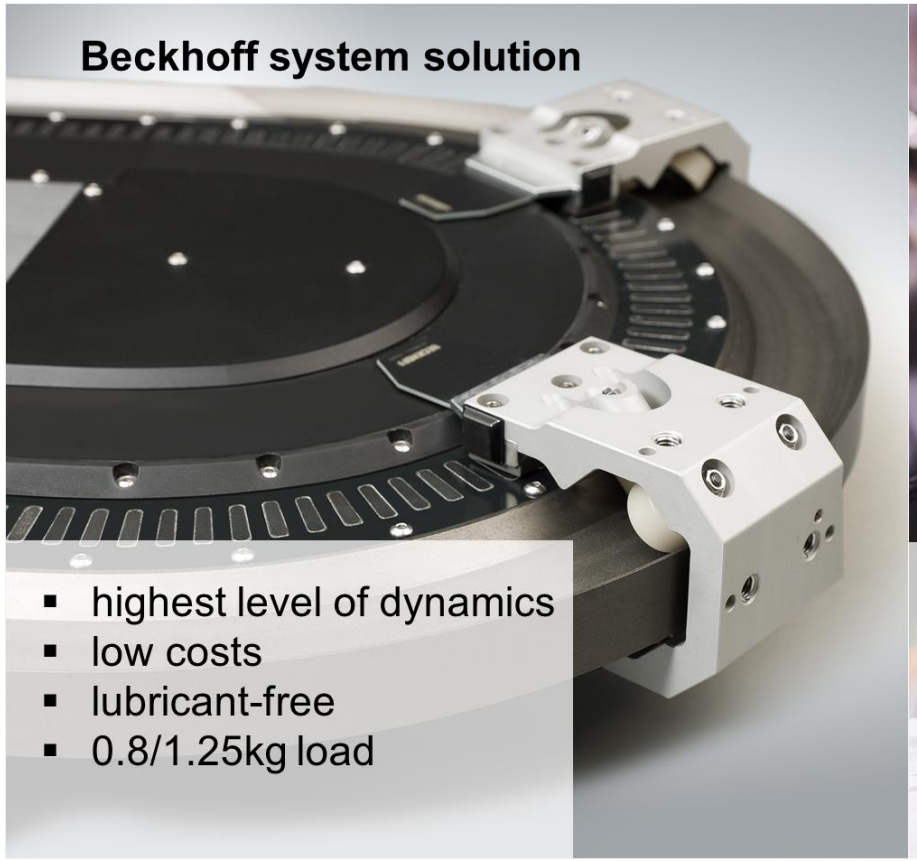
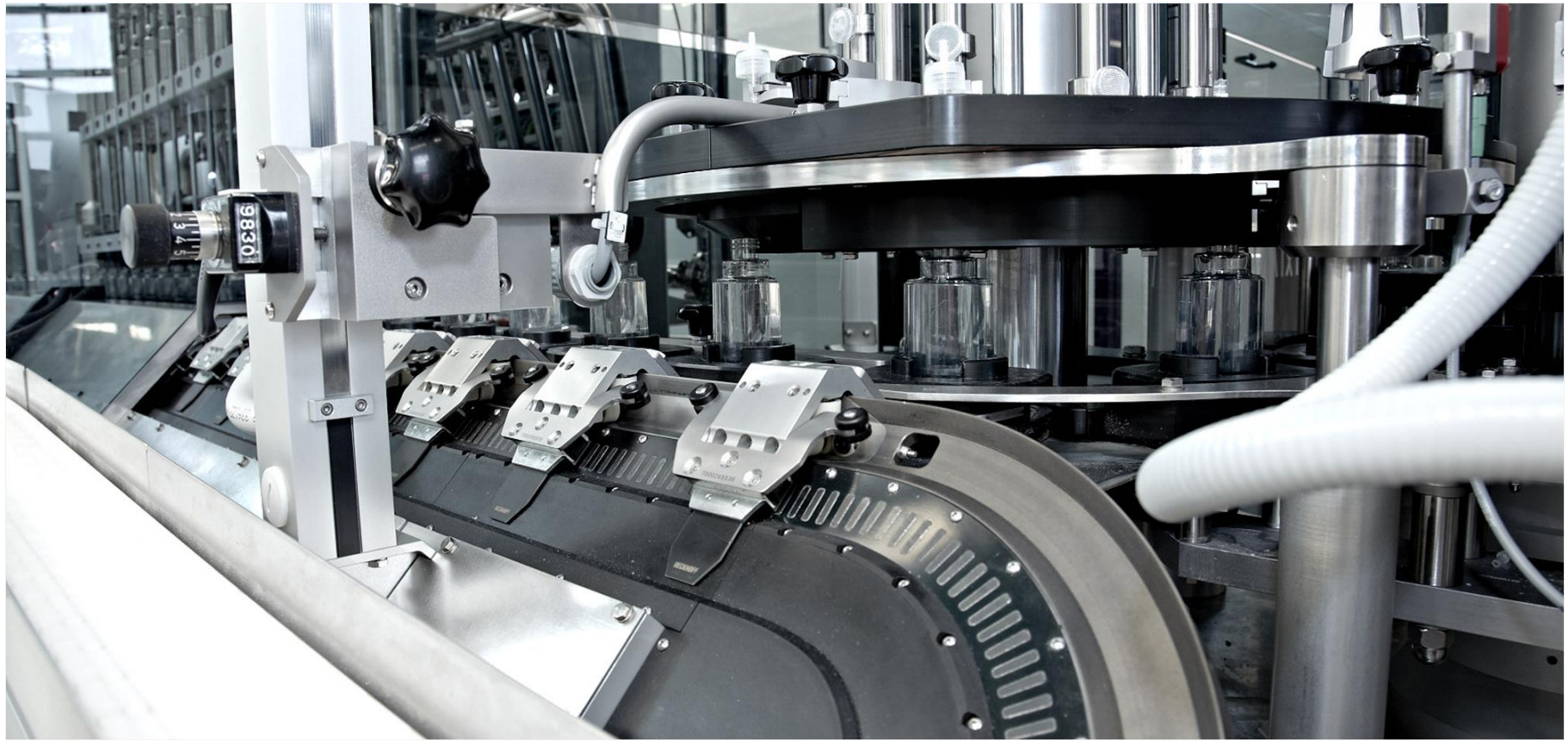
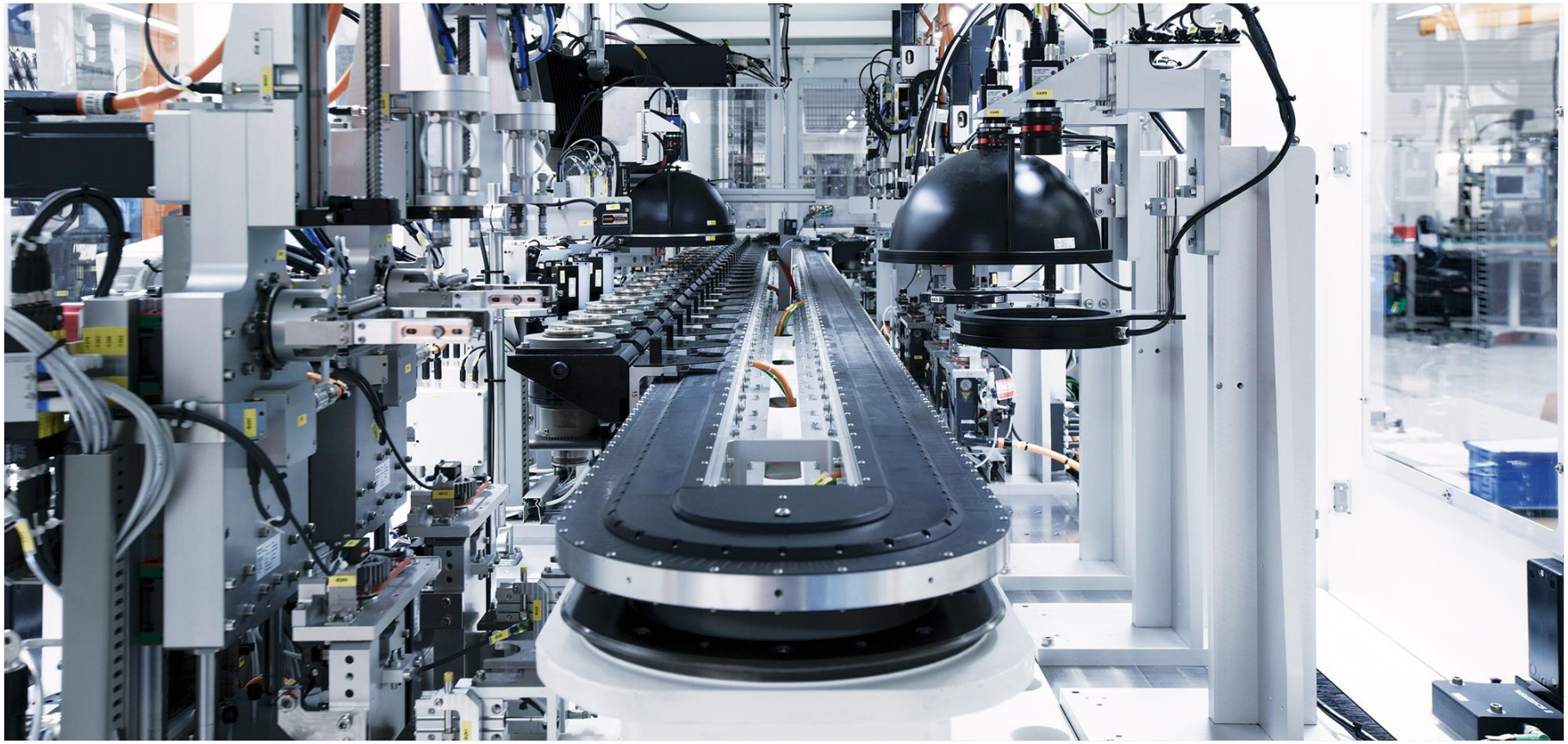
The modular XTS system: guide rails and movers – comparison



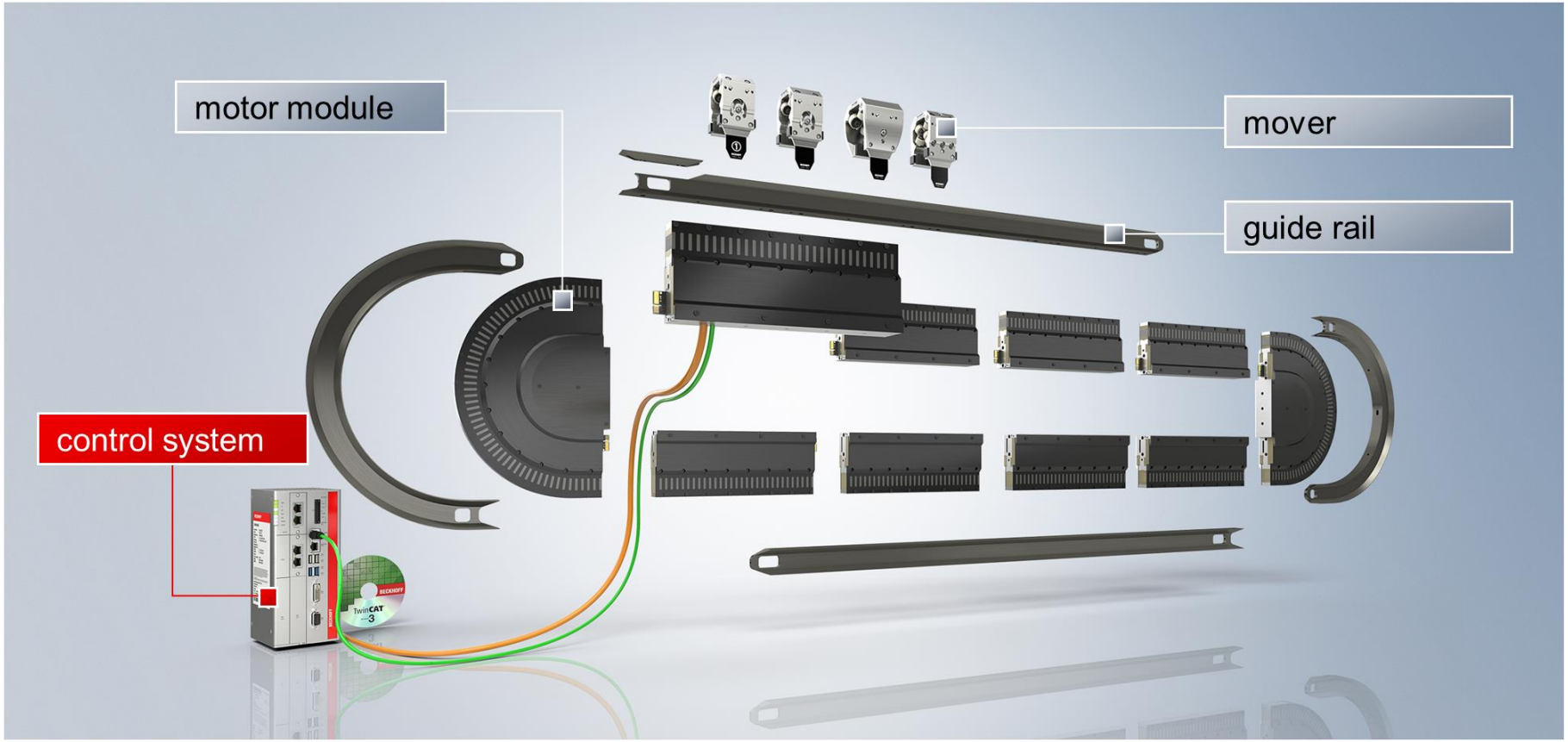
Application example: cosmetics filling line – groninger & Co. GmbH, Germany



Application example: optical inspection system – GEFASOFT, Germany



The modular XTS system: the control system



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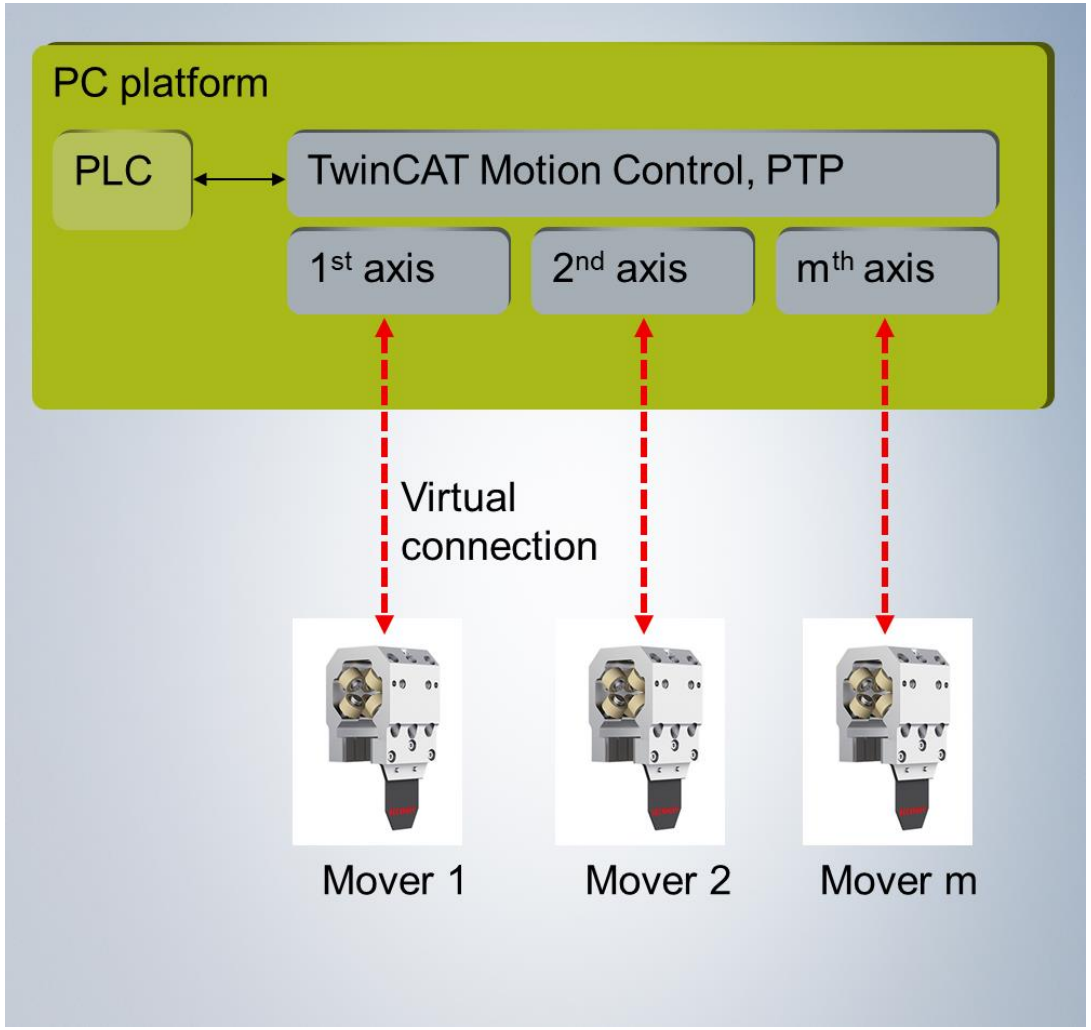
The control system: software and programming

- The XTS extension in TwinCAT 3 automation software decouples servo algorithms from the hardware components and calculates them centrally.



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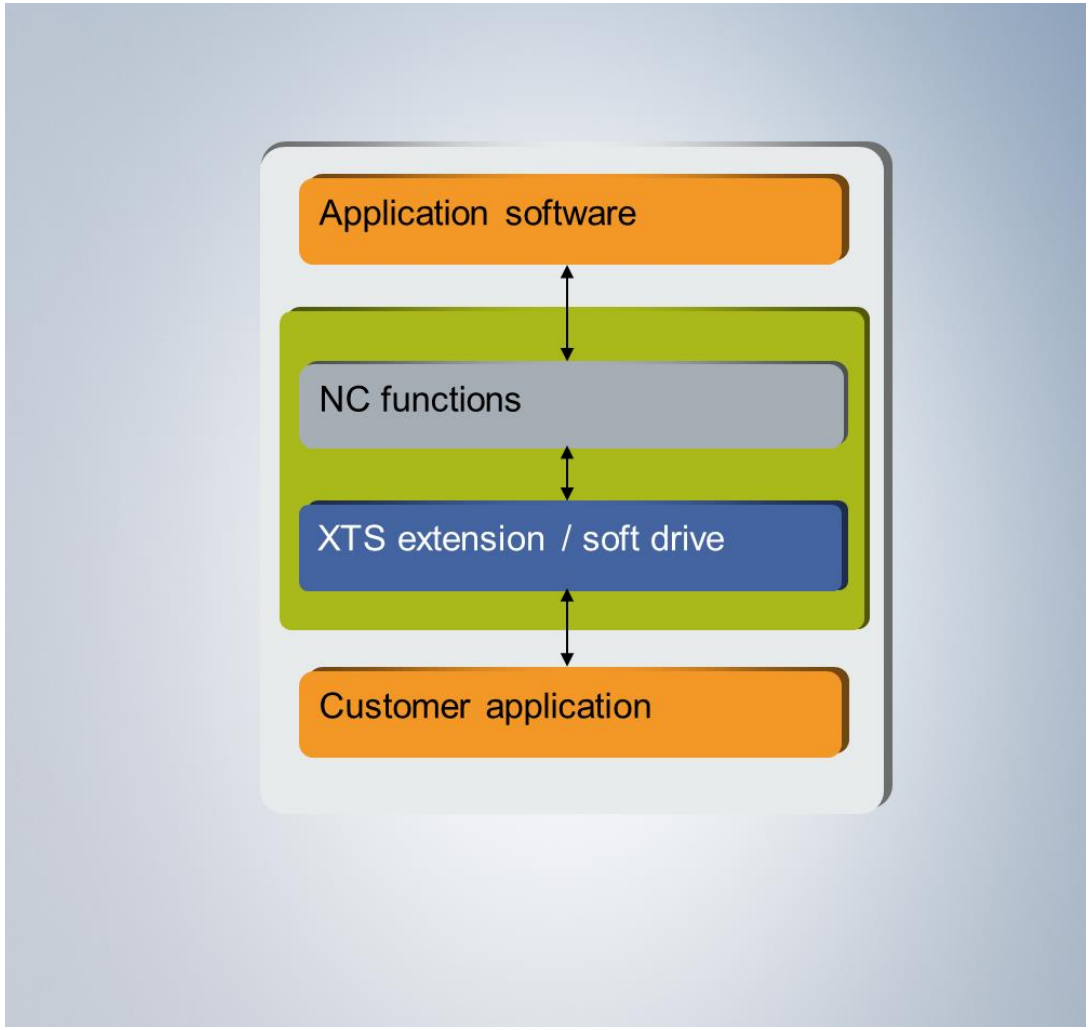
The control system: software and programming

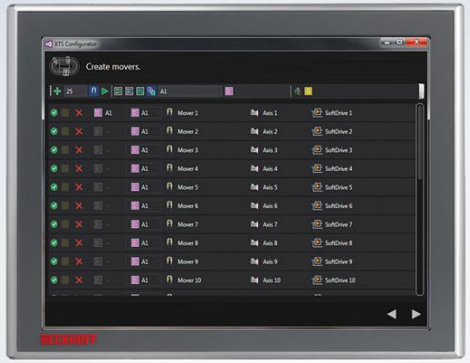
Regarding application programming, a mover appears like a “normal” servo axis.

- All motion control functions are available, for example:
  - flying saw
  - electrical gear unit
  - cam plates
- Functional extensions handle typical XTS requirements:
  - automatic accumulation
  - collision and jerk avoidance
  - centrifugal force limitation

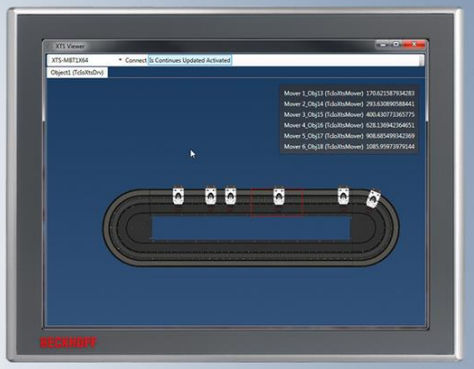


The control system: software and programming – XTS Configurator and XTS Viewer

- System configuration is automated to the greatest possible extent.



- Axis and control parameters of the movers can be copied.



- Intuitive online visualization of the moving movers in 2D.
- Diagnostic and simulation tool.

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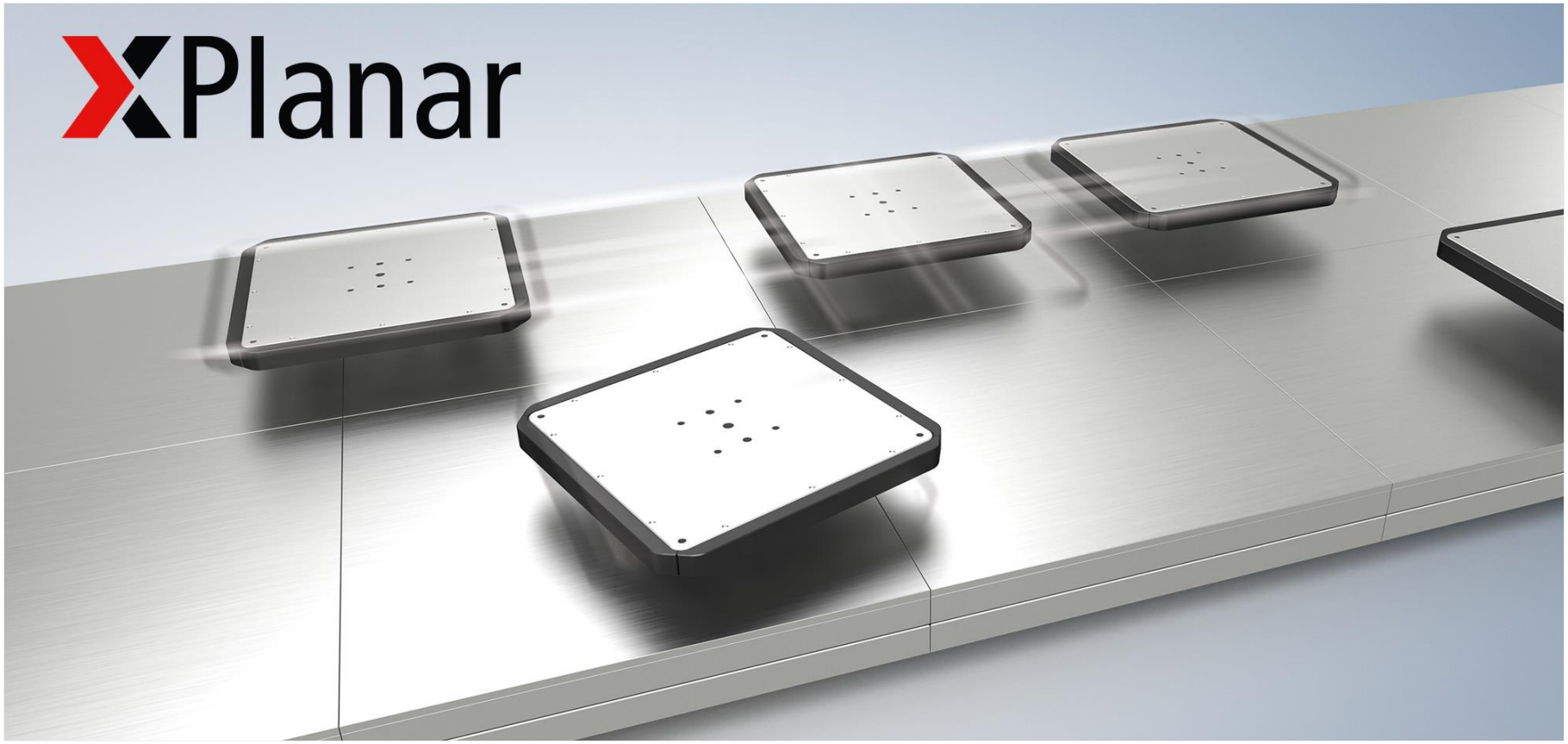
XPlanar: Flying Motion



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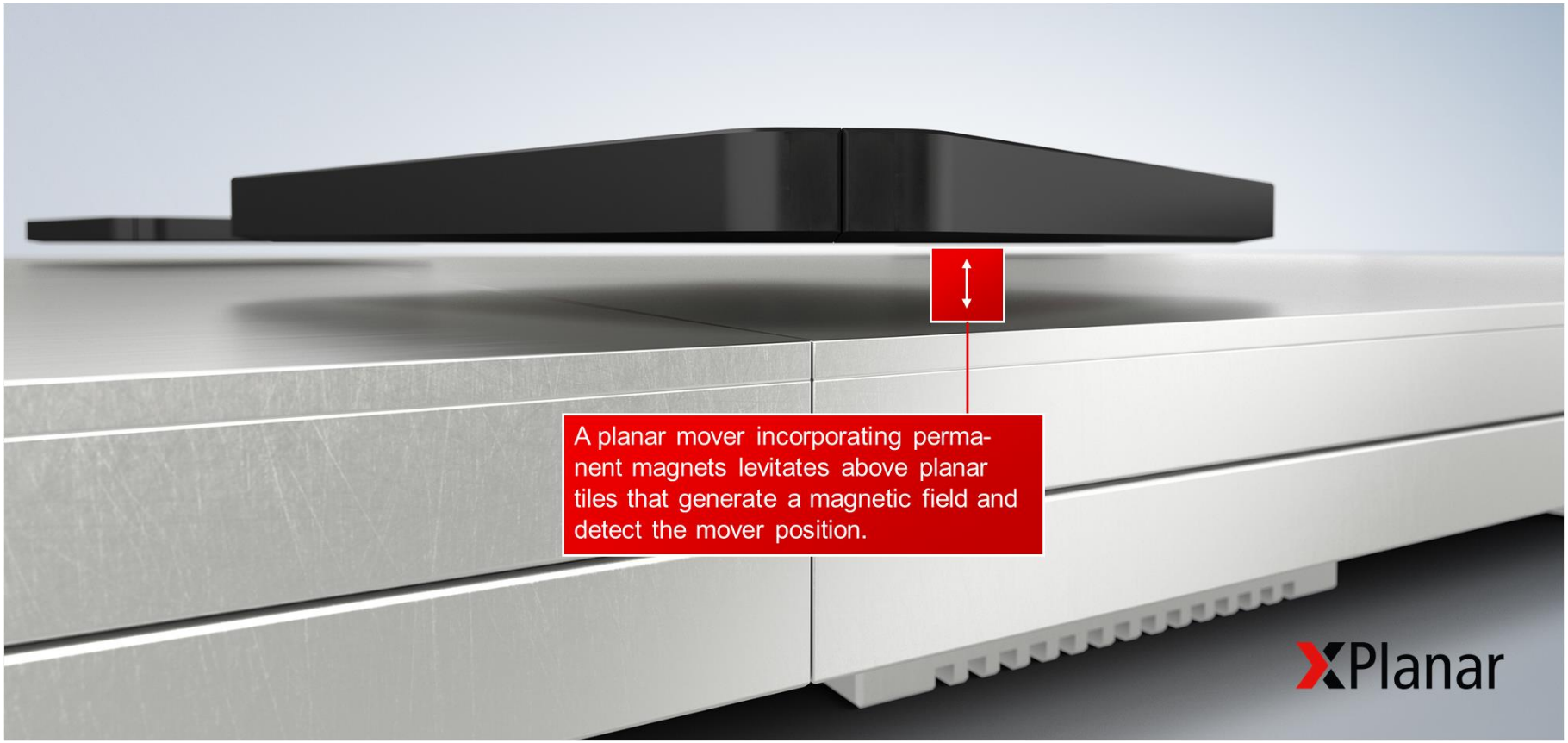
XPlanar: free-floating movers for non-contact movement



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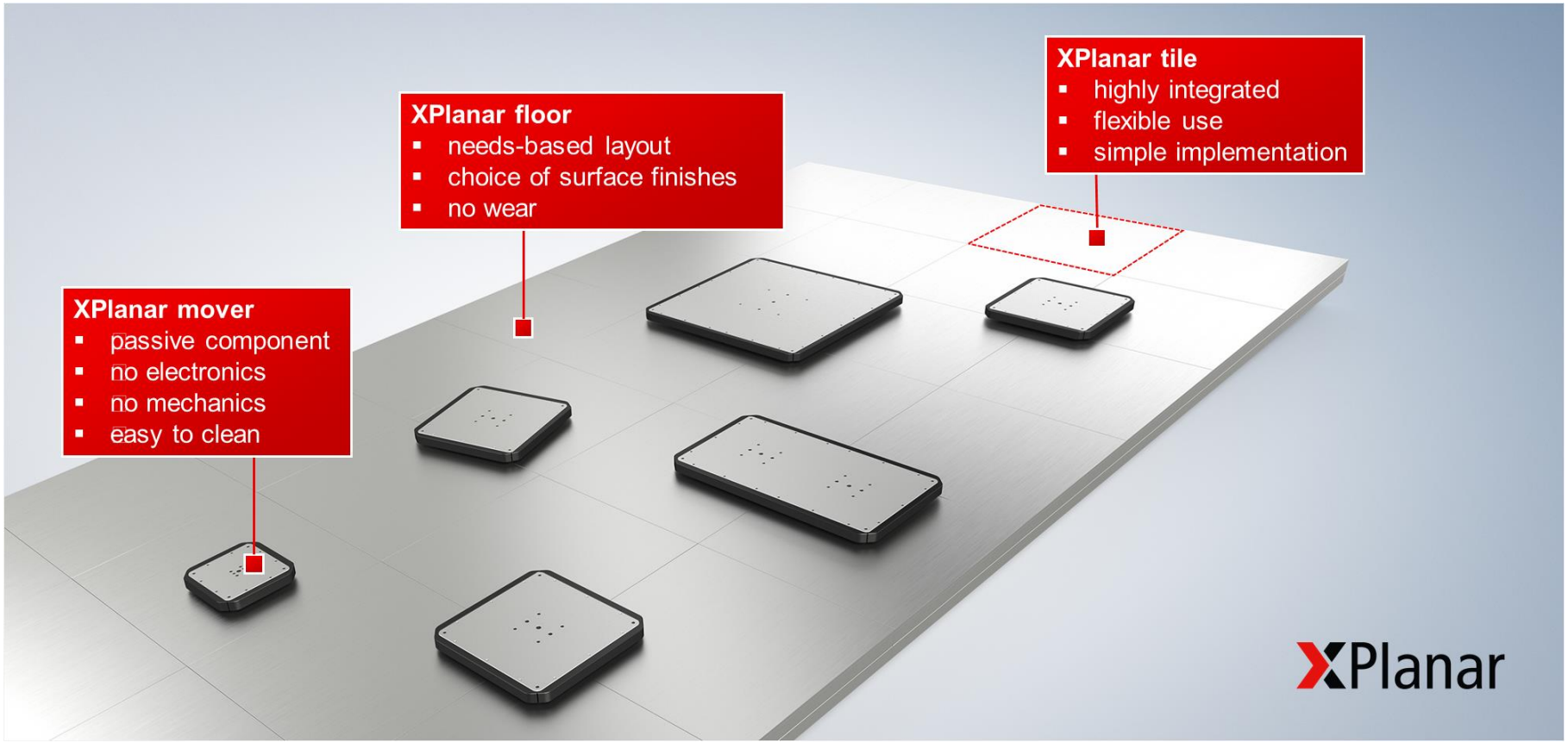
XPlanar system: flying magnets with six degrees of freedom



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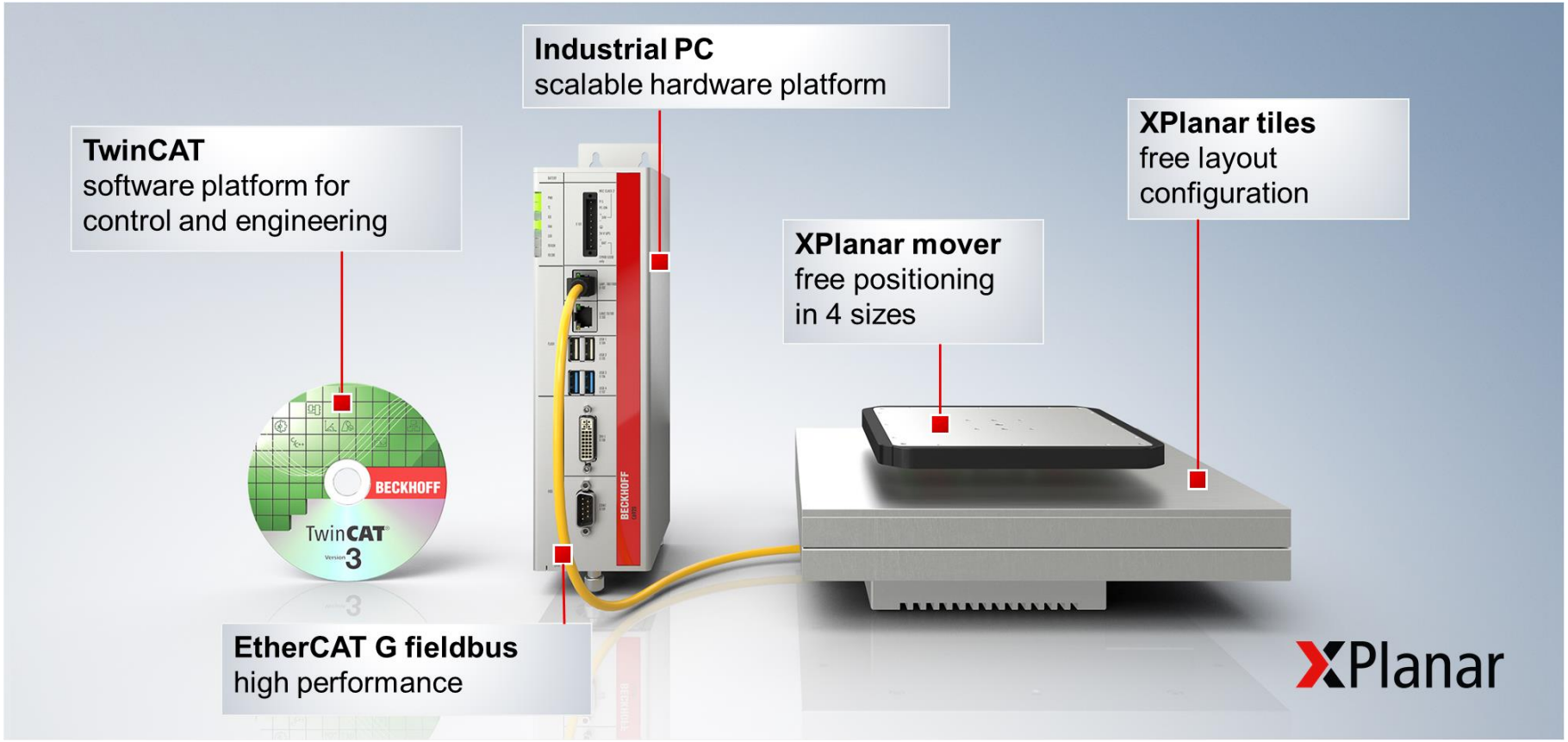
XPlanar system: minimum components, maximum design flexibility



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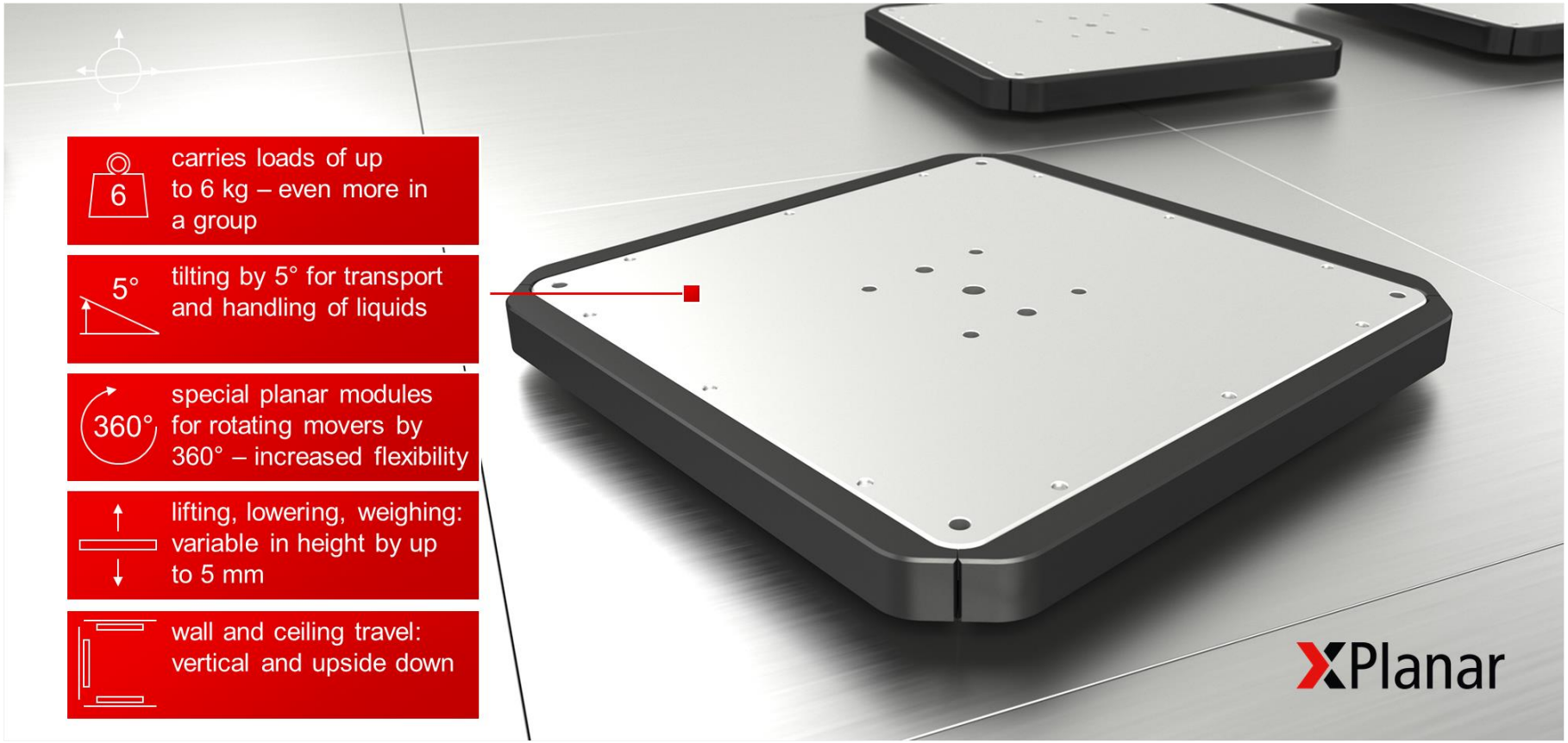
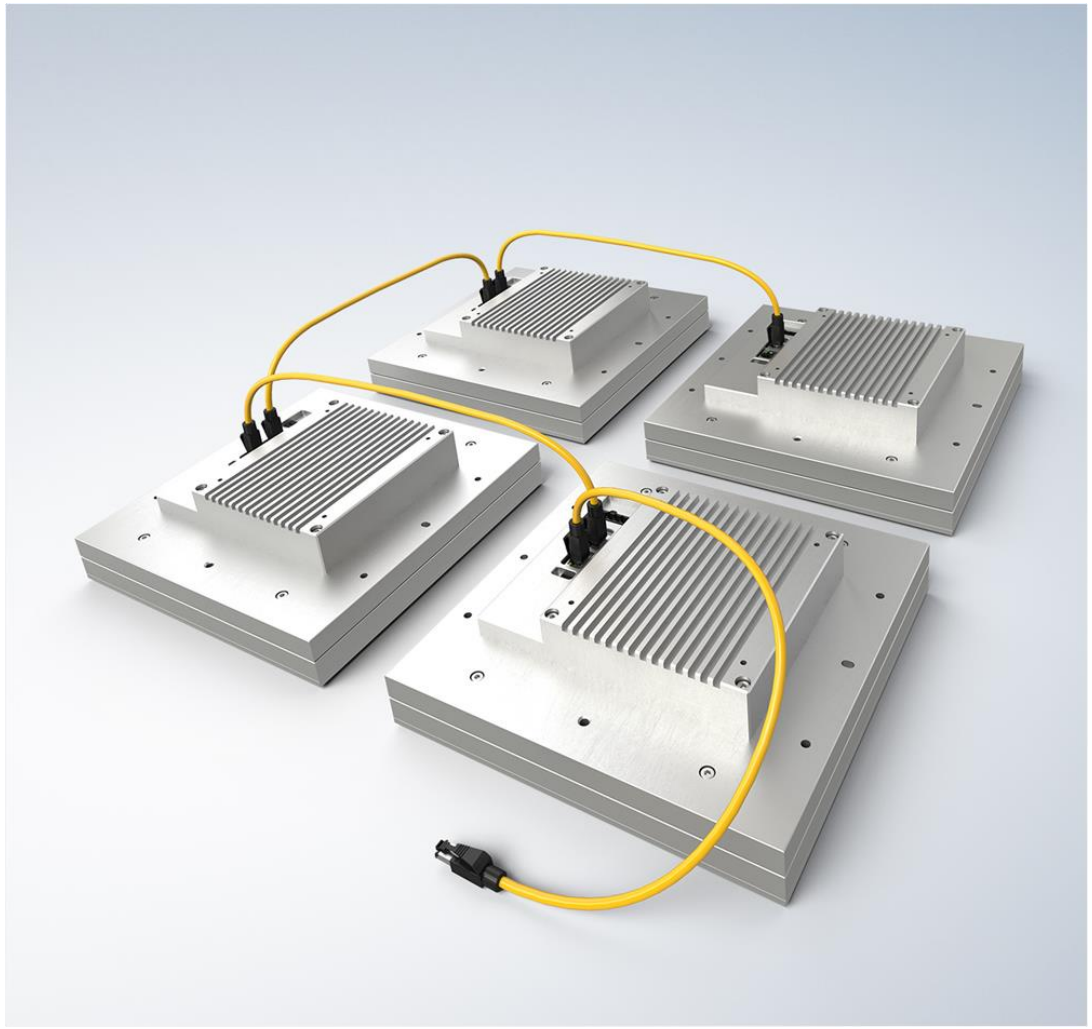
XPlanar movers: reaching every point in every way



XPlanar tile: planar motor with integrated position feedback

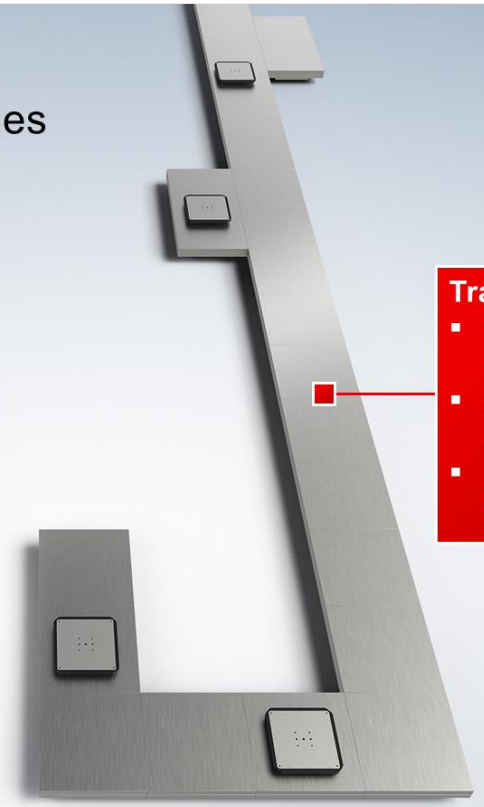
- The planar tile is highly integrated and unites all relevant functions.
- The mover positions are detected by the tiles.
- A power supply unit supplies the output stages with power.
- Super-flat coils generate the travelling magnetic field.
- EtherCAT G establishes a broadband connection to the Industrial PC.
- The tiles can be connected in series on a carrier construction on the machine side.



XPlanar system: high flexibility in geometry and application

- planar tiles in the 24 x 24 cm format
- arbitrary application-specific track geometries

Floor layout
- compact layout
- short transport routes
- flexible use



Track layout
- connects different systems
- accommodates buffer zones
- simplifies congestion avoidance

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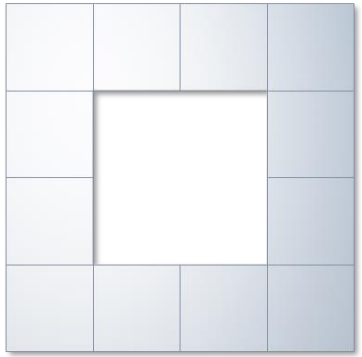
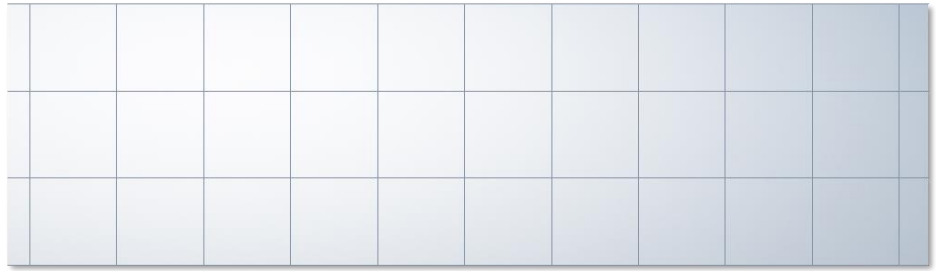
XPlanar system: high flexibility in geometry and application

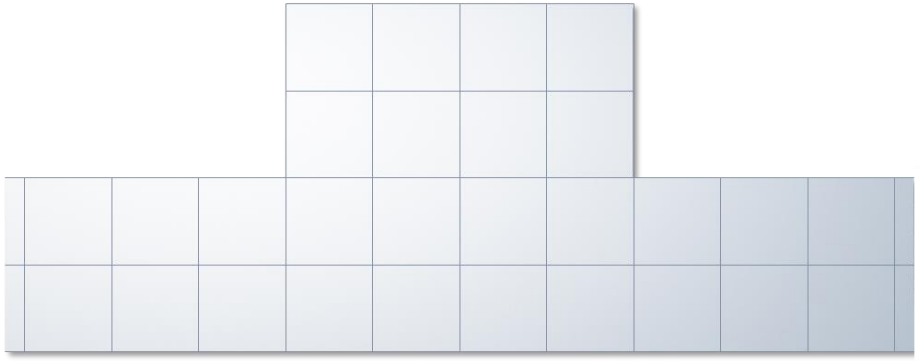
Ring shapes



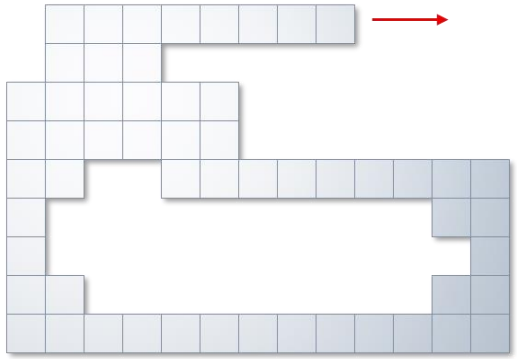
Large tile floors



Waiting zones



Free-form shapes



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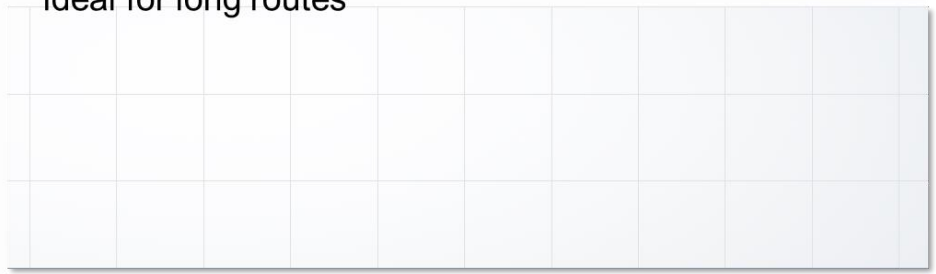
XPlanar system: high flexibility in geometry and application

Ring shapes
for the flow of product
around a processing station

Large tile floors
ideal for long routes

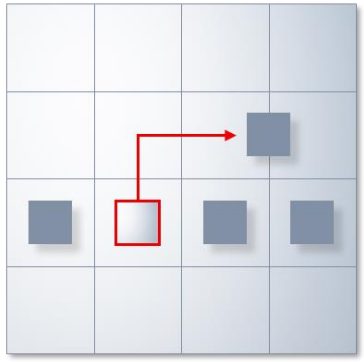


Waiting zones
can be set up directly
alongside the track

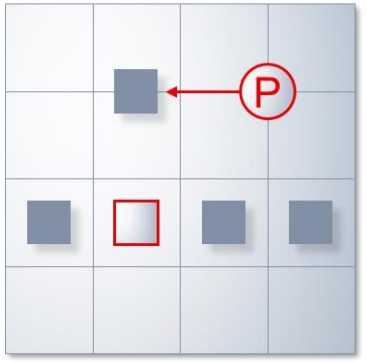
Free-form shapes
provide a match for any
space requirements

XPlanar system: high flexibility in geometry and application

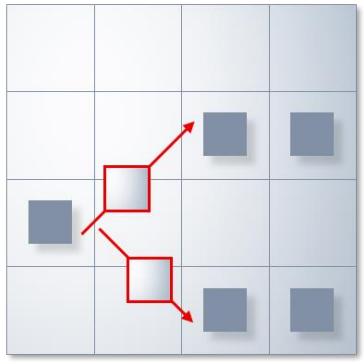
Overtaking



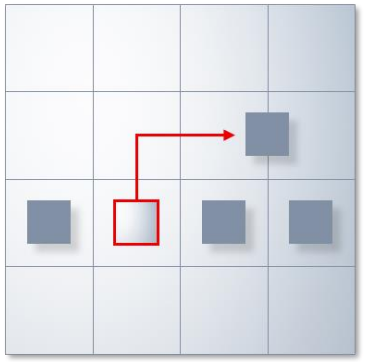
Parking



Divider



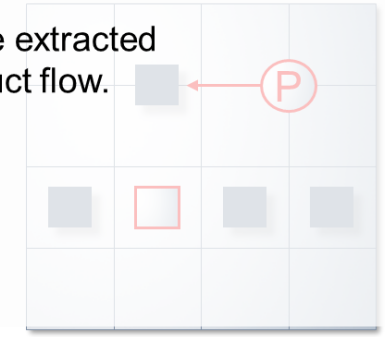
Infeed and outfeed



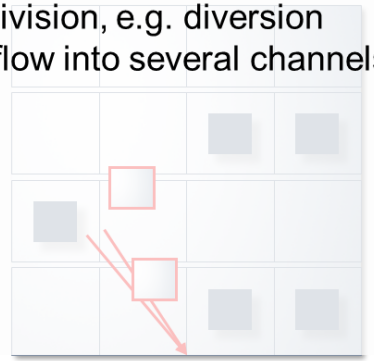
XPlanar system: high flexibility in geometry and application

Overtaking
Movers can change lanes and accelerate.

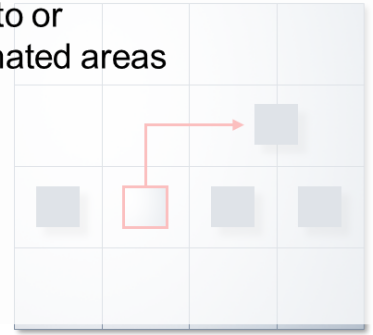
Parking
Movers can be extracted from the product flow.



Divider
simple flow division, e.g. diversion of a product flow into several channels



Infeed and outfeed
for example, into or out of contaminated areas



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MODEX 2020
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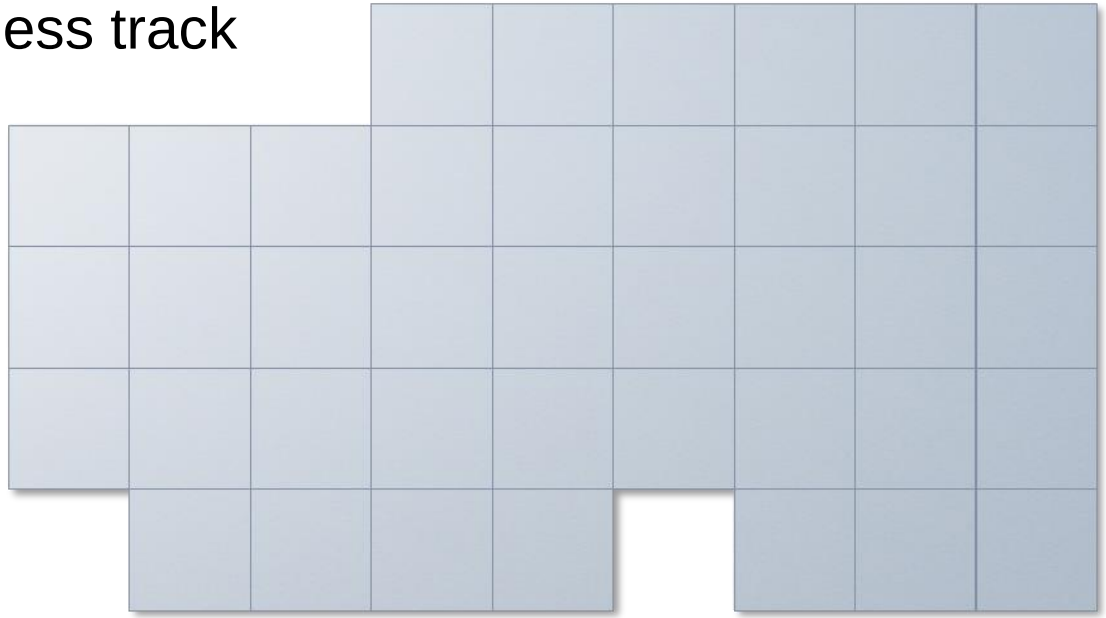
XPlanar software: commissioning and track management

Stage 1
a predefined endless track



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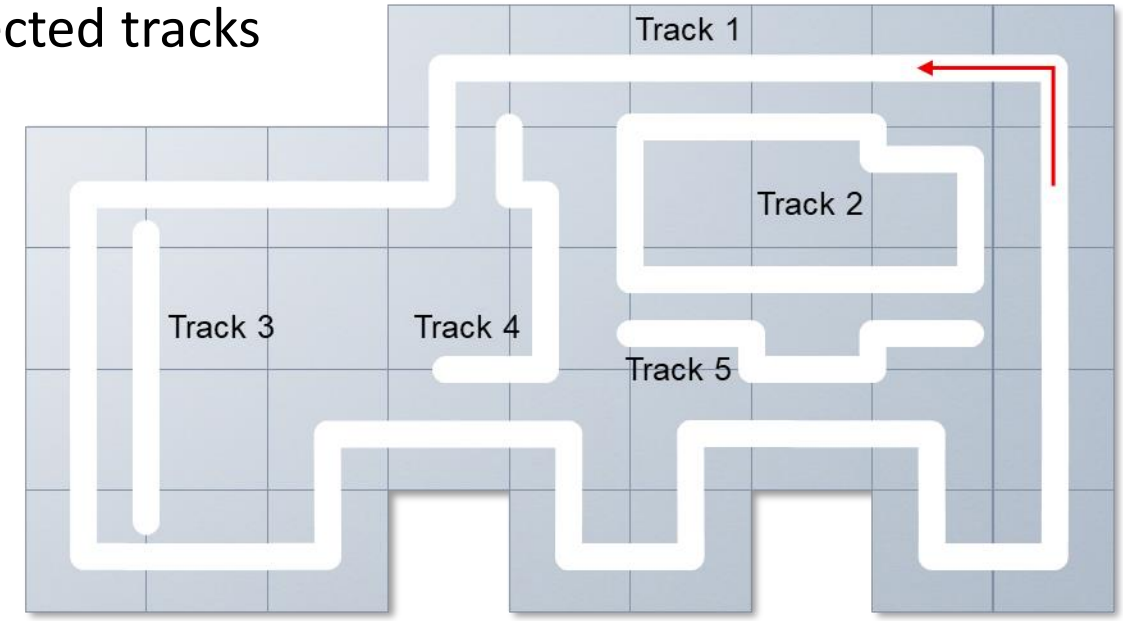
XPlanar software: commissioning and track management

Stage 2

several interconnected tracks



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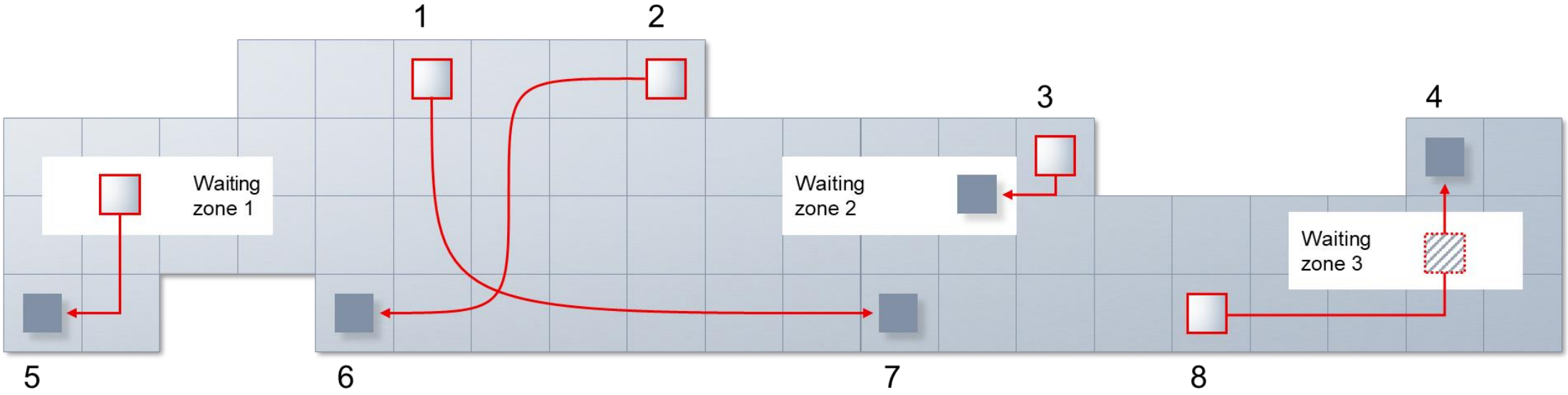
XPlanar software: commissioning and track management

Stage 3
fully automatic path calculation: all movers can move freely.



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XPlanar: product overview

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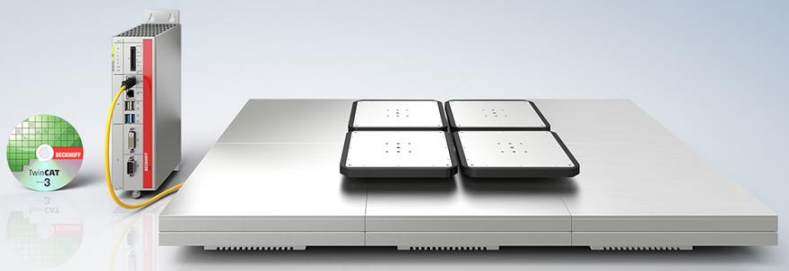
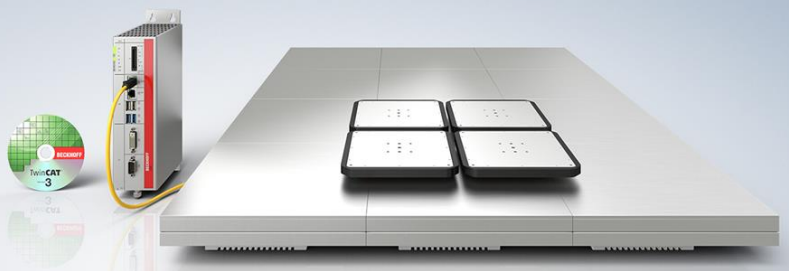
XPlanar starter kit: fully functional for a fast introduction

APS9000
starter kit for planar motor technology



- 6 (2 x 3) APS1003 planar motor tiles
- 4 APM1003 movers
- IPC
- software
- pre-installed, ready for operation

APS9001
starter kit for planar motor technology



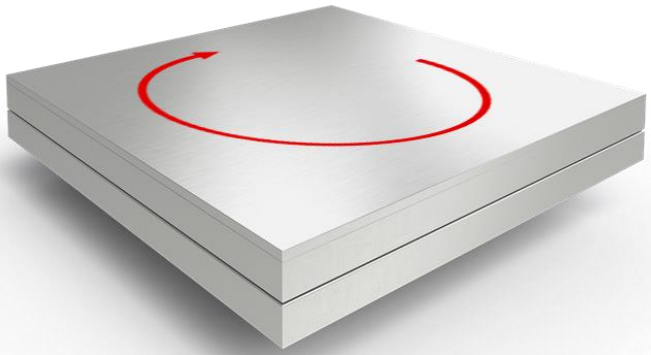
- 12 (4 x 3) APS1003 planar motor tiles
- 4 APM1003 movers
- IPC
- software
- pre-installed, ready for operation

XPlanar tiles

APS1003-0000
planar tile

- 4 active areas
- 110/230 V AC/24 V DC
- 240 mm x 240 mm x 67 mm (L x W x H)
- 4.0 kg

APS2003-0000
planar tile



- rotor area
- 110/230 V AC/24 V DC
- 240 mm x 240 mm x 67 mm (L x W x H)
- 4.0 kg

XPlanar movers

APM1002-0000
planar mover

APM1003-0000
planar mover

APM1005-0000
planar mover

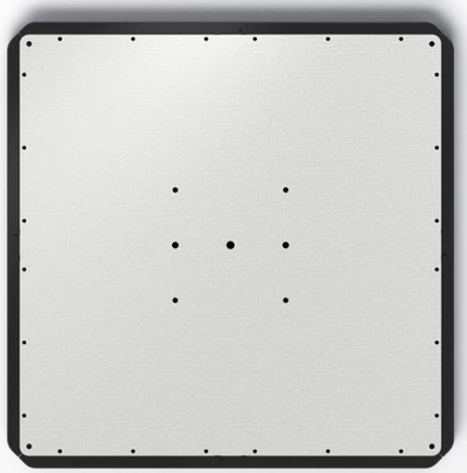
APM1004-0000
planar mover

- aluminum body, hard coated
- bottom side inox coated

- 95 x 95 x 12 mm, 0.39 kg
- 0.4 kg payload

- 155 x 155 x 12 mm, 1.27 kg
- 1.5 kg payload

- 155 x 275 x 12 mm, 2.5 kg
- 3.0 kg payload



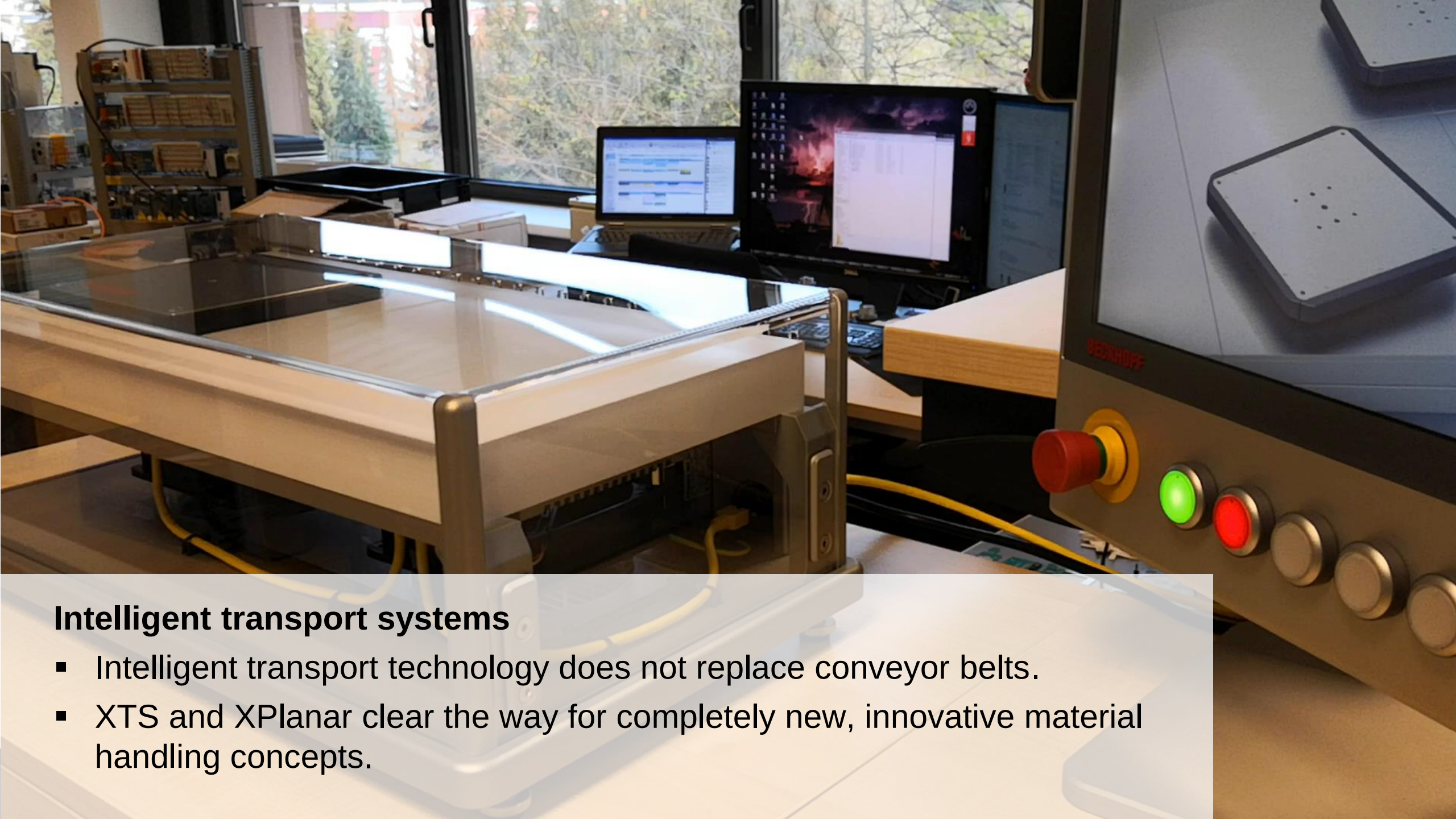
- 275 x 275 x 12 mm, 5.0 kg
- 6.0 kg payload

XPlanar: technical data

Mover	Technical data	Comment
Speed	4 m/s	
Acceleration	20 m/s²	without load
Max. load	6 kg	at low speed
Flight height without load	5 mm	
Flight height 1 kg load	1 mm	
Max. angle of rotation (±)	360°, ±15°	
Positioning accuracy		
Position resolution	1 µm (X, Y, Z), 0,001° (A, B, C)	
	0.001° (A, B, C)	
Absolute accuracy (±)	150 µm (X, Y, Z)	at 25° C, per module
	0.15° (A, B)	at 25° C
	0.2° (C)	at 25° C
Repeatability (±)	< 50 µm (X, Y, Z)	

XPlanar: technical data

Power consumption	Technical data	Comment
In standby mode per planar module	13 W	
Per mover, 1 mm flight height, unloaded, at standstill	40 … 60 W	position dependent
Per mover, 1 mm flight height, unloaded, in motion	105 W	
Per mover, 2 mm flight height, unloaded, at standstill	50 … 75 W	position dependent
Per mover, 2 mm flight height, unloaded, in motion	115 W	



Intelligent transport systems

- Intelligent transport technology does not replace conveyor belts.
- XTS and XPlanar clear the way for completely new, innovative material handling concepts.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BECKHOFF

For more information:

Speaker email: j.johnson@beckhoff.com

Website: www.beckhoffautomation.com

Or visit MODEX Booth 4026

Contact

Beckhoff Automation LLC
Headquarters
13130 Dakota Ave
Savage, MN 55378
USA

Phone: 952-890-0000
Fax: 952-890-2888
E-Mail: beckhoff.usa@beckhoff.com
Web: www.beckhoffautomation.com

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