

Automation solutions for the photovoltaic industry



Automation across the entire manufacturing process for ultrahigh productivity

Greater flexibility and availability – the requirements placed on the photovoltaic industry continue to increase. Production lines must be adapted to current market trends while the demand for machine availability spirals upwards. Rexroth recognizes these changes, which is why it offers an automation toolkit specially designed for the photovoltaic industry.

From control technology, electric drives, and pneumatics through to linear and assembly technology, Rexroth covers the entire product portfolio for photovoltaic automation. The scalable hardware and software found in Rexroth products facilitates customized process and handling solutions as well as standardizes operation along the entire value-added chain. Perfectly coordinated interfaces – both mechanical and electronic – expedite engineering and minimize assembly and commissioning outlay.

Enhanced flexibility in manufacturing

Our components and systems allow you to quickly and easily adapt your production lines to accommodate larger solar modules, modified machine concepts, and end customer requirements.

Thin-film and wafer-based solar modules of different sizes and weights, for example, can be conveniently handled thanks to flexible transfer technology. Coordinated interfaces, such as those found in the EasyHandling automation kit, streamline assembly by optimizing communication among Rexroth components, while engineering tools like EasyWizard reduce design time. Capacity can be enhanced simply by associating processes with the drive controller, and complete, preprogrammed function blocks from Rexroth make your manufacturing processes even more flexible.

Reduced total cost of ownership (TCO)

A single control hardware platform for PLC motion, CNC, and robotic applications provides a high level of standardization for hardware and software. The IndraWorks engineering tool groups all commissioning and diagnostic software tools on a modular basis. Motion logic integrations are based on IEC 61131-3 specifications and PLCopen function libraries. Predefined functions replace programming with simple parameter setting in many cases. Our innovative solutions reduce your total cost of ownership.

Minimized machine downtime

The diagnostic functionality built into the servo drives detects mechanical wear early on so that preventive maintenance can be carried out. Certified drive safety technology reduces downtime following manual intervention, and innovative condition-monitoring systems for electric drives and pneumatic cylinders warn the operator of mechanical wear in good time to reduce downtime still further.



Crystalline production – from liquid silicon to the finished module

Perfectly coordinated controls, drives, pneumatics, and linear and assembly technology cover all aspects of the production process for crystalline solar cells and modules. Rexroth caters to these application scenarios by offering a comprehensive automation toolkit that targets handling solutions and transfer technology.



◀ Ingot production

**Vibration-free –
powerful direct drives
for high torque and
outstandingly smooth
action.**



◀ Test and quality classification

**Careful –
contact-free handling
with pneumatic grabbers
based on the Bernoulli
principle**



◀ Ingot sawing

**Safe and easy –
Turnkey motion solution
for handling wire in an
ingot saw.**



◀ Diffusion

**Process-independent –
contact-free transport
by the Linear Motion
System with a linear
motor mounted outside
the process chamber.**



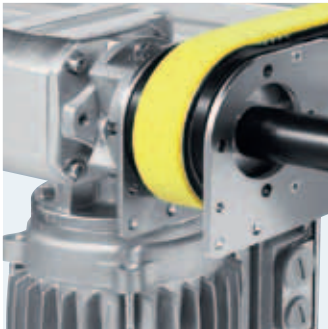
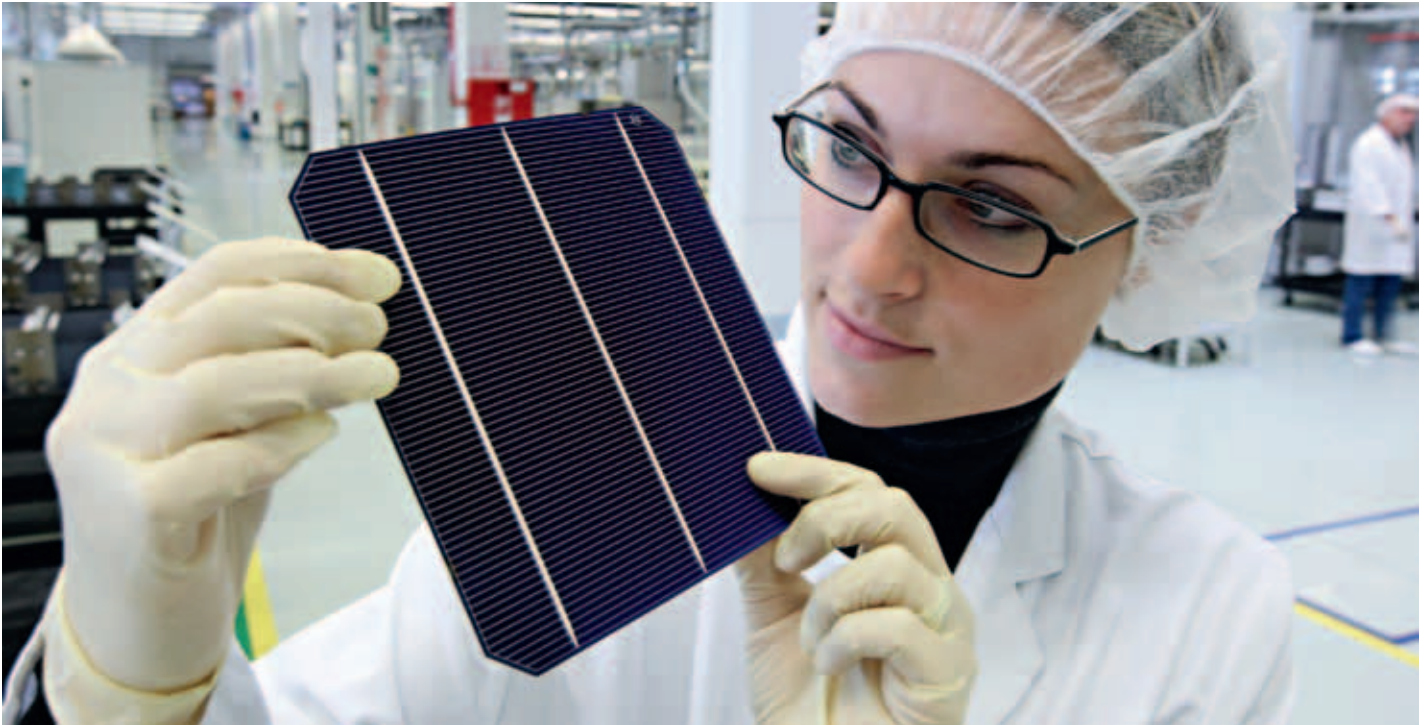
◀ Wafer cleaning

**Media-resistant –
protective transport
thanks to corrosion-
proof components.**



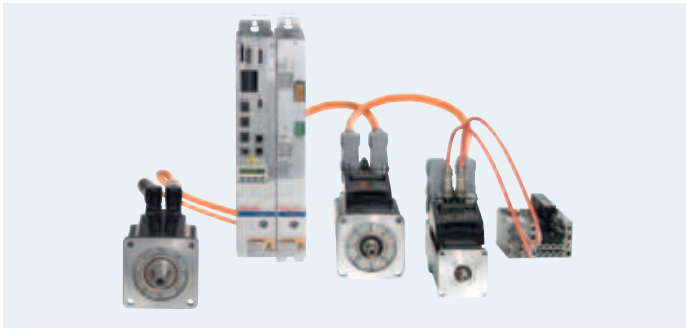
◀ Metallizing

**Dynamic –
Ironless linear motors
position small masses
with utmost precision
and maximum synchron-
ization.**



◀ **Module transport,
module storage**

Vibration-free –
toothed belts with closed
surfaces and many con-
veyor modules for the
transfer system.



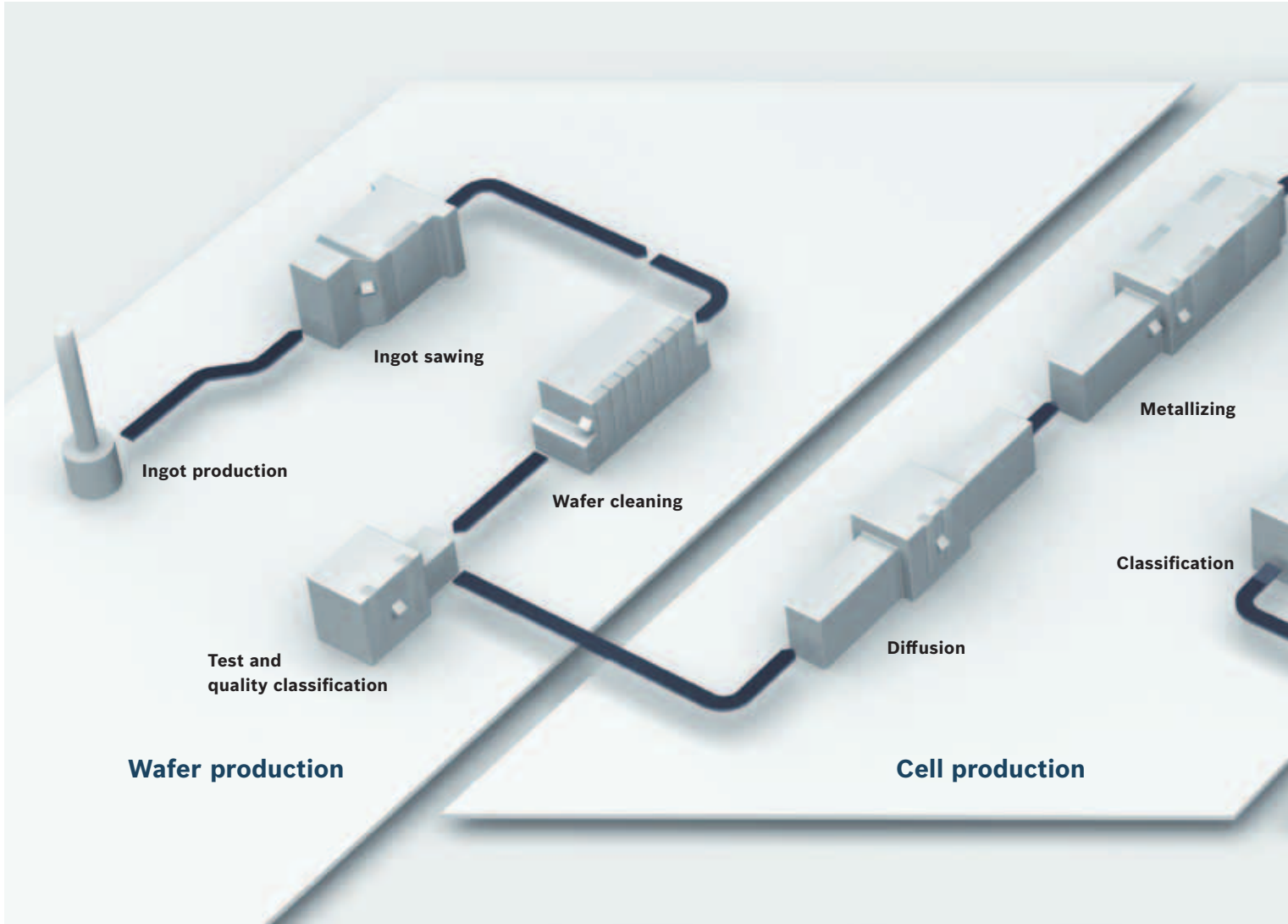
▲ **Lamination**

Energy efficient –
Decentralized drive
technology considerably
reduces cabling outlay
and the footprint of the
machine as well as
enables modular machine
concepts.

▶ **Testing**

Documented –
Mechanical precision
instruments, in conjunc-
tion with high-perform-
ance industrial PC com-
puting power, process
measured data in milli-
seconds.



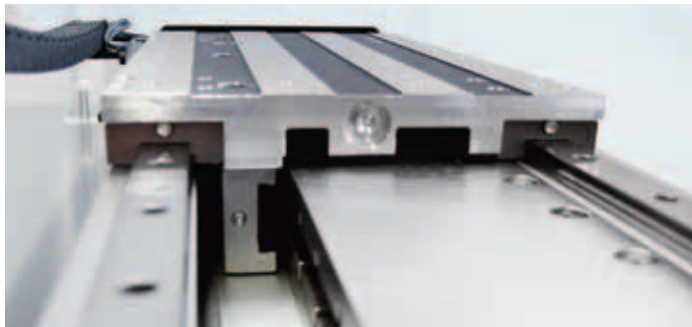


◀ **Classification**

Flexible – motion logic systems with robot control or turnkey cartesian systems.

▼ **Sintering**

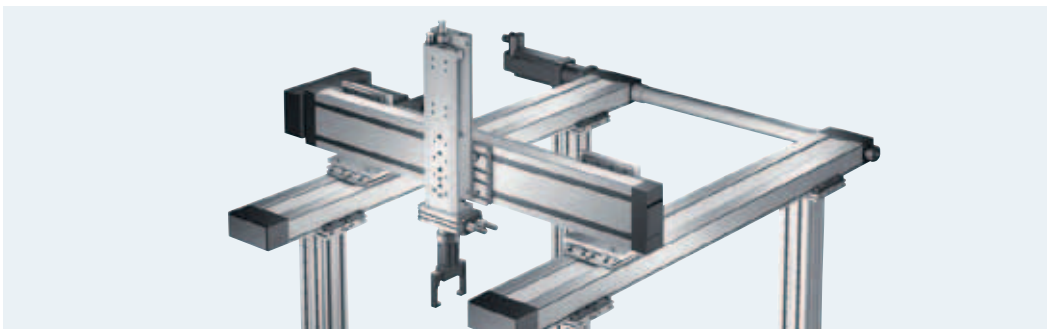
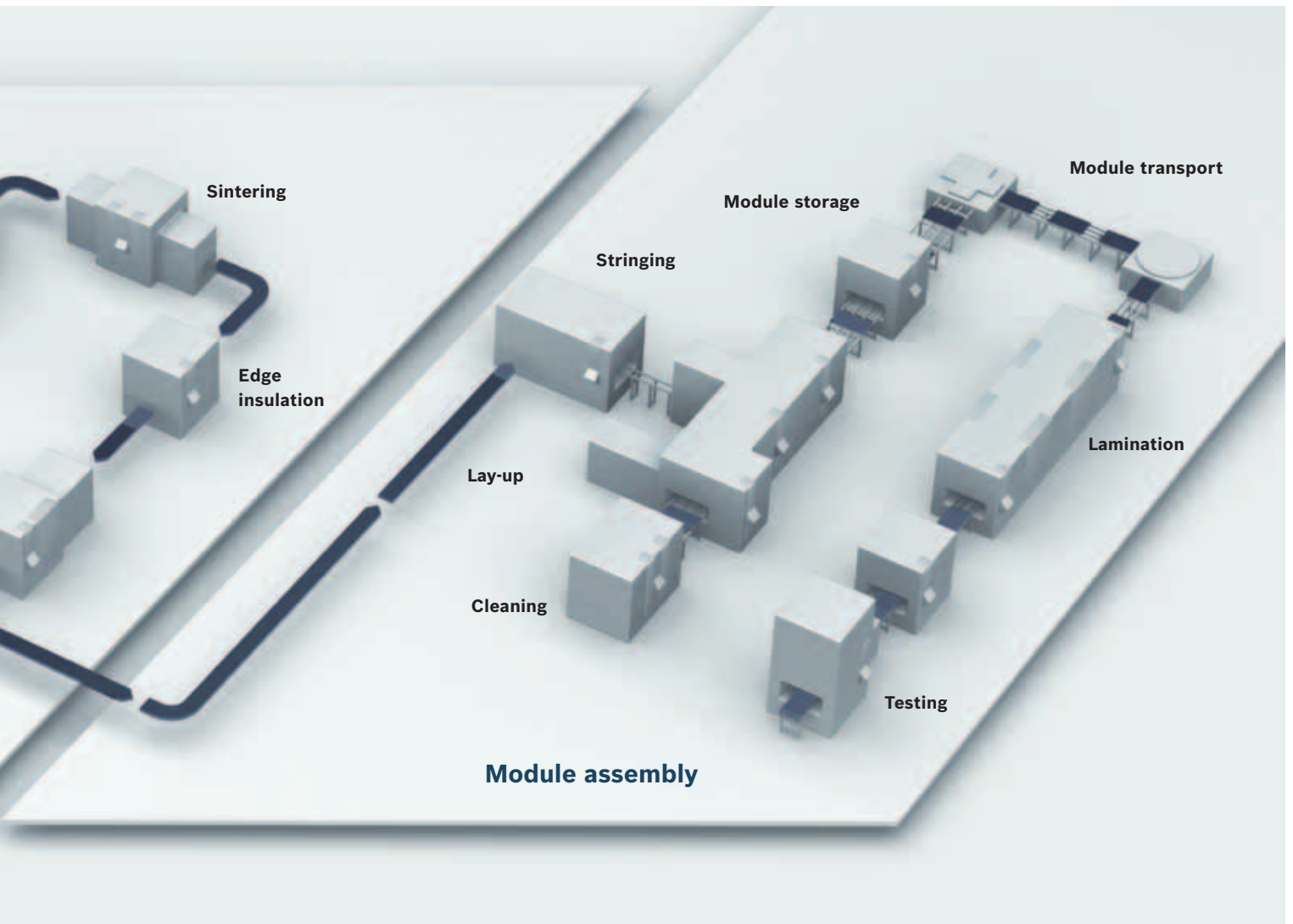
Temperature-resistant – ultra-quiet toothed chains resistant up to 450 °C.



◀ **Edge insulation**

Productive – swift CNC system solution with linear motors for demanding laser processing.





◀ Stringing

Fully fledged – modular axle system to motion logic with pre-defined handling functions.



◀ Lay-up

Scalable – drive- and controller-based control systems with identical PLC and PLC-open function libraries.

Thin-film production – coating glass efficiently

Rexroth facilitates thin-film production on glass by supplying the right transfer technology and efficient handling solutions, in particular for coating modules, laser texturing, and handling glass plates in a wide variety of sizes and weights. Profit from the flexibility and bandwidth of our systems and components.



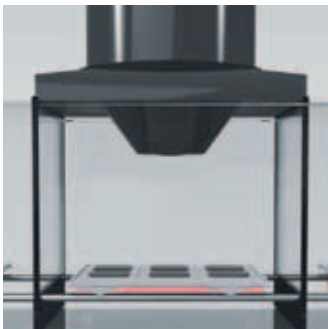
◀ Laser texturing

Dynamic –
Ironless linear motors position small masses with utmost precision and maximum synchronization.



◀ Glass washing

Media-resistant –
Gentle transport thanks to corrosion-proof components.



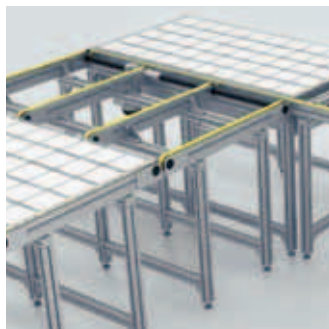
◀ Coating process

Precise –
Intelligent Linear Motion System drive concept for contact-free transport under demanding conditions.



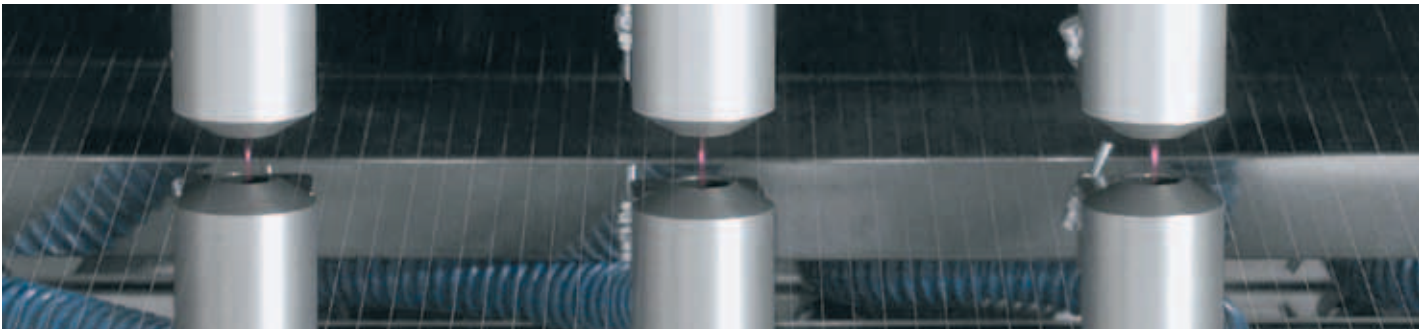
◀ Glass loading

Faster –
The EasyHandling system can be flexibly scaled. It will take you next to no time to make the changes necessary to meet current and future needs.



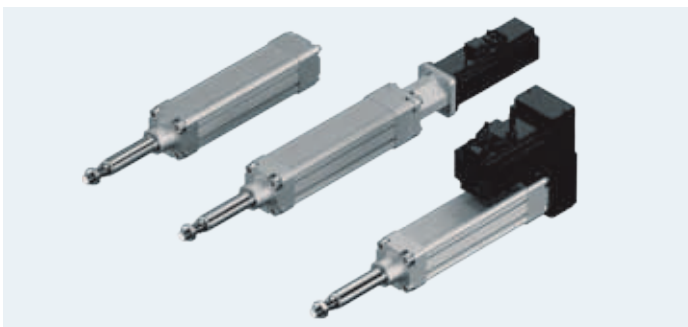
◀ Module transport, module storage

Vibration-free –
Toothed belt with closed surface and numerous conveyor modules for gentle material transport on multi-track conveyor segments. Can be used in ESD rooms and in class 6 cleanrooms.



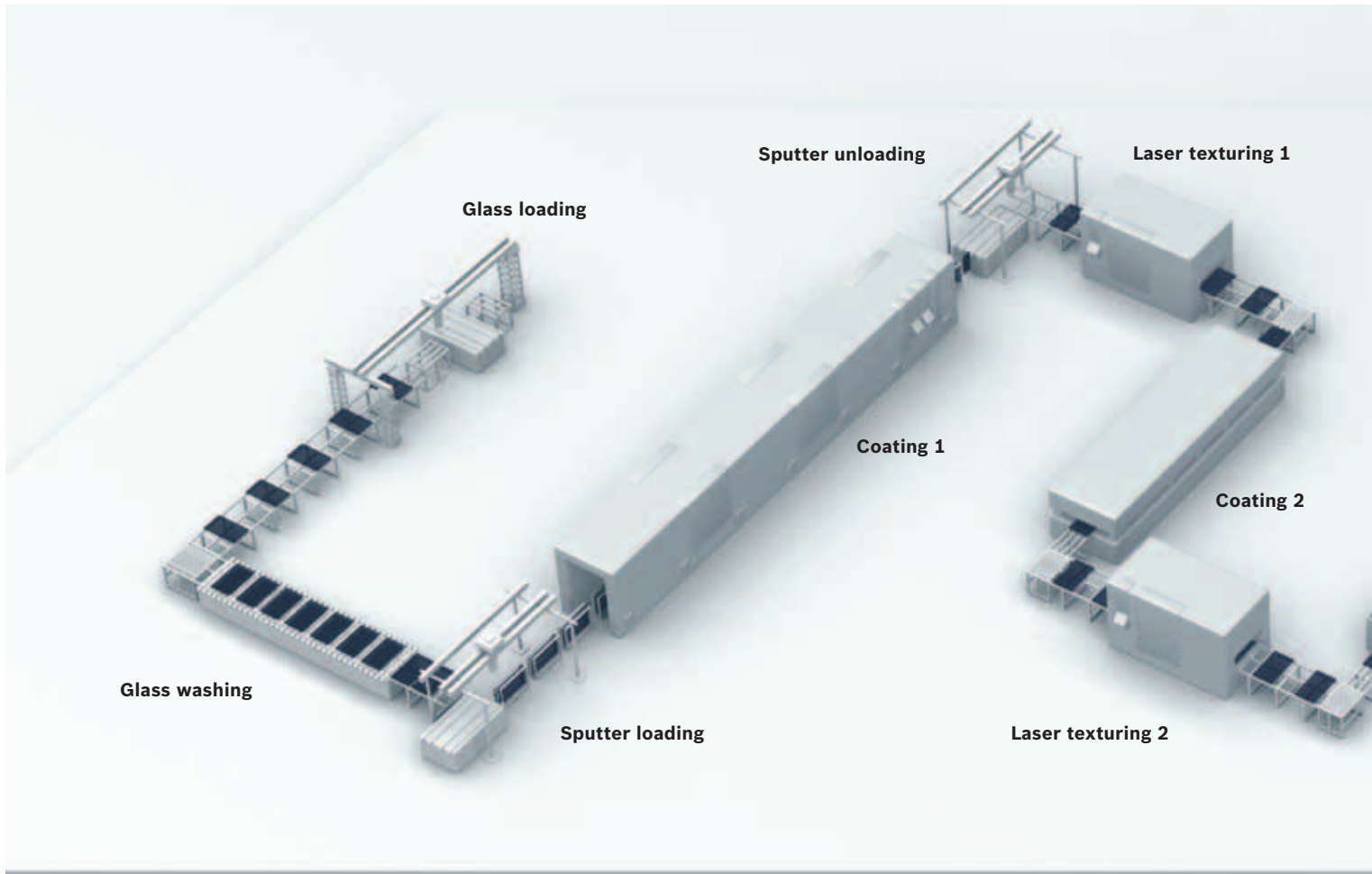
◀ Loading/unloading of sputter

Simple and effective –
The turnkey automation solution with open-source software simplifies engineering and maximizes flexibility. The system solution for handling systems is characterized by the perfect interplay of the drive and control technologies to reduce standardized interfaces, and a new commissioning assistant minimizes project planning, assembly, and commissioning times by up to 80 %.



◀ Coating systems

Flexible –
Easy opening thanks to good dynamic response and precision of electro-mechanical cylinders that can be fully integrated in drive and control systems.



◀ **Edge ablation**

Forward looking –
 The open automation solution leverages all the freedoms of modern automation concepts with a wide variety of functions for motion, robot, and logic control.

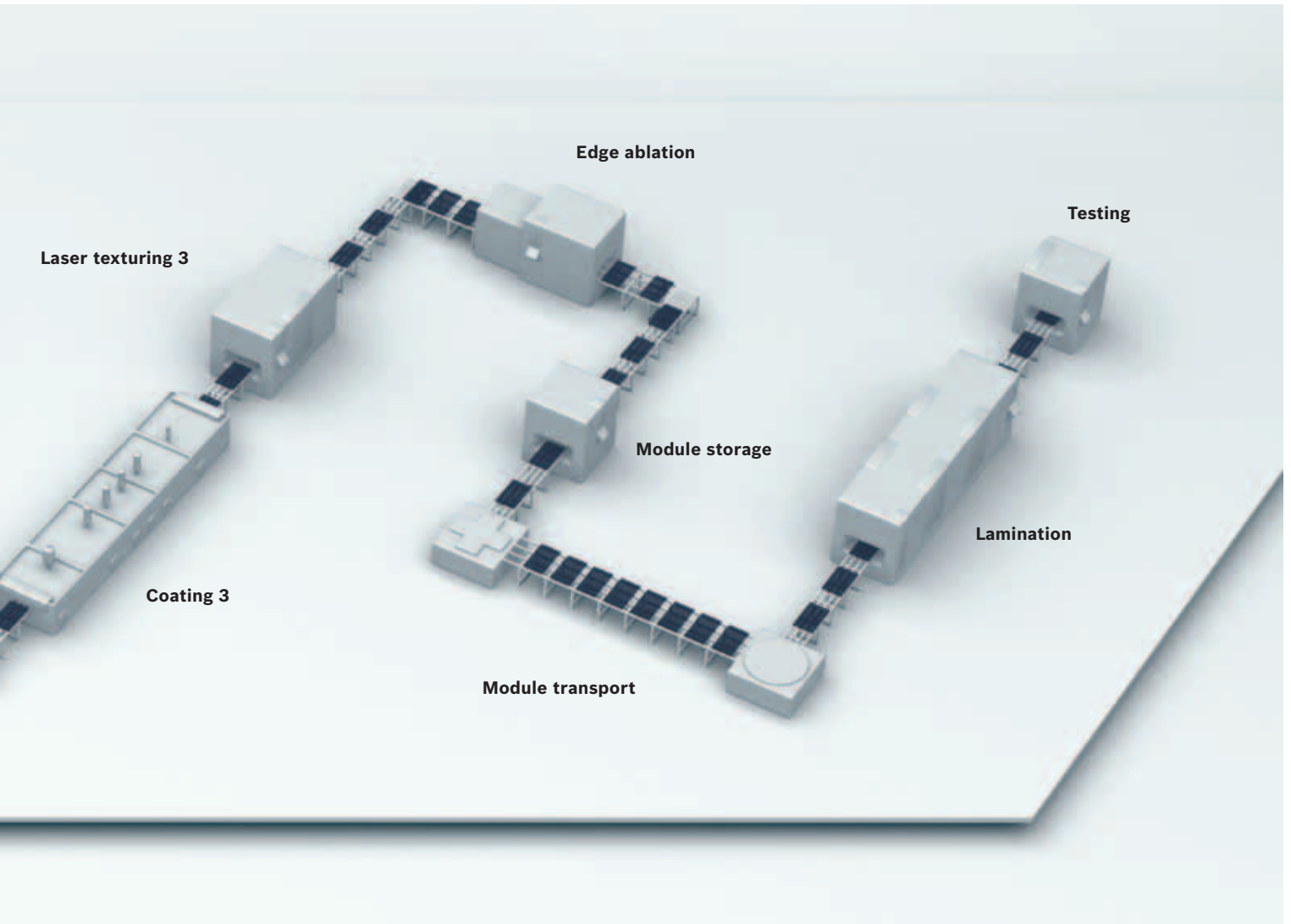


◀ **Lamination**

Energy efficient –
 Decentralized drive technology reduces cabling outlay, enables modular machine concepts, and reduces the footprint of the machine considerably.

▲ **Testing**

Documented –
 Mechanical precision instruments, in conjunction with high-performance industrial PC computing power, process measured data in milliseconds.



Thin-film production – flexible solar cells in new production method

Roll-to-roll processing as it applies to photovoltaic production is new and innovative. Rexroth leverages many years of experience and comprehensive know-how in the printing industry when it comes to thin-film production on foil. Our proven technology functions and function libraries provide efficient engineering support.

Technology functions

Implement complex processes conveniently and easily

- ▶ Finished functions for all processes
 - Winding controller for constant speed
 - Dancer control regulates the continuous web tension
 - Dynamic web buffer for brief stopping of web transport for inspection or punching applications
- ▶ Simply parameterization instead of programming
- ▶ 40 % less engineering outlay

Advantages

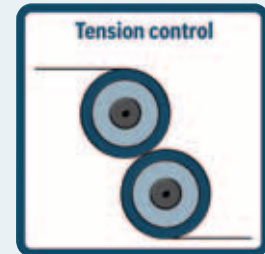
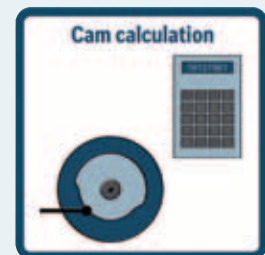
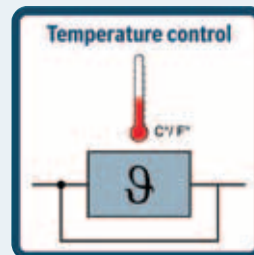
- ▶ Rapid reaction to market and customer requirements
- ▶ Ready-to-use function libraries and pre-defined technology functions make easy work of complex processes
- ▶ Efficient modifications for new machine modules and system designs
- ▶ Simplified implementation of modular machine control concepts

Engineering framework

One environment for all tasks

- ▶ All engineering tasks coordinated centrally in one framework
- ▶ Pre-defined project structure, interfaces, and state machines
- ▶ Open software architecture and object-oriented programming

Examples of pre-defined technology functions



◀ Engineering framework IndraWorks

The engineering framework IndraWorks combines all tools for the entire engineering process – from commissioning through to standardized programming.



sercos
the automation bus

◀ sercos technology

- One Ethernet-based system bus for
- Motion
 - Drives
 - I/O
 - Safety

**SAFETY
ON
BOARD**

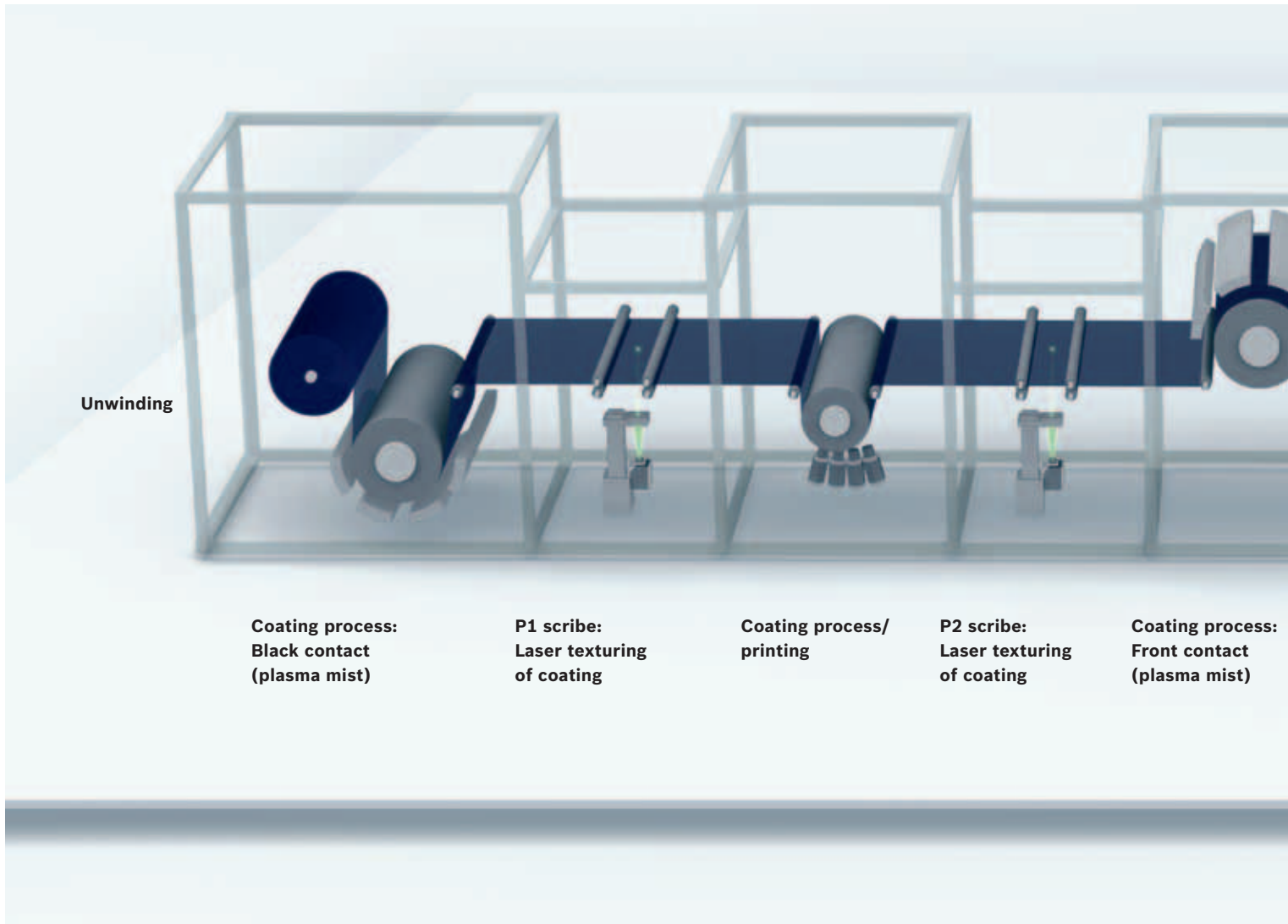
◀ Safety on Board

- Safety on Board Products and know-how for certified and compliant machine safety:
- Increased operational safety
 - Greatly minimized downtime



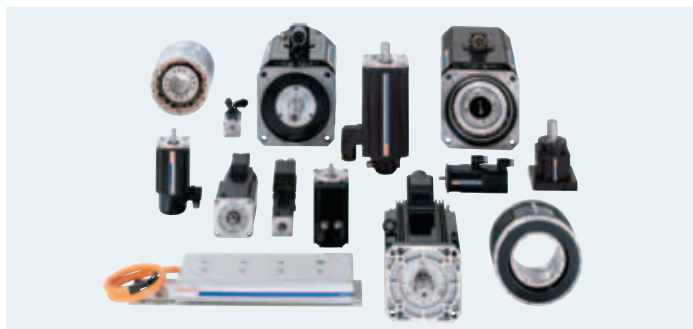
◀ Intelligent controls

Motion logic systems from Rexroth give you access to very configurable controls for realizing fully-automated production applications. The open system architecture and modular, scalable hardware and software let you adapt the systems to meet your exact requirements.



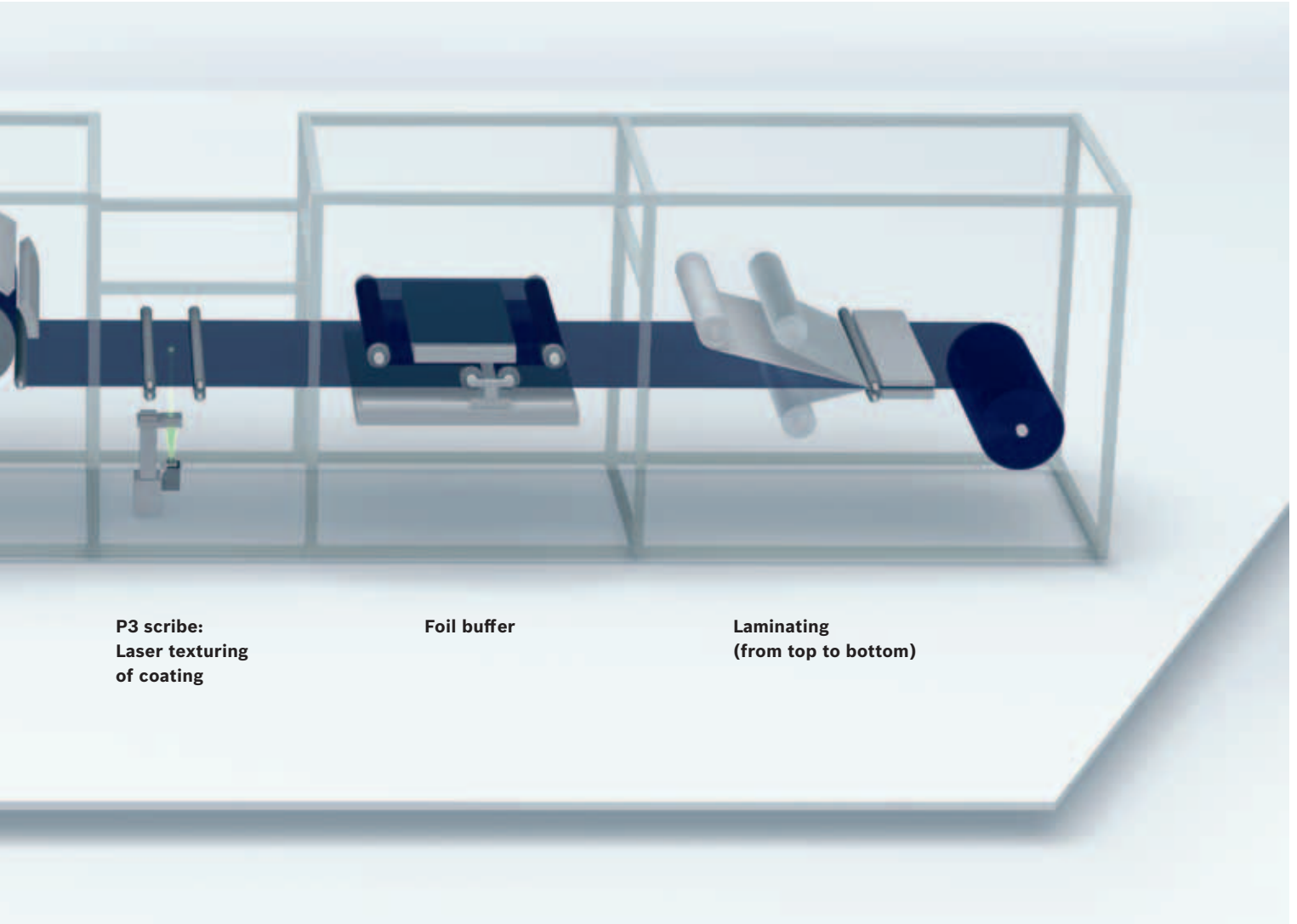
◀ **Electric drives**

The electric drive systems cover the entire power range from 0.1 to 630 kW. Regardless whether they are distributed centrally in the control cabinet or decentrally in the plant, the systems meet all customer flexibility requirements. Use the scalable motion logic functions, certified safety technology, or multi-Ethernet communications option for your customized solution.



◀ **High-dynamic motors**

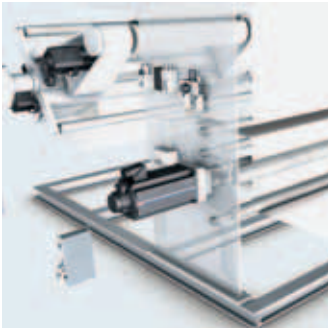
The wide range of high-dynamic servo, torque, and linear motors fulfills all drive functions for e.g. powerful winders, precision feed axes, and high-dynamic cross cutters. Direct drives reduce torsion in the machine to lengthen its useful life. Rexroth offers ATEX and UL/CSA servo motors for integration in explosive atmospheres.



P3 scribe:
Laser texturing
of coating

Foil buffer

Laminating
(from top to bottom)



◀ **Precision tension controllers**

Always the right web tension for superior quality and productivity: The tension controller maintains precise control of web tension. Ultrahigh printing accuracy is ensured as soon as production ramps up. All print media are covered, including various foils and their respective elongation properties.

▼ **Productive laser texturing**

Fast and highly precise CNC system solution for demanding laser machining.



◀ **Dynamic foil buffer**

Brief stopping of a process area with continued web transport of plant. Ironless linear motors position small masses with utmost precision and maximum synchronization.



Your global partner for the entire machine lifecycle

Rexroth is your professional and experienced technology partner in the photovoltaic industry. Active in more than 80 countries, we support you on a global scale to standardize and boost the efficiency of your production lines.

Rexroth pools the resources of a global partner to service your needs. You have access to a team of photovoltaic industry experts in Europe, America and Asia. Our people have first-hand experience and understand the specific needs in every region.

You can rely on us to remain at your side after commissioning. Our extensive service network places us in close proximity to the customer, ensuring fast response times. Our portfolio of innovative service solutions such as condition monitoring helps machine manufacturers and users to further enhance the availability of their automation systems. A global partnership with Rexroth offers distinct advantages over the entire lifecycle.





Tough application,
ingenious solution } Exactly

Advantages:

- ✓ Enhanced flexibility
- ✓ Increased productivity
- ✓ Improved engineering
- ✓ Reduced machine downtime
- ✓ Lower total cost of ownership

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