Rexroth
Bosch Group

IndraMotion for Packaging
Automation system for the packaging industry

The market sets the pace

Staying close to the consumer, determining trends early on, and quickly incorporating findings into current products: Ever-shorter product lifecycles present great challenges for manufacturers of food, beverages, pharmaceuticals, and cosmetics. Consumer requirements change more quickly – global mega trends characterize consumer behaviour.

The demographic shift in industrial societies affects previous habits. More and more people are living in cities, households are becoming smaller, and the percentage of the elderly continues to rise. These trends increase the demand for smaller portion packs and food that can be prepared quickly. It therefore comes as no surprise that frozen foods and instant meals are taking up more space on supermarket shelves.

Consumers around the world are also more conscious about eating healthier and take the time to review ingredients as well as demand top quality. At the same time, more attention is being paid to specific brands, which must be renowned and clearly positioned to win over consumers and secure long-term success in regional and global markets.

Visual impressions also count, since attractive packaging arouses interest, lures customers, and increases recognition. New packaging and new packaging materials present products in a more captivating manner while fulfilling additional functions. Environment-friendly packaging made from recyclable materials, for example, is enjoying ever-increasing popularity.

▲ **IndraMotion for Packaging is a complete, intelligent solution for the food and packaging industry from Control City – your control technology capital.**

www.control-city.com
www.boschrexroth.de/packaging

Such complex developments require new concepts from producers and machine manufacturers alike:

Ultra-fast flexibility for product changes
Automation enables changes to be made at the press of a button to ensure the feasibility of small batches, for example.

Modularity for high productivity
Modular machine concepts allow production lines to be quickly adapted for product changes, while the certified safety technology provides for high availability.

Ultra-high reliability for rapid processes
The quality of the integrated components plays a key role in realizing ever-increasing production speeds.

Standardization for easy-to-use
Intuitive user interfaces and standardized software tools simplify operation, even of complex plants, and shorten personnel training periods.

Energy efficiency and sustainability safeguard current and future success
Those who optimize energy consumption during development conserve the environment and save money in the long term.

Global partnership for reliability
International companies and globally-operating OEMs look for partners that offer products and services around the world.

IndraMotion for Packaging – the complete packaging solution

Rexroth has enjoyed success in the packaging industry for over 30 years. This experience has also been leveraged for IndraMotion for Packaging. Select all components for your customized automation concept using our modular system; perfectly coordinated control systems, HMI devices, and drives make automation all but child‘s play.

The requirements for packaging machines are more complex and differentiated than ever before and continue to place new demands on manufacturers. IndraMotion for Packaging is the ideal automation solution, regardless of whether pharmaceutical or food products in solid or liquid form are involved.

IndraMotion for Packaging bundles Rexroth‘s industry know-how in a standardized complete solution for all segments of the food and packaging industry:

- food
- beverages
- confectionary
- pharmaceuticals
- cosmetics

Profit with all applications – from individual machines to entire production lines:

- form, fill and seal machines
- thermoforming machines
- bag machines
- labeling machines
- intelligent sorting systems
- casepacking machines
- cartoners
- pick-and-place robots
- palletizers

A competent partner, Rexroth offers end-to-end solutions tailored for the packaging industry. This also applies to all applications with motion control and PLC functionality – from operation and visualization through to drive system. We continually advance our systems to ensure that we meet your exact needs. The result of this development work is a very modular system, which integrates all components for flexible and intelligent automation – scalable, comprehensive, and open:

- **IndraWorks –**
  integrated engineering framework for configuring, programming, visualizing, and diagnosing all technologies

- **IndraMotion –**
  intelligent system software with integrated motion, robot, and logic control

- **IndraControl –**
  scalable control platform for HMI, operation, visualization, and I/O devices

- **IndraDrive –**
  intelligent drive solution with integrated motion logic, technology, and safety functions

Rexroth provides much more than just components, however. We can test and optimize your new ideas via simulation during the development phase. This minimizes expensive real-world testing and greatly reduces the time required to launch the product. Using proven tools for selecting optimum components helps in configuring an efficient machine from the very beginning. Expected power consumption can also be calculated, providing end customers peace of mind.

Benefits for the user

Future-proof system architecture

Scalable control portfolio

- performance control platform: drive-, controller, and PC-based
- control system for motion, robotics, and logic

Ethernet-based system bus for

- motion
- drives
- I/O
- safety

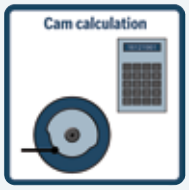
Drive and control

- multi-technological integration (electricity, hydraulics, linear motion technology, pneumatics)
- mechatronic systems and modules
- cross-technology simulation

Maximum flexibility

Technology functions

- finished functions for all packaging processes
- parameterize instead of program
- 40 % less engineering time



Innovative cams

- quickest possible format and product changeovers
- flexible, segmented, and adaptive cams

Robotics

- over 100 kinematic equations
- adaptive belt synchronization
- multi-kinematics
- integration of camera systems

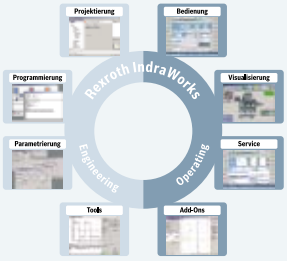
Easy engineering

Decentralized drive technology

- 85 % lower costs for wiring
- 70 % lower control cabinet costs
- improved modularity of machines

„One-stop engineering“

- one engineering frame-work for all tasks
- multi-user engineering
- parameterize instead of program using technology functions



Open standards

- open interfaces
- SERCOS PackProfile
- programming according to IEC 61131-3 and PLCopen
- simple integration of 3rd-party solutions, e.g. sensors

SERCOS interface · PROFIBUS · PROFINET · DeviceNet · EtherNet/IP · IEC · OMAC · CC-Link

Low costs of ownership and best service

Safety on Board

- raised operational safety
- substantial less downtime
- up to 70% less costs for safety engineering

SAFETY ON BOARD

Energy efficient

- Energy System Design
- Energy Efficient Components
- Energy on Demand
- Energy Recovery

4EE ENERGY EFFICIENCY

Overall Equipment Efficiency

- up to 30 % higher line availability
- prevention of unplanned downtime
- preventative maintenance

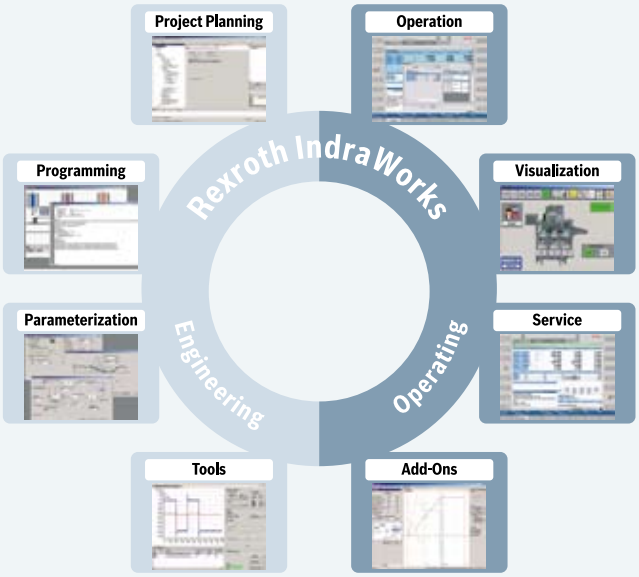
World-wide support

- international project coordination
- global technical support and service
- large world-wide installed base

IndraWorks – rapid programming and easy operation

Today‘s modular machine concepts and increasingly complex tasks require a clearly-structured software architecture. Simple, complete solutions are what counts. Engineering and programming must be easy to realize, without any hassle, and it should be possible to operate the machine intuitively.

IndraMotion for Packaging helps you accommodate all engineering tasks centrally, in the IndraWorks engineering framework. This integrated framework guides you automatically through all steps – from project planning and programming to visualization and diagnosis on the machine. To this end, IndraWorks offers a wide range of features that facilitate cost-effective engineering:



Predefined project structure, interfaces, and state machines
Clearly-arranged, easy-to-use programs facilitate reusability

Open software architecture and object-oriented programming
For efficiently applying your machine know-how in the application program

Multi-user engineering
Simultaneously work with multiple users on a project

GAT – Generic Application Template
For rapid development of your application

Parameterize instead of program using technology functions
Prepared function blocks and automatic code generation free you of routine tasks

FDT/DTM technology
For seamless integration of 3rd-party components

Customer-friendly, cost-effective licensing model
Reasonable software costs for OEMs and machine users

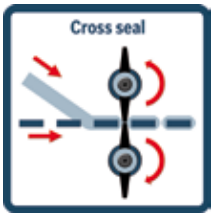
Predefined technology functions considerably reduce engineering time by accelerating programming and facilitating reusability thanks to clearly defined structures and interfaces.

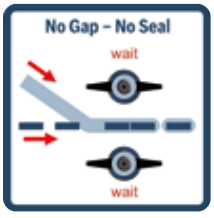
Examples of finished technology functions for packaging systems:

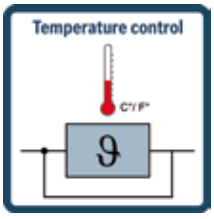
- intermittent duty of the machine cycle (No Product – No Bag, No Gap – No Seal)
- print mark control
- FlexProfile
- cams calculation
- magic belt
- measuring wheel
- probe
- flying shear
- product infeed
- product grouping
- cross sealing
- temperature control
- tension control
- and much more

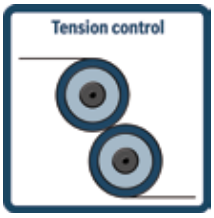
IndraMotion for Packaging offers a wide range of advanced functions. End customers in packaging will see increased productivity:

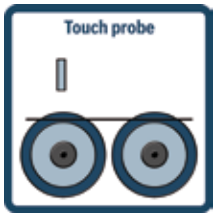
- modular machine designs
- quick response to market and customer requirements as a result of easy modification
- simple operation of all processes from a standardized user interface

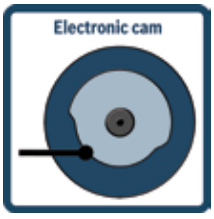


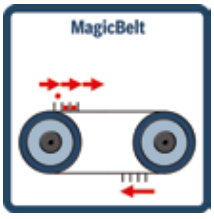


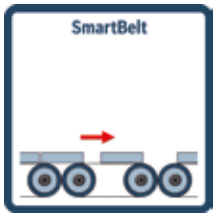












Control technology from Rexroth – scalable, consistent, open

Rexroth controls communicate consistently with integrated, standardized interfaces and are based on open standards. Our competency allows us to offer upgradable complete solutions and customized service packages that utilize state-of-the-art technology and are very cost effective for successful automation.

IndraMotion MLC – scalable motion-logic system

- superior performance for synchronizing up to 64 drives per control system
- individual expansion using function modules for communication and technology
- direct connection for local inline I/Os, 8 high-speed I/Os already on board
- SERCOS III, PROFIBUS, PROFINET IO, EtherNet/IP, DeviceNet, Ethernet TCP/IP, and RS232 communication interfaces
- easy device exchange, since all data is on removable media
- future-proof thanks to extended hardware availability

IndraControl V – visualization devices and industrial PC

- controller-based compact operator panels measuring 7.6 cm (3“) to 26.4 cm (10.4“) – from the keypad unit to the touch screen
- embedded-PC-based terminals to 38.1 cm (15“) touch screen
- embedded-PC-based manual operator panel for mobile use
- complete industrial PC portfolio – from panel PC, to control cabinet PC with remote display, through to complete PC operating units

Flexible I/O systems with IP20 and IP67 protection

- I/O systems for centralized or decentralized connection
- ultra-fine channel selectivity of digital modules, with 2, 4, 8, 16, or 32 channels
- comprehensive portfolio with digital, analog, function, relay, and feed terminals
- fieldbus coupler for SERCOS III and all standard fieldbus systems
- IP67 version with M8 and M12 connection technology

Drive technology from Rexroth – intelligent and compact

The trend in packaging machine construction is toward greater flexibility and small, intelligent drives designed to handle specific tasks. In response, Rexroth has developed the revolutionary IndraDrive Mi and versatile IndraDrive Cs to achieve further milestones in automating packaging machines.

IndraDrive Mi – the motor-integrated drive system
IndraDrive Mi combines drive electronics and a servo motor in an ultra-compact unit for substantially reduced overall size and cabling. This makes IndraDrive Mi the ideal solution for all applications for which only minimum space is available and ultra-high flexibility and maximum cost effectiveness are required.

- the ideal solution for modular machines
- up to 70 % reduction in control cabinet volume
- wiring costs reduced by up to 85 %
- all sizes covered, with IP65 protection, and for torques ranging from 2 to 30 Nm
- up to 20 drives on one daisy-chain cable
- absolute encoder and optional holding brake
- digital I/Os integrated – can also be used for registration inputs
- one size drive for all motor sizes
- easy device exchange, since all data is on removable media

IndraDrive Cs – the compact series Multi-Ethernet drive
IndraDrive Cs can be used with many different communication configurations and encoders thanks to the new multi-protocol-capable communication hardware and multiple transducer interface. This makes it easier to choose the right device, reduces stock levels, and allows the IndraDrive Cs to cover wide range of applications in the lower power range.

- drastically reduced hardware variants
- extremely compact dimensions
- suitable for motors ranging from 0.05 to 9 kW of continuous power
- multiprotocol Ethernet for SERCOS III, PROFINET IO, EtherNet/IP, and EtherCat
- digital inputs/outputs and analog input integrated
- easy device exchange by way of intelligent operating panel with saving function for all data

Better energy efficiency with Rexroth – less is more

Almost 70 % of industrial power consumption can be attributed to electrical drive systems. The potential for realizing savings is substantial; according to several studies, an average savings of 30 % can be achieved in this area, with up to 85 % possible.

In its 4EE concept, Rexroth has developed solutions aimed at reducing energy consumption in production processes and in plant and machinery – for all phases of the machine lifecycle: from development, to commissioning, through to modernization.

4EE
ENERGY EFFICIENCY

- Energy System Design
- Energy Efficient Components
- Energy on Demand
- Energy Recovery

Feasible measures and solutions from Rexroth	Savings potential*
Take the energy efficiency of the overall system into account in the design phase Rexroth mechatronic support/simulation	25 %
Optimal combination of mechanicals, transmission, motor, and drive control unit Rexroth IndraSize design tool	20 %
Energy-optimized drive layout or motion design Rexroth IndraSize, Rexroth CamBuilder, Rexroth FlexProfile	25 %
Best possible adaptation of the drive to the operating point Frequency/servo converter in place of power operation	25 %
Energy exchange between motorized and regenerative drives Rexroth IndraDrive with DC bus	40 %
Feedback into the power line Rexroth IndraDrive M/Mi with regenerative supply units	20 %
Electric buffering Rexroth IndraDrive with additional DC bus capacitors for energy buffering during fast starts and stops	15 %
Standby concepts, intelligent load control/distribution, integrated energy monitoring Energy efficiency consultation provided by Rexroth	20 %

*Actual savings can be higher or lower with respect to the application.

Overall Equipment Efficiency – reducing downtime

The competition among machine manufacturers and food producers continues to increase. It is in this context that Overall Equipment Efficiency (OEE) should be introduced, which quantifies the total efficiency of a machine or plant based on availability, output, and product quality:

OEE in % =	**availability** x	**output** x	**product quality**
Reduction for:	▶ setup ▶ machine failure	▶ material shortage ▶ brief interruptions ▶ lower production speed	▶ rejects during start-up, product changeovers, and production
Examples	▶ product or format changeovers ▶ start-up times ▶ scheduled maintenance ▶ machine defect	▶ product or packaging jam ▶ rectification of faults ▶ removal of rejects ▶ machine not optimized ▶ unscheduled maintenance	▶ damage caused to products during production or packaging ▶ deficient packaging ▶ foreign particles in product

Using IndraMotion for Packaging allows you to better the overall efficiency of your machines and counteract increasing cost pressure.

Maximum production time via the integrated and certified safety solution, Safety on Board, from Rexroth.

Ultra-fast product and format change-overs are possible, since FlexProfile from Rexroth knows the correlation of your machine‘s axes in detail and automatically takes this into account when format change-over required.

Highest quality all the time
Avoid unexpected failures by permanently monitoring critical parameters using the Rexroth Productivity Agent for predective maintenance of your machines.

Technical data

System software		IndraMotion MLC			IndraMotion MLP
Hardware variant: IndraControl		**L25[1)]**	**L45[1)]**	**L65[1)]**	**VEP[2)]**
1	**Number of axes**				
1.1	Number of axes per control system (real, virtual, encoder, group)	16	32	64	32
1.2	Max. number of axes in control group (C2C)	1,024	2,048	4,096	2,048
2	**On board interfaces**				
2.1	SERCOS III	●	●	●	●
2.2	Ethernet TCP/IP	●	●	●	●
2.3	Real-Time Ethernet: PROFINET RT, EtherNet/IP	–	●/●	●/●	●/●
2.4	PROFIBUS-V1 master/slave	–	●/●	●/●	●/▼
2.5	Digital inputs/outputs (50 µs, interrupt-enabled/500 µs)	–	8/8	8/8	–
3	**Function modules (optional)**				
3.1	Max. number of function modules per control system	2	4	4	–
3.2	SERCOS III cross communication (C2C)	●	●	●	–
3.3	PROFIBUS master	–	●	●	–
3.4	Realtime Ethernet: PROFINET RT, EtherNet/IP and PROFIBUS	●	●	●	–
3.5	Realtime Ethernet: PROFINET RT, EtherNet/IP and DeviceNet	●	●	●	–
3.6	DeviceNet master	●	●	●	–
3.7	FAST I/O: 8 inputs (typ. deceleration time of 40 µs), 8 inputs/outputs, 8 outputs (typ. deceleration time of 70 µs)	●	●	●	–
3.8	High-speed programmable limit switches (125 µs, 16 outputs)	●	●	●	–
4	**I/O modules, bus couplers**				
4.1	Inline: digital, analog, relays, technology (local at the control system)	●	●	●	–
4.2	SERCOS III block I/O (digital/analog)	●	●	●	●
4.3	SERCOS III bus coupler for inline I/Os	●	●	●	●
4.4	PROFIBUS bus coupler for inline I/Os	●[3)]	●	●	●
4.5	IndraContol S67/Fieldline (IP67)	●[3)]	●	●	●
5	**Drives supported**				
5.1	IndraDrive M, C, Mi, Cs	●	●	●	●
5.2	3rd-party via SERCOS PackProfile	●	●	●	●
6	**HMI connection**				
6.1	IndraControl VEP embedded-PC	●	●	●	●
6.2	IndraControl VCP compact operator units	●	●	●	–
6.3	Industrial PC IndraControl VPP, VSP, VPB, VSB	●	●	●	–
7	**Service, maintenance**				
7.1	Remote access via service tool	●	●	●	●
7.2	PC-free component exchange	●	●	●	–

[1)] Controller-based control hardware [2)] Embedded-PC-based control hardware [3)] With real-time Ethernet function module and PROFIBUS

● Standard ▼ In preparation – Not available

System software		IndraMotion MLC			IndraMotion MLP
Hardware variant: IndraControl		**L25[1)]**	**L45[1)]**	**L65[1)]**	**VEP[2)]**
8	**Engineering framework IndraWorks**				
8.1	Programming languages according to IEC 61131-3	IL, ST, FBD, LD, SFC, CFC			
8.2	Project management	●	●	●	●
8.3	Version management/multi-user interface	●	●	●	●
8.4	System configurator, library administration	●	●	●	●
8.5	Fieldbus and I/O configurator	●	●	●	●
8.6	Online/offline switching	●	●	●	●
8.7	Commissioning assistants	●	●	●	●
8.8	Debugging and diagnostics	●	●	●	●
8.9	Firmware administration	●	●	●	●
8.10	HMI engineering (interfaces)	●	●	●	●
8.11	Cam editor	●	●	●	●
8.12	FlexProfile configurator	●	●	●	●
9	**Technology functions (selection)**				
9.1	Jog functions, cross sealer, perforation feeder, cams calculation, FlexProfile, inline machining, intermittent duty, product infeed, product grouping, crank and toggle lever kinematics, tension control, probe, temperature controller, winder, productivity agent, and much more				
10	**Logic control**				
10.1	IndraLogic PLC kernel according to IEC 61131-3	●	●	●	●
10.2	Freely configurable tasks (cyclical, free-running, event-controlled)	8	8	8	8
10.3	External event task, SERCOS synchrony/system-specific	1/1	1/1	1/1	1/1
10.4	Minimum cycle time (SERCOS/motion)	1/2 ms	1/1 ms	0.25/1 ms	1/1 ms
11	**Motion control**				
11.1	Single axis (torque, speed, position)	●	●	●	●
11.2	Electronic synchronization (angle, speed)	●	●	●	●
11.3	Cams in drive (max. 1,024 sort points)	4 per drive			
11.4	Cams in the control system	99			
11.5	Points table for cam	●	●	●	●
11.6	Segmented cam profile (up to 16 segments)	●	●	●	●
11.7	Rexroth FlexProfile	●	●	●	●
11.8	Virtual/real masters	●	●	●	●
12	**Integrated motion laws (selection)**				
12.1	User-specific cam; 5th-order polynomial, 7th-order polynomial; linear motion, sines, modified acceleration trapezoidal, speed-limited and jerk-limited motion, and much more				
13	**Robot control**				
13.1	Max. number of kinematic equations (= robots) per control system	16	16	16	–
13.2	Max. number of axes per kinematic chain (incl. belt axes)	16	16	16	–
13.3	Max. number of belts per control system/kinematic equation	16/4	16/4	16/4	–
13.4	Linear/circular interpolation (also belt synchrony)	●	●	●	–
13.5	Point-to-point (also belt synchrony)	●	●	●	–
13.6	Work area monitoring (software limit switch)	●	●	●	–
13.7	Speed/acceleration control (path and axis)	●	●	●	–
13.8	Override for speed/acceleration/deceleration	●	●	●	–
13.9	Belt synchronization (continuous or intermittent belts)	●	●	●	–
13.10	Movements with blendings (also from and to a belt-synchrony point)	●	●	●	–
13.11	Exact-position switching with lead time	●	●	●	–
13.12	Teach-in function/jogging (jogging of axes)	●	●	●	–
13.13	Axis/machine/product coordinate system	●	●	●	–

[1)] Controller-based control hardware [2)] Embedded-PC-based control hardware [3)] With Real-Time Ethernet function module and PROFIBUS

● Standard ▼ In preparation – Not available

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