IndraMotion MLC
motion logic control for
hydraulic drives
Motion control
Technology optimized to hydraulics – experience from thousands of applications

Hydraulics features a unique power density and robustness for numerous applications. With a wide range of Motion Control systems Rexroth opens up modern automation to hydraulic drives. What counts here is the experience gained in many thousands of applications, for this know-how significantly simplifies engineering and brings about fast, flexible and reliable solutions.

Consistent ease of application
The easy handling of Motion Control, the operator units and the drive decisively accelerates commissioning.

Rexroth opens up the entire productivity potential of electric, hydraulic and hybrid drives for both, decentralized and central architectures. With industry- and application-specific function libraries you will achieve optimum production results more easily and faster. Associated motion control software covers the special aspects of hydraulics and separates drive physics from automation equipment. As a result, all drives behave identical for both, the control and the operator.

Rexroth offers optimal control performance for nearly all industrial sectors in steelworks, forming and rolling mill technology, material handling and testing technology as well as in plastics processing, woodworking and paper-making or special machines.
System overview motion control

Logic Control (PLC)

DFEC pumps with pressure and flow control (p/Q)

IAC-P valves with pressure and flow control (p/Q)

Motion Logic Control

Engineering

HMI

Motion Control – integrated

I/O units (4 axes)
The perfect solution for your application:
Motion controls for electrohydraulic drives

**Scalable in hardware and software**
From single-axis controls integrated in the drive and multi-axis controls installed in the control cabinet through to the complete machine control with integrated PLC, Rexroth always perfectly meets the requirements of any type of hydraulic application. The proven bundled I/O strategy covers a wide variety of interfaces to offer you the optimum solution for your specific application.

This fine scalability of hardware and software from Rexroth standardizes automation across all drive technologies.

Flexible parameterization, simple commissioning and transparent diagnostics of all drives via the control shortens commissioning times and cuts total cost of ownership for the user.

**Open to any solution**
Also with regard to control solutions for hydraulic drives Rexroth consequently counts on open interfaces and programming standards. Motion controls support all common field buses and Ethernet protocols and fit seamlessly into a wide variety of automation environments.
Motion logic system solution: Open for your ideas

A complete control for hydraulic, electric and hybrid drives with compact and control-based hardware: The IndraMotion MLC integrates an open PLC according to IEC 61131-3 with a powerful motion control. Rexroth is the pioneer in utilizing the advantages of motion logic systems also for hydraulic and hybrid drives.

This opens up new degrees of freedom in the modularization of your system, for IndraMotion MLC splits the drive physics from the automation. You can commission electric, hydraulic and hybrid drives equally conveniently and with the same engineering tools.

Internationally standardized programming and open support of all common field bus systems and Ethernet protocols, reduces complexity: Irrespective of the master communication used, IndraMotion MLC fits seamlessly, thus reducing the number of variants required.

Utilizing open programming standards, pre-defined function libraries and ready to use technology functions shorten your engineering times. Nevertheless, you can integrate own expertise securely at any time and thereby protect your competitive edge: IndraMotion MLC – open for your ideas.
Openness

Openness in programming

- OPC Foundation
- IEC
- PLCopen

PLC to IEC 61131-3 with function libraries according to PLCopen

Openness in communication

- OPC-UA
- DeviceNet
- EtherNet/IP

Support of all common field buses and Ethernet protocols

Openness for specific control know-how

- MathWorks
- MATLAB
- Simulink

Open control interfaces simplify the implementation of application-specific functions such as command value generation or of individual control models through to the integration of complete simulation data.
The proven bundled I/O strategy covers a wide variety of interfaces to offer you the optimum solution for your specific application. Even better, the use of Ethernet-based real-time communication sercos guarantees synchronous communication between the control, drives and I/O.

Perfect implementation: Finely scalable for your application

Only as much automation as you require. Be it for the central control of up to 32 axes or the decentralized control of up to 64 drives: Due to the strictly modular design of the finely scalable IndraMotion MLC, Rexroth always offers the right performance that is actually required for the relevant application.

Rexroth integrated its comprehensive experience in the field of hydraulics in software. You can therefore benefit from the advantages of hydraulic drive technology such as high power density, robustness and efficiency for modern drive concepts in an optimum way. Special, motion logic integrated hydraulic, position, velocity, force and alternating control functions perfectly assume the implementation of your automation sequence.

**Controls**

- **IndraControl L25**
  - With central drive control of up to 4 axes
  - With decentralized drive control of up to 16 axes

- **IndraControl L45**
  - With central drive control of up to 8 axes
  - With decentralized drive control of up to 32 axes

- **IndraControl L65**
  - With central drive control of up to 32 axes
  - With decentralized drive control of up to 64 axes
Hardware scalability

High-end control technology for hydraulic controls with sercos connectivity

I/O device (4 axes) for central drive control

- 12 analog differential inputs, 16 bit resolution.
  Current: ±10 mA; ±20 mA; 0-20 mA; 4-20 mA.
  Voltage: 0-10 V, ±10 V
- 4 analog outputs, 16 bit resolution.
  Current: ±10 mA; ±20 mA; 0-20 mA; 4-20 mA.
  Voltage: 0-10 V, ±10 V
- 4 SSI position encoder inputs
- Thermal short-circuit and overload protection, dielectric strength up to 28 V

High-end control technology for hydraulic controls with sercos connectivity

IndraControl S20 distributed I/O system in protection class IP20

- sercos bus coupler
- digital I/O
- analog I/O
- resistance temperature detector
- incremental encoder input
- SSI encoder input
- ...

...
Standardization of complete automation

IndraMotion MLC integrates Best in Class fluid power control technology into automation. For commissioning and operation no in-depth knowledge of fluid power is required. Pre-defined blocks and functions automatically compensate for all special characteristics with high control quality. For positioning in processing machines with micrometer accuracy or for lifting extremely heavy loads in plants – motion controls optimizes hydraulic to meet the most exacting demands.

Hydraulic-specific functions

- Best in Class controls
  Central control for hydraulic axes

- Synchronization controls
  Central control for hydraulic axes, position active and force passive

- Alternating control
  Positioning with automatic transfer to force control and back

Position-dependent braking
Open-loop controlled positioning with braking to the target

Variable-speed pump drives Sytronix
Central control for hybrid axes

Standard functions (excerpt)

- Logic control according to PLC IEC 61131-3 with extensions

- PLCopen
  Standardized blocks for motion control

- Libraries
  Pre-defined function blocks
IndraMotion MLC is a control with standardized system software for controlling electric, hydraulic and hybrid drives.

You can concentrate on the actual automation task and realize your individual solution transparently using a modular software structure. Rexroth complements PLCopen function blocks for position, velocity and force with industry-specific functions such as flying shears or belt tensioning control. You have a high degree of freedom for defining and implementing your own functions.

Standardization in hardware and software simplifies the entire system architecture and helps you to save costs and time in the entire engineering process.
Reach your goal faster:
Ease of engineering

From engineering and commissioning through to diagnostics, IndraWorks shortens the time from the idea to the finished solution. The consistent engineering environment for all IndraMotion systems simplifies handling of the PLC, motion and all drive technologies.

Whenever possible, Rexroth replaces complicated and time-consuming programming by parameterization. Of special importance for complex tasks: IndraWorks also supports multi-project management for simultaneous engineering with version and user administration.

Dialog-supported 'Agents' with comprehensive online help and tool tips simplify the configuration and handling of system peripherals. You can parameterize all drive types according to the physical situation with the help of uniform, user-friendly dialogs. The project explorer provides the required overview and serves as control center for all devices and functions of IndraMotion MLC.

In this way, you will reach your goal faster, for one standardized engineering environment is sufficient for all your automation tasks.
The more demanding the task, the more efficient must be the diagnosis options. The Rexroth tool WinView integrated in IndraWorks records all PLC and process variables in real time in up to 100 channels and saves them continuously on a PC. This allows long-term records for a machine, simplifies analyses of sporadic errors, thus accelerating a restart after malfunction.
Fast and structured: Short programming times

On the basis of numerous automation solutions Rexroth examined typical application and developed a ‘wizard’, which creates all essential parts of an application interactively and significantly reduces the engineering effort. It assumes time-consuming routine tasks. Moreover, it promotes the standardization of the program structure and shortens the time of getting familiar with the project in the case of a project hand-over or when repairs are must be carried out.

The pre-defined program frame with the machine sequence control increases the modularization of software, and application-specific templates simplify the project start and error handling. For the layout of the user interface, Rexroth provides templates that ensure ease of programming.
Sequential programming:
Simple and transparent

With sequential programming, Rexroth offers an engineering tool, with the help of which users can realize cyclical and sequential tasks with a common language. With a clear separation of PLC- and motion control tasks, this tool is based on Structured Text (ST). In addition, it utilizes a common syntax and user interface, administers common variables and resources and offers an integrated debugger. Sequential programming dedicated to electrohydraulic system solutions, simplifies even complex projects while offering extremely high transparency.

This complement to IEC 61131-3 allows easy and clearly arranged programming of motion sequences within the framework of an ST program for sequential processing.

The example of a press cycle shows, how a sequence can be created using sequential programming with only a few efficient commands. While executing a ‘MoveProfile’ command, the press first moves at rapid speed and then at pressing speed to the given pressing position. During this, the set pressing force (‘ForceRamp’ command) is monitored and, if required, limited. The graphic shows that the pressing force is achieved and starts the pressing time. Then, the press returns to the home position due to a ‘MoveAbsolute’ command.
Tailored hydraulic controls: Unique wealth of experience

Rexroth has unparalleled knowledge and experience in the application of hydraulics in motion control. On this basis, control strategies for hydraulic and hybrid drives can be easily optimized and integrated with ready-to-use software. Enjoy the benefits of the Rexroth experience!

Central and fast
In addition to decentralized drive controls, Rexroth offers a fast, central control for hydraulic drives with IndraMotion MLC. Peripherals hooked up via sercos and fast I/O modules exchange data with the control in real time. This offers unrestricted and cyclical access to all process variables and parameters. The result: Highly dynamic controls in real time.

Your know-how reliably protected
Machine manufacturers can simply integrate their own command value generation or individual control models within the framework of IEC 61131-3. Even the integration of complete simulation models requires only a few mouse clicks. The library technology ensures optimum know-how protection for the machine manufacturer.

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**PLC: application**
- IEC 61131-3

**Control (own task)**
- IEC 61131-3

**Best in Class controls**
- Position control with fine positioning
- State control
- Force control
- Inner-loop velocity control
- Alternating control
- Point-to-point control
- etc.

**Firmware**
- Command value generation

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**Target positions**

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**Hydraulic axis**
- Valve command value
- Actual position value

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**I/O device (4 axes)**

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* SFC: Sequential Function Chart
  FBD: Function Block Diagram
Synchronization of your choice
Be it in presses, in plastics processing machines or in plant engineering: The perfect synchronization of several hydraulic cylinders and drives is one of the basic requirements.

Rexroth developed tailored synchronization algorithms, which the user simply has to select. These algorithms cover all synchronization tasks: They control the synchronicity of positions as well as the distribution of loads for active and passive variants. But even more: Like no other control, IndraMotion MLC is ideal for realizing mixed synchronization groups consisting of electric, hydraulic and hybrid drives.

Variant examples

Master principle (active synchronization)
All axes follow the master axis. For master axis applications.

Maximum value principle (active synchronization)
The axis with the greatest actual position value is the master axis. For vertical axes and encoder setting 'Max. value up', such as, for example, for downstroke presses.

Minimum value principle (active synchronization)
The axis with the smallest actual position value is the master axis. For vertical axis and encoder setting 'Max. value up', such as, for example, for lifting platforms and elevators.

Average value principle (passive synchronization)
Alternating control: the axes follow the average position of all axes. For parallel-holding (displacement synchronization).
Hydraulics with IndraMotion MLC: Powerful, intelligent, energy-efficient

**Simplified: Position/force control**
Fast positioning with dynamic transition into force control and defined force command value curve: This function sets the standard for hydraulic controls and used to require complicated programming in the past. Rexroth simplifies this comprehensive function and reduces it to convenient parameterization. Controls developed by Rexroth automatically handle the transition from position to force control – in highest quality.

**For robust solutions**
Position-dependent braking has proven as robust control with high availability in many applications. With IndraMotion MLC, Rexroth opens up additional combination options with position controls or alternating controls. Beyond PLCopen, this motion control offers further, hydraulics-specific blocks for traversing axes.
Rexroth combines know-how across technologies with competence in controls and hydraulics to create system solutions in all drive and control technologies for nearly all industrial sectors. Your advantage: The open Rexroth system solutions fit easily into your concept and shorten your ‘time to market’. Consistently simple engineering tools help you realize your concepts. And proven technology functions ensure perfect results.

**Up to 80 percent more energy-efficient**

Thanks to variable-speed pump drives Sytronix, Rexroth cuts the energy consumption of hydraulics by up to 80 percent. These hybrid drives reduce the speed in partial-load operation and, at the same time, lower noise emission by up to 20 dB(A).

The drive software takes account of all special requirements of fluid power technology. Three scaleable variants Sytronix FcP 5000, DFEn 5000 and SvP 7000 cover a wide range of dynamic and automation requirements.
Control technology from Rexroth – scalable, consistent and easy to use, open

Rexroth controls communicate consistently with integrated, standardized interfaces and are based on open standards. Our control competence offers users extendable complete solutions and individual packages at the highest technical and economic level to ensure successful automation.

IndraMotion MLC – scalable motion logic system
- Highest performance for synchronizing up to 64 drives per control
- Ease of extension by means of function modules for communication and technologies
- Direct connection of local Inline I/O, 8 fast I/O on board
- Communication interfaces sercos, PROFINET IO, EtherNet/IP, DeviceNet, Ethernet TCP/IP and RS232
- Simple replacement of devices, because all data is saved on removable storage devices
- Future-proof due to long hardware availability

IndraControl V – visualization devices and industrial PC
- Control-based, small operator terminals ranging from 7.6 cm (3”) to 26.4 cm (10.4”) – from the keypad through to a touch screen
- Embedded PC-based terminals with touch screen of up to 38.1 cm (15”)

Flexible I/O systems in IP20 und IP67
- I/O systems for central or decentralized connection
- Finest granularity of digital modules with 2, 4, 8, 16 or 32 channels
- Comprehensive portfolio with digital, analog, function, relay and supply terminals

- Embedded PC-based, hand-held control unit for mobile use
- Complete industrial PC portfolio – from the panel PC via cabinet-mounted PC with separate display through to complete PC operator units

- Field bus coupler for sercos and all standard field bus systems
- IP67 variant with M8 and M12 connection technique
## System software

<table>
<thead>
<tr>
<th>Hardware variant</th>
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<th>L6S&lt;sup&gt;1)&lt;/sup&gt;</th>
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<td>16</td>
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<td></td>
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<td></td>
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<td>2.1 1,000 bit commands</td>
<td>20 µs</td>
<td>30 µs</td>
<td>5 µs</td>
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<tr>
<td>2.2 1,000 word commands</td>
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<td>30 µs</td>
<td>5 µs</td>
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<tr>
<td>2.3 1,000 combined commands</td>
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<td>30 µs</td>
<td>5 µs</td>
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<tr>
<td>4.4 EtherNet/IP (scanner/adapter)</td>
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<td>max. 512.</td>
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<td>6.4 Via DeviceNet</td>
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<tr>
<td>6.5 Via PROFINET IO</td>
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<td>6.6 Via EtherNet/IP</td>
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</table>

- Standard
- ▼ In preparation
- ○ Optional
- □ Depending on variant
- 1) Control-based control hardware
## Technical data

### System software

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**IndraMotion MLC**

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<tr>
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**Functionality (hydraulics-specific)**

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**Engineering tool IndraWorks**

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<td>9.13 Diagnosis tools</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>9.14 Remote diagnosis (web-based)</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

- ● Standard
- ▼ In preparation
- – Not available
- ○ Optional
- □ Depending on variant
- \(^1\) Control-based control hardware
IndraMotion MLC for hydraulic drives – the solution for demanding applications worldwide

Like your success, motion logic systems from Rexroth are distinguished in the field of hydraulics. Rexroth products are developed with the support of a global network of product, application and service specialists and used around the world. In conjunction with IndraMotion MLC for hydraulic drives, Rexroth offers tailored training courses, application-related programming and commissioning on site. Chart the way for success with this unique application know-how and support!

Be it in presses, steelworks and rolling mill technology, material handling or special machinery – Rexroth offers the optimum motion logic systems.

**Presses**
- Ejector controls
- Glass presses
- Internal high-pressure forming
- Laboratory presses
- Metal/ceramic powder presses
- Tube forming presses
- SMC/IMC presses
- Brick presses
- Deep drawing presses/die cushions

**Steelworks and rolling mill technology**
- 3-roll bending machines
- Curved-mold continuous casting machines
- Flying shears
- Ladle cars
- Mold oscillation

**Material handling**
- Belt feed
- Container cranes
- Quay cranes
- Train lifts
- Truck lifts

**Special machines**
- Thick plate turnover device
- Automatic rotary tables
- Screw conveyors
- Bending and pushing devices
- Coal distributors
- Motor turning plants
- Stretch bending machines

**Woodworking machines**
and many more
The data specified above only serve to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.