



The Lexium Controller range offers two levels of application implementation: Easy Motion mode for configuration and Motion Pro mode for configuration and programming.

Easy Motion mode is intended for applications in which the Lexium Controller motion controller handles the positioning functions, while a third-party device, such as a PLC, controls the machine automation functions. This mode is available with Lexium 05A servo drive.

Motion Pro mode is intended for applications in which the Lexium Controller motion controller handles both the motion control functions and the automation functions.

Easy Motion mode

Presentation

Supplied preinstalled in Lexium Controller motion controllers, the application template associated with the Easy Motion software is an ergonomic tool which allows:

- Rapid configuration of axes
- Implementation of the first movements in manual mode (JOG+/-)
- Creation of a Motion task table
- Control of execution of this table in automatic mode
- Diagnostics of the motion controller and of the different axes
- Backup and recovery of the machine parameters.

This tool optimizes debugging times, whether it involves a new installation, a prototype or on-site set-up.

Configuration

Configuration of axes

Configuration involves defining the physical parameters of the axis:

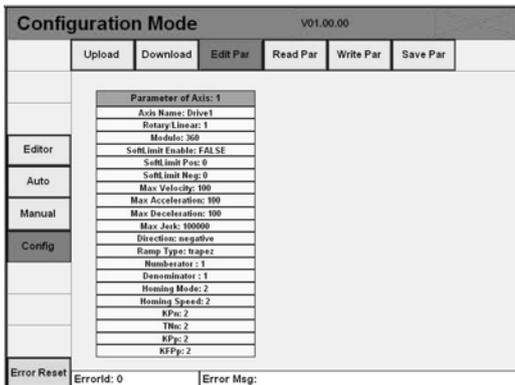
- Rotary or linear axis
- Maximum and minimum limits
- User units
- Principal parameters of the Lexium 05A servo drive

Manual control

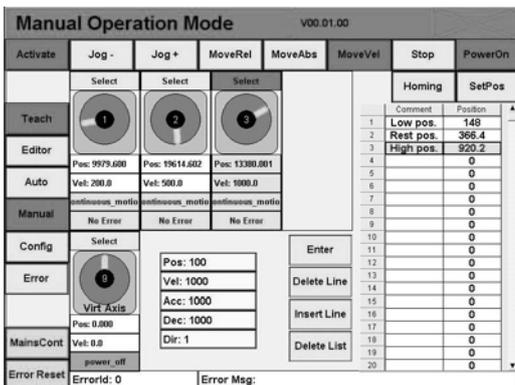
One control panel per axis enables the first movements to be implemented manually, so that the mechanical constraints of the machine can be identified very quickly.

The available functions are:

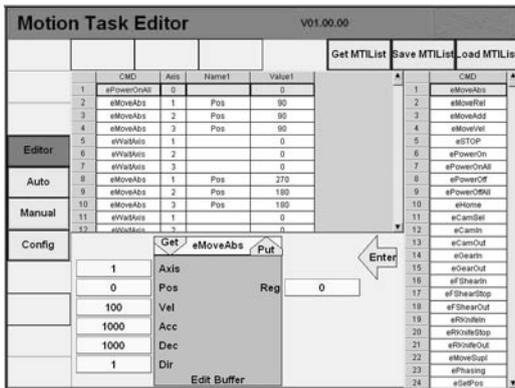
- Validation drive variables
- Speed control
- Position control
- JOG+/-/JOG-
- Homing
- Creation of position registers via the teach function.



Example of configuration with the application template



Manual control mode



Motion Task Editor

Motion Task Editor

The Motion Task editor allows you to define a motion task table and configure each task.

These functions conform to the PLCopen standard.

The principal configurable functions are as follows:

- Single-axis:
 - Absolute positioning
 - Relative positioning
 - Additive positioning
 - Homing
 - Speed control
- Multi-axis:
 - Cam profile
 - Phasing
 - Electronic gearing
- For the application function blocks:
 - Flying shear
 - Rotary knife
 - Grouping/ungrouping
 - Clamping with torque control

In addition, logical functions (waiting for conditions, time delay etc.) allow you to create a complete positioning sequence.

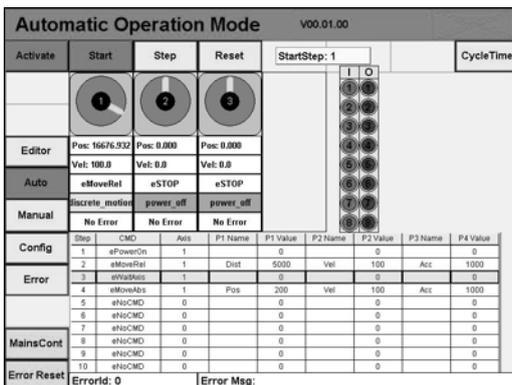
Automatic control

Automatic control mode allows execution of Motion Task table.

This step ensures debugging of program sequences and parameters.

Thanks to the control panel, it is possible:

- To visualize the behaviour of all the axes
- To control the execution of the function table (stop, pre-positioning etc.).



Automatic control mode

Complementary functions

Configuration in Easy Motion mode also allows:

- Editing of cam profiles (8 profiles of 16 points of type XYVA)
- Backup and recovery:
 - of the machine parameters (configuration of axes, positioning function table)
 - of the complete configuration of the Lexium 05A, to reduce the time taken to replace a device
 - of the Motion Task table
- Access to on-line help



Motion Pro mode

Presentation

Motion Pro mode provides a graphical development environment for configuring, programming and managing motion controller applications.

It relies on a standard interface, CoDeSys®, offering the convenience of the familiar Windows® environment: windows, toolbars, pop-up menus, contextual help etc. As in Easy Motion mode, the application template can be used to configure the positioning functions. The automation functions are then added in the program organization units (POU).

In this way, Motion Pro allows you to create an application perfectly adapted to your needs.

Programming in Motion Pro

Creating a project

The application is structured using function modules, function blocks or programs. An ergonomic browser gives you an overall view of the different components of the application.

Configuration

The Motion Pro software allows you to configure:

- I/O (discrete, capture or event-triggered)
- Tasks (master, auxiliary or event-triggered)
- Networks (Modbus TCP)
- Fieldbuses (PROFIBUS DP or Device Net)
- A CANopen machine bus and CANopen Motionbus

Programming conforming to standard IEC 61131

The Motion Pro software offers six programming languages of which two are text languages and four are graphical languages.

The text languages are:

- IL: Instruction List
- ST: Structured Text language

The graphical languages include:

- LD: Ladder Diagram (FBD reversible)
- FBD: Function Block Diagram (LD reversible)
- SFC: Sequential Function Chart (Grafcet)
- CFC: Continuous Function Chart

Multitask structure

The master task, which controls the synchronization of axes, is sequenced from 1 to 8 ms. This cycle time is linked to the number of configured drives to be synchronized. One auxiliary, non-priority task can be configured to process the automation functions.

To be able to manage reflex actions in response to external events, it is also possible to configure two event-triggered tasks.

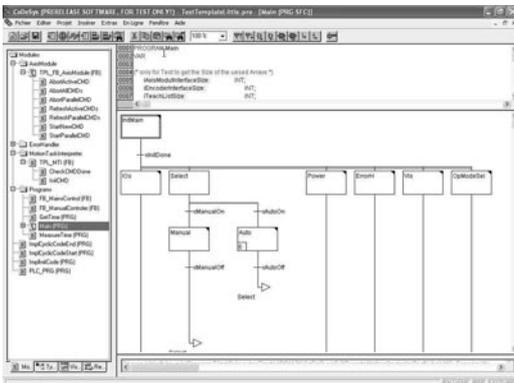
Library manager

The library manager lists all the libraries integrated into the project.

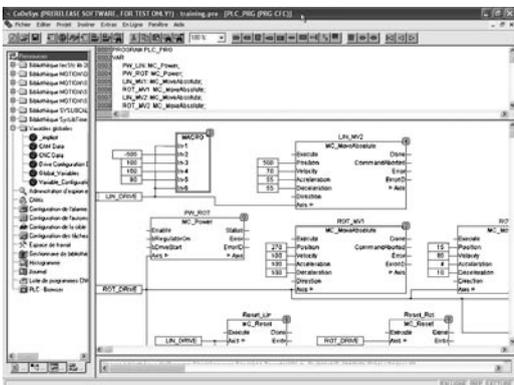
Standard library

The main functions are as follows:

- Processing on character string
- Time delay
- Counting
- Bistable
- Data type conversion
- Mathematical calculation functions
- System



Example of sequential function chart (Grafcet)



Example of continuous sequential function chart



Library manager (continued)

■ **Motion library**
This library is based on the 3S SoftMotion function library and conforms to the PLCopen standard.

It is composed of administrative function blocks (read/write parameters, statuses etc.) and single-axis and multi-axis function blocks.

The main functions are as follows:

- "Power On", stop, reset
- Absolute, relative or additive positioning
- Continuous positioning (reaching position at a predetermined speed)
- Velocity control
- Velocity profile
- Position profile
- Cam profile
- Electronic gearing
- Phasing
- Programmable cam switch
- Linear or circular interpolation

This library also includes application function blocks:

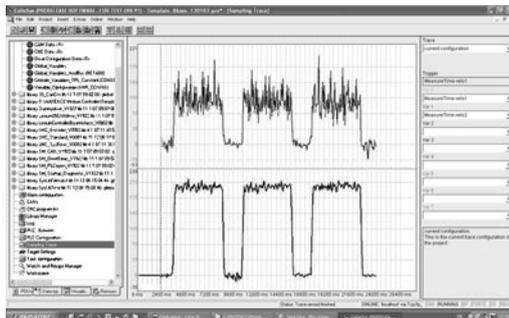
- Flying shear
- Rotary knife
- Grouping/ungrouping
- Clamping with torque control

See pages 61725-EN/8 and 61725-EN/9.

■ **User library**

With Motion Pro software, it is very easy to create your own function blocks (user library) so as to reduce programming time.

Creating a user library simplifies the standardization and reuse of programs and also allows you to protect your know-how.



Example of trace recording

Debugging tools

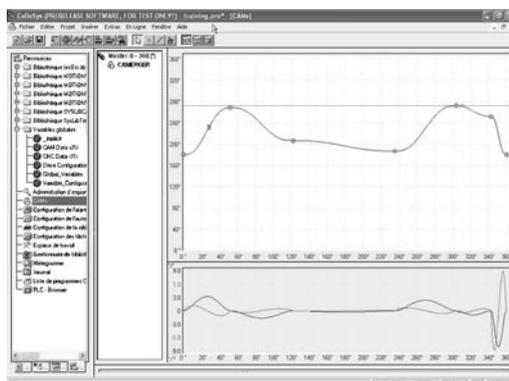
Motion Pro software offers tools to help the user debug his applications, including:

- **Dynamic animation of program blocks**
- **Breakpoints which allow you to run the program step by step**
- **Display screens:**
 - Direct access to the variables of the Lexium Controller motion controller
 - Command buttons
 - Visualization of dynamic values
 - Animation of diagrams

Trace recording

In trace recording, the sequence of variable values is logged during a particular period.

The values are written into a ring memory (trace buffer). When the memory is full, the oldest values are overwritten. It is possible to record a maximum of 20 variables, each with up to 500 values, at the same time.



Example of cam profile

Cam profile editor

Two graphic editors are incorporated into the programming interface of the Motion Pro software:

- A cam profile editor
- An interpolation profile editor

These editors allow you to create, back up and restore profiles.

Comparative table of functions				
Functions	Graphic display terminal	Easy Motion mode	Motion Pro mode	
	With application template			Without application template
	For Lexium 05A			For Lexium 15
Configuration of axes and drives				
Mechanical parameters				
User units				
Configuration of master encoder				
Drive parameters				
Manual mode functionalities				
Power On/Off				
JOG+/JOG-				
Absolute or relative positioning				
Velocity reference				
Position teaching				
Set position				
Homing				
Automatic mode functionalities				
Execution of motion task table				
Pre-positioning of motion task table				
Diagnostics				
Motion functions				
Configuration				
Configuration of motion task table				
Status of motion task table				
Backup and restore motion task table				
Programming conforming to standard IEC 61131				
Cam profile functionalities				
Creation of "CAM" function				
Cam profile editor				
XYVA profiles				
Equidistant point profiles				
Number of cam profiles				
Programmable cam switch				

Function accessible
 Function not accessible
 Not applicable

Comparative table of functions (continued)			
Functions	Graphic display terminal	Easy Motion mode	Motion Pro mode
	With application template		Without application template
	For Lexium 05A		For Lexium 15

I/O functionalities

Input forcing and display	Function accessible	Function accessible	Function accessible	Function accessible
Output forcing and display	Function accessible	Function accessible	Function accessible	Function accessible
Logical functions and combinations	Function not accessible	Function not accessible	Function accessible	Function accessible
Dedicated output: power control	Not applicable	Function accessible	Function accessible	Function accessible
Position capture (by Touch Probe input)	Not applicable	Function accessible	Function accessible	Function accessible
Distance measurement (by Touch Probe input)	Not applicable	Not applicable	Function accessible	Function accessible
Event-triggered tasks	Not applicable	Not applicable	Function accessible	Function accessible

Up/Downloading

Applications (data and program)	Function accessible	Function accessible	Function accessible	Function accessible
Table of motion tasks	Function accessible	Function accessible	Function accessible	Not applicable
Configuration of drives	Function accessible	Function accessible	Function accessible	Function accessible
Programming of logical functions conforming to standard IEC 61131	Not applicable	Function not accessible	Function accessible	Function accessible
Programming of motion control functions conforming to standard IEC 61131	Function not accessible	Function not accessible	Function accessible	Function accessible
Programming of linear and circular interpolation function blocks in 2½ dimensions	Function not accessible	Function not accessible	Function accessible	Function accessible

CANopen machine bus

Configuration of slave devices	Function not accessible	Function not accessible	Function accessible	Function accessible
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Configuration of Lexium Controller motion controller

IP address	Not applicable	Function accessible	Function accessible	Function accessible
Modbus bus address	Not applicable	Function accessible	Function accessible	Function accessible
Profibus DP/DeviceNet bus addresses (via terminal with 8 microswitches)	Not applicable	Function accessible	Function accessible	Function accessible
RUN/STOP Lexium Controller	Not applicable	Function not accessible	Function accessible	Function accessible
Configurable automatic "RUN" mode (default: no)	Function not accessible	Function not accessible	Function accessible	Function accessible

User management

Password creation	Function not accessible	Function accessible	Function accessible	Not applicable
Access limited by password	Not applicable	Not applicable	Not applicable	Not applicable

Function accessible
 Function not accessible
 Not applicable

Application function block library

Presentation

This library is a function library developed specifically by Schneider Electric.

It contains application functions currently encountered in applications used in the fields of:

- Assembly
- Material handling
- Cutting to length

Each function block comprises a large number of mechanical and application variants.

The use of function blocks:

- Saves programming time
- Saves set-up time
- Makes reading easier

The function blocks available in the library are:

- Flying shear
- Rotary knife
- Grouping/ungrouping
- Clamping with torque control

“Flying shear” function block

This function block optimises the production performance of machines. It enables an operation to be performed on a product without stopping the flow.

The “Flying shear” function block guarantees synchronisation of two linear axes, the master axis conveying the product and the slave axis performing the operation. Once the operation is finished, the slave axis returns to its home position and is resynchronised for the next operation.

This function block is suitable for such diverse applications as:

- Cutting (thick or hard products)
- Gluing
- Inspection
- Assembly
- ...

To meet a wide range of applications, the “Flying shear” function block incorporates numerous mechanical and functional variants:

- Continuous or discontinuous flow
- With or without mark detection
- With or without tolerance window on mark detection
- Dynamic length modification
- Immediate cutting
- Master/slave coefficient

“Rotary knife” function block

Like “Flying shear” function block, this function block optimizes the production performance of machines. It enables an operation to be performed on a product without stopping the flow.

It guarantees synchronization of a linear master axis conveying the product and of a rotary slave axis performing the operation. Once the operation is finished, the slave axis carries on turning to its home position before being resynchronized for the next operation.

This function block is suitable for such diverse applications as:

- Cutting (fine products, flexible products etc.)
- Printing of motifs
- Marking
- ...

To meet a wide range of applications, the “Rotary knife” function block incorporates numerous mechanical and functional variants:

- Continuous or discontinuous flow
- With or without mark detection
- With or without tolerance window on mark detection
- Dynamic length modification
- Immediate cutting
- Master/slave coefficient

“Grouping/ungrouping” function block

The “Grouping/Ungrouping” function is very widely used in manufacturing and the handling sector.

It synchronizes several linear axes so that products can be sorted and grouped on a conveyor, with defined spacing between products/groups.

The function is suitable for applications requiring handling:

- Of products of different sizes
- Of fragile products
- With low acceleration/deceleration to avoid products sliding on the conveyor.

To meet a wide range of applications, the “Grouping/ungrouping” function block takes account of numerous mechanical and functional variants:

- Different groups of products possible
- Fixed or variable spacing between groups and products
- Number and type of conveyors that can be adapted to the application requirements

“Clamping” function block

This function block provides automatic tightening of a part with torque control to avoid marking the part.

The logical sequence is carried out in three steps:

- Rapid approach
- Tightening
- Rapid release

This function block is suitable for such diverse applications as:

- Shoeing/welding
- Machine tool chucking
- Inspection
- Assembly/shrink fitting
- ...

To meet a wide range of applications, the “Clamping” function block incorporates numerous mechanical and functional variants:

- Automatic measurement of approach distance
- With or without teach function