OMRON

Sysmac Library for NJ/NX/NY Controller

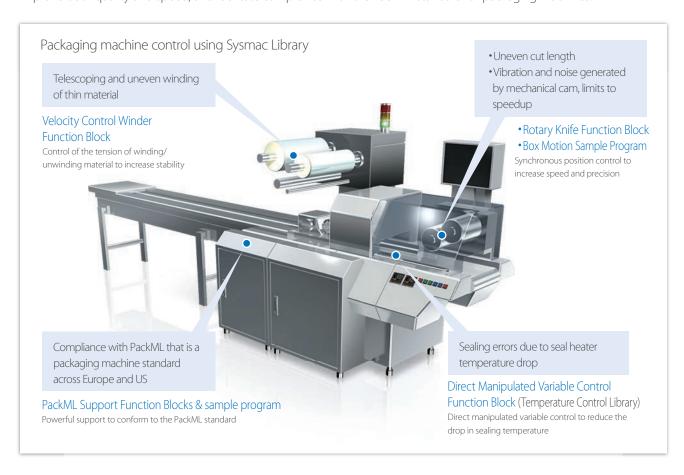SYSMAC-XR012
Packaging Machine Library
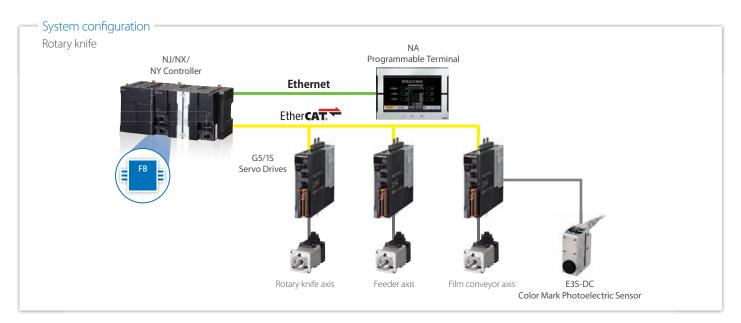
Sysmac Library

✔ **Improve packaging quality and performance in a short time.**

Issue 1 Reduce cutting and sealing errors to **stabilize packaging quality.**

Issue 2 Reduce machine vibration and noise to **shorten cycle times.**

Issue 3 **Easily** conform to industry standard PackML.

Packaging Machine Library offers solution!

Combining with high-speed, high-precision synchronous control using the NJ/NX/NY Controller on EtherCAT, the Packaging Machine Library provides versatile functionalities for packaging machines to stabilize cutting position and sealing quality, improve both quality and speed, and facilitate compliance with the PackML standard for packaging machines.

Packaging machine control using Sysmac Library

Telescoping and uneven winding of thin material

Velocity Control Winder Function Block
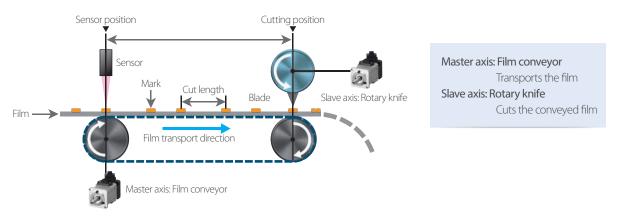Control of the tension of winding/ unwinding material to increase stability

• Uneven cut length
• Vibration and noise generated by mechanical cam, limits to speedup

• Rotary Knife Function Block
• Box Motion Sample Program
Synchronous position control to increase speed and precision

Compliance with PackML that is a packaging machine standard across Europe and US

PackML Support Function Blocks & sample program
Powerful support to conform to the PackML standard

Sealing errors due to seal heater temperature drop

Direct Manipulated Variable Control Function Block (Temperature Control Library)
Direct manipulated variable control to reduce the drop in sealing temperature

sysmac
always in control

System configuration

Rotary knife

NJ/NX/
NY Controller

NA
Programmable Terminal

Ethernet

EtherCAT.

FB

G5/1S
Servo Drives

Rotary knife axis

Feeder axis

Film conveyor axis

E3S-DC
Color Mark Photoelectric Sensor

Applications

Material cutting control

Issue
- Uneven cut length
- Vibration and noise generated by mechanical cam, limits to speedup

Solution
Rotary Knife Function Block

Box Motion Sample Program is also available.

High-precision positioning in accordance with film transport distance and mark positions is possible.
Its versatile functions enable adjustment to the machine configuration and stabilization of the cutting position.

Sensor position

Cutting position

Sensor

Mark

Cut length

Blade

Slave axis: Rotary knife

Film

Film transport direction

Master axis: Film conveyor

Master axis: Film conveyor
Transports the film
Slave axis: Rotary knife
Cuts the conveyed film

Choice of modes

- The number of blades (1 to 4) and device conditions can be set
- Cutting configuration can be selected between Continuous mode (fixed cut length) and Mark To Mark mode (cutting at mark positions)

Polynomial 5 Cam Profile to suppress vibration

- **Polynomial 5 Cam Profile** reduces impact, noise, and vibration
- **Advance Angle Compensation** can compensate delay in synchronization

Precise cutting position

- Marks can be detected precisely by latching detection positions, independent of the control cycle
- Cutting configuration can be fine-tuned by changing settings during operation
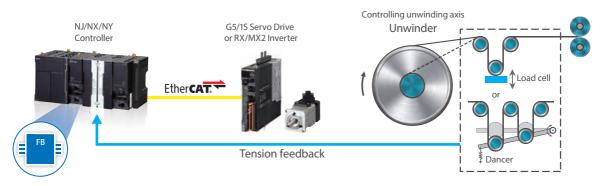
Winder/unwinder control

Issue   Telescoping and uneven winding of thin material

Solution

Velocity Control Winder Function Block

The tension of winding/unwinding material is controlled.
The material speed, reel diameter, and tension feedback are instantly calculated to stabilize the tension

NJ/NX/NY
Controller

G5/1S Servo Drive
or RX/MX2 Inverter

Controlling unwinding axis
Unwinder

EtherCAT.

Load cell

or

Tension feedback

Dancer

FB

PackML support

Issue   Compliance with PackML that is a packaging machine standard across Europe and US

Solution

PackML Support Function Blocks & sample program

The PackML (Packaging Machine Language) standard is a guideline that defines state transition of packaging machines and machine-to-machine communication. The use of PackML-compliant PackML Support Function Blocks and sample program to use the Function Blocks facilitates compliance with the PackML standard. The Function Blocks and sample program can be used for NJ/NX/NY controller enabling standardization of various packaging machines.
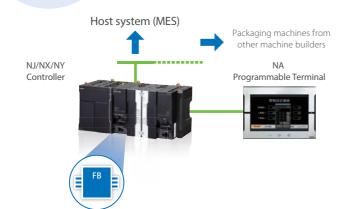
Packaging machine builders
Food manufacturers are requiring PackML-compliant machines...

Benefit to end users
- Unified machine-to-machine communication reduces setup and changeover time of production lines that consist of packaging machines from different machine builders

Benefit to packaging machine builders
- Structured programming, based on state transition and modularization defined by PackML, reduces debugging and development time
- A common method of data exchange in packaging machinery reduces problems when a production line is set up, resulting in fast setup

Host system (MES)

Packaging machines from other machine builders

NJ/NX/NY
Controller

NA
Programmable Terminal

Sample program & screens

Sample program for PackML is also available.
Ask your Omron sales representative for details.

- Sample program including PackTag setting required for communication between host and machines
- Sample HMI screens to display package machine status

FB

Compatible Models

Name	Model
Machine Automation Controller NJ/NX CPU Unit	NX502-□□□□
	NX102-□□□□
	NX1P2-1□□□□□ (1)
	NX701-1□□□/ NJ101-1□□□
	NJ501-□□□□/ NJ301-□□□□
Industrial PC Platform NY IPC Machine Controller	NY5□□-1
	NY5□□-5
Automation Software Sysmac Studio	SYSMAC-SE2□□□

Note. Refer to "Sysmac Library Catalog (P102)" for applicable version.

Function Block (FB)/Function (FUN) Specifications

FB group type	Name	FB/FUN name	Description
Rotary Knife	Rotary Knife	RotaryKnife	Controls the rotary knife. This FB is a software module consisting of the functions necessary for the following applications and was developed to reduce programming time. • Cutting web-like products such as sheets • End sealing and cutting operation of the pillow packaging machine • Labeling • Applications that follow the product-flow and process the products
Winder, Unwinder	Velocity Control Winder (for Servo)	WinderVelCtrl_Servo	Controls the tension of a continuous material being wound or unwound with servo motor. This FB can be used for the following applications. • Winding or unwinding materials from a drum or roll • Feeding wrapping materials in packaging application (unwinder) • Other sheet transfer applications
	Velocity Control Winder (for Inverter)	WinderVelCtrl_Inverter	Controls the tension of a continuous material being wound or unwound with inverter. This FB can be used for the following applications. • Winding or unwinding materials from a drum or roll • Feeding wrapping materials in packaging application (unwinder) • Other sheet transfer applications
PackML Support	PackML Mode/State Machine	PackMLModeStateMachine	Based on the mode/state machine stipulated by PackML, outputs the current mode and state according to the mode change/state transition command.
	Dwell Time Measure	PackMLModeStateTimer	Measures and outputs a dwell time (second) in each state and mode of the mode/state machine stipulated by PackML.
	Transition Command Display	PMLCtrlCmd	Checks which transition command is the number of Command.CntrlCmd stipulated by PackTag.
	State Output	PMLState_Is	Checks which state number stipulated by PackML represents which state.
	Transition Command All Reset	PMLTransitionCmd_ResetAll	For the state transition command sPACKML_TRANSITION_COMMAND structure-type variables, this function resets every BOOL member that indicates the state transition to FALSE. This function is used for initializing the state transition request to the host module.
	Transition Command Reset State Set	PMLTransitionCmd_ResetAllCmdSetAllSC	For the state transition command sPACKML_TRANSITION_COMMAND structure variable, resets all the state transition commands (Cmd_<state name>) in the BOOL type members which indicates state transition to FALSE, and sets all the Wait state complete report (STs_<state name>_SC) to TRUE. This function is used for initializing the state transition command to the host module.
	Transition Command Summarize	PMLTransitionCmd_Summarize	Output by each lower module as follows, and output them as the State Transition Commands for the host module, • Execute OR evaluation on state transition commands (Cmd_<state name>) • Execute AND evaluation on Wait state completion notifications (Sts_<state name>_SC)
	Pack Tag Transition Command	PMLTransitionCmd_SummarizePackTagCtrlCmd	Processes and reflects the state transition requests coming from outside of the machine through the Command.CtrlCmd tag of PackTag to the summarize destination as follows. • Execute OR evaluation on state transition commands (Cmd_<state name>) • Execute AND evaluation on Wait state completion notifications (Sts_<state name>_SC)
	Alarm	Alarm	Defines "Alarm" to support events and reports the state of the defined Alarm to sALARM_STATUS (2) structure-type variables under the host module control.
	Alarm 2	Alarm2	
	EM Alarm Status Update	AlarmStatus_Update	Checks whether each alarm status changed against Cfg_EMAlarmStatus that indicates the status of Alarms collected to EM as In/Out variables, and then updates each member of sALARM_STATUS (2). Also, the FB resets Cfg_EMAlarmStatus based on the instruction given as In variables.
	EM Alarm Status Update 2	AlarmStatus_Update2	
	UN Alarm Status Add	AlarmSummation_Add	Adds the specific EM Alarm status given by In/Out variable EMEventStatus for the In/Out variable that retains the Alarm statuses merged to Cfg_UNEventSummation UN (unit/machine).
	UN Alarm Status Add 2	AlarmSummation_Add2	
	Alarm Sort and Filter	AlarmSummation_SortFilter	Reflects the results of filtering and sorting that are conducted with the conditions specified by the In/Out variable Cfg_UNEventSummation that retains the Alarm statuses merged into UN (unit/machine), to sALARM array variable Output.
	Alarm Sort and Filter 2	AlarmSummation_SortFilter2	
	DATE_AND_TIME Type Pack Tag ArrayConversion	DT_TO_PackTagDINTarray	Converts the input of DATE_AND_TIME into the date-time array specified by PackTag.

Note. A function block or function that the last number of its name is "2", supports a variable-length array. It is available for unit version 1.18 or later.

Note: Do not use this document to operate the Unit.

OMRON Corporation Industrial Automation Company

Kyoto, JAPAN　　　　　　　　　　　　　**Contact : www.ia.omron.com**

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