OMRON

Sysmac Library for NJ/NX/NY Controller

SYSMAC-XR007

Temperature Control Library

Sysmac Library

Improve product quality and reduce cycle time with optimal temperature control.

Issue 1	Uneven heating of a hotplate causes differences in product temperature. This reduces the yield.
Issue 2	In PID control, it takes time to increase the temperature while avoiding overshooting.
Issue 3	Placing objects (disturbance) lowers the heater temperature, which results in poor product quality. It takes time to raise the temperature again after the disturbance in PID control.

Temperature Control Library offers solution!

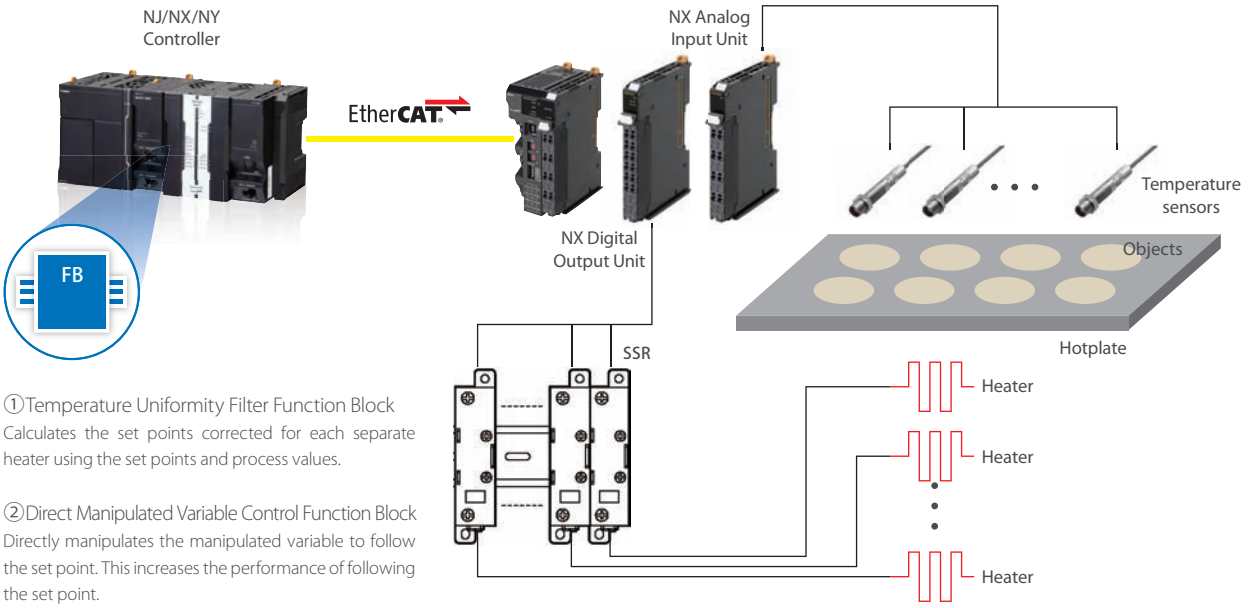
The Temperature Uniformity Filter Function Block reduces in-furnace temperature variations or maintains different heater temperatures.
The Direct Manipulated Variable Control Function Block quickly raises the temperature while reducing overshooting or reduces the drop in temperature to stabilize the heater temperature immediately.

Four types of temperature control

Temperature uniformity	Reduces temperature variations	Temperature Uniformity Filter Function Block
Temperature gradient	Controls temperature distribution	
Rapid temperature increase	Quickly increases temperature while reducing overshooting	Direct Manipulated Variable Control Function Block
Disturbance suppression	Reduces temperature fluctuations caused by disturbance to stabilize temperature immediately	

SYSMAC always in control

System configuration



①Temperature Uniformity Filter Function Block
Calculates the set points corrected for each separate heater using the set points and process values.

②Direct Manipulated Variable Control Function Block
Directly manipulates the manipulated variable to follow the set point. This increases the performance of following the set point.

Applications

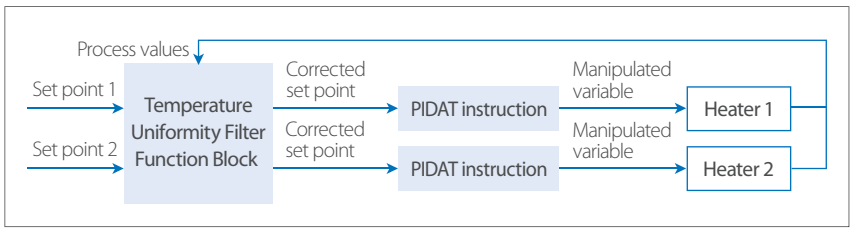
Temperature uniformity/Temperature gradient

Issue

The temperature of where an object is placed drops. This causes differences in the hotplate temperature. As the chemical reaction time of objects varies depending on temperature, the yield is reduced.

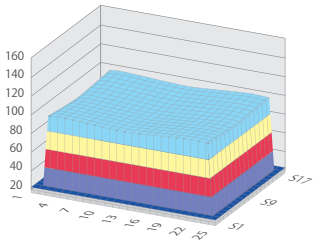
Solution

Temperature uniformity/gradient can be achieved by controlling temperatures based on the set points corrected by the Temperature Uniformity Filter Function Block.



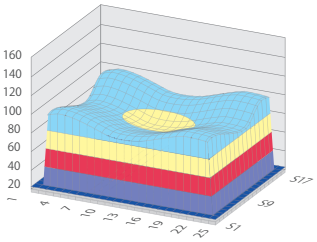
Temperature uniformity

Reduces temperature variations and makes surface temperature uniform

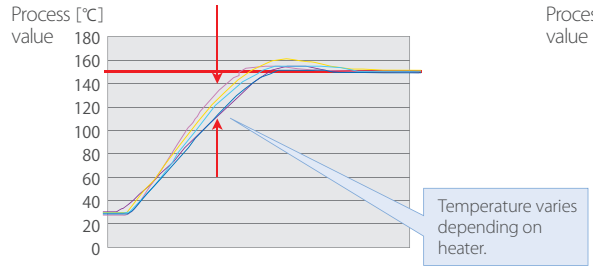


Temperature gradient

Controls temperatures to produce a specified temperature distribution



From



To

Rapid temperature increase

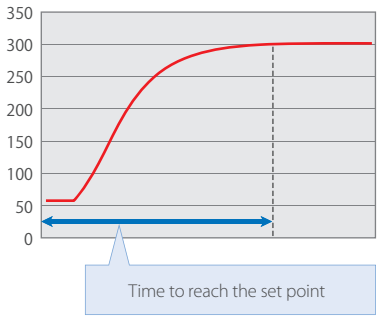
Issue

Reduce the time to raise the temperature of a reflow oven without overshooting to Improve productivity.
PID control can avoid overshooting, but it takes time to increase the temperature.

Solution

The Direct Manipulated Variable Control Function Block controls manipulated variables when the temperature is increased. Then the control is changed to PID control. This control enables a rapid temperature increase while suppressing the overshooting.

From



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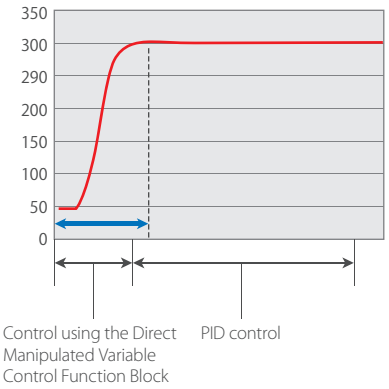


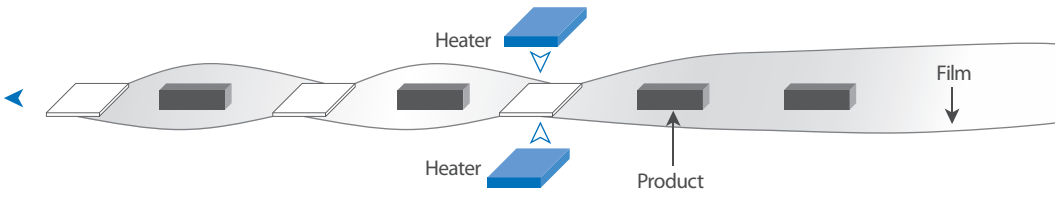
Disturbance suppression

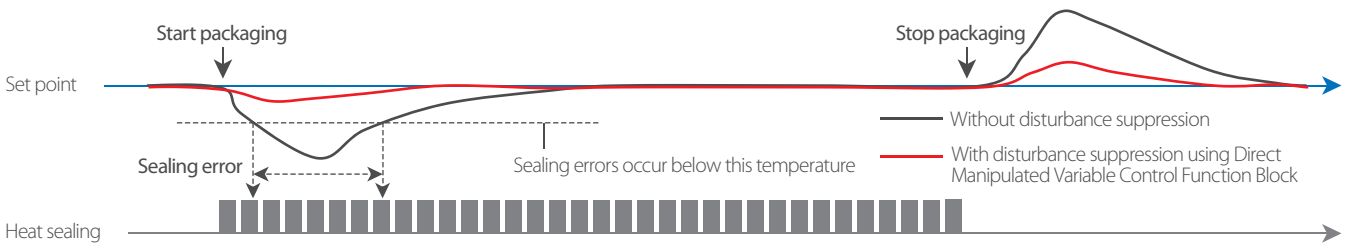
Issue

Disturbance, such as placing products on a packaging machine, lowers the heater temperature, resulting in heat sealing error. Once disturbance occurs, it takes some time before the heater temperature is stabilized.

Solution

The Direct Manipulated Variable Control Function Block controls manipulated variables when packaging starts. Then the control is changed to PID control. This control reduces the drop in temperature to stabilize the heater temperature immediately.





Compatible Models

Name	Model	Version
Machine Automation Controller NJ/NX CPU Unit	NX701-□□□□/ NJ101-□□□□	Version 1.10 or later
	NJ501-□□□□/ NJ301-□□□□	Version 1.02 or later
	NX1P2-□□□□□□(1)	Version 1.13 or later
Industrial PC Platform NY IPC Machine Controller	NY5□□-1	Version 1.12 or later
Automation Software Sysmac Studio	SYSMAC-SE2□□□	Version 1.14 or higher

Function Block (FB) Specifications

Name	FB name	Description
Temperature Uniformity Filter	TempUniformityFilter	Calculates the set points suitable for each separate heater.
Direct Manipulated Variable Control	DirectPowerControl	Directly manipulates the manipulated variable to follow the set point in temperature control. You can use it to increase the performance of following the set point.

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

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