OMRON

Sysmac Library for NJ/NX/NY Controller

SYSMAC-XR006

Vibration Suppression Library

Sysmac Library

Increase material handling speed to reduce production cycle time.

Issue 1	When handling speed is increased, the machine and objects vibrates and vibration settling time is required.
Issue 2	Slides or spilling that occur during material handling result in poor product quality.

Vibration Suppression Library offers solution!

Function Blocks in this library suppress vibration after and during high-speed material handling, significantly reducing production cycle time.

sysmac
always in control

Vibration Suppression Function Block Selection

Challenge Suppress vibration.

Solution The vibration of the specified resonance frequency is reduced.

■ Choosing vibration suppression over travel time

FB

Multiple Frequency VS Filter 1 (MultiVSFilter1)

Vibration can be reduced by specifying up to five resonance frequencies.

■ Balancing vibration suppression with travel time

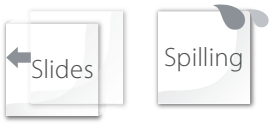
FB

Resonance Frequency Specific Vibration Suppression Parameter Calculation 1 (VSMoveParam1)

Vibration can be reduced by specifying a resonance frequency. (Patent pending)

Challenge Suppress slides and spilling.

Solution The vibration is reduced by smooth movement.



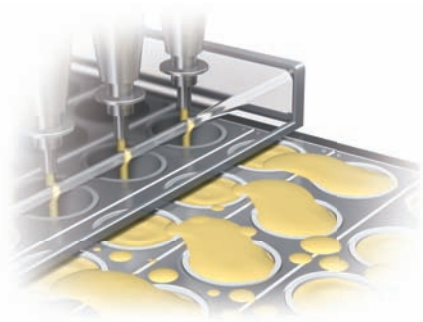
■ Specifying travel time

FB

Time Specific Vibration Suppression Profile 1 (VSConstTimeProfile1)

The position profile for smooth acceleration and deceleration is calculated according to the specified parameters.

■ Specifying distance and velocity in constant velocity zone



FB

Constant Velocity Specific VS Profile 1 (VSConstVelProfile1)

The position profile for smooth acceleration and deceleration is calculated according to the specified parameters.

Applications

Semiconductor chip handler

Issue The chip handler needs to wait over the socket until the vibration stops.

Handling time: 1.0 s

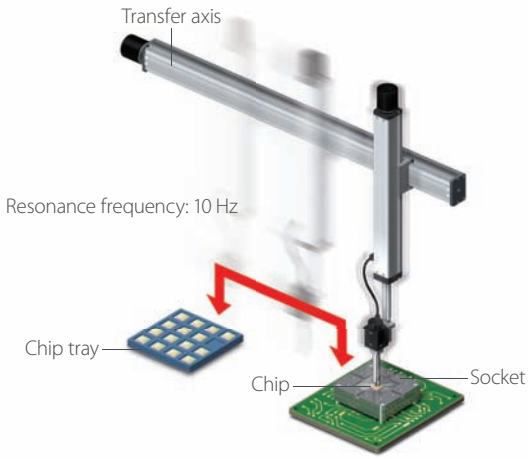
Travel time: 500 ms | Vibration settling time: 500 ms

Solution Function Blocks in the Vibration Suppression Library shorten handling time.

Handling time: 0.2 s

Travel time: 200 ms

Shorten handling time to 1/5



Application The XZ axis handler transfers a chip from a chip tray to a socket.

Semiconductor inspection machine

Issue The vision sensor cannot inspect a chip until the vibration stops after a pallet is moved.

Inspection time per chip

Travel time: 120 ms | Vibration settling time: 300 ms | Vision inspection

Handling time per pallet: 420 ms per chip x 400 chips = 168 s

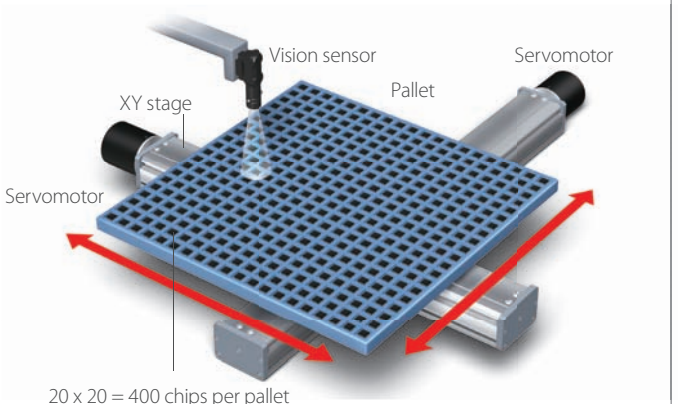
Solution Function Blocks in the Vibration Suppression Library shorten vibration settling time.

Inspection time per chip

Travel time: 120 ms | Vibration settling time: 100 ms | Vision inspection

Handling time per pallet: 220 ms per chip x 400 chips = 88 s

Shorten inspection time by 80 seconds



20 x 20 = 400 chips per pallet
Resonance frequency of pallet: 30 Hz

Application The XY stage moves a pallet so that the vision sensor can inspect chips one by one.

Semiconductor die bonder

Shorten handling time to half

Issue The arm cannot bond a chip until the vibration stops.

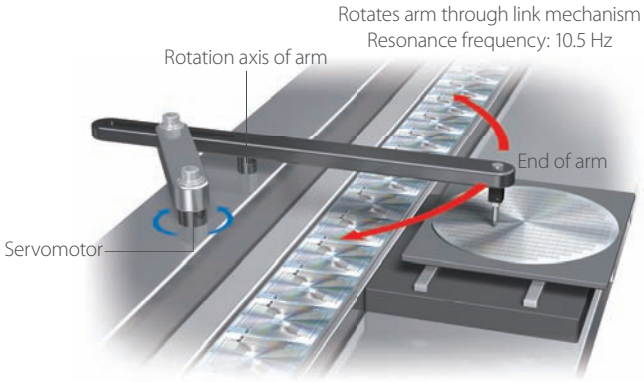
Handling time (end of arm): 0.54 s

Travel time: 180 ms | Travel time: 360 ms

Solution Function Blocks in the Vibration Suppression Library shorten vibration settling time.

Handling time (end of arm): 0.21 s

Travel time: 180 ms | Vibration settling time: 30 ms



Application The arm with a link mechanism bonds a chip to a frame or substrate.

FPD stacker crane

Shorten handling time by 2.6 seconds

Issue

- The crane cannot load or unload a cassette until the horizontal vibration stops.
- Resonance frequency varies depending on the height position of a cassette.

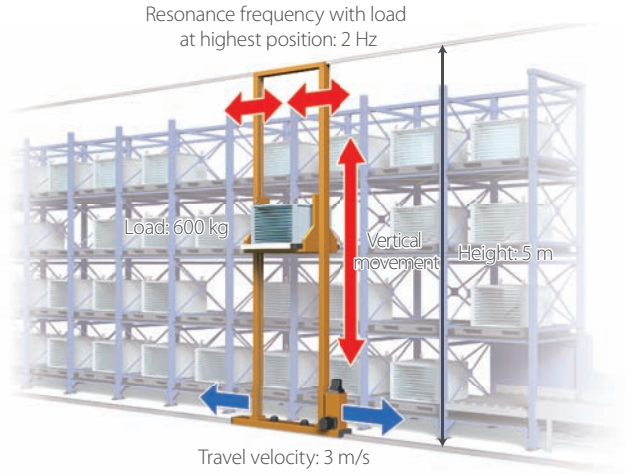
Handling time (with load at the highest position)

Travel time | Vibration settling time: 3 s

Solution Function Blocks in the Vibration Suppression Library shorten vibration settling time.

Handling time (with load at the highest position)

Travel time | Vibration settling time: 0.4 s



Application The stacker crane loads and unloads a glass substrate cassette onto and from a shelf.

Liquid filling and packaging machine

Shorten handling time by 0.2 seconds

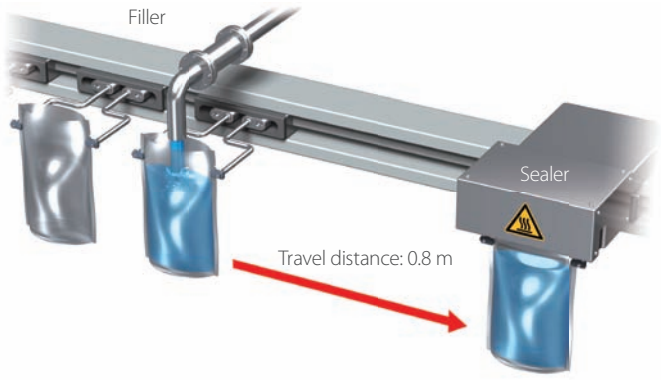
Issue The travel speed is limited to avoid splashing liquid onto the sealing part of a pouch.

Travel time: 1.2 s

Shorter travel time causes sloshing of liquid in a pouch, resulting in sealing failure due to its wet sealing part.

Solution Function Blocks in the Vibration Suppression Library shorten travel time without sealing failure.

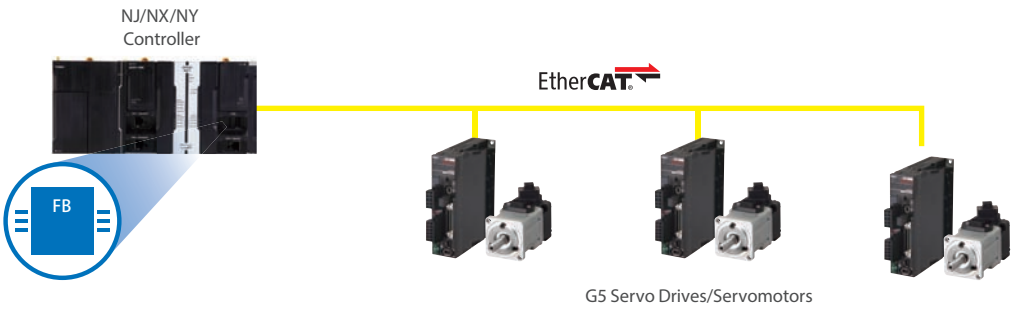
Travel time: 1.0 s



Resonance frequency: 2.5 Hz

Application The machine fills a pouch with liquid and transfers it to the sealer to heat seal it.

System configuration



Programs created by combining Function Blocks in Vibration Suppression Library and motion control instructions are used to suppress vibrations.

Compatible Models

Name	Model	Version
Machine Automation Controller NJ/NX CPU Unit	NX701-1□□□/NJ101-1□□□	Version 1.10 or later
	NJ501-□□□□/NJ301-□□□□	Version 1.10 or later
	NX1P2-□□□□□□(1)	Version 1.13 or later
	NX102-□□□□	Version 1.30 or later
Industrial PC Platform NY IPC Machine Controller	NY5□□-1	Version 1.12 or later
	NY5□□-5	Version 1.18 or later
Automation Software Sysmac Studio	SYSMAC-SE2□□□	Version 1.14 or higher
G5 Servo Drive with Built-in EtherCAT Communications	R88D-KN□□□-ECT	Version 2.10 or later

Function Block (FB)/Function (FUN) Specifications

Name	FB/FUN name	Description
Multiple Frequency VS Filter 1	MultiVSFilter1	Creates, from the command position of the axis, the command position that can suppress up to five vibrations that occur on the equipment.
Time Specific Positioning Parameter Calculation 1	TimeToMoveParam1	Calculates parameters needed for creating the command pattern that can reach the target position in the specified time when positioning is performed using MultiVSFilter1.
Resonance Frequency Specific Vibration Suppression Parameter Calculation 1	VSMoveParam1	Calculates the S-curve (i.e., velocity, acceleration, and jerk) parameters for suppressing the vibration that occurs during single axis positioning. High-speed travel is achieved by suppressing vibration of the specified resonance frequency.
Constant Velocity Specific VS Profile 1	VSConstVelProfile1	Calculates the position profile with the specified velocity in constant velocity zone. Calculates a smooth position profile for each of the acceleration and deceleration distances, so that residual vibration at the stopping position can be reduced and the vibration during constant velocity motion can also be suppressed.
Time Specific Vibration Suppression Profile 1	VSConstTimeProfile1	Calculates the position profile for the high level S-curve with a specified travel time. Positioning can be made in smooth velocity and acceleration/deceleration from the start to end points.

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

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