Sysmac Library for NJ/NX/NY Controller

SYSMAC-XR014

Dimension Measurement Library

Sysmac Library

✓ Measure thickness, flatness, level difference, and other dimensions using displacement sensors.

| Issue 1 | There is no knowledge what arithmetic expression should be used. |
| Issue 2 | The more sensors are used, the more complicated and time consuming the program will be. |

Dimension Measurement Library offers solution!

The Function Blocks in this library can be used to easily calculate the dimensions required for your application from the values obtained from displacement sensors Programming time can be reduced significantly. For example, previously the ST program for measuring level differences while moving sensor required 2,650 steps, but now, thanks to Function Blocks, it requires only 325 steps.

Program size reduced by **up to 85%***

* Omron survey as of October 2016

Multipoint Measurement

Thickness measurement of battery sheets

Case width measurement

Level difference measurement of assembled parts

2D Shape Measurement

Height measurement of assembled parts

Flatness measurement of case

LED potting shape measurement

Level difference   Slope

Flatness

Shape

**sysmac**
always in control

FB Multipoint Measurement
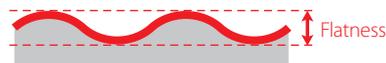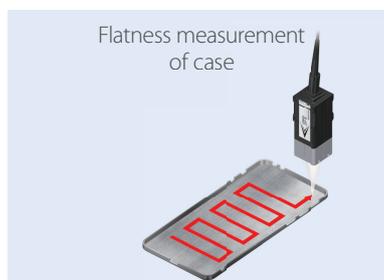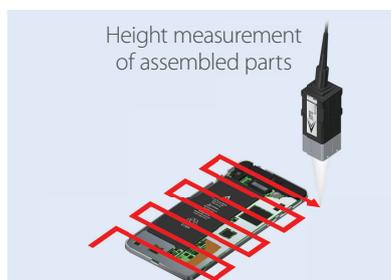
Function Blocks in this library can be used to calculate dimensions from measurement values obtained from two or more sensors.
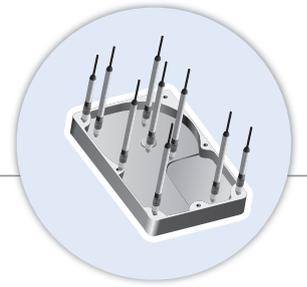
Reduced work : No program required for calculation

To calculate the required dimension, just select the Function Block that is fit for your purpose, and then specify sensors for parameters.

Maximum value

Minimum value

Flatness

Flatness = (Max. value – Min. value)

Mean value

Mean value = $((A + B + ...) / n)$
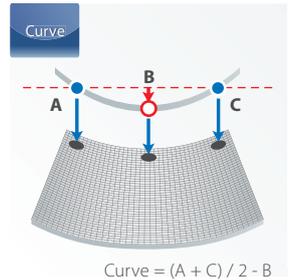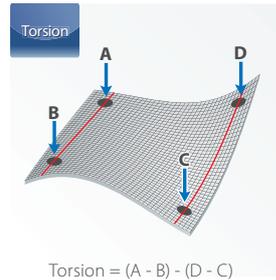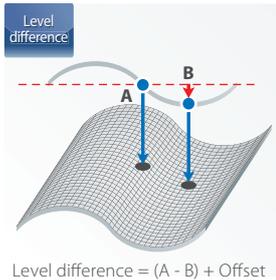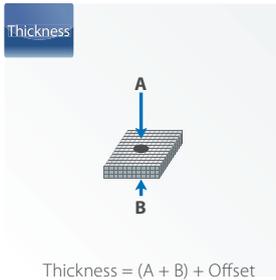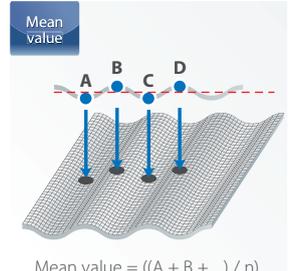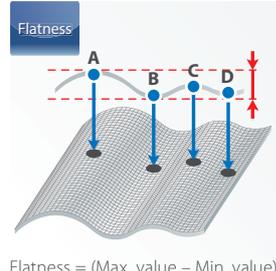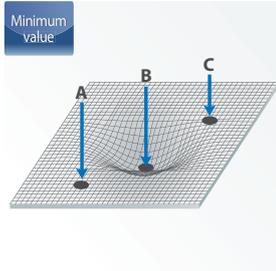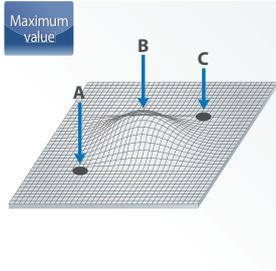
Thickness

Thickness = (A + B) + Offset

Level difference

Level difference = (A - B) + Offset

Torsion

Torsion = (A - B) - (D - C)

Curve

Curve = (A + C) / 2 - B

System Configurations

E9NC for contact sensing

System configuration

Sensor heads

EtherCAT

NJ/NX/NY Controller

Amplifier units

Communications unit

FB

Sysmac Studio

ZW-8000/7000/5000 for non-contact sensing

System configuration

NJ/NX/NY Controller

EtherCAT

FB

Sensor heads

Controllers

Sysmac Studio

Compatible Models

Name	Model
Machine Automation Controller NJ/NX CPU Unit	NX701-1□□□ NJ101-□□□□
	NJ501-□□□□ NJ301-□□□□
	NX1P2-□□□□□□(1)
	NX102-□□□□
Industrial PC Platform NY IPC Machine Controller	NY5□□-1
	NY5□□-5
Automation Software Sysmac Studio	SYSMAC-SE2□□□
Sensor Head	E9NC-TH□□□□ 2M
Amplifier Unit	E9NC-TA0
Sensor Communications Unit (EtherCAT)	E3NW-ECT

Compatible Models

Name	Model
Machine Automation Controller NJ/NX CPU Unit	NX701-1□□□ NJ101-□□□□
	NJ501-□□□□ NJ301-□□□□
	NX1P2-□□□□□□(1)
	NX102-□□□□
Industrial PC Platform NY IPC Machine Controller	NY5□□-1
	NY5□□-5
Automation Software Sysmac Studio	SYSMAC-SE2□□□
Sensor Head	ZW-80□0/70□0/50□0 □M
Controller	ZW-8000□/7000□/5000□

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

2D Shape Measurement

The Function Blocks can be used to measure while moving a sensor and calculate dimensions. Shape can be measured easily by linking movement data (X/Y) of the stage or robot with measurement data (Z) from the sensor in the controller, without any complicated programming.

Reduced work : Function Blocks prevent the out of measurement range error

Function Blocks can adjust the height of the sensor to keep the measured surface height within the measurement range of the sensor even when the surface height varies greatly.

You can select from the following two control methods to suit your application.

Tracer Control

This method is suitable for measuring shapes whose height varies gradually.
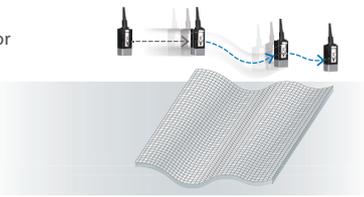
Surface Search

This method is suitable for measuring shapes whose height varies greatly and sharply. When the height of the measurement surface changes and it goes outside the measurement range of the displacement sensor, the height of the displacement sensor is readjusted and the measurement is continued.
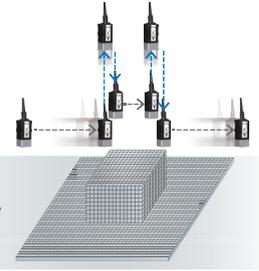
Reduced work : Function Blocks easily create 2D shape data

2D shape data can easily be created from moving measurement data to calculate the dimension of the characteristic point. To calculate the required dimension, just select the Function Block that is fit for your purpose, and then specify the measurement range.

Height	Edge position	Inflection point	Angle	Sectional area	Shape comparison

Height: Z axis, Measurement range, Maximum height (Z), Mean height (Z), Minimum height (Z), X axis

Edge position: Z axis, Measurement range, Edge level, Edge position (X), X axis

Inflection point: Z axis, Measurement range, Inflection point (X), X axis

Angle: Z axis, Measurement range 1, Measurement range 2, Angle (θ), X axis

Sectional area: Z axis, Measurement range, Sectional area, X axis

Shape comparison: Z axis, Measurement range, Positive difference (Z), Master shape, Target shape, Negative difference (Z), X axis

Reduced work : No need to design screens for setting and measurement

Omron provides HMI templates that include functionality for various applications as well as basic setting(sensor and servo system).

Monitor waveforms
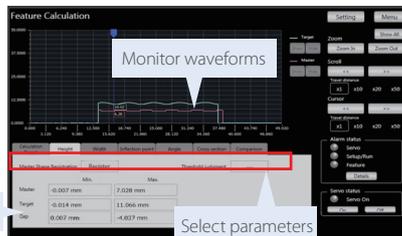
Set parameters

Select parameters

Built-in functions:
Waveform display of line measurement data, characteristic point calculation, comparison calculation, etc.

* Ask your Omron sales representative for details.

System Configuration

ZW-8000/7000/5000 for non-contact sensing

NA Programmable Terminal

EtherNet/IP

Sensor head

Controller

EtherCAT

NJ/NX/NY Controller

G5/1S AC Servo Systems
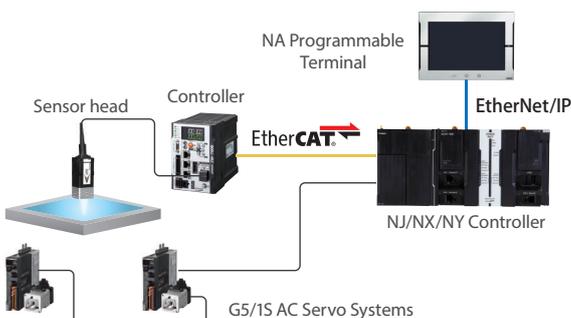
Compatible Models

Name	Model
Machine Automation Controller NJ/NX CPU Unit	NX701-1□□□ NJ101-1□□□ *
	NJ501-□□□□ NJ301-□□□□
	NX1P2-□□□□□□(1)
	NX102-□□□□
Industrial PC Platform NY IPC Machine Controller	NY5□□-1
	NY5□□-5
Automation Software Sysmac Studio	SYSMAC-SE2□□□
Sensor Head	ZW-80□0/70□0/50□0 □M
Controller	ZW-8000□/7000□/5000□
Programmable Terminal	NA5-□W
AC Servo Drive	R88D-KN□-ECT
	R88D-1SN□-ECT

* This Library is not available for NJ101-90□□ CPU Units.

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

Function Block (FB) Specifications

Multipoint Measurement

Name	FB name	Description
Point Measurement Calculation (Maximum Value, Minimum Value, Flatness and Mean Value)	CalcPointMeasurement	Utilizes the measurement data obtained from 1 to 16 measurement sensors to perform the calculation of maximum value, minimum value, flatness, and mean value.
Deviation Calculation	PointMeasure_Deviation	Outputs the difference of measurement values (Input1 and Input2) obtained from two measurement sensors on the calculation result.
Torsion Calculation	PointMeasure_Torsion	Calculates the degree of torsion from the measurement values (Input1, Input2, Input3, and Input4) obtained from four measurement sensors and outputs it on the calculation result.
Curve Calculation	PointMeasure_Curve	Calculates the degree of curve from the measurement values (Input1, Input2, and Input3) obtained from three measurement sensors and outputs it on the calculation result.
Thickness Calculation	PointMeasure_Thickness	Calculates the thickness from the measurement values (Input1 and Input2) obtained from two measurement sensors and outputs it on the calculation result.

2D Shape Measurement

Name	FB name	Description
Line Measurement with Cartesian Coordinate System (Surface Search/Tracer Control)	LineMeasure_Cartesian	Measures the height of measurement surfaces while moving a single axis with a displacement sensor in X and Z directions. From the measurement result, this Function Block creates the line measurement data. You can select from the following two methods to control the single axis during measurement: Surface Search and Tracer Control.
Line Measurement with Cartesian Coordinate System 2 (Surface Search/Tracer Control)	LineMeasure_Cartesian2	
Master 2D Shape Data Creation	LineMeasure_CreateShape2D_Master	Converts from the line measurement data to the 2D shape data and registers it as master data.
Master 2D Shape Data Creation 2	LineMeasure_CreateShape2D_Master2	
2D Shape Data Creation	LineMeasure_CreateShape2D	Converts from the line measurement data to the 2D shape data. Correction is performed so that the target data has the same slope, height and position as the master 2D shape data.
2D Shape Data Creation 2	LineMeasure_CreateShape2D2	
2D Shape Height Measurement	Shape2D_Height	Measures heights in a specified measurement range of the 2D shape data.
2D Shape Height Measurement 2	Shape2D_Height2	
2D Shape Edge Position Measurement	Shape2D_Edge	Measures the position (X coordinate) at which a height in the specified measurement range of the 2D shape data passes the edge level.
2D Shape Edge Position Measurement 2	Shape2D_Edge2	
2D Shape Inflection Point Measurement	Shape2D_InflectionPoint	Measures the position at which the shape line is bent (inflection point) in the specified measurement range of the 2D shape data. If there are multiple inflection points in the measurement range, the position (inflection point) with the largest amount (sensitivity) of bend is output.
2D Shape Inflection Point Measurement 2	Shape2D_InflectionPoint2	
2D Shape Angle Measurement	Shape2D_Angle	Draws a straight line between heights within in the two calculation measurement ranges of the 2D shape data. Then, the Function Block calculates the angle θ of the straight line to the horizontal surface. This Function Block also outputs slope a and intercept b of the straight line relative to the horizontal axis X and vertical axis Z (height).
2D Shape Angle Measurement 2	Shape2D_Angle2	
2D Shape Sectional Area Measurement	Shape2D_Area	Calculates the area in the specified integral range of the 2D shape data.
2D Shape Sectional Area Measurement 2	Shape2D_Area2	
2D Shape Comparison Measurement	Shape2D_Compare	Compares the master 2D shape data and target 2D shape data in the specified measurement range and detects the difference in height (Z direction).
2D Shape Comparison Measurement 2	Shape2D_Compare2	

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.

Common (ZW Operation Control)

Name	FB name	Description
ZW Zero Reset Control	ZW_ZeroResetControl	Performs the Zero Reset and Clear Zero Reset functions for the specified task of the ZW-8000/7000/5000 Confocal Fiber Displacement Sensor through EtherCAT communications.
ZW Command Control	ZW_CmdControl	Controls the commands for the ZW-8000/7000/5000 Confocal Fiber Displacement Sensor that communicates with the NJ/NX/NY Controller via EtherCAT.

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

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