

LGF_SmoothByPolynomFB/LGF_SmoothByPolynomFC

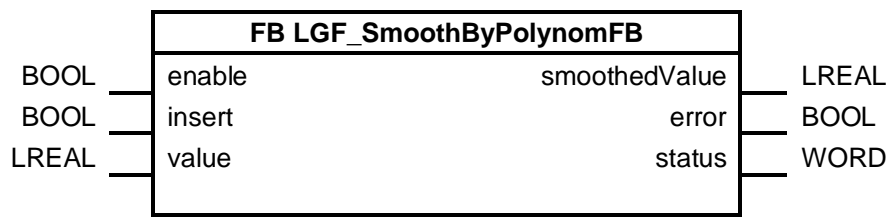
Short description

For smoothing, a 3rd degree polynomial is placed through five value points. The error squares of the distances between polynomial and real value are minimized. The smoothed values can be determined from the polynomial parameters obtained in this way.

The block is implemented as a function and as a function block.

Function (FC)	Function block (FB)
The function calculates the smoothed values acyclically. The function reads an array that is smoothed. N-4 smoothed measured values can be calculated from N measured values. The output array contains the value 0 in the index (0,1,N-1,N). However, replacement values can be calculated.	The function block calculates the smoothed values cyclically. The function block reads-in a value with each positive edge on the "insert" input. As soon as five values have been read in, the block calculates a smoothed value and outputs it.

Function block (FB)



Input parameters

Parameters	Data type	Description
enable	BOOL	Activates the block. As long as enable is "TRUE", the block can accept values on the parameter "value".
insert	BOOL	Accepts the value at input "value" and outputs a "smoothedValue" if five values have been read in.
value	LREAL	Value that is to be included in the smoothing.

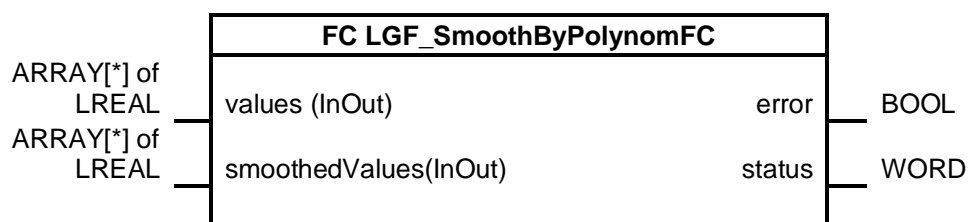
Output parameters

Parameters	Data type	Description
smoothedValue	LREAL	Smoothed value.
error	BOOL	FALSE: No error TRUE: An error occurred during the execution of the FB.
status	WORD	16#0000-16#7FFF: Status of the FB, 16#8000-16#FFFF: Error identification (see following Table).

Status and error displays

status	Meaning	Remedy / notes
16#0000	No error	Processing was completed successfully
16 #7000	Block is not being edited	The block waits for activation through the parameter "enable".
16#7001	First FB call.	-
16#7002	Processing is active.	Subsequent call of the FB
16#7010	Too few values	The block requires five values to calculate a smoothed value. Transfer additional values with a positive edge on the "insert" input.

Function (FC)



Input/output parameters (InOut)

Parameters	Data type	Description
values	ARRAY[*] of LREAL	Values that are to be included in the smoothing.
smoothedValues	ARRAY[*] of LREAL	The smoothed values.

Output parameters

Parameters	Data type	Description
error	BOOL	FALSE: No error TRUE: An error occurred during the execution of the FB.
status	WORD	16#0000-16#7FFF: Status of the FB, 16#8000-16#FFFF: Error identification (see following Table).

Status and error displays

status	Meaning	Remedy / notes
16#0000	No error	Processing was completed successfully
16#8400	Unequal array sizes	The arrays "values" and "smoothedValues" must have the same size.
16#8401	Too few values	The block requires five values to calculate a smoothed value. Increase the size of the array at the input parameter "values". Adapt the array on the output parameter "smoothedValues" to the new size.

Principle of operation

The 3rd degree compensation polynomial is calculated as follows:

$$\overline{y(n)} = \frac{1}{35} * (-3 * y(n-2) + 12 * y(n-1) + 17 * y(n) + 12 * y(n+1) - 3 * y(n+2))$$

N-4 smoothed measured values can thus be calculated from the N measured values. The output array contains the value 0 in the index (0.1, N-1, N).

These “missing” values are calculated with the following formalisms:

$$\overline{y(n-2)} = \frac{1}{70} * (69 * y(n-2) + 4 * y(n-1) - 6 * y(n) + 4 * y(n+1) - y(n+2))$$

$$\overline{y(n-1)} = \frac{2}{70} * (2 * y(n-2) + 27 * y(n-1) + 12 * y(n) - 8 * y(n+1) + 2 * y(n+2))$$

$$\overline{y(n+1)} = \frac{2}{70} * (2 * y(n-2) - 8 * y(n-1) + 12 * y(n) + 27 * y(n+1) + 2 * y(n+2))$$

$$\overline{y(n+2)} = \frac{1}{70} * (-y(n-2) + 4 * y(n-1) - 6 * y(n) + 4 * y(n+1) + 69 * y(n+2))$$

Further information on libraries in TIA Portal:

- Topic page libraries
<https://support.industry.siemens.com/cs/ww/en/view/109738702>
- Guideline on Library Handling
<https://support.industry.siemens.com/cs/ww/en/view/109747503>
- Programming Guideline for S7-1200/1500 in chapter “Libraries”
<https://support.industry.siemens.com/cs/ww/en/view/81318674>
- Programming Styleguide
<https://support.industry.siemens.com/cs/ww/en/view/81318674>