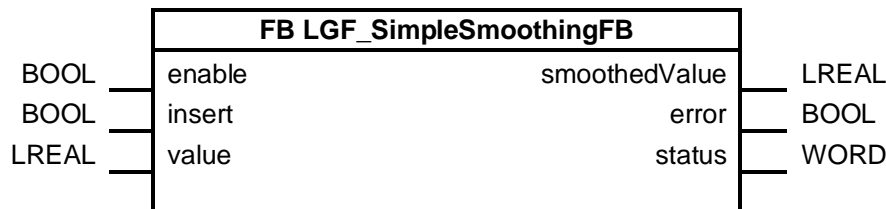## LGF_SimpleSmoothingFB/LGF_SimpleSmoothingFC

Short description

The simplest form of smoothing a sequence of measured values is to calculate the linear mean value by three points.

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

Function (FC)	Function block (FB)
The function calculates the linear mean value acyclically.	The function block calculates the linear mean value cyclically.
The function reads an array that is smoothed. N-2 smoothed measured values can be calculated from N measured values. Therefore, the output array in the index (0) and index (N) contains the value 0.	The function block reads-in a value with each positive edge on the "insert" input. As soon as three values have been read in, the block calculates a smoothed value and outputs it.

Function block (FB)

```
              ┌─────────────────────────────────────────┐
              │        FB LGF_SimpleSmoothingFB          │
  BOOL  ──────┤ enable                     smoothedValue ├────── LREAL
  BOOL  ──────┤ insert                             error ├────── BOOL
  LREAL ──────┤ value                             status ├────── WORD
              │                                          │
              └─────────────────────────────────────────┘
```

Input parameters

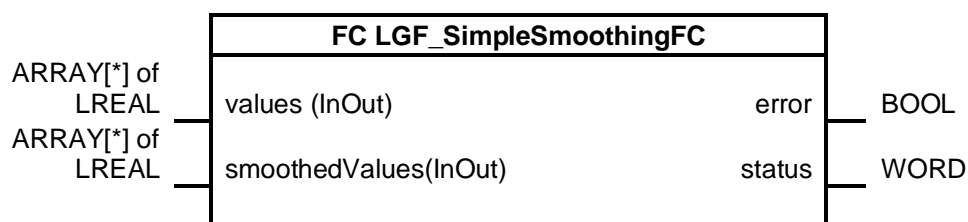| Parameters	Data type	Description
enable	BOOL	Activates the block. As long as enable is "TRUE", the block can accept values on the parameter "value".
insert	BOOL	Accepts the value at the input "value" at positive edge and outputs a "smoothedValue" if three values have been read in.
value	LReal	Value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

Output parameters

Parameters	Data type	Description
smoothedValue	LREAL	The smoothed values.
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 three values to calculate a smoothed value. Transfer additional values with a positive edge on the "insert" input.

Function (FC)

FC LGF_SimpleSmoothingFC

ARRAY[*] of LREAL — values (InOut) — error — BOOL

ARRAY[*] of LREAL — smoothedValues(InOut) — status — WORD

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	Too few values	The block requires three 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.
16#8401	Unequal array sizes	The arrays "values" and "smoothedValues" must have the same size.

Principle of operation

The block calculates the smoothed values using the following formula:

$$\overline{y(n)} = \frac{y(n-1) + y(n) + y(n+1)}{3}$$

The calculated value is output or the calculated values are output at output "smoothedValue".

Based on this formula, the FC cannot calculate values for the elements 0 and N.

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