

A man in a light blue shirt is seen from the side, holding a tablet. He is in a factory or industrial setting with various machines and equipment in the background. Overlaid on the image are several digital graphics: a '24/7' icon with a circular arrow, a 'NEWS' icon with a person silhouette, a 'Home' icon, and a 'Library of Basic Controls (LBC)' icon. The background is a blurred industrial environment with bright lights and a clock on the wall.

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## Library of Basic Controls (LBC)

STEP 7 / WinCC Unified (TIA PORTAL V16)

<https://support.industry.siemens.com/cs/ww/en/view/109792175>

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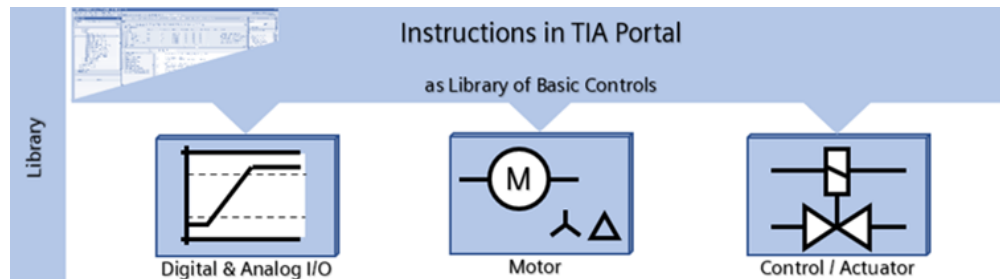
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# 1 Introduction

## 1.1 Overview



The “Library of Basic Controls” (LBC) provides basic control modules that are programmed in a standardized concept according to the Siemens programming style guide and the PLCopen guideline.

In addition to that the library provides alarm text lists for each block.

### NOTE

All blocks in the LBC were created in accordance with the Programming Style Guide.

<https://support.industry.siemens.com/cs/ww/en/view/81318674>

## 1.2 General information

This library provides the starting point for the individual path of standardization. The functions are provided in the form of a global library and can be used freely. The library described here is versioned and it will be continuously extended and improved.

For more information on libraries, visit:

- Libraries in the TIA Portal  
<https://support.industry.siemens.com/cs/ww/en/view/109738702>
- How do you open libraries in STEP 7 (TIA Portal)?  
<https://support.industry.siemens.com/cs/ww/en/view/37364723>
- Information on the general handling of libraries is provided in the Guideline for Library Handling  
<https://support.industry.siemens.com/cs/ww/en/view/109747503>
- and in the Programming Guideline for S7-1200/1500 in the chapter “Libraries”  
<https://support.industry.siemens.com/cs/ww/en/view/81318674>

## 1.3 Hardware and software requirements

### Requirements for this library

To be able to use the functionality of the library described here, the following hardware and software requirements must be met.

#### Hardware

Modules can be used with

- S7-1200 (without Motion control)
- S7-1500(TF) / Software Controller
- Simulation with S7-PLCSIM and PLCSIM Advanced

#### Software

- TIA Portal V16
- STEP 7 Professional
- ProDiag (for S7-1500 only)

#### NOTE

In general, it is possible to open a library with STEP 7 Basic, although STEP 7 Professional elements (e.g. SIMATIC S7-1500 controller) are included. In this case you will be informed with a message when opening the library.

All elements (types and copy templates) can be used if they are supported by the hardware installed in the TIA Portal.

If you try to copy elements with STEP 7 Basic from the library that are not supported (e.g. SIMATIC S7-1500 controller), an error message is displayed.

## 1.4 User-defined documentation

In order to explain the principle of operation and use of the blocks to users of the library, user-defined documentation has been created for each block. The files are stored in the following directories of the library.

- English: `UserFiles\UserDocumentation\en-US\Library Types`

The user-defined documentation for a block can be called up in the Task Card "Library" and in the library view with the key combination `<Shift+F1>`. The respective file is always opened with the standard program defined in Microsoft Windows.

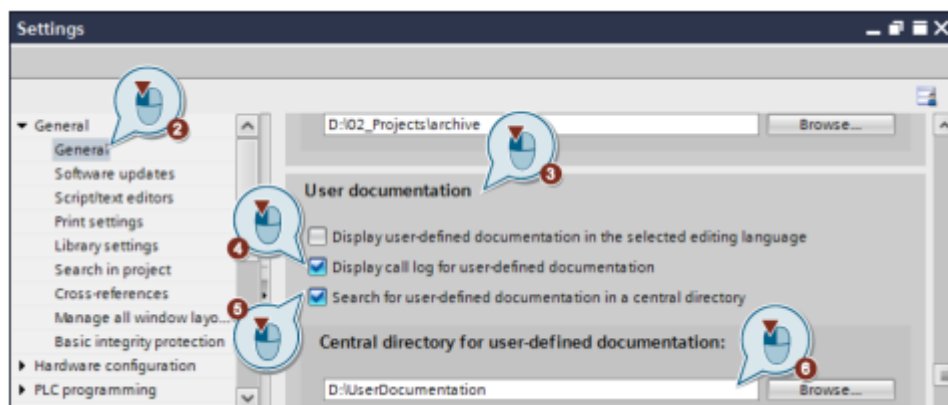
So that the user-defined documentation of the blocks can also be called up in the project navigation, you must copy the directories with the files into the project directory `UserFiles`.

**NOTE** For user-defined documentation, you require SIMATIC STEP 7 Basic / Professional V15.1 Update 1.

### Central directory for user-defined documentation

Alternatively, you can store the user-defined documentation in a central directory for all projects. To define a central storage location for user help, proceed as follows:

1. In the "Options" menu, select the "Settings" command.
2. Open the area "General > General".
3. Navigate to the "User documentation" section.
4. Activate the checkbox "Display call log for user-defined documentation" to display a log of the call-up of the user-defined documentation in the Inspector window.
5. Activate the "Search for user-defined documentation in a central directory" checkbox to store user-defined documentation in a central directory for projects.
6. In the "Central directory for user-defined documentation" field, specify the path where you want to store cross-project documentation.



**NOTE** Do not change the names of the files, because the file name must precisely match the name of the object in the TIA Portal!

## 2 Library Concept

The “Library of Basic Controls” (LBC) is developed on the basis of PLCopen and the Siemens Programming Style Guide. The aim of this library is to show how standardization can be practiced and implemented in today's PLC software development.

Key features of this library are:

### 2.1 Modularization

The modules of this library can be used as standalone and as well as a part of a more complex hierarchy due to their interface design.

### 2.2 Independent of field of application

The name of the library already reveals it, “basic” stands for the fundamental technical functional units. The program blocks of this library can be universally used as blocks in various fields of technology.

### 2.3 Storage of configuration parameters

The module configuration of each block are transferred via the I/O interface, so the user has to define the memory location when calling the module.

If a module is used in a higher level component, like an equipment module, the module configuration can be embedded in the higher levels configuration UDT or directly specified by the calling environment.

This allows the user to store all configuration data in a central storage location, such as a Global Data Block (DB), for a simple backup strategy.



## 2.4 Diagnostic

Each module delivers its diagnostic information via the output interface and the module interface.

The `status` of datatype word delivers the information along to the style guide defined number structure (refer to style guide /3/: DA013 Rule: Report status/errors via `status/ error`).

By using the provided text lists in combination with the status word of the block, diagnostic messages can be generated.

While using a S7-1500, each module delivers pre-configured ProDiag supervisions. That means that no additional adjustments and engineering efforts for diagnostics are required.

### NOTE

Using systems, different to ProDiag, there is the possibility to use the trigger together with the status word and the belonging text list to generate errors in different systems.

### Status codes

Information	Value range
Command finished, no warnings and no further details	16#0000
Command finished, further details	16#0001 ... 16#0FFF
No command in execution (initial value)	16#7000
First call after receiving a new command. (rising edge on execute)	16#7001
Follow up call during active execution of a command without further details	16#7002
Follow up call during active execution of a command with further details. Warnings without effect of further processing.	16#7003 ... 16#7FFF

### Error codes

Error	Value range
Wrong operation of the function block	16#8001 ... 16#81FF
Wrong configuration / parameterization	16#8200 ... 16#83FF
Errors during execution from outside (e.g. wrong I/O signals)	16#8400 ... 16#85FF
Internal error during execution (e.g. during a system call)	16#8600 ... 16#87FF
Reserved	16#8800 ... 16#8FFF
User defined error classes	16#9000 ... 16#FFFF

## 2.5 Module interface

All the modules have an interface for data exchange with external systems, called `moduleInterface`.

This interface is based on a module related data type (UDT - `LBC_typeMODULEInterface`) and transferred via the I/O interface.

This concept is designed to achieve the following goals:

- Visualization of the module's actual process values
- Adjust configuration without using the engineering system (engineering-less commissioning)
- Deliver module specific diagnostic information for external systems

### Parameter of `LBC_typeMODULEInterface`

Name	Type	Comment
commands	<code>LBC_typeInterfaceCommands</code>	Datatype for commands from external systems
parameters	<code>LBC_typeMODULEParameters</code>	Module related parameters
monitoring	<code>LBC_typeMODULEProcessValues</code>	Module related monitoring information
diagnostics	<code>LBC_typeDiagnostics</code>	Datatype for diagnostic keeps status, subfunctionStatus and the state number

### Parameter of `LBC_typeInterfaceCommands`

Name	Type	Comment
refreshConfiguration	Bool	TRUE: Copy global configuration parameters into module interface for external systems
editConfiguration	Bool	TRUE: Edit mode for configuration parameters in control system is active - copying into module interface is stopped
saveConfiguration	Bool	TRUE: Save configuration parameters from module interface into to global configuration parameters after change
alarmAck	Bool	TRUE: Module error acknowledge / reset of errors in function block

### Parameter of module configuration UDT (`LBC_typeNAMEConfiguration`)

The configuration UDT (module related) contains the configuration parameters needed for each functional module. The modules process is working on the configuration parameters of the I/O interface.

All module related configuration parameters can be changed and adjusted via a external system. This is intended to provide the basis for an engineering-less commissioning. In case of dynamic assignment of parameters by the process, changes from external system will be overwritten.

The configuration parameters of the module interface only updated on request:

- towards the surrounding system:  
`moduleInterface.commands.refreshConfiguration`
- from surrounding into the module configuration:  
`moduleInterface.commands.saveConfiguration`

### The module monitoring UDT (LBC\_typeNAMEProcessValues)

The monitoring UDT (module related) delivers all the process data related to the operation of the module.

### Parameter of LBC\_typeDiagnostics

Name	Type	Comment
status	Word	Standardized status (based on style guide)
subfunctionStatus	Word	Status or return value of called FB's, FCs and system blocks
stateNumber	DInt	State in the state machine of the block where the error occurred

The UDT for diagnostic keeps the block status, status of a called sub function and the state number where the error occurred.

## 3 Program Blocks

### 3.1.1 LBC\_AnalogInput (FB / V1.0.0)

Author: Siemens Digital Industry

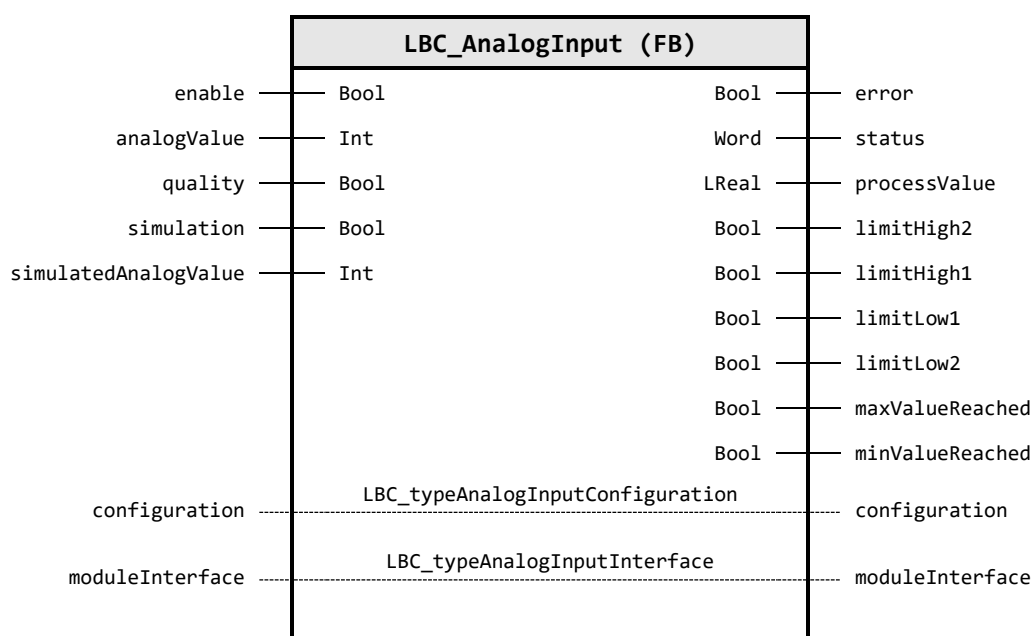
#### Short description

The function is used for processing (scaling) a value from analog input card and converts it into a meaningful unit (temperature, height, pressure...) that is within a user defined range.

The peripheral I/O card is working with current or voltage - depending on the card and its configuration.

#### Interface description

##### Block Interface



#### Input parameter

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
analogValue	Int	0	Input value from sensor (analog signal)
quality	Bool	TRUE	Quality bit from sensor FALSE = error, TRUE = healthy [default]
simulation	Bool	FALSE	TRUE: Enable simulation input (analog value)
simulatedAnalogValue	Int	0	Simulated analog input value

#### Output parameter

Identifier	Data Type	Description
error	Bool	FALSE: No error TRUE: An error occurred during the execution of the FB

### 3 Program Blocks

Identifier	Data Type	Description
status	Word	16#0000-16#7FFF: Status of the FB 16#8000-16#FFFF: Error identification (see following Table)
processValue	LReal	Processed and scaled sensor value
limitHigh2	Bool	Limit high 2 exceeded (Lim 2 > Lim1, resets Lim 1)
limitHigh1	Bool	Limit high 1 exceeded
limitLow1	Bool	Limit low 1 exceeded
limitLow2	Bool	Limit low 2 exceeded (Lim 2 < Lim1, resets Lim 1)
maxValueReached	Bool	Maximum configured process value reached. Value is limited to the maximum configured value.
minValueReached	Bool	Minimum configured process value reached. Value is limited to the minimum configured value.

#### In/Out parameter

Identifier	Data Type	Description
configuration	LBC_typeAnalogInputConfiguration	Module related configuration parameters
moduleInterface	LBC_typeAnalogInputInterface	Module interface for external systems

#### Status & Error codes

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: Function block is not enabled
16#7002	STATUS_ENABLED Status: Function block is enabled
16#7601	ALARM_LIMIT_HIGH_2 Status: Limit high 2 exceeded (Lim 2 > Lim1, resets Lim 1)
16#7602	ALARM_LIMIT_HIGH_1 Status: Limit high 1 exceeded
16#7603	ALARM_LIMIT_LOW_1 Status: Limit low 1 exceeded
16#7604	ALARM_LIMIT_LOW_2 Status: Limit low 2 exceeded (Lim 2 < Lim1, resets Lim 1)
16#7605	ALARM_MAX_VALUE_REACHED Status: Maximum configured process value reached. Value is limited to the maximum configured value.
16#7606	ALARM_MIN_VALUE_REACHED Status: Minimum configured process value reached. Value is limited to the minimum configured value.
16#8201	ERR_CONFIGURATION_RANGE_PARAMETRIZATION Error: Configuration, range of parameters. min >= max
16#8202	ERR_CONFIGURATION_SCALE_ANALOG_POINTS Error: Configuration, analog input points. Process Lower >= Upper
16#8211	ERR_CONFIGURATION_LIMIT_LOW1_LOW2 Error: Configuration, incorrect values of limit low Limit low 2 is greater than limit 1

### 3 Program Blocks

Code / Value	Identifier / Description
16#8212	ERR_CONFIGURATION_LIMIT_LOW1_HIGH1 Error: Configuration, incorrect values of limit low 1 and limit high 1 Limit low 1 is greater than limit high 1
16#8213	ERR_CONFIGURATION_LIMIT_HIGH1_HIGH2 Error: Configuration, incorrect values of limit high Limit high 1 is greater than limit high 2
16#8401	ERR_QUALITY_BAD Error: Bad quality of the analog input signal (hardware periphery)
16#8402	ERR_HIGH_LIMIT_OVERFLOW Error: Input signal is over the value 32511(Dec)
16#8403	ERR_HIGH_LIMIT_OVER_RANGE Error: Input signal is over the value 27649(Dec)
16#8404	ERR_LOW_LIMIT_UNDER_RANGE_UNIPOLAR Error: Input signal is below the value 0 (Dec), unipolar analog input configured
16#8405	ERR_LOW_LIMIT_UNDERFLOW_UNIPOLAR Error: Input signal is below the value - 4864(Dec), unipolar analog input configured
16#8406	ERR_LOW_LIMIT_UNDER_RANGE_BIPOLAR Error: Input signal is below the value -27649 (Dec), bipolar analog input configured
16#8407	ERR_LOW_LIMIT_UNDERFLOW_BIPOLAR Error: Input signal is below the value - 32512(Dec), bipolar analog input configured



**User defined datatype(s)****LBC\_typeAnalogInputConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'AnalogInput'	Device name or device ID
physicalUnit	String[10]	'unit'	Each value should have a physical unit (like [°C], [kWh], etc.)
isUnipolarSignal	Bool	TRUE	TRUE: Sensor is a unipolar type (just positive values), FALSE: Sensor is a bipolar type (positive and negative values)
default	LReal	0.0	Default OUTPUT process value to be returned if function block is not enabled or quality is bad
limitHigh2	LReal	90.0	Process value limit high 2
limitHigh1	LReal	80.0	Process value limit high 1
limitLow1	LReal	-80.0	Process value limit low 1
limitLow2	LReal	-90.0	Process value limit low 2
processValueMax	LReal	100.0	Maximum limit of the process value
processValueMin	LReal	-100.0	Minimum limit of the process value
scaleAnalogUpperPoint	LReal	27648.0	Upper point for the analog value. Maximum value from the hardware module - i.e. 27648
scaleAnalogLowerPoint	LReal	0.0	Lower point for the analog value. Minimum value from the hardware module - i.e. 0
scaleProcessUpperPoint	LReal	100.0	Upper point for the process value - scaled value
scaleProcessLowerPoint	LReal	-100.0	Lower point for the process value - scaled value
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

**LBC\_typeAnalogInputInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeAnalogInputConfiguration	default	Module related configuration parameters
monitoring	LBC_typeAnalogProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The analog input function block converts an electrical signal from analog periphery (analog value) to a scaled (meaningful – temperature, weight, pressure, etc.) value, that is within a user defined range.

The processing of the function is started by assigning **TRUE** signal to the **enable** input, from then on, the quality bit is monitored.  
If the **quality** bit is "healthy" (logical **TRUE**) then the input value is scaled according to settings of the block.

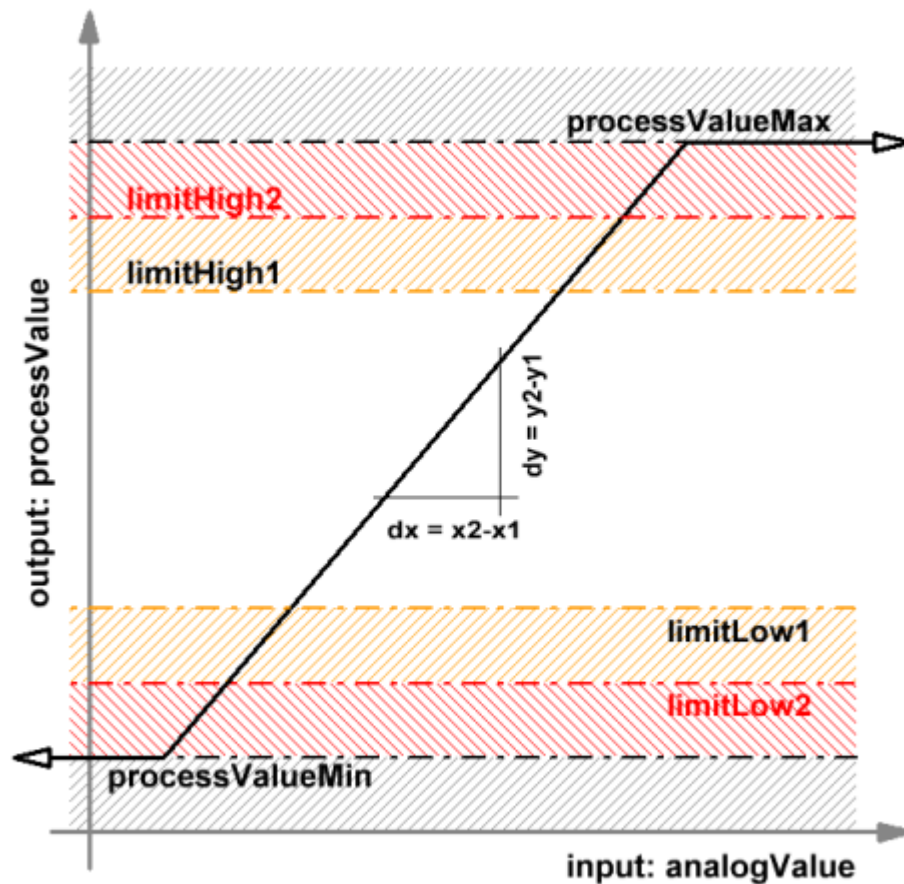
In order to ensure, that scaling works correctly, it is necessary to set the minimum and the maximum values for input and output.

Other optional settings are defining high and low limits/ levels.

The block can be configured to monitor the level of the scaled value and generate alarms if a certain level is reached.

For further information see the explanation in the picture and math formulas below.

### Process chart



$$dx = x_2 - x_1 = \text{scaleAnalogUppPoint} - \text{scaleAnalogLowPoint}$$

$$dy = y_2 - y_1 = \text{scaleProcessUppPoint} - \text{scaleProcessLowPoint}$$

### Math equation

$$y = \frac{y_2 - y_1}{x_2 - x_1} \cdot (x - x_1) + y_1$$

$$x = \text{analogValue}$$

$$y = \text{processValue}$$

$$x_1 = \text{scaleAnalogLowPoint}$$

$$x_2 = \text{scaleAnalogUppPoint}$$

$$y_1 = \text{scaleProcessLowPoint}$$

$$y_2 = \text{scaleProcessUppPoint}$$

#### Change log

Version & Date	Change description
<b>01.00.00</b> 15.02.2021	<b>SIMATIC Systems Support</b> First released version

### 3.1.2 LBC\_AnalogOutput (FB / V1.0.0)

Author: Siemens Digital Industry

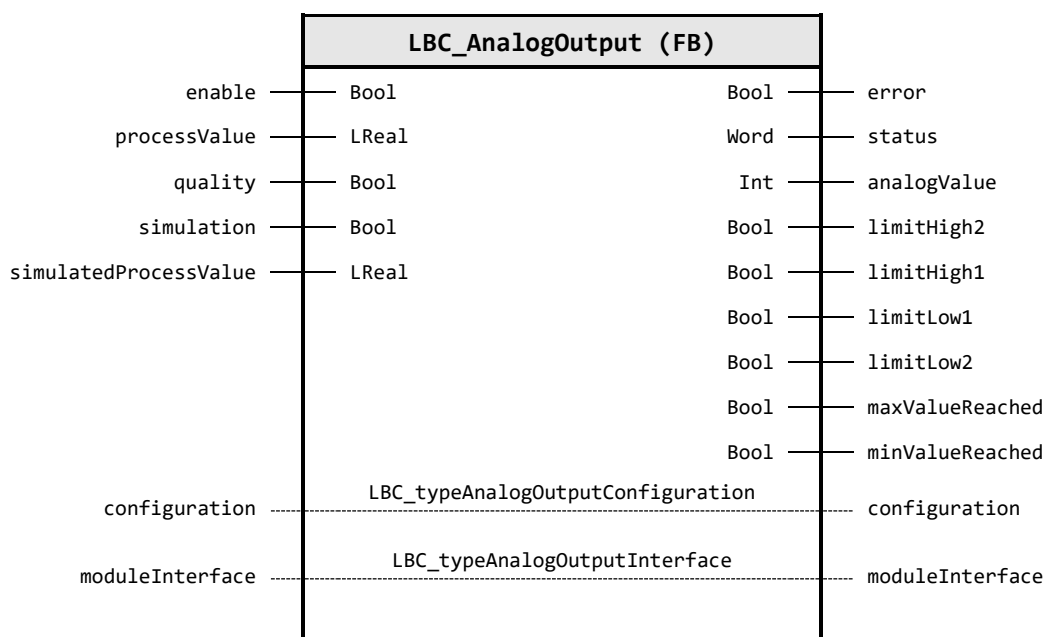
#### Short description

The function is used for processing (scaling) a value from meaningful units (temperature, height, pressure...) and converts it into an analog output value fitting for hardware analog output that is within a user defined range.

The periphery I/O card is working with current or voltage - depending on the card and its configuration.

#### Interface description

##### Block Interface



#### Input parameter

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
processValue	LReal	0.0	Input value for scaling from a process
quality	Bool	TRUE	Quality bit from sensor FALSE = error, TRUE = healthy [default]
simulation	Bool	FALSE	TRUE: Enable simulation input (process value)
simulatedProcessValue	LReal	0.0	Input process value for scaling from simulated process

#### Output parameter

Identifier	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)
analogValue	Int	Processed and scaled sensor value (analog signal)

### 3 Program Blocks

Identifier	Data Type	Description
limitHigh2	Bool	Limit high 2 exceeded (Lim 2 > Lim1, resets Lim 1)
limitHigh1	Bool	Limit high 1 exceeded
limitLow1	Bool	Limit low 1 exceeded
limitLow2	Bool	Limit low 2 exceeded (Lim 2 < Lim1, resets Lim 1)
maxValueReached	Bool	Maximum configured process value reached. Value is limited to the maximum configured value.
minValueReached	Bool	Minimum configured process value reached. Value is limited to the minimum configured value.

#### In/Out parameter

Identifier	Data Type	Description
configuration	LBC_typeAnalogOutputConfiguration	Module related configuration parameters
moduleInterface	LBC_typeAnalogOutputInterface	Module interface for external systems

#### Status & Error codes

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: Function block is not enabled
16#7002	STATUS_ENABLED Status: Function block is enabled
16#8201	ERR_CONFIGURATION_RANGE_PARAMETRIZATION Error: Configuration range of parameters. min >= max
16#8202	ERR_CONFIGURATION_SCALE_ANALOG_POINTS Error: Configuration of analog input points. Process Lower >= Upper
16#8211	ERR_CONFIGURATION_LIMIT_LOW1_LOW2 Error: Configuration, incorrect values of limit low Limit low 2 is greater than limit 1
16#8212	ERR_CONFIGURATION_LIMIT_LOW1_HIGH1 Error: Configuration, incorrect values of limit low 1 and limit high 1 Limit low 1 is greater than limit high 1
16#8213	ERR_CONFIGURATION_LIMIT_HIGH1_HIGH2 Error: Configuration, incorrect values of limit high Limit high 1 is greater than limit high 2
16#8401	ERR_QUALITY_BAD Error: Bad quality of the analog output signal (hardware periphery)
16#8402	ERR_HIGH_LIMIT_OVERFLOW Error: Scaled value is over 32511(Dec)
16#8403	ERR_HIGH_LIMIT_OVER_RANGE Error: Scaled value is over 27649(Dec)
16#8404	ERR_LOW_LIMIT_UNDER_RANGE_UNIPOLAR Error: Scaled value is below 0 (Dec), unipolar analog output configured
16#8405	ERR_LOW_LIMIT_UNDERFLOW_UNIPOLAR Error: Scaled value is below - 4864(Dec), unipolar analog output configured

### 3 Program Blocks

Code / Value	Identifier / Description
16#8406	ERR_LOW_LIMIT_UNDER_RANGE_BIPOLAR Error: Scaled value is below -27649 (Dec), bipolar analog output configured
16#8407	ERR_LOW_LIMIT_UNDERFLOW_BIPOLAR Error: Scaled value is below - 32512(Dec), bipolar analog output configured

#### User defined datatype(s)

#### LBC\_typeAnalogOutputConfiguration (UDT)

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'AnalogOutput'	Device name or device ID
physicalUnit	String[10]	'unit'	Each value should have a physical unit (like [°C], [kWh], etc.)
isUnipolarSignal	Bool	TRUE	TRUE: Sensor is a unipolar type (just positive values), FALSE: Sensor is a bipolar type (positive and negative values)
default	Int	0	Default OUTPUT analog value to be returned if function block is not enabled or quality is bad
limitHigh2	LReal	90.0	Process value limit high 2
limitHigh1	LReal	80.0	Process value limit high 1
limitLow1	LReal	-80.0	Process value limit low 1
limitLow2	LReal	-90.0	Process value limit low 2
processValueMax	LReal	100.0	Maximum limit of the process value
processValueMin	LReal	-100.0	Minimum limit of the process value
scaleProcessUpperPoint	LReal	100.0	Upper point for the process value
scaleProcessLowerPoint	LReal	-100.0	Lower point for the process value
scaleAnalogUpperPoint	LReal	27648.0	Upper point for the analog output. Maximum value from the hardware module - i.e. 27648 - scaled value
scaleAnalogLowerPoint	LReal	0.0	Lower point for the analog output. Minimum value from the hardware module - i.e. 0 - scaled value
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block



**LBC\_typeAnalogOutputInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeAnalogOutputConfiguration	default	Module related configuration parameters
monitoring	LBC_typeAnalogProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The analog output function block converts from a meaningful value, that is within a user defined range (temperature, weight, pressure, etc.), to an electrical signal for the analog periphery (analog value).

The processing of the function is started by assigning **TRUE** signal to the **enable** input, from then on, the quality bit is monitored.

If the **quality** bit is "healthy" (logical **TRUE**) then the output value is scaled according to settings of the block.

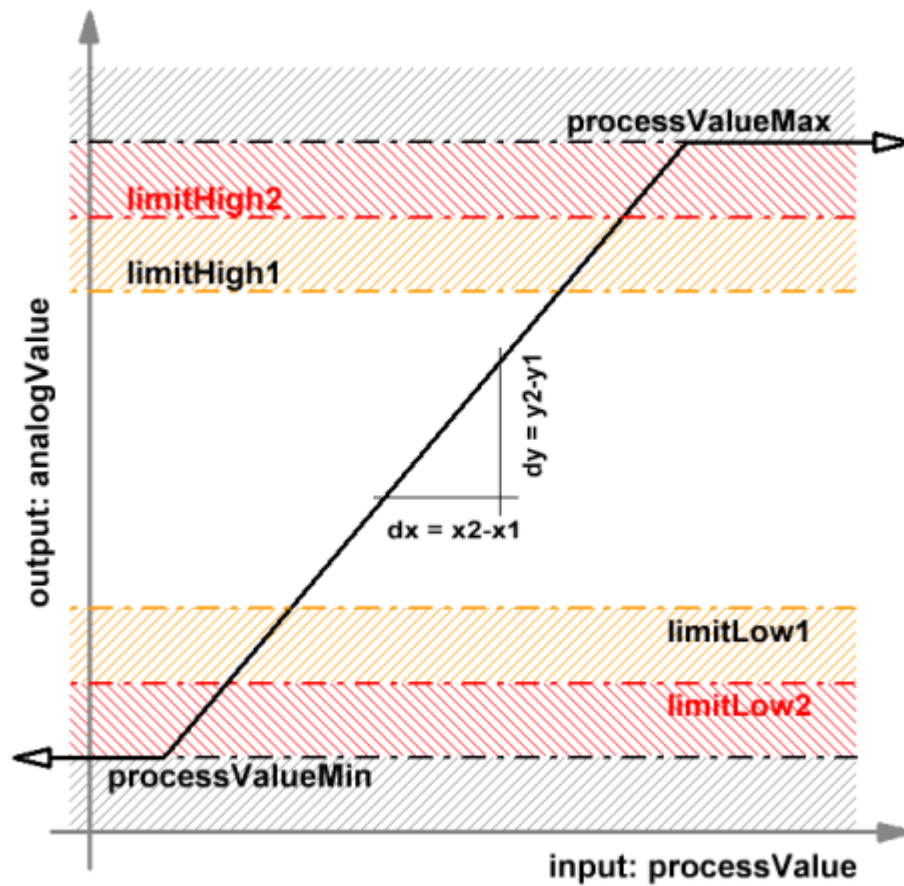
In order to ensure, that scaling works correctly, it is necessary to set the minimum and the maximum values for input and output.

Other optional settings are defining high and low limits/ levels.

The block can be configured to monitor the level of the scaled value and generate alarms if a certain level is reached.

For further information see the explanation in the picture and math formulas below.

## Process chart



$$dx = x_2 - x_1 = \text{scaleProcessUppPoint} - \text{scaleProcessLowPoint}$$

$$dy = y_2 - y_1 = \text{scaleAnalogUppPoint} - \text{scaleAnalogLowPoint}$$

## Math equation

$$y = \frac{y_2 - y_1}{x_2 - x_1} \cdot (x - x_1) + y_1$$

$$x = \text{processValue}$$

$$y = \text{analogValue}$$

$$x_1 = \text{scaleProcessLowPoint}$$

$$x_2 = \text{scaleProcessUppPoint}$$

$$y_1 = \text{scaleAnalogLowPoint}$$

$$y_2 = \text{scaleAnalogUppPoint}$$

## Change log

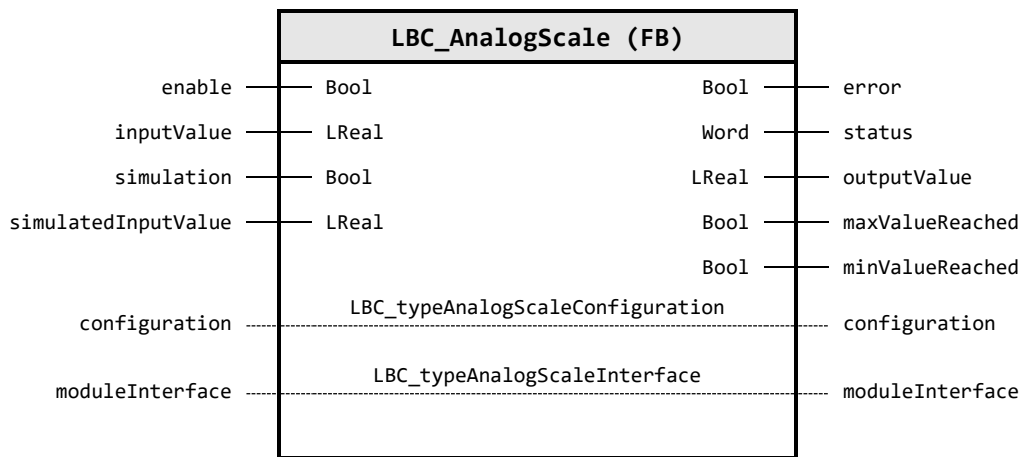
Version & Date	Change description
01.00.00	SIMATIC Systems Support
15.02.2021	First released version

**3.1.3 LBC\_AnalogScale (FB / V1.0.0)**

Author: Siemens Digital Industry

**Short description**

The function is used for processing (scaling) an analog process value to another process value of a different range.  
Converts it from one to another meaningful unit, e.g. [rpm] to [m/s], [°C] to [°F].

**Interface description****Block Interface****Input parameter**

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
inputValue	LReal	0.0	Value to be converted
simulation	Bool	FALSE	TRUE: Enable simulation (input value)
simulatedInputValue	LReal	0.0	Simulated input value

**Output parameter**

Identifier	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)
outputValue	LReal	Processed and scaled value
maxValueReached	Bool	Maximum configured process value reached. Value is limited to the maximum configured value.
minValueReached	Bool	Minimum configured process value reached. Value is limited to the minimum configured value.

**In/Out parameter**

Identifier	Data Type	Description
configuration	LBC_typeAnalogScaleConfiguration	Module related configuration parameters
moduleInterface	LBC_typeAnalogScaleInterface	Module interface for external systems

**Status & Error codes**

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: Function block is not enabled
16#7002	STATUS_ENABLED Status: Function block is enabled
16#8201	ERR_RANGE_PARAMETRIZATION Error: Configuration range of parameters. min >= max
16#8202	ERR_SCALE_ANALOG_POINTS Error: Configuration of analog input points. Process Lower >= Upper

**User defined datatype(s)****LBC\_typeAnalogScaleConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'AnalogScale'	Device name or device ID
physicalUnitInput	String[10]	'unit'	Physical unit (like [°C], [kWh], etc.) for the input value
physicalUnitOutput	String[10]	'unit'	Physical unit (like [°C], [kWh], etc.) for the output value
default	LReal	0.0	Default OUTPUT value to be returned if function block is not enabled or quality is bad
inputValueMax	LReal	100.0	Maximum limit of the process value
inputValueMin	LReal	-100.0	Minimum limit of the process value
scaleInputUppPoint	LReal	100.0	Upper point for the process value
scaleInputLowPoint	LReal	-100.0	Lower point for the process value
scaleOutputUppPoint	LReal	200.0	Upper point for the analog process output
scaleOutputLowPoint	LReal	-200.0	Lower point for the analog process output
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

**LBC\_typeAnalogScaleInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeAnalogScaleConfiguration	default	Module related configuration parameters
monitoring	LBC_typeAnalogScaleValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The analog scale function block converts a process value to another process value of a different range, e.g.  $[rpm]$  to  $[m/s]$ ,  $[^{\circ}C]$  to  $[^{\circ}F]$ .

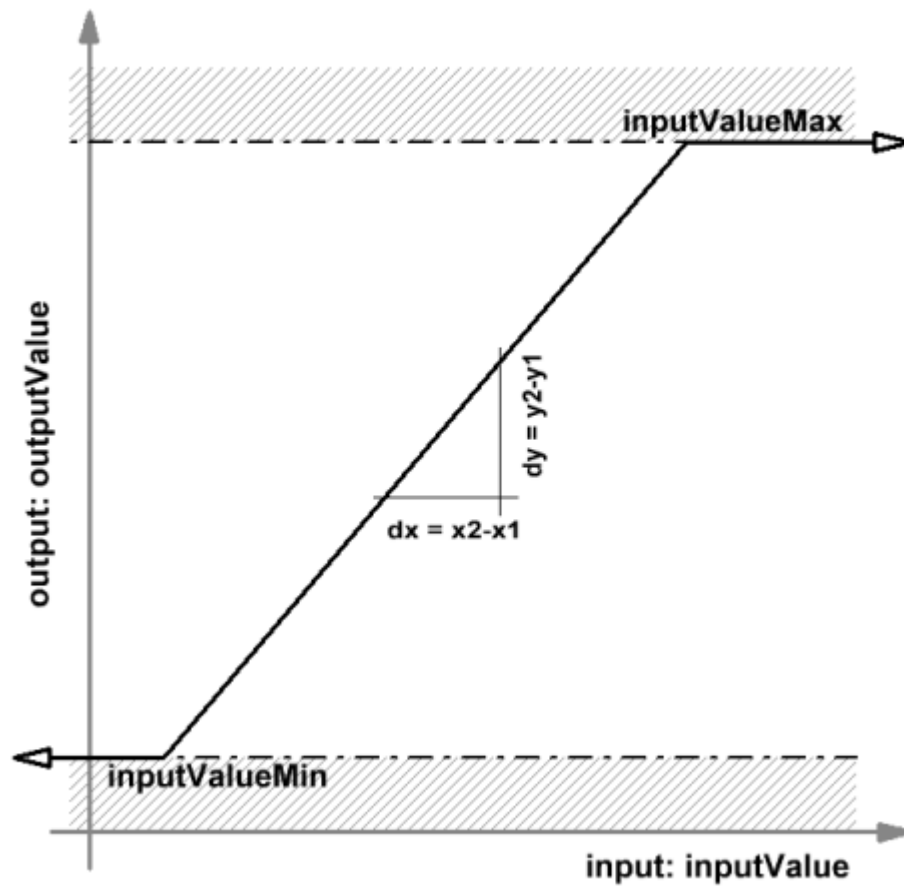
The processing of the function is started by assigning **TRUE** signal to the **enable** input.

If the block is enabled (logical **TRUE**) then the output value is scaled according to settings of the block.

In order to ensure, that scaling works correctly, it is necessary to set the minimum and the maximum values for input and output.

For further information see the explanation in the picture and math formulas below.

## Process chart



$$dx = x_2 - x_1 = \text{scaleInputUppPoint} - \text{scaleInputLowPoint}$$

$$dy = y_2 - y_1 = \text{scaleOutputUppPoint} - \text{scaleOutputLowPoint}$$

## Math equation

$$y = \frac{y_2 - y_1}{x_2 - x_1} \cdot (x - x_1) + y_1$$

$$x = \text{inputValue}$$

$$y = \text{outputValue}$$

$$x_1 = \text{scaleInputLowPoint}$$

$$x_2 = \text{scaleInputUppPoint}$$

$$y_1 = \text{scaleOutputLowPoint}$$

$$y_2 = \text{scaleOutputUppPoint}$$

## Change log

Version & Date	Change description
01.00.00	<b>SIMATIC Systems Support</b>
15.02.2021	First released version

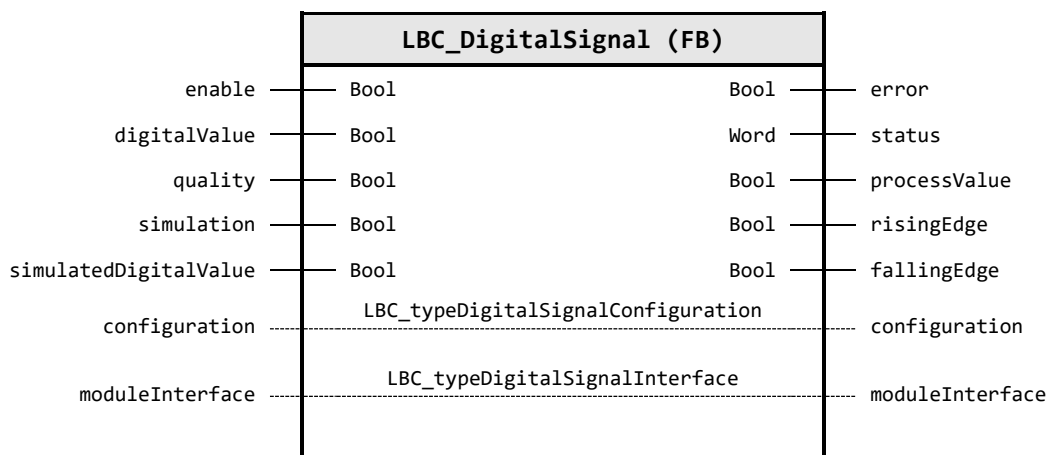


**3.1.4 LBC\_DigitalSignal (FB / V1.0.0)**

Author: Siemens Digital Industry

**Short description**

The digital signal function block is used to process a digital signal, to evaluate the quality of the signal, delay / filter it and pass out the result to the output.

**Interface description****Block Interface****Input parameter**

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
digitalValue	Bool	FALSE	Input value from digital sensor Rising edge starts on delay, falling edge starts off delay
quality	Bool	TRUE	Quality bit from sensor FALSE = error, TRUE = healthy [default]
simulation	Bool	FALSE	TRUE: Enable simulation input (digital value)
simulatedDigitalValue	Bool	FALSE	Simulated input value

**Output parameter**

Identifier	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)
processValue	Bool	Processed sensor value
risingEdge	Bool	Rising edge of sensor process value output
fallingEdge	Bool	Falling edge of sensor process value output

**In/Out parameter**

Identifier	Data Type	Description
configuration	LBC_typeDigitalSignalConfiguration	Module related configuration parameters
moduleInterface	LBC_typeDigitalSignalInterface	Module interface for external systems

**Status & Error codes**

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: Function block is not enabled
16#8201	ERR_CONFIGURATION_ON_DELAY_NEGATIVE Error: Configuration parameter `onDelay` is negative which is not accepted
16#8202	ERR_CONFIGURATION_OFF_DELAY_NEGATIVE Error: Configuration parameter `offDelay` is negative which is not accepted
16#8401	ERR_QUALITY_BAD Error: Bad quality of the digital input signal (hardware periphery)

**User defined datatype(s)****LBC\_typeDigitalSignalConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'DigitalSignal'	Device name or device ID
onDelay	Time	T#0s	Set time value for on delay
offDelay	Time	T#0s	Set time value for off delay
default	Bool	FALSE	Value to be returned if function block is not enabled or quality is bad (independent from `invertProcessValue`)
invertProcessValue	Bool	FALSE	Invert the process value (only the processed value, not the default)
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

**LBC\_typeDigitalSignalInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeDigitalSignalConfiguration	default	Module related configuration parameters
monitoring	LBC_typeDigitalSignalProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

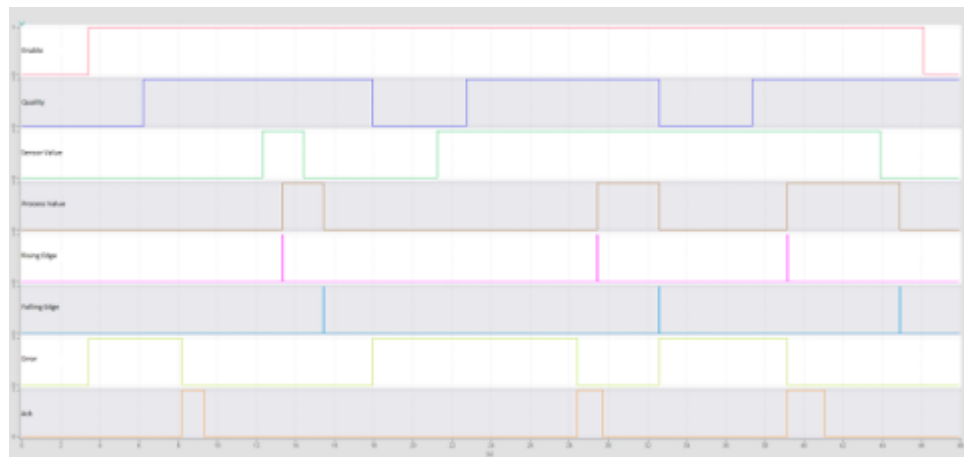
#### Functional description

The processing of the function is started by providing `TRUE` signal to the `enable` input, from then on, the `quality` bit is monitored.

If the quality is "healthy" (logical `TRUE`) the input called `sensorValue` is processed with the delay setting for filtration from the `configuration` structure.

There is filtration for changing the signal from `FALSE` to `TRUE` and from `TRUE` to `FALSE`, after a change in the signal and after the respective filtration has expired, the result is passed on to the output `processValue`.

Process timing chart



Description of the signals from top to bottom:

- Red – Enable of the function block – “Enable”
- Blue – Input quality of the signal – “Quality”
- Green – Input value of the signal – “Sensor Value”
- Brown – Output value of the evaluated signal – “Process Value”
- Magenta – Rising edge of the “Process Value”– “Rising Edge”
- Light Blue – Falling edge of the “Process Value”– “Falling Edge”
- Lime – Error in the block – “Error”
- Orange – Acknowledgment input “Ack”

#### Change log

Version & Date	Change description
<b>01.00.00</b>	<b>SIMATIC Systems Support</b>
15.02.2021	First released version

**3.1.5 LBC\_DriveControl\_StdPlc (FB / V1.0.0)**

Author: Siemens Digital Industry

**Short description**

This function block offers functionalities for axis control in Standard PLCs. It can be used for any type of motion control applications. The library contains two blocks - one for Standard PLC, the other one for Technology PLCs

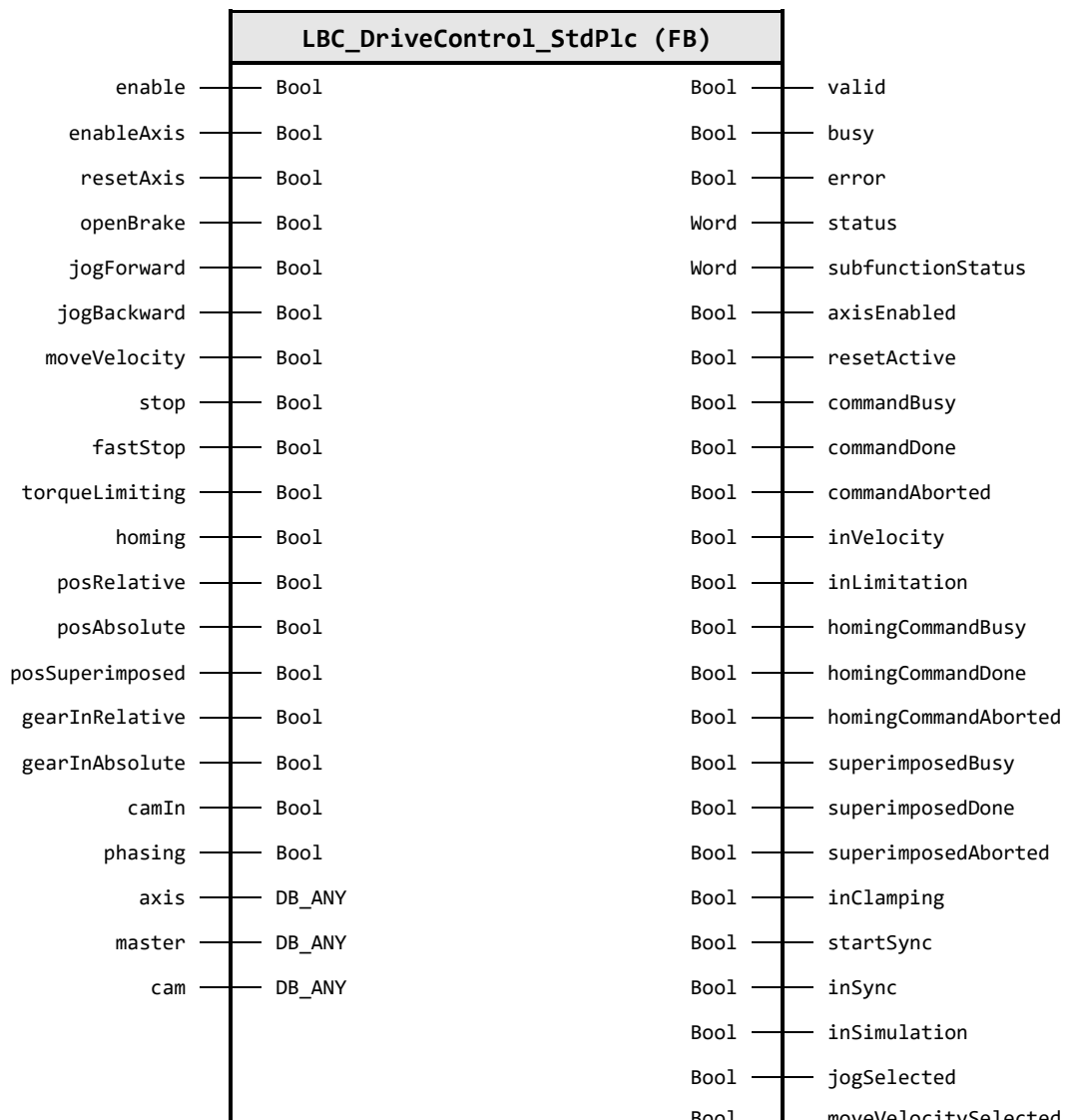
LBC\_DriveControl\_StdPlc / LBC\_DriveControl\_TecPlc

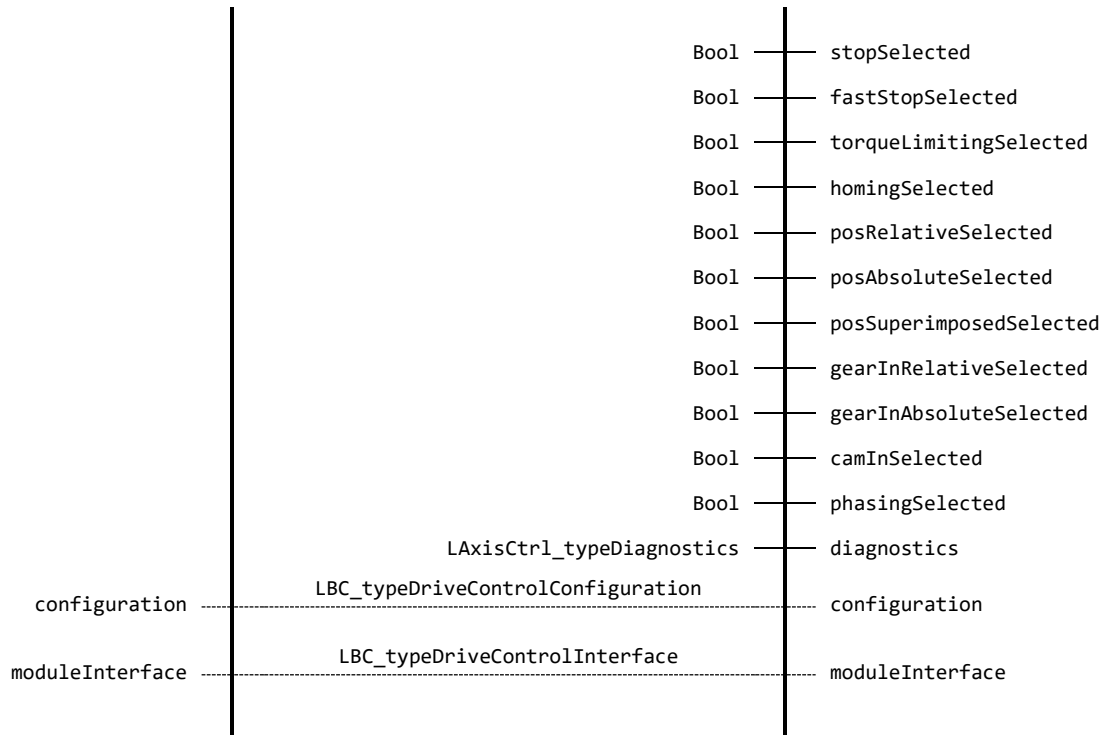
**NOTE**

This block is using the library LAxisCtrl that is used to operate motion control technology (MC).

For more information about the block operation, please refer to the LAxisCtrl manual at the Siemens Industry Online Support:

<https://support.industry.siemens.com/cs/ww/en/view/109749348>

**Interface description****Block Interface**



#### Input parameter

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
enableAxis	Bool	FALSE	TRUE: Set axis enable; FALSE: Remove axis enable
resetAxis	Bool	FALSE	Rising edge: Acknowledgement of technology alarms or restart of the axis (depending on configuration)
openBrake	Bool	FALSE	TRUE: Unconditionally open brake
jogForward	Bool	FALSE	Rising edge: Move an axis in jog mode (forward); Falling edge: Stop jogging
jogBackward	Bool	FALSE	Rising edge: Move an axis in jog mode (backward); Falling edge: Stop jogging
moveVelocity	Bool	FALSE	Rising edge: Move an axis at constant velocity/speed
stop	Bool	FALSE	Rising edge: Brake an axis until it comes to a standstill. Note: MC_Halt is triggered internally
fastStop	Bool	FALSE	Rising edge: Brake an axis until it comes to a standstill (with fastStop dynamics). Note: MC_Halt is triggered internally
torqueLimiting	Bool	FALSE	TRUE: Enable force/torque limiting
homing	Bool	FALSE	Rising edge: Home axis
posRelative	Bool	FALSE	Rising edge: Move an axis relative to its position when execution of the job began
posAbsolute	Bool	FALSE	Rising edge: Move an axis to an absolute position
posSuperimposed	Bool	FALSE	Rising edge: Start a superimposed positioning
gearInRelative	Bool	FALSE	Rising edge: Start a gearing operation (relative)
gearInAbsolute	Bool	FALSE	Rising edge: Start a gearing operation (absolute)



### 3 Program Blocks

Identifier	Data Type	Default Value	Description
camIn	Bool	FALSE	Rising edge: Start a camming operation
phasing	Bool	FALSE	Rising edge: Start a phasing operation
axis	DB_ANY	default	Reference to axis technology object to be controlled
master	DB_ANY	default	Reference to leading axis technology object for synchronous motion
cam	DB_ANY	default	Cam technology object

#### Output parameter

Identifier	Data Type	Description
valid	Bool	TRUE: Valid set of output values available at the FB
busy	Bool	TRUE: FB is working and new output values can be expected
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)
subfunctionStatus	Word	Status of internally called subfunctions (ErrorID of Motion Control instructions)
axisEnabled	Bool	TRUE: The technology object is enabled. Motion commands can be executed
resetActive	Bool	TRUE: Reset/Restart of the axis is active
commandBusy	Bool	TRUE: The selected basic motion command is being executed
commandDone	Bool	TRUE: The selected basic motion command has completed without error
commandAborted	Bool	TRUE: The selected basic motion command has been aborted
inVelocity	Bool	TRUE: The setpoint velocity/speed was reached and will be maintained
inLimitation	Bool	TRUE: The drive is operating at the force/torque limit
homingCommandBusy	Bool	TRUE: Homing command is being executed
homingCommandDone	Bool	TRUE: Homing command has completed without error
homingCommandAborted	Bool	TRUE: Homing command has been aborted
superimposedBusy	Bool	TRUE: The selected superimposed motion command is being executed
superimposedDone	Bool	TRUE: The selected superimposed motion command has completed without error
superimposedAborted	Bool	TRUE: The selected superimposed motion command has been aborted
inClamping	Bool	TRUE: The drive is kept at the fixed stop (clamping), the axis position is within the positioning tolerance
startSync	Bool	TRUE: The axis is synchronizing to the leading axis
inSync	Bool	TRUE: The axis is synchronized to the leading axis
inSimulation	Bool	TRUE: Synchronous operation is being simulated

### 3 Program Blocks

Identifier	Data Type	Description
jogSelected	Bool	TRUE: Jogging is active
moveVelocitySelected	Bool	TRUE: Moving with constant velocity/speed is active
stopSelected	Bool	TRUE: Stopping is active
fastStopSelected	Bool	TRUE: Stopping is active (with fastStop dynamics)
torqueLimitingSelected	Bool	TRUE: Force/Torque limiting is active
homingSelected	Bool	TRUE: Homing is active
posRelativeSelected	Bool	TRUE: Relative positioning is active
posAbsoluteSelected	Bool	TRUE: Absolute positioning is active
posSuperimposedSelected	Bool	TRUE: Superimposed positioning is active
gearInRelativeSelected	Bool	TRUE: Relative gearing is active
gearInAbsoluteSelected	Bool	TRUE: Absolute gearing is active
camInSelected	Bool	TRUE: Camming is active
phasingSelected	Bool	TRUE: Phasing is active
diagnostics	LAxisCtrl_typeDiagnostics	Diagnostics structure

#### In/Out parameter

Identifier	Data Type	Description
configuration	LBC_typeDriveControlConfiguration	Module related configuration parameters
moduleInterface	LBC_typeDriveControlInterface	Module interface for external systems

#### Status & Error codes

Code / Value	Identifier / Description
16#7000	STATUS_NO_CALL No call of FB
16#7001	STATUS_FB_FIRST_CALL First cycle of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL FB enabled
16#8001	ERR_INVALID_BASIC_MOTION_CMD Invalid basic command selected (rising edge at 2 or more basic motion command inputs)
16#8002	ERR_INVALID_EXTENDED_CMD Invalid extended command selected (rising edge at torque limiting and homing on fixed stop)
16#8003	ERR_INVALID_SUPERIMPOSED_MOTION_CMD Invalid superimposed command selected (rising edge at 2 or more superimposed motion command inputs)
16#8200	ERR_INVALID_CAM Error occurred during camIn command (invalid cam connected at cam input)
16#8201	ERR_INVALID_JOG_MODE Invalid jog mode selected

### 3 Program Blocks

Code / Value	Identifier / Description
16#8202	ERR_INVALID_HOMING_EXTENDED_MODE Command Error: Invalid extended homing mode selected
16#8203	ERR_TORQUE_LIMITING_NOT_ALLOWED Error during extended homing command - torque limiting not allowed during homing on fixed stop is active or axis in clamping
16#8204	ERR_INVALID_JOG_DIR Invalid direction selected (jog forward and jog backward)
16#8205	ERR_INVALID_POS_RELATIVE_DIR Invalid direction is set for relative positioning command
16#8206	ERR_INVALID_POS_SUPERIMPOSED_DIR Invalid direction is set for superimposed positioning command
16#8207	ERR_HOMING_MODE_NOT_ALLOWED Passive/Direct homing is not allowed during extended homing mode (homing on fixed stop process) is active
16#8208	ERR_MODULO_NOT_ALLOWED Extended homing mode (homing on fixed stop process) is not allowed with modulo axis
16#8209	ERR_INVALID_TORQUE_LIMIT Configured torque limit value for extended homing mode (homing on fixed stop process) = 0
16#820A	ERR_INVALID_VELOCITY Configured velocity (in technology object) for active homing = 0
16#820B	ERR_INVALID_AXIS No axis interconnected
16#8600	ERR_MC_POWER Error occurred during MC_POWER command
16#8601	ERR_MC_RESET Error occurred during MC_RESET command
16#8602	ERR_MC_HOME Error occurred during MC_HOME command
16#8603	ERR_MC_TORQUELIMITING Error occurred during MC_TORQUELIMITING command
16#8604	ERR_MC_HALT Error occurred during MC_HALT command
16#8605	ERR_MC_MOVEJOG Error occurred during MC_MOVEJOG command (continuous jogging)
16#8606	ERR_MC_MOVEVELOCITY Error occurred during MC_MOVEVELOCITY command
16#8607	ERR_MC_MOVERELATIVE Error occurred during MC_MOVERELATIVE command
16#8608	ERR_MC_MOVEABSOLUTE Error occurred during MC_MOVEABSOLUTE command
16#8609	ERR_MC_MOVESUPERIMPOSED Error occurred during MC_MOVESUPERIMPOSED command
16#860A	ERR_MC_GEARIN Error occurred during MC_GEARIN command
16#860B	ERR_MC_PHASINGABSOLUTE Error occurred during MC_PHASINGABSOLUTE command
16#860C	ERR_MC_PHASINGRELATIVE Error occurred during MC_PHASINGRELATIVE command
16#860D	ERR_MC_CAMIN Error occurred during MC_CAMIN command

### 3 Program Blocks

Code / Value	Identifier / Description
16#860E	ERR_MC_GEARINPOS Error occurred during MC_GEARINPOS command
16#860F	ERR_MC_SYNCHRONIZEDMOTIONSIMULATION Error occurred during MC_SYNCHRONIZEDMOTIONSIMULATION command
16#8700	ERR_UNDEFINED_FB_STATE Error due to an undefined FB state
16#8701	ERR_UNDEFINED_RESET_STATE Error due to an undefined reset state
16#8702	ERR_UNDEFINED_BASIC_MOTION_STATE Error due to an undefined basic motion state
16#8703	ERR_UNDEFINED_TORQUE_LIMITING_STATE Error due to an undefined torque limiting state
16#8704	ERR_UNDEFINED_INCREMENTAL_JOG_STATE Error due to an undefined incremental jog state
16#8705	ERR_UNDEFINED_INCREMENTAL_JOG_SUBSTATE Error due to an undefined incremental jog substate
16#8706	ERR_UNDEFINED_EXTENDED_HOMING_STATE Error due to an undefined homing state
16#8707	ERR_UNDEFINED_EXTENDED_HOMING_SUBSTATE Error due to an undefined homing substate
16#8708	ERR_UNDEFINED_SUPERIMPOSED_MOTION_STATE Error due to an undefined superimposed motion state
16#8709	ERR_UNDEFINED_MOTION_SIMULATION_STATE Error due to an undefined synchronized motion simulation state
16#870A	ERR_UNDEFINED_MAIN_SELECTION_STATE Error due to an undefined main selection state

### User defined datatype(s)

#### LBC\_typeDriveControlConfiguration (UDT)

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'DriveControl'	Device name or device ID
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
driveConfiguration	LAxisCtrl_typeAxisConfiguration	default	Drive parameter configuration from - Support: tech.team.motioncontrol@siemens.com

**LBC\_typeDriveControlInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeDriveControlConfiguration	default	Module related configuration parameters
monitoring	LBC_typeDriveControlProcessValues	default	Module related monitoring information
diagnostics	LAxisCtrl_typeDiagnostics	default	

**Functional description**

This block is used to control motion axis in Standard PLCs.

The block is used as a wrapper to adopt the standardized interface from LBC to the standard motion control library (LAxisCtrl).

With the LBC customization, the same type of faceplates can be provided for the LAxisCtrl block, as they are included for all other blocks.

The interfaces and the controlling of the LAxisCtrl function blocks is based on the PLCopen standard V2.0 with taking into account behavior of execute and enable inputs.

**NOTE**

This block is using the library LAxisCtrl that is used to operate motion control technology (MC).

For more information about the block operation, please refer to the LAxisCtrl manual at the Siemens Industry Online Support:

<https://support.industry.siemens.com/cs/ww/en/view/109749348>

**Change log**

Version & Date	Change description
<b>01.00.00</b> 15.02.2021	<b>SIMATIC Systems Support</b> First released version

**3.1.6 LBC\_DriveControl\_TecPlc (FB / V1.0.0)**

Author: Siemens Digital Industries

**Short description**

This function block offers functionalities for axis control with Technology PLCs. It can be used for any type of motion control applications. The library contains two blocks - one for Standard PLC, the other one for Technology PLCs

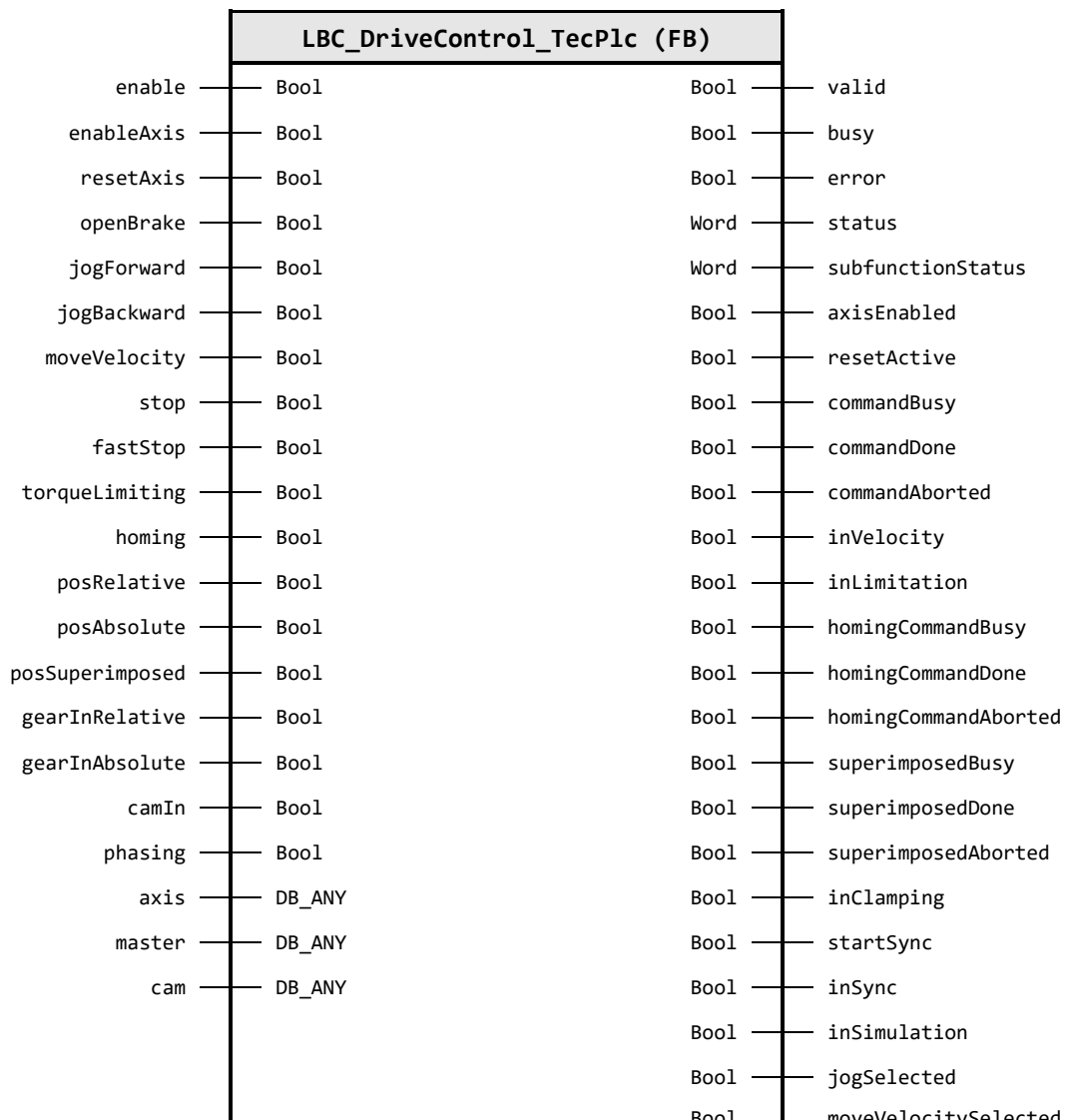
LBC\_DriveControl\_StdPlc / `LBC\_DriveControl\_TecPlc'

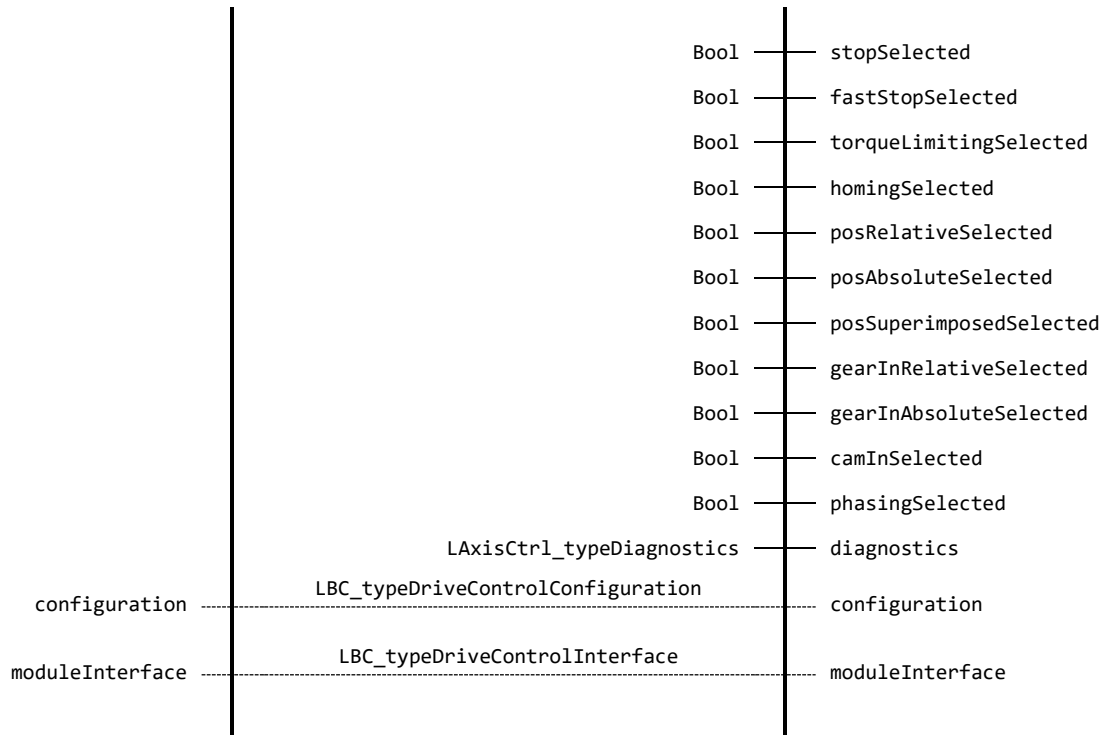
**NOTE**

This block is using the library LAxisCtrl that is used to operate motion control technology (MC).

For more information about the block operation, please refer to the LAxisCtrl manual at the Siemens Industry Online Support:

<https://support.industry.siemens.com/cs/ww/en/view/109749348>

**Interface description****Block Interface**



#### Input parameter

Identifier	Data Type	Default Value	Description
enable	Bool	false	TRUE: Enable functionality of FB
enableAxis	Bool	false	TRUE: Set axis enable; FALSE: Remove axis enable
resetAxis	Bool	false	Rising edge: Acknowledgement of technology alarms or restart of the axis (depending on configuration)
openBrake	Bool	false	TRUE: Unconditionally open brake
jogForward	Bool	false	Rising edge: Move an axis in jog mode (forward); Falling edge: Stop jogging
jogBackward	Bool	false	Rising edge: Move an axis in jog mode (backward); Falling edge: Stop jogging
moveVelocity	Bool	false	Rising edge: Move an axis at constant velocity/speed
stop	Bool	false	Rising edge: Brake an axis until it comes to a standstill. Note: MC_Halt is triggered internally
fastStop	Bool	false	Rising edge: Brake an axis until it comes to a standstill (with fastStop dynamics). Note: MC_Halt is triggered internally
torqueLimiting	Bool	false	TRUE: Enable force/torque limiting
homing	Bool	false	Rising edge: Home axis
posRelative	Bool	false	Rising edge: Move an axis relative to its position when execution of the job began
posAbsolute	Bool	false	Rising edge: Move an axis to an absolute position
posSuperimposed	Bool	false	Rising edge: Start a superimposed positioning
gearInRelative	Bool	false	Rising edge: Start a gearing operation (relative)
gearInAbsolute	Bool	false	Rising edge: Start a gearing operation (absolute)

### 3 Program Blocks

Identifier	Data Type	Default Value	Description
camIn	Bool	false	Rising edge: Start a camming operation
phasing	Bool	false	Rising edge: Start a phasing operation
axis	DB_ANY	0	Reference to axis technology object to be controlled
master	DB_ANY	0	Reference to leading axis technology object for synchronous motion
cam	DB_ANY	0	Cam technology object

#### Output parameter

Identifier	Data Type	Description
valid	Bool	TRUE: Valid set of output values available at the FB
busy	Bool	TRUE: FB is working and new output values can be expected
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)
subfunctionStatus	Word	Status of internally called subfunctions (ErrorID of Motion Control instructions)
axisEnabled	Bool	TRUE: The technology object is enabled. Motion commands can be executed
resetActive	Bool	TRUE: Reset/Restart of the axis is active
commandBusy	Bool	TRUE: The selected basic motion command is being executed
commandDone	Bool	TRUE: The selected basic motion command has completed without error
commandAborted	Bool	TRUE: The selected basic motion command has been aborted
inVelocity	Bool	TRUE: The setpoint velocity/speed was reached and will be maintained
inLimitation	Bool	TRUE: The drive is operating at the force/torque limit
homingCommandBusy	Bool	TRUE: Homing command is being executed
homingCommandDone	Bool	TRUE: Homing command has completed without error
homingCommandAborted	Bool	TRUE: Homing command has been aborted
superimposedBusy	Bool	TRUE: The selected superimposed motion command is being executed
superimposedDone	Bool	TRUE: The selected superimposed motion command has completed without error
superimposedAborted	Bool	TRUE: The selected superimposed motion command has been aborted
inClamping	Bool	TRUE: The drive is kept at the fixed stop (clamping), the axis position is within the positioning tolerance
startSync	Bool	TRUE: The axis is synchronizing to the leading axis
inSync	Bool	TRUE: The axis is synchronized to the leading axis
inSimulation	Bool	TRUE: Synchronous operation is being simulated



### 3 Program Blocks

Identifier	Data Type	Description
jogSelected	Bool	TRUE: Jogging is active
moveVelocitySelected	Bool	TRUE: Moving with constant velocity/speed is active
stopSelected	Bool	TRUE: Stopping is active
fastStopSelected	Bool	TRUE: Stopping is active (with fastStop dynamics)
torqueLimitingSelected	Bool	TRUE: Force/Torque limiting is active
homingSelected	Bool	TRUE: Homing is active
posRelativeSelected	Bool	TRUE: Relative positioning is active
posAbsoluteSelected	Bool	TRUE: Absolute positioning is active
posSuperimposedSelected	Bool	TRUE: Superimposed positioning is active
gearInRelativeSelected	Bool	TRUE: Relative gearing is active
gearInAbsoluteSelected	Bool	TRUE: Absolute gearing is active
camInSelected	Bool	TRUE: Camming is active
phasingSelected	Bool	TRUE: Phasing is active
diagnostics	LAxisCtrl_typeDiagnostics	Diagnostics structure

#### In/Out parameter

Identifier	Data Type	Description
configuration	LBC_typeDriveControlConfiguration	Module related configuration parameters
moduleInterface	LBC_typeDriveControlInterface	Module interface for external systems

#### Status & Error codes

Code / Value	Identifier / Description
16#7000	STATUS_NO_CALL No call of FB
16#7001	STATUS_FB_FIRST_CALL First cycle of FB after enabling
16#7002	STATUS_SUBSEQUENT_CALL FB enabled
16#8001	ERR_INVALID_BASIC_MOTION_CMD Invalid basic command selected (rising edge at 2 or more basic motion command inputs)
16#8002	ERR_INVALID_EXTENDED_CMD Invalid extended command selected (rising edge at torque limiting and homing on fixed stop)
16#8003	ERR_INVALID_SUPERIMPOSED_MOTION_CMD Invalid superimposed command selected (rising edge at 2 or more superimposed motion command inputs)
16#8200	ERR_INVALID_CAM Error occurred during camIn command (invalid cam connected at cam input)
16#8201	ERR_INVALID_JOG_MODE Invalid jog mode selected

### 3 Program Blocks

Code / Value	Identifier / Description
16#8202	ERR_INVALID_HOMING_EXTENDED_MODE Command Error: Invalid extended homing mode selected
16#8203	ERR_TORQUE_LIMITING_NOT_ALLOWED Error during extended homing command - torque limiting not allowed during homing on fixed stop is active or axis in clamping
16#8204	ERR_INVALID_JOG_DIR Invalid direction selected (jog forward and jog backward)
16#8205	ERR_INVALID_POS_RELATIVE_DIR Invalid direction is set for relative positioning command
16#8206	ERR_INVALID_POS_SUPERIMPOSED_DIR Invalid direction is set for superimposed positioning command
16#8207	ERR_HOMING_MODE_NOT_ALLOWED Passive/Direct homing is not allowed during extended homing mode (homing on fixed stop process) is active
16#8208	ERR_MODULO_NOT_ALLOWED Extended homing mode (homing on fixed stop process) is not allowed with modulo axis
16#8209	ERR_INVALID_TORQUE_LIMIT Configured torque limit value for extended homing mode (homing on fixed stop process) = 0
16#820A	ERR_INVALID_VELOCITY Configured velocity (in technology object) for active homing = 0
16#820B	ERR_INVALID_AXIS No axis interconnected
16#8600	ERR_MC_POWER Error occurred during MC_POWER command
16#8601	ERR_MC_RESET Error occurred during MC_RESET command
16#8602	ERR_MC_HOME Error occurred during MC_HOME command
16#8603	ERR_MC_TORQUELIMITING Error occurred during MC_TORQUELIMITING command
16#8604	ERR_MC_HALT Error occurred during MC_HALT command
16#8605	ERR_MC_MOVEJOG Error occurred during MC_MOVEJOG command (continuous jogging)
16#8606	ERR_MC_MOVEVELOCITY Error occurred during MC_MOVEVELOCITY command
16#8607	ERR_MC_MOVERELATIVE Error occurred during MC_MOVERELATIVE command
16#8608	ERR_MC_MOVEABSOLUTE Error occurred during MC_MOVEABSOLUTE command
16#8609	ERR_MC_MOVESUPERIMPOSED Error occurred during MC_MOVESUPERIMPOSED command
16#860A	ERR_MC_GEARIN Error occurred during MC_GEARIN command
16#860B	ERR_MC_PHASINGABSOLUTE Error occurred during MC_PHASINGABSOLUTE command
16#860C	ERR_MC_PHASINGRELATIVE Error occurred during MC_PHASINGRELATIVE command
16#860D	ERR_MC_CAMIN Error occurred during MC_CAMIN command

### 3 Program Blocks

Code / Value	Identifier / Description
16#860E	ERR_MC_GEARINPOS Error occurred during MC_GEARINPOS command
16#860F	ERR_MC_SYNCHRONIZEDMOTIONSIMULATION Error occurred during MC_SYNCHRONIZEDMOTIONSIMULATION command
16#8700	ERR_UNDEFINED_FB_STATE Error due to an undefined FB state
16#8701	ERR_UNDEFINED_RESET_STATE Error due to an undefined reset state
16#8702	ERR_UNDEFINED_BASIC_MOTION_STATE Error due to an undefined basic motion state
16#8703	ERR_UNDEFINED_TORQUE_LIMITING_STATE Error due to an undefined torque limiting state
16#8704	ERR_UNDEFINED_INCREMENTAL_JOG_STATE Error due to an undefined incremental jog state
16#8705	ERR_UNDEFINED_INCREMENTAL_JOG_SUBSTATE Error due to an undefined incremental jog substate
16#8706	ERR_UNDEFINED_EXTENDED_HOMING_STATE Error due to an undefined homing state
16#8707	ERR_UNDEFINED_EXTENDED_HOMING_SUBSTATE Error due to an undefined homing substate
16#8708	ERR_UNDEFINED_SUPERIMPOSED_MOTION_STATE Error due to an undefined superimposed motion state
16#8709	ERR_UNDEFINED_MOTION_SIMULATION_STATE Error due to an undefined synchronized motion simulation state
16#870A	ERR_UNDEFINED_MAIN_SELECTION_STATE Error due to an undefined main selection state

### User defined datatype(s)

#### LBC\_typeDriveControlConfiguration (UDT)

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'DriveControl'	Device name or device ID
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
driveConfiguration	LAxisCtrl_typeAxisConfiguration	default	Drive parameter configuration from - Support: tech.team.motioncontrol@siemens.com

**LBC\_typeDriveControlInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeDriveControlConfiguration	default	Module related configuration parameters
monitoring	LBC_typeDriveControlProcessValues	default	Module related monitoring information
diagnostics	LAxisCtrl_typeDiagnostics	default	

**Functional description**

This block is used to control motion axis in Technology PLCs.

The block is used as a wrapper to adopt the standardized interface from the LBC to the standard motion control library (LAxisCtrl).

With the LBC customization, the same type of faceplates can be provided for the LAxisCtrl block, as they are included for all other blocks.

The interfaces and the controlling of the LAxisCtrl function blocks is based on the PLCopen standard V2.0 with taking into account behavior of execute and enable inputs.

**NOTE**

This block is using the library LAxisCtrl that is used to operate motion control technology (MC).

For more information about the block operation, please refer to the LAxisCtrl manual at the Siemens Industry Online Support:

<https://support.industry.siemens.com/cs/ww/en/view/109749348>

**Change log**

Version & Date	Change description
<b>01.00.00</b>	<b>SIMATIC Systems Support</b>
15.02.2021	First released version

### 3.1.7 LBC\_MotorStarter (FB / V1.0.0)

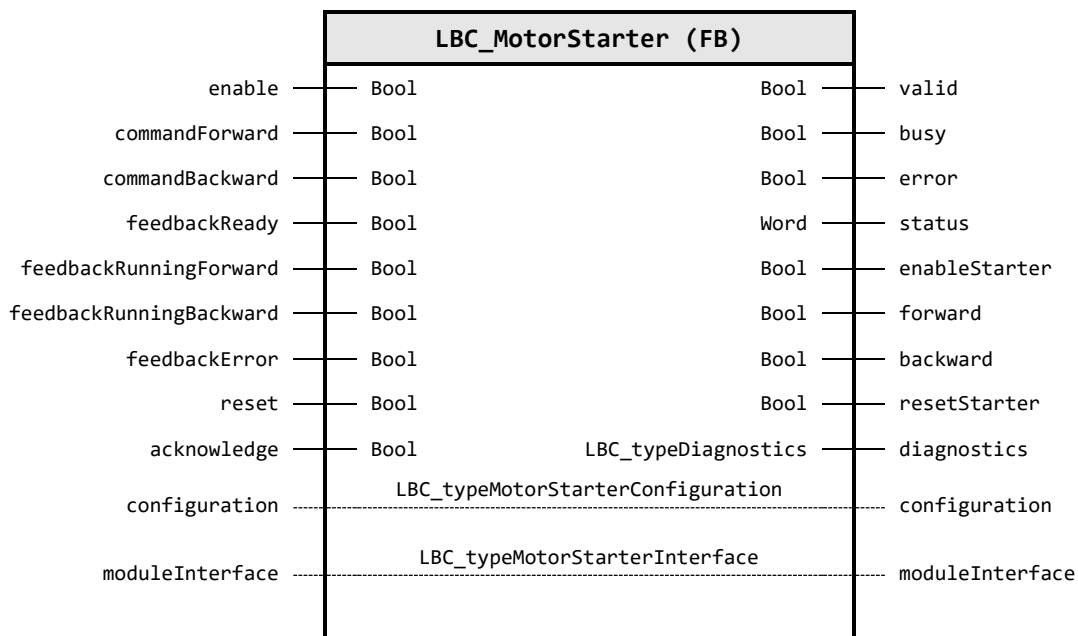
Author: Siemens Digital Industry

#### Short description

The module is used to control direct motor starters with two directions. It contains the most commonly used functions like monitoring the feedbacks as well as resetting the starter within configurable timers.

#### Interface description

##### Block Interface



#### Input parameter

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandForward	Bool	FALSE	Rising edge: Start the motor forward
commandBackward	Bool	FALSE	Rising edge: Start the motor backward
feedbackReady	Bool	FALSE	TRUE: Motor is ready for switching on
feedbackRunningForward	Bool	FALSE	TRUE: Motor is running / soft starter bypass in forward direction
feedbackRunningBackward	Bool	FALSE	TRUE: Motor is running / soft starter bypass in backward direction
feedbackError	Bool	FALSE	TRUE: Motor starter is in error state (e.g. overheating)
reset	Bool	FALSE	TRUE: Reset the motor starter. Output `resetStarter` is TRUE at least for the time configured at parameter `resetTime`
acknowledge	Bool	FALSE	Acknowledgement of the alarms

**Output parameter**

Identifier	Data Type	Description
valid	Bool	TRUE: Valid set of output values available at the FB
busy	Bool	TRUE: FB is not finished and new output values can be expected
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)
enableStarter	Bool	TRUE: Start/enable the motor starter
forward	Bool	TRUE: Starting the motor forward
backward	Bool	TRUE: Starting the motor backward
resetStarter	Bool	TRUE: Reset the starter in case of an active `error` and command `resetStarter`
diagnostics	LBC_typeDiagnostics	Module related diagnostic information

**In/Out parameter**

Identifier	Data Type	Description
configuration	LBC_typeMotorStarterConfiguration	Module related configuration parameters
moduleInterface	LBC_typeMotorStarterInterface	Module interface for external systems

**Status & Error codes**

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: No job being currently processed
16#7001	STATUS_FIRST_CALL Status: First call after incoming new job (rising edge `enable`)
16#7002	STATUS_SUBSEQUENT_CALL Status: Subsequent call during active processing without further details
16#7003	STATUS_ENABLED_WAIT_FOR_FEEDBACK_READY Status: Function block is waiting for feedback ready. Needed for starting to motor
16#7004	STATUS_ENABLED_STOPPED Status: Function block is enabled and starter is stopped
16#7005	STATUS_STARTING_FORWARD Status: Function block is starting the motor forward
16#7006	STATUS_STARTING_BACKWARD Status: Function block is starting the motor backward
16#7007	STATUS_RUNNING_FORWARD Status: Function block is running the motor forward
16#7008	STATUS_RUNNING_BACKWARD Status: Function block is running the motor backward
16#7009	STATUS_STOPPING Status: Function block is stopping the motor
16#7099	STATUS_DISABLING_ACTIVE Status: Function block is disabling and wait for feedback ready = FALSE

### 3 Program Blocks

Code / Value	Identifier / Description
16#7999	STATUS_RESETTING_ACTIVE Status: Function block is resetting the starter
16#8201	ERR_CONFIGURATION_START_CONTROL_TIME_NEGATIVE Error: Configuration parameter start up control time is negative which is not accepted
16#8202	ERR_CONFIGURATION_STOP_CONTROL_TIME_NEGATIVE Error: Configuration parameter stopping control time is negative which is not accepted
16#8203	ERR_CONFIGURATION_RESET_TIME_NEGATIVE Error: Configuration parameter reset time is negative which is not accepted
16#8401	ERR_FEEDBACK_ERROR Error: Feedback Motor has an error / failure (e.g. overheated)
16#8402	ERR_FEEDBACK_READY Error: Feedback that the motor is ready for operation is missing
16#8403	ERR_BOTH_COMMANDS_PRESENT_AT_SAME_TIME Error: Both start commands present at the same time, Motor stopped
16#8404	ERR_FEEDBACK_MOTOR_NOT_STOPPING Error: Feedback motor running still present when motor is switched off - timeout for feedback
16#8411	ERR_FEEDBACK_MOTOR_RUNNING_WHILE_STOPPED_FW Error: Feedback motor running still present when motor is switched off / stopped - Forward
16#8412	ERR_FEEDBACK_MOTOR_RUNNING_WHILE_STOPPED_BW Error: Feedback motor running still present when motor is switched off / stopped- Backward
16#8413	ERR_FEEDBACK_MOTOR_RUNNING_WHILE_STOPPED_FW_AND_BW Error: Feedback motor running still present when motor is switched off / stopped - Forward and Backward
16#8421	ERR_FEEDBACK_MISSING_DURING_STARTUP_FORWARD Error: Feedback motor running is missing during startup - Forward
16#8422	ERR_FEEDBACK_MISSING_DURING_STARTUP_BACKWARD Error: Feedback motor running is missing during startup - Backward
16#8431	ERR_WRONG_FEEDBACK_DURING_STARTUP_FORWARD Error: Wrong feedback during startup. Starting forward and feedback backward combination - check feedback inputs
16#8432	ERR_WRONG_FEEDBACK_DURING_STARTUP_BACKWARD Error: Wrong feedback during startup. Starting backward and feedback forward combination - check feedback inputs
16#8441	ERR_FEEDBACK_DISAPPEAR_WHILE_RUNNING_FORWARD Error: Feedback motor running is missing while running forward
16#8442	ERR_FEEDBACK_DISAPPEAR_WHILE_RUNNING_BACKWARD Error: Feedback motor running is missing while running backward
16#8451	ERR_WRONG_FEEDBACK_WHILE_RUNNING_FORWARD Error: Wrong feedback while motor is running forward - check feedback inputs
16#8452	ERR_WRONG_FEEDBACK_WHILE_RUNNING_BACKWARD Error: Wrong feedback while motor is running backward - check feedback inputs
16#8600	ERR_UNDEFINED_STATE Error: due to an undefined state in state machine

**User defined datatype(s)****LBC\_typeDiagnostics (UDT)**

Module related diagnostic information

Identifier	Data Type	Default Value	Description
status	Word	16#0000	16#0000-16#7FFF: Status of the FB 16#8000-16#FFFF: Error identification
subfunctionStatus	Word	16#0000	Status or return value of called FB's, FCs, system blocks or other status information
stateNumber	DInt	0	State in the state machine of the block where the error occurred

**LBC\_typeMotorStarterConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'MotorStarter'	Device name or device ID
startingControlTime	Time	T#5s	Control time for receiving feedback motor is running or time to ramp up motor if feedback is disabled
stoppingControlTime	Time	T#5s	Control time for feedback motor is stopped (fb running has disappeared) or time to ramp down motor if feedback is disabled
resetTime	Time	T#5s	Control time for reset - time to set reset output / the reset signal is present at the reset output (advanced motor starter)
disableFeedbackRunning	Bool	TRUE	TRUE: Disable feedback for started / running motor
disableFeedbackError	Bool	TRUE	TRUE: Disable feedback for error monitoring (e.g. over temperature)
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

**LBC\_typeMotorStarterInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeMotorStarterConfiguration	default	Module related configuration parameters
monitoring	LBC_typeMotorStarterProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The module is in operating state as soon as the input `enable` is set to TRUE and as long as the input `enable` is remaining TRUE. Start operation is possible as soon as the `feedbackReady` input is TRUE, based on the directional command input (`commandForward` or `commandBackward`) the module sets its respective output – `forward` or `backward`.



Only one control command can be present at any time (`commandForward` or `commandBackward`).

After a command is present, the module goes into the startup state which means, that the block will expect the `feedbackRunning` to become TRUE, so the block can verify that the motor has started.

During startup the input `feedbackRunning` is monitored and has to appear in between the configured `startingControlTime`. If this feedback is not present (TRUE) after the control time expires, the block will generate an error message, turn off the output (FALSE) and goes into error state.

If the `disableFeedbackRunning` is set to TRUE, the configured `startingControlTime` would be the ramp up time for the motor before the `status` returns the running feedback.

When the control command (`commandForward` or `commandBackward`) is switched off (FALSE) the module goes into stopping mode, the motor output `forward` or `backward` is set to FALSE.

The stopping control time is started and the block goes to stopping state, if the control time expires and the feedback `feedbackRunning` is still present (TRUE) the block generates an error and goes to stop state.

If the `disableFeedbackRunning` is disabled, the block waits for the control time to expire and goes to stop state without generating an error.

There is another feedback called `feedbackError`, this is used as general error signal input that is used for indicating if there is an error - for example: motor overheating, fuse is off or other feedback.

Both control times for starting and stopping control can be configured in the module `configuration` structure.

#### Change log

Version & Date	Change description
<b>01.00.00</b>	<b>SIMATIC Systems Support</b>
15.02.2021	First released version

### 3.1.8 LBC\_StarDeltaStarter (FB / V1.0.0)

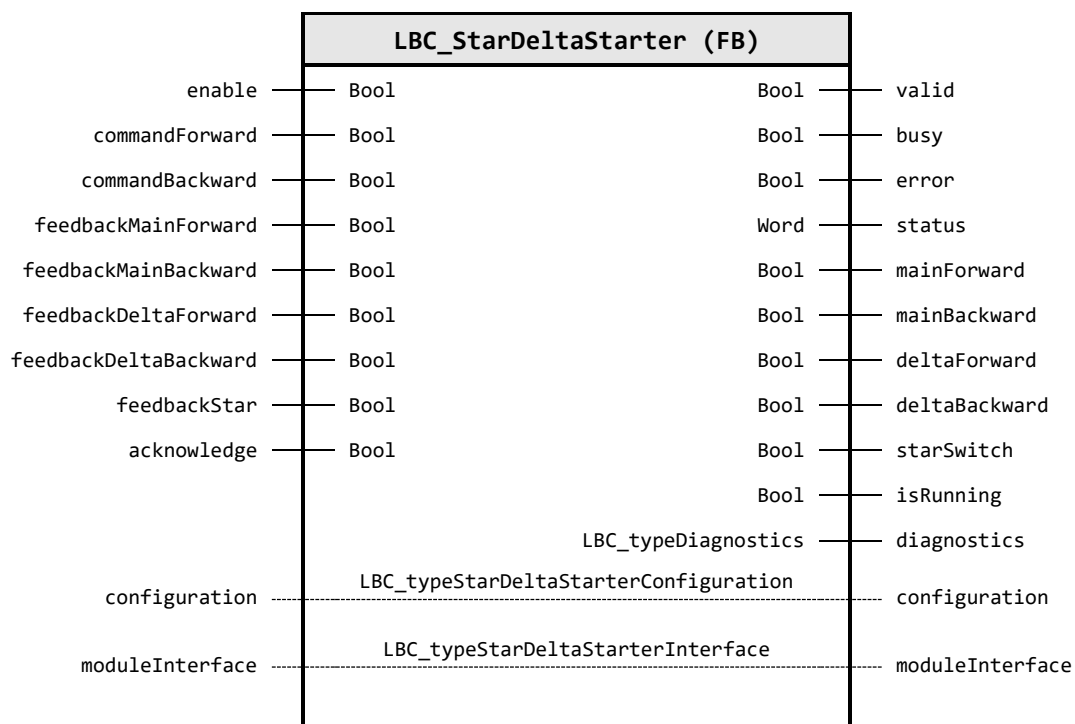
Author: Siemens Digital Industry

#### Short description

The module is used to startup a motor in star circuit and switch to delta circuit after ramp up time.  
It can be used for two different directions. Ramp up times and ramp down time can be configured.

#### Interface description

##### Block Interface



#### Input parameter

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandForward	Bool	FALSE	Rising edge: Starts the motor forward
commandBackward	Bool	FALSE	Rising edge: Starts the motor backward
feedbackMainForward	Bool	FALSE	TRUE: Feedback main switch present for forward direction
feedbackMainBackward	Bool	FALSE	TRUE: Feedback main switch present for backward direction
feedbackDeltaForward	Bool	FALSE	TRUE: Feedback delta forward switch present
feedbackDeltaBackward	Bool	FALSE	TRUE: Feedback delta switch backward present
feedbackStar	Bool	FALSE	TRUE: Feedback star switch present
acknowledge	Bool	FALSE	Acknowledgement of the alarms

**Output parameter**

Identifier	Data Type	Description
valid	Bool	TRUE: Valid set of output values available at the FB
busy	Bool	TRUE: FB is not finished and new output values can be expected
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)
mainForward	Bool	TRUE: Activating main switch for forward direction
mainBackward	Bool	TRUE: Activating main switch for backward direction
deltaForward	Bool	TRUE: Activating delta switch for forward direction
deltaBackward	Bool	TRUE: Activating delta switch for backward direction
starSwitch	Bool	TRUE: Activating star switch
isRunning	Bool	TRUE: Motor is running at full power / fill speed after ramp up
diagnostics	LBC_typeDiagnostics	Module related diagnostic information

**In/Out parameter**

Identifier	Data Type	Description
configuration	LBC_typeStarDeltaStarterConfiguration	Module related configuration parameters
moduleInterface	LBC_typeStarDeltaStarterInterface	Module interface for external systems

**Status & Error codes**

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: No job being currently processed
16#7001	STATUS_FIRST_CALL Status: First call after incoming new job (rising edge 'enable')
16#7002	STATUS_SUBSEQUENT_CALL Status: Subsequent call during active processing without further details
16#7004	STATUS_STOPPED Status: Motor is stopped
16#7011	STATUS_STARTING_STAR_FORWARD Status: Starting star forward
16#7012	STATUS_STARTING_STAR_BACKWARD Status: Starting star backward
16#7021	STATUS_STARTING_DELTA_FORWARD Status: Starting delta circuit forward
16#7022	STATUS_STARTING_DELTA_BACKWARD Status: Starting delta circuit backward
16#7030	STATUS_STOPPING Status: Function block is stopping the motor
16#7031	STATUS_RUNNING_DELTA_FORWARD Status: Motor is running forward in delta

### 3 Program Blocks

Code / Value	Identifier / Description
16#7032	STATUS_RUNNING_DELTA_BACKWARD Status: Motor is running backward in delta
16#7099	STATUS_DISABLING Status: Block is disabling
16#8201	ERR_CONFIGURATION_STARTUP_STAR_TIME_NEGATIVE Error: Configuration parameter start up control time for Star Switch is negative which is not accepted
16#8202	ERR_CONFIGURATION_STARTUP_DELTA_TIME_NEGATIVE Error: Configuration parameter start up control time for Delta Switch is negative which is not accepted
16#8203	ERR_CONFIGURATION_FEEDBACK_MONITORING_TIME_NEGATIVE Error: Configuration parameter feedback monitoring control time for switch feedbacks is negative which is not accepted
16#8204	ERR_CONFIGURATION_SHUT_DOWN_TIME_NEGATIVE Error: Configuration parameter restart delay control time is negative which is not accepted
16#8401	ERR_BOTH_COMMANDS_PRESENT_AT_SAME_TIME Error: Both start commands present at the same time, Motor stopped
16#8411	ERR_TIMEOUT_MISSING_FEEDBACK_STARTUP_STAR_FORWARD Error: Missed feedbacks during startup in star forward
16#8412	ERR_TIMEOUT_MISSING_FEEDBACK_STARTUP_STAR_BACKWARD Error: Missed feedbacks during startup in star backward
16#8420 - 16#8427	ERR_WRONG_FEEDBACK_DURING_STARTUP_STAR_FORWARD Error: Wrong feedbacks present during startup forward in star - could be a delta switch feedback or one of the backward switches, , last 3 bits in lower byte are the feedbacks 0 - Delta FW, 1 - Main BW, 2 - Delta BW
16#8430 - 16#8437	ERR_WRONG_FEEDBACK_DURING_STARTUP_STAR_BACKWARD Error: Wrong feedbacks present during startup backward in star - could be a delta switch feedback or one of the forward switches, last 3 bits in lower byte are the feedbacks 0 - Delta BW, 1 - Main FW, 2 - Delta FW
16#8441	ERR_TIMEOUT_MISSING_FEEDBACK_STARTUP_DELTA_FORWARD Error: Missed feedbacks during startup in delta forward
16#8442	ERR_TIMEOUT_MISSING_FEEDBACK_STARTUP_DELTA_BACKWARD Error: Missed feedbacks during startup in delta backward
16#8450 - 16#8457	ERR_WRONG_FEEDBACK_DURING_STARTUP_DELTA_FORWARD Error: Wrong feedbacks present during startup forward in delta - could be a star switch feedback or one of the backward switches, , last 3 bits in lower byte are the feedbacks 0 - Star, 1 - Main BW, 2 - Delta BW
16#8460 - 16#8467	ERR_WRONG_FEEDBACK_DURING_STARTUP_DELTA_BACKWARD Error: Wrong feedbacks present during startup backward in delta - could be a star switch feedback or one of the backward switches, last 3 bits in lower byte are the feedbacks 0 - Star, 1 - Main FW, 2 - Delta FW
16#8471	ERR_MISSING_FEEDBACK_DURING_RUN_DELTA_FORWARD_MAIN Error: Missed feedbacks during run in delta forward - main switch
16#8472	ERR_MISSING_FEEDBACK_DURING_RUN_DELTA_FORWARD_DELTA Error: Missed feedbacks during run in delta forward - delta switch
16#8473	ERR_MISSING_FEEDBACK_DURING_RUN_DELTA_FORWARD_MAIN_AND_DELTA_AND Error: Missed feedbacks during run in delta forward - main and delta switch
16#8481	ERR_MISSING_FEEDBACK_DURING_RUN_DELTA_BACKWARD_MAIN Error: Missed feedbacks during run in delta forward - main switch

### 3 Program Blocks

Code / Value	Identifier / Description
16#8482	ERR_MISSING_FEEDBACK_DURING_RUN_DELTA_BACKWARD_DELTA Error: Missed feedbacks during run in delta forward - delta switch
16#8483	ERR_MISSING_FEEDBACK_DURING_RUN_DELTA_BACKWARD_MAIN_AND_DELTA Error: Missed feedbacks during run in delta forward - main and delta switch
16#8490 - 16#8497	ERR_WRONG_FEEDBACK_DURING_RUN_DELTA_FORWARD Error: Wrong feedbacks present during run forward in delta - could be a star switch feedback or one of the backward switches, last 3 bits in lower byte are the feedbacks 0 - Star, 1 - Main BW 2 - Delta BW
16#84A0 - 16#84A7	ERR_WRONG_FEEDBACK_DURING_RUN_DELTA_BACKWARD Error: Wrong feedbacks present during run backward in delta - could be a star switch feedback or one of the backward switches, last 3 bits in lower byte are the feedbacks 0 - Star, 1 - Main FW, 2 - Delta FW
16#8500 - 16#851F	ERR_FEEDBACKS_NOT_DISAPPEAR_DURING_STOP Error: Feedbacks do not disappear during stop, last 5 bits in lower byte are the feedbacks 0 - FB Star, 1 - FB Main forward, 2 - Main backward, 4 - Delta forward 5 - Delta backward
16#8520 - 16#853F	ERR_FEEDBACKS_NOT_DISAPPEAR_DURING_DISABLING Error: Feedbacks do not disappear during disabling, last 5 bits in lower byte are the feedbacks 0 - FB Star, 1 - FB Main forward, 2 - Main backward, 4 - Delta forward 5 - Delta backward
16#8600	ERR_UNDEFINED_STATE Error: Block in undefined state

#### User defined datatype(s)

#### LBC\_typeDiagnostics (UDT)

Module related diagnostic information

Identifier	Data Type	Default Value	Description
status	Word	16#0000	16#0000-16#7FFF: Status of the FB 16#8000-16#FFFF: Error identification
subfunctionStatus	Word	16#0000	Status or return value of called FB's, FCs, system blocks or other status information
stateNumber	DInt	0	State in the state machine of the block where the error occurred

**LBC\_typeStarDeltaStarterConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'StarDeltaStarter'	Device name or device ID
startUpTimeStarSwitch	Time	T#5s	Time to run in star circuit to ramp up
startUpTimeDeltaSwitch	Time	T#5s	Time to run in delta circuit to ramp up
monitoringFeedbacks	Time	T#5s	Time to monitor and control the appearance of the feedbacks
shutDownTime	Time	T#5s	Time delay for shut down the motor before restart is possible
restartBlocking	Bool	FALSE	TRUE: Block restarting delay of the motor
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

**LBC\_typeStarDeltaStarterInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeStarDeltaStarterConfiguration	default	Module related configuration parameters
monitoring	LBC_typeStarDeltaStarterProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The module is in operating state as soon as the input `enable` is set to TRUE and as long as the input `enable` is remaining TRUE. Starting the operation is based on the directional command input (`commandForward` or `commandBackward`). The module sets its respective output for forward or backward operation.

Only one control command can be present at any time (`commandForward` or `commandBackward`).

After a command is present, the module goes into the startup state in Star circuit which means, that the block will expect the `feedbackStar` to become TRUE. After star feedback is present, the main switch for the direction will switch on and await as well the `feedbackMainDIRECTION`.

The feedback inputs are monitored by the time set at `monitoringFeedbacks`, if the time expires without those two feedbacks, an error is raised and the outputs will go to FALSE.

If both feedbacks present, the `startUpTimeStarSwitch` is running. After the time expires, the state switches from Star into Delta circuit, the feedbacks also monitored for this state like before.

The time to ramp up in Delta is set in `startUpTimeDeltaSwitch`, after expiring, the module sets the output `isRunning` to TRUE and returns therefore the valid state of the motor.

During runtime the feedbacks are monitored and if some wrong feedback appears in between, the module will generate an error message, turn off the output (FALSE)

and go into error state.

This error state has to be acknowledged to rest the module and be able to restart.

When the control command (`commandForward` or `commandBackward`) is switched off (FALSE) the module goes into stopping mode, the motor output `forward` or `backward` is set to FALSE.

The stopping control time is started and the block goes to stopping state, if the control time expires and one of the feedbacks is still present (TRUE) the block generates an error which has to be acknowledged as well.

The control times for starting and stopping control can be configured in the module `configuration` structure.

#### Change log

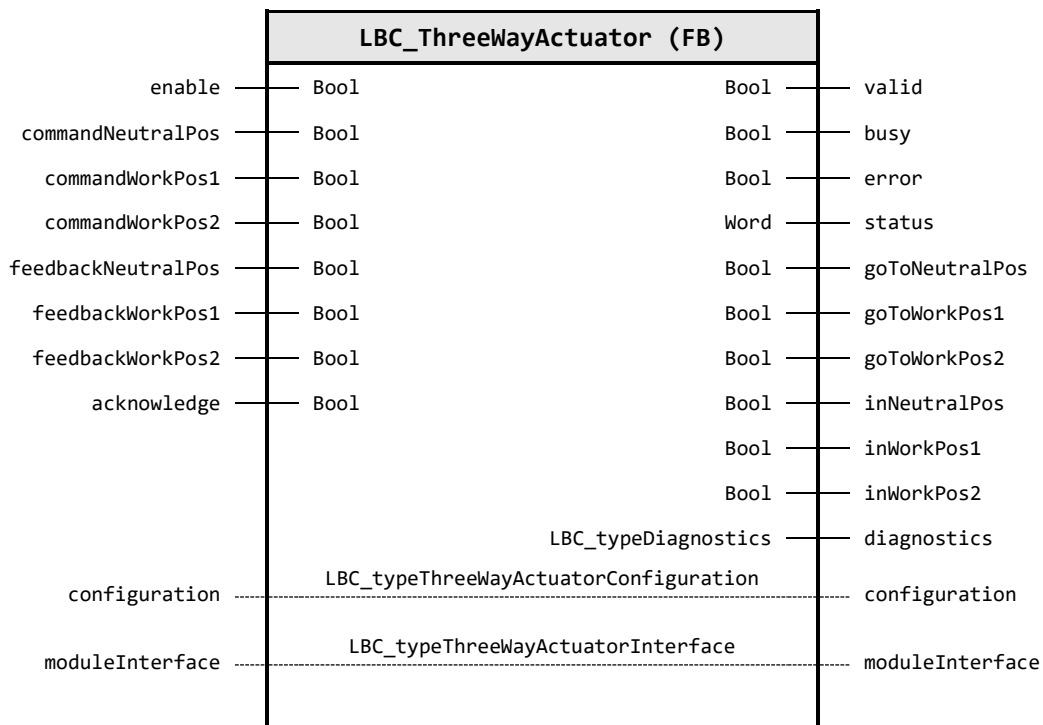
Version & Date	Change description
<b>01.00.00</b>	<b>SIMATIC Systems Support</b>
15.02.2021	First released version

**3.1.9 LBC\_ThreeWayActuator (FB / V1.0.0)**

Author: Siemens Digital Industry

**Short description**

Controls an actuator between three states (e.g. positions of a valve) with three or two control commands. For three stable state devices.

**Interface description****Block Interface****Input parameter**

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandNeutralPos	Bool	FALSE	Rising edge: Move actuator to neutral position
commandWorkPos1	Bool	FALSE	Rising edge: Move actuator to work position 1
commandWorkPos2	Bool	FALSE	Rising edge: Move actuator to work position 2
feedbackNeutralPos	Bool	FALSE	TRUE: Feedback actuator is in neutral position
feedbackWorkPos1	Bool	FALSE	TRUE: Feedback actuator is in work position 1
feedbackWorkPos2	Bool	FALSE	TRUE: Feedback actuator is in work position 2
acknowledge	Bool	FALSE	Acknowledgement of the alarms



**Output parameter**

Identifier	Data Type	Description
valid	Bool	TRUE: Valid set of output values available at the FB
busy	Bool	TRUE: FB is not finished and new output values can be expected
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)
goToNeutralPos	Bool	TRUE: Control output to move to actuator to neutral position
goToWorkPos1	Bool	TRUE: Control output to move to actuator to work position 1
goToWorkPos2	Bool	TRUE: Control output to move to actuator to work position 2
inNeutralPos	Bool	TRUE: Actuator is in neutral position
inWorkPos1	Bool	TRUE: Actuator is in work position 1
inWorkPos2	Bool	TRUE: Actuator is in work position 2
diagnostics	LBC_typeDiagnostics	Module related diagnostic information

**In/Out parameter**

Identifier	Data Type	Description
configuration	LBC_typeThreeWayActuatorConfiguration	Module related configuration parameters
moduleInterface	LBC_typeThreeWayActuatorInterface	Module interface for external systems

**Status & Error codes**

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: No job being currently processed
16#7001	STATUS_FIRST_CALL Status: First call after incoming new job (rising edge 'enable')
16#7002	STATUS_SUBSEQUENT_CALL Status: Subsequent call during active processing without further details
16#7003	STATUS_POSITION_NOT_DEFINED Status: Position of the actuator is uncertain
16#7004	STATUS_IN_NEUTRAL_POSITION Status: Actuator is in NEUTRAL position
16#7005	STATUS_IN_WORK_POSITION_1 Status: Actuator is in work position 1
16#7006	STATUS_IN_WORK_POSITION_2 Status: Actuator is in work position 2
16#7010	STATUS_MOVE_FROM_NEUTRAL_TO_WORK_1 Status: Actuator is moving from neutral to work 1
16#7011	STATUS_MOVE_FROM_NEUTRAL_TO_WORK_2 Status: Actuator is moving from neutral to work 2

### 3 Program Blocks

Code / Value	Identifier / Description
16#7012	STATUS_MOVE_FROM_WORK_1_TO_NEUTRAL Status: Actuator is moving from work 1 to neutral position
16#7013	STATUS_MOVE_FROM_WORK_1_TO_WORK_2 Status: Actuator is moving from work 1 to work position 2
16#7014	STATUS_MOVE_FROM_WORK_2_TO_NEUTRAL Status: Actuator is moving from work 2 to neutral position
16#7015	STATUS_MOVE_FROM_WORK_2_TO_WORK_1 Status: Actuator is moving from work 2 to work 1
16#7016	STATUS_MOVE_FROM_UNDEFINED_TO_NEUTRAL Status: Actuator is moving from undefined position to neutral
16#7017	STATUS_MOVE_FROM_UNDEFINED_TO_WORK_1 Status: Actuator is moving from undefined position to work 1
16#7018	STATUS_MOVE_FROM_UNDEFINED_TO_WORK_2 Status: Actuator is moving from undefined position to work 2
16#8201	ERR_CONFIGURATION_LEAVE_FEEDBACK_TIME_NEGATIVE Error: Negative value for leaving position feedback time
16#8202	ERR_CONFIGURATION_REACH_FEEDBACK_TIME_NEGATIVE Error: Negative value for reaching position feedback time
16#8400	ERR_MORE_THAN_ONE_CMD_PRESENT_AT_SAME_TIME Error: Commands for neutral and Work positions present at the same time
16#8401	ERR_MORE_THAN_ONE_FEEDBACK_PRESENT_AT_SAME_TIME Error: Feedbacks for neutral and Work positions present at the same time
16#8402	ERR_TIMEOUT_NEUTRAL_POSITION Error: Monitoring time out, did not reach feedback neutral position
16#8403	ERR_TIMEOUT_WORK_POSITION_1 Error: Monitoring time out, did not reach feedback work position 1
16#8404	ERR_TIMEOUT_WORK_POSITION_2 Error: Monitoring time out, did not reach feedback work position 2
16#8406	ERR_INCORRECT_FEEDBACK_NEUTRAL_POSITION Error: Incorrect appearance of feedback neutral position
16#8407	ERR_INCORRECT_FEEDBACK_WORK_POSITION_1 Error: Incorrect appearance of feedback work position 1
16#8408	ERR_INCORRECT_FEEDBACK_WORK_POSITION_2 Error: Incorrect appearance of feedback work position 2
16#8410	ERR_MISSING_FEEDBACK_NEUTRAL_POSITION Error: Missing feedback neutral position
16#8411	ERR_MISSING_FEEDBACK_WORK_POSITION_1 Error: Missing feedback work position 1
16#8412	ERR_MISSING_FEEDBACK_WORK_POSITION_2 Error: Missing feedback work position 2
16#8415	ERR_NOT_LEAVING_NEUTRAL_POSITION Error: Not leaving neutral position feedback
16#8416	ERR_NOT_LEAVING_WORK_POSITION_1 Error: Not leaving work position 1 feedback
16#8417	ERR_NOT_LEAVING_WORK_POSITION_2 Error: Not leaving work position 2 feedback
16#8600	ERR_UNDEFINED_STATE Error: block cannot determine the position of the Actuator

#### User defined datatype(s)

#### LBC\_typeDiagnostics (UDT)

Module related diagnostic information

Identifier	Data Type	Default Value	Description
status	Word	16#0000	16#0000-16#7FFF: Status of the FB 16#8000-16#FFFF: Error identification
subfunctionStatus	Word	16#0000	Status or return value of called FB's, FCs, system blocks or other status information
stateNumber	DInt	0	State in the state machine of the block where the error occurred

**LBC\_typeThreeWayActuatorConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'ThreeWayAct.'	Device name or device ID
monitoringLeavingFeedback	Time	T#5s	Control time for leaving the "start of movement" position
monitoringReachingFeedback	Time	T#5s	Control time for reaching the "end of movement" position
setOutputNeutralContinuously	Bool	TRUE	TRUE: Output neutral is set as long as command neutral is present. FALSE: Output has just an impulse as long as the actuator has not reached the position and is moving
setOutputWork1Continuously	Bool	TRUE	TRUE: Output work 1 is set as long as command work is present. FALSE: Output has just impulse as long as the actuator has not reached the position and is moving
setOutputWork2Continuously	Bool	TRUE	TRUE: Output work 2 is set as long as command work is present. FALSE: Output has just impulse as long as the actuator has not reached the position and is moving
disableNeutralCommand	Bool	FALSE	TRUE: Disable command for neutral position. Actuator starts moving to neutral position when `commandWorkPosX` is set to false
disableFeedbackNeutralPos	Bool	FALSE	TRUE: Disable the monitoring of the Neutral position feedback. FALSE: Neutral position is reached after `monitoringReachingFeedback` time expires.
disableFeedbackWorkPos1	Bool	FALSE	TRUE: Disable the monitoring of the Work position 1 feedback. FALSE: Work position 1 is reached after `monitoringReachingFeedback` time expires.
disableFeedbackWorkPos2	Bool	FALSE	TRUE: Disable the monitoring of the Work position 2 feedback. FALSE: Work position 2 is reached after `monitoringReachingFeedback` time expires.
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
resetOutputsOnError	Bool	FALSE	TRUE: in case of an error the outputs are be reset and the error has to be acknowledged before further processing is possible

**LBC\_typeThreeWayActuatorInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeThreeWayActuatorConfiguration	default	Module related configuration parameters
monitoring	LBC_typeThreeWayActuatorProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The module is put in operating state if the input `enable` is TRUE. The actuator is controlled by the inputs `commandWorkPosX` and `commandNeutralPos`, only one should be set at any time.

If `commandWorkPosX` is TRUE then the block sets the output `goToWorkPosX`, if the `commandNeutralPos` is TRUE then the block sets the output `goToNeutralPos`.

Once the module starts movement from one position to another, two control times are started – control time for leaving position and for reaching position.

The usage for those timers is to monitor if the actuator is leaving the actual position, therefore the name `leavingFeedback`, and to monitor the actuator reaching new the position it is moving towards – `reachingFeedback`.

Those timers can be configured via the `configuration` in the module interface. If the actuator is moving from Neutral to one of the Work positions, the leaving position is “home position” (`feedbackNeutralPos`) and the reaching position is a work position (`feedbackWorkPositionX`).

If the actuator is moving from a Work to Neutral position, the leaving position is a work position (`feedbackWorkPositionX`) and reaching position is neutral position (`feedbackNeutralPos`). Same time settings (`leavingFeedback` and `reachingFeedback`) are used independent if the actuator is moving from Neutral to one of the Work positions or from a Work to Neutral.

When the actuator finishes moving towards a Work position or Neutral position, the respective output is reset (FALSE). This is intended for control of actuators that don't require additional force once they reach their end position.

If it is required that the outputs `goToWorkPositionX` or `goToNeutralPosition` remain set (TRUE) when the destination is reached, it can be configured via `setOutputNeutralContinuously` and `setOutputWork X Continuously`.

In the case where one of the feedbacks or both are not available, it is possible to disable their monitoring from the configuration of the block. –

`disableFeedbackNeutralPos` and `disableFeedbackWorkPosX`.

In this case the transition and duration for changing one state to another (Neutral to one of the Work positions and a Work to Neutral) is done entirely on the `monitoringReachingFeedback` parameter.

In case the time expires and the feedbacks aren't disabled, the module raises an error. Depending on the configuration `resetOutputsOnError` it will stay in the actual state if configuration is set to FALSE (default) or jump into the error state with resetting the outputs.

If the module is in the error state, the error has to be acknowledged via the input `acknowledge`, as soon the error is acknowledged it is possible to restart the operation.

#### Change log

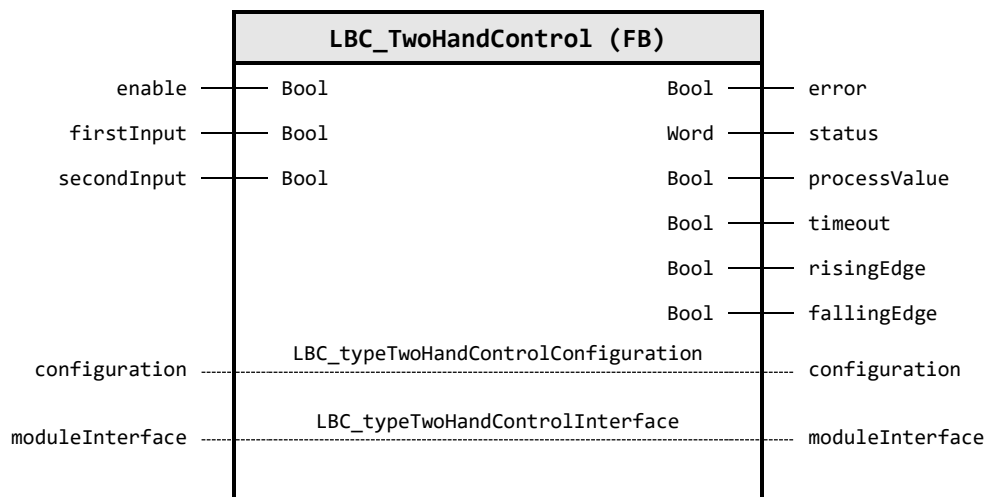
Version & Date	Change description
<b>01.00.00</b> 15.02.2021	<b>SIMATIC Systems Support</b> First released version

**3.1.10 LBC\_TwoHandControl (FB / V1.0.0)**

Author: Siemens Digital Industry

**Short description**

Supervises two inputs (e.g. two buttons), which must be activated together within a certain time to set the output to **TRUE**.

**Interface description****Block Interface****Input parameter**

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
firstInput	Bool	FALSE	First input to verify
secondInput	Bool	FALSE	Second input to verify

**Output parameter**

Identifier	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)
processValue	Bool	Checked and verified signal state
timeout	Bool	Signal is not valid because of timeout
risingEdge	Bool	Rising edge of signal
fallingEdge	Bool	Falling edge of signal

**In/Out parameter**

Identifier	Data Type	Description
configuration	LBC_typeTwoHandControlConfiguration	Module related configuration parameters
moduleInterface	LBC_typeTwoHandControlInterface	Module interface for external systems

**Status & Error codes**

Code / Value	Identifier / Description
16#0000	STATUS_INPUTS_PRESENT_WITHIN_TIMEFRAME Status: Inputs present together in the defined time frame
16#7000	STATUS_NO_CALL Status: Function block is not enabled
16#7001	STATUS_WAIT_FOR_INPUTS Status: Wait for input occurrence
16#7002	STATUS_TIME_RUNNING_WAIT_FOR_SECOND_INPUTS Status: One input present, timer is running, wait for second input
16#70FF	STATUS_INPUT_TIMEOUT_OCCURRED Status: TIMEOUT, Inputs don't come together in the defined time
16#8201	ERR_CONFIGURATION_TIMEOUT_TIME_NEGATIVE Error: Configuration parameter timeout control time is negative which is not accepted

**User defined datatype(s)****LBC\_typeTwoHandControlConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'TwoHandCtrl'	Device name or device ID
timeout	Time	t#1s	Timeout for the discrepancy between the two inputs
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

**LBC\_typeTwoHandControlInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeTwoHandControlConfiguration	default	Module related configuration parameters
monitoring	LBC_typeTwoHandControlProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

Supervises two inputs (e.g. two buttons), which must be activated together within a certain time to set the output to **TRUE**. It also sets an output **timeout**, if the time has expired and there is just one of them present. Rising and falling edge of the "signal" output is detected as well.



#### Change log

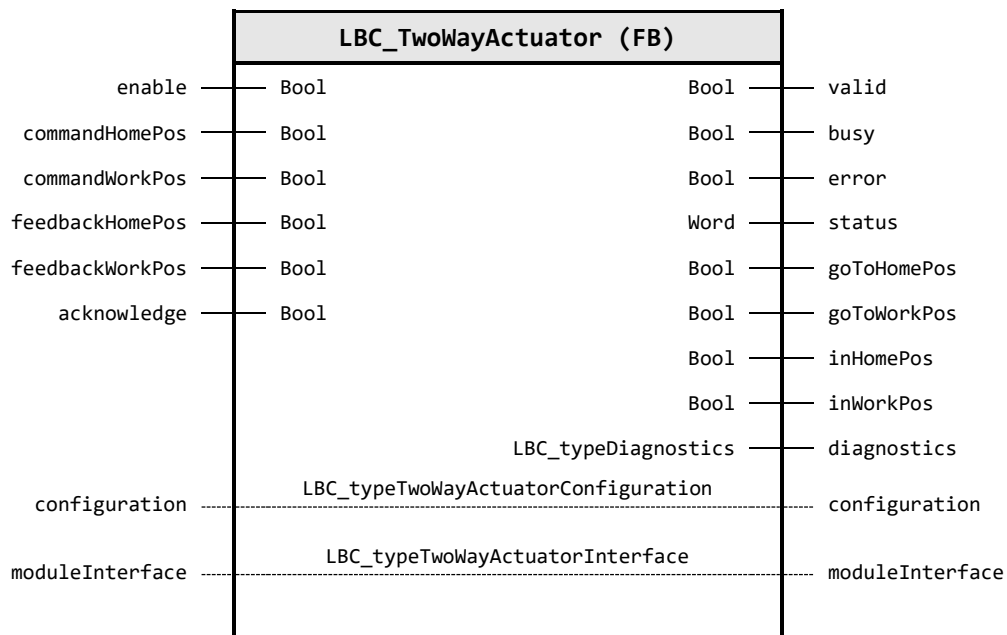
Version & Date	Change description
<b>01.00.00</b> 15.02.2021	<b>SIMATIC Systems Support</b> First released version

**3.1.11 LBC\_TwoWayActuator (FB / V1.0.0)**

Author: Siemens Digital Industry

**Short description**

Controls an actuator between two states (e.g. positions of a valve) with two or one control commands. For bi stable state devices.

**Interface description****Block Interface****Input parameter**

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandHomePos	Bool	FALSE	Rising edge: Move actuator to home position
commandWorkPos	Bool	FALSE	Rising edge: Move actuator to work position
feedbackHomePos	Bool	FALSE	TRUE: Feedback actuator is in home position
feedbackWorkPos	Bool	FALSE	TRUE: Feedback actuator is in work position
acknowledge	Bool	FALSE	Acknowledgement of the alarms

**Output parameter**

Identifier	Data Type	Description
valid	Bool	TRUE: Valid set of output values available at the FB
busy	Bool	TRUE: FB is not finished and new output values can be expected
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)

### 3 Program Blocks

Identifier	Data Type	Description
goToHomePos	Bool	TRUE: Control output to move to actuator to home position
goToWorkPos	Bool	TRUE: Control output to move to actuator to work position
inHomePos	Bool	TRUE: Actuator is in home position
inWorkPos	Bool	TRUE: Actuator is in work position
diagnostics	LBC_typeDiagnostics	Module related diagnostic information

#### In/Out parameter

Identifier	Data Type	Description
configuration	LBC_typeTwoWayActuatorConfiguration	Module related configuration parameters
moduleInterface	LBC_typeTwoWayActuatorInterface	Module interface for external systems

#### Status & Error codes

Code / Value	Identifier / Description
16#0000	STATUS_NO_ERROR_OCCURRED Status: No error occurred during execution
16#7000	STATUS_NO_CALL Status: No job being currently processed
16#7001	STATUS_FIRST_CALL Status: First call after incoming new job (rising edge 'enable')
16#7002	STATUS_SUBSEQUENT_CALL Status: Subsequent call during active processing without further details
16#7003	STATUS_POSITION_NOT_DEFINED Status: Position of the actuator is uncertain
16#7004	STATUS_IN_HOME_POSITION Status: Actuator is in home position
16#7005	STATUS_MOVE_TO_WORK_POSITION Status: Actuator is moving towards work position
16#7006	STATUS_IN_WORK_POSITION Status: Actuator is in work position
16#7007	STATUS_MOVE_TO_HOME_POSITION Status: Actuator is moving towards home position
16#8201	ERR_CONFIGURATION_LEAVE_FEEDBACK_TIME_NEGATIVE Error: Negative value for leaving position feedback time
16#8202	ERR_CONFIGURATION_REACH_FEEDBACK_TIME_NEGATIVE Error: Negative value for reaching position feedback time
16#8400	ERR_MORE_THAN_ONE_CMD_PRESENT_AT_SAME_TIME Error: Commands for Home and Work positions present at the same time
16#8401	ERR_MORE_THAN_ONE_FEEDBACK_PRESENT_AT_SAME_TIME Error: Feedbacks for neutral and Work positions present at the same time
16#8402	ERR_TIMEOUT_HOME_POSITION Error: Monitoring time out, missed feedback home position
16#8403	ERR_TIMEOUT_WORK_POSITION Error: Monitoring time out, missed feedback work position
16#8404	ERR_INCORRECT_FEEDBACK_WORK_POSITION Error: Not expected appearance of feedback work position

### 3 Program Blocks

Code / Value	Identifier / Description
16#8405	ERR_INCORRECT_FEEDBACK_HOME_POSITION Error: Not expected appearance of feedback home position
16#8406	ERR_MISSING_FEEDBACK_WORK_POSITION Error: Missing feedback work position
16#8407	ERR_MISSING_FEEDBACK_HOME_POSITION Error: Missing feedback home position
16#8408	ERR_NOT_LEAVING_HOME_POSITION Error: Not leaving home position
16#8409	ERR_NOT_LEAVING_WORK_POSITION Error: Not leaving work position
16#8600	ERR_UNDEFINED_STATE Error: due to an undefined state in state machine

#### User defined datatype(s)

#### LBC\_typeDiagnostics (UDT)

Module related diagnostic information

Identifier	Data Type	Default Value	Description
status	Word	16#0000	16#0000-16#7FFF: Status of the FB 16#8000-16#FFFF: Error identification
subfunctionStatus	Word	16#0000	Status or return value of called FB's, FCs, system blocks or other status information
stateNumber	DInt	0	State in the state machine of the block where the error occurred

**LBC\_typeTwoWayActuatorConfiguration (UDT)**

Module related configuration parameters

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'TwoWayAct .'	Device name or device ID
monitoringLeavingFeedb ack	Time	T#5s	Control time for leaving the "start of movement" position
monitoringReachingFeed back	Time	T#5s	Control time for reaching the "end of movement" position
setOutputHomeContinuo usly	Bool	TRUE	TRUE: Output home is set as long as command home is present. FALSE: Output has just an impulse as long as the actuator has not reached the position and is moving
setOutputWorkContinuo usly	Bool	TRUE	TRUE: Output work is set as long as command work is present. FALSE: Output has just impulse as long as the actuator has not reached the position and is moving
disableHomeCommand	Bool	FALSE	TRUE: Disable command for home position. Actuator starts moving to home position when 'commandWorkPos' is set to FALSE
disableFeedbackHomePo s	Bool	FALSE	TRUE: Disable the monitoring of the Home position feedback. FALSE: Home position is reached after 'monitoringReachingFeedback' time expires.
disableFeedbackWorkPo s	Bool	FALSE	TRUE: Disable the monitoring of the Work position feedback. FALSE: Work position is reached after 'monitoringReachingFeedback' time expires.
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
resetOutputsOnError	Bool	FALSE	TRUE: in case of an error the outputs are reset and the error has to be acknowledged before further processing is possible

**LBC\_typeTwoWayActuatorInterface (UDT)**

Module interface for external systems

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuratio n	LBC_typeTwoWayActuatorConfi guration	default	Module related configuration parameters
monitoring	LBC_typeTwoWayActuatorProc essValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**Functional description**

The module is put in operating state if the input `enable` is TRUE. The actuator is controlled by the two inputs `commandWorkPos` and `commandHomePos`, only one should be set at any time.

If `commandWorkPos` is TRUE then the block sets the output `goToWorkPos`, if the `commandHomePos` is TRUE then the block sets the output `goToHomePos`.

Once the module starts movement from one position to another, two control times are started – control time for leaving position and for reaching position. The usage for those timers is to monitor if the actuator is leaving the actual position, therefore the name `leavingFeedback`, and to monitor the actuator reaching new the position it is moving towards – `reachingFeedback`.

Those timers can be configured via the parameters in the module interface. If the actuator is moving from Home to Work position, the leaving position is home position (`feedbackHomePos`) and the reaching position is work position (`feedbackWorkPosition`).

If the actuator is moving from Work to Home position, the leaving position is work position (`feedbackWorkPosition`) and reaching position is home position (`feedbackHomePos`). Same time settings (`leavingFeedback` and `reachingFeedback`) are used independent if the actuator is moving from Home to Work or from Work to Home.

When the actuator finishes moving towards Work position or Home position, the respective output is reset (FALSE). This is intended for control of actuators that don't require additional force once they reach their end position.

If it is required that the outputs `goToWorkPosition` or `goToHomePosition` remain set (TRUE) when the destination is reached, it can be configured via `setOutputHomeContinuously` and `setOutputWorkContinuously`.

In the case where one of the feedbacks or both are not available, it is possible to disable their monitoring from the parameters of the block. – `disableFeedbackHomePos` and `disableFeedbackWorkPos`.

In this case the transition and duration for changing one state to another (Home to Work and Work to Home) is done entirely on the `monitoringReachingFeedback` parameter.

In case the time expires and the feedbacks aren't disabled, the module raises an error. Depending on the configuration `resetOutputsOnError` it will stay in the actual state if parameter is set to FALSE (default) or jump into the error state with resetting the outputs.

If the module is in the error state, the error has to be acknowledged via the input `acknowledge`, as soon the error is acknowledged it is possible to restart the operation.

#### Change log

Version & Date	Change description
<b>01.00.00</b>	<b>SIMATIC Systems Support</b>
15.02.2021	First released version

## 4 PLC data types

### 4.1.1 LBC\_typeDiagnostics (UDT)

#### Description

Module related diagnostic information

#### Parameter description

Identifier	Data Type	Default Value	Description
status	Word	16#0000	16#0000-16#7FFF: Status of the FB 16#8000-16#FFFF: Error identification
subfunctionStatus	Word	16#0000	Status or return value of called FB's, FCs, system blocks or other status information
stateNumber	DInt	0	State in the state machine of the block where the error occurred

### 4.1.2 LBC\_typeInterfaceCommands (UDT)

#### Description

Module related commands from external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
refreshConfiguration	Bool	FALSE	TRUE: Copy global configuration parameters into module interface for external systems
editConfiguration	Bool	FALSE	TRUE: Edit mode for configuration parameters in control system is active - copying into module interface is stopped
saveConfiguration	Bool	FALSE	TRUE: Save configuration parameters from module interface into to global configuration parameters after change
acknowledge	Bool	FALSE	TRUE: Module error acknowledge / reset of errors in function block

## 4.2 AnalogSignals

### 4.2.1 LBC\_typeAnalogProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
simulation	Bool	FALSE	TRUE: Enable simulation input of analog value
processValue	LReal	0.0	Scaled process value
analogValue	Int	0	Analog value for/from hardware periphery
limitHigh2	Bool	FALSE	Process value limit high 2 exceeded (Lim 2 > Lim1, resets Lim 1)
limitHigh1	Bool	FALSE	Process value limit high 1 exceeded
limitLow1	Bool	FALSE	Process value limit low 1 exceeded
limitLow2	Bool	FALSE	Process value limit low 2 exceeded (Lim 2 < Lim1, resets Lim 1)
maxValueReached	Bool	FALSE	Maximum configured process value reached. Value is limited to the maximum configured value.
minValueReached	Bool	FALSE	Minimum configured process value reached. Value is limited to the minimum configured value.
error	Bool	FALSE	TRUE: An error occurred while processing the FB



## 4.3 AnalogSignals / Input

### 4.3.1 LBC\_typeAnalogInputConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'AnalogInput'	Device name or device ID
physicalUnit	String[10]	'unit'	Each value should have a physical unit (like [°C], [kWh], etc.)
isUnipolarSignal	Bool	TRUE	TRUE: Sensor is a unipolar type (just positive values), FALSE: Sensor is a bipolar type (positive and negative values)
default	LReal	0.0	Default OUTPUT process value to be returned if function block is not enabled or quality is bad
limitHigh2	LReal	90.0	Process value limit high 2
limitHigh1	LReal	80.0	Process value limit high 1
limitLow1	LReal	-80.0	Process value limit low 1
limitLow2	LReal	-90.0	Process value limit low 2
processValueMax	LReal	100.0	Maximum limit of the process value
processValueMin	LReal	-100.0	Minimum limit of the process value
scaleAnalogUppPoint	LReal	27648.0	Upper point for the analog value. Maximum value from the hardware module - i.e. 27648
scaleAnalogLowPoint	LReal	0.0	Lower point for the analog value. Minimum value from the hardware module - i.e. 0
scaleProcessUppPoint	LReal	100.0	Upper point for the process value - scaled value
scaleProcessLowPoint	LReal	-100.0	Lower point for the process value - scaled value
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.3.2 LBC\_typeAnalogInputInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeAnalogInputConfiguration	default	Module related configuration parameters

#### 4 PLC data types

Identifier	Data Type	Default Value	Description
monitoring	LBC_typeAnalogProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

## 4.4 AnalogSignals / Output

### 4.4.1 LBC\_typeAnalogOutputConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'AnalogOutput'	Device name or device ID
physicalUnit	String[10]	'unit'	Each value should have a physical unit (like [°C], [kWh], etc.)
isUnipolarSignal	Bool	TRUE	TRUE: Sensor is a unipolar type (just positive values), FALSE: Sensor is a bipolar type (positive and negative values)
default	Int	0	Default OUTPUT analog value to be returned if function block is not enabled or quality is bad
limitHigh2	LReal	90.0	Process value limit high 2
limitHigh1	LReal	80.0	Process value limit high 1
limitLow1	LReal	-80.0	Process value limit low 1
limitLow2	LReal	-90.0	Process value limit low 2
processValueMax	LReal	100.0	Maximum limit of the process value
processValueMin	LReal	-100.0	Minimum limit of the process value
scaleProcessUppPoint	LReal	100.0	Upper point for the process value
scaleProcessLowPoint	LReal	-100.0	Lower point for the process value
scaleAnalogUppPoint	LReal	27648.0	Upper point for the analog output. Maximum value from the hardware module - i.e. 27648 - scaled value
scaleAnalogLowPoint	LReal	0.0	Lower point for the analog output. Minimum value from the hardware module - i.e. 0 - scaled value
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.4.2 LBC\_typeAnalogOutputInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeAnalogOutputConfiguration	default	Module related configuration parameters

#### 4 PLC data types

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Identifier	Data Type	Default Value	Description
monitoring	LBC_typeAnalogProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

## 4.5 AnalogSignals / Scale

### 4.5.1 LBC\_typeAnalogScaleConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'AnalogScale'	Device name or device ID
physicalUnitInput	String[10]	'unit'	Physical unit (like [°C], [kWh], etc.) for the input value
physicalUnitOutput	String[10]	'unit'	Physical unit (like [°C], [kWh], etc.) for the output value
default	LReal	0.0	Default OUTPUT value to be returned if function block is not enabled or quality is bad
inputValueMax	LReal	100.0	Maximum limit of the process value
inputValueMin	LReal	-100.0	Minimum limit of the process value
scaleInputUppPoint	LReal	100.0	Upper point for the process value
scaleInputLowPoint	LReal	-100.0	Lower point for the process value
scaleOutputUppPoint	LReal	200.0	Upper point for the analog process output
scaleOutputLowPoint	LReal	-200.0	Lower point for the analog process output
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.5.2 LBC\_typeAnalogScaleInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeAnalogScaleConfiguration	default	Module related configuration parameters
monitoring	LBC_typeAnalogScaleValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

### 4.5.3 LBC\_typeAnalogScaleValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
simulation	Bool	FALSE	TRUE: Enable simulation input of input value
inputValue	LReal	0.0	Value to be converted
outputValue	LReal	0.0	Processed and scaled value
minValueReached	Bool	FALSE	Minimum configured process value reached. Value is limited to the minimum configured value.
maxValueReached	Bool	FALSE	Maximum configured process value reached. Value is limited to the maximum configured value.
error	Bool	FALSE	TRUE: An error occurred while processing the FB

## 4.6 DigitalSignal

### 4.6.1 LBC\_typeDigitalSignalConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'DigitalSignal'	Device name or device ID
onDelay	Time	T#0s	Set time value for on delay
offDelay	Time	T#0s	Set time value for off delay
default	Bool	FALSE	Value to be returned if function block is not enabled or quality is bad (independent from `invertProcessValue`)
invertProcessValue	Bool	FALSE	Invert the process value (only the processed value, not the default)
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.6.2 LBC\_typeDigitalSignalInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeDigitalSignalConfiguration	default	Module related configuration parameters
monitoring	LBC_typeDigitalSignalProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

### 4.6.3 LBC\_typeDigitalSignalProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
simulation	Bool	FALSE	TRUE: Enable simulation input of digital value
processValue	Bool	FALSE	Processed sensor value
error	Bool	FALSE	TRUE: An error occurred while processing the FB

## 4.7 DriveControl

### 4.7.1 LBC\_typeDriveControlConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'DriveControl'	Device name or device ID
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
driveConfiguration	LAxisCtrl_typeAxisConfig	default	Drive parameter configuration from - Support: tech.team.motioncontrol@siemens.com

### 4.7.2 LBC\_typeDriveControlInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeDriveControlConfiguration	default	Module related configuration parameters
monitoring	LBC_typeDriveControlProcessValues	default	Module related monitoring information
diagnostics	LAxisCtrl_typeDiagnostics	default	

### 4.7.3 LBC\_typeDriveControlProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
enableAxis	Bool	FALSE	TRUE: Set axis enable; FALSE: Remove axis enable
brakeOpened	Bool	FALSE	TRUE: Unconditionally open brake
error	Bool	FALSE	TRUE: An error occurred while processing the FB
axisEnabled	Bool	FALSE	TRUE: The technology object is enabled. Motion commands can be executed



#### 4 PLC data types

Identifier	Data Type	Default Value	Description
resetActive	Bool	FALSE	TRUE: Reset/Restart of the axis is active
inVelocity	Bool	FALSE	TRUE: The setpoint velocity/speed was reached and will be maintained
inLimitation	Bool	FALSE	TRUE: The drive is operating at the force/torque limit
inClamping	Bool	FALSE	TRUE: The drive is kept at the fixed stop (clamping), the axis position is within the positioning tolerance
startSync	Bool	FALSE	TRUE: The axis is synchronizing to the leading axis
inSync	Bool	FALSE	TRUE: The axis is synchronized to the leading axis
inSimulation	Bool	FALSE	TRUE: Synchronous operation is being simulated
jogSelected	Bool	FALSE	TRUE: Jogging is active
moveVelocitySelected	Bool	FALSE	TRUE: Moving with constant velocity/speed is active
stopSelected	Bool	FALSE	TRUE: Stopping is active
fastStopSelected	Bool	FALSE	TRUE: Stopping is active (with fastStop dynamics)
torqueLimitingSelected	Bool	FALSE	TRUE: Force/Torque limiting is active
homingSelected	Bool	FALSE	TRUE: Homing is active
posRelativeSelected	Bool	FALSE	TRUE: Relative positioning is active
posAbsoluteSelected	Bool	FALSE	TRUE: Absolute positioning is active
posSuperimposedSelected	Bool	FALSE	TRUE: Superimposed positioning is active
gearInRelativeSelected	Bool	FALSE	TRUE: Relative gearing is active
gearInAbsoluteSelected	Bool	FALSE	TRUE: Absolute gearing is active
camInSelected	Bool	FALSE	TRUE: Camming is active
phasingSelected	Bool	FALSE	TRUE: Phasing is active
commandBusy	Bool	FALSE	TRUE: The selected basic motion command is being executed
commandDone	Bool	FALSE	TRUE: The selected basic motion command has completed without error
homingCommandBusy	Bool	FALSE	TRUE: Homing command is being executed
homingCommandDone	Bool	FALSE	TRUE: Homing command has completed without error
superimposedBusy	Bool	FALSE	TRUE: The selected superimposed motion command is being executed
superimposedDone	Bool	FALSE	TRUE: The selected superimposed motion command has completed without error

## 4.8 MotorStarter

### 4.8.1 LBC\_typeMotorStarterConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'MotorStarter'	Device name or device ID
startingControlTime	Time	T#5s	Control time for receiving feedback motor is running or time to ramp up motor if feedback is disabled
stoppingControlTime	Time	T#5s	Control time for feedback motor is stopped (fb running has disappeared) or time to ramp down motor if feedback is disabled
resetTime	Time	T#5s	Control time for reset - time to set reset output / the reset signal is present at the reset output (advanced motor starter)
disableFeedbackRunning	Bool	TRUE	TRUE: Disable feedback for started / running motor
disableFeedbackError	Bool	TRUE	TRUE: Disable feedback for error monitoring (e.g. over temperature)
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.8.2 LBC\_typeMotorStarterInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeMotorStarterConfiguration	default	Module related configuration parameters
monitoring	LBC_typeMotorStarterProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

### 4.8.3 LBC\_typeMotorStarterProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
reset	Bool	FALSE	TRUE: Command reset the motor starter
enabledStarter	Bool	FALSE	TRUE: Start/enable the motor starter
resetStarter	Bool	FALSE	TRUE: Reset the starter in case of an active 'error' and command 'resetStarter'
commandForward	Bool	FALSE	TRUE: Start the motor forward
commandBackward	Bool	FALSE	TRUE: Start the motor backward
forward	Bool	FALSE	TRUE: Starting the motor forward
backward	Bool	FALSE	TRUE: Starting the motor backward
feedbackReady	Bool	FALSE	TRUE: Motor is ready for switching on
feedbackRunningForward	Bool	FALSE	TRUE: Motor is running / soft starter bypass in forward direction
feedbackRunningBackward	Bool	FALSE	TRUE: Motor is running / soft starter bypass in backward direction
feedbackError	Bool	FALSE	TRUE: Motor starter is in error state (e.g. overheating)
error	Bool	FALSE	TRUE: An error occurred while processing the FB

## 4.9 StarDeltaStarter

### 4.9.1 LBC\_typeStarDeltaStarterConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'StarDeltaStarter'	Device name or device ID
startUpTimeStarSwitch	Time	T#5s	Time to run in star circuit to ramp up
startUpTimeDeltaSwitch	Time	T#5s	Time to run in delta circuit to ramp up
monitoringFeedbacks	Time	T#5s	Time to monitor and control the appearance of the feedbacks
shutDownTime	Time	T#5s	Time delay for shut down the motor before restart is possible
restartBlocking	Bool	FALSE	TRUE: Block restarting delay of the motor
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.9.2 LBC\_typeStarDeltaStarterInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeStarDeltaStarterConfiguration	default	Module related configuration parameters
monitoring	LBC_typeStarDeltaStarterProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

### 4.9.3 LBC\_typeStarDeltaStarterProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandForward	Bool	FALSE	TRUE: Starts the motor forward

#### 4 PLC data types

Identifier	Data Type	Default Value	Description
commandBackward	Bool	FALSE	TRUE: Starts the motor backward
feedbackMainForward	Bool	FALSE	TRUE: Feedback main switch present for forward direction
feedbackMainBackward	Bool	FALSE	TRUE: Feedback main switch present for backward direction
feedbackDeltaForward	Bool	FALSE	TRUE: Feedback delta forward switch present
feedbackDeltaBackward	Bool	FALSE	TRUE: Feedback delta switch backward present
feedbackStar	Bool	FALSE	TRUE: Feedback star switch present
mainForward	Bool	FALSE	TRUE: Activating main switch for forward direction
mainBackward	Bool	FALSE	TRUE: Activating main switch for backward direction
deltaForward	Bool	FALSE	TRUE: Activating delta switch for forward direction
deltaBackward	Bool	FALSE	TRUE: Activating delta switch for backward direction
starSwitch	Bool	FALSE	TRUE: Activating star switch
isRunning	Bool	FALSE	TRUE: Motor is running at full power / full speed after `startUpTime` has expired
error	Bool	FALSE	TRUE: An error occurred while processing the FB

## 4.10 ThreeWayActuator

### 4.10.1 LBC\_typeThreeWayActuatorConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'ThreeWayAct.'	Device name or device ID
monitoringLeavingFeedback	Time	T#5s	Control time for leaving the "start of movement" position
monitoringReachingFeedback	Time	T#5s	Control time for reaching the "end of movement" position
setOutputNeutralContinuously	Bool	TRUE	TRUE: Output neutral is set as long as command neutral is present. FALSE: Output has just an impulse as long as the actuator has not reached the position and is moving
setOutputWork1Continuously	Bool	TRUE	TRUE: Output work 1 is set as long as command work is present. FALSE: Output has just impulse as long as the actuator has not reached the position and is moving
setOutputWork2Continuously	Bool	TRUE	TRUE: Output work 2 is set as long as command work is present. FALSE: Output has just impulse as long as the actuator has not reached the position and is moving
disableNeutralCommand	Bool	FALSE	TRUE: Disable command for neutral position. Actuator starts moving to neutral position when 'commandWorkPosX' is set to false
disableFeedbackNeutralPos	Bool	FALSE	TRUE: Disable the monitoring of the Neutral position feedback. FALSE: Neutral position is reached after 'monitoringReachingFeedback' time expires.
disableFeedbackWorkPos1	Bool	FALSE	TRUE: Disable the monitoring of the Work position 1 feedback. FALSE: Work position 1 is reached after 'monitoringReachingFeedback' time expires.
disableFeedbackWorkPos2	Bool	FALSE	TRUE: Disable the monitoring of the Work position 2 feedback. FALSE: Work position 2 is reached after 'monitoringReachingFeedback' time expires.
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
resetOutputsOnError	Bool	FALSE	TRUE: in case of an error the outputs are be reset and the error has to be acknowledged before further processing is possible

**4.10.2 LBC\_typeThreeWayActuatorInterface (UDT)****Description**

Module interface for external systems

**Parameter description**

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeThreeWayActuatorConfiguration	default	Module related configuration parameters
monitoring	LBC_typeThreeWayActuatorProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

**4.10.3 LBC\_typeThreeWayActuatorProcessValues (UDT)****Description**

Module related monitoring information

**Parameter description**

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandNeutralPos	Bool	FALSE	TRUE: Move the actuator to neutral position
commandWorkPos1	Bool	FALSE	TRUE: Move the actuator to work position 1
commandWorkPos2	Bool	FALSE	TRUE: Move the actuator to work position 2
feedbackNeutralPos	Bool	FALSE	TRUE: Feedback that the actuator is in neutral position
feedbackWorkPos1	Bool	FALSE	TRUE: Feedback that the actuator is in work position 1
feedbackWorkPos2	Bool	FALSE	TRUE: Feedback that the actuator is in work position 2
goToNeutralPos	Bool	FALSE	TRUE: Control output to move to actuator to neutral position
goToWorkPos1	Bool	FALSE	TRUE: Control output to move to actuator to work position 1
goToWorkPos2	Bool	FALSE	TRUE: Control output to move to actuator to work position 2
inNeutralPos	Bool	FALSE	TRUE: Actuator is in neutral position
inWorkPos1	Bool	FALSE	TRUE: Actuator is in work position 1
inWorkPos2	Bool	FALSE	TRUE: Actuator is in work position 2
error	Bool	FALSE	TRUE: An error occurred while processing the FB

## 4.11 TwoHandControl

### 4.11.1 LBC\_typeTwoHandControlConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'TwoHandCtrl'	Device name or device ID
timeout	Time	t#1s	Timeout for the discrepancy between the two inputs
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block

### 4.11.2 LBC\_typeTwoHandControlInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuration	LBC_typeTwoHandControlConfiguration	default	Module related configuration parameters
monitoring	LBC_typeTwoHandControlProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

### 4.11.3 LBC\_typeTwoHandControlProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
firstInput	Bool	FALSE	First input to verify
secondInput	Bool	FALSE	Second input to verify
signal	Bool	FALSE	Checked and verified signal state
timeout	Bool	FALSE	Inputs not valid because of timeout
error	Bool	FALSE	TRUE: An error occurred while processing the FB



## 4.12 TwoWayActuator

### 4.12.1 LBC\_typeTwoWayActuatorConfiguration (UDT)

#### Description

Module related configuration parameters

#### Parameter description

Identifier	Data Type	Default Value	Description
referenceDesignator	String[20]	'TwoWayAct'	Device name or device ID
monitoringLeavingFeedb ack	Time	T#5s	Control time for leaving the "start of movement" position
monitoringReachingFeed back	Time	T#5s	Control time for reaching the "end of movement" position
setOutputHomeContinuo usly	Bool	TRUE	TRUE: Output home is set as long as command home is present. FALSE: Output has just an impulse as long as the actuator has not reached the position and is moving
setOutputWorkContinuou sly	Bool	TRUE	TRUE: Output work is set as long as command work is present. FALSE: Output has just impulse as long as the actuator has not reached the position and is moving
disableHomeCommand	Bool	FALSE	TRUE: Disable command for home position. Actuator starts moving to home position when `commandWorkPos` is set to FALSE
disableFeedbackHomePo s	Bool	FALSE	TRUE: Disable the monitoring of the Home position feedback. FALSE: Home position is reached after `monitoringReachingFeedback` time expires.
disableFeedbackWorkPo s	Bool	FALSE	TRUE: Disable the monitoring of the Work position feedback. FALSE: Work position is reached after `monitoringReachingFeedback` time expires.
disableAlarms	Bool	FALSE	TRUE: Disable the alarms of the block
resetOutputsOnError	Bool	FALSE	TRUE: in case of an error the outputs are be reset and the error has to be acknowledged before further processing is possible

### 4.12.2 LBC\_typeTwoWayActuatorInterface (UDT)

#### Description

Module interface for external systems

#### Parameter description

Identifier	Data Type	Default Value	Description
commands	LBC_typeInterfaceCommands	default	Module related commands from external systems
configuratio n	LBC_typeTwoWayActuatorConfi guration	default	Module related configuration parameters

## 4 PLC data types

Identifier	Data Type	Default Value	Description
monitoring	LBC_typeTwoWayActuatorProcessValues	default	Module related monitoring information
diagnostics	LBC_typeDiagnostics	default	Module related diagnostic information

### 4.12.3 LBC\_typeTwoWayActuatorProcessValues (UDT)

#### Description

Module related monitoring information

#### Parameter description

Identifier	Data Type	Default Value	Description
enable	Bool	FALSE	TRUE: Enable functionality of FB
commandHomePos	Bool	FALSE	TRUE: Move the actuator to home position
commandWorkPos	Bool	FALSE	TRUE: Move the actuator to work position
feedbackHomePos	Bool	FALSE	TRUE: Feedback that the actuator is in home position
feedbackWorkPos	Bool	FALSE	TRUE: Feedback that the actuator is in work position
goToHomePos	Bool	FALSE	TRUE: Control output to move to actuator to home position
goToWorkPos	Bool	FALSE	TRUE: Control output to move to actuator to work position
inHomePos	Bool	FALSE	TRUE: Actuator is in home position
inWorkPos	Bool	FALSE	TRUE: Actuator is in work position
error	Bool	FALSE	TRUE: An error occurred while processing the FB

## 5 Appendix

### 5.1 Service and support

#### Industry Online Support

Do you have any questions or need assistance?

Siemens Industry Online Support offers round the clock access to our entire service and support know-how and portfolio.

The Industry Online Support is the central address for information about our products, solutions and services.

Product information, manuals, downloads, FAQs, application examples and videos, all information is accessible with just a few mouse clicks:

<https://support.industry.siemens.com>

#### Technical Support

The Technical Support of Siemens Industry provides you fast and competent support regarding all technical queries with numerous tailor-made offers - ranging from basic support to individual support contracts. Please send queries to

Technical Support via Web form:

<https://www.siemens.com/industry/supportrequest>

#### SITRAIN - Digital Industry Academy

We support you with our globally available training courses for industry with practical experience, innovative learning methods and a concept that's tailored to the customer's specific needs.

For more information on our offered trainings and courses, as well as their locations and dates, refer to our web page:

<https://www.siemens.com/sitrain>

#### Service offer

Our range of services includes the following:

- Plant data services
- Spare parts services
- Repair services
- On-site and maintenance services
- Retrofitting and modernization services
- Service programs and contract's

You can find detailed information on our range of services in the service catalog web page:

<https://support.industry.siemens.com/cs/sc>

#### Industry Online Support app

You will receive optimum support wherever you are with the "Siemens Industry Online Support" app. The app is available for iOS and Android:

<https://support.industry.siemens.com/cs/ww/en/sc/2067>

## 5.2 Links and Literature

No.	Topic
\1\	Siemens Industry Online Support <a href="https://support.industry.siemens.com">https://support.industry.siemens.com</a>
\2\	Link to the entry page of the application example <a href="https://support.industry.siemens.com/cs/ww/en/view/109792175">https://support.industry.siemens.com/cs/ww/en/view/109792175</a>
\3\	Programming Guidelines and Programming Style guide for SIMATIC S7-1200 and S7-1500 <a href="https://support.industry.siemens.com/cs/ww/en/view/81318674">https://support.industry.siemens.com/cs/ww/en/view/81318674</a>
\4\	Guideline on Library Handling in Tia Portal <a href="https://support.industry.siemens.com/cs/ww/en/view/109747503">https://support.industry.siemens.com/cs/ww/en/view/109747503</a>
\5\	Libraries in the TIA Portal <a href="https://support.industry.siemens.com/cs/ww/en/view/109738702">https://support.industry.siemens.com/cs/ww/en/view/109738702</a>

## 5.3 Change documentation

### Versioning of the library

The library and library elements are maintained in accordance with the table below:

P	a.	b.	c.
	Non-compatible change	Compatible change	Error correction
	<ul style="list-style-type: none"> <li>- Reduction of interfaces</li> <li>- Changing the interfaces</li> <li>- Incompatible extension of functionality</li> </ul>	<ul style="list-style-type: none"> <li>- Extension of the interfaces</li> <li>- Compatible extension of functionality</li> </ul>	<ul style="list-style-type: none"> <li>- Bug fix</li> </ul>

### Versioning example

Example for changing the version:

Library	FB1	FB2	FC1	FC2	Comment
1.0.0	1.0.0	1.0.0	1.0.0	-	Released
1.0.1	1.0.1	1.0.0	1.0.0	-	Troubleshooting of FB1
1.0.2	1.0.1	1.0.1	1.0.0	-	Optimization of FB2
1.1.0	1.1.0	1.0.1	1.0.0	-	Extension to FB1
1.2.0	1.2.0	1.0.1	1.0.0	-	Extension to FB1
2.0.0	2.0.0	1.0.1	2.0.0	-	New functionality on FB1 and FC1
2.0.1	2.0.0	1.0.2	2.0.0	-	Troubleshooting FB2
3.0.0	2.0.0	1.0.2	2.0.0	1.0.0	New function FC2
3.0.1	2.0.1	1.0.3	2.0.1	1.0.1	Upgrade to new TIA Portal version
3.0.2	2.0.2	1.0.4	2.0.2	1.0.1	New functions, bug fixes

## 6 Change log

Version & Date	Change description
<b>V1.0.0</b> 03/2021	<b>NEW:</b> LBC_AnalogInput / V01.00.00 LBC_AnalogOutput / V01.00.00 LBC_AnalogScale / V01.00.00 LBC_DigitalSignal / V01.00.00 LBC_DriveControl_StdPlc / V01.00.00 LBC_DriveControl_TecPlc / V01.00.00 LBC_MotorStarter / V01.00.00 LBC_StarDeltaStarter / V01.00.00 LBC_ThreeWayActuator / V01.00.00 LBC_TwoHandControl / V01.00.00 LBC_TwoWayActuator / V01.00.00