

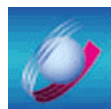
# Lenze

*Manual*

IEC 61131-3

*inside*

***Global Drive  
PLC Developer Studio***



***Global Drive***

*Function library*

*LenzeDrive.lib*

The function library **LenzeDrive.lib** can be used for the following Lenze PLC devices:

	<b>Type</b>	<b>as of hardware version</b>	<b>as of software version</b>
<b>9300 Servo PLC</b>	EVS93XX-xI	2K	1.0
<b>9300 Servo PLC</b>	EVS93XX-xT	2K	1.0
<b>Drive PLC</b>	EPL10200	VA	1.0
<b>ECSxA</b>	ECSxAxxx	1C	7.0

### **Important note:**

The software is supplied to the user as described in this document. Any risks resulting from its quality or use remain the responsibility of the user. The user must provide all safety measures protecting against possible maloperation.

We do not take any liability for direct or indirect damage, e.g. profit loss, order loss or any loss regarding business.

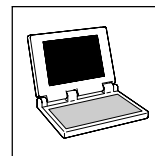
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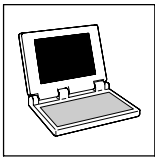
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Version 1.7 07/2006



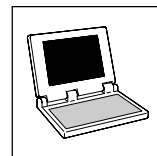
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# Function library LenzeDrive.lib

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# 1 Preface and general information

## 1.1 About this Manual

This Manual contains information on the function blocks that are included in the function library **LenzeDrive.lib** for the **Drive PLC Developer Studio**.

- These function blocks can be used in the **9300 Servo PLC, Drive PLC** and **ECSxA** automation system.
- The function blocks are based on the functions that are available in the 9300 servo inverter (V2.0).

In the **Drive PLC Developer Studio** (DDS) you make the basic settings for your drive application *offline* by using variables (in accordance with the IEC61131-3 standard) as aids for parameterizing the appropriate function blocks.

Via **Global Drive Control** (GDC) or the **keypad** you can then set the parameters for the required functionality of your drive application *online* by accessing the codes of the function block instances.

### 1.1.1 Conventions used in this Manual

This Manual uses the following conventions to distinguish between different types of information:

#### Variable names

are written in italics in the explanation:

- "The signal at *nln\_a* ..."

#### Lenze functions/function blocks

can be recognized by their names. They always begin with an "L\_":

- "The FB **L\_ARIT** can ..."

#### Program listings

are written in "Courier", keywords are printed in bold:

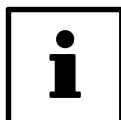
- "**IF** (ReturnValue < 0) **THEN**..."

#### Instances

For function blocks that have one or more first instances there are tables that describe the corresponding codes:

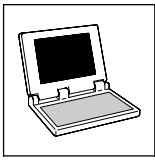
Variable name	L_ARIT1	L_ARIT2		Setting range	Lenze
byFunction	C0338	C0600		0 ... 5	1

You can access these codes *online* with **Global Drive Control** (GDC) or **keypad**.



#### Tip!

You can use the Parameter Manager to assign the same codes to these instances that are assigned in the 9300 servo inverter (V2.0).



# Function library LenzeDrive.lib

## Preface and general information

### About this Manual

### 1.1.2 Description layout

All function/function block and system block descriptions contained in this Manual have the same structure:

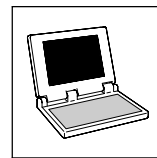
	Function	Function block (FB)/ system block (SB)	
	①	Heading stating function and function identifier	
	②	Declaration of the function: <ul style="list-style-type: none"> <li>• Data type of the return value</li> <li>• Function identifier</li> <li>• List of transfer parameters</li> </ul>	-
	③	Short description of the most important properties	
	④	Function chart including all associated variables <ul style="list-style-type: none"> <li>• Transfer parameters</li> <li>• Return value</li> </ul>	FB/SB chart including all associated variables <ul style="list-style-type: none"> <li>• Input variables</li> <li>• Output variables</li> </ul>
	⑤	Table giving information about the transfer parameters: <ul style="list-style-type: none"> <li>• Identifiers</li> <li>• Data type</li> <li>• Possible settings</li> <li>• Info</li> </ul>	Table giving information about the input and output variables: <ul style="list-style-type: none"> <li>• Identifiers</li> <li>• Data type</li> <li>• Variable type</li> <li>• Possible settings</li> <li>• Info</li> </ul>
	⑥	Table giving information about the return value: <ul style="list-style-type: none"> <li>• Data type of the return value</li> <li>• Possible return values and their meaning</li> </ul>	-
	⑦	Additional information (Notes, tips, application examples, etc.)	

### 1.1.3 Pictographs used in this Manual

	Pictographs used	Signal words	
Warning of material damage		Stop!	Warns of <b>potential damage to material</b> . Possible consequences if disregarded: Damage to the controller/drive system or its environment.
Other notes		Tip! Note!	Indicates a tip or note.

### 1.1.4 Terminology used

Term	In the following text used for
DDS	Drive PLC Developer Studio
FB	Function block
GDC	Global Drive Control (parameterization program from Lenze)
Parameter codes	Codes for setting the functionality of a function block
PLC	<ul style="list-style-type: none"> <li>• 9300 Servo PLC</li> <li>• Drive PLC</li> <li>• ECSxA "Application" axis module</li> </ul>
SB	System block



## 1.2 Lenze software guidelines for variable names

The previous concepts for Lenze controllers were based on codes that represented the input and output signals, and the parameters of function blocks.

- For the sake of clarity, names were defined for the codes in the documentation.
- In addition, the signal types were defined by graphical symbols.

The user could see at a glance which kind of signal (analog, phase-angle etc.) had to be present at the particular interface.

**The concept for the new automation system does not use direct codes in the programming. The IEC 61131-3 standard is used instead.**

- This standard is based on a structure of variable names.
- If the user applies variables in his project, then he can name the variables as he chooses.

In order to avoid the growth of a multitude of different conventions for naming variables in existing and future projects and function libraries that are programmed by Lenze personnel, we have set up software guidelines that must be followed by all Lenze staff.

In this convention for creating variable names, Lenze keeps to the Hungarian Notation that has been specifically expanded by Lenze.

If you make use of Lenze-specific functions or function blocks, you will immediately be able to see, for instance, which data type you must transfer to a function block, and which type of data you will receive as an output value.

### 1.2.1 Hungarian Notation

These conventions are used so that the most significant characteristics of a program variable can instantly be recognized from its name.

#### Variable names

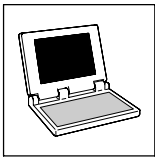
consist of

- a **prefix** (optional)
- a **data-type entry**
- and an **identifier**

The prefix and data-type entry are usually formed by one or two characters. The identifier (the "proper" name) should indicate the application, and is therefore usually somewhat longer.

#### Prefix examples

prefix	Meaning
a	Array (combined type), field
p	Pointer



## Function library *LenzeDrive.lib*

### *Preface and general information*

#### *Lenze software guidelines for variable names*

#### Examples of the data-type entry

Examples of a data-type	Meaning
b	Bool
by	Byte
n	Integer
w	Word
dn	Double integer
dw	Double word
s	String
f	Real (float)
sn	Short integer
t	Time
un	Unsigned integer
udn	Unsigned double integer
usn	Unsigned short integer

#### Identifier (the proper variable name)

- An identifier begins with a capital letter.
- If an identifier is assembled from several "words", then each "word" must start with a capital letter.
- All other letters are written in lower case.

#### Examples:

Array of integers	<i>anJogValue[10]</i> ;
Bool	<i>blsEmpty</i> ;
Word	<i>wNumberOfValues</i> ;
Integer	<i>nLoop</i> ;
Byte	<i>byCurrentSelectedJogValue</i> ;

### 1.2.1.1 Recommendation for designating variable types

In order to be able to recognize the type of variable in a program according to the name, it makes sense to use the following designations, which are placed in front of the proper variable name and separated from it by an underline stroke:

<u>I</u> <Variablename>	VAR_INPUT
<u>Q</u> <Variablename>	VAR_OUTPUT
<u>IQ</u> <Variablename>	VAR_IN_OUT
<u>R</u> <Variablename>	VAR_RETAIN
<u>C</u> <Variablename>	VAR_CONSTANT
<u>CR</u> <Variablename>	VAR_CONSTANT_RETAIN
<u>g</u> <Variablename>	VAR_GLOBAL
<u>gR</u> <Variablename>	VAR_GLOBAL_RETAIN
<u>gC</u> <Variablename>	VAR_GLOBAL_CONSTANT
<u>gCR</u> <Variablename>	VAR_GLOBAL_CONSTANT_RETAIN

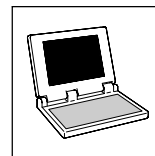
#### Example

for a global array of type integer that includes fixed setpoints (analog) for a speed setting:

*g\_anFixSetSpeedValue\_a*

# Function library LenzeDrive.lib

**Preface and general information**  
Lenze software guidelines for variable names



## 1.2.1.2 Designation of the signal type in the variable name

The inputs and outputs of the Lenze function blocks each have a specific signal type assigned. These may be: digital, analog, position, or speed signals.

For this reason, each variable name has an ending attached that provides information on the type of signal.

Signal type	Ending	Previous designation
analog	_a (analog)	○
digital	_b (binary)	□
Phase-angle difference or speed	_v (velocity)	△
Phase-angle or position	_p (position)	▲



### Tip!

Normalizing to signal type phase-angle difference/speed:  $16384 \text{ (INT)} \triangleq 15000 \text{ rpm}$

Normalizing to signal type analog:  $16384 \triangleq 100 \% \triangleq \text{value under [C0011]} = n_{\text{max}}$

Normalizing to signal type angle or position:  $65536 \triangleq 1 \text{ motor revolution}$

### Examples:

Variable name	Signal type	Type of variable
nIn_a	Analog input value	Integer
dnPhiSet_p	Phase signals	Double integer
bLoad_b	Binary value (TRUE/FALSE)	Bool
nDigitalFrequencyIn_v	Speed input value	Integer

## 1.2.1.3 Special handling of system variables

System variables require special handling, since the system functions are only available for the user as I/O connections in the control configuration.

In order to be able to access a system variable quickly during programming, the variable name must include a label for the system function.

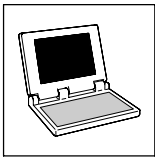
For this reason, the name of the corresponding system block is placed before the name of the variable.

### Examples:

AIN1\_nIn\_a

CAN1\_bCtrlTripSet\_b

DIGIN\_bIn3\_b



## Function library *LenzeDrive.lib*

### *Preface and general information*

#### *Version identifiers of the function library*

## 1.3 Version identifiers of the function library

The version of the function library can be found under the global constant `C_w[Function library name]Version`.

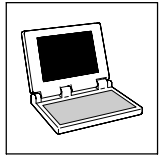
Version identifiers as of PLC software version 7.x:

Constant	Meaning	Example value
<code>C_w[FunctionLibraryName]VersionER</code>	External Release	01
<code>C_w[FunctionLibraryName]VersionEL</code>	External Level	05
<code>C_w[FunctionLibraryName]VersionIR</code>	Internal Release	00
<code>C_w[FunctionLibraryName]VersionBN</code>	Build No.	00

Version: 01 05 00 00

The value of this constant is a hexadecimal code.

- In the example, "01050000" stands for version "1.05".



## 2 Function blocks

---



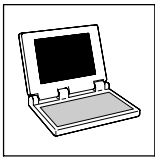
### Note!

Due to their internal structure, the below function blocks have to be called in a time-equidistant task (e.g. in a 5-ms task):

- L\_DIGDEL
- L\_DT1\_
- L\_MPOT
- L\_NSET
- L\_ParRead
- L\_ParWrite
- L\_PCTRL
- L\_PHDIFF
- L\_PHINT
- L\_PHINTK
- L\_PT1\_
- L\_RFG
- L\_SRFG
- L\_TRANS

**Caution: The cyclic task PLC\_PRG is not time-equidistant!**

---



## Function library LenzeDrive.lib

### General signal processing

#### Programming fixed setpoints (L\_FIXSET)

## 2.1 General signal processing

### 2.1.1 Programming fixed setpoints (L\_FIXSET)

You can program up to 15 fixed setpoints with this FB. The addressing of the setpoint that is to be output is made through the boolean (logic) inputs.

Fixed setpoints can be used, for example, for:

- Different set dancer positions in a dancer position control
- Different stretch ratios (gearbox factor) when using a speed ratio control with digital frequency coupling

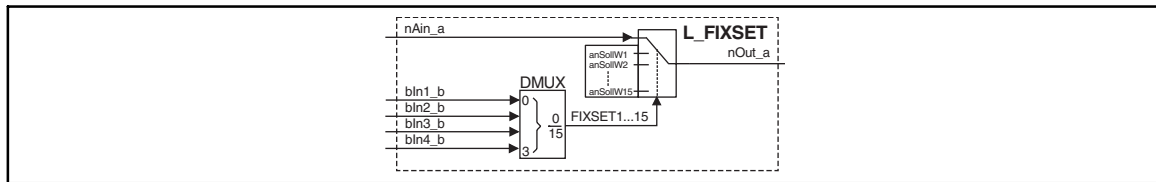


Fig. 2-1 Programming fixed setpoints (L\_FIXSET)

VariableName	DataType	SignalType	VariableType	Note
nAin_a	Integer	analog	VAR_INPUT	nAin_a is connected to nOut_a , if (bln1_b ... bln4_b) FALSE is on all the selection inputs.
bln1_b	Bool	binary	VAR_INPUT	The number of inputs to be assigned depends on the number of required fixed setpoints.
bln2_b	Bool	binary	VAR_INPUT	
bln3_b	Bool	binary	VAR_INPUT	
bln4_b	Bool	binary	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	
anSolIW[1...15]	Array of integers		VAR CONSTANT RETAIN	Variable that can have fixed setpoints assigned to them.

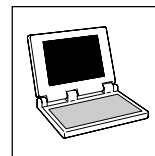
#### Parameter codes of the instances

VariableName	L_FIXSET1		SettingRange	Lenze
anSolIW[1...15]	C0560/1 ... 15		-199.99 ... 199.99 %	0.00

#### Function

nOut\_a can be used as a setpoint source (signal source) for another FB (e.g. process controller, arithmetic block, etc.). The parameterization and handling is the same as for JOG, but it is independent of JOG. (☐ 2-73: L\_NSET)

- Parameterization of the fixed setpoints
  - The individual fixed setpoints can be parameterized through anSolIW1 ... anSolIW15.
- Output of the selected fixed setpoint:
  - If the binary inputs are triggered with a HIGH signal, a fixed setpoint from the table is switched to nOut\_a . (☐ 2-3)
- Range:
  - You can enter values from -199.99% ... 199.99% (100 % corresponds to 16384).

**Function library LenzeDrive.lib****General signal processing**  
**Programming fixed setpoints (L\_FIXSET)****2.1.1.1 Enable of the fixed setpoints**

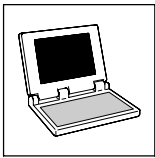
Number of required fixed setpoints	Number of the inputs to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

Decoding table of the binary input signals:

Output signal nOut_a =	1st input bln1_b	2nd input bln2_b	3rd input bln3_b	4th input bln4_b
nAin_a	0	0	0	0
anSolIW1	1	0	0	0
anSolIW2	0	1	0	0
anSolIW3	1	1	0	0
anSolIW4	0	0	1	0
anSolIW5	1	0	1	0
anSolIW6	0	1	1	0
anSolIW7	1	1	1	0
anSolIW8	0	0	0	1
anSolIW9	1	0	0	1
anSolIW10	0	1	0	1
anSolIW11	1	1	0	1
anSolIW12	0	0	1	1
anSolIW13	1	0	1	1
anSolIW14	0	1	1	1
anSolIW15	1	1	1	1

0 = FALSE

1 = TRUE



## Function library *LenzeDrive.lib*

### Analog signal processing

#### Absolute value generation (L\_ABS)

## 2.2 Analog signal processing

### 2.2.1 Absolute value generation (L\_ABS)

This FB converts bipolar values into unipolar values. It calculates the absolute value of the input signal.

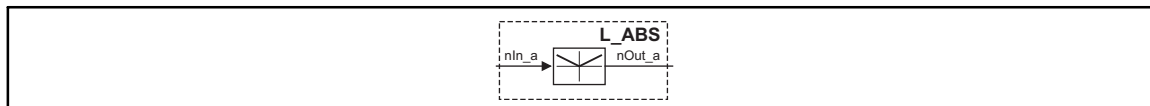
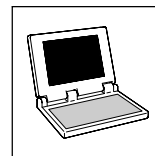


Fig. 2-2

Absolute value generation (L\_ABS)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	

**Function library LenzeDrive.lib****Analog signal processing**  
**Addition (L\_ADD)****2.2.2 Addition (L\_ADD)**

This FB adds or subtracts input values, depending on the input that is used.

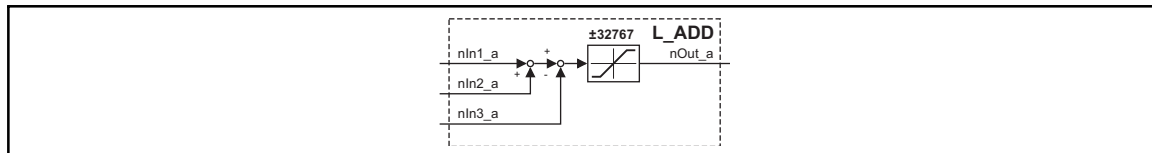


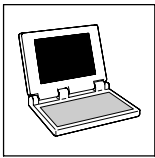
Fig. 2-3

Addition (L\_ADD)

VariableName	DataType	SignalType	VariableType	Note
nIn1_a	Integer	analog	VAR_INPUT	Addition input
nIn2_a	Integer	analog	VAR_INPUT	Addition input
nIn3_a	Integer	analog	VAR_INPUT	Subtraction input
nOut_a	Integer	analog	VAR_OUTPUT	Signal is limited to $\pm 32767$ .

**Functional sequence**

1. The value at *nIn1\_a* is added to the value of *nIn2\_a*.
2. The value of *nIn3\_a* is subtracted from the calculated result.
3. The result of the subtraction is then limited to  $\pm 32767$ .



## Function library *LenzeDrive.lib*

### Analog signal processing

#### Input gain and offset (L\_AIN)

### 2.2.3 Input gain and offset (L\_AIN)

This FB is preferentially used for addition circuitry at the analog input terminals, to adjust the gain and offset.

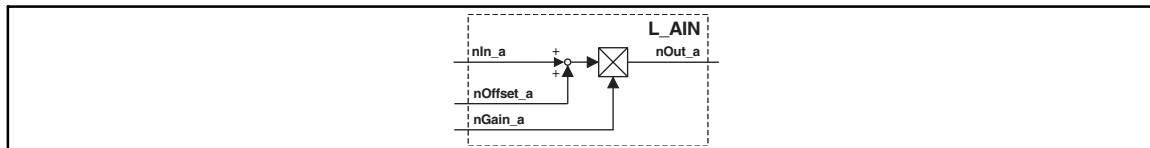


Fig. 2-4 Input gain and offset (L\_AIN)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	Input signal
nOffset_a	Integer	analog	VAR_INPUT	Offset of the input signal
nGain_a	Integer	analog	VAR_INPUT	Gain of the input signal
nOut_a	Integer	analog	VAR_OUTPUT	

#### Function

- Offset
  - The value at *nOffset\_a* is added to the value of *nIn\_a*
  - The result of the addition is limited to  $\pm 32767$ .
- Gain
  - The limited value (after the offset) is multiplied by the value at *nGain\_a*.
  - Next, the signal is limited to  $\pm 32767$ .
- The signal is given out at *nOut\_a*.

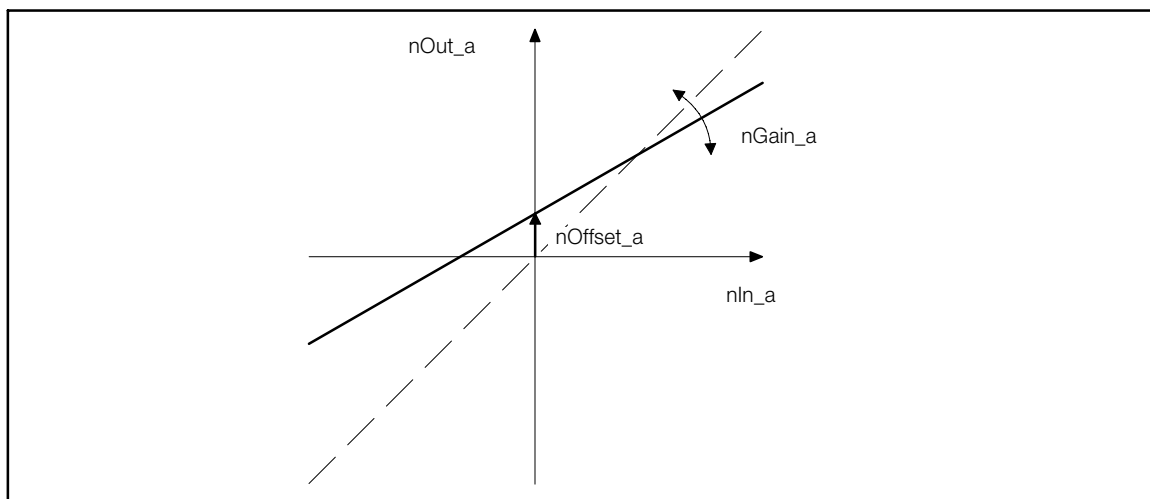
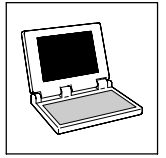
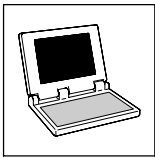


Fig. 2-5 Offset and gain of the analog input

**Function library LenzeDrive.lib****Analog signal processing**  
**Input gain and offset (L\_AIN)****Funtion in IL**

```
LD nIn_a
INT_TO_DINT
ADD (nOffset_a
INT_TO_DINT
)
LIMIT -32767,32767
MUL (nGain_a
INT_TO_DINT
)
DIV 16384
LIMIT -32767,32767
DINT_TO_INT
ST nOut_a
```



## Function library *LenzeDrive.lib*

### Analog signal processing

#### Inversion (L\_ANEG)

### 2.2.4 Inversion (L\_ANEG)

This FB inverts the sign of an input value. The input value is multiplied by -1 and then output.

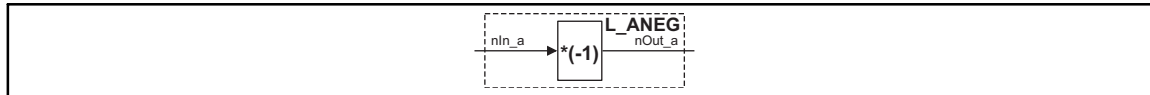


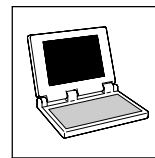
Fig. 2-6

Inversion (L\_ANEG)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	

## Function library LenzeDrive.lib

Analog signal processing  
Output gain and offset (L\_AOUT)



### 2.2.5 Output gain and offset (L\_AOUT)

This FB is preferentially used for additional circuitry at analog output terminals, to adjust the gain and offset.

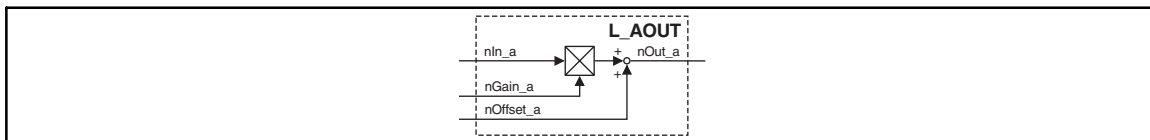


Fig. 2-7 Output gain and offset (L\_AOUT)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	Input signal
nGain_a	Integer	analog	VAR_INPUT	Gain of the input signal
nOffset_a	Integer	analog	VAR_INPUT	Offset of the input signal
nOut_a	Integer	analog	VAR_OUTPUT	

#### Function

- Gain
  - The value at  $nIn_a$  is multiplied by the value at  $nGain_a$  .
  - The multiplication is performed according to the formula:
 
$$16384 \cdot 16384 \cdot 2^{-14} = 16384 \quad [100 \% \cdot 100 \% = 100 \%]$$
  - The result of the multiplication is limited to  $\pm 2^{14}$
- Offset
  - The limited value (after amplification) is added to the value at  $nOffset_a$
  - The result of the addition is limited to  $\pm 2^{14}$
- Next, the signal is limited to  $\pm 2^{14}$  and output to  $nOut_a$  .

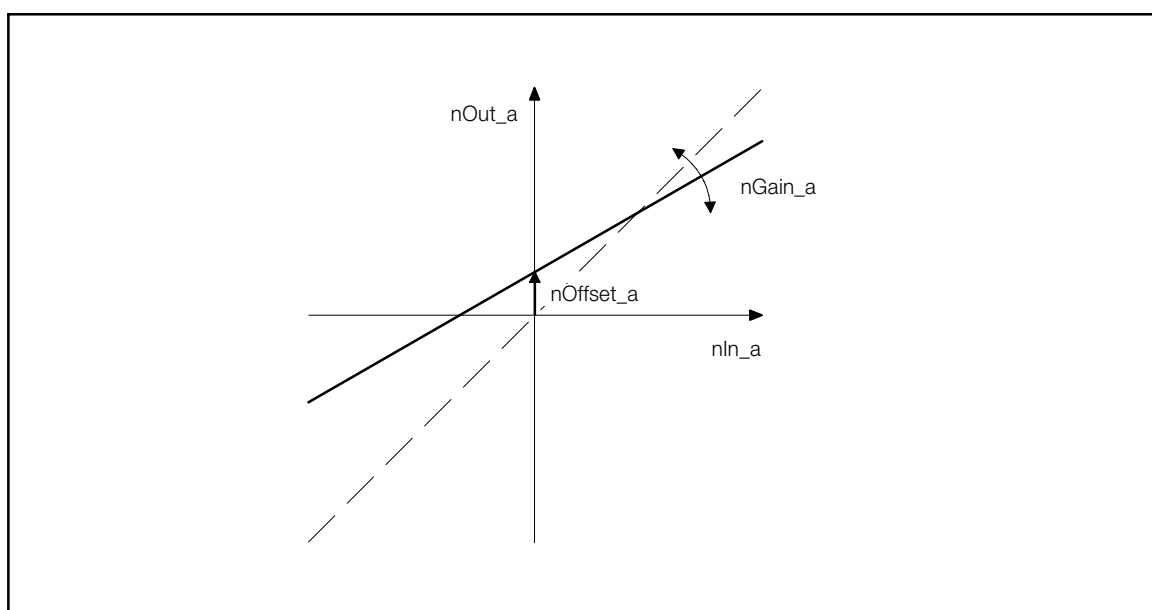
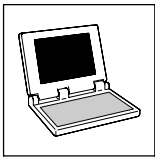


Fig. 2-8 Offset and gain of the analog output



## **Function library LenzeDrive.lib**

### **Analog signal processing**

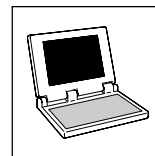
#### **Output gain and offset (L\_AOUT)**

#### **Function in IL**

```
LD  nIn_a
INT_TO_DINT
MUL  (nGain_a
INT_TO_DINT
)
DIV  -32767,32767
ADD  (nOffset_a
INT_TO_DINT
)
LIMIT  -32767,32767
DINT_TO_INT
ST  nOut_a
```

# Function library LenzeDrive.lib

Analog signal processing  
Arithmetic (L\_ARIT)



## 2.2.6 Arithmetic (L\_ARIT)

This FB can arithmetically combine two analog signals.

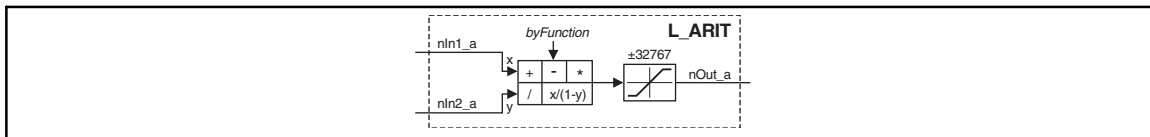


Fig. 2-9

Arithmetic (L\_ARIT)

VariableName	DataType	SignalType	VariableType	Note
nIn1_a	Integer	analog	VAR_INPUT	
nIn2_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	The signal is limited to $\pm 32767$ .
byFunction	Byte		VAR CONSTANT RETAIN	Selection of the function

### Parameter codes of the instances

VariableName	L_ARIT1	L_ARIT2	SettingRange	Lenze
byFunction	C0338	C0600	0 ... 5	1

### Function

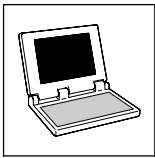
Selection of the function	Arithmetic function	Notes
byFunction = 0	$nOut\_a = nIn1\_a$	
byFunction = 1	$nOut\_a = nIn1\_a + nIn2\_a$	
byFunction = 2	$nOut\_a = nIn1\_a - nIn2\_a$	
byFunction = 3	$nOut\_a = \frac{(nIn1\_a) \cdot (nIn2\_a)}{16384}$	
byFunction = 4	$nOut\_a = \frac{nIn1\_a}{nIn2\_a} \cdot 164$	If the denominator = 0, the denominator is set = 1.
byFunction = 5	$nOut\_a = \frac{nIn1\_a}{16384 - nIn2\_a} \cdot 16384$	

### Function in ST

```

CASE byFunktion OF
0: nOut_a:=nIn1_a;
1: nOut_a:= DINT_TO_INT ( LIMIT (-32767, ( INT_TO_DINT (nIn1_a)+ INT_TO_DINT (nIn2_a)),32767));
2: nOut_a:= DINT_TO_INT ( LIMIT (-32767, ( INT_TO_DINT (nIn1_a)- INT_TO_DINT (nIn2_a)),32767));
3: nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)* INT_TO_DINT (nIn2_a))/16384),32767));
4: IF (nIn2_a=0) THEN
nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)*164),32767));
ELSE
nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)*164)/ ABS (nIn2_a)),32767));
END_IF
5: IF (16384- INT_TO_DINT (nIn2_a)=0) THEN
nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)*16384),32767));
ELSIF (16384- INT_TO_DINT (nIn2_a)>32767) THEN
nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)*16384/32767),32767));
ELSIF (16384- INT_TO_DINT (nIn2_a)<=-32767) THEN
nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)*16384/-32767),32767));
ELSE
nOut_a:= DINT_TO_INT ( LIMIT (-32767, (( INT_TO_DINT (nIn1_a)*16384)/(16384- INT_TO_DINT (nIn2_a)))
END_IF
END_CASE ;

```



## Function library LenzeDrive.lib

### Analog signal processing

#### Changeover (L\_ASW)

### 2.2.7 Changeover (L\_ASW)

This FB switches between two integer values. So it is, for example, possible to change between an initial diameter and a calculated diameter during winding.

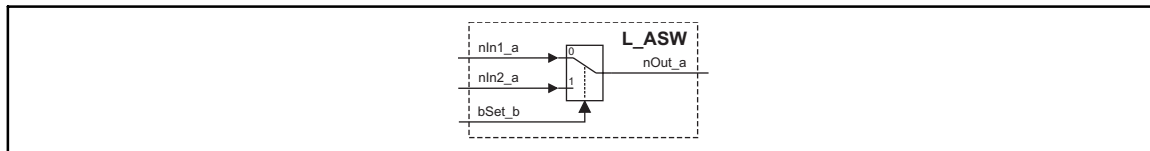


Fig. 2-10

Changeover (L\_ASW)

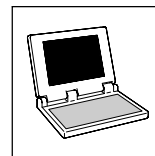
VariableName	DataType	SignalType	VariableType	Note
nIn1_a	Integer	analog	VAR_INPUT	
nIn2_a	Integer	analog	VAR_INPUT	
bSet_b	Bool	binary	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	

#### Function

Control signal	Output signal
bSet_b = TRUE	nOut_a = nIn2_a
bSet_b = FALSE	nOut_a = nIn1_a

# Function library LenzeDrive.lib

Analog signal processing  
Comparison (L\_CMP)



## 2.2.8 Comparison (L\_CMP)

This FB compares two integer values with each other. You can use comparators to implement threshold switches.

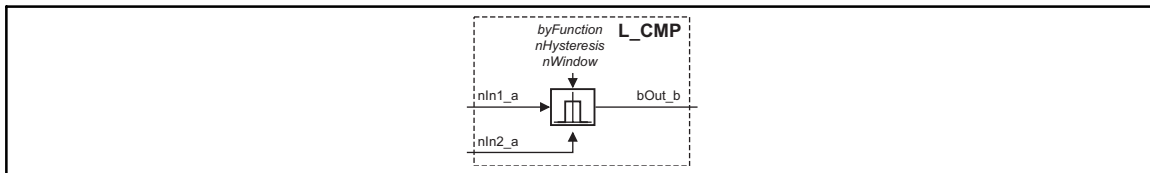


Fig. 2-11 Comparison (L\_CMP)

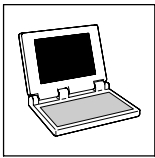
VariableName	DataType	SignalType	VariableType	Note
nln1_a	Integer	analog	VAR_INPUT	
nln2_a	Integer	analog	VAR_INPUT	
bOut_b	Bool	binary	VAR_OUTPUT	
byFunction	Byte		VAR CONSTANT RETAIN	Comparison function for the inputs
nHysteresis	Integer		VAR CONSTANT RETAIN	Hysteresis function
nWindow	Integer		VAR CONSTANT RETAIN	Window function

### Parameter codes of the instances

VariableName	L_CMP1	L_CMP2	L_CMP3	SettingRange	Lenze
byFunction	C0680	C0685	C0690	1 ... 6	6
nHysteresis	C0681	C0686	C0691	0.00 ... 100.00 %	1.00
nWindow	C0682	C0687	C0692	0.00 ... 100.00 %	1.00

### Function

Selection of the function	Comparison function
byFunction = 1	nln1_a = nln2_a
byFunction = 2	nln1_a > nln2_a
byFunction = 3	nln1_a < nln2_a
byFunction = 4	nln1_a   =   nln2_a
byFunction = 5	nln1_a   >   nln2_a
byFunction = 6	nln1_a   <   nln2_a



## Function library *LenzeDrive.lib*

### Analog signal processing

#### Comparison (L\_CMP)

#### 2.2.8.1 Function 1: $nIn1\_a = nIn2\_a$

- Selection: *byFunction* = 1
- This function compares two signals for equality. For instance, you can make the V comparison "actual speed is equal to set speed" ( $n_{act} = n_{set}$ ).
- The exact function can be seen in the diagram. (□Fig. 2-12)

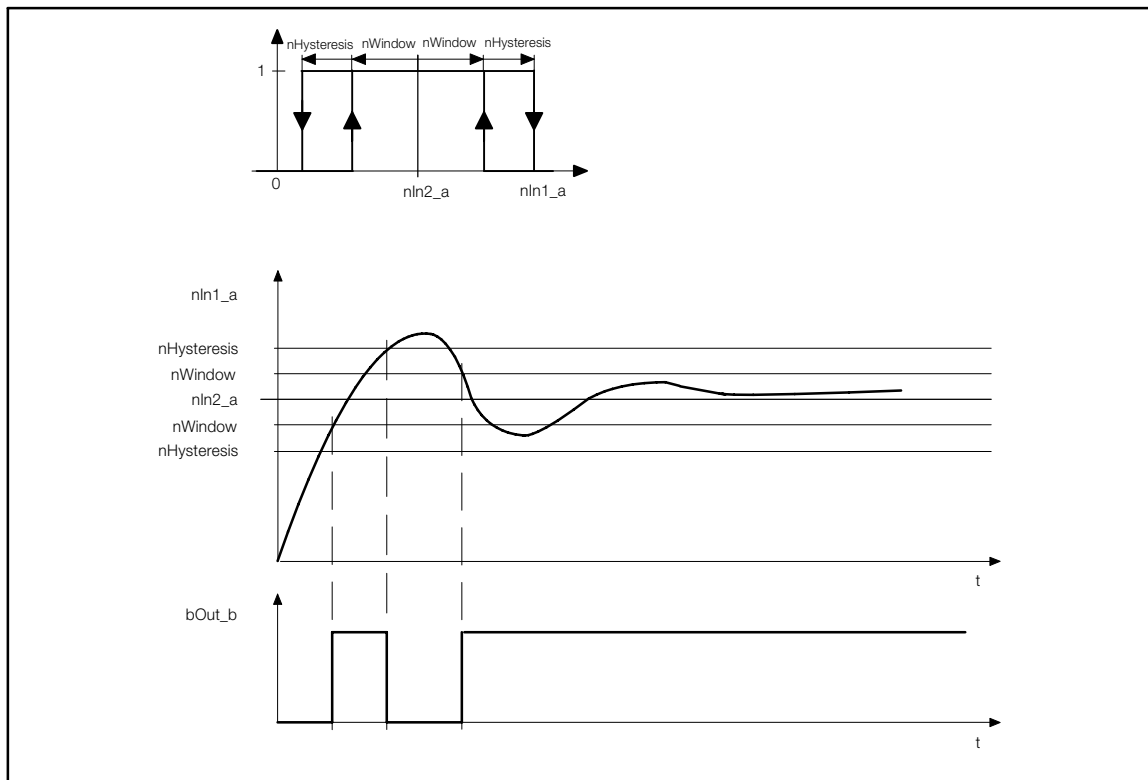


Fig. 2-12

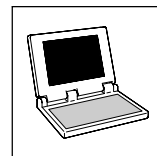
Equality of signals ( $nIn1\_a = nIn2\_a$ )

- Use *nWindow* to set the window within which the equality is valid.
- Use *nHysteresis* to set a hysteresis, if the input signals are not stable and the output oscillates.



#### Note!

With this function, you must use the FB in a fast task, to achieve optimum sampling of the signals.



### 2.2.8.2 Function 2: $nIn1\_a > nIn2\_a$

- Selection: *byFunction* = 2
- With this function, you can make the comparison "actual speed is above a limit" ( $n_{act} > n_x$ ) for one direction of rotation.

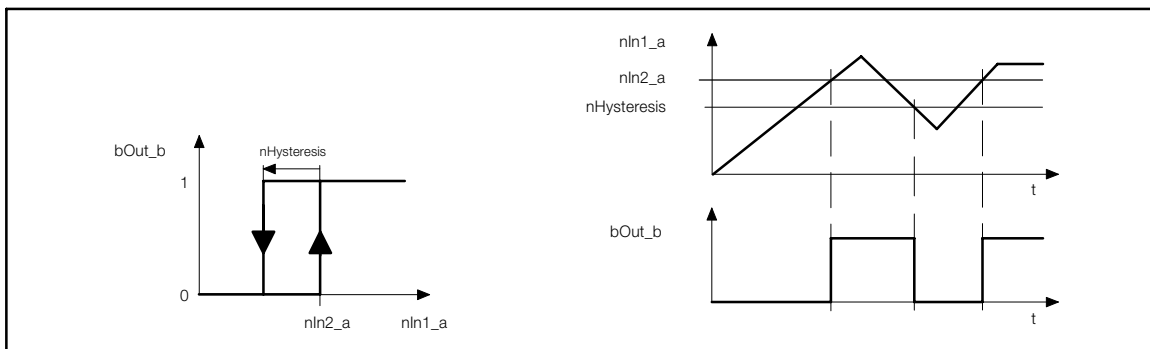


Fig. 2-13

Signal values exceeded ( $nIn1\_a > nIn2\_a$ )

#### Functional sequence

1. If the value at  $nIn1\_a$  is below the value at  $nIn2\_a$ , then  $bOut\_b$  changes from FALSE to TRUE.
2. Only when the signal at  $nIn1\_a$  is above the value of  $nIn2\_a - nHysteresis$  again, will  $bOut\_b$  change from TRUE to FALSE.

### 2.2.8.3 Function 3: $nIn1\_a < nIn2\_a$

- Selection: *byFunction* = 3
- With this function, for instance, you can make the comparison "actual speed is below a limit" ( $n_{act} < n_x$ ) for one direction of rotation.

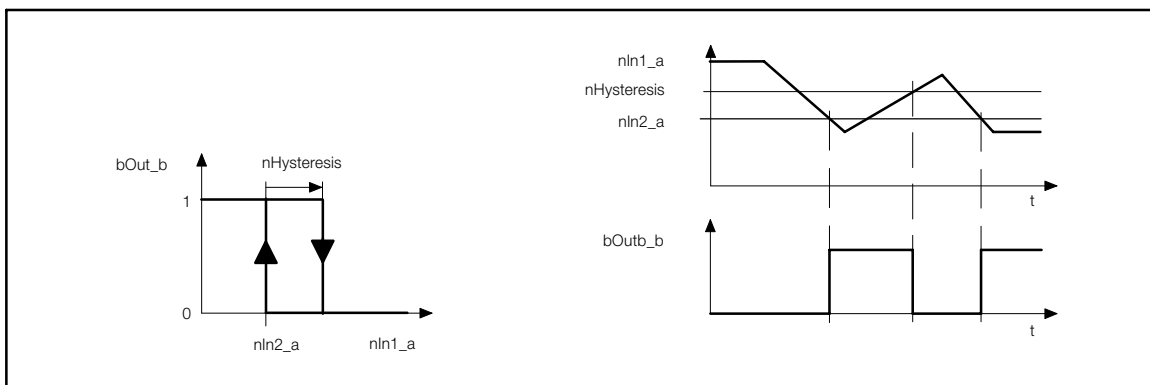
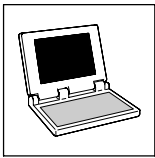


Fig. 2-14

Gone below signal values ( $nIn1\_a < nIn2\_a$ )

#### Functional sequence

1. If the value at  $nIn1\_a$  is below the value at  $nIn2\_a$ , then  $bOut\_b$  changes from FALSE to TRUE.
2. Only when the signal at  $nIn1\_a$  is above the value of  $nIn2\_a + nHysteresis$  again, will  $bOut\_b$  change from TRUE to FALSE.



## Function library LenzeDrive.lib

### Analog signal processing

#### Comparison (L\_CMP)

#### 2.2.8.4 Function 4: $|\text{nl}n1\_a| = |\text{nl}n2\_a|$

- Selection: *byFunction* = 4
- With this function, for instance, you can make the comparison " $n_{\text{act}} = 0$ ".
- This function is the same as function 1. (☞ 2-14)
  - However, the absolute value of the input signals (without sign) is generated here before the signal processing.

#### 2.2.8.5 Function 5: $|\text{nl}n1\_a| > |\text{nl}n2\_a|$

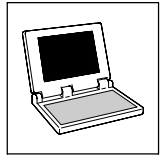
- Selection: *byFunction* = 5
- With this function, for instance, you can make the comparison " $n_{\text{act}} > |n_x|$ " independently of the direction of rotation.
- This function is the same as function 2. (☞ 2-15)
  - However, the absolute value of the input signals (without sign) is generated here before the signal processing.

#### 2.2.8.6 Function 6: $|\text{nl}n1\_a| < |\text{nl}n2\_a|$

- Selection: *byFunction* = 6
- With this function, you can make the comparison " $n_{\text{act}} < |n_x|$ " independently of the direction of rotation.
- This function is the same as function 3. (☞ 2-15)
  - However, the absolute value of the input signals (without sign) is generated here before the signal processing.

# Function library LenzeDrive.lib

Analog signal processing  
Curve function (L\_CURVE)



## 2.2.9 Curve function (L\_CURVE)

This FB converts an analog signal into a characteristic curve.

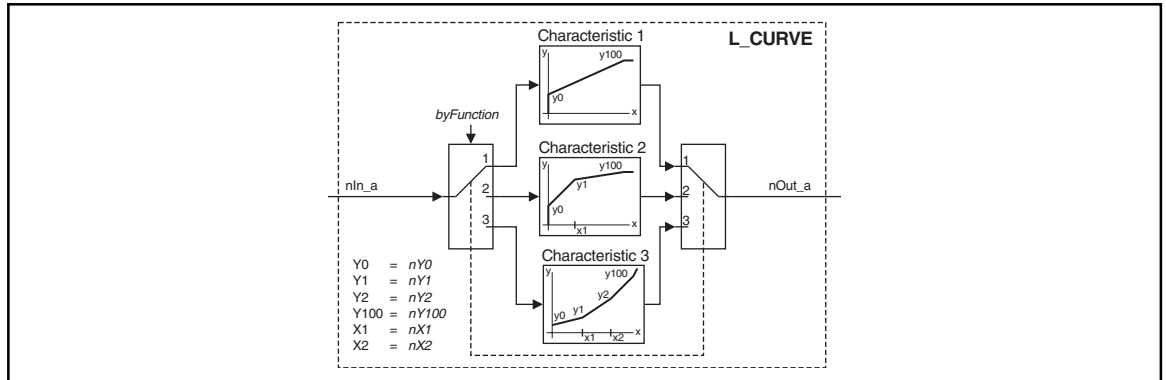


Fig. 2-15 Curve function (L\_CURVE)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	
byFunction	Byte		VAR_CONSTANT_RETAIN	Selection of the characteristic/curve function
nY0	Integer		VAR_CONSTANT_RETAIN	Entry of Y0 from vector (0, Y0)
nY1	Integer		VAR_CONSTANT_RETAIN	Entry of Y1 from vector (X1, Y1)
nY2	Integer		VAR_CONSTANT_RETAIN	Entry of Y2 from vector (X2, Y2)
nY100	Integer		VAR_CONSTANT_RETAIN	Entry of Y100 from vector (16384, Y100)
nX1	Integer		VAR_CONSTANT_RETAIN	Entry of X1 from vector (X1, Y1)
nX2	Integer		VAR_CONSTANT_RETAIN	Entry of X2 from vector (X2, Y2)

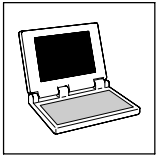
### Parameter codes of the instances

VariableName	L_CURVE1	SettingRange	Lenze
byFunction	C0960	1 ... 3	1
nY0	C0961	0 ... 199.99 %	0.00
nY1	C0962	0 ... 199.99 %	50.00
nY2	C0963	0 ... 199.99 %	75.00
nY100	C0964	0 ... 199.99 %	100.00
nX1	C0965	0.01 ... 99.99 %	50.00
nX2	C0966	0.01 ... 99.99 %	75.00

### Function

Selection of the function	Curve function	Informationen for entry of the interpolation points
byFunction = 1	Characteristic with two co-ordinates	Fig. 2-16
byFunction = 2	Characteristic with three co-ordinates	Fig. 2-17
byFunction = 3	Characteristic with four interpolatio points	Fig. 2-18

- 100% corresponds to 16384.
- A linear interpolation is carried out between the co-ordinates.
- For negative values at *nIn\_a* the settings of the interpolation points are processed inversely (see line diagrams).
  - If this is not required, insert an FB **L\_ABS** or an FB **L\_LIM** before or after the FB **L\_CURVE**.



## Function library LenzeDrive.lib

Analog signal processing

Curve function (L\_CURVE)

### 2.2.9.1 Characteristic with two co-ordinates

byFunction = 1

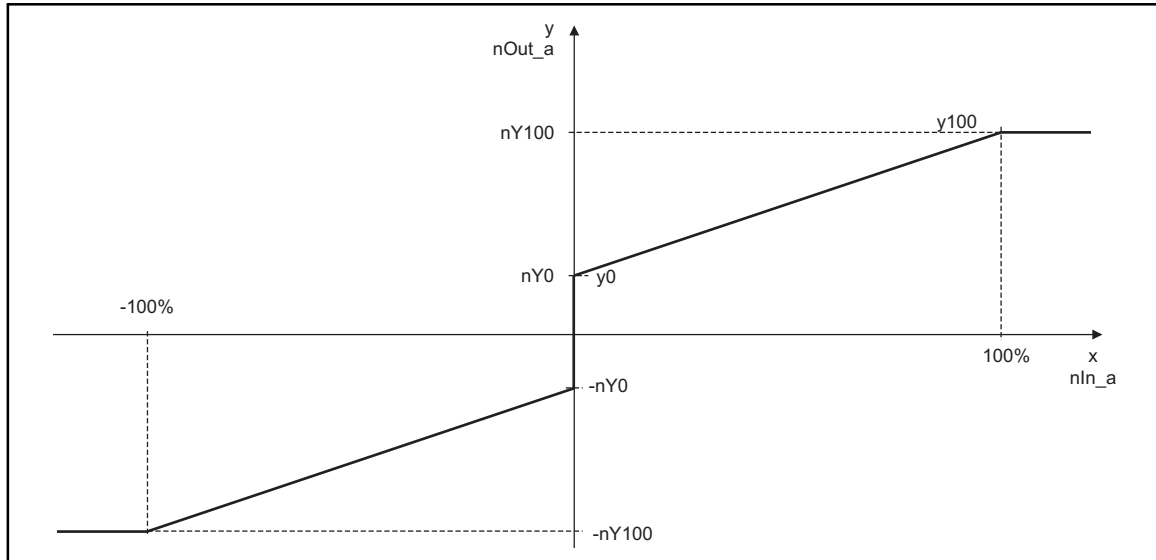


Fig. 2-16 Line diagram with 2 co-ordinates

### 2.2.9.2 Characteristic with three co-ordinates

byFunction = 2

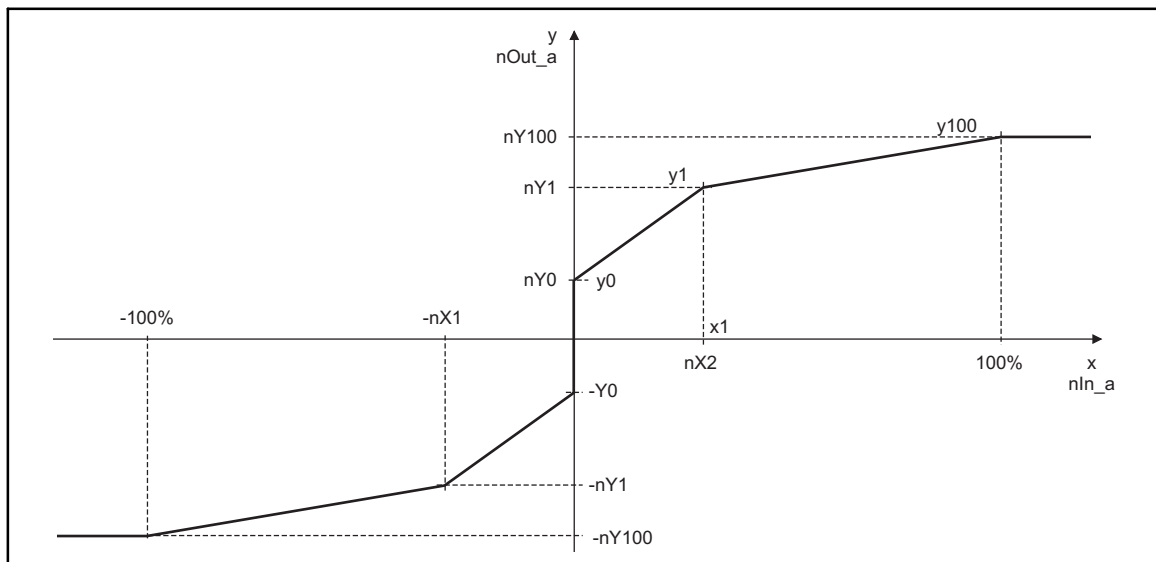
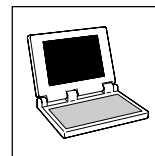


Fig. 2-17 Line diagram with 3 co-ordinates



### 2.2.9.3 Characteristic with four co-ordinates

*byFunction = 3*

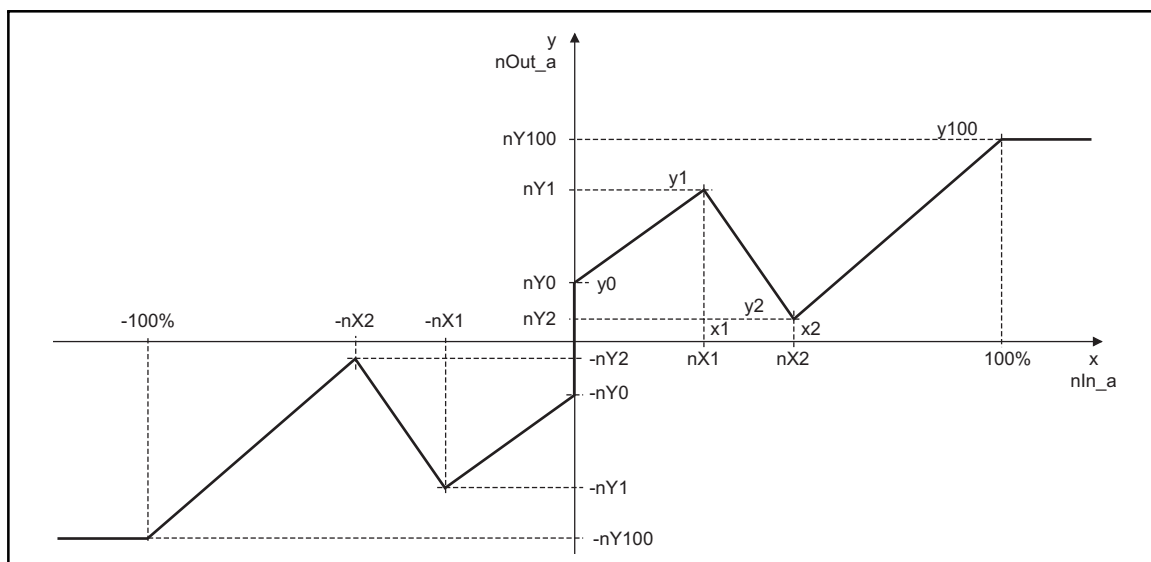
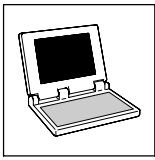


Fig. 2-18 Line diagram characteristic with 4 co-ordinates



# Function library LenzeDrive.lib

## Analog signal processing

### Dead-band (L\_DB)

#### 2.2.10 Dead-band (L\_DB)

This FB eliminates disturbances around the zero point (e.g. interfering influences on analog input voltages).

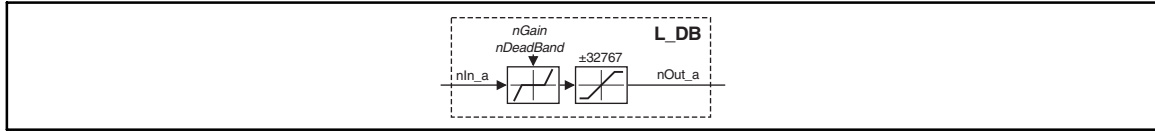


Fig. 2-19 Dead band (L\_DB)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	The signal is limited to ±32767.
nGain	Integer	-	VAR CONSTANT RETAIN	Gain
nDeadBand	Integer	-	VAR CONSTANT RETAIN	Dead band

#### Parameter codes of the instances

VariableName	L_DB1			SettingRange	Lenz
nGain	C0620			-10.00 ... 10.00	1.00
nDeadBand	C0621			0 ... 100.00 %	1.00

#### Function

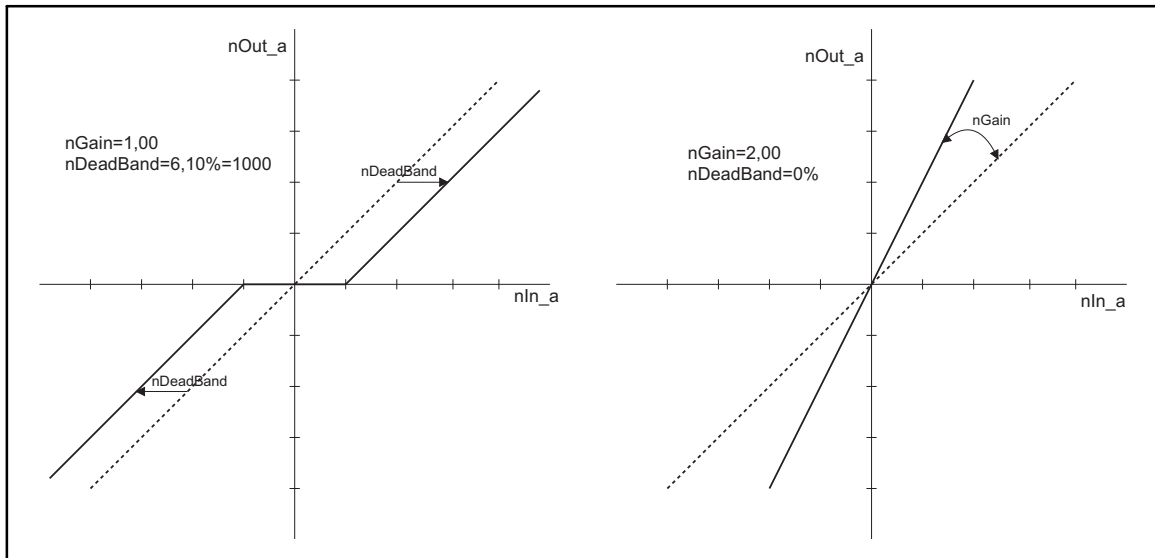
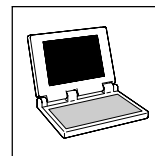


Fig. 2-20 Dead band and gain

- In *nDeadBand* you can set the parameters for the dead band.
- In *nGain* you can alter the gain.
- 100 % corresponds to 16384.

# Function library LenzeDrive.lib

Analog signal processing  
Differentiation (L\_DT1\_)



## 2.2.11 Differentiation (L\_DT1\_)

This FB differentiates signals. You can use it, for instance, for the acceleration injection (dv/dt).

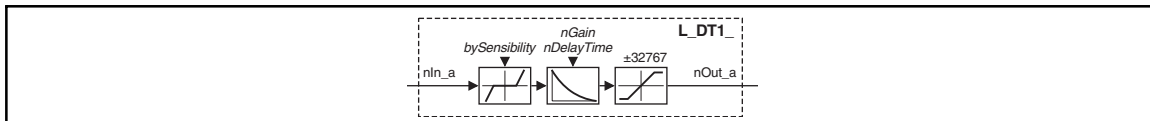


Fig. 2-21

Differentiation (L\_DT1\_)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	The signal is limited to ±32767.
nGain	Integer		VAR CONSTANT RETAIN	Gain K
nDelayTime	Integer		VAR CONSTANT RETAIN	Delay time $T_{loss}$
bySensibility	Byte		VAR CONSTANT RETAIN	Input sensitivity of <i>nIn_a</i> The FB only evaluates the specified most significant bits, according to the setting.

### Parameter codes of the instances

VariableName	L_DT1_1		SettingRange	Lenze
nGain	C0650		-320.00 ... 320.00	1.00
nDelayTime	C0651		0.005 ... 5.000 s	1.000
bySensibility	C0653		1 ... 7	1

### Function

Selection of the function	Function
bySensibility = 1	15 Bit
bySensibility = 2	14 Bit
bySensibility = 3	13 Bit
bySensibility = 4	12 Bit
bySensibility = 5	11 Bit
bySensibility = 6	10 bit
bySensibility = 7	9 Bit

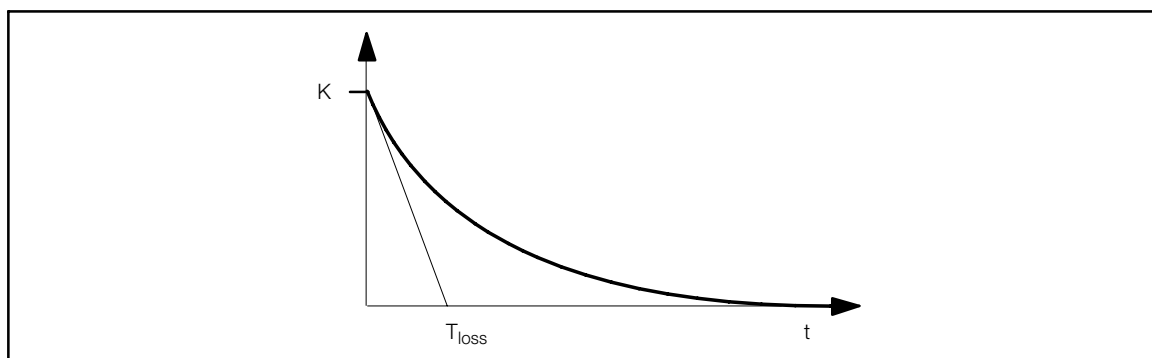
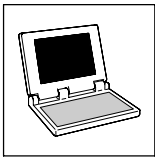


Fig. 2-22

Delay time  $T_{loss}$  of the 1st order differential section



## Function library LenzeDrive.lib

### Analog signal processing

#### Limiting (L\_LIM)

### 2.2.12 Limiting (L\_LIM)

This FB limits signals to preset ranges of values. You can fix the range of values by defining an upper and a lower limit.

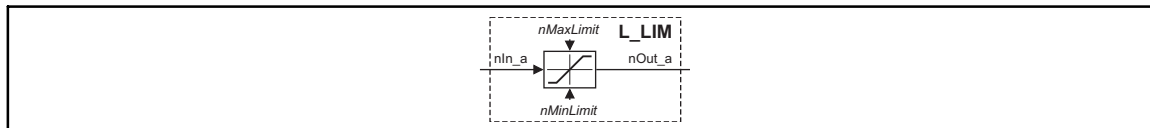


Fig. 2-23

Limiting (L\_LIM)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog/velocity	VAR_INPUT	
nOut_a	Integer	analog/velocity	VAR_OUTPUT	
nMaxLimit	Integer		VAR CONSTANT RETAIN	Defines the upper limit. (100 % = 16384)
nMinLimit	Integer		VAR CONSTANT RETAIN	Defines the lower limit. (100 % = 16384)

#### Parameter codes of the instances

VariableName	L_LIM1			SettingRange	Lenze
nMaxLimit	C0630			-199.99 ... 199.99 %	100.00
nMinLimit	C0631			-199.99 ... 199.99 %	-100.00



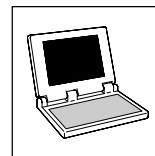
#### Note!

The lower limit must always be set lower than the upper limit. Otherwise *nOut\_a* is set = 0.

## Function library LenzeDrive.lib

Analog signal processing

Delay (L\_PT1\_)



### 2.2.13 Delay (L\_PT1\_)

This FB filters and delays analog signals.

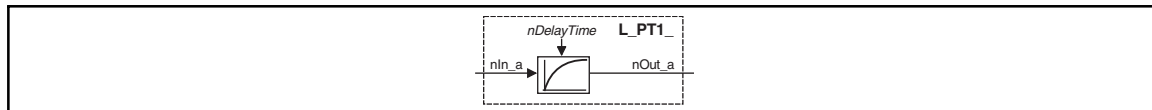


Fig. 2-24

Delay (L\_PT1\_)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	
nOut_a	Integer	analog	VAR_OUTPUT	
nDelayTime	Integer		VAR CONSTANT RETAIN	Time constant

#### Parameter codes of the instances

VariableName	L_PT1_1			SettingRange	Lenze
nDelayTime	C0640			0.01 ... 50.00	20.00

#### Function

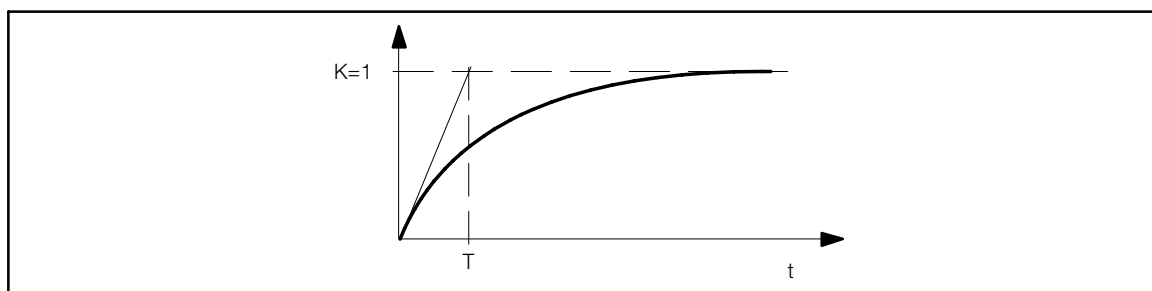
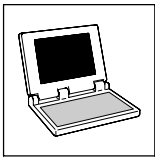


Fig. 2-25

Delay T of the first-order delay element

- Use the constant *nDelayTime* to set the delay time.
- The proportional value is fixed at  $K = 1$ .



## Function library LenzeDrive.lib

### Analog signal processing

#### Ramp generator (L\_RFG)

### 2.2.14 Ramp generator (L\_RFG)

This FB functions as a ramp generator to control the rate of rise of signals.

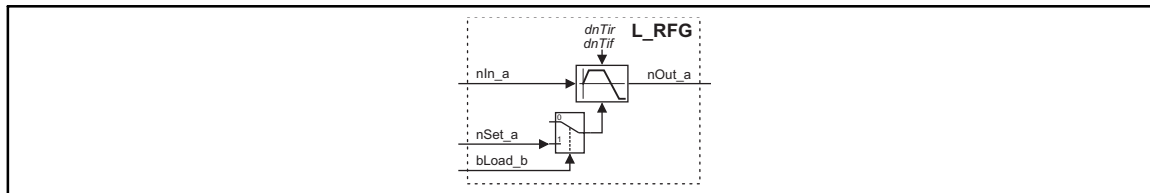


Fig. 2-26

Ramp generator (L\_RFG)

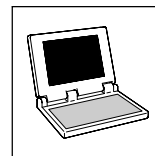
VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog/velocity	VAR_INPUT	
nSet_a	Integer	analog/velocity	VAR_INPUT	
bLoad_b	Bool	binary	VAR_INPUT	
nOut_a	Integer	analog/velocity	VAR_OUTPUT	
dnTir	Double Integer		VAR CONSTANT RETAIN	Acceleration time $T_{ir}$
dnTif	Double Integer		VAR CONSTANT RETAIN	Deceleration time $T_{if}$

#### Parameter codes of the instances

Variable name	L_RFG1			SettingRange	Lenze
dnTir	C0671			0.000 ... 999.999 s	0.000
dnTif	C0672			0.000 ... 999.999 s	0.000

#### Range of functions

- Calculation and setting of the acceleration and deceleration times
- Loading of the ramp generator



### 2.2.14.1 Calculation and setting of the acceleration and deceleration times

The acceleration time and deceleration times refer to a change of the output value from 0 to 100 % (100% = 16384). The times to be set:  $T_{ir}$  and  $T_{if}$  can be calculated from the formula in Fig. 2-27:

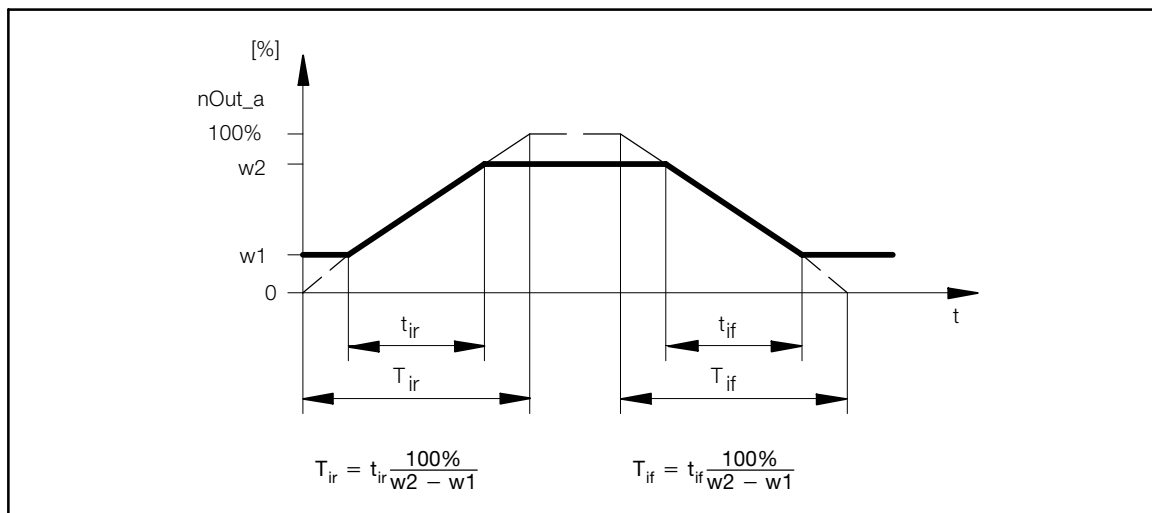


Fig. 2-27

Acceleration and deceleration times of L\_RFG

$w1, w2$  Change of the main setpoint, depending on  $t_{ir}$  resp.  $t_{if}$

Here  $t_{ir}$  and  $t_{if}$  are the required times for the change between  $w1$  and  $w2$ . The calculated values  $T_{ir}$  and  $T_{if}$  are entered under  $dnTir$  and  $dnTif$ .

### 2.2.14.2 Loading of the ramp generator

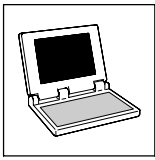
By using  $nSet_a$  and  $bLoad_b$  you can initialize the ramp generator with defined values.

- As long as  $bLoad_b = TRUE$ , the signal at  $nSet_a$  is output to  $nOut_a$ .
- If  $bLoad_b$  is set =  $FALSE$ , then the ramp generator runs with the preset  $T_i$ -times from the loaded value through  $nSet_a$  to the value at  $nIn_a$ .



#### Note!

16384  $\equiv$  100 %  $\equiv$  C0011 ( $n_{max}$ )



## Function library LenzeDrive.lib

### Analog signal processing

#### Sample & Hold (L\_SH)

### 2.2.15 Sample & Hold (L\_SH)

This FB can store analog signals. The stored value is also available after mains disconnection.

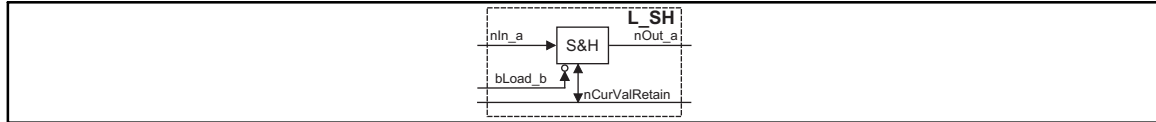


Fig. 2-28

Sample & Hold (L\_SH)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog/velocity	VAR_INPUT	
bLoad_b	Bool	binary	VAR_INPUT	FALSE = store
nOut_a	Integer	analog/velocity	VAR_OUTPUT	
nCurValRetain	Integer		VAR_GLOBAL RETAIN	

#### Function

- By using *bLoad\_b* = TRUE the signal at *nIn\_a* is switched to *nOut\_a*.
- By using *bLoad\_b* = FALSE the last valid value is stored and output at *nOut\_a*. A signal change at *nIn\_a* does not produce any change at *nOut\_a*.
- Storing in the case of mains disconnection:
  - Set *bLoad\_b* = FALSE, when the supply voltage is switched off (either mains/line supply, DC-bus, or voltage supply of the control terminals).
  - Set *bLoad\_b* = FALSE, when the supply voltage is switched on again (either mains/line supply, DC-bus, or voltage supply of the control terminals).

#### Store the present output value after power interruption

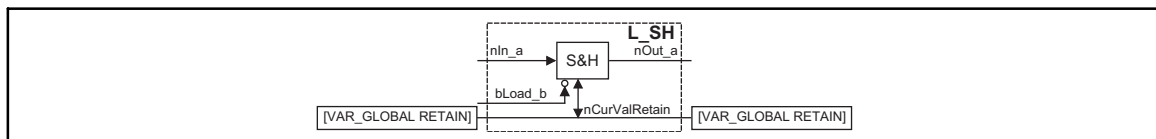


Fig. 2-29

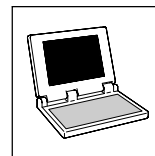
Programming to store the present output value after a supply interruption

In order to store the latest value at *nOut\_a* after a supply interruption, you must declare a global variable of type RETAIN (VAR\_GLOBAL RETAIN). Link this variable as shown in Fig. 2-29.

- In this variable, the present value is always stored at *nOut\_a*. The variable will hold the value after a supply interruption.
- When the supply is switched on again, the stored value is read into the FB L\_SH from the variable and applied as the starting value.

## Function library LenzeDrive.lib

Analog signal processing  
S-ramp generator (L\_SRFG)



### 2.2.16 S-ramp generator (L\_SRFG)

This FB conditions a setpoint through an S-curve ( $\sin^2$ -curve).

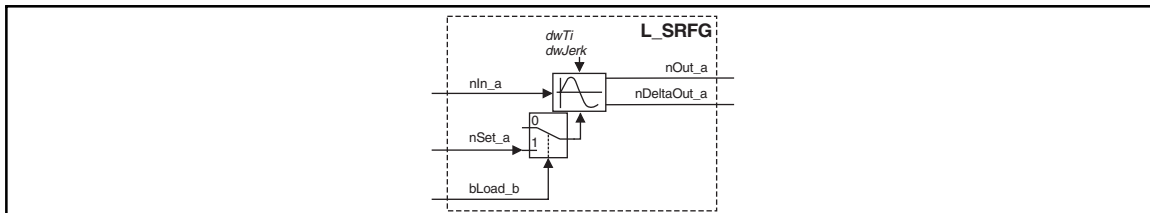


Fig. 2-30

S-ramp generator (L\_SRFG)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	Input
nSet_a	Integer	analog	VAR_INPUT	Start value for the ramp generator. The ramp is initiated by <i>bLoad_b</i> = TRUE.
bLoad_b	Bool	binary	VAR_INPUT	TRUE = takes the value at <i>nSet_a</i> and outputs this at <i>nOut_a</i> ; <i>nDeltaOut_a</i> remains at 0 %.
nOut_a	Integer	analog	VAR_OUTPUT	The signal is limited to $\pm 100\%$ . (100 % = 16384)
nDeltaOut_a	Integer	analog	VAR_OUTPUT	<ul style="list-style-type: none"> <li>Provides the acceleration of the ramp generator.</li> <li>The signal is limited to <math>\pm 100\%</math>.</li> </ul>
dwTi	Unsigned Long		VAR CONSTANT RETAIN	Acceleration in [%] (100 % = 16384)
dwJerk	Unsigned Long		VAR CONSTANT RETAIN	Jerk

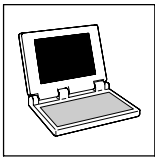
#### Parameter codes of the instances

VariableName	L_SRFG1		SettingRange	Lenze
dwTi	C1040		0.001 ... 5000.000 %	100.000
dwJerk	C1041		0.001 ... 999.999 s	0.200



#### Note!

16384  $\equiv$  100 %  $\equiv$  C0011 ( $n_{\max}$ )



## Function library LenzeDrive.lib

### Analog signal processing

#### S-ramp generator (L\_SRFG)

#### Function

##### Load ramp generator

- By using  $bLoad\_b = TRUE$  loads the ramp generator with the signal at  $nSet\_a$ .
- This value is instantly accepted and output to  $nOut\_a$ . No ramp-up or ramp-down through an S-curve takes place.
- As long as  $bLoad\_b$  remains = TRUE, the ramp generator is disabled.

##### Acceleration and jerk

The maximum acceleration and the jerk can be adjusted separately.

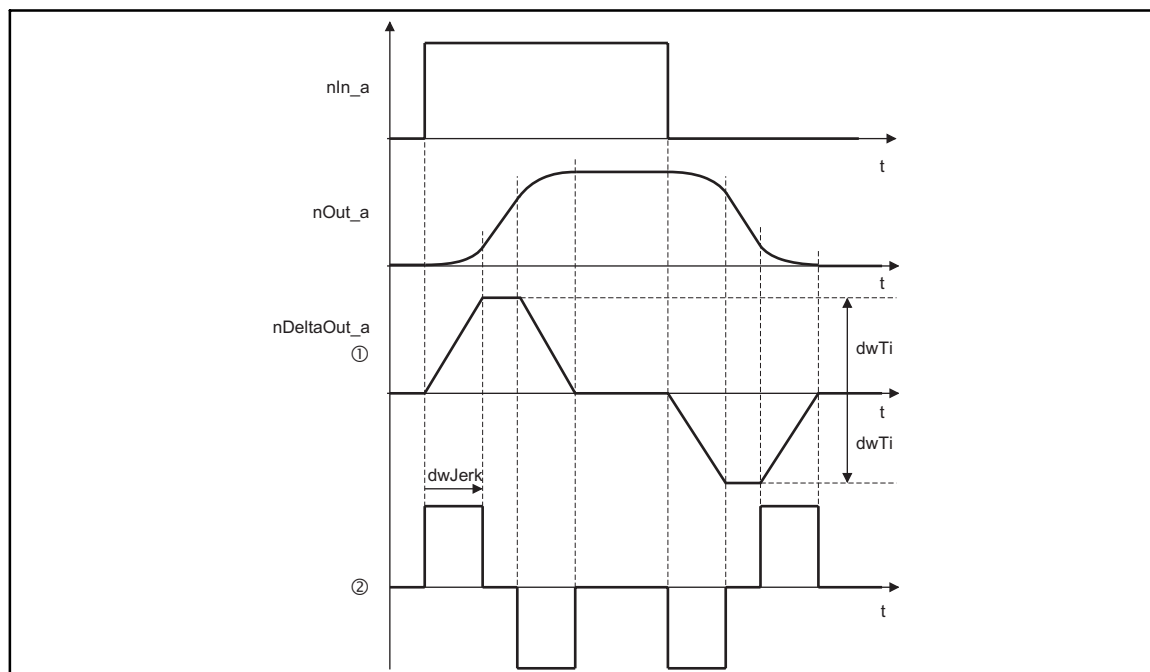


Fig. 2-31

Line diagram

- ① Acceleration
- ② Jerk

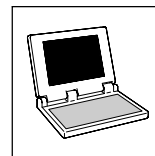
- Max. acceleration:
  - By using  $dwTi$  you set the positive as well as the negative acceleration.
  - The setting is calculated according to the formula:

$$\frac{1 \text{ s} \cdot 100 \%}{dwTi}$$

- Jerk:
  - By using  $dwJerk$  you set up a jerk-free acceleration of the drive.
  - The jerk is entered in [s] until the ramp generator operates with maximum acceleration (see Fig. 2-31).

# Function library LenzeDrive.lib

Digital signal processing  
Logical AND (L\_AND)



## 2.3 Digital signal processing

### 2.3.1 Logical AND (L\_AND)

This FB implements the logical AND combination of binary signals. These operations can be used for the control of functions or the generation of status information.

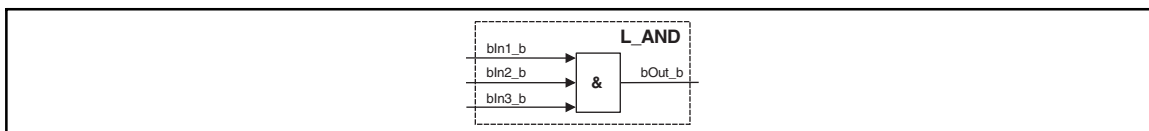


Fig. 2-32 Logical AND (L\_AND)

VariableName	DataType	SignalType	VariableType	Note
bln1_b	Bool	binary	VAR_INPUT	
bln2_b	Bool	binary	VAR_INPUT	
bln3_b	Bool	binary	VAR_INPUT	
bOut_b	Bool	binary	VAR_OUTPUT	

#### Truth table

bln1_b	bln2_b	bln3_b	bOut_b
0	0	0	0
1	0	0	0
0	1	0	0
1	1	0	0
0	0	1	0
1	0	1	0
0	1	1	0
1	1	1	1

0 = FALSE

1 = TRUE

The function corresponds to a series connection of normally-open contacts in a contactor control.

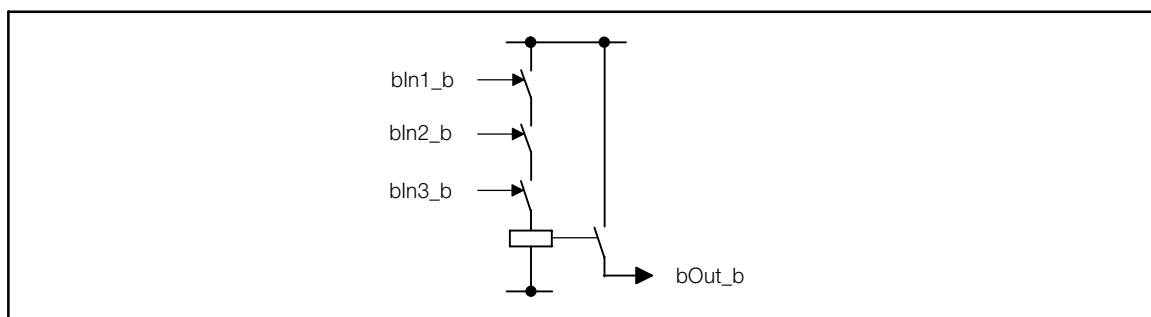
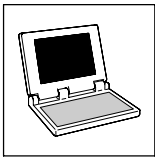


Fig. 2-33 AND function as a series connection of normally-open contacts



#### Note!

Use the inputs *bln1\_b* and *bln2\_b* if you only need two inputs. Fix input *bln3\_b* to TRUE.



## Function library LenzeDrive.lib

### Digital signal processing

#### Delay (L\_DIGDEL)

### 2.3.2 Delay (L\_DIGDEL)

This FB delays binary signals.

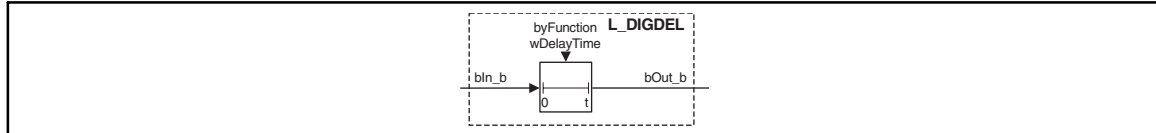


Fig. 2-34

Delay element (L\_DIGDEL)

VariableName	DataType	SignalType	VariableType	Note
bln_b	Bool	binary	VAR_INPUT	
bOut_b	Bool	binary	VAR_OUTPUT	
byFunction	Byte		VAR CONSTANT RETAIN	Selection of the function
wDelayTime	Word		VAR CONSTANT RETAIN	Delay time

#### Parameter codes of the instances

VariableName	L_DIGDEL1	L_DIGDEL2	SettingRange	Lenze
byFunction	C0720		0 ... 2	2
		C0725		0
wDelayTime	C0721	C0726	0.001 ... 60.000 s	1.000

#### Range of functions

- On-delay
- Dropout delay
- General delay

#### 2.3.2.1 On-delay

*byFunction* = 0

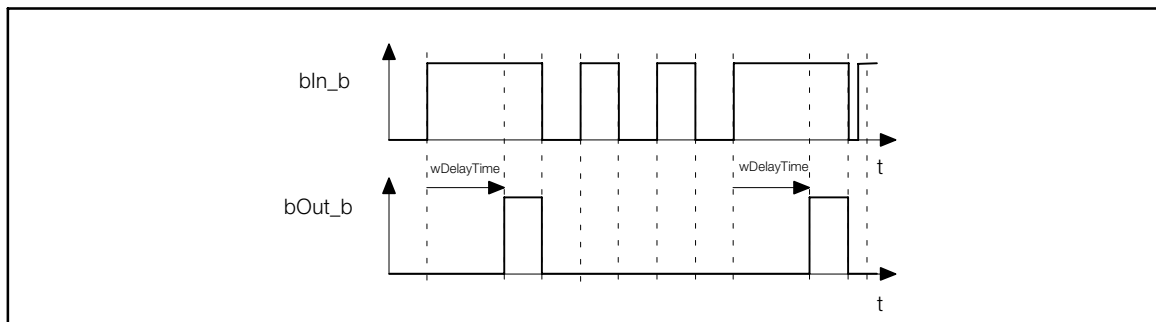


Fig. 2-35

On-delay

The FB L\_DIGDEL operates like a retriggerable monostable circuit.

#### Functional sequence

1. A FALSE-TRUE transition at *nIn\_b* starts the timer element.
2. If the delay time has elapsed, that is set by *wDelayTim* has elapsed, *bOut\_b* switches immediately = TRUE.
3. A TRUE-FALSE edge at *nIn\_b* resets the timer element, and switches *bOut\_b* = FALSE, immediately.

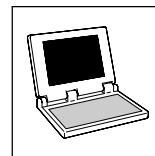
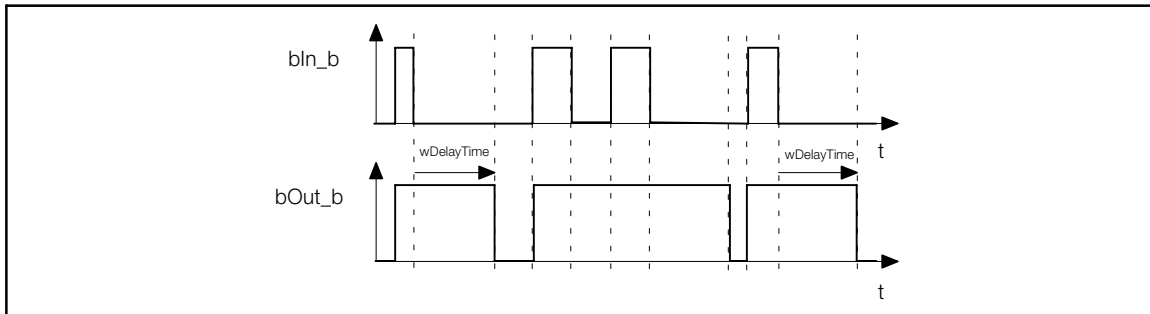
**2.3.2.2 Dropout delay***byFunction* = 1

Fig. 2-36

Dropout delay

**Functional sequence**

1. A FALSE-TRUE transition at *nIn\_b* switches *bOut\_b* = TRUE and resets the timer element.
2. A TRUE-FALSE edge at *nIn\_b* starts the timer element.
3. If the delay time, that is set by *wDelayTime* has elapsed, *bOut\_b* = FALSE, immediately.

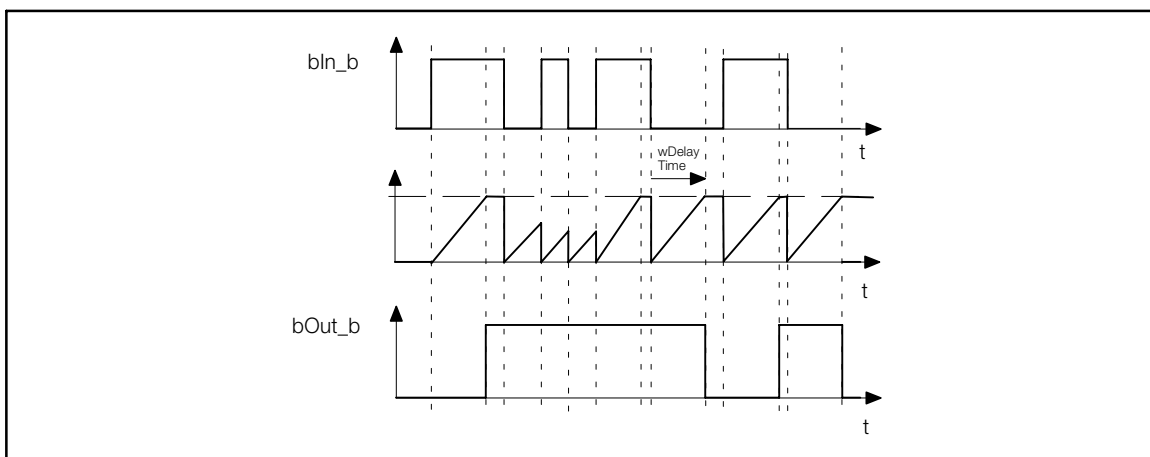
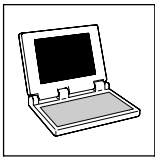
**2.3.2.3 General delay***byFunction* = 2

Fig. 2-37

General delay

**Functional sequence**

1. Any edge/transition at *nIn\_b* resets the timer element, and starts it.
2. After the delay time, that is set by *wDelayTime* has elapsed, *bOut\_b* = *nIn\_b*.



## Function library LenzeDrive.lib

### Digital signal processing

#### Up/down counter (L\_FCNT)

### 2.3.3 Up/down counter (L\_FCNT)

This FB is a digital up/down counter, that is limited to the value  $nCmpVal_a$ .

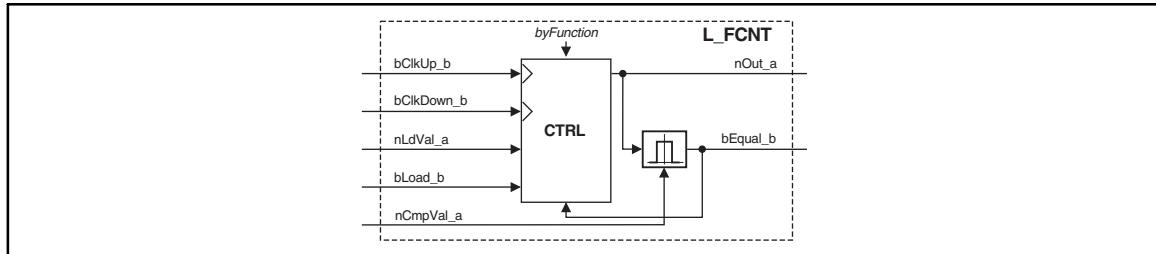


Fig. 2-38

Up/down counter (L\_FCNT)

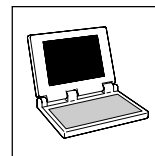
VariableName	Data Type	Signal Type	Variable Type	Note
bCikUp_b	Bool	binary	VAR_INPUT	FALSE-TRUE edge = counts up by 1.
bCikDwn_b	Bool	binary	VAR_INPUT	FALSE-TRUE edge = counts down by 1.
nLdVal_a	Integer	analog	VAR_INPUT	Start value
bLoad_b	Bool	binary	VAR_INPUT	<ul style="list-style-type: none"> <li>TRUE = accept start value</li> <li>The input has the highest priority.</li> </ul>
nCmpVal_a	Integer	analog	VAR_INPUT	Comparison value
nOut_a	Integer	analog	VAR_OUTPUT	The count value is limited to $\pm 32767$ .
bEqual_b	Bool	binary	VAR_OUTPUT	TRUE = comparison value reached.
byFunction	Byte		VAR CONSTANT RETAIN	Selection of the function

#### Parameter codes of the instances

VariableName	L_FCNT1			SettingRange	Lenze
byFunction	C1100			1 ... 2	1

#### Function

Selection of the Function	Description
byFunction = 1	<ul style="list-style-type: none"> <li>If the <math> \text{count value}  \geq  nCmpVal_a </math>, the output <math>bEqual_b</math> is set to TRUE. At the next clock cycle, the counter is reset to the value <math>nLdVal_a</math> and the output <math>bEqual_b</math> is set to FALSE.</li> </ul>
byFunction = 2	<ul style="list-style-type: none"> <li>If the <math> \text{count value}  =  nCmpVal_a </math>, the counter stops (<math>bCikUp_b</math> / <math>bCikDwn_b</math> are ignored).</li> <li><math>bLoad_b = \text{TRUE}</math> sets the counter to the value at <math>nLdVal_a</math> and responds to <math>bCikUp_b</math> / <math>bCikDwn_b</math> again.</li> </ul>



### 2.3.4 Flip-flop (L\_FLIP)

This FB is implemented as a D flip-flop. You can use this function to evaluate and store digital signal transitions (edges).

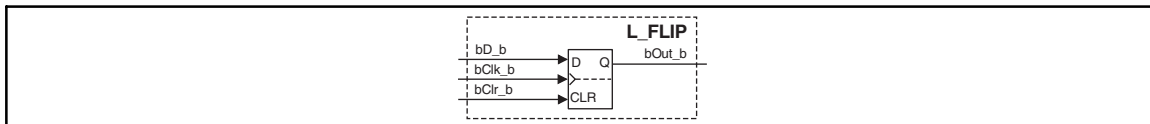


Fig. 2-39

Flipflop (L\_FLIP)

VariableName	DataType	SignalType	VariableType	Note
bD_b	Bool	binary	VAR_INPUT	
bClk_b	Bool	binary	VAR_INPUT	Evaluates FALSE-TRUE edges only (edge-triggered).
bClr_b	Bool	binary	VAR_INPUT	Evaluates the input level only; input has highest priority (reset input).
bOut_b	Bool	binary	VAR_OUTPUT	

#### Functional sequence

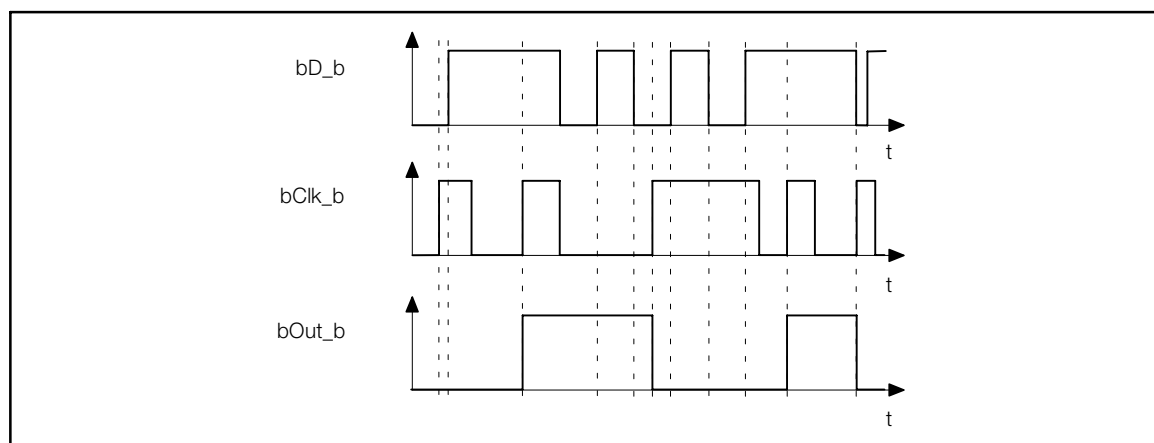
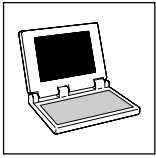


Fig. 2-40

Sequence of a flip-flop

*bClr\_b* always has priority.

1. If *bClr\_b* = TRUE, then *bOut\_b* switches = FALSE. This state is held as long as *bClr\_b* = TRUE.
2. A FALSE-TRUE edge at *bClk\_b* switches *bD\_b* = *bOut\_b*. This state is stored until
  - another FALSE-TRUE edge occurs at *bClk\_b* or
  - *bClr\_b* switches = TRUE.



## Function library LenzeDrive.lib

### Digital signal processing

#### Logical NOT (L\_NOT)

### 2.3.5 Logical NOT (L\_NOT)

This FB enables the logical inversion of digital signals. You can use this FB for the control of functions or the generation of status information.

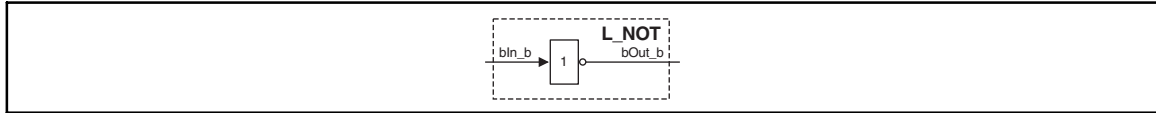


Fig. 2-41

Logical NOT (L\_NOT)

VariableName	DataType	SignalType	VariableType	Note
bln_b	Bool	binary	VAR_INPUT	
bOut_b	Bool	binary	VAR_OUTPUT	

#### Truth table

bln_b	bOut_b
0	1
1	0

0 = FALSE

1 = TRUE

The function corresponds to a change from a normally-open contact to a normally-closed contact in a control with contactors.

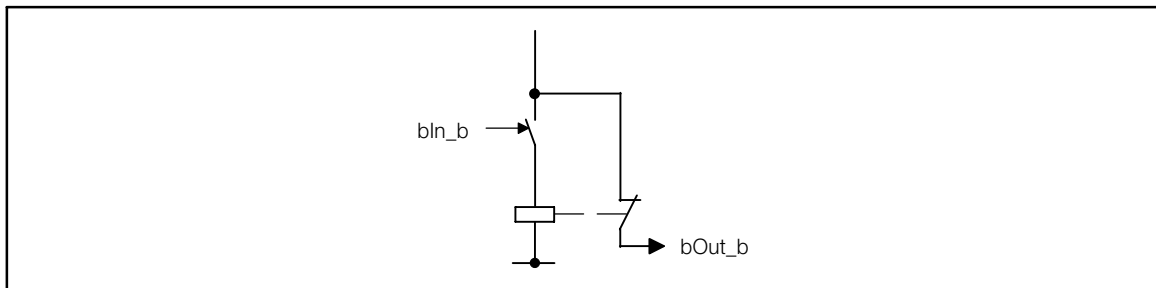
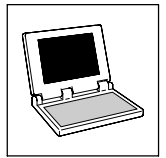


Fig. 2-42

Function of L\_NOT as a change from a normally-open to a normally-closed contact



### 2.3.6 Logical OR (L\_OR)

This FB enables the logical OR combination of digital signals. You can use this combination for the control of functions or the generation of status information.

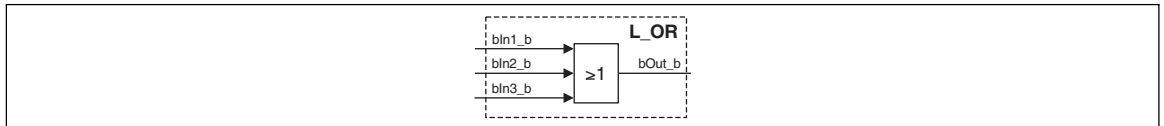


Fig. 2-43

Logical OR (L\_OR)

VariableName	DataType	SignalType	VariableType	Note
bln1_b	Bool	binary	VAR_INPUT	
bln2_b	Bool	binary	VAR_INPUT	
bln3_b	Bool	binary	VAR_INPUT	
bOut_b	Bool	binary	VAR_OUTPUT	

#### Truth table

bln1_b	bln2_b	bln3_b	bOut_b
0	0	0	0
1	0	0	1
0	1	0	1
1	1	0	1
0	0	1	1
1	0	1	1
0	1	1	1
1	1	1	1

0 = FALSE

1 = TRUE

The function corresponds to a parallel connection of normally-open contacts in a contactor control.

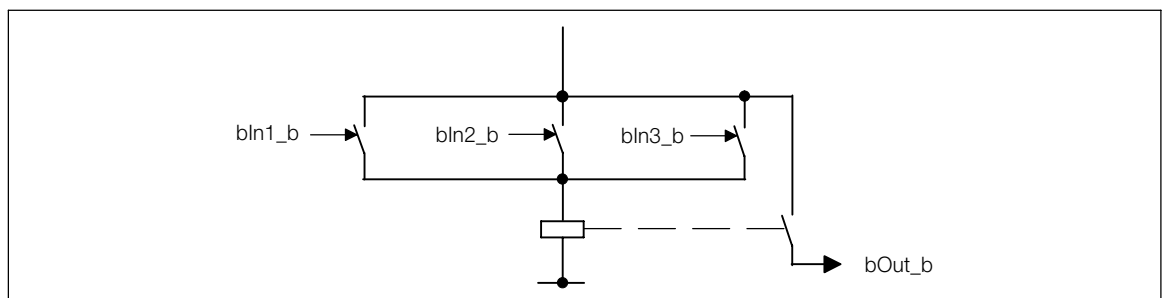


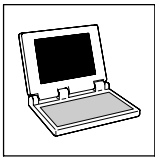
Fig. 2-44

Function of L\_OR as a parallel connection of normally-open contacts



#### Note!

If you only need 2 inputs, use the inputs *bln1\_b* and *bln2\_b*. Fix the input *bln3\_b* to FALSE.



## Function library LenzeDrive.lib

### Digital signal processing

#### Edge evaluation (L\_TRANS)

### 2.3.7 Edge evaluation (L\_TRANS)

This FB is a post-triggered edge detector. You can use this function to detect digital signal transitions (edges) and turn them into defined pulses.

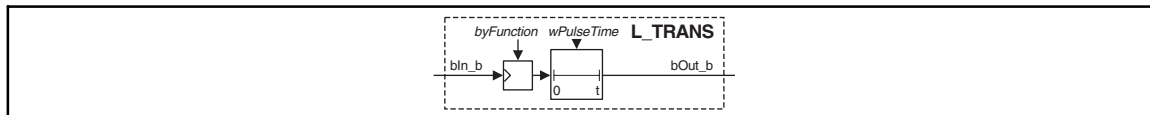


Fig. 2-45

Edge evaluation (L\_TRANS)

VariableName	DataType	SignalType	VariableType	Note
bln_b	Bool	binary	VAR_INPUT	
bOut_b	Bool	binary	VAR_OUTPUT	(retriggerable)
byFunction	Byte	-	VAR CONSTANT RETAIN	Selection of the function
wPulseTime	Word	-	VAR CONSTANT RETAIN	Pulse duration of the output signal

#### Parameter codes of the instances

VariableName	L_TRANS1	L_TRANS2	L_TRANS3	SettingRange	Lenze
byFunction	C0710	C0715	C1140	0 ... 2	0
wPulseTime	C0711	C0716	C1141	0.001 ... 60.000 s	0.001

VariableName	L_TRANS4			SettingRange	Lenze
byFunction	C1145			0 ... 2	0
wPulseTime	C1146			0.001 ... 60.000 s	0.001

#### Range of functions

- Evaluate rising edges
- Evaluate falling edges
- Evaluate rising and falling edges

#### 2.3.7.1 Evaluate rising edges

*byFunction* = 0

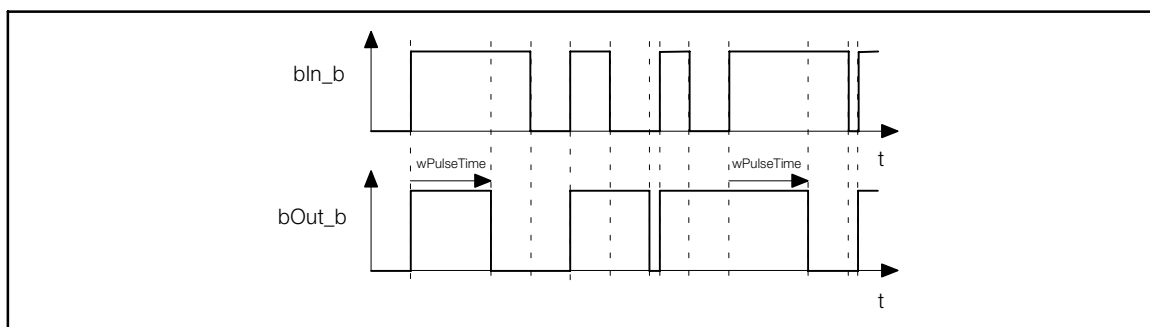


Fig. 2-46

Evaluation of FALSE-TRUE transitions

#### Functional sequence

1. If a TRUE-FALSE or a FALS-TRUE transition occurs at *nIn\_b*, then *bOut\_b* switches = TRUE.
2. After the time defined as *wPulseTime* has elapsed, then *bOut\_b* switches = FALSE, provided no further FALSE-TRUE transition has occurred at *nIn\_b*.

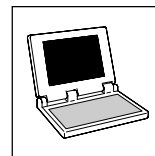
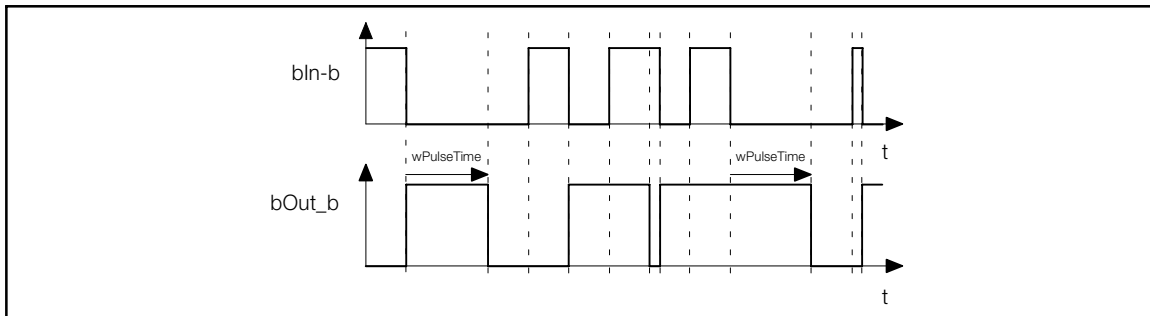
**2.3.7.2 Evaluate falling edges***byFunction = 1*

Fig. 2-47 Evaluation of TRUE-FALSE transitions

**Functional sequence**

1. If a TRUE-FALSE or a FALSE-TRUE transition occurs at *nIn\_b*, then *bOut\_b* switches = TRUE.
2. After the time defined as *wPulseTime* has elapsed, then *bOut\_b* switches = FALSE, provided no further TRUE-FALSE transition has occurred at *nIn\_b*.

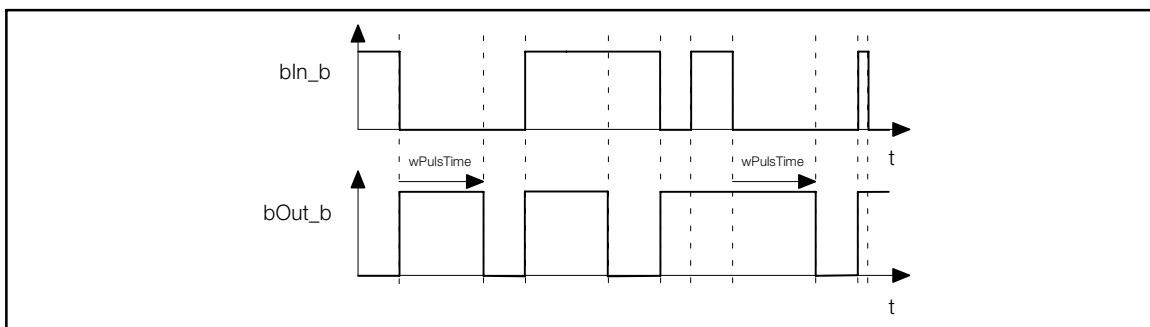
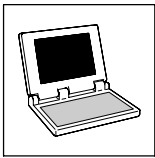
**2.3.7.3 Evaluate rising and falling edges***byFunction = 2*

Fig. 2-48 Evaluation of both transitions

**Functional sequence**

1. If a TRUE-FALSE or a FALSE-TRUE transition occurs at *nIn\_b*, then *bOut\_b* switches = TRUE.
2. After the time defined as *wPulseTime* has elapsed, then *bOut\_b* switches = FALSE, provided no further TRUE-FALSE or FALSE-TRUE transition has occurred at *nIn\_b*.



## Function library LenzeDrive.lib

### Processing of phase-angle signals

#### Arithmetic (L\_ARITPH)

## 2.4 Processing of phase-angle signals

### 2.4.1 Arithmetic (L\_ARITPH)

This FB calculates a phase output signal from two phase input signals.

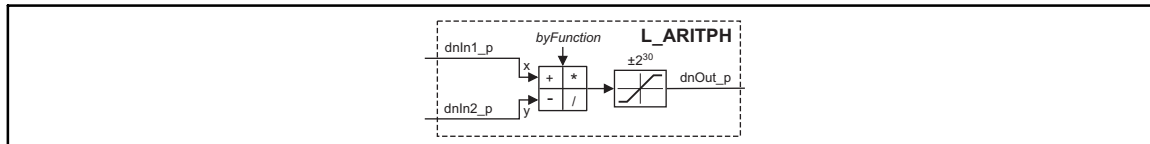


Fig. 2-49

Arithmetic (L\_ARITPH)

VariableName	DataType	SignalType	VariableType	Note
dnln1_p	Double Integer	position	VAR_INPUT	
dnln2_p	Double Integer	position	VAR_INPUT	
dnOut_p	Double Integer	position	VAR_OUTPUT	The signal is limited to $\pm 2^{30}$ .
byFunction	Byte		VAR_CONSTANT_RETAIN	Selection of the function

#### Parameter codes of the instances

VariableName	L_ARITPH1		SettingRange	Lenze
byFunction	C1010		0 ... 3, 14, 21, 22	1

#### Function

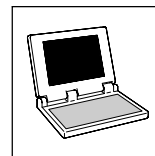
Selection of the function	Arithmetic function	Limiting of the result	Note
byFunction = 0	$dnOut\_p = dnln1\_p$	without	dnOut_p is not limited.
byFunction = 1	$dnOut\_p = dnln1\_p + dnln2\_p$	$2^{30}$	
byFunction = 2	$dnOut\_p = dnln1\_p - dnln2\_p$	$2^{30}$	
byFunction = 3	$dnOut\_p = (dnln1\_p \cdot dnln2\_p) / 2^{30}$	$2^{30}$	(remainder not considered)
byFunction = 14	$dnOut\_p = dnln1\_p / dnln2\_p$	$2^{30}$	(remainder not considered)
byFunction = 21	$dnOut\_p = dnln1\_p + dnln2\_p$	without	with overflow
byFunction = 22	$dnOut\_p = dnln1\_p - dnln2\_p$	without	with overflow

- byFunction = 21/22:  
Please note, that an overflow may occur, and then the numerical value of  $dnOut\_p$  does not match the result.
- byFunction = 14:  
If the denominator = 0, then  $dnOut\_p = \pm 2^{30}$ . The sign depends on the sign of  $dnln1\_p$ .

## Function library LenzeDrive.lib

### Processing of phase-angle signals

#### Addition (L\_PHADD)



### 2.4.2 Addition (L\_PHADD)

This FB adds or subtracts phase signals, depending on the input that is used.

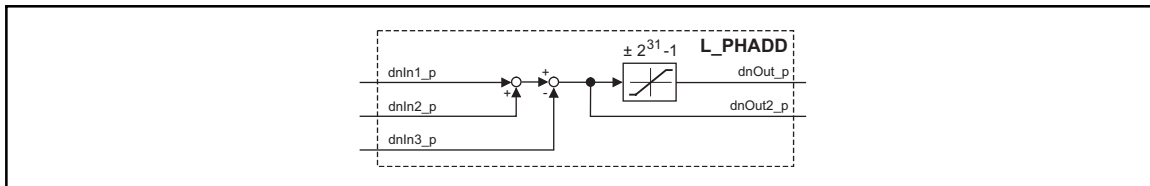


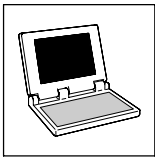
Fig. 2-50

Addition (L\_PHADD)

VariableName	DataType	SignalType	VariableType	Note
dnIn1_p	Double-integer	position	VAR_INPUT	Addition input
dnIn2_p	Double-integer	position	VAR_INPUT	Addition input
dnIn3_p	Double-integer	position	VAR_INPUT	Subtraction input
dnOut_p	Double-integer	position	VAR_OUTPUT	The signal is limited to $\pm 2147483647$
dnOut2_p	Double-integer	position	VAR_OUTPUT	Signal without limiting / with overflow

#### Functional sequence

1. The signal at *dnIn1\_p* is added to the signal at *dnIn2\_p*
2. The signal at *dnIn3\_p* is subtracted from the calculated result.
3. The result of the subtraction is then limited to  $\pm 2147483647$  and output to *dnOut\_p* and output as unlimited to *dnOut2\_p*.  
Please observe, that at *dnOut2\_p* there may be an overflow, thus producing a false value.



# Function library LenzeDrive.lib

## Processing of phase-angle signals

### Comparison (L\_PHCMP)

#### 2.4.3 Comparison (L\_PHCMP)

This FB compares two phase signals (paths) with each other.

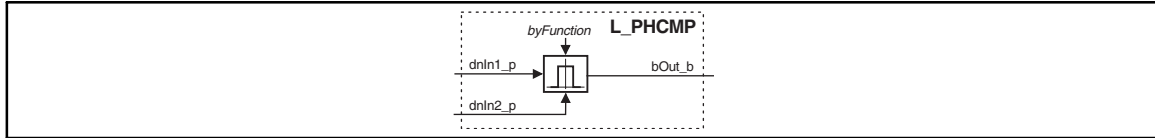


Fig. 2-51

Comparison (L\_PHCMP)

VariableName	DataType	SignalType	VariableType	Note
dnln1_p	Double-integer	position	VAR_INPUT	Signal to be compared
dnln2_p	Double-integer	position	VAR_INPUT	Comparison value
bOut_b	Bool	binary	VAR_OUTPUT	
byFunction	Byte		VAR CONSTANT RETAIN	Selection of the function

#### Parameter codes of the instances

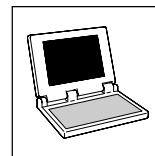
VariableName	L_PHCMP1	L_PHCMP2	L_PHCMP3	SettingRange	Lenze
byFunction	C0695	C1207	C1272	1 ... 2	2

#### Function

Selection	Comparison function	If the comparison condition is fulfilled	Note
byFunction = 1	$dnln1\_p < dnln2\_p$	bOut_b = HIGH	
	$dnln1\_p \geq dnln2\_p$	bOut_b = LOW	
byFunction = 2	$ dnln1\_p  <  dnln2\_p $	bOut_b = HIGH	Compares the absolute value of the inputs.
	$ dnln1\_p  \geq  dnln2\_p $	bOut_b = LOW	

## Function library LenzeDrive.lib

### Processing of phase-angle signals Difference (L\_PHDIFF)



#### 2.4.4 Difference (L\_PHDIFF)

This FB adds a phase-angle signal to the phase setpoint. A setpoint/actual value comparison is also possible.

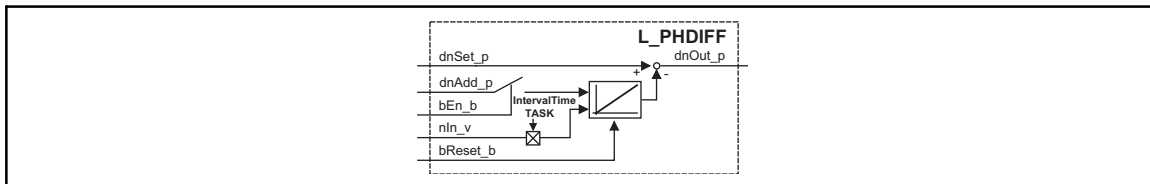


Fig. 2-52

Difference (L\_PHDIFF)

VariableName	DataType	SignalType	VariableType	Note
dnSet_p	Double-integer	position	VAR_INPUT	Provision of a position setpoint
dnAdd_p	Double-integer	position	VAR_INPUT	Adaptive position value for an actual position
bEn_b	Bool	binary	VAR_INPUT	TRUE = Adaptive position value is added on.
nIn_v	Integer	velocity	VAR_INPUT	Provision of the actual speed for conversion/calculation of the position value
bReset_b	Bool	binary	VAR_INPUT	TRUE = Actual phase-angle integrator is set to 0.
dnOut_p	Double-integer	position	VAR_OUTPUT	Signal is not limited.

#### Functional sequence

If  $bEn\_b = \text{TRUE}$  :

1. The speed (rpm) signal at  $nIn\_v$  is integrated by the phase-angle integrator.
2. The phase-angle signal at  $dnAdd\_p$  is added to the integrated speed signal in each task cycle.
3. The result of the phase-angle integrator is subtracted from the phase-angle signal at  $dnSet\_p$  and then output at  $dnOut\_p$ .

If  $bEn\_b = \text{FALSE}$

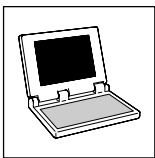
1. The speed (rpm) signal at  $nIn\_v$  is integrated by the phase-angle integrator.
2. The result of the phase-angle integrator is subtracted from the phase-angle signal at  $dnSet\_p$  and then output at  $dnOut\_p$ .



#### Note!

The phase-angle integrator derives a position from a speed.

- In  $nIn\_v$  the speed can be defined (16384  $\equiv$  15000 rpm ).
- (INT)65536 corresponds to one encoder turn.



## Function library LenzeDrive.lib

### Processing of phase-angle signals

#### Division (L\_PHDIV)

### 2.4.5 Division (L\_PHDIV)

This FB divides or multiplies phase-angle signals in binary-exponent format.

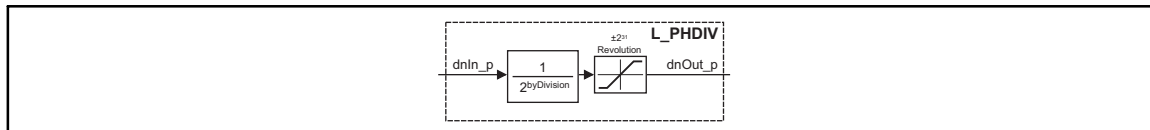


Fig. 2-53

Division (L\_PHDIV)

VariableName	DataType	SignalType	VariableType	Note
dnIn_p	Double integer	position	VAR_INPUT	
dnOut_p	Double integer	position	VAR_OUTPUT	65536 inc = 1 encoder revlution
byDivision	Short Integer		VAR CONSTANT RETAIN	Exponent of the divisor

#### Parameter codes of the instances

VariableName	L_PHDIV1			SettingRange	Lenze
byDivision	C0995			-31 ... 31	0

#### Function

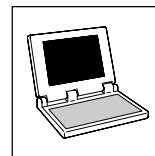
You can calculate the result of the arithmetical function according to the formula:

$$dnOut\_p = \frac{dnIn\_p}{2^{byDivision}}$$

- Positive values in *byDivision* result in a division.
- Negative values in *byDivision* result in a multiplication.
- The output signal is limited to  $\pm 2^{31}-1$  encoder turns.
  - The output signal cannot exceed this limit value.

## Function library LenzeDrive.lib

### Processing of phase-angle signals Integration (L\_PHINT)



#### 2.4.6 Integration (L\_PHINT)

This FB can integrate a speed or a velocity to a phase-angle (path/distance). The integrator can accept max.  $\pm 32000$  encoder revolutions.

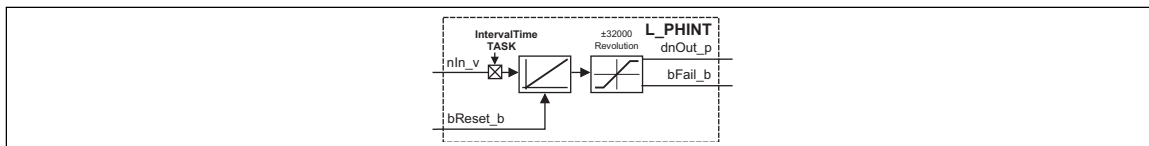


Fig. 2-54

Integration (L\_PHINT)

VariableName	DataType	SignalType	VariableType	Note
nIn_v	Integer	velocity	VAR_INPUT	Actual speed value: 16384 $\equiv$ 15000 rpm
bReset_b	Bool	binary	VAR_INPUT	TRUE sets the phase-angle integrator = 0 and <i>bFail_b</i> = FALSE .
dnOut_p	Double-integer	position	VAR_OUTPUT	65536 inc = 1 encoder revolution (Overflow is possible.)
bFail_b	Bool	binary	VAR_OUTPUT	TRUE = Overflow occurred.

#### Range of functions

- Constant input value
- Calculation of the output signal

##### 2.4.6.1 Constant input value

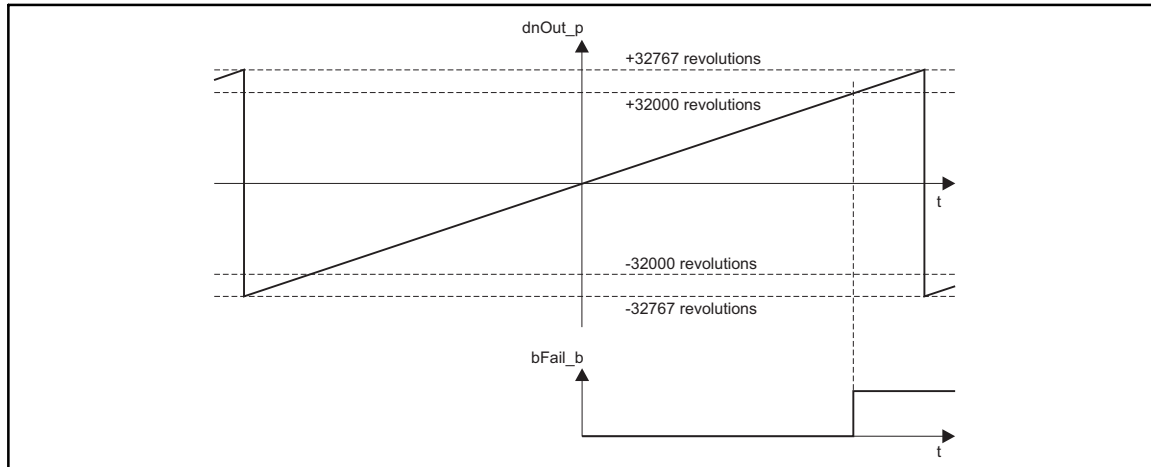
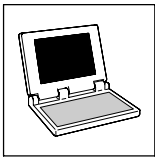


Fig. 2-55

Function of L\_PHINT with constant input value

- A positive signal at *nIn\_v* is incremented (the counter value is increased at every call of the function).
- A negative signal at *nIn\_v* is decremented (the counter value is decreased at every call of the function).
- *dnOut\_p* produces the count value of the bipolar integrator.
- If the count exceeds the value of +32000 encoder revolutions, then *bFail\_b* switches = TRUE.
- If the count exceeds the value of +32767 encoder revolutions (corresponds to +2147483647 inc.) there is an overflow, and the count procedure continues from a value of -32768 encoder turns.



## Function library LenzeDrive.lib

### Processing of phase-angle signals

#### Integration (L\_PHINT)

- If the count falls below the value of -32000 encoder revolutions, then *bFail\_b* switches= TRUE.
- If the count falls below the value of -32768 encoder revolutions (corresponds to -2147483648 inc.) there is an overflow, and the count procedure continues from a value of +32767 encoder turns.
- *bReset\_b* = TRUE:
  - the integrator switches to 0.
  - sets *dnOut\_p* to 0, as long as *nIn\_v* has a positive signal applied.
  - switches *bFail\_b* = FALSE .

### 2.4.6.2 Calculation of the output signal

The output value at *dnOut\_p* can be derived from the formula:

$$dnOut\_p \text{ [inc]} = nIn\_v \text{ [rpm]} \cdot t \text{ [s]} \cdot 65536 \text{ [inc/Umdr.]}$$

(t = integration time, 16384  $\equiv$  15000 rpm, 1 inc. = 1)

#### Example:

You want to determine the count of the integrator with a certain speed at the input and a certain integration time t.

- Given values:
  - *nIn\_v* = 1000 rpm  $\approx$  (INT)1092
  - t = 10 s
  - Start value of the integrator is 0.
- Solution:

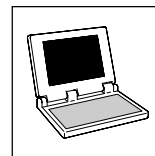
$$1000 \text{ rpm} = \frac{1000 \text{ rev.}}{60 \text{ s}}$$

– Calculation of the output signal

$$dnOut\_p = \frac{1000 \text{ rev.}}{60 \text{ s}} \cdot 10 \text{ s} \cdot \frac{65536 \text{ inc}}{\text{rev.}} = 10922666 \text{ inc}$$

## Function library LenzeDrive.lib

### Processing of phase-angle signals Integration (L\_PHINTK)



#### 2.4.7 Integration (L\_PHINTK)

This FB can integrate a speed or a velocity to a phase-angle (path/distance). It can also recognize a relative distance. The integrator can accept max.  $\pm 32000$  encoder revolutions.

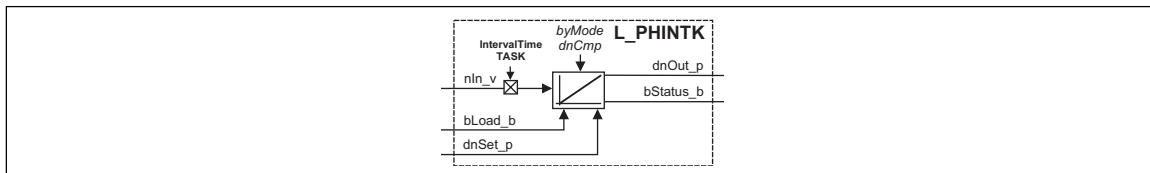


Fig. 2-56

Integration (L\_PHINTK)

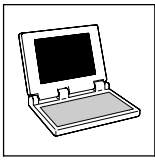
VariableName	DataType	SignalType	VariableType	Note
nIn_v	Integer	velocity	VAR_INPUT	Actual speed value: 16384 $\approx$ 15000 rpm
bLoad_b	Bool	binary	VAR_INPUT	= TRUE sets the phase-angle integrator to the signal at <i>nIn_v</i> and <i>bStatus_b</i> = FALSE .
dnSet_p	Double-integer	position	VAR_INPUT	
dnOut_p	Double-integer	position	VAR_OUTPUT	65536 inc = 1 encoder revolution (Overflow is possible.)
bStatus_b	Bool	binary	VAR_OUTPUT	TRUE = Overflow occurred or distance processed.
byMode	Byte		VAR CONSTANT RETAIN	Selection of the function
dnCmp	Double-integer		VAR CONSTANT RETAIN	Comparison value

#### Parameter codes of the instances

VariableName	L_PHINTK1			SettingRange	Lenze
byMode	C1150			0 ... 2	0
dnCmp	C1151			0 ... 2000000000	2000000000

#### Range of functions

- Constant input value
- Input value with change of sign
- Calculation of the output signal



## Function library LenzeDrive.lib

### Processing of phase-angle signals

#### Integration (L\_PHINTK)

#### 2.4.7.1 Constant input value

3 functions are available, that you can select with *byMode*.

##### byMode = 0

The input *bLoad\_b* is level-triggered (TRUE-level).

- *bLoad\_b* = TRUE
  - The integrator is loaded with the value at *dnSet\_p*.
  - The FB switches *bStatus\_b* = FALSE.

##### byMode = 1

The input *bLoad\_b* is edge-triggered (FALSE-TRUE transition).

- *bLoad\_b* = FALSE-TRUE edge/transition
  - The integrator is loaded with the value at *dnSet\_p* and immediately integrated from then on.
  - The FB switches *bStatus\_b* = FALSE.

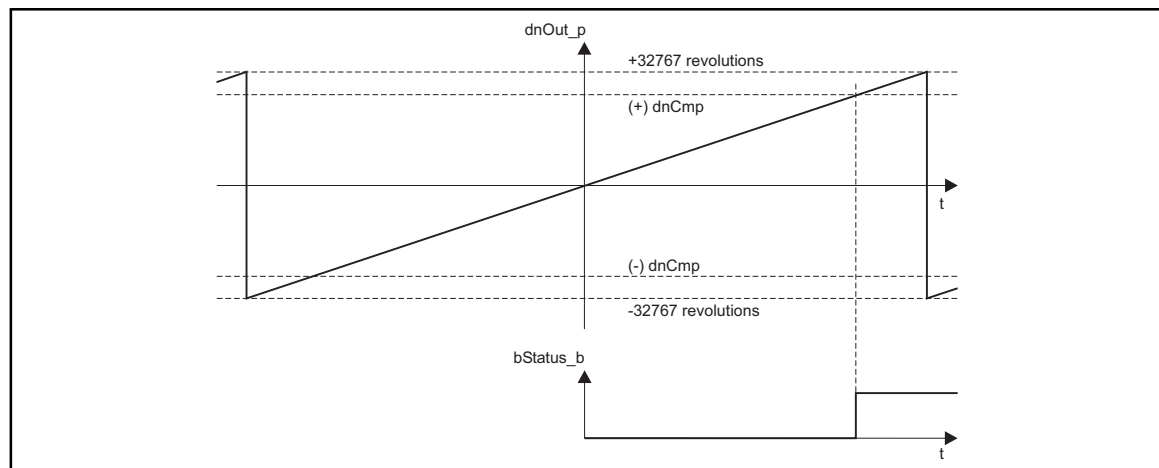
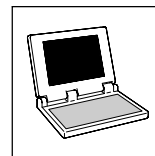


Fig. 2-57 Function of L\_PHINTK with constant input value

- (+) Variable with positive value
- (-) Variable with negative value

- A positive value at *nIn\_v* is incremented (the counter value is increased at every call of the function).
- A negative value at *nIn\_v* is decremented (the counter value is decreased at every call of the function).
- *dnOut\_p* produces the count value of the bipolar integrator.
- If the count exceeds the value of +32767 encoder revolutions (corresponds to +2147483647 inc):
  - There is an overflow, and counting continues at the value -32768 encoder turns.
  - Switches *bStatus\_b* = TRUE, when a positive preset value is reached at *dnCmp*.
- If the count falls below the value of -32768 encoder revolutions (corresponds to -2147483648 inc):
  - There is an overflow, and counting continues at the value +32767 encoder turns.
  - Switches *bStatus\_b* = TRUE, when a negative preset value is reached at *dnCmp*.



### 2.4.7.2 Input value with change of sign

**byMode = 2**

The input *bLoad\_b* is level-triggered (TRUE-level).

- *bLoad\_b* = TRUE
  - The integrator is loaded with the value at *dnSet\_p*.
  - The FB switches *bStatus\_b* = FALSE.

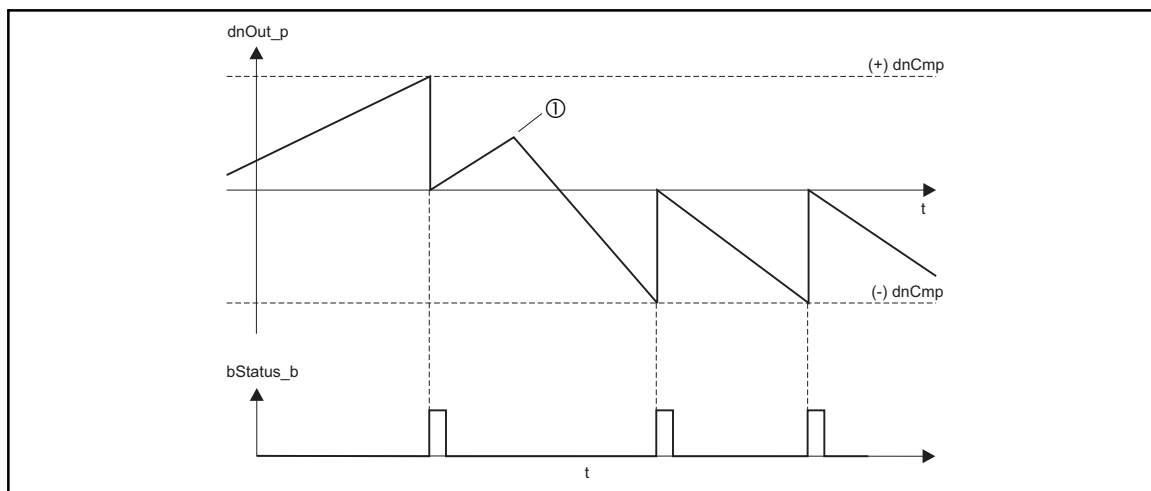


Fig. 2-58

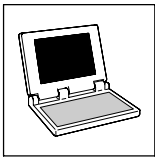
Function of L\_PHINTK with change of sign for the input value

(+) Variable with positive value

(-) Variable with negative value

① Change of sign for the value at *nIn\_v*

- A positive value at *nIn\_v* is incremented (the counter value is increased at every call of the function).
- A negative value at *nIn\_v* is decremented (the counter value is decreased at every call of the function).
- *dnOut\_p* produces the count value of the bipolar integrator.
- If the count value exceeds a preset positive value at *dnCmp*:
  - The count value is reduced by the value of *dnCmp*.
  - Switches *bStatus\_b* = TRUE for the time of one cycle.
- If the count value goes below a preset negative value in *dnCmp*:
  - The count value is increased by the value of *dnCmp*.
  - Switches *bStatus\_b* = TRUE for the time of one cycle.



## Function library LenzeDrive.lib

### Processing of phase-angle signals

#### Integration (L\_PHINTK)

### 2.4.7.3 Calculation of the output signal

The output value at  $dnOut\_p$  can be derived from the formula:

$$dnOut\_p \text{ [inc]} = nIn\_v \text{ [rpm]} \cdot t \text{ [s]} \cdot 65536 \text{ [inc/rev.]}$$

( $t$  = integration time, 16384  $\approx$  15000 rpm, 1 incr. = 1)

#### Example:

You want to determine the count of the integrator with a certain speed at the input and a certain integration time  $t$ .

- Given values:
  - $nIn\_v = 1000 \text{ rpm} \approx (\text{INT})1092$
  - $t = 10 \text{ s}$
  - Start value of the integrator is 0.
- Solution:
  - Conversion of the input signal at  $nIn\_v$ :

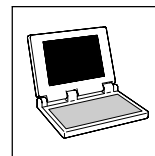
$$1000 \text{ rpm} = \frac{1000 \text{ rev.}}{60 \text{ s}}$$

- Calculation of the output signal

$$dnOut\_p = \frac{1000 \text{ rev.}}{60 \text{ s}} \cdot 10 \text{ s} \cdot \frac{65536 \text{ inc}}{\text{rev.}} = 10922666 \text{ inc}$$

## Function library LenzeDrive.lib

Signal conversion  
Normalization (L\_CONV)



## 2.5 Signal conversion

### 2.5.1 Normalization (L\_CONV)

This FB normalizes signals. The calculation is made quite precisely, with remainder processing and definition of the conversion factor as a numerator and denominator.

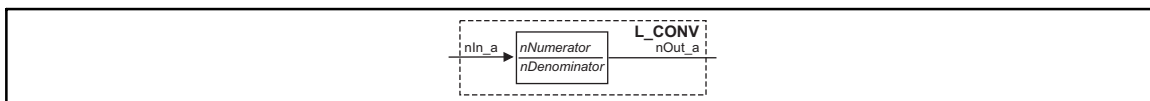


Fig. 2-59

Normalization (L\_CONV)

VariableName	DataType	SignalType	VariableType	Note
nIn_a	Integer	analog	VAR_INPUT	100 % ≙ 16384 ≙ C0011 (n <sub>max</sub> )
nOut_a	Integer	analog	VAR_OUTPUT	The signal is limited to ±199.99 % (100 % ≙ 16384).
nNumerator	Integer		VAR CONSTANT RETAIN	Numerator
nDenominator	Integer		VAR CONSTANT RETAIN	Denominator

#### Parameter codes of the instances

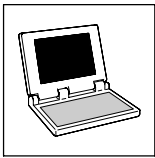
VariableName	L_CONV1	L_CONV2	L_CONV3	SettingRange	Lenze
nNumerator	C0940	C0945	C0950	-32767 ... 32767	1
nDenominator	C0941	C0946	C0951	1 ... 32767	1

VariableName	L_CONV4	L_CONV5	L_CONV6	SettingRange	Lenze
nNumerator	C0955	C0655	C1170	-32767 ... 32767	1
nDenominator	C0956	C0656	C1171	1 ... 32767	1

#### Function

The multiplication or division of signals is made according to the formula:

$$nOut = nIn \cdot \frac{nNumerator}{nDenominator}$$



## Function library LenzeDrive.lib

### Signal conversion

#### Conversion of phase-angle to analog (L\_CONVPA)

## 2.5.2 Conversion of phase-angle to analog (L\_CONVPA)

This FB converts a phase-angle signal into an integer signal.

This function corresponds to the function of the FB CONVPHA in the 9300 servo inverter.

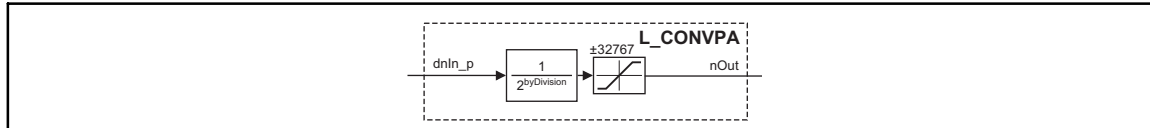


Fig. 2-60

Conversion of phase-angle to analog (L\_CONVPA)

VariableName	DataType	SignalType	VariableType	Note
dnIn_p	Double Integer	position	VAR_INPUT	
nOut	Integer	analog	VAR_OUTPUT	<ul style="list-style-type: none"> <li>The signal is limited to <math>\pm 32767</math>.</li> <li>Remainder handling</li> </ul>
byDivision	Byte		VAR CONSTANT RETAIN	Division factor

#### Parameter codes of the instances

VariableName	L_CONVPA1		SettingRange	Lenze
byDivision	C1000		0 ... 31	1

#### Function

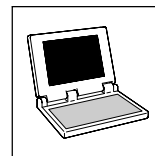
The conversion is made according to the formula:

$$nOut_a = dnIn_p \cdot \frac{1}{2^{byDivision}}$$



#### Note!

This FB operates with remainder handling.

**Function library LenzeDrive.lib****Signal conversion****Conversion of a phase-angle signal (L\_CONVPP)****2.5.3 Conversion of a phase-angle signal (L\_CONVPP)**

This FB converts a phase signal with a dynamic fraction.

This function corresponds to the function of the FB CONVPHPH in the 9300 servo inverter.

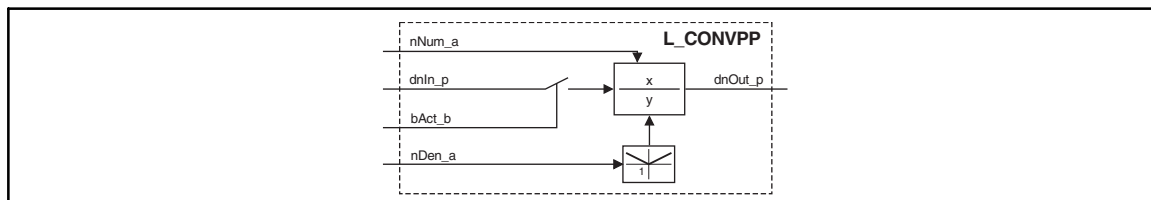


Fig. 2-61

Conversion of a phase-angle signal (L\_CONVPP)

VariableName	DataType	SignalType	VariableType	Note
nNum_a	Integer	analog	VAR_INPUT	Numerator
dnIn_p	Double Integer	position	VAR_INPUT	
bAct_b	Bool	binary	VAR_INPUT	
nDen_a	Integer	analog	VAR_INPUT	Denominator (with absolute value generation)
dnOut_p	Double Integer	position	VAR_OUTPUT	<ul style="list-style-type: none"> <li>The signal is not limited.</li> <li>Remainder handling</li> </ul>

**Function****STOP!**

The conversion result is not limited. The result must therefore not exceed the range of  $\pm 2147483647$ .

The conversion is made according to the formula:

- With  $bAct_b = TRUE$

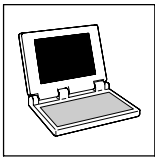
$$dnOut\_p = dnIn\_p \cdot \frac{nNum\_a}{nDen\_a}$$

- With  $bAct_b = FALSE$

$$dnOut\_p = \text{Remainder} \cdot \frac{nNum\_a}{nDen\_a}$$

**Tip!**

- This FB operates with remainder handling.
- The denominator can only be  $\geq 1$ .
- (INT)65536 corresponds to one encoder turn (one encoder turn corresponds to 65536 increments).



## Function library LenzeDrive.lib

### Signal conversion

#### Conversion (L\_CONVVV)

### 2.5.4 Conversion (L\_CONVVV)

This FB converts a phase signal with a dynamic fraction.

This function corresponds to the function of the FB CONVPP in the 9300 servo inverter.

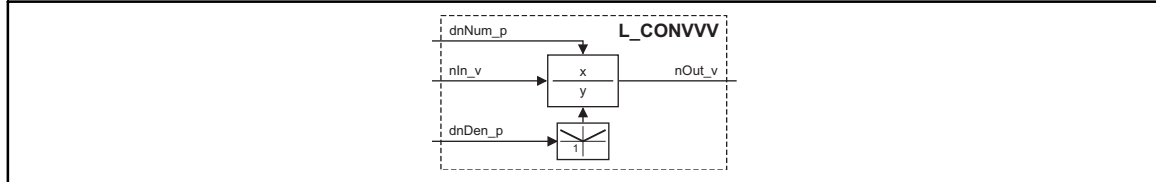


Fig. 2-62

Conversion (L\_CONVVV)

VariableName	DataType	SignalType	VariableType	Note
dnNum_p	Double Integer	position	VAR_INPUT	Numerator
nIn_v	Integer	analog/velocity	VAR_INPUT	
dnDen_p	Double Integer	position	VAR_INPUT	Denominator (with absolute value generation)
nOut_v	Integer	analog/velocity	VAR_OUTPUT	<ul style="list-style-type: none"> <li>The signal is not limited.</li> <li>Remainder handling</li> </ul>

#### Function



#### Stop!

The conversion result is not limited. The result must therefore not exceed the range of  $\pm 32767$ .

The conversion is made according to the formula:

$$nOut\_v = nIn\_v \cdot \frac{dnNum\_p}{dnDen\_p}$$



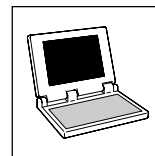
#### Note!

- This FB operates with remainder handling.
- The denominator can only be  $\geq 1$ .
- $16384 \equiv 15000$  rpm.

## Function library LenzeDrive.lib

### Signal conversion

#### Normalization with limiting (L\_CONVX)



### 2.5.5 Normalization with limiting (L\_CONVX)

This FB normalizes signals. The calculation is made with high-precision and remainder handling, using the conversion factor for numerator and denominator.

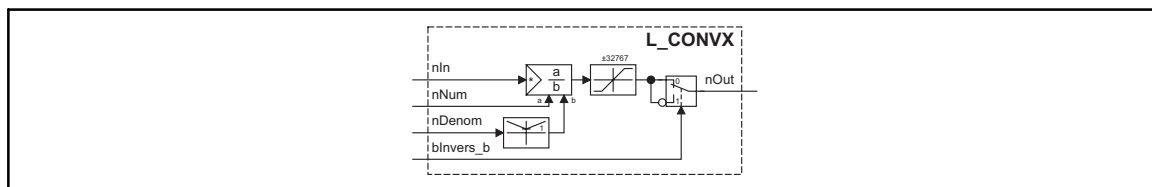


Fig. 2-63

Conversion (L\_CONVX)

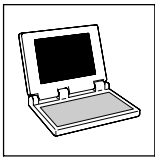
VariableName	DataType	SignalType	VariableType	Note
nIn	Integer	analog/velocity	VAR_INPUT	
nNum	Integer	analog/velocity	VAR_INPUT	Counter
nDenom	Integer	analog/velocity	VAR_INPUT	Denominator
blnvers_b	Bool	binary	VAR_INPUT	
nOut	Integer	analog/velocity	VAR_OUTPUT	

#### Function

The multiplication or division of signals is made according to the formula:

$$nOut = nIn \cdot \frac{dnNum}{|dnDenom|} \cdot \text{sgn } |blnvers_b|$$

- Division by zero is prevented: if  $nDenom = 0$  the the value of  $nDenom$  is set to 1.
- The input value is calculated for nDenominator.
- $blnvers_b = \text{TRUE}$  means that the sign is reversed for the output variable  $nOut$ .
- The calculation is made using remainder handling.



## Function library *LenzeDrive.lib*

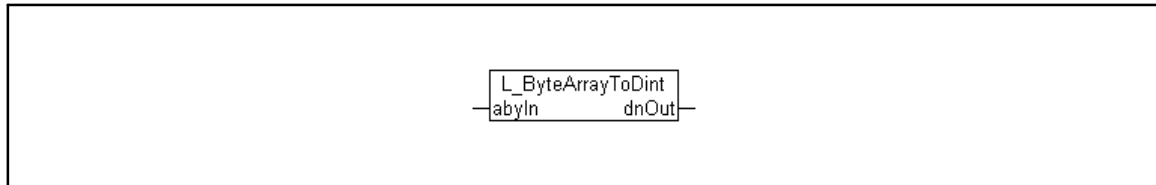
### Communication

#### Type conversion (*L\_ByteArrayToDint*)

## 2.6 Communication

### 2.6.1 Type conversion (*L\_ByteArrayToDint*)

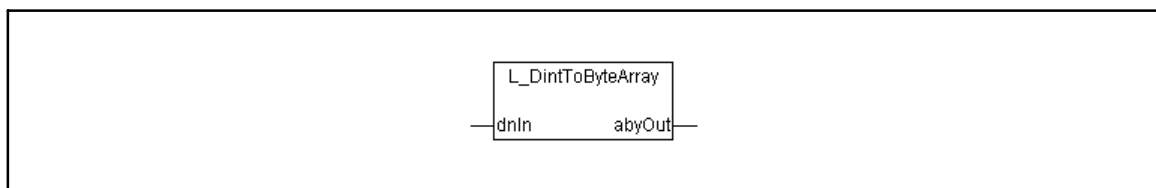
This FB converts a 4-byte array into a variable of type **DINT**.



VariableName	DataType	SignalType	VariableType	Note
abyIn	Byte [0 ... 3]		VAR_INPUT	
dnOut	Double-integer		VAR_OUTPUT	

### 2.6.2 Type conversion (*L\_DintToByteArray*)

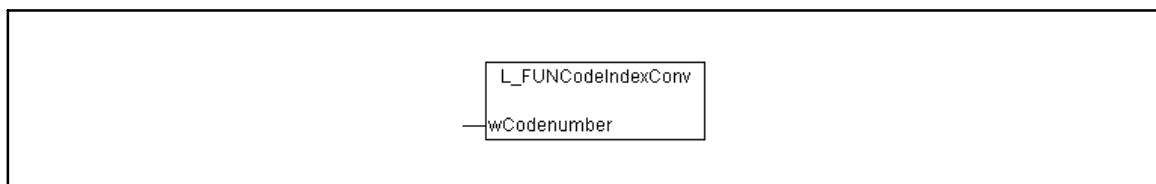
This FB converts a variable of type **DINT** into a 4-byte array, as, for instance, the FB **L\_ParWrite** expects for the input **abyData**.



VariableName	DataType	SignalType	VariableType	Note
dnIn	Double-integer		VAR_INPUT	
abyOut	Byte [0 ... 3]		VAR_OUTPUT	

### 2.6.3 Code index (*L\_FUNCodeIndexConv*)

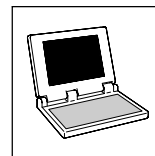
This function checks the value range 1 ... 8000 of a code index and transmits the index to, e. g. the FB **L\_ParWrite** via the **wIndex** input. If the code numbers are invalid, the function transmits the 0000 index.



VariableName	DataType	SignalType	VariableType	Note
wCodenummer	Word		VAR_INPUT	

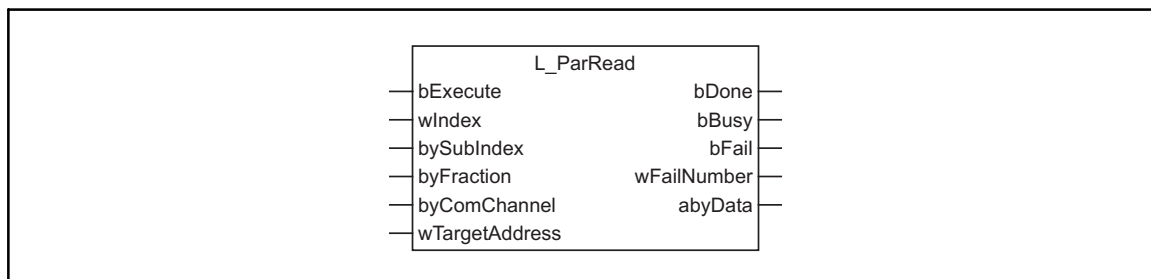
# Function library LenzeDrive.lib

Communication  
Read codes (L\_ParRead)

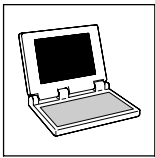


## 2.6.4 Read codes (L\_ParRead)

This FB is used to read parameters, with Lenze so-called codes. The FB can read both the PLC codes and codes of other devices via the system bus (CAN).



VariableName	DataType	VariableType	Note
wTimeOut	Word	VAR_CONSTANT RETAIN	1 ... 65535 Time-out time in ms is the time for processing the order. <ul style="list-style-type: none"> <li>• Initialized with 1000 ms.</li> <li>• This variable can be parameterized by means of a user code.</li> </ul>
bExecute	Bool	VAR_INPUT	FALSE/TRUE transition activates a read request.
wIndex	Word	VAR_INPUT	0 ... 65535 Code index Conversion formula: Index = 24575 - code number
bySubIndex	Byte	VAR_INPUT	0 ... 255 Subindex (subcode number) of the code
byFraction	Byte	VAR_INPUT	0 ... 254 Number of decimal places of the code to be read 255 Code without decimal places (e.g. hexadecimal code).
byComChannel	Byte	VAR_INPUT	0 Constant: <b>C_PLC</b> Reading a PLC code. 10 Constant: <b>C_SYSTEMBUS_CAN</b> Reading a code from a device connected via the system bus (CAN).
wTargetAddress	Word	VAR_INPUT	Selecting the parameter data channel of the target device (only with <i>byComChannel</i> = 10) 1 ... 64 Data transfer via SDO1 of the target device: <i>wTargetAddress</i> = CAN device address of the target device 65 ... 127 Data transfer via SDO2 of the target device: <i>wTargetAddress</i> = CAN device address of the target device + 64
bDone	Bool	VAR_OUTPUT	TRUE Order has been processed (observe <i>bFail</i> ).
bBusy	Bool	VAR_OUTPUT	TRUE Order is being processed.
bFail	Bool	VAR_OUTPUT	TRUE Error occurred.
wFailNumber	Word	VAR_OUTPUT	0 OK - read request was executed without error. 1 Error during data transfer via system bus (CAN). 2 External device did not respond within the set time-out time. 4 Subindex does not exist. 5 Index does not exist. 13 Parameter value to be read is not within the valid range. 117 Invalid communication channel ( <i>byComChannel</i> ). 118 There are not enough free CAN objects available. 119 The Send Order memory is full.
abyData	Byte [0 ... 3]	VAR_OUTPUT	The four data bytes with the read code value.



## Function library *LenzeDrive.lib*

### Communication

#### Read codes (*L\_ParRead*)



#### Note!

The FB **L\_ParRead** must be cyclically called to ensure that the read response is received. Due to the cycle time of the receiver, it may happen that the PLC receives the read response only after a few program cycles.

If the FB is not cyclically called (e.g. in an event-controlled task) the FB might "get stuck" as a result.

#### Selection of the transmission channel

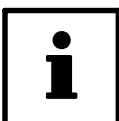
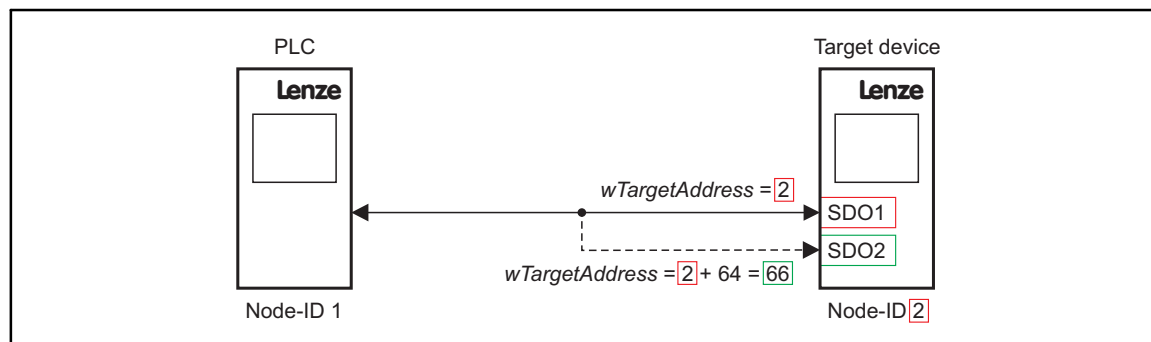
The transmission channel is selected under code C2118:

Code	LCD	Possible settings		Info
		Lenze	Selection	
C2118		0	0 PDO channel (CAN1_IO ... CAN3_IO)	Data is transferred via a free PDO channel of the PLC. For the selection you need: <ul style="list-style-type: none"> <li>• A free CAN transmitter (CAN1_OUT ... CAN3_OUT) to transmit the read request.</li> <li>• A free CAN receiver (CAN1_IN ... CAN3_IN) to receive the read response from the other device.</li> </ul>
			1 SDO2 channel	

#### Selection of the bus participant and the parameter data channel for the bus participant

The bus participant whose codes are to be accessed is selected under *wTargetAddress*. The parameter data channel (SDO1 or SDO2) to be used for the bus participant is also selected under *wTargetAddress*:

- For data transfer via parameter data channel SDO1 enter the corresponding CAN device address (1 ... 64) of the bus participant under *wTargetAddress*.
- For data transfer via parameter data channel SDO2 enter the corresponding CAN device address (1 ... 64) of the bus participant incremented by 64, i.e. a value between 65 and 127 under *wTargetAddress*.

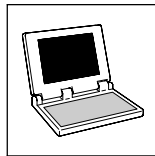


#### Note!

Please ensure that the bus participant is not at the same time accessed by other bus participants via the same parameter data channel since the system bus changes to the state "bus off" if a "collision" occurs.

## Function library LenzeDrive.lib

Communication  
Read codes (L\_ParRead)

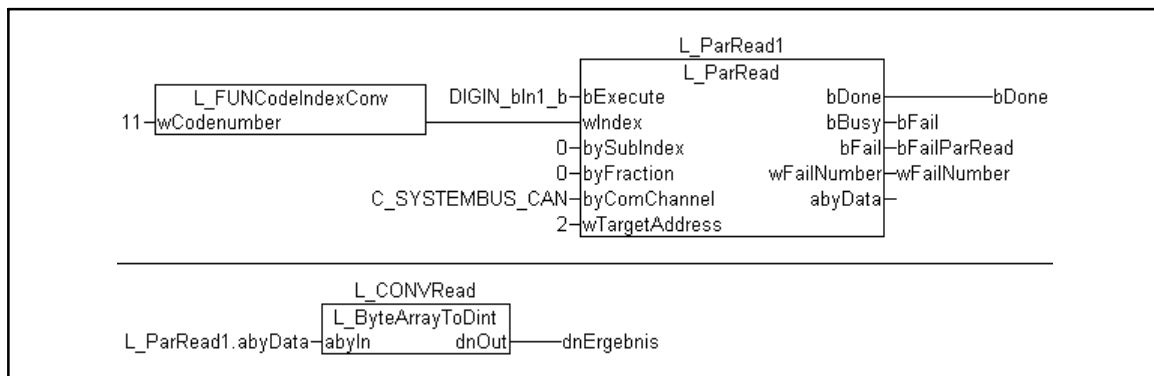


### Tip!

General information about the CAN objects and the system bus (CAN) can be found in the Manual "System bus (CAN) for PLC devices".

### Example

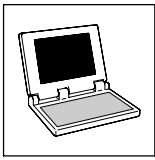
Read value of code C0011 of the device with CAN device address 2:



### Tip!

For converting the code number into the value required for **wIndex** you can use the function **L\_FUNCCodeIndexConv** (see example).

If you want to process the read value in DINT format you can use the FB **L\_DintToByteArray** to convert the 4-byte array **abyData** into a DINT value (see example).



## Function library LenzeDrive.lib

### Communication

#### Read codes (L\_ParRead)

#### Parameter values with decimal places



#### Tip!

The parameters of the Lenze controllers are stored in different formats.

Detailed information about this can be found in the "Table of attributes" in the corresponding drive controller Manual.

If the code to be read uses a data format with decimal places the number of decimal places has to be communicated to the function block **L\_ParRead** via the input **byFraction**.

The following formats apply:

byFraction (number of decimal places)	Value output by FB L_ParRead	Read code value
0	1	1
1	10	1.0
2	100	1.00
3	1000	1.000
4	10000	1.0000

*Example:*

Reading a code with the value "43" in fixed32 data format.

- Fixed32 is a fixed-point format with 4 decimal places. For data transfer the value therefore has to be multiplied by 10000:

$$Data_{1...4} = 43 \cdot 10000 = 430000 = 00\ 06\ 8F\ B0_{hex}$$

- Select the value "4" at the input **byFraction**.
- The FB **L\_ParRead** outputs the value "430000".



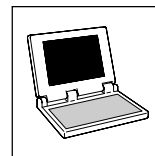
#### Tip!

If the code does not use the fixed-point format the value "255" has to be selected at the input **byFraction**.

Detailed information about reading and writing parameters via the system bus (CAN) can be found in the Manual "System bus (CAN) for PLC devices".

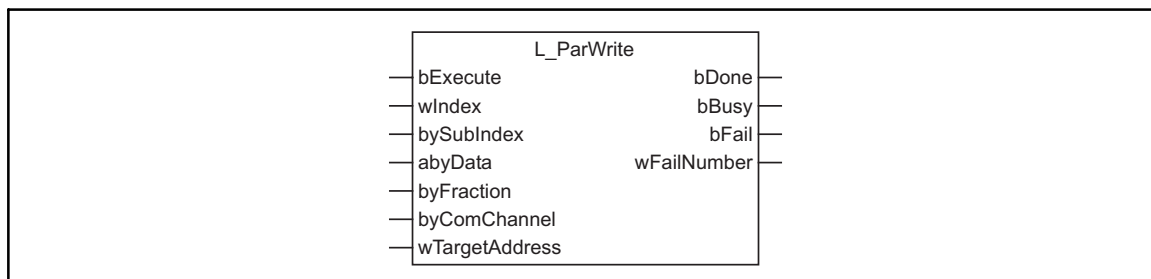
## Function library LenzeDrive.lib

Communication  
Write codes (L\_ParWrite)

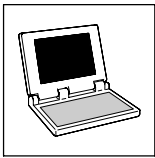


### 2.6.5 Write codes (L\_ParWrite)

This FB is used to write parameters, with Lenze so-called codes. The FB can write both the PLC codes and codes of other devices via the system bus (CAN).



VariableName	Data Type	VariableType	Note
wTimeOut	Word	VAR CONSTANT RETAIN	1 ... 65335 Time-out time in ms is the time for processing the order. <ul style="list-style-type: none"> <li>• Initialized with 1000 ms.</li> <li>• This variable can be parameterized by means of a user code.</li> </ul>
bExecute	Bool	VAR_INPUT	FALSE/TRUE transition activates a write request.
wIndex	Word	VAR_INPUT	0 ... 65535 Code index Conversion formula: Index = 24575 - code number
bySubIndex	Byte	VAR_INPUT	0 ... 255 Subindex (subcode number) of the code
abyData	Byte [0 ... 3]	VAR_INPUT	The four data bytes with the code value to be written.
byFraction	Byte	VAR_INPUT	0 ... 254 255 Number of decimal places of the code to be written. Code without decimal places (e.g. hexadecimal code).
byComChannel	Byte	VAR_INPUT	0 Constant: <b>C_PLC</b> 10 Constant: <b>C_SYSTEMBUS_CAN</b> Writing a PLC code. Writing a code in a device connected via the system bus (CAN).
wTargetAddress	Word	VAR_INPUT	Selecting the parameter data channel of the target device (only with <i>byComChannel</i> = 10) 1 ... 64 Data transfer via SDO1 of the target device: <i>wTargetAddress</i> = CAN device address of the target device 65 ... 127 Data transfer via SDO2 of the target device: <i>wTargetAddress</i> = CAN device address of the target device + 64
bDone	Bool	VAR_OUTPUT	TRUE Order has been processed (observe <i>bFail</i> ).
bBusy	Bool	VAR_OUTPUT	TRUE Order is being processed.
bFail	Bool	VAR_OUTPUT	TRUE Error occurred.



## Function library LenzeDrive.lib

### Communication

#### Write codes (L\_ParWrite)

VariableName	DataType	VariableType	Note	
wFailNumber	Word	VAR_OUTPUT	0	OK - write request was executed without error.
			1	Error during data transfer via system bus (CAN).
			2	External device did not respond within the set time-out time.
			4	Subindex does not exist.
			5	Index does not exist.
			7	The controller inhibit required for writing the code has not been set in the target device.
			13	Parameter value to be written is not within the valid range.
			117	Invalid communication channel (byComChannel)
			118	There are not enough free CAN objects available.
			119	The Send Order memory is full.



### Note!

The FB **L\_ParWrite** must be cyclically called to ensure that the write response is received. Due to the cycle time of the receiver, it may happen that the PLC receives the write response only after a few program cycles.

If the FB is not cyclically called (e.g. in an event-controlled task) the FB might "get stuck" as a result.

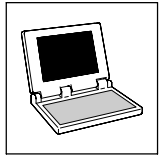
### Selection of the transmission channel

The transmission channel is selected under code C2118:

Code	LCD	Possible settings		Info
		Lenze	Selection	
C2118		0	0 PDO channel (CAN1_IO ... CAN3_IO)	Data is transferred via a free PDO channel of the PLC. For the selection you need: <ul style="list-style-type: none"> <li>• A free CAN transmitter (CAN1_OUT ... CAN3_OUT) to transmit the write request.</li> <li>• A free CAN receiver (CAN1_IN ... CAN3_IN) to receive the write response from the other device.</li> </ul>
			1 SD02 channel	

## Function library LenzeDrive.lib

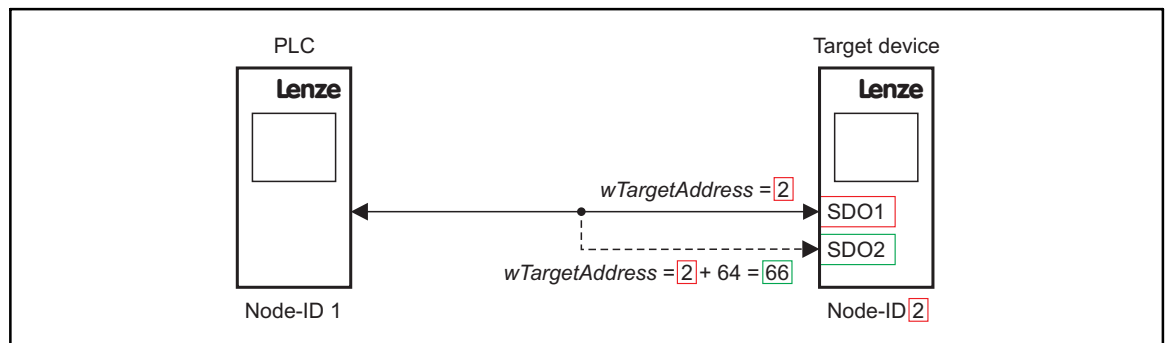
**Communication**  
Write codes (L\_ParWrite)



### Selection of the bus participant and the parameter data channel for the bus participant

The bus participant whose codes are to be accessed is selected under *wTargetAddress*. The parameter data channel (SOD1 or SDO2) to be used for the bus participant is also selected under *wTargetAddress*:

- For data transfer via parameter data channel SDO1 enter the corresponding CAN device address (1 ... 64) of the bus participant under *wTargetAddress*.
- For data transfer via parameter data channel SDO2 enter the corresponding CAN device address (1 ... 64) of the bus participant incremented by 64, i.e. a value between 65 and 127 under *wTargetAddress*.



### Note!

Please ensure that the bus participant is not at the same time accessed by other bus participants via the same parameter data channel since the system bus changes to the state "bus off" if a "collision" occurs.

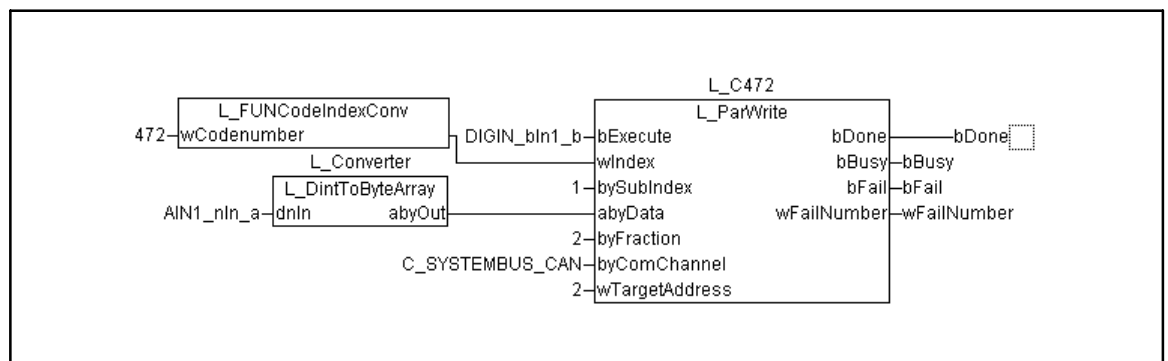


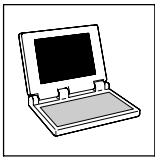
### Tip!

General information about the CAN objects and the system bus (CAN) can be found in the Manual "System bus (CAN) for PLC devices".

### Example

Transfer the value of the analog input AIN1 (terminal 1/2 for 9300 Servo PLC) to code C0472/1 of the controller using the CAN device address 2:





## Function library *LenzeDrive.lib*

### Communication

Write codes (*L\_ParWrite*)



#### Tip!

For converting the code number into the value required for **wIndex** you can use the function **L\_FUNCCodeIndexConv** (see example).

If you want to write the value to be written in DINT format you can use the FB **L\_DintToByteArray** to convert the DINT value into the 4-byte array required for **abyData** (see example).

#### Parameter values with decimal places



#### Tip!

The parameters of the Lenze controllers are stored in different formats.

Detailed information about this can be found in the "Table of attributes" in the corresponding drive controller Manual.

If the code to be written uses a data format with decimal places the number of decimal places has to be communicated to the function block **L\_ParWrite** via the input **byFraction**.

The following formats apply:

byFraction (number of decimal places)	Value assigned to FB L_ParWrite	Code value to be written
0	1	1
1	10	1.0
2	100	1.00
3	1000	1.000
4	10000	1.0000

Example:

Transmitting the value "20" for a code in fixed32 data format.

- Fixed32 is a fixed-point format with 4 decimal places. For data transfer the value therefore has to be multiplied by 10000:

$$Data_{1...4} = 20 \cdot 10000 = 200000 = 00\ 03\ 0D\ 40_{hex}$$

- Select the value "4" at the input **byFraction**.
- Enter the value "20,0000" under the code.



#### Tip!

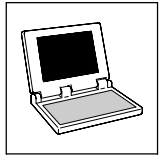
If the code does not use the fixed-point format the value "255" has to be selected at the input **byFraction**.

Detailed information about reading and writing parameters via the system bus (CAN) can be found in the Manual "System bus (CAN) for PLC devices".

# Function library LenzeDrive.lib

## Special functions

### Transparent mode with keypad 9371BB/9371BC (L\_Display9371BB)



## 2.7 Special functions

### 2.7.1 Transparent mode with keypad 9371BB/9371BC (L\_Display9371BB)

With the **keypad 9371BB and 9371BC** you can enter parameters (e.g. setpoints), display operating data, and transfer parameter sets to other target systems via a keyboard.

This FB is used to switch the keypad to a "transparent" mode which makes it possible to access all display elements and keys of keypad 9371BB/9371BC from the program.



#### Note!

- Due to its internal structure, the FB must be called in a time-equidistant task (30 ... 50 ms).
- Data will only be sent to the keypad if changes occur at the FB inputs.

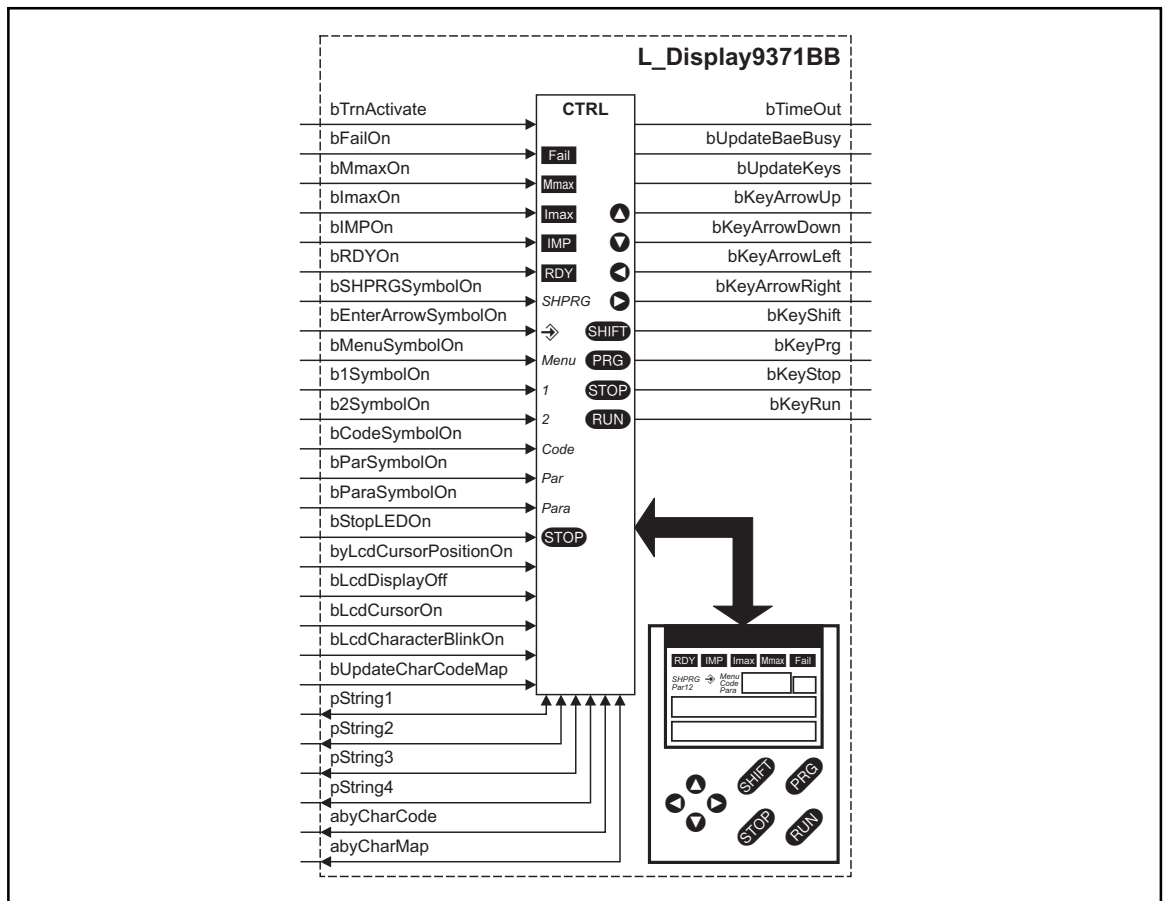
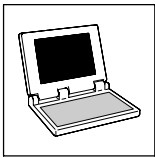


Fig. 2-64

FB L\_Display9371BB

VariableName	Data Type	SignalType	VariableType	Note
bTrnActivate	Bool	binary	VAR_INPUT	TRUE: Activates transparent mode.
bFailOn	Bool	binary	VAR_INPUT	TRUE: The display indicates <b>Fail</b> .
bMmaxOn	Bool	binary	VAR_INPUT	TRUE: The display indicates <b>Mmax</b> .
blmaxOn	Bool	binary	VAR_INPUT	TRUE: The display indicates <b>lmax</b> .
bIMPOn	Bool	binary	VAR_INPUT	TRUE: The display indicates <b>IMP</b> .
bRDYOn	Bool	binary	VAR_INPUT	TRUE: The display indicates <b>RDY</b> .
bSHPRGSymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "SHPRG".



## Function library LenzeDrive.lib

### Special functions

#### Transparent mode with keypad 9371BB/9371BC (L\_Display9371BB)

VariableName	DataType	SignalType	VariableType	Note
bEnterArrowSymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates ↵.
bMenuSymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "Menu".
b1SymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "1".
b2SymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "2".
bCodeSymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "Code".
bParSymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "Par".
bParaSymbolOn	Bool	binary	VAR_INPUT	TRUE: The display indicates "Para".
bStopLEDOn	Bool	binary	VAR_INPUT	TRUE: The key <b>STOP</b> lights up.
byLcdCursorPositionOn	Bool	binary	VAR_INPUT	Selection of the cursor position (0 ... 30) <ul style="list-style-type: none"> <li>• String 1: Position 0 ... 3</li> <li>• String 2: Position 4 ... 5</li> <li>• String 3: Position 6 ... 17</li> <li>• String 4: Position 18 ... 30</li> </ul>
bLcdDisplayOff	Bool	binary	VAR_INPUT	TRUE: Display is switched off.
bLcdCursorOn	Bool	binary	VAR_INPUT	TRUE: Cursor is activated.
bLcdCharacterBlinkOn	Bool	binary	VAR_INPUT	TRUE: The character at the cursor position is blinking.
bUpdateCharCodeMap	Bool	binary	VAR_INPUT	TRUE: The inputs <i>abyCharCode</i> and <i>abyCharMap</i> with the special character definition are read again.
pString1	String	-	VAR_IN_OUT	String 1, length: 4 characters
pString2	String	-	VAR_IN_OUT	String 2, length: 2 characters
pString3	String	-	VAR_IN_OUT	String 3, length: 12 characters
pString4	String	-	VAR_IN_OUT	String 4, length: 13 characters
abyCharCode	Array of byte	-	VAR_IN_OUT	ASCII code assigned to special characters 0 ... 6
abyCharMap	Array of byte	-	VAR_IN_OUT	Definition of special characters 0 ... 6
bTimeOut	Bool	binary	VAR_OUTPUT	TRUE: The keypad has been disconnected from the PLC and the time-out time has expired.
bUpdateBaeBusy	Bool	binary	VAR_OUTPUT	TRUE: The keypad display is updated, the inputs should not be changed.
bUpdateKeys	Bool	binary	VAR_OUTPUT	TRUE: Keypad keys are pressed.
bKeyArrowUp	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>▲</b> is pressed.
bKeyArrowDown	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>▼</b> is pressed.
bKeyArrowLeft	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>◀</b> is pressed.
bKeyArrowRight	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>▶</b> is pressed.
bKeyShift	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>SHIFT</b> is pressed.
bKeyPrg	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>PRG</b> is pressed.
bKeyStop	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>STOP</b> is pressed.
bKeyRun	Bool	binary	VAR_OUTPUT	TRUE: Keypad key <b>RUN</b> is pressed.

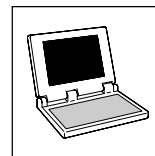
#### Activation of transparent mode

The transparent mode is activated on the keypad by setting *bTrmActivate* to TRUE. All display elements and keys of keypad 9371BB/9371BC can then be accessed via the FB.

## Function library LenzeDrive.lib

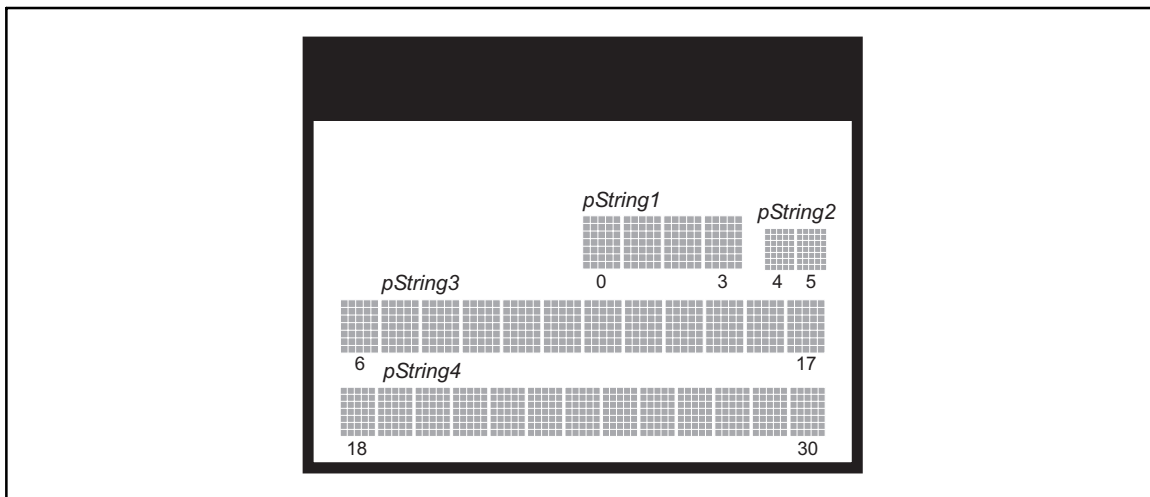
### Special functions

#### Transparent mode with keypad 9371BB/9371BC (L\_Display9371BB)

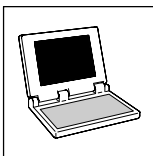


#### Display of ASCII characters on the keypad

The keypad has four fields to display ASCII strings:



- Under *pString* ... *pString4* you can select the ASCII strings to be displayed.
- Under *byLcdCursorPositionOn* you can select the cursor position (0 ... 30).
- By setting *bLcdCursorOn* to TRUE you can display the cursor.
- If *bLcdCharacterBlinkOn* is set to TRUE the character at the cursor position blinks.



## Function library LenzeDrive.lib

### Special functions

Transparent mode with keypad 9371BB/9371BC (L\_Display9371BB)

#### Table of ASCII characters

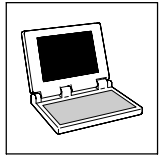
The below table shows the ASCII characters which can be displayed on the keypad:

HEX	DEC	CHAR	HEX	DEC	CHAR	HEX	DEC	CHAR
20	32	[Space]	40	64	@	60	96	`
21	33	!	41	65	A	61	97	a
22	34	"	42	66	B	62	98	b
23	35	#	43	67	C	63	99	c
24	36	\$	44	68	D	64	100	d
25	37	%	45	69	U	65	101	e
26	38	&	46	70	F	66	102	f
27	39	'	47	71	G	67	103	g
28	40	(	48	72	H	68	104	h
29	41	)	49	73	I	69	105	i
2A	42	*	4A	74	J	6A	106	j
2B	43	+	4B	75	K	6B	107	k
2C	44	,	4C	76	A	6C	108	l
2D	45	-	4D	77	M	6D	109	m
2E	46	.	4E	78	N	6E	100	n
2F	47	/	4F	79	O	6F	111	o
30	48	0	50	80	P	70	112	p
31	49	1	51	81	Q	71	113	q
32	50	2	52	82	R	72	114	
33	51	3	53	83	S	73	115	s
34	52	4	54	84	T	74	116	t
35	53	5	55	85	V	75	117	u
36	54	6	56	86	V	76	118	v
37	55	7	57	87	W	77	119	w
38	56	8	58	88	X	78	120	x
39	57	9	59	89	Y	79	121	y
3A	58	:	5A	90	Z	7A	122	z
3B	59	;	5B	91	[	7B	123	{
3C	60	<	5C	92	¥	7C	124	
3D	61	=	5D	93	]	7D	125	}
3E	62	>	5E	94	^	7E	126	→
3F	63	?	5F	95	_	7F	127	←

# Function library LenzeDrive.lib

## Special functions

### Transparent mode with keypad 9371BB/9371BC (L\_Display9371BB)



#### Layout and definition of the special characters

The FB enables the definition of 7 special characters. It is possible to assign an individual ASCII code to each of these special characters.

- The 5 x 7 matrix of a character is defined via the array variable *abyCharMap*. Each array element of data type byte is bit-coded and represents one column of the matrix (0 = white pixel, 1 = black pixel).
- The array variable *abyCharCode* is used to define the ASCII codes for the special characters.

Example:

Define a "μ" as second special character under ASCII code "200":

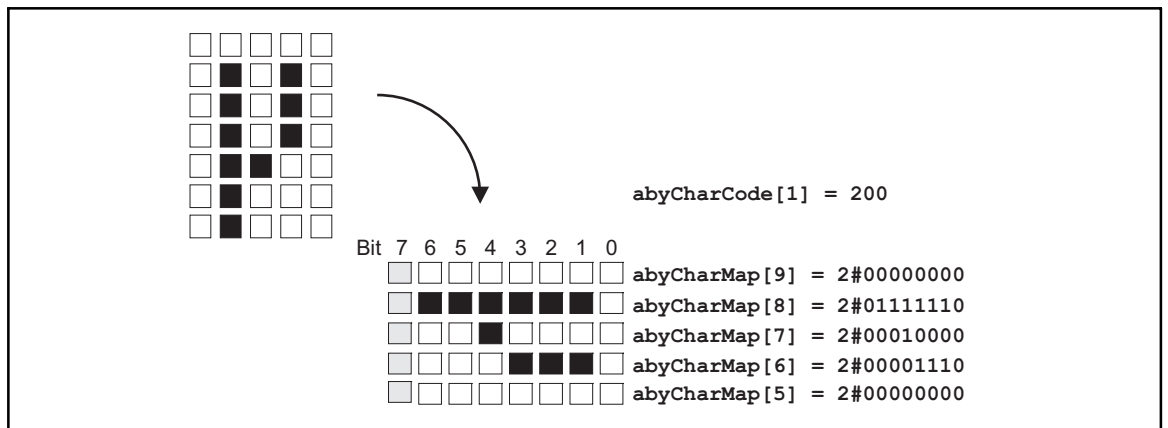


Fig. 2-65

Example: Defining the matrix of a special character

The following figure shows the assignment of the array index to the matrix column:

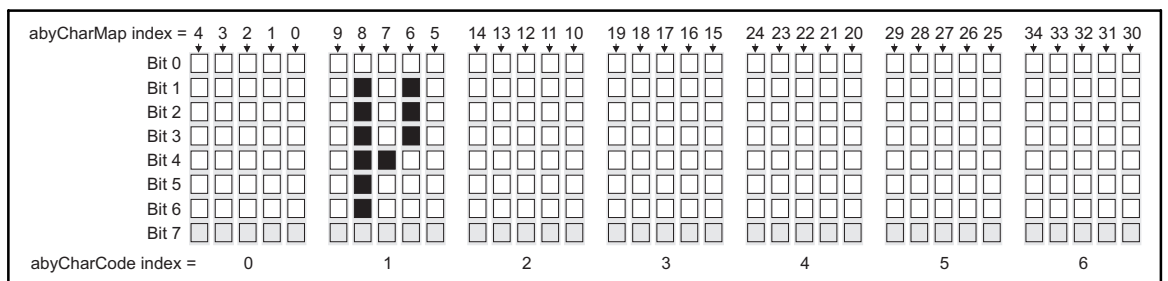


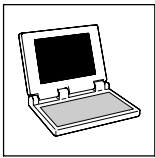
Fig. 2-66

Assignment of the array index [0...30] to the matrix column



#### Note!

- If special characters are defined under ASCII codes between 32 and 127 the special characters will be indicated instead of the standard ASCII characters.
- The defined special characters are only transferred to the strings *pString1* ... *pString4* if *bUpdateCharCodeMap* is set to TRUE.



## Function library *LenzeDrive.lib*

### Special functions

#### Fault trigger (L\_FWM)

## 2.7.2 Fault trigger (L\_FWM)



### Note!

The FB **L\_FWM** of function library **LenzeDrive0201.lib** has been revised and can be used for the following Lenze PLCs:

- 9300 Servo PLC EVS93XX-xl - version 7.0
- 9300 Servo PLC EVS93XX-xT - version 7.0
- Drive PLC EPL10200 - version 7.2
- ECSxAxxx - version 7.0

If the FB **L\_FWM** is used from older LenzeDrive.lib versions, it should be replaced or only be used after consultation with Lenze!

The FB **L\_FWM** is used to transmit error messages to the PLC. In this way, a TRIP, FAIL-QSP, message or warning can be triggered in the PLC while the PLC program is running.

The fault number that is transmitted is stored in the history buffer of the PLC (C0168/x).

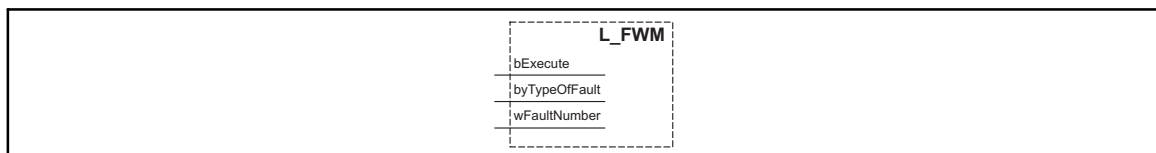


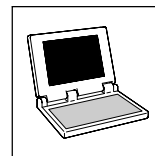
Fig. 2-67

Fault trigger (L\_FWM)

VariableName	DataType	SignalType	VariableType	Note
bExecute	Bool		VAR_INPUT	A High transition triggers a fault signal.
byTypeOfFault	Byte		VAR_INPUT	Triggered by fault type 0: TRIP 1: Message 2: Warning 3: Switched off 4: FAIL-QSP
wFaultNumber	Word		VAR_INPUT	Fault number (400-999) The fault number that is transmitted is stored in the history buffer of the PLC (C0168/x) together with the offset for the fault type.

## Function library LenzeDrive.lib

Special functions  
Fault trigger (L\_FWM)



```

0001 PROGRAM PLC_PRG
0002 VAR
0003   L_FWM1: L_FWM;
0004   L_FWM2: L_FWM;
0005   L_FWM3: L_FWM;
0006   L_FWM4: L_FWM;
0007   L_FWM5: L_FWM;
0008 END_VAR
-----
0001 (*Trip*)
0002 CAL      L_FWM1(bExecute := DIGIN_bIn1_b, byTypeOfFault := 0, wFaultNumber := 450)
0003
0004 (*Meldung*)
0005 CAL      L_FWM2(bExecute := DIGIN_bIn2_b, byTypeOfFault := 1, wFaultNumber := 451)
0006
0007 (*Warnung*)
0008 CAL      L_FWM3(bExecute := DIGIN_bIn3_b, byTypeOfFault := 2, wFaultNumber := 452)
0009
0010 (*Fail-QSP*)
0011 CAL      L_FWM5(bExecute := DIGIN_bIn5_b, byTypeOfFault := 4, wFaultNumber := 454)
0012
0013 (*Keine Fehlerauswirkung*)
0014 CAL      L_FWM4(bExecute := DIGIN_bIn4_b, byTypeOfFault := 3, wFaultNumber := 453)

```

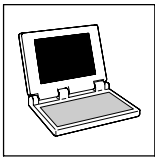
Fig. 2-68 Configuration for triggering the various fault types



### Note!

Each FB instance may only be called once! If you need the FB **L\_FWM** several times, create the corresponding number of FB instances.

- If the program includes several instances of the FB **L\_FWM** which are of the same fault type, then only the first fault of this fault type that is detected will be recorded.
- If several faults with a different response occur at the same time, only the fault whose response has the highest priority will be recorded in the history buffer:
  - TRIP (highest priority) → message → FAIL-QSP → warning (lowest priority).
- Only edit L\_FWM() in a task.
- If *byTypeOfFault* has an invalid value, then the value 0 (TRIP) is used for *byTypeOfFault*.
- If the value of *wFaultNumber* < 400, then the value 400 is used for *wFaultNumber*, if *wFaultNumber* > 999, then the value 999 is used for *wFaultNumber*.
- If a fault occurs, it can be read out by using the system variable **DCTRL\_wFaultNumber**.



## Function library LenzeDrive.lib

### Special functions

#### Motor potentiometer (L\_MPOT)

### 2.7.3 Motor potentiometer (L\_MPOT)

This FB replaces a hardware motor potentiometer. It is used as an alternative setpoint source that is operated via two inputs.

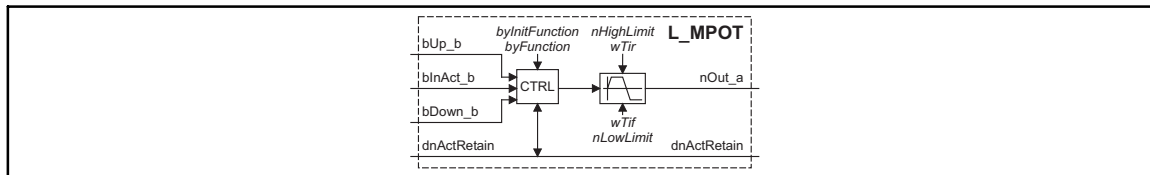


Fig. 2-69

Motor potentiometer (L\_MPOT)

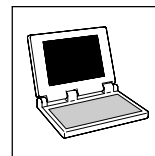
VariableName	DataType	SignalType	VariableType	Note
bUp_b	Bool	binary	VAR_INPUT	Motor potentiometer runs up to the upper limit.
bDown_b	Bool	binary	VAR_INPUT	Motor potentiometer runs down to the lower limit.
bInAct_b	Bool	binary	VAR_INPUT	Activates a function.
nOut_a	Integer	analog	VAR_OUTPUT	Setpoint output
dnActRetain	Double integer		VAR_IN_OUT	Stores the current setpoint.
nHighLimit	Integer		VAR CONSTANT RETAIN	Upper limit (16384 $\equiv$ 100% $\equiv$ C0011)
nLowLimit	Integer		VAR CONSTANT RETAIN	Lower limit (16384 $\equiv$ 100% $\equiv$ C0011)
wTir	Unsigned Integer		VAR CONSTANT RETAIN	Acceleration time Tir (10 $\equiv$ 1 s)
wTif	Unsigned Integer		VAR CONSTANT RETAIN	Deceleration time Tif (10 $\equiv$ 1 s)
byFunction	Byte		VAR CONSTANT RETAIN	Deactivation function
byInitFunction	Byte		VAR CONSTANT RETAIN	Initialization function

#### Parameter codes of the instances

VariableName	L_MPOT1			SettingRange	Lenze
nHighLimit	C0260			-199.99 ... 199.99%	100.00
nLowLimit	C0261			-199.99 ... 199.99%	-100.00
wTir	C0262			0.1 ... 6000.0 s	10.00
wTif	C0263			0.1 ... 6000.0 s	10.00
byFunction	C0264			0 ... 5	0
byInitFunction	C0265			0 ... 2	0

#### Range of functions

- Operation of the motor potentiometer
- Initialization of the motor potentiometer
- Store the current output value after supply interruption.



### 2.7.3.1 Operation of the motor potentiometer

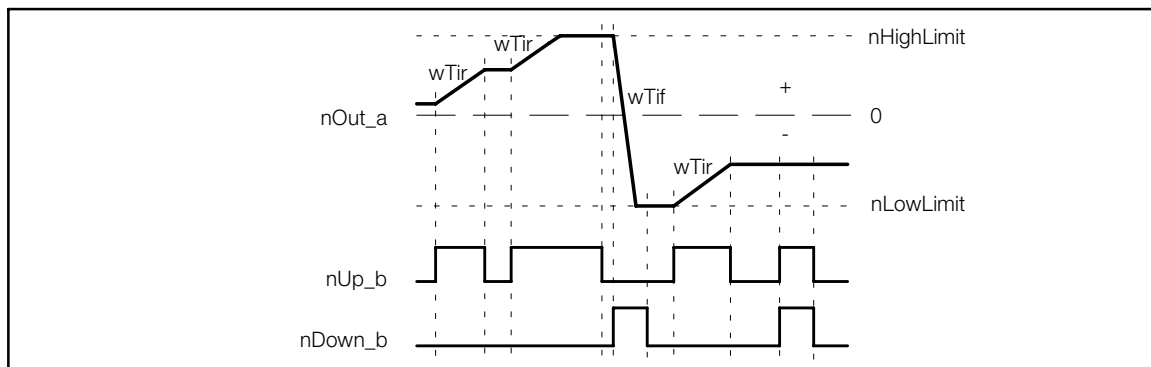


Fig. 2-70

Control signals for the motor potentiometer

- $bUp\_b = \text{TRUE}$ :
  - The signal at  $nOut\_a$  runs up to its upper limit ( $nHighLimit$ ).
- $nDown\_b = \text{TRUE}$ :
  - The signal at  $nOut\_a$  runs down to its lower limit ( $nDownLimit$ ).
- $bUp\_b = \text{FALSE}$  and  $nDown\_b = \text{FALSE}$  or  $bUp\_b = \text{TRUE}$  and  $nDown\_b = \text{TRUE}$ :
  - The signal at  $nOut\_a$  does not change.

### Deactivation of the motor potentiometer

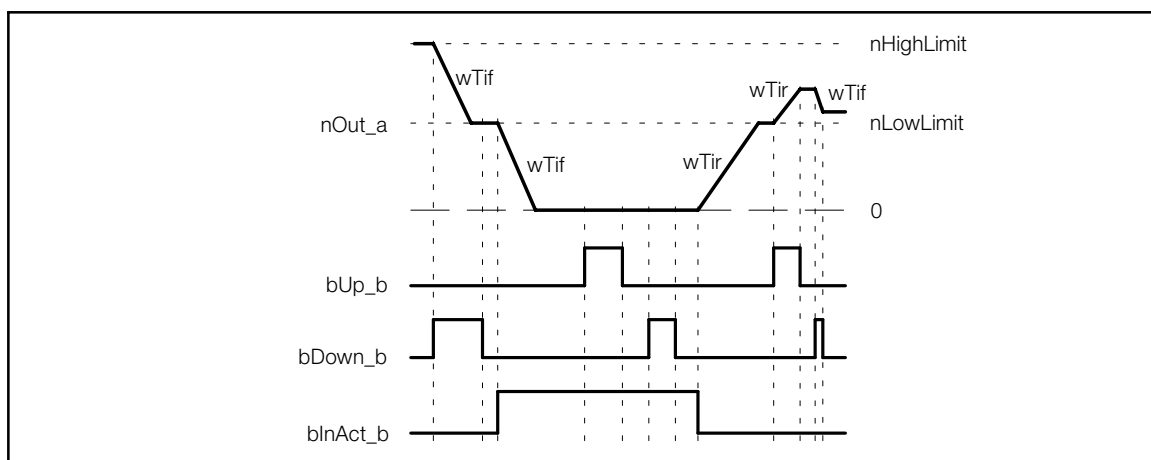


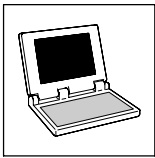
Fig. 2-71

Deactivation of the motor potentiometer

- If  $bInAct\_ = \text{TRUE}$ , then the motor potentiometer is deactivated  
 $bInAct\_b$  has priority over  $bUp\_b$  and  $bDown\_b$ .

If the motor potentiometer is deactivated, the signal at  $nOut\_a$  follows the function set by  $byFunction$ . You can set the following functions:

byFunction	Meaning
0	No further action; $nOut\_a$ retains its value.
1	The motor potentiometer runs down to 0 %, using the run-down time $Tif$ .
2	The motor potentiometer runs down to the lower limit, using the run-down time $Tif$ $nLowLimit$ .
3	The motor potentiometer immediately changes its output to 0 % ( <b>Important for the EMERGENCY STOP function</b> ).
4	The motor potentiometer immediately changes its output to the lower limit ( $nLowLimit$ ).
5	The motor potentiometer runs up to the upper limit, using the run-up time $Tir$ $nHighLimit$ .



## Function library *LenzeDrive.lib*

### Special functions

#### Motor potentiometer (L\_MPOT)

#### Activation of the motor potentiometer

- If *bInAct\_b* = FALSE, then the motor potentiometer is activated. The function that is now performed depends on
  - the momentary output signal.
  - the preset limit values.
  - the control signals at *bUp\_b* and *bDown\_b*.
- If the signal at *nOut\_a*
  - is outside the limits that have been set, then the output signal moves to the nearest limit, using the  $T_i$  times that have been set. The sequence is independent of the control signals at *bUp\_b* and *bDown\_b*.
  - within the limits that have been set, then the output signal moves according to the control signals at *bUp\_b* and *bDown\_b*.

### 2.7.3.2 Initialization of the motor potentiometer

On initialization after power-on, the motor potentiometer is loaded with a specific initial value. Under *byInitFunction* you can select the initialization function.

<i>byInitFunction</i>	Function
0	The output value that is output on power-off, is stored in the internal non-volatile memory of the drive controller. This value is loaded in again at power-on.
1	On mains power-on the lower limit (defined by <i>nLowLimit</i> ) is loaded.
2	On mains power-on an initial value = 0 % is loaded.

### 2.7.3.3 Storing the current output value after supply interruption

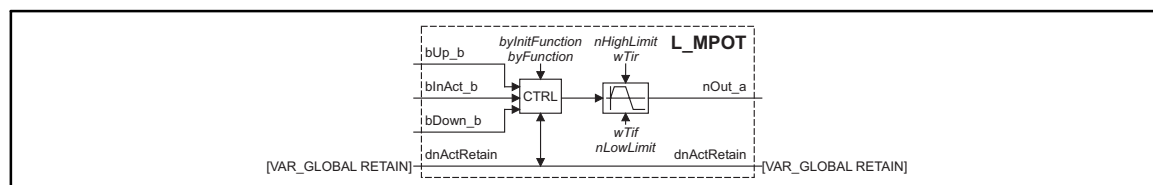


Fig. 2-72

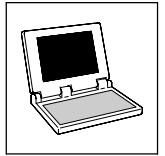
Programming to store the current output value after a supply interruption

In order to store the latest value at *nOut\_a* after a supply interruption, you must declare a global variable of type RETAIN (VAR\_GLOBAL RETAIN). Combine the variable as described in Fig. 2-72.

- The current value at *nOut\_a* is always stored in this variable. The variable will hold the value after a supply interruption.
- When the power is switched on again, the stored value is read into the FB **L\_MPOT** from the variable and applied as the starting value.

# Function library LenzeDrive.lib

Special functions  
Speed preconditioning (L\_NSET)



## 2.7.4 Speed preconditioning (L\_NSET)

This FB conditions the main speed setpoint as well as an additional setpoint (or other signals) for the subsequent controller structure by using a ramp generator or fixed speeds.

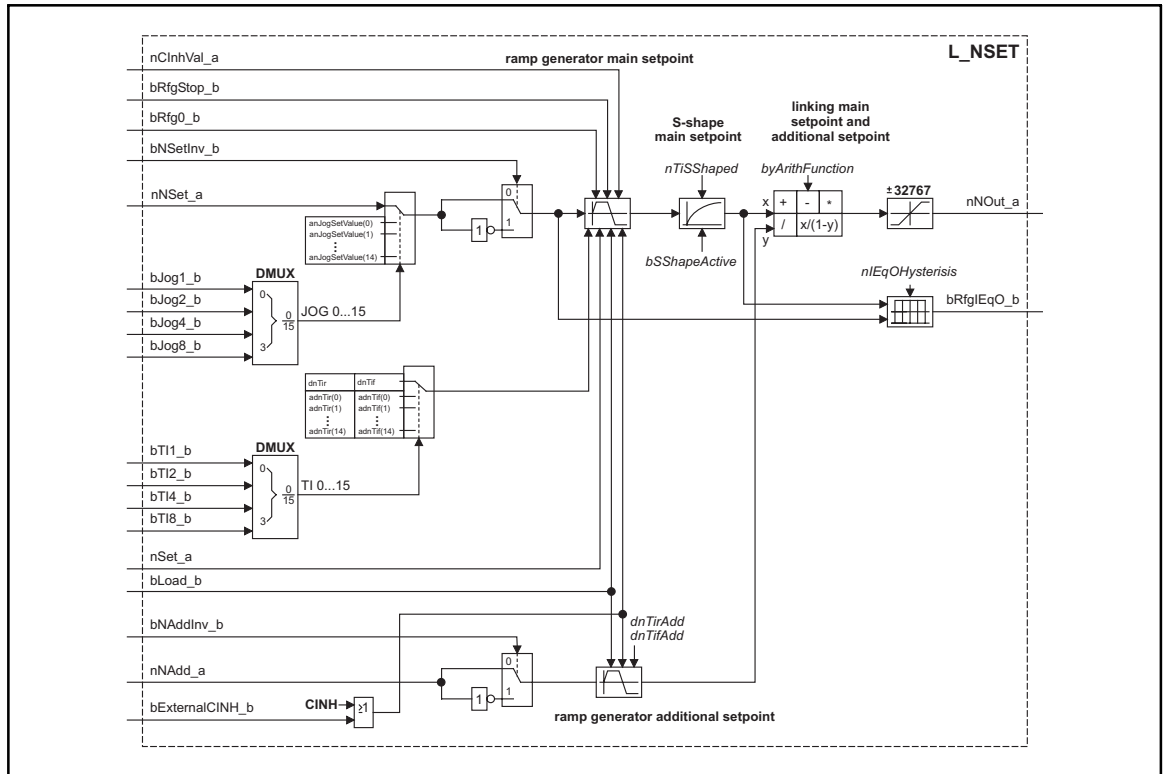
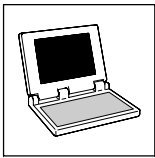


Fig. 2-73 Speed preconditioning (L\_NSET)

Variable name	Data type	Signal type	Variable type	Comment
nClnhVal_a	Integer	analog	VAR_INPUT	Here the signal is applied that the main setpoint integrator is to accept when the controller is inhibited (CINH).
bRfgStop_b	Bool	binary	VAR_INPUT	Holding (freezing) of the main setpoint integrator to its current value.
bRfg0_b	Bool	binary	VAR_INPUT	Leads the main-setpoint integrator via the current T <sub>r</sub> -times to 0.
bNSetInv_b	Bool	binary	VAR_INPUT	Control of the signal inversion for the main setpoint.
nNSet_a	Integer	analog	VAR_INPUT	Provided for main setpoint; other signals are permissible.
bJog1_b	Bool	binary	VAR_INPUT	Selection and control of overriding "fixed setpoints" for the main setpoint.
bJog2_b	Bool	binary	VAR_INPUT	
bJog4_b	Bool	binary	VAR_INPUT	
bJog8_b	Bool	binary	VAR_INPUT	
bTI1_b	Bool	binary	VAR_INPUT	Selection and control of alternative "fixed setpoints" for the main setpoint.
bTI2_b	Bool	binary	VAR_INPUT	
bTI4_b	Bool	binary	VAR_INPUT	
bTI8_b	Bool	binary	VAR_INPUT	
nSet_a	Integer	analog	VAR_INPUT	Here the signal is applied that the main-setpoint integrator is to accept when <i>bLoad_b</i> = TRUE.
bLoad_b	Bool	binary	VAR_INPUT	Control of the two ramp generators in special situations, e.g. quick stop (QSP)
bAddInv_b	Bool	binary	VAR_INPUT	Control of the signal inversion for the additional setpoint



## Function library LenzeDrive.lib

### Special functions

#### Speed preconditioning (L\_NSET)

Variable name	Data type	Signal type	Variable type	Comment
nNAdd_a	Integer	analog	VAR_INPUT	Provided for additional setpoint; other signals are permissible.
bExternalCINH	Bool	binary	VAR_INPUT	Resets the ramp function generator and the additional ramp generator.
nNOut_a	Integer	analog	VAR_OUTPUT	Speed setpoint (16384 $\equiv$ 100 % $\equiv$ $n_{\max}$ (C0011))
bRfIqEq0_b	Bool	binary	VAR_OUTPUT	Status check
dnTir	Double integer		VAR CONSTANT RETAIN	Acceleration time $T_{ir}$ for the main setpoint
dnTif	Double integer		VAR CONSTANT RETAIN	Deceleration time $T_{if}$ for the main setpoint
adnTir[0...14]	Array of double integers		VAR CONSTANT RETAIN	Acceleration time $T_{ir}$ for the main setpoint
adnTif[0...14]	Array of double integers		VAR CONSTANT RETAIN	Deceleration time $T_{if}$ for the main setpoint
anJogSetValue[0...14]	Array of integers		VAR CONSTANT RETAIN	Selectable fixed speeds
bSShapeActive	Bool		VAR CONSTANT RETAIN	S-curve ramp generator characteristic for the main setpoint
nTiSShaped	Integer		VAR CONSTANT RETAIN	$T_r$ -time for the S-curve ramp generator
byArithFunction	Byte		VAR CONSTANT RETAIN	Arithmetic function, combines mains and additional setpoints.
dnTirAdd	Double integer		VAR CONSTANT RETAIN	Acceleration time $T_{ir}$ for the additional setpoint
dnTifAdd	Double integer		VAR CONSTANT RETAIN	Deceleration time $T_{if}$ for the additional setpoint
nIEqOHysteresis	Integer		VAR CONSTANT RETAIN	Ramp generator threshold for the main setpoint

#### Parameter codes of the instances

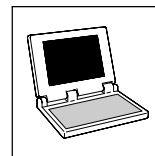
Variable name	L_NSET1		Setting range	Lenze
dnTir	C0012		0.000 ... 999.900 sec	0.000
adnTir[0...14]	C0101/1 ... 15		0.000 ... 999.900 sec	0.000
dnTif	C0013		0.000 ... 999.900 sec	0.000
adnTif[0...14]	C0103/1 ... 15		0.000 ... 999.900 sec	0.000
anJogSetValue[0...14]	C0039/1 ... 15		-199.99 ... 199.99%	0.00
bSShapeActive	C0134		0 ... 1	0
nTiSShaped	C0182		0.01 ... 50.00 sec	20.00
byArithFunction	C0190		0 ... 5	0
dnTirAdd	C0220		0.000 ... 999.900 sec	0.000
dnTifAdd	C0221		0.000 ... 999.900 sec	0.000
nIEqOHysteresis	C0241		0.00 ... 100.00%	1.00

### 2.7.4.1 Main setpoint channel

- The signals in the main setpoint channel are limited to the range of  $\pm 32767$ .
- The signal at  $nNSet_a$  is initially led by the function JOG-select.
- A selected JOG value switches the input  $nNSet_a$  inactive. Then the following signal conditioning uses the JOG value.

## Function library LenzeDrive.lib

Special functions  
Speed preconditioning (L\_NSET)



### 2.7.4.2 JOG setpoints

JOG setpoints are fixed values that are stored under *anJogSetValue[0]* ... *anJogSetValue[14]* in the memory.

- The JOG values can be called up from the memory by *bJog1\_b* ... *bJog8\_b*.
  - These inputs are binary coded, so that 15 JOG values can be called.
- The decoding for the enabling of the JOG values (calling from the memory) is carried out according to the following table:

Main setpoint of	bJog8_b	bJog4_b	bJog2_b	bJog1_b
nNSet_a	0	0	0	0
anJogSetValue[0]	0	0	0	1
anJogSetValue[1]	0	0	1	0
anJogSetValue[2]	0	0	1	1
anJogSetValue[3]	0	1	0	0
anJogSetValue[4]	0	1	0	1
anJogSetValue[5]	0	1	1	0
anJogSetValue[6]	0	1	1	1
anJogSetValue[7]	1	0	0	0
anJogSetValue[8]	1	0	0	1
anJogSetValue[9]	1	0	1	0
anJogSetValue[10]	1	0	1	1
anJogSetValue[11]	1	1	0	0
anJogSetValue[12]	1	1	0	1
anJogSetValue[13]	1	1	1	0
anJogSetValue[14]	1	1	1	1

0 = FALSE

1 = TRUE

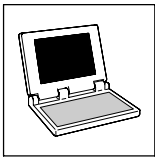
- The number of VAR\_INPUT variables to be assigned depends on the number of JOG setpoints required. A maximum of 4 VAR\_INPUT variables and thus 15 selection possibilities are available.

Number of the required JOG setpoints	Number of VAR_INPUT (bJog1_b ... bJog8_b) to be assigned
1	at least 1
1 ... 3	at least 2
4 ... 7	at least 3
8 ... 15	4

### 2.7.4.3 Setpoint inversion

The output signal of the JOG function is led via an inverter.

The sign of the setpoint is inverted, when *bNSetInv\_b* switches = TRUE .



## Function library LenzeDrive.lib

### Special functions

#### Speed preconditioning (L\_NSET)

#### 2.7.4.4 Ramp generator for the main setpoint

The setpoint is then led via a ramp generator with a linear characteristic. The ramp generator converts setpoint jumps at the input into a ramp.

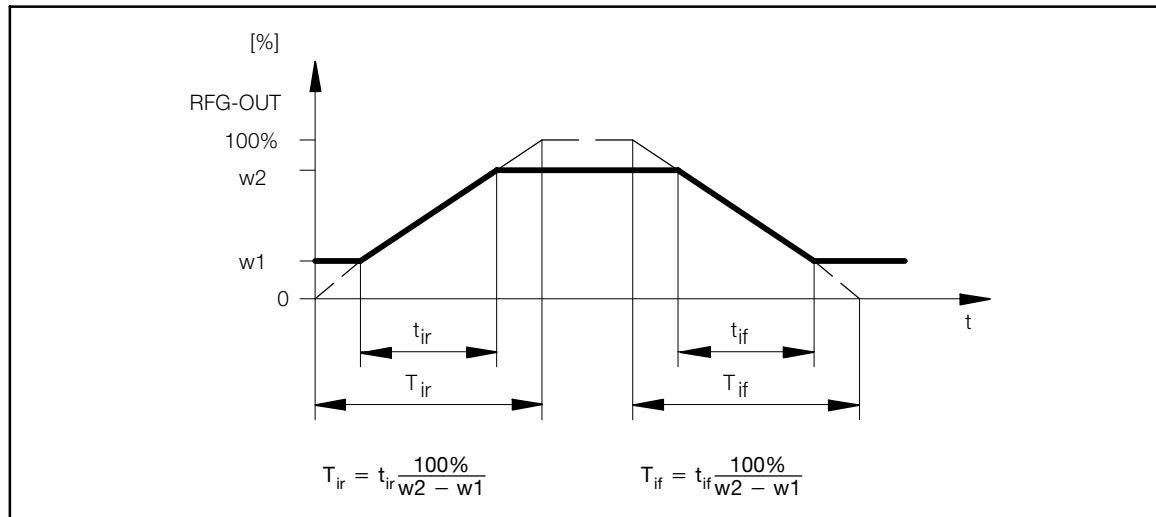


Fig. 2-74

Acceleration and deceleration times of the ramp generator

w1 ,w2                      Change of the main setpoint, depending on  $t_{ir}$  or  $t_{if}$   
RFG-OUT                    Output of the ramp generator

- $T_i$ -times are fixed values that are stored under
  - $adnTir[0] \dots adnTir[14]$  (ramp-up times) and
  - $adnTif[0] \dots adnTif[14]$  (ramp-down times) in the memory.
- The  $T_i$ -times can be called from the memory by  $bTI1\_b \dots bTI8\_b$ 
  - These inputs are binary coded, so that 16  $T_i$ -times can be called.
  - The  $T_i$ -times can only be activated in pairs.
- The decoding for the enabling of the  $T_i$ -times (calling from the memory) is made according to the following plan:

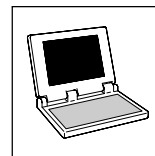
Acceleration time	Deceleration time	bTI8_b	bTI4_b	bTI2_b	bTI1_b
dnTir	dnTif	0	0	0	0
adnTir[0]	adnTif[0]	0	0	0	1
adnTir[1]	adnTif[1]	0	0	1	0
adnTir[2]	adnTif[2]	0	0	1	1
adnTir[3]	adnTif[3]	0	1	0	0
adnTir[4]	adnTif[4]	0	1	0	1
adnTir[5]	adnTif[5]	0	1	1	0
adnTir[6]	adnTif[6]	0	1	1	1
adnTir[7]	adnTif[7]	1	0	0	0
adnTir[8]	adnTif[8]	1	0	0	1
adnTir[9]	adnTif[9]	1	0	1	0
adnTir[10]	adnTif[10]	1	0	1	1
adnTir[11]	adnTif[11]	1	1	0	0
adnTir[12]	adnTif[12]	1	1	0	1
adnTir[13]	adnTif[13]	1	1	1	0
adnTir[14]	adnTif[14]	1	1	1	1

0 = FALSE

1 = TRUE

## Function library LenzeDrive.lib

Special functions  
Speed preconditioning (L\_NSET)



- When the controller inhibit (CINH) is set, the ramp generator accepts the value at *nClnhVal\_a* and passes it on to the following function. This function has priority over all other functions.
- *bRfgStop\_b* = TRUE:
  - The ramp generator is stopped. Changes at the input of the ramp generator have no effect on the output signal.
- *bRfg0\_b* = TRUE:
  - The ramp generator decelerates to zero along its deceleration ramp.
- It is also possible to load the ramp generator online with a defined value. For this *bLoad\_b* must be set = TRUE. As long as this input is set, the value at *nNSet\_a* is accepted by the ramp generator and provided at the output.

### Priorities:

CINH	bLoad_b	bRfg0_b	bRfgStop_b	Function
0	0	0	0	RFG follows the input value via the set ramps.
0	0	0	1	The value at the output of RFG is frozen.
0	0	1	0	RFG decelerates to zero along the set deceleration ramp.
0	0	1	1	
0	1	0	0	RFG takes the value at <i>nSet_a</i> and provides it at its output.
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	RFG takes the value at <i>nClnhVal_a</i> and provides it at its output.
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

0 = FALSE

1 = TRUE

### 2.7.4.5 S-ramp

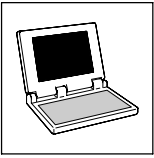
A PT1 element is connected to the linear ramp generator. This arrangement implements an S-ramp for an almost jerk-free acceleration and deceleration.

- The PT1 section is switched on/off with *bSShapeActive*.
- The time constant is set with *nTiSShaped*.

### 2.7.4.6 Arithmetic operation

The arithmetic module makes an arithmetical combination of the main setpoint and the additional setpoint. The arithmetical combination is selected by *byArithFunction*.

byArithFunction	Function	Example
0	$nNout\_a = x$ (y is not processed)	
1	$nNout\_a = x + y$	
2	$nNout\_a = x - y$	
3	$nNout\_a = x * y$	$nNout\_a = \frac{x \cdot y}{16384}$
4	$nNout\_a = x /  y $	$nNout\_a = \frac{x}{ y } \cdot 164$
5	$nNout\_a = x / (100\% - y)$	$nNout\_a = \frac{x}{16384 - y} \cdot 16384$



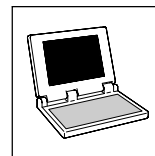
## Function library LenzeDrive.lib

### Special functions

#### Speed preconditioning (L\_NSET)

#### 2.7.4.7 Additional setpoint

- Via *nNAdd\_a* you can combine an additional setpoint (e.g. a correction signal) with the main setpoint.
- Via *bNAddInv\_b* you can invert the input signal, before it is applied to the ramp generator. The ramp generator has a linear characteristic. Its  $T_i$ -times are set with *dnTirAdd* (ramp-up time) and *dnTifAdd* (ramp-down time).
- If *bLoad\_b* = TRUE, the ramp generator is set to 0 and held there, without considering the  $T_i$ -times. The same applies when controller inhibit (CINH) is set.



## 2.7.5 Process controller (L\_PCTRL)

This FB is used, for instance, as a higher-level controller (dancer position controller, tension controller, pressure controller, etc.).

Setpoint and actual value are sent to the process controller via the corresponding inputs and processed according to the selected control algorithm (PID-, PI- or P-algorithm).

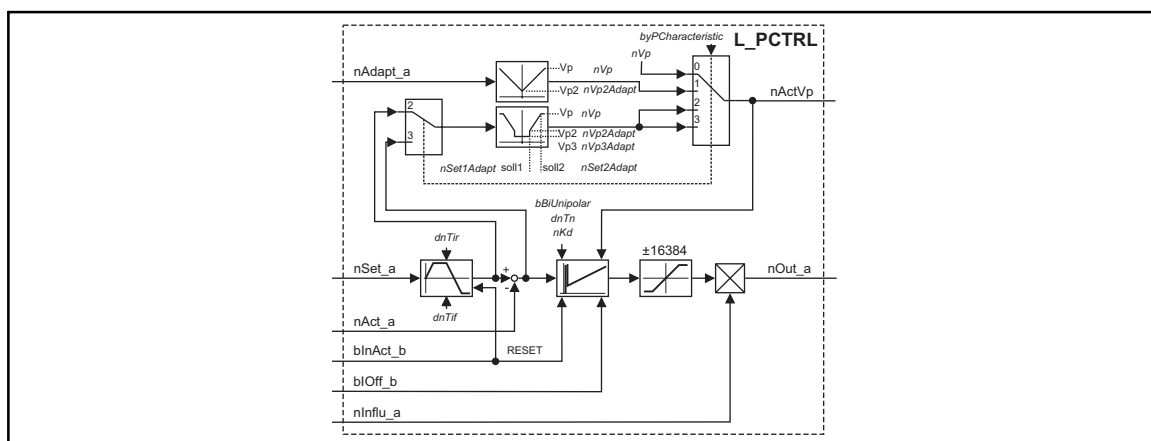
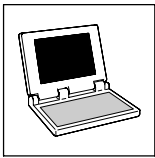


Fig. 2-75

Process controller (L\_PCTRL)

VariableName	DataType	SignalType	VariableType	Note
nAdapt_a	Integer	analog	VAR_INPUT	Gain $V_p$ <ul style="list-style-type: none"> <li>Value range: <math>\pm 32767</math></li> <li>You can alter the gain online.</li> </ul>
nSet_a	Integer	analog	VAR_INPUT	Input of the process setpoint. <ul style="list-style-type: none"> <li>Range of possible values: <math>\pm 32767</math></li> <li>The rate of change of step-change signals can be slowed by using the ramp generator (with <math>dnTir</math> and <math>dnTif</math>).</li> </ul>
nAct_a	Integer	analog	VAR_INPUT	Actual value input <ul style="list-style-type: none"> <li>Value range: <math>\pm 32767</math></li> </ul>
bInAct_b	Bool	binary	VAR_INPUT	Deactivation of the process controller. <ul style="list-style-type: none"> <li>You can carry out this function online.</li> </ul>
bOff_b	Bool	binary	VAR_INPUT	Set I-component to 0. <ul style="list-style-type: none"> <li>You can carry out this function online.</li> </ul>
nInflu_a	Integer	analog	VAR_INPUT	Evaluation or suppression of the output signal. <ul style="list-style-type: none"> <li>Value range: <math>\pm 32767</math></li> </ul>
nOut_a	Integer	analog	VAR_OUTPUT	Output signal. Value range $\pm 16384$ (bipolar), or 0 ... 16384 (unipolar)
nActVp	Integer	-	VAR_OUTPUT	Shows the actual gain.
nVp	Integer	-	VAR CONSTANT RETAIN	Gain $V_p$ ( $10 \equiv 1.0$ )
dnTn	Double integer	-	VAR CONSTANT RETAIN	Integral-action time $T_n$ ( $20 \equiv 20$ ms)
nKd	Integer	-	VAR CONSTANT RETAIN	Differential component $K_d$ ( $10 \equiv 1.0$ )
nVp2Adapt	Integer	-	VAR CONSTANT RETAIN	$V_p2$ - process controller adaptation ( $64 \equiv 1.0$ )
nVp3Adapt	Integer	-	VAR CONSTANT RETAIN	$V_p3$ - process controller adaptation ( $64 \equiv 1.0$ )
nSet1Adapt	Integer	-	VAR CONSTANT RETAIN	Set1 - process controller adaptation ( $16384 \equiv 100.00$ %)
nSet2Adapt	Integer	-	VAR CONSTANT RETAIN	Set2 - process controller adaptation ( $16384 \equiv 100.00$ %)
byPCharacteristic	Byte	-	VAR CONSTANT RETAIN	Function selection for the provision of the P-gain
dnTir	Double integer	-	VAR CONSTANT RETAIN	Acceleration time $T_{ir}$ ( $1000 \equiv 1.000$ s)
dnTif	Double integer	-	VAR CONSTANT RETAIN	Deceleration time $T_{if}$ ( $1000 \equiv 1.000$ s)
bBiUnipolar	Bool	-	VAR CONSTANT RETAIN	Value range of the output signal



## Function library LenzeDrive.lib

### Special functions

#### Process controller (L\_PCTRL)

#### Parameter codes of the instances

VariableName	L_PCTRL1		SettingRange	Lenze
nVp	C0222		0.1 ... 500.0	1.0
dnTn	C0223		20 ... 99999 ms	400
nKd	C0224		0.0 ... 5.0	0.0
nVp2Adapt	C0325		0.1 ... 500.0	1.0
nVp3Adapt	C0326		0.1 ... 500.0	1.0
nSet1Adapt	C0328		0.00 ... 100.00 %	0.00
nSet2Adapt	C0327		0.00 ... 100.00 %	100.00
byPCharacteristic	C0329		0 ... 3	0
dnTir	C0332		0.000 ... 999.900 sec	0.000
dnTif	C0333		0.000 ... 999.900 sec	0.000
bBiUnipolar	C0337		0 ... 1	0

#### Range of functions

- Control characteristic
- Ramp generator
- Value range of the output signal
- Evaluation of the output signal
- Deactivation of the process controller

### 2.7.5.1 Control characteristic

In the default setting, the PID algorithm is active.

#### Differential component $K_d$

You can deactivate the  $K_d$ -component by setting  $nKd = 0.0$ . The controller now becomes a PI-controller (or P-controller if the I-component is also switched off).

#### Integral-action component I

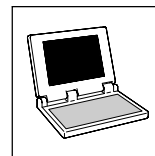
You can switch off the I-component with

- $bloff\_b = \text{TRUE}$ , or on with
- $bloff\_b = \text{FALSE}$ .

Switching on and off can also be done online. If the I-component is to be switched off permanently, set  $bloff\_b$  to TRUE.

#### Integral-action time $T_n$

By using  $nTn$  you can set the parameter for the integral-action time.

**Gain  $V_p$** 

The gain  $V_p$  can be set in different ways. By using *byPCharacteristic* you can select the function you require.

With *nActVp* you can display the actual value of the gain  $V_p$ .

*byPCharacteristic* = 0:

- The gain  $V_p$  is provided by *nVp*.

*byPCharacteristic* = 1:

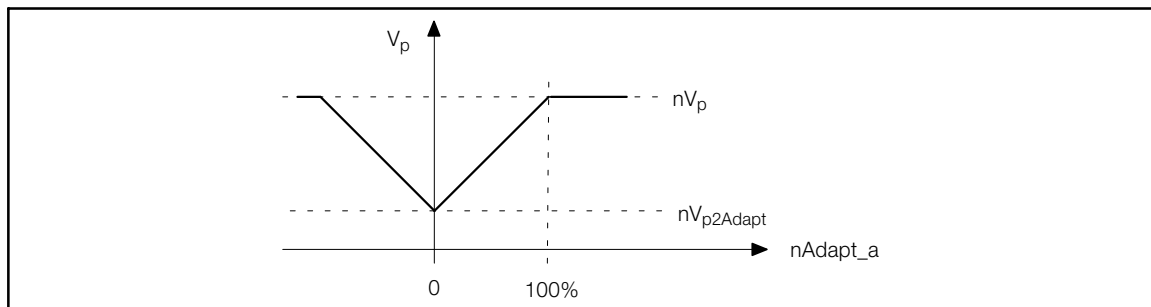


Fig. 2-76

The gain  $V_p$  is provided by *nAdapt\_a*

- The gain  $V_p$  is provided by *nAdapt\_a*. The input value is led via a linear characteristic. The slope of the characteristic is fixed by *nVp* (upper limit) and *nVp2Adapt* (lower limit). The value in *nVp* is valid if the input value = +100% or -100% (100% = 16384). The value in *nVp2Adapt* is valid if the input value = 0.

*byPCharacteristic* = 2:

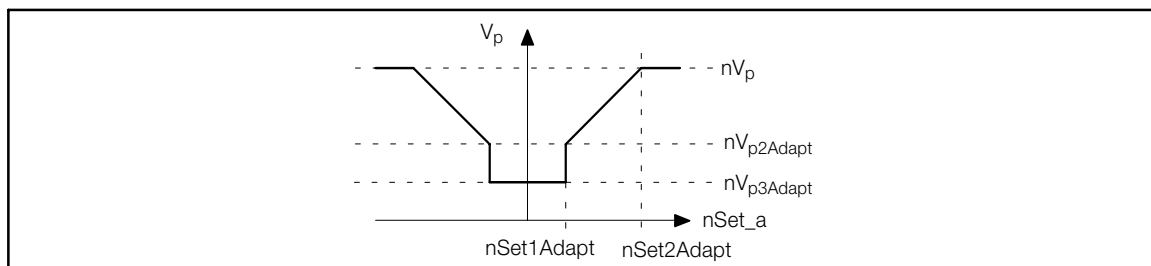


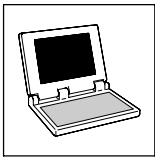
Fig. 2-77

The gain  $V_p$  derived from the process setpoint *nSet\_a*

- The gain  $V_p$  is derived from the process setpoint *nSet\_a*. The setpoint is acquired after the ramp generator, and calculated from a characteristic with 3 interpolation points.

*byPCharacteristic* = 3:

- The gain  $V_p$  is derived from the control difference, and led by the same characteristic generation as for *byPCharacteristic* = 2.



## Function library LenzeDrive.lib

### Special functions

#### Process controller (L\_PCTRL)

### 2.7.5.2 Ramp generator

The setpoint at  $nSet\_a$  is led via a ramp generator with a linear characteristic (100 %  $\equiv$  16384  $\equiv$   $n_{max}$  (C0011)).

This means that setpoint jumps at the input can be converted into a ramp.

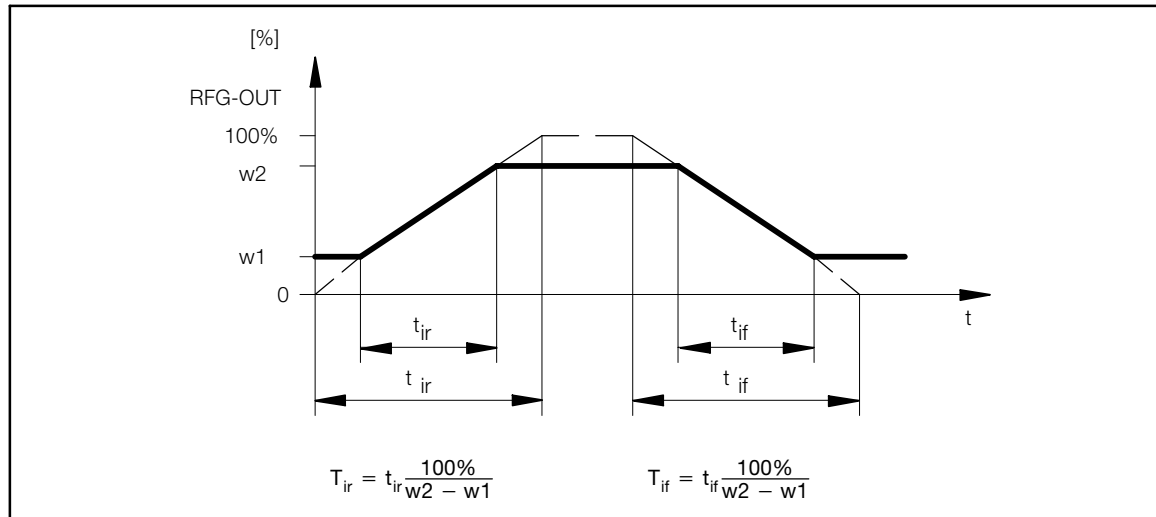


Fig. 2-78

Acceleration and deceleration times of the ramp generator

$w1, w2$  Change of the main setpoint, depending on  $t_{ir}$  or  $t_{if}$   
 RFG-OUT Output of the ramp generator

- The ramps can be adjusted separately for acceleration and deceleration:
  - Acceleration time  $t_{ir}$  with  $dnTir$
  - Deceleration time  $t_{if}$  with  $dnTif$
- Using  $blnAct\_b = TRUE$  sets the ramp generator immediately to 0.

### 2.7.5.3 Value range of the output signal

- In the factory setting, the process controller has bipolar operation ( $bBiUnipolar = 0$ ).
  - The output signal is limited to  $\pm 100\%$  ( $\pm 16384$ ).
- Using  $bBiUnipolar = 1$  the process controller has unipolar operation.
  - The output signal is limited to 0 ... +100 % (0 ... 16384).

### 2.7.5.4 Evaluation of the output signal

- The limitation is followed by an evaluation of the output signal by  $nInflu\_a$ .
  - The calculation is done according to the following formula:

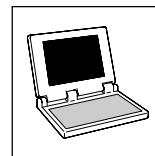
$$nOut\_a = \frac{(\text{Values after the limitation}) \cdot nInflu\_a}{16384}$$

### 2.7.5.5 Deactivation of the process controller

- $blnAct\_b = TRUE$  deactivates the process controller. This means that
  - $nOut\_a$  is set = 0.
  - the I-component is set = 0.
  - the ramp generator is set = 0.

# Function library LenzeDrive.lib

Special functions  
Right/Left/Quickstop (L\_RLQ)



## 2.7.6 Right/Left/Quickstop (L\_RLQ)

This FB links the input for the direction of rotation and the QSP function, and is safe against an open circuit.

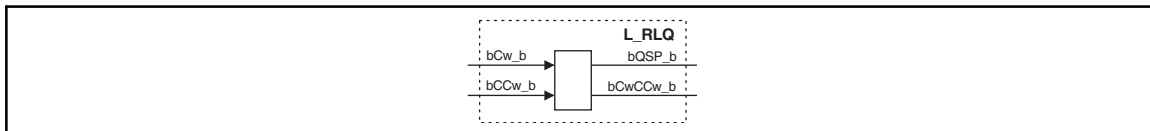


Fig. 2-79

Right/Left/Quickstop (L\_RLQ)

VariableName	DataType	SignalType	VariableType	Note
bCw_b	Bool	binary	VAR_INPUT	Right
bCCw_b	Bool	binary	VAR_INPUT	Left
bCwCCw_b	Bool	binary	VAR_OUTPUT	Status Right/Left
bQSP_b	Bool	binary	VAR_OUTPUT	Set Quickstop

### Function

- After mains connection **and** simultaneous TRUE at both inputs, the outputs are set as follows:

Inputs		Outputs	
bCw_b	bCCw_b	bCwCCw_b	bQSP_b
1	1	0	1

0 = FALSE

1 = TRUE

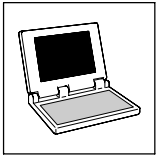
- The following truth-table results only if the inputs were set to TRUE once after power switch-on

Inputs		Outputs	
bCw_b	bCCw_b	bCwCCw_b	bQSP_b
0	0	0	1
1	0	1	0
0	1	1	0
1	1	unchanged	unchanged

0 = FALSE

1 = TRUE

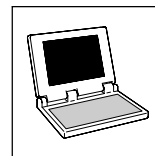
If you set both inputs to TRUE during operation, both outputs still have their previous output value.



## ***Function library LenzeDrive.lib***

### ***Special functions***

***Right/Left/Quickstop (L\_RLQ)***



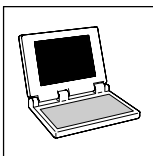
## 3 Appendix

### 3.1 Code table

How to read the code table:

Column	Abbreviation	Meaning
Code	Cxxxx	Code Cxxxx
	1	Subcode 1 of code Cxxxx
	2	Subcode 2 of code Cxxxx
	...	...
	[Cxxxx]	Parameter value of the code can only be modified when the controller is inhibited.
LCD		Keypad LCD <ul style="list-style-type: none"> <li>• DIS: Display only</li> <li>• All others are parameter values.</li> </ul>
Lenze		Lenze setting of the code
		The column IMPORTANT contains further information.
Choice	1 {1 %} 99	Minimum value {Smallest step/unit} Maximum value
IMPORTANT	-	Additional, important explanation of the code

Code	LCD	Possible settings		IMPORTANT	Info
		Lenze	Choice		
C0012	dnTir	0.000	0.000 {0.001 s} 999.900	Acceleration time $T_{ir}$ for the main setpoint of L_NSET1 <ul style="list-style-type: none"> <li>• Related to the speed change <math>0 \dots \eta_{max}</math>.</li> </ul>	2-73
C0013	dnTif	0.000	0.000 {0.001 sec} 999.900	Deceleration time $T_{if}$ for the main setpoint of L_NSET1 <ul style="list-style-type: none"> <li>• Related to the speed change <math>\eta_{max} \dots 0</math>.</li> </ul>	2-73
C0039	1 anJOGSetValue1 ... 14 anJOGSetValue14 15 anJOGSetValue15	0.00 ... 0.00 0.00	-199.99 {0.01} 199.99	Fixed speeds (JOG setpoints) can be selected for L_NSET1 using digital inputs.	2-73
C0101	1 adnTir1 2 adnTir2 ... 15 adnTir15	0.000 0.000 ... 0.000	0.000 {0.001 sec} 999.900	Additional acceleration times $T_{ir}$ for the main setpoint of L_NSET1 <ul style="list-style-type: none"> <li>• Related to the speed change <math>0 \dots \eta_{max}</math>.</li> </ul>	2-73
C0103	1 adnTif1 2 adnTif2 ... 15 adnTif15	0.000 0.000 ... 0.000	0.000 {0.001 sec} 999.900	Additional deceleration times $T_{if}$ for the main setpoint of L_NSET1 <ul style="list-style-type: none"> <li>• Related to the speed change <math>\eta_{max} \dots 0</math>.</li> </ul>	2-73
C0134	bSShapeActive	0	0 linear 1 S-shaped	Ramp generator characteristic for the main setpoint of L_NSET1 Linear S-shaped	2-73 2-73
C0182	nTIShaped	20.00	0.01 sec {0.01 sec} 50.00 sec	$T_r$ -time of the S-curve ramp generator for L_NSET1 Determines the S curve <ul style="list-style-type: none"> <li>• Low values <math>\Rightarrow</math> small S-rounding</li> <li>• High values <math>\Rightarrow</math> large S-rounding</li> </ul>	2-73



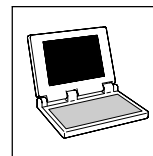
# Function library LenzeDrive.lib

## Appendix

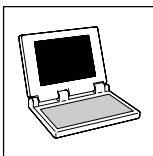
Code	LCD	Possible settings		IMPORTANT	Info	
		Lenze	Choice			
C0190	byArithFunction	0	0 OUT = C46 1 C46 + C49 2 C46 - C49 3 C46 * C49 4 C46 / C49 5 C46/(100 - C49)	Arithmetic block in the function block L_NSET1 • Combines main setpoint C0046 and additional setpoint C0049.	2-73	
C0220	dnTirAdd	0.000	0.000 {0.001 sec}	999.900	Acceleration time $T_{if}$ of the additional setpoint for L_NSET1 • Related to the speed change 0 ... $n_{max}$ .	2-73
C0221	dnTifAdd	0.000	0.000 {0.001 sec}	999.900	Deceleration time $T_{if}$ of the additional setpoint for L_NSET1 • Related to the speed change $n_{max}$ ... 0.	2-73
C0222	nVp	1.0	0.1 {0.1}	500.0	Gain $V_p$ of L_PCTRL1	2-79
C0223	nTn	400	20 {1 msec} 99999 ms switched off	99999	Integral component $T_i$ of L_PCTRL1	2-79
C0224	nKd	0.0	0.0 {0.1}	5.0	Differential component $K_d$ of L_PCTRL1	2-79
C0241	niEq0Hysteresis	1.00	0.00 {0.01 %} 100 % = $n_{max}$	100.00	Threshold ramp generator for main setpoint of L_NSET1 Input = output	2-73
C0260	nHighLimit	100.00	-199.99 {0.01 %}	199.99	Upper limit of L_MPOT1 • Mandatory is: C0260 > C0261	2-70
C0261	nLowLimit	-100.0	-199.99 {0.01 %}	199.99	Lower limit of L_MPOT1 • Mandatory is: C0261 < C0260	2-70
C0262	wTir	10.0	0.1 {0.1 s}	6000.0	Acceleration time $T_{if}$ of L_MPOT1 • Related to change 0 ... 100 %.	2-70
C0263	wTif	10.0	0.1 {0.1 s}	6000.0	Deceleration time $T_{if}$ of L_MPOT1 • Related to change 0 ... 100 %.	2-70
C0264	byFunction	0	0 No function 1 Down to 0 % 2 Down to C261 3 Jump 0 % 4 Jump to C261 5 Up to C260		Deactivation function of L_MPOT1 • Function which is executed when motor pot is deactivated via the input MPOT1-INACTIVE.	2-70
					No change Deceleration with $T_{if}$ to 0 % Deceleration with $T_{if}$ to C0261 Inhibit with $T_{if} = 0$ to 0 % Inhibit with $T_{if} = 0$ to C0261 Acceleration with $T_{if}$ to C0260	2-70
C0265	byInitFunction	0	0 Power off 1 C0261 2 0 %		Initialisation function of L_MPOT1 • Value which is accepted during mains switching and activated motor pot.	2-70
					Value during mains failure Lower limit of C0261: 0 %	2-70
C0325	nVp2Vdapt	1.0	0.1 {0.1}	500.0	Gain adaptation ( $V_{p2}$ ) of L_PCTRL1	2-79
C0326	nVp3Adapt	1.0	0.1 {0.1}	500.0	Gain adaptation ( $V_{p3}$ ) of L_PCTRL1	2-79
C0327	nSet2Adapt	100.00	0.00 {0.01 %}	100.00	Adaptation $n_{set2}$ of L_PCTRL1 Set speed threshold of the process controller adaptation • Mandatory is: C0327 > C0328	2-79
C0328	nSet1Adapt	0.00	0.00 {0.01 %}	100.00	Adaptation $n_{set1}$ of L_PCTRL1 Set speed threshold of the process controller adaptation • Mandatory is: C0328 < C0327	2-79

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## Appendix



Code	LCD	Possible settings		IMPORTANT	Info
		Lenze	Choice		
C0329	byPCharacteristic	0	0 no 1 External Vp 2 Setpoint 3 Ctrl diff	Activate adaptation of L_PCTRL1 no process controller adaptation external via input Adaptation via setpoint Adaptation via control difference	2-79 2-79
C0332	PCTRLdnTir	0.000	0.000 {0.001 sec} 999.900	Acceleration time $T_{ir}$ of L_PCTRL1 • Referred to the setpoint change 0 ... 100 %.	2-79
C0333	dnTif	0.000	0.000 {0.001 sec} 999.900	Deceleration time $T_{if}$ of L_PCTRL1 • Referred to the setpoint change 0 ... 100 %.	2-79
C0337	bBiUnipolar	0	0 bipolar 1 unipolar	Effective range bipolar/unipolar of L_PCTRL1	2-79
C0338	byFunction	1	0 $OUT = nln1\_a$ 1 $nln1\_a + nln2\_a$ 2 $nln1\_a - nln2\_a$ 3 $nln1\_a * nln2\_a$ 4 $nln1\_a / nln2\_a$ 5 $nln1\_a / (100 - nln2\_a)$	Function arithmetic block L_ARIT1 • Combines inputs $nln1\_a$ and $nln2\_a$ .	2-11
C0560	1 anSolIW1 ... 14 anSolIW14 15 anSolIW15	0.00 ... 0.00 0.00	-199.99 {0.01 %} 199.99	Fixed setpoints for L_FIXSET1	2-2
C0600	byFunction	1	0 $OUT = nln1\_a$ 1 $nln1\_a + nln2\_a$ 2 $nln1\_a - nln2\_a$ 3 $nln1\_a * nln2\_a$ 4 $nln1\_a / nln2\_a$ 5 $nln1\_a / (100 - nln2\_a)$	Function arithmetic block L_ARIT2 • Combines inputs $nln1\_a$ and $nln2\_a$ .	2-11
C0620	nGain	1.00	-10.00 {0.01} 10.00	Gain for dead-band component L_DB1	2-20
C0621	nDeadBand	1.00	0.00 {0.01 %} 100.00	Dead-band of DB1	2-20
C0630	nMaxLimit	100.00	-199.99 {0.01 %} 199.99	Upper limit of limiter L_LIM1	2-22
C0631	nMinLimit	-100.0	-199.99 {0.01 %} 199.99	Upper limit of limiter L_LIM1	2-22
C0640	nDelayTime	20.00	0.01 {0.01 sec} 50.00	Time constant of L_PT1_1	2-23
C0650	nGain	1.00	-320.00 {0.01} 320.00	Gain of L-DT1_1	2-21
C0651	nDelayTime	1.000	0.005 {0.001 sec} 5.000	Time constant of L_DT1_1	2-21
C0653	bySensibility	1	1 15 Bit 2 14 Bit 3 13 Bit 4 12 Bit 5 11 Bit 6 10 bit 7 9 Bit	Input sensitivity of L_DT1_1	2-21
C0655	nNumerator	1	-32767 {1} 32767	Numerator for L_CONV5	2-49
C0656	nDenominator	1	1 {1} 32767	Denominator for L_CONV5	2-49
C0671	dnTir	0.000	0.000 {0.01 sec} 999.900	Acceleration time $T_{ir}$ of ramp generator L_RFG1	2-24
C0672	dnTif	0.000	0.000 {0.01 sec} 999.900	Deceleration time $T_{if}$ of L_RFG1	2-24
C0680	byFunction	6	1 $nln1 = nln2$ 2 $nln1 > nln2$ 3 $nln1 < nln2$ 4 $lnln1 = lnln2!$ 5 $lnln1 > lnln2!$ 6 $lnln1 < lnln2!$	Function comparator L_CMP1 • Compares the inputs $nln1$ and $nln2$	2-13
C0681	nHysteresis	1.00	0.00 {0.01 %} 100.00 %	Hysteresis of L_CMP1	2-13
C0682	nWindow	1.00	0.00 {0.01 %} 100.00 %	Window of L_CMP1	2-13



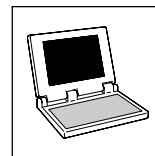
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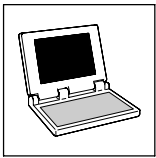
Code	LCD	Possible settings			IMPORTANT	Info	
		Lenze	Choice				
C0685	byFunction	1	1 $nln1 = nln2$ 2 $nln1 > nln2$ 3 $nln1 < nln2$ 4 $lnln1  = lnln2 $ 5 $lnln1  > lnln2 $ 6 $lnln1  < lnln2 $		Function comparator L_CMP2 • Compares the inputs $nln1$ and $nln2$		
C0686	nHysteresis	1.00	0.00	{0.01 %}	100.00 %	Hysteresis of L_CMP2	2-13
C0687	nWindow	1.00	0.00	{0.01 %}	100.00 %	Window of L_CMP2	2-13
C0690	byFunction	1	1 $nln1 = nln2$ 2 $nln1 > nln2$ 3 $nln1 < nln2$ 4 $lnln1  = lnln2 $ 5 $lnln1  > lnln2 $ 6 $lnln1  < lnln2 $		Function comparator L_CMP3 • Compares the inputs $nln1$ and $nln2$		
C0691	nHysteresis	1.00	0.00	{0.01 %}	100.00 %	Hysteresis of L_CMP3	2-13
C0692	nWindow	1.00	0.00	{0.01 %}	100.00 %	Window of L_CMP3	2-13
C0695	byFunction	2	1 $dln1\_p < dln2\_p$ 2 $ldln1\_pl < ldln2\_pl$		Function comparator for phase signals L_PHCMP1 • Compares the inputs $dln1\_p$ and $dln2\_p$	2-40	
C0710	byFunction	0	0 Rising edge 1 Falling edge 2 Both edges		Edge-evaluation function of L_TRANS1	2-36	
C0711	wPulseTime	0.001	0.001	{0.001 sec}	60.000	Pulse time of TRANS1	2-36
C0715	byFunction	0	0 Rising edge 1 Falling edge 2 Both edges		Edge-evaluation function of L_TRANS2	2-36	
C0716	wPulseTime	0.001	0.001	{0.001 sec}	60.000	Pulse duration of L_TRANS2	2-36
C0720	byFunction	2	0 On delay 1 Off delay 2 On/Off delay		Function digital delay component L_DIGDEL1	2-30	
C0721	wDelayTime	1.000	0.001	{0.001 sec}	60.000	Delay time of L_DIGDEL1	2-30
C0725	byFunction	0	0 On delay 1 Off delay 2 On/Off delay		Function digital delay component L_DIGDEL2	2-30	
C0726	WDelayTime	1.000	0.001	{0.001 sec}	60.000	Delay time of L_DIGDEL2	2-30
C0940	nNumerator	1	-32767	{1}	32767	Numerator for L_CONV1	2-49
C0941	nDenominator	1	1	{1}	32767	Denominator for L_CONV1	2-49
C0945	nNumerator	1	-32767	{1}	32767	Numerator for L_CONV2	2-49
C0946	nDenominator	1	1	{1}	32767	Denominator for L_CONV2	2-49
C0950	nNumerator	1	-32767	{1}	32767	Numerator for L_CONV3	2-49
C0951	nDenominator	1	1	{1}	32767	Denominator for L_CONV3	2-49
C0955	nNumerator	1	-32767	{1}	32767	Numerator for L_CONV4	2-49
C0956	nDenominator	1	1	{1}	32767	Denominator for L_CONV4	2-49
C0960	byFunction	1	1 Function 1 2 Function 2 3 Function 3		Characteristic CURVE1-IN	2-17	
C0961	ny0	0.00	0.00	{0.01 %}	199.99	Ordinate of the value-pair (x = 0 % / y0) of L_CURVE1	2-17
C0962	ny1	50.00	0.00	{0.01 %}	199.99	Ordinate of the value-pair (x1 / y1) of L_CURVE1	2-17
C0963	ny2	75.00	0.00	{0.01 %}	199.99	Ordinate of the value-pair (x2 / y2) of L_CURVE1	2-17
C0964	ny100	100.00	0.00	{0.01 %}	199.99	Ordinate of the value-pair (x = 100 % / y100) of L_CURVE1	2-17
C0965	nx1	50.00	0.01	{0.01 %}	100.00	Abscissa of the value-pair (x1 / y1) of L_CURVE1	2-17

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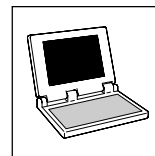


Code	LCD	Possible settings		IMPORTANT	Info	
		Lenze	Choice			
C0966	nx2	75.00	0.01 {0.01 %}	99.00	Abscissa of the value-pair (x2 / y2) of L_CURVE1	2-17
C0995	byDivision	0	-31 {1}	31	Division factor of phase division L_PHDIV1	2-42
C1000	nDivision	1	0 {1}	31	Factor	2-50
C1010	byFunction	1	0 OUT = dnln1_p 1 dnln1_p + dnln2_p 2 dnln1_p - dnln2_p 3 dnln1_p * dnln2_p 14 dnln1_p / dnln2_p 21 dnln1_p + dnln2_p (no limit) 22 dnln1_p - dnln2_p (no limit)		Function of L_ARITPH1	2-38
C1040	dwTi	100.000	0.001 {0.001 %}	5000.000	Acceleration of L_SRFG1	2-28
C1041	dwJerk	0.200	0.001 {0.001 sec}	999.999	Jolt of L_SRFG1	2-28
C1100	byFunction	1	1 Return 2 Hold		Function of L_FCNT1	2-32
C1140	byFunction	0	0 Rising edge 1 Falling edge 2 Both edges		Edge-evaluation function of L_TRANS3	2-36
C1141	wPulseTime	0.001	0.001 {0.001 sec}	60.000	Pulse duration of L_TRANS3	2-36
C1145	byFunction	0	0 Rising edge 1 Falling edge 2 Both edges		Edge-evaluation function of L_TRANS4	2-36
C1146	wPulseTime	0.001	0.001 {0.001 sec}	60.000	Pulse duration of L_TRANS4	2-36
C1150	byMode	0	0 Load perm 1 Load edge 2 Cmp & sub		Function of L_PHINTK	2-43
C1151	dnCmp	2 · 10 <sup>9</sup>	0 {1}	2000000000	Comparison value of L_PHINTK	2-43
C1170	nNumerator	1	-32767 {1}	32767	Numerator for L_CONV6	2-49
C1171	nDenominator	1	1 {1}	32767	Denominator for L_CONV6	2-49
C1207	byFunction	2	1 dnln1_p < dnln2_p 2 ldln1_pl < ldln2_pl		Function comparator for phase signals L_PHCMP2 • Compares the inputs <i>dnln1_p</i> and <i>dnln2_p</i>	2-40
C1272	byFunction	2	1 dnln1_p < dnln2_p 2 ldln1_pl < ldln2_pl		Function comparator for phase signals L_PHCMP3 • Compares the inputs <i>dnln1_p</i> and <i>dnln2_p</i>	2-40
C2118		0	0 Communication via 2 free PDO channels 1 Communication via SDO 2-channel		Channel selection for communication via system bus with L_ParWrite/L_ParRead	2-55 2-59



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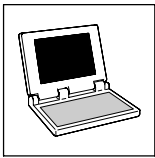
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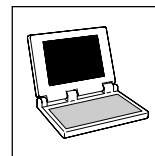
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