

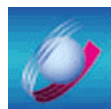
Lenze

Manual

IEC 61131-3

inside

***Global Drive
PLC Developer Studio***



Global Drive

Function library

LenzeCanDSxDrv.lib

The function library **LenzeCanDSxDrv.lib** can be used for the following Lenze PLCs:

	Type	from hardware version	from software version
9300 Servo PLC	EVS93XX-xI	6A	6.0
9300 Servo PLC	EVS93XX-xT	6A	6.0
Drive PLC	EPL10200	1A	6.0
ECSxA	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.

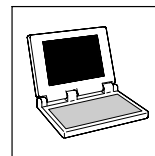
We do not take any liability for direct or indirect damage, e.g. profit loss, order loss or any loss regarding business.

© 2006 Lenze Drive Systems GmbH

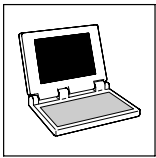
No part of this documentation may be copied or made available to third parties without the explicit written approval of Lenze Drive Systems GmbH.

All information given in this documentation has been carefully selected and tested for compliance with the hardware and software described. Nevertheless, discrepancies cannot be ruled out. We do not accept any responsibility or liability for any damage that may occur. Required corrections will be included in updates of this documentation.

All product names mentioned in this documentation are trademarks of the corresponding owners.

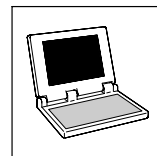
Function library LenzeCanDSxDrv.lib**Contents**

1 Preface and general information	1-1
1.1 About this Manual	1-1
1.1.1 Conventions in this Manual	1-1
1.1.2 Description layout	1-2
1.1.3 Pictographs used in this Manual	1-2
1.1.4 Terminology used	1-2
1.2 Version identifiers of the function library	1-3
2 Introduction	2-1
2.1 General information	2-1
2.2 CanDSx driver	2-1
2.2.1 Operating principle - example	2-2
2.3 Monitoring mechanisms	2-3
2.3.1 "Heartbeat"	2-3
2.3.2 "Node Guarding"	2-4
3 Functions/function blocks	3-1
3.1 Overview	3-1
3.2 L_CanDSxInitIndexCode - Configuration of index mapping	3-2
3.3 L_CanDSxOpen - Initialisation of the CanDSx driver	3-4
3.4 L_CanDSxClose - Deactivation of index mapping	3-5
3.5 L_CanDSxOpenHeartBeat - Initialisation of "Heartbeat"	3-6
3.6 L_CanDSxHeartBeat - Execution of "Heartbeat"	3-7
3.7 L_CanDSxCloseHeartBeat - Deactivation of "Heartbeat"	3-9
3.8 L_CanDSxOpenNodeGuarding - Initialisation of "Node Guarding"	3-10
3.9 L_CanDSxNodeGuarding - Execution of "Node Guarding"	3-11
3.10 L_CanDSxCloseNodeGuarding - Deactivation of "Node Guarding"	3-14



Function library LenzeCanDSxDrv.lib

Contents



1 Preface and general information

1.1 About this Manual

This Manual contains information about function library **LenzeCanDSxDrv.lib** for the **Drive PLC Developer Studio**.

- With the functions of function library **LenzeCanDSxDrv.lib** it is possible to "map" CAN indices received via the system bus interface within the PLC on codes other than the automatically assigned codes.
- The function library also provides functions/FBs for the implementation of the "Heartbeat" and "Node Guarding" monitoring mechanisms to ensure the functionality of the system bus devices.

1.1.1 Conventions in this Manual

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

Variable identifiers

are written in italics in the explanation:

- "Use *bEnable...*"



Tip!

Information about the conventions used for the variables of Lenze system blocks, function blocks and functions can be obtained from the appendix of the DDS online documentation "Introduction into IEC 61131-3 programming". The conventions ensure universal and uniform labelling and make reading the PLC program easier.

Lenze functions/function blocks

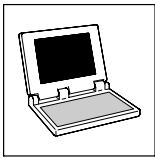
can be recognized by their names. They always begin with an "L_":

- "Use the FB **L_XYZ...**"

Program listings

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

- "**IF** (nValue1 < 0) **THEN...**"



Function library LenzeCanDSxDrv.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: • Data type of the return value • Function identifier • List of transfer parameters	-
	③	Short description of the most important properties	
	④	Function chart including all associated variables • Transfer parameters • Return value	FB/SB chart including all associated variables • Input variables • Output variables
	⑤	Table giving information about the transfer parameters: • Identifiers • Data type • Possible settings • Info	Table giving information about the input and output variables: • Identifiers • Data type • Variable type • Possible settings • Info
	⑥	Table giving information about the return value: • Data type of the return value • Possible return values and their meaning	-
	⑦	Additional information (Notes, tips, application examples, etc.)	

1.1.3 Pictographs used in this Manual

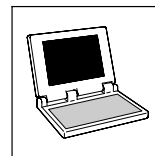
	Pictographs used	Signal words
Warning of material damage		Stop! Warns of potential damage to material . Possible consequences if disregarded: Damage to the controller/drive system or its environment.
Other notes		Tip! Note! Indicates a tip or note.

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"> • 9300 Servo PLC • Drive PLC • Axis module ECSxA "Application"
SB	System block

Function library LenzeCanDSxDrv.lib

Preface and general information
Version identifiers of the function library



1.2 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`.

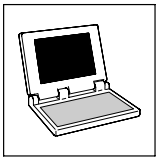
Version identifiers as of PLC software version 7.x:

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

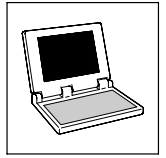
The value of this constant is a hexadecimal code.

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



Function library LenzeCanDSxDrv.lib

Preface and general information



2 Introduction

2.1 General information

The communication behaviour of the CAN bus devices is defined in a variety of communication profiles for CAN communication, e. g.:

- **DS301** - Standard communication between bus devices
- **DS402** - Communication and control of positioning systems

The above communication profiles deal with the following subjects:

- Object directory (connection between index numbers and device functions)
- Network management (start, reset, states of bus devices)
- Bus boot-up messages
- Bus monitoring ("Node Guarding" and "Heartbeat")
- Service data communication (writing/reading of indices/parameters)
- Process data communication (event-controlled/cyclic data transfer)
- Block data transfer



Tip!

With the functions of function libraries **LenzeCanDrv.lib** and **LenzeCanDSxDrv.lib** it is possible to program communication mechanisms according to the IEC 61131 standard which meet the most important requirements of the above communication profiles.

2.2 CanDSx driver

The operating system (as of V6.0) of Lenze PLCs includes a specific CanDSx driver which can be activated by means of the functions of function library **LenzeCanDSxDrv.lib**.

With the driver it is possible to assign indices within the PLC to codes other than the automatically assigned codes.



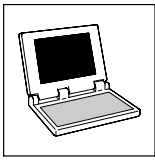
Note!

- Every Lenze code is assigned to a fixed index using the following formula:

$$\text{Index} = 5\text{FFF}_{\text{hex}} - \text{code}$$

$$\text{Index} = 24575_{\text{dec}} - \text{code}$$

- The function of the CanDSx driver is limited to the system bus (CAN). It cannot be used for the second FIF CAN channel of the Drive PLC!



Function library *LenzeCanDSxDrv.lib*

Introduction

CanDSx driver

2.2.1 Operating principle - example

Task

A user has implemented a functionality in his PLC which can be parameterised under user code C3200/5. Code C3200 is automatically assigned to the index $_{dec}$:

$$\text{Index} = 24575_{dec} - \text{code} = 24575_{dec} - 3200 = 21375_{dec}$$

The communication profile requires, however, that the functionality is parameterised under the index 4101 $_{dec}$ /subindex 2.

Solution

Use the functions of function library **LenzeCanDSxDrv.lib** to redirect index 4101 $_{dec}$ /subindex 2 within the PLC to code C3200/5 so that the communication profile need not be changed.

Operating principle

The operating system (as of V6.0) of Lenze PLCs includes a "mapping table" which allows to map up to 256 codes on codes other than the automatically assigned codes within the PLC.

If a CAN telegram is received and the index is within the valid range, the system checks whether the index is listed in the mapping table.

- If the index is listed in the mapping table, the PLC accesses the new code assigned to the index in the mapping table. ①
- If the index is **not** listed in the mapping table, the PLC accesses the automatically assigned code which results from the above formula. ②

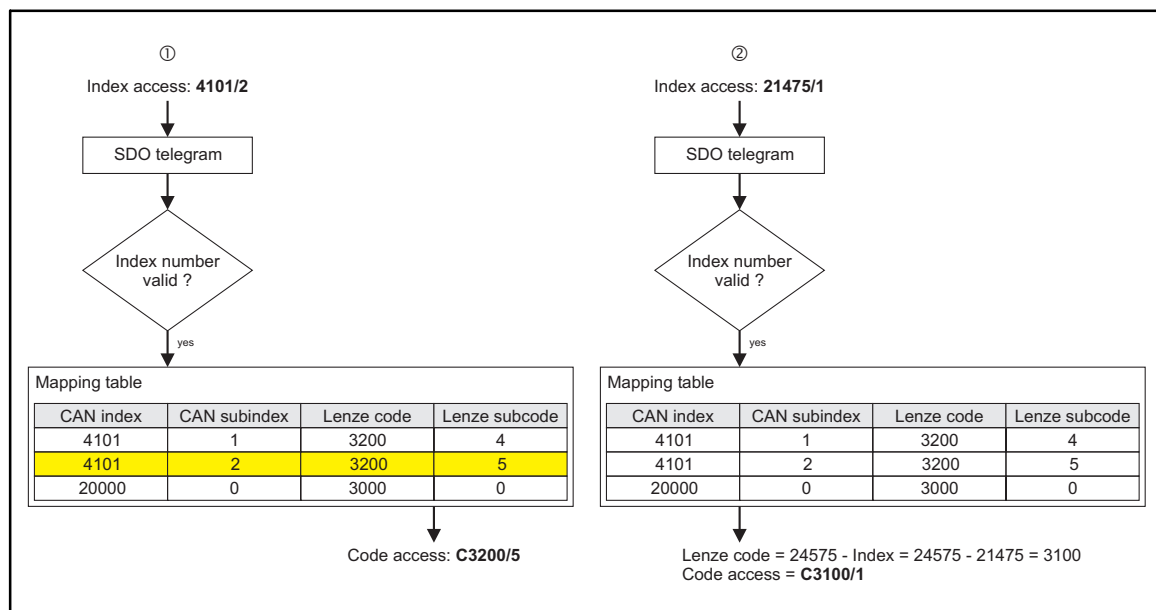
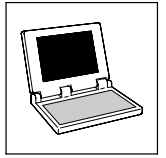


Fig. 2-1

Redirection of indices to codes

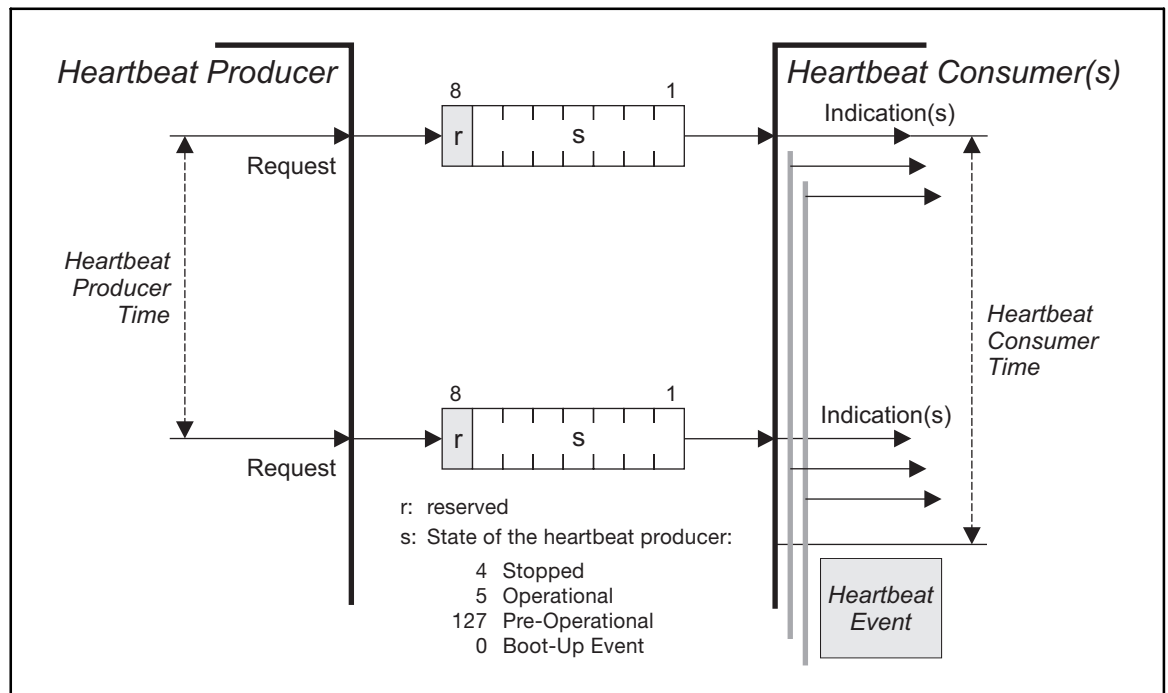


2.3 Monitoring mechanisms

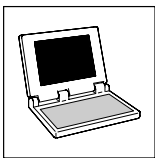
The CANopen communication profile (CiA DS301, version 4.01) specifies two optional monitoring mechanisms to ensure the functionality of the system bus devices: "Heartbeat" and "Node Guarding".

2.3.1 "Heartbeat"

The "Heartbeat" monitoring mechanism is a *producer-consumer* orientated method. Every bus device can monitor the state of the other bus devices. A polling message is not required.



- A bus device (*producer*) indicates its communication status by the cyclic transmission of a "Heartbeat" message.
- The "Heartbeat" message can be received by one, more than one or all bus devices (*consumer*) to monitor the corresponding bus device.
- Unless the monitoring bus device (*consumer*) receives the "Heartbeat" message from the bus device to be monitored (*producer*) within the selected monitoring time (*HeartBeatConsumerTime*), a "Heartbeat" event will be indicated.



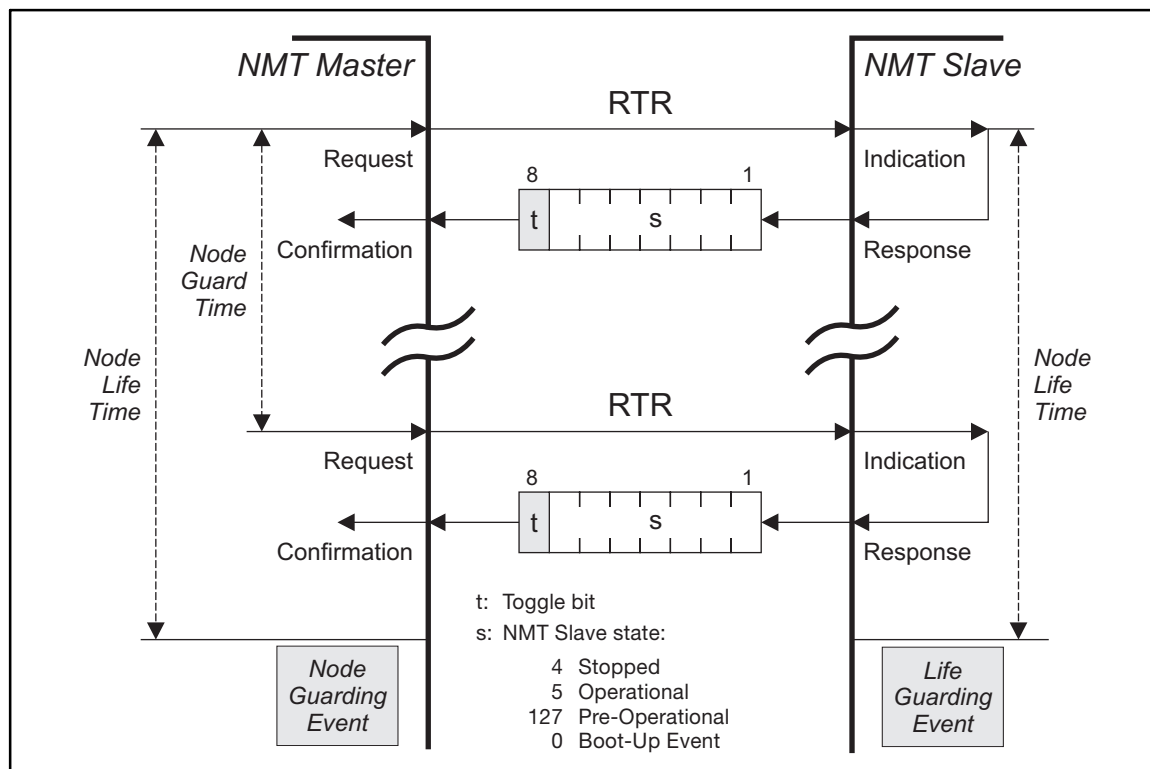
Function library LenzeCanDSxDrv.lib

Introduction

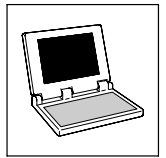
Monitoring mechanisms

2.3.2 "Node Guarding"

Unlike the "Heartbeat" monitoring mechanism, "Node Guarding" requires a polling message from the monitoring bus device (*NMT master*).












- The monitoring bus device (*NMT master*) cyclically polls every bus device to be monitored (*NMT slave*) using a node-specific remote transmission request telegram.
- As response, the bus device to be monitored (*NMT slave*) returns its communication status.
- Unless the monitoring bus device (*NMT master*) receives the message from the bus device to be monitored (*NMT slave*) within the selected monitoring time (*NodeLifeTime*), a "Node Guarding" event will be indicated.
- If the status of the monitoring bus device (*NMT master*) is not polled within its "Node Lifetime", a "Life Guarding" event will be indicated at the bus device to be monitored (*NMT slave*).



3 Functions/function blocks

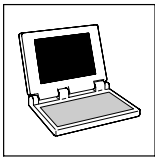
3.1 Overview

Function/FB	Info
Index mapping on codes	
<ul style="list-style-type: none"> The functions only refer to parameter access via the system bus interface of the PLC. 	
L_CanDSxInitIndexCode	Configuration of index mapping  3-2
L_CanDSxOpen	Activation of index mapping  3-4
L_CanDSxClose	Deactivation of index mapping  3-5
"Heartbeat" monitoring mechanism	
L_CanDSxOpenHeartBeat	Initialisation of "Heartbeat"  3-6
L_CanDSxHeartBeat	Execution of "Heartbeat"  3-7
L_CanDSxCloseHeartBeat	Deactivation of "Heartbeat"  3-9
"Node Guarding" monitoring mechanism	
L_CanDSxOpenNodeGuarding	Initialisation of "Node Guarding"  3-10
L_CanDSxNodeGuarding	Execution of "Node Guarding"  3-11
L_CanDSxCloseNodeGuarding	Deactivation of "Node Guarding"  3-14



Tip!

For the mapping of codes accessed via the AIF interface, use the functions provided by function library **LenzeAifParMapDrv.lib**.



Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

L_CanDSxInitIndexCode - Configuration of index mapping

3.2 L_CanDSxInitIndexCode - Configuration of index mapping

Function

This function is used to configure the mapping table and the redirection of indices to codes other than the automatically assigned codes.

- With every function call one index and the corresponding Lenze code can be entered in the mapping table.

Declaration	
INT	<code>L_CanDSxInitIndexCode (byTabIndex, wCANIndex, byCANSubIndex, wLenzeCodeNumber, byLenzeSubCodeNumber);</code>

Transfer parameters	Data type	Information/possible settings	
byTabIndex	Byte	0 ... 255	Number of the configuration entry in the mapping table.
		Index to be redirected:	
wCANIndex	Word	1000 _{hex} ... 8FFF _{hex} (4096 _{dec} ... 36863 _{dec})	CAN index
byCANSubIndex	Byte	0 ... 255	CAN subindex
		Redirection target (Lenze code):	
wLenzeCodeNumber	Word	1 ... 7999	Code number
byLenzeSubCode Number	Byte	0 ... 255	Subcode number

Return value	Data type	Value/meaning	
	Integer	Status	
		0	Entry in the mapping table has been successful.
		-20	Error: Transfer parameter <i>wCANIndex</i> is invalid.
		-30	Error: Transfer parameter <i>wLenzeCodeNumber</i> is invalid.

- A maximum of 256 entries can be entered in the mapping table:

byTabIndex	Code to be redirected		Redirection target	
	wCANIndex	byCANSubIndex	wLenzeCodeNumber	byLenzeSubCodeNumber
0				
1	4104	2	3200	5
2				
...				
255				



Note!

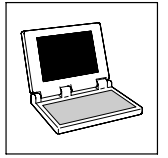
If the function **L_CanDSxInitIndexCode** is called while code read or write requests are active an error may occur!

This is why all actions with code access should be completed before this function is called.

Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

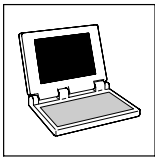
L_CanDSxInitIndexCode - Configuration of index mapping



Example

Calling the function in ST:

```
nReturnInitIndexCode := L_CanDSxInitIndexCode (byTabIndex:=1,  
wCANIndex:=4101,  
byCANSubIndex:=2,  
wLenzeCodeNumber:=3200,  
byLenzeSubCodeNumber:=5);
```



Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

L_CanDSxOpen - Initialisation of the CanDSx driver

3.3 *L_CanDSxOpen* - Initialisation of the CanDSx driver

Function

This function is used to initialise the CanDSx driver in the operating system of the PLC.

- For initialisation, the transfer parameter *bOpen* must be TRUE.
- After the driver has been initialised, the indexes accessed via the system bus interface will not be directed to the automatically assigned codes, but redirected to the codes of the mapping table configured by the function **L_CanDSxIndexInitCode**.

Declaration	
DWORD	L_CanDSxOpen (bOpen);

Transfer parameters	Data type	Information/possible settings
bOpen	Bool	Initialisation of the CanDSx drive in the operating system.
		TRUE The CanDSx driver is initialised in the operating system.

Return value	Data type	Value/meaning	
	Double word	Status	
		Bit Value	
		0 0	Driver initialised.
		0 1	Driver is not initialised. • Remedy: Call the function with transfer parameter <i>bOpen</i> = TRUE.
		1-15	Reserved for future extensions (bits are set to 0). • Invalid if bit 0 = 1
16-31	Version of function library LenzeCanDSxDrv.lib • Format: Main version/subversion (e. g. 0103hex = version 1.03) • Invalid if bit 0 = 1		



Note!

If the function **L_CanDSxOpen** is called while code read or write requests are active an error may occur!

This is why all actions with code access should be completed before this function is called.

Example

Calling the function in ST:

```

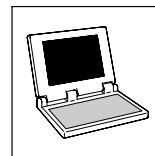
IF bOpenCanDSxDriver AND NOT bOpen THEN
  bOpen := TRUE;
  dwReturnOpen := L_CanDSxOpen (bOpen:= TRUE);
END_IF

```

Function library LenzeCanDSxDrv.lib

Functions/function blocks

L_CanDSxClose - Deactivation of index mapping



3.4 L_CanDSxClose - Deactivation of index mapping

Function

This function is used to deactivate the mapping table and the redirection of indices.

- For deactivation, the transfer parameter *bClose* must be set to TRUE.
- After this function has been executed, the indices accessed via the system bus interface will **no longer** be redirected to the corresponding codes of the mapping table.

Declaration	
BOOL	<code>L_CanDSxClose (bClose);</code>

Transfer parameters	Data type	Information/possible settings
bClose	Bool	Deactivation of index redirections according to the mapping table.
		TRUE The CanDSx driver is deactivated in the operating system.

Return value	Data type	Value/meaning
	Bool	Status
		TRUE The CanDSx driver has been deactivated in the operating system.
		FALSE The CanDSx driver has not been deactivated in the operating system. • Remedy: Call the function with transfer parameter <i>bClose</i> = TRUE.



Note!

If the function `L_CanDSxClose` is called while code read or write requests are active an error may occur!

This is why all actions with code access should be completed before this function is called.

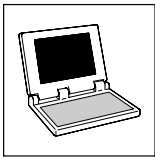
Example

Calling the function in ST:

```

IF bCloseCanDSxDriver AND NOT bClose THEN
  bClose := TRUE;
  dwReturnClose := L_CanDSxClose(bClose:= TRUE);
END_IF

```



Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

L_CanDSxOpenHeartBeat - Initialisation of "Heartbeat"

3.5 *L_CanDSxOpenHeartBeat* - Initialisation of "Heartbeat"

Function

The CANopen communication profile (CiA DS301, version 4.01) specifies two optional monitoring mechanisms to ensure the functionality of the system bus devices: "Heartbeat" and "Node Guarding".

This function is used to initialise the "Heartbeat" monitoring mechanism of the CanDSx driver.

- For initialisation, the transfer parameter *bOpen* must be TRUE.
- The actual monitoring is implemented by means of the FB **L_CanDSxHeartBeat**. (□ 3-7)
- Use the function **L_CanDSxCloseHeartBeat** to deactivate the "Heartbeat" monitoring mechanism. (□ 3-9)



Note!

It is not permitted to use the two monitoring mechanisms simultaneously!

If the transmission cycle time selected for the "Heartbeat" message of the bus device to be monitored is unequal zero, the "Heartbeat" mechanism will have priority over the "Node Guarding" mechanism.

Declaration
<pre>BOOL L_CanDSxOpenHeartBeat (bOpen);</pre>

Transfer parameters	Data type	Information/possible settings
bOpen	Bool	Initialisation of "Heartbeat". TRUE The "Heartbeat" monitoring mechanism of the CanDSx driver is initialised.

Return value	Data type	Value/meaning
	Bool	Status
		TRUE The "Heartbeat" monitoring mechanism has been initialised.
		FALSE A The "Heartbeat" monitoring mechanism has not been initialised. – Remedy: Call the function with transfer parameter <i>bOpen</i> = TRUE. or B The function L_CanDSxOpenNodeGuarding was activated before ("Node Guarding" is activated). – Remedy: Call the function L_CanDSxCloseNodeGuarding with transfer parameter <i>bClose</i> = TRUE (deactivate "Node Guarding").

Example

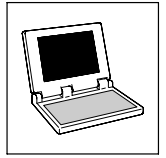
Calling the function in ST:

```
bReturnOpenHeartBeat := L_CanDSxOpenHeartBeat (bOpen := TRUE);
```

Function library LenzeCanDSxDrv.lib

Functions/function blocks

L_CanDSxHeartBeat - Execution of "Heartbeat"

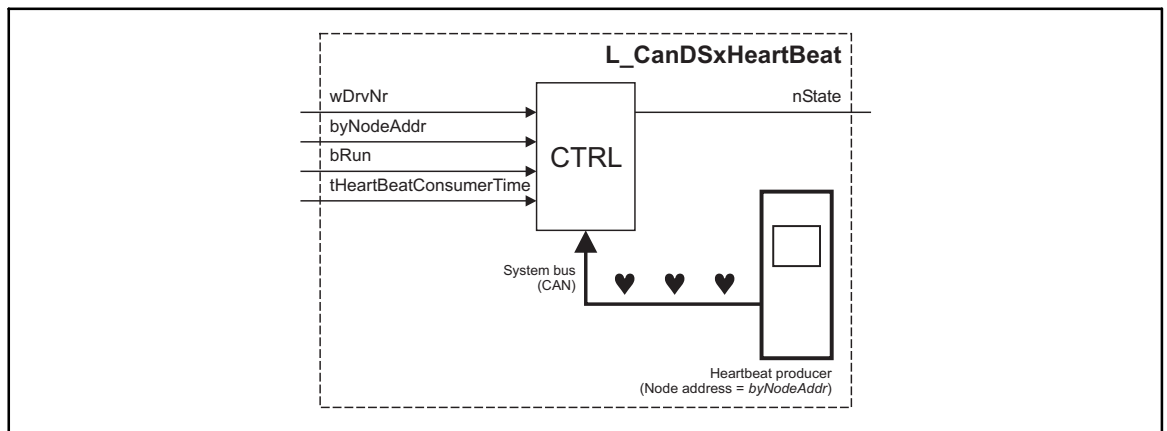


3.6 L_CanDSxHeartBeat - Execution of "Heartbeat"

Function block

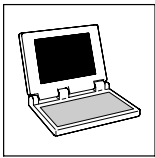
This FB is used for the cyclic monitoring of the CAN connection between the PLC and other system bus devices by means of the "Heartbeat" mechanism.

- The FB acts as "Heartbeat consumer". For this, it must be activated in the monitoring PLC.
- Before the function is executed, the "Heartbeat" monitoring mechanism must be initialised in the CanDSx driver by means of the function **L_CanDSxOpenHeartBeat**. (☐ 3-6)



FB call in:	<input type="checkbox"/> Cyclic task (PLC_PRG)	<input checked="" type="checkbox"/> Time-controlled task (INTERVAL)	<input type="checkbox"/> Event-controlled task (EVENT)	<input type="checkbox"/> Interrupt task
--------------------	--	---	--	---

Inputs	Data type	Information/possible settings
wDrv	Word	Driver number for the CAN interface of the PLC 10 On board system bus (CAN)
byNodeAddr	Byte	Node address of the bus device to be monitored. 1 ... 128 Node address
bRun	Bool	Activation of "Heartbeat" monitoring. TRUE Monitoring is activated. • The FB continuously monitors if the bus device with node address <i>byNodeAddr</i> sends its "Heartbeat" message within the selected monitoring time <i>tHeartBeatConsumerTime</i> via the system bus and outputs the corresponding status at <i>nState</i> .
tHeartBeat ConsumerTime	Time	Monitoring time within which the "Heartbeat" message is to be received from the bus device to be monitored. Otherwise, a "Heartbeat" event (<i>nState</i> = -10) will be activated. • Adapt the consumer time to the "Heartbeat producer time" in which the bus device to be monitored sends the "Heartbeat" message. • Recommended setting: 200 ... 2000 ms • Maximum setting: 65535 ms



Function library LenzeCanDSxDrv.lib

Functions/function blocks

L_CanDSxHeartBeat - Execution of "Heartbeat"

Outputs	Data type	Information/possible settings	
nState	Integer	Status	
		300	FB is deactivated (<i>bRun</i> = FALSE).
		127	Bus device to be monitored is in CAN state <i>Pre-operational</i> .
		5	Bus device to be monitored is in CAN state <i>Operational</i> .
		4	Bus device to be monitored is in CAN state <i>Stopped</i> .
		0	Bus device to be monitored is in CAN state <i>Boot-up</i> or FB is not activated.
		-5	Monitoring time <i>tHeartBeatConsumerTime</i> is set to "0".
		-10	"Heartbeat" event: The "Heartbeat" message from the bus device to be monitored was not received within the selected monitoring time <i>tHeartBeatConsumerTime</i> .
		-12	The selected node address (<i>byNodeAddr</i>) is invalid.
		-120	The monitoring mechanism has not been initialised in the CanDSx driver. • Use the function L_CanDSxOpenHeartBeat to initialise the monitoring mechanism.
-121	The selected driver number (<i>wDrvNr</i>) is invalid.		

Settings required for the PLC to be monitored

(Valid for 9300 Servo PLC/Drive PLC as from V6.2)

Select the following settings for the PLC to be monitored to ensure that the PLC will act as "Heartbeat producer":

1. Set code C0352 of the PLC to be monitored to "3" to configure the PLC as "slave and Heartbeat producer":

Code	LCD	Possible settings		Info	
		Lenze	Selection		
C0352	CAN mst	0		System bus: Master/slave configuration of the PLC	
			0		Slave (boot-up not active)
			1		Master (boot-up active)
			2		Master with Node Guarding (SyncReceived no longer possible)
			3		Slave and Heartbeat producer
4	Slave with Node Guarding				

2. Use C0381 to select the time interval for sending the "Heartbeat" message in the PLC to be monitored. Depending on the bus load, it is recommended to select a setting between 200 ... 2000 ms:

Code	LCD	Possible settings		Info
		Lenze	Selection	
C0381	HeartProTime	0		System bus: Heartbeat (slave): HeartbeatProducerTime
			0	

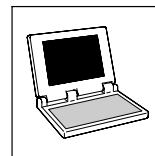
3. Set code C0003 of the PLC to be monitored to "1" to save the new settings fail-safe.
4. Set code C0358 of the PLC to be monitored to "1" to carry out a CAN Reset Node.
 - As an alternative, the CAN Reset Node can also be carried out by means of a fresh power-on.

After the CAN Reset Node, the PLC to be monitored ("Heartbeat" producer) will continuously send the "Heartbeat" telegram within the time interval selected under C0381 via the system bus. The "Heartbeat" monitoring can now be activated in the monitoring PLC.

Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

L_CanDSxCloseHeartBeat - Deactivation of "Heartbeat"



3.7 L_CanDSxCloseHeartBeat - Deactivation of "Heartbeat"

Function

This function is used to deactivate the "Heartbeat" monitoring mechanism of the CanDSx driver.

- For deactivation, the transfer parameter *bClose* must be set to TRUE.

Declaration
<pre>BOOL L_CanDSxCloseHeartBeat (bClose);</pre>

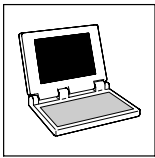
Transfer parameters	Data type	Information/possible settings
bClose	Bool	Deactivation of the "Heartbeat" monitoring mechanism.
		TRUE The "Heartbeat" monitoring mechanism of the CanDSx driver is deactivated.

Return value	Data type	Value/meaning	
	Bool	Status	
		TRUE	The "Heartbeat" monitoring mechanism of the CanDSx driver has been deactivated.
		FALSE	The "Heartbeat" monitoring mechanism of the CanDSx driver has not been deactivated. <ul style="list-style-type: none"> • Remedy: Call the function with transfer parameter <i>bClose</i> = TRUE.

Example

Calling the function in ST:

```
bReturnCloseHeartBeat := L_CanDSxCloseHeartBeat (bClose := TRUE);
```



Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

L_CanDSxOpenNodeGuarding - Initialisation of "Node Guarding"

3.8 L_CanDSxOpenNodeGuarding - Initialisation of "Node Guarding"

Function

The CANopen communication profile (CiA DS301, version 4.01) specifies two optional monitoring mechanisms to ensure the functionality of the system bus devices: "Heartbeat" and "Node Guarding".

This function is used to initialise the "Node Guarding" monitoring mechanism of the CanDSx driver.

- For initialisation, the transfer parameter *bOpen* must be TRUE.
- The actual monitoring is implemented by means of the FB **L_CanDSxNodeGuarding**. (□ 3-11)
- Use the function **L_CanDSxCloseNodeGuarding** to deactivate the "Node Guarding" monitoring mechanism. (□ 3-14)



Note!

It is not permitted to use the two monitoring mechanisms simultaneously!

If the transmission cycle time selected for the "Heartbeat" message of the bus device to be monitored is unequal zero, the "Heartbeat" mechanism will have priority over the "Node Guarding" mechanism.

Declaration	
BOOL	L_CanDSxOpenNodeGuarding (<i>bOpen</i>);

Transfer parameters	Data type	Information/possible settings
<i>bOpen</i>	Bool	Initialisation of the "Node Guarding" monitoring mechanism.
		TRUE The "Node Guarding" monitoring mechanism of the CanDSx driver is initialised.

Return value	Data type	Value/meaning	
	Bool	Status	
		TRUE	The "Node Guarding" monitoring mechanism has been initialised.
		FALSE	A The "Node Guarding" monitoring mechanism has not been initialised. – Remedy: Call the function with transfer parameter <i>bOpen</i> = TRUE. or B The PLC has not been configured as "master with Node Guarding". – Remedy: Set code C0352 to "2" to configure the PLC as "master with Node Guarding".

Example

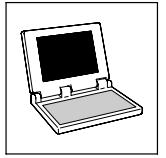
Calling the function in ST:

```
bReturnOpenNodeGuarding := L_CanDSxOpenNodeGuarding (bOpen := TRUE);
```

Function library LenzeCanDSxDrv.lib

Functions/function blocks

L_CanDSxNodeGuarding - Execution of "Node Guarding"

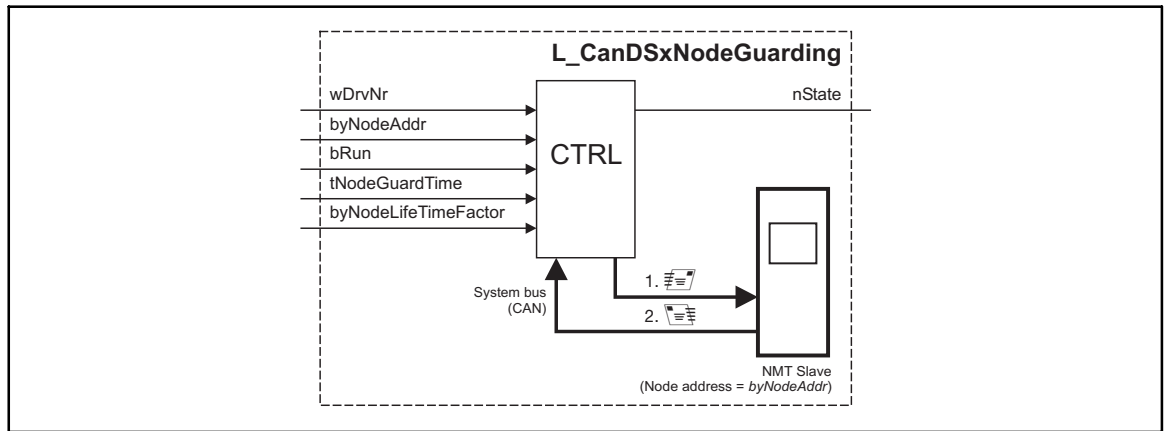


3.9 L_CanDSxNodeGuarding - Execution of "Node Guarding"

Function block

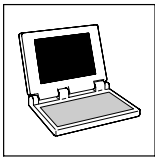
This FB is used for the cyclic monitoring of the CAN connection between the PLC and other system bus devices by means of the "Node Guarding" mechanism.

- Before the function is executed, the "Node Guarding" monitoring mechanism must be initialised in the CanDSx driver by means of the function **L_CanDSxOpenNodeGuarding**.
(3-10)



FB call in:	<input type="checkbox"/> Cyclic task (PLC_PRG)	<input checked="" type="checkbox"/> Time-controlled task (INTERVAL)	<input type="checkbox"/> Event-controlled task (EVENT)	<input type="checkbox"/> Interrupt task
--------------------	--	---	--	---

Inputs	Data type	Information/possible settings
wDrv	Word	Drive number for the CAN interface of the PLC 10 On board system bus (CAN)
byNodeAddr	Byte	Node address of the bus device to be monitored. 1 ... 128 Node address
bRun	Bool	Activation of "Node Guarding". TRUE Monitoring is activated. <ul style="list-style-type: none"> • The FB uses the transmission cycle selected under <i>tNodeGuardTime</i>, sends a remote transmission request telegram to the bus device with the node address <i>byNodeAddr</i> and expects a corresponding response. If the response is not received within the monitoring time ("NodeLifeTime"), the FB will output the corresponding status at <i>nState</i>.
tNodeGuardTime	Time	Transmission cycle of the remote transmission request telegram. <ul style="list-style-type: none"> • Time interval in which the PLC sends a status enquiry to the bus device to be monitored (cyclic polling). • The setting must correspond to the "GuardTime" (C0382) selected in the PLC to be monitored.
byNodeLifeTimeFactor	Byte	Factor for the "NodeLifeTime". "NodeLifeTime" = <i>byNodeLifeTimeFactor</i> · <i>tNodeGuardTime</i> <ul style="list-style-type: none"> • Unless the bus device to be monitored responds to the status enquiry within the "NodeLifeTime", a "Node Guarding" event will be activated (<i>nState</i> = -10). • The setting must correspond to the "NodeLifeTimeFactor" (C0383) selected in the PLC to be monitored.



Function library LenzeCanDSxDrv.lib

Functions/function blocks

L_CanDSxNodeGuarding - Execution of "Node Guarding"

Outputs	Data type	Information/possible settings	
nState	Integer	Status	
		300	FB is deactivated (<i>bRun</i> = FALSE).
		127	Bus device to be monitored is in CAN state <i>Pre-operational</i> .
		5	Bus device to be monitored is in CAN state <i>Operational</i> .
		4	Bus device to be monitored is in CAN state <i>Stopped</i> .
		0	Bus device to be monitored is in CAN state <i>Boot-up</i> or FB is not activated.
		-5	Monitoring time <i>tNodeGuardTime</i> or factor <i>byNodeLifeTimeFactor</i> is set to "0".
		-9	Response received from bus device to be monitored is invalid.
		-10	"Node Guarding" event: No status response received from bus device to be monitored within the "NodeLifeTime".
		-12	The selected node address (<i>byNodeAddr</i>) is invalid.
-120	The monitoring mechanism has not been initialised in the CanDSx driver. <ul style="list-style-type: none"> Use the function L_CanDSxOpenNodeGuarding to initialise the monitoring mechanism. 		
-121	The selected driver number (<i>wDrvNr</i>) is invalid.		

Settings required for the PLC to be monitored

(Valid for 9300 Servo PLC/Drive PLC as from V6.2 and ECSxA as from V7.0)

Select the following settings for the PLC to be monitored to ensure that the PLC will act as "Node Guarding slave":

1. Set code C0352 of the PLC to be monitored to "4" to configure the PLC as "slave with Node Guarding":

Code	LCD	Possible settings		Info	
		Lenze	Selection		
C0352	CAN mst	0		System bus: Master/slave configuration of the PLC	
			0		Slave (boot-up not active)
			1		Master (boot-up active)
			2		Master with Node Guarding (SyncReceived no longer possible)
			3		Slave and Heartbeat producer
4	Slave with Node Guarding				

2. Use C0382 to select the time interval for the status enquiry of the master in the PLC to be monitored. The value must correspond to the setting at the FB input *tNodeGuardTime* in the PLC to be monitored:

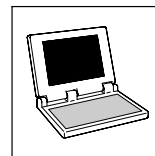
Code	LCD	Possible settings		Info
		Lenze	Selection	
C0382	GuardTime	0		System bus: Node Guarding (slave): NodeGuardTime
			0	

3. Set the Node Guarding master C0352/0 = 2 in the monitoring PLC.

Function library LenzeCanDSxDrv.lib

Functions/function blocks

L_CanDSxNodeGuarding - Execution of "Node Guarding"



4. Use C0383 to select the factor for the monitoring time ("NodeLifeTime") in the PLC to be monitored. The value must correspond to the setting at the FB input *byNodeLifeTimeFactor*:

Code	LCD	Possible settings		Info
		Lenze	Selection	
C0383	LifeTimeFact.	0		System bus: Node Guarding (slave): NodeLifeTimeFactor
			0	



Tip!

The "NodeLifeTime" results from the settings for the "NodeGuardTime" (C0382) and the "NodeLifeTimeFactor" (C0383) in the PLC to be monitored:

$$\text{NodeLifeTime} = \text{NodeGuardTime}(\text{C0382}) \cdot \text{NodeLifeTimeFactor}(\text{C0383})$$

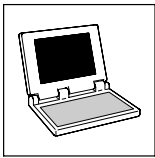
- Unless the PLC to be monitored receives a status enquiry from the monitoring PLC within the "NodeLifeTime", a "Life Guarding" event will be activated in the PLC to be monitored.

5. Use C0384 of the PLC to be monitored to select how the PLC to be monitored shall respond to a "Life Guarding" event:

Code	LCD	Possible settings		Info
		Lenze	Selection	
C0384	Err NodeGuard	3		System bus: Node Guarding (slave): Response to a "Life Guarding" event.
			0	
		1	Message	
		2	Warning	
		3	Off	
		4	Fail QSP	

6. Set code C0003 of the PLC to be monitored to "1" to save the new settings fail-safe.
7. Set code C0358 of the PLC to be monitored to "1" to carry out a CAN reset node.
- As an alternative, the CAN reset node can also be carried out by means of a fresh power-on.

After the CAN reset node, the PLC to be monitored has been configured as "Node Guarding slave" and the monitoring can be activated in the "Node Guarding master".



Function library *LenzeCanDSxDrv.lib*

Functions/function blocks

L_CanDSxCloseNodeGuarding - Deactivation of "Node Guarding"

3.10 L_CanDSxCloseNodeGuarding - Deactivation of "Node Guarding"

Function

This function is used to deactivate the "Node Guarding" monitoring mechanism of the CanDSx driver.

- For deactivation, the transfer parameter *bClose* must be set to TRUE.

Declaration
<pre>BOOL L_CanDSxCloseNodeGuarding (bClose);</pre>

Transfer parameters	Data type	Information/possible settings
bClose	Bool	Deactivation of the "Node Guarding" monitoring mechanism.
		TRUE The "Node Guarding" monitoring mechanism of the CanDSx driver is deactivated.

Return value	Data type	Value/meaning	
	Bool	Status	
		TRUE	The "Node Guarding" monitoring mechanism of the CanDSx driver has been deactivated.
		FALSE	The "Node Guarding" monitoring mechanism of the CanDSx driver has not been deactivated. <ul style="list-style-type: none"> • Remedy: Call the function with transfer parameter <i>bClose</i> = TRUE.

Example

Calling the function in ST:

```
bReturnCloseNodeGuarding := L_CanDSxCloseNodeGuarding (bClose := TRUE);
```