

## Application Note:

# Setting up Nanotec Drives as NC axis in TwinCAT via CANopen (in CSP mode)

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#### System configuration

The status of TwinCAT is shown in the lower right corner.

1. Make sure that TwinCAT is in configuration mode. If not, click on this icon.



3. Select the system from the list. In case it is not listed, click on 'Search' (Ethernet) and start a broadcast search.

Choose Target System	<b>—</b>
□	OK Cancel
	Search (Ethernet)
	🕅 Set as Default
Connection Timeout (s): 5	



4. Scan for devices as shown below.



5. If CANopen Master is used, it will be detected at this point. Simply click on 'Yes' and select the appropriate Baudrate.

TwinCAT System	n Manager 🛛 🕅
Crea ('CA	:ial EtherCAT slave found: 751 CANopen Master' ite corresponding device automatically Nopen Master EL6751, EtherCAT')
	Ja Nein
Select Baudra	ite 💌
Device:	Device 3 (EL6751)
Baudrate:	1 M 💌
OK	Cancel



#### **CANopen node configuration**

1. Once selected, click on the CANopen Master (Device 3) and scan for boxes. The Nanotec controller will be detected after this stage and displayed as a box.





2. In order to configure the Nanotec controller, select the appropriate EDS file. To do so, right click on the box with the controller name and select 'Loads PDOs from EDS file', as shown below.

Gevice 3 (E	L6751)	
	3 (EL6751)-Image	2
🚛 🖓 Inputs	-	
	Insert TxPDC Insert RxPDC	)
	Loads PDOs	from EDS file
	Insert Box Be ★ Delete Box	efore
	😭 I <u>m</u> port Box E 😭 <u>E</u> xport Box	3efore
	<mark>Ϫ Cut</mark>	Ctrl+X
	E∰ <u>C</u> opy	Ctrl+C
	Paste	Ctrl+V
	Paste with Li	inks Alt+Ctrl+V
	🗙 Disabled	

3. If using CSP mode, the interpolation time has to be configured. This is done by appending the object 0x60C2:01 as a SDO, which will be overwritten in the box when switching to RunTime. Click on 'Append' and follow the next screenshot.



The value of the interpolation time (0x60C2:01) should equal to the cycle value of the NC axis.





#### Configuring a system task

1. Add a new task by clicking on 'Append Task'.





2. Click on 'Auto start' and set Cycle ticks to 1.



3. Click on 'Inputs' and select 'Insert Variable'. Two variables 'Error' & 'State' need to be inserted and linked as shown below.

🖃 👧 SYSTEM - Configuration				
🖃 📴 Additional Tasks				
⊨ 🖻 Task 1				
- 📫 Task 1-Image				
🍋 🛛 🏪 Insert Variable				
Route Set				
COM O Recalc Adresses				

In	sert Variable				
	General Name: Comment:	Error	Multiple:	1	OK Cancel
	Start Address:	Byte: O	Bit:		6 H
	- Vanable Type	BYTE UINT16 INT16 UINT8ARR2 BITARR16 WORD ENUM VARTYPE_DPV2TIMES UINT24	STAMPSTATUS	1.0 2.0 2.0 2.0 2.0 2.0 2.0 2.0 2	Sort by Name Size Type



General				OK
Name:	State	Multiple:	1 🚍	Cancel
Comment:				
Start Address:	Byte: 1	Bit:		
Variable Type				Sort by
	UINT16		2.0	🔘 Name
	UINT8ARR2		2.0	Size
	BITARR16 WORD ENUM		2.0 2.0 2.0	💮 Туре
	VARTYPE_DPV2TIMES UINT24	TAMPSTATUS	2.0 3.0 🖵	

4. Link the variables to variables in CANopen Master and EtherCAT.









When the linking is completed, the two variables should have a link symbol.



#### Configuring a NC axis

1. Add a new task to NC-Configuration.



2. Select 'NC-Task1-SAF' and configure 'Cycle ticks'.

Additional Tasks	Name: NC-Task 1 SAF	Port: 501
- 🌩 Task 1-Image	Auto start	Ontions
🚍 🖓 Inputs	Auto Start	
<del>@</del> ↑ Error		
∰† State	Priority: 4	Disable
	Cycle ticks: 10 🚔 10.000	ms Create symbols
🙀 Route Settings		
	Start tick (modulo): 0	Include external symbols
NC - Configuration	Separate input update	
NC-Task 1 SAF	Pre ticks: 0	
📴 NC-Task 1 SVB		Extern sync
🕂 💠 NC-Task 1-Image	Warning by exceeding	
Tables	Message box	
Axes		
PLC - Configuration	Comment:	
Cam - Configuration	common.	
I/O - Configuration		
🗄 📲 I/O Devices		



3. Add a new continuous axis.

🖶 🔂 NC - C	onfiguration
📄 🖻 NC	-Task1 SAF
🖻	NC-Task 1 SVB
	NC-Task 1-Image
	Tables
	Axes
- PLC - (	Conf 🔤 Append Axis
	Cont Channel
⊨ <b>₩</b> 1/0 - C	onfi
<u>⊨</u> <b>≣∳</b> I/O	Dev 😭 Import Axis
	Dev
	Dev 1d Change Id
1 1 1	Device 7-Image
Insert NC Axi	s 🔀
Name:	Axis 1 Multiple: 1 🖃 🛛 🔿
Туре:	Continuous Axis Cancel
Community	
Lomment:	
	Append object(s)

4. Configure the axis as a CANopen DS402 (CoE Drive) axis.





5. Configure the encoder as 'Incremental Encoder.



6. Link Axis Encoder Input 'nInData1' to the Position Actual Value TxPDO 2. Simply double click on 'nInData1' and select TxPDO 2 from the list.





7. Similarily, link Axis Drive Output 'nOutData1' to the Target Position (RxPDO 2) variable.



8. For linking the Statusword, click on TxPDO 1 in the box and select both nStatus1 and nStatus2 from 'Axis 1\_Drive\_In'.





As Statusword is 2 bytes long and nStatus1 and nStatus2 are both 1 byte.Set offset '8' for nStatus2

Variable Size Mism	atch		<b>—</b>
Linked Variable:	nStatus1		
	Size	Offset	
Linked Variable:	8		
Own Variable:	16	0 🚔	
Overlapped:	8 🚖		UK
	(Size and C	)ffset in bits )	Cancel

Variable Size Mism	natch		<b>—</b> ×
Linked Variable:	nStatus2		
	Size	Offset	
Linked Variable:	8	0 *	
Own Variable:	16	8	
Overlapped:	8 🚔		UK
	( Size and C	)ffset in bits )	Cancel

9. Similar to step 20, configure the Controlword in RxPDO 1.

Address: Linked to Comment: Attach Variable Co	0 (0x0)	User ID:	0	
NC - Configuration	is 1_Enc         is 1_Drive         ↓ Axis 1_Drive_Out > QB 15         ↓ ∩OutData1         ↓ ∩OutData1(1) > 1         ↓ ∩OutData1(1) > 1         ↓ ∩OutData1(1) > 1         ↓ ∩OutData2(2) > 0         ↓ ∩OutData2(1) > 1         ↓ ∩OutData2(1) > 1         ↓ ∩OutData2(1) > 0         ↓ ∩OutData2(1) > 0         ↓ ∩Ctrl > QB 178.0.U         ↓ ∩Ctrl > QB 179.0.U         ↓ ∩OutData3 > QB 180.U         ↓ ∩OutData3 > QB 180.U         ↓ ∩OutData3 > QB 180.U         ↓ ∩OutData3(1) > 10         ↓ ∩OutData4(1) > 10         ↓ ∩OutData4(1) > 10         ↓ ∩OutData4(1) > 10	68.0, NCDRIVEST 3.0, UINT16ARR2 38 1680, UINT16 38 1700, UINT16 38 1720, UINT16 38 1720, UINT16 38 1740, UINT16 38 1740, UINT16 30, UINT164RR2 38 1800, UINT16 38 1840, UINT16 38 1840, UINT16 38 1840, UINT16	RUCT_OUT       4.0]       [2.0]       (2.0]       (2.0]       (2.0]       (2.0]       (2.0)       (2.0)       (2.0)       (2.0)       (2.0)       (2.0)       (2.0)       (2.0)	Show Variables  Ulsed and unused  Exclude disabled  Exclude disabled  Exclude same Image Show Variable Types  Matching Type Array Mode  Offsets Continuous Show Dialog  Variable Name Hand over Take over  Cancel OK



Variable Size Misn	natch	<b>—</b>
Linked Variable:	nCtrl1	
listed Vesiable.	Size Offset	
Linked Variable:	8	
Own Variable:	16 0 🚖	
Overlapped:	8 🌲	
	(Size and Offset in bits)	Cancel
Variable Size Misn	natch	×
Variable Size Misn Linked Variable:	natch nCtrl2	
Variable Size Misn Linked Variable:	natch nCtrl2 Size Offset	<b>×</b>
Variable Size Misn Linked Variable: Linked Variable:	natch nCtrl2 Size Offset 8 0 🗼	X
Variable Size Misn Linked Variable: Linked Variable: Own Variable:	natch nCtrl2 Size Offset 8 0 🐳 16 8 🐳	
Variable Size Misn Linked Variable: Linked Variable: Own Variable: Overlapped:	natch nCtrl2 Size Offset 8 0 1 16 8 1 8 1	OK

10. Once the linking is completed, the node tree should look as the one shown below.





11. Configure the RxPDO 2 (Target Position) as Cyclic Synchronous. The Cyclic value should equal the value configured in interpolation time period (0x60C2:01) and the cycle time for the NC axis.



Bringing the configuration into effect

1. When the configuration is done, it can be brought into effect by clicking on 'Generate Mappings'.





Click on 'Check configuration' to verify all mappings and linkages.



Finally, if no errors were found during checking, click on 'Activate Configuration' to switch TwinCAT into Run Time mode.



#### Operating the node in CSP mode

1. Click on RxPDO 1, select 'Modes of Operation'. As shown below, go to the 'Online' tab and click 'Write'. Enter value 8 (CSP mode value).





2. Similarly, enter a value of 1 for 'Motor drive submode select'. Writing 1 will configure the drive to operate in closed-loop mode.



3. Select the NC axis and click on 'Axis 1'. Under the 'Parameter' tab, select 'Position Lag Monitoring' and force it to FALSE. Click on the 'Download' option at the bottom.





4. Configure the encoder resolution. The Encoder resolution is 2000 increments per revolution. This means 360°/2000 = 0.18. Enter the value and click on 'Download'.



5. Now Axis 1 is configured to run as an NC axis. Turn the drive ON by selecting 'Set'. In the new window select all three options and set 'Override %' to 100.

