

# Running ServoStep<sup>™</sup> - MIS motors with CANopen as NC axis in TwinCAT

The ServoStep<sup>™</sup> series:

- MIS17x, MIS23x, MIS34x and MIS43x integrated stepper motors
- SMC66 and SMC85 stepper motor controllers

with **built-in CANopen** modules (e.g. MIS232S1<u>P6</u>H266 and SMC66B1-<u>P6</u>AABX1) all support the TwinCAT NC axis. The NC axis enables you to control the motor via the PLC Open Standard.

NC axis supports synchronized axes with interpolation.

This document describes how to set up the MIS motor to run as NC axis in TwinCAT3 with Visual Studio 2017, on a CX55130 PLC with EL 6751 CANopen master module.

Other variants of IDE or Hardware may vary in behavior.

### This guide will help you with the following:

- Setup the motor for CANopen
- Create a new TwinCAT project
- Connect to your PLC hardware
- Scan your Hardware
- Setup the connected motor for NC axis support

## Contents

1.	Copy EDS file to TwinCAT folder	2
2.	Motor Setup	2
3.	Create a new TwinCAT project	3
4.	Connect to PLC in Config mode	3
5.	Scan for hardware	4
6.	Configure PDO mapping	8
7.	Create NC axis	9
8.	Map PDO data	11
9.	Set SDO data	14
10.	Sync interval	17
11.	Set gear factor	17
12.	Set motor parameters	18
13.	Follow Error Monitoring	18
14.	Store settings in PLC	19



## 1. Copy EDS file to TwinCAT folder

Download the EDS file for MIS34 from JVL homepage.

The EDS file is an Electronic Data sheet, that describes the interface between the PLC and the motor. This enables the PLC to map the right registers in the motor.

📙   🛃 📕 🖛   CA	Nopen			-	- 🗆 ×
File Home	Share View				~ 🔞
Pin to Quick Copy access	A Cut Paste Copy path Paste shortcut Copy to ⊤ to ⊤ to ⊤	Delete Rename Folder	Rew item ▼ T Easy access ▼	Properties	Select all Select none Invert selection
← → ~ (↑	C:\TwinCAT\3.1\Config\lo\CANopen	ت		Vopen	Juitt
🔮 Quick access	Name	Date modified	Туре	Size	
Quick access	AX2000-B100.eds	16-03-2012 09:09	EDS File	373 K	В
OneDrive	CX2020-B510.dib	01-07-2013 14:2	5 DIB File	2 K	В
This PC	CX2020-B510.eds	30-10-2013 12:2	EDS File	79 K	В
= 3D Objects	CX2500-B510.dib	30-10-2013 12:2	1 DIB File	2 K	В
J SD Objects	CX2500-B510.eds	30-10-2013 12:2	EDS File	79 K	В
Desktop	CX5020-B510.dib	01-07-2013 14:2	5 DIB File	2 K	В
🔮 Documents	CX5020-B510.eds	01-07-2013 14:2	5 EDS File	79 K	В
👆 Downloads	CX8051.dib	01-07-2013 14:25	5 DIB File	2 K	В
h Music	CX8051.eds	01-07-2013 14:25	5 EDS File	79 K	В
Pictures	CX9020-B510.dib	01-07-2013 14:2	5 DIB File	2 K	В
	CX9020-B510.eds	01-07-2013 14:2	5 EDS File	79 K	В
Videos	FC5121.dib	01-07-2013 14:2	5 DIB File	2 K	В
🏪 Local Disk (C	) FC5121.eds	01-07-2013 14:2	5 EDS File	79 K	В
鹶 Network	FC5122.dib	01-07-2013 14:2	5 DIB File	2 K	В
-	FC5122.eds	01-07-2013 14:25	5 EDS File	79 K	В
	smc85_v1_10_S.eds	15-07-2020 11:03	B EDS File	142 K	В

# Open the TwinCAT folder.

# Copy the EDS file to this location. Here an EDS file version 1.10 is used. Current version is 1.42

## 2. Motor Setup

Connect your ServoStep<sup>™</sup> motor with MacTalk. Open the CANopen Setup tab.

	📥 Ma	cTalk® -	Nona	me							
	Files	Motor e	PLC	Setup	Update	es Tabs He	p				
	1		~		$\left( \right)$	-	<u><u></u> <u></u> <u></u> </u>	5	3	4	STO
	Ор	en		Save		Save in Moto	r Réset Position	n Clear Errois	Reset Motor	Filter Setup	STOP
	📟 S	erial port				$\checkmark$	Comport: 12	✓ Baud: 19.2	200	Motor Address: All	$\sim$
	Main	I/O Set	up R	egisters	CANo	pen Setup Ad	anced Event I	Log Scope eP	LC Homing		
	CANo	pen Node I	ID	6		5		)			
	CANo	pen Baud F	Rate	$\sim$		500 kbit/s $\smallsetminus$					
•		nable DSP se Beckhol	402 Si f <del>f Con</del>	upport figuratio							

- # Choose you node ID and Baud rate. Node ID 5 and 500 kbits/sec is default.
- # Make sure Enable DSP 402 Support is checked.
- # Save the settings in the motor.
- # Reset the motor

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



### 3. Create a new TwinCAT project

Open Visual studio 2017 with TwinCAT3 integration. If TwinCAT is not installed on the computer, the TwinCAT project will not be available.

The rest of this example is done in Visual Studio.

Click File -> New project.

Start Page - Microsoft Visu File Edit View Project	ial Studio Debug TwinCA	AT TwinSAFE PLC	Team Scope	Nsight Tools Te	st Analyze Window He	lp	
0 - 0 📅 - 🛅 - 😭 I	🗎 📲 🕺 🗗 d	1 9 - 9 -	-		Attach	- 🔎 ArrowAnimatio	on_Completed +
Build 4024.7 (Default) 🔹		2 🔨 🛞 🕲 🖏 🦻	6	-		• • =	≥ ► = <] :
Solution Explorer			→ 쿠 × Start Pa	age → X	Cat Ctartac	1	
New Pro	oject						? ×
▷ Recen	nt	Sort	by: Default			Search (Ctrl+E)	<del>،</del> م
<ul> <li>✓ Install</li> <li>Þ Visu</li> <li>Þ Othu</li> <li>Þ Twin</li> <li>▶ ₩₩</li> <li>▼ Win</li> <li>■ Nøt fi</li> </ul>	Ied Ial C# er Languages er Project Types nCAT Measurement DIA DIA DIA TO TO Projects aCAT PLC re inding what you are	e looking for?	TwinCAT XAE Pro	oject (XML format)	TwinCAT Project	Type: TwinCAT Projects TwinCAT XAE System Mana Configuration	ıger
Name	Open visual studio	anstaller					
Location	in: C:\	Users\YourName\Sour	ce\Repos		<b>_</b>	Browse	
Solution	n na <u>m</u> e: Mis	534x				Create directory for solutio	n
						Add to Source Control	
						ОК	Cancel

# In the new project window, select TwinCAT project.

- # Select the TwinCAT XAE project
- # Give your project a name and click "OK" button.

## 4. Connect to PLC in Config mode

Connect to your PLC to scan the connected hardware. This will also detect nodes attached to the CAN bus. Make sure that all other nodes are disconnected, to get the same result as in this example.

Doc	Author	Date	Approv
LA0017-11	RRA	2021-05-04	PS



刘 Mis34x - Microsoft Visual Studio			
File Edit View Project Build Debug	TwinCAT TwinSAFE PLC	Team Scope Nsight Tools Test Ana	lyze
0 - 0   🕅 - 🖆 - 🛀 💾 🚜 🗍	🏦 🤊 - 🤆 - 🛛 Release 🚽	- TwinCAT RT (x64) - Attach	
🛛 📕 Build 4024.7 (Loaded) 🔽 🚽 🔛 🧕	🥏 🏹 🎯 🚺 🌠 🖌 Mis34x	CX-50D9EC	)
Solution Exp Choose TwinCAT Version	<b>▼</b> ₽ ×		
© © 🟠 🛗 -   To - S 🗗   🌶 💻			
Search Solution Explorer (Ctrl+")	ρ-		
Jolution 'Mis34x' (1 project)			
🔺 🚟 Mis34x			
SYSTEM			
MOTION			
PLC			
👸 SAFETY			
96+ C++			
ANALYTICS			
I/O			

# Select the ADS connection for your PLC.# Click the Restart TwinCAT in config mode





Click OK to allow TwinCAT to restart.

You should now be connected to your PLC.

## 5. Scan for hardware

Make sure your motor is connected to the Beckhoff CANopen master module and ready for communication with the master.

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



Mis34x - Microsof	t Visual Studio			
File Edit View P	roject Build Debu	ig TwinCAT	TwinSAFE	PLC Tea
0-0 10-11	- 🛀 🗎 📲   X 🖞	1 白 ?・!	C - Relea	se 🔹
Build 4024.7 (Loaded)	🚽 🗐 🖬 🖉 📕	2 🕆 🎯	0 🐾 🔏	Mis34x
Solution Explorer				<b>-</b> ₽ ×
○ ○ 🏠 🛗 - │ <sup>™</sup> ⊙	• 5 🗗 🎤 🗕			
Search Solution Explorer	(Ctrl+")			<u>- م</u>
Solution 'Mis34x' ( Mis34x Mis34x SYSTEM MOTION PLC SAFETY C++ ANALYTICS JO Solution 'Mis34x' ( MOTION L SUBJECT MOTION SAFETY	l project)			
Map *	Add New Item	Ins		
ť	Add Existing Item	Shift+	Alt+A	
	Add New Folder			
	Export EAP Config F	ile		
	Scan			
<u> </u>	Paste	Ctrl+V	(	
	Paste with Links			
	Paste with Links	Carry		

# Right click IO->Devices in your solution tree.

### # Select Scan

This will find all hardware on your PLC: IO's, busses, etc.

Sometime the Scan function does not find the CANopen master. In this case just scan the bus where the master is connected. In the actual case the Device1 EtherCAT.

Microsof	t Visual Studio	×
?	Special EtherCAT slave found: 'EL6751 CANopen Master' Create corresponding device automatically ('CANopen Master EL6751, EtherCAT')	
	Yes No	

When the master is found, you will be prompted to create CANopen devices automatically. Click "Yes". In this example the EL6751 CANopen Master module is used.

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



Select Baudr	ate	×
Device:	Device 4 (EL6751)	
Baudrate:	500 k	~
OK		Cancel

Select the baud rate you selected in MacTalk, to scan your CANopen bus with and Click "OK"

If the scan was able to detect the PDO automatically, continue to the next heading 6 "Configure PDO mapping".

If you get this message below, the PLC did not recognize the motor as the one in the EDS file.



Continue with enabling the node and load the PDOs manually from file.

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



### Find the Motor Box under your CANopen master device.

- Device 3 (EtherCAT Automation Protocol)
- Device 5 (COM Port)
  - CIR Device 4 (EL6751)

4

🛟 Image



- # Right click the motor Box
- # Click Disable, to re-enable the node

### Load the PDOs from EDS file.



- # Right click the motor Box.
- # Select Load PDOs from EDS file.

Select the EDS file you copied to the EDS folder earlier.

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS





TwinCAT will generate COB-IDs for unused PDO's.

Click "Yes" for both RX and TX PDO's.

Unused PDO's are removed later in the guide but allow automatically generated COB-IDs for now.

## 6. Configure PDO mapping

The PDO is the data send cyclic to and from the node.

We need to send (RX PDO) Controlword and requested position to the motor, and we need to receive (TX PDO) Status word and actual position from the motor. This is easy to setup when the EDS file does most of the work.

The scan can generate up to 24 RX PDOs, and 24 TX PDO's.

We only need TxPDO1 and RxPDO1 and RxPDO4

To limit the communication to what is essential for NC axis, all PDO's larger than the one used can be deleted.

Delete TxPDO2 - TxPDO24 and RxPDO5 to RxPDO24

You should end up with something like this



We do not need RxPDO2 and RxPDO3, but we cannot delete them without destroying the mapping of RxPDO4, but we can remove the mapping inside them.

Expand RxPDO2 and RxPDO3 by clicking on the white triangle.

Doc	Author	Date	Approv
LA0017-11	RRA	2021-05-04	PS



Box 5 (JVL A/S)	
🕨 🛄 Inputs	
utputs	
TxPDO 1	
RxPDO 1	
RxPDO 2	
🔺 🛄 Outputs	
Controlword	
Modes_of_operation	
RxPDO 3	
Outputs	
Target_position	
Profile_velocity	
RxPDO 4	
📸 Mappings	

Delete the mapped object marked with red squares.

Select them with mouse and use the "Delete" key to remove them.

## 7. Create NC axis

The NC axis is a PLC motion component that represent a virtual axis. You can use a NC axis without any hardware and use it to simulate a moving axis.

In this case, we map the virtual axis to a physical motor. The motor will be a slave of the virtual axis. The NC axis will handle all control and monitoring of the physical motor, when mapped correctly to the axis.

This way the PLC program does not need any information about what kind of hardware that is mapped to the axis. All motors behave the same way when mapped to a NC axis.

Start by creating a NC task.



# Right click on the MOTION icon,

<sup>#</sup> Select "Add new Item"

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



### Select "NC/PTP NCI configuration" and give the motion configuration a name

Insert Moti	on Configuration	×
Туре:	NC/PTP NCI Configuration CNC Configuration	Ok Cancel
Name:	NC-Task 1	

Add the axis to the new task.

TcCOM C MOTION MOTION NC-Task NC-Task Imagu Tables Dobject	Dbjec 1 SAF ask 1 e s ts	ts : SVB		
Axes PLC SAFETY C++ ANALYTICS A 2 I/O A 2 Devices A 2 Devices A 2 I/C		Add New Item Add Existing Item Add New Folder Paste Paste with Links Disable	Ins Shift+A Ctrl+V	<ul><li># Right click "Axes"</li><li># Click "Add new item"</li></ul>
a lu	nage-	Info		

Give the axis a name, and click "OK"

Insert NC A	is ×
Name:	Axis 1 Multiple: 1 🖨 OK
Туре:	Continuous Axis 🗸 Cancel
Parameter:	(default) ~
Comment:	

Set the Axis to the right type and with the right units.

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



Solution Explorer	<b>-</b> ₽ ×	Mis34x → ×
◎ ◎ 🏠 🛱 -   ™₀ - ≒ 🗗   🎤 💻		General Settings Parameter Dynamics Online Functions Coupling Compensation
Search Solution Explorer (Ctrl+ ")	ρ-	
Solution 'Mis34x' (1 project)		
Mis34x		Link To PLC
SYSTEM		
MOTION		Axis Type: CANopen DS402/Profile MDP 742 (e.g. EtherCAT CoE Drive)
NC-Task 1 SAF		Lisa, Display (Only)
NC-Task 1 SVB		
irage Table		
		Velocity: */min
Axis 1		Result Position: Velocity: Acceleration: Jerk:
PLC -		
SAFETY		/3 /32 /33
<u>∽</u> <sub>6</sub> , C++		
ANALYTICS		Axis Cycle Time / Access Divider
▲ 🔄 I/O		Divider: 1 Cycle Time (ms): 2.000
✓ ™ Devices		Modulo: 0
Device I (EtherCAI)		
SvncUnits		
N house		

- # Double click on Axis.
- # Select the settings tab
- # Under Axis Type, select CANopen DS402....
- # Units: This example are using angle as units. This could also be a linear axis and could use millimeters instead.

### 8. Map PDO data

Mapping is where data is mapped from the virtual axis to the physical motor.

### 8.1 Link position from motor to axis



Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



### 8.2 Link status word from motor to axis





Variable Size	Mismatch	×
Linked Variable:	nState2	
	Size Offset	
Linked Variable:	8 0 🔶	
Own Variable:	16 🛛 😫 🖨	01/
Overlapped:	8	UK
	(Size and Offset in bits)	Cancel

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



Cancel

#### 8.3 Link ControlWord from axis to motor



#### 8.4 Link position from axis to motor

(Size and Offset in bits)



8

Overlapped:

Cancel

÷

(Size and Offset in bits)

Doc	Author	Date	Approv
LA0017-11	RRA	2021-05-04	PS



### 9. Set SDO data

SDO is data send at startup to do some pre-use configuration, to enable the motor to respond correctly to the PDO data.

A few parameters in the motor need to be setup:

Set motor "mode of operation" to 7 : Interpolated position mode. This is the operation mode the NX axis is using to control the motor. The NC axis expect the motor to be in this operation mode when its available and ready.



- # Click on Motor Box.
- # Select the online tab
- # If list is empty. Click the Advanced button. And select the EDS file manually. (Window below)

Advanced Settings		×
Dictionary	Dictionary	
	<ul> <li>Online - via SDO Information</li> <li>Offline - from Device Description</li> <li>All Objects Mappable Objects (RxPDO) Mappable Objects (TxPDO) Backup Objects Settings Objects</li> </ul>	Device OD     Module OD (via AoE port)     Hide Standard Objects     Hide PDO Objects
	Offline - via EDS File     C:\TwinCAT\3.1\Config\lo\CANopen\sn	nc85_v1_10_S.eds Browse OK Cancel

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



	Advance	d C:\TwinCAT\3.1\Config\	lo\CANopen\sm	c85_v1_10_S.eds	
<	Add to Star	tup Online Data	Module OD (Ao	E Port): 0	
	Index	Name	Flags	Value	
		Motor parameters 257-510 (all 16-bit)	RO	> 254 <	
	6007	Abort_connection_option_code	RW	0	
	603F	Error_code	RW	0x0000 (0)	
	6040	Controlword	RW P	0x0000 (0)	
	6041	Statusword	RO P	0x0260 (608)	
	605A	Quick_stop_option_code	RW	2	
	6060	Modes_of_operation	RW P	0	
	6061	Modes_of_operation_display	RO P	0	
	6064	Position_actual_value	RO P	11375641	
	6067	Position_window	RW	0x00000064 (100)	
	6069	Velocity_sensor_actual_value	RO	0	
	606B	Velocity_demand_value	RO	5000	
	606C	Velocity_actual_value	RO P	0	
	6072	Max_torque	RW	0x03E8 (1000)	
	607A	Target position	RW P	0	

# Select object 6060 Modes of operation from the list of objects.

# Click the button "Add to startup"

Edit SDO Entry		×
Index (hex):	0x6060	OK
Subindex (dec):	0	Cancel
Length (dec):	1	
Value (dec): 🤇	7 (he)	k): 0x7

# Change value to 7 and press OK.

### 9.1 Set the synchronous timing with SDO

The motor and the PLC need to be synchronized. The PLC used the timing to transmit Sync messages to the motor, and the motor uses the timing to calculate when to expect the next sync message. It is important that the motor and the PLC is set up to use the same timing.

The object 60C2 sub 01 is used to tell the motor what timing is used in the PLC.

Select the object 602:01 ip\_time\_Period

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



Gene	ral CAN Nod	le SDOs ADS Diag	Online		
	Update Lis Advanced Add to Startu	st Auto Upda C:\TwinCAT\ up Online Data	te 🗹 Single U 3.1\Config\lo\C4	pdate Sh \Nopen\smci ule OD (AoE	now Offline Data 85_v1_42_S.eds Port): 0
In	dex	Name	F	lags	Value
-	609A	Homing_acceleration	F	łW	0x00001388 (5000)
, H	60C1:0	interpolation_data_record	F	10	>2<
÷.	60C2:0	interpolation_time_period	F	10	>2<
	60C2:01	ip_time_Period	F	۲W	10
	60C2:02	ip_time_index	F	₹₩	-3
	60FD	Digital_inputs	F	10 P	0x00000000 (0)
÷.	60FE:0	Digital_outputs	F	10	>2<
	60FF	Target_velocity	F	∛W P	5000

### Click the button "Add to startup"

Edit SDO Entry		×
Index (hex):	Dx60C2	ОК
Subindex (dec):	1	Cancel
Length (dec):	1	
Value (dec): 🧲	10 (he):	0xA

Set value for the sync time in milliseconds. The default is 10ms. Lower synchronization can be used for better precision.

Make sure this value is the same set by the CANopen master

Both custom SDO values can be viewed and edited under the SDO tab

General CAN Node SDOs ADS Diag Online					
Obj. idx	Sub. idx	Length	Value (dec)	Value (hex)	-
<0x1400>	1	4	517	0x205	
<0x1400>	2	1	255	0xFF	100
<0x1401>	1	4	773	0x305	
<0x1401>	2	1	255	0xFF	
<0x1402>	1	4	1029	0x405	
<0x1402>	2	1	255	0xFF	
<0x1403>	1	4	1285	0x505	
<0x1403>	2	1	255	0xFF	
0x6069	0	1	7	<del>8x7</del>	
0x60c2	1	1	10	0xA 🔵	
					•
Restart No	de when no TxF	200s are receive	d for 10s after Start N	lode	
max. SDOs in S	Send Queue:	5 ≑	max. Boot-Up Ti	meout (s): 0 🖃	<b>+</b>
max. SDO Timeout (ms): 2000					
	A	ppend	Insert De	lete Edit	



## 10. Sync interval

This is where the CANopen master timing is configured.

The cycle time is setup automatically to the PLC task that uses the fastest timing. In this case we only have a NC task, which by default uses 2ms cycle time. We can adjust the Sync time by multiplying the cycle time.

The default cycle time for JVL motor is 10ms, which need a multiplier of 5.

Set the CANopen master Sync interval. The sync interval should match the object 60C2:01

Solution Explorer		Mis34x + ×
◎ ◎ 🏠 🛱 -   ™ - ≒ 🗿   🌽 💻		General EL6751 AD; EtherCAT General Diag Sync Diag Box States DPRAM (Online)
Search Solution Explorer (Ctrl+")	<u>ہ</u> م	Blac(AT) Tom 2 (FL C751)
Solution 'Mis34x' (1 project)		Search
🔺 📅 Mis34x		Identify Device Hardware Configuration
SYSTEM		Master-Node-ID: 127   Upload Configuration
		Baudrate: 500 k Verify Configuration
		Finimare
6. C++		Cycle Time (µs): 2000 18 (V01.15)
ANALYTICS		
▲ 🔄 I/O		Sync-Cycle Multiplier: 5 T
▲ 📲 Devices		Sync-Cycle-Time (in µs): 10000 Advanced Settings
Device I (Ethercar)		Sync-Tx-PDO Delay (in %): 30 ♦
		Input Shift Time (in %):
Inputs		
▲ Box 5 (JVL A/S)		Disable Node-State Modification
Inputs		
Outputs		
► RxPDO 2		

- # Select the CiA device
- # Click the EL6751 (Beckhoff CANopen master)
- # Adjust the Multiplier so that Cycle Time times Multiplier is the Sync interval.
- # Set Sync interval updates on next build.

## 11. Set gear factor

The gear factor converts the virtual axis units to a physical unit. In this example we use angle. Thus 360 units is 1 revolution on the motor.

### 11.1 Set scaling factor in degrees (example)

Solution Explorer 🔹 🕂 🗙	Mis34x	: -		
○ ○ ☆ ☆ - '⊙ - ≒ ☞ / ≁ -	Gene	aral NC-Encoder Parameter Time Compensation Online		
Search Solution Explorer (Ctrl+ ")		D	Offline Meller	
Solution 'Mis34x' (1 project)		Parameter		
Mis34x	•	Encoder Evaluation:		_
SYSTEM		Invert Encoder Counting Direction	EALSE	-
MOTION		Scaling Factor Numerator	0.000879	
NC-Task 1 SAF		Scaling Factor Denominator (default: 1.0)	1.0	
i∰ NC-lask 1 SVB		Position Bias	0.0	
Tables		Modulo Factor (e.g. 360.0°)	360.0	
Objects		Tolerance Window for Modulo Start	0.0	
⊿ 🚔 Axes		Encoder Mask (maximum encoder value)	0xFFFFFFFF	
		Encoder Sub Mask (absolute range maximum value)	0x000FFFFF	
		Reference System	'INCREMENTAL'	-
ta Ctri	-	Limit Switches:		
Inputs		Soft Position Limit Minimum Monitoring	FALSE	-
Dutputs		Minimum Position	0.0	
I A A A A A A A A A A A A A A A A A A A		Soft Position Limit Maximum Monitoring	FALSE	-
5. C++		Maximum Position	0.0	
ANALYTICS	+	Filter:		
▲ 🖾 I/O	+	Homing:		
▲ "E Devices		en eur		

# Select the Encoder (Enc) for the NC axis



# Enter the calculated unit for the motor. See example calculation below.

**Example calculation** Count per revolution = 409600 Degrees per revolution = 360 Scaling Factor Numerator:

Degrees per Count = Degrees per Revolution / Count per Revolution = 360/409600 = 0,000879

## 12. Set motor parameters

Maximum velocity and maximum acceleration should also be entered to get the best performance from the motor.

Solution Explorer 👻 👎 🗙	Mis34x	<b>₩</b> X	
	Gener	al Settings Parameter Dynamics Online Functions Coupling Compensatio	n
Search Solution Explorer (Ctrl+ -)			
Solution 'Mis34x' (1 project)  Solution 'Mis34x  Motion  Motion  Notark 1 SAF  Notark 1 SAF  Notark 1 SVB  Solution  Notark 1 SVB  Notark 1 S	•	Parameter Maximum Dynamics: Reference Velocity	Offline Value Online
		Maximum Velocity	18000.0
		Maximum Acceleration Maximum Deceleration	300000.0
Tables	-	Default Dynamics:	
Objects		Default Acceleration	1500.0
A Axes		Default Deceleration	1500.0
Axis 1		Default Jerk	2250.0
▷ ⇒ Drive	+	Manual Motion and Homing:	
1 Ctrl	+	Fast Axis Stop:	
Inputs	+	Limit Switches:	
Outputs In PLC	+	Monitoring:	

# Select the motor axis

# Select Parameters

### 12.1 Maximum Velocity #

Enter the calculated values. Example calculation below.

### Example calculation:

Max RPM = 3000 Seconds per Minute = 60 Degrees per Revolution = 360

Degrees per Second = Max RPM \* Degrees per Revolution / Seconds per Minute = 3000 \* 360/ 60 = 18000

### 12.2 Max acceleration #

Enter the calculated values. Example calculation below.

### Example calculation:

Max Acceleration RPM= 500000 Seconds per Minute = 60 Degrees per Revolution = 360

Degrees in Seconds<sup>2 =</sup> Max Acceleration RPM \* Degrees per Revolution / Seconds per Minute = 500000 \* 360 / 60= 3000000

## 13. Follow Error Monitoring

The NC axis monitors the Follow Error. This is how far behind the motor is at any given time. The motor will always be behind at least the time it takes to move between two sync cycles. With full speed that is significant.

Doc	Author	Date	Approv.
LA0017-11	RRA	2021-05-04	PS



It is recommended to adjust the Follow error limit to your suit the application.

TwinCAT's terminology for Follow Error is "Position Lag Value".

In this example it is set to 100.0 degrees.



# Select the motor Axis

# Select Parameters

# Enter the Follow Error limit in the "Maximum Position Lag value" field.

## 14. Store settings in PLC

To use the new settings in the PLC project , the configuration needs to be activated.

This is done with the "Activate configuration" button



# Click the Activate configuration





Allow TwinCAT to restart in Run mode by clicking "OK".

Now the NC axis is ready to control your JVL motor!