



Application Note

Starting up a Nanotec Controller/Drive with Trio MC 4N-ECAT

Version 1.0.0

www.nanotec.com



Contents

1	Pre	requisites	1
2	Har	dware	1
3	Sof	tware	1
4	Set	up Communication	2
	4.1	Connect to MC4N	2
	4.2	Setting the IP address of the network card	3
5	Loa	ding a project and configuring the communication	4
	5.1	Loading the example project	4
	5.2	Setup EC_EXTEND	6
	5.3	Synchronize master and slave	8
6	Des	cription of the example project	10
	6.1	HOMING	
	6.2	EXAMPLE_POSITION	11
	6.3	Checking the status of the slave	
7	Liat	oility	13
8	Сор	oyrights and contact	13



1 Prerequisites

The slave drive (Nanotec Controller) must be configured beforehand. Proper operation of the motor and the slave drive must be ensured before the example can be used. Make sure that the controller/drive operation is not hindered, e.g. by a stand-alone program running on the slave.

2 Hardware

- Trio MC4N-ECAT Mini Master
- Nanotec N5-1-1 controller/drive for brushless DC motors and stepper motors

3 Software

Motion Perfect, Version 4.3.3



4 Setup Communication

4.1 Connect to MC4N

- 1. Install Motion Perfect.
- 2. Connect the network card of your PC to the MC4N's Programming port via an Ethernet cable.
- 3. Use a second Ethernet cable to connect MC4N's EtherCAT port to the *EtherCAT IN* RJ45 port of N5-1-1.



- 4. Apply power to both N5-1-1 and MC4N.
- 5. Set the IP address of the network card of your PC as described in the next chapter and run the Motion Perfect software.



4.2 Setting the IP address of the network card

The IP address of a MC4N controller is per default 192.168.0.250 and the subnet mask is 255.255.255.0. You need to assign an IP address to the network card of your PC, that is in the same subnet as the MC4N controller. For example, set the network card's IP address to 192.168.0.249, as shown below.

lgemein					
IBv4-Koppektivität	Kein Netzwerkzugriff				
IPv6 Koppektivität	Kein Netzwerkzugriff				
Mediepstatus:	Aktiviert				
Dauer:	01-52-17				
Übertragungsrate:	100.0 MBit	Eigenschaften von Ethernet	×		
Details		Netzwerk Freigabe			
		Verbindung herstellen über:			
Aktivität		Intel(R) Gigabit CT2 Desktop Adapter			
Gesendet —	📜 — Empfanı	Konfigu	rieren	schaften von Internetproto	koll, Version 4 (TCP/IPv4) X
Bytes: 8.212.525	8.782.70	 ✓ Client für Microsoft-Netzwerke ✓ ¹/₂ Datei- und Druckerfreigabe für Microsoft-Netzwe ✓ ¹/₂ QoS-Paketplaner 	rke IP-E Net Net	instellungen können automat zwerk diese Funktion untersti zwerkadministrator, um die ge	isch zugewiesen werden, wenn das ützt. Wenden Sie sich andernfalls an den eeigneten IP-Einstellungen zu beziehen.
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5 Loading a project and configuring the communication

5.1 Loading the example project

- 1. Download the example project from the Nanotec website <u>www.nanotec.com</u>.
- 2. Select in the **Connection** window the interface **Ethenet** and click on **Apply & Connect** to connect to MC4N in Sync mode.

Image: Antion Perfect v4.3.3 (Development build 1752)) Project Controller Edit Search File/Program Build/Run Tools Window Help Image:	0 a at · O Motion
	Connection – 🗆 X
	Interface Connection parameters
	Serial Controller in access (1921000230 Pci IP ort 23 Timeouts
	US8 Simulator
	Apply & Connect Cancel

3. Click on Load to load the example project folder named "Application note".

Motion Perfect v4.3.3 (Development build 17523)		
Project Controller Edit Search File/Program Build/Run Tools Window Help		
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	Motion Perfect v4.3 X	
	Please choose how the project for that controller should be obtained	
	Please choose what the next step should be.	
	Create a new empty project and erase the current controller contents	
	Create from controller Create a new project from the current controller contents	
	Load Load Load an existing project onto the controller, ensing its current contents	
	Open & Synchronize Open an existing project and synchronize it with the controller contents	
	Cancel	
Output		
Connected to thremet (Vz. Inst.0.230		



The folder contains three files, the configuration file *EC_EXTEND* and the example programs *EXAMPLE_POSITION* and *HOMING*.

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< > V Load tool configuration	rfect_4_3_3_17523_Setu; V V Load desktop layout	
Path: F:\Applikation note		

The picture below shows that the controller is now connected and the project named "Application note" has benn correctly loaded.

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B EXAMPLE_POSITION III II V	Initialization Commands		
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5.2 Setup EC_EXTEND

The EC_EXTEND file is a text file in XML-format containing configuration data for one or more EtherCAT slave devices. The file can be loaded onto the MC4N so that MC4N is able to interact with the EtherCAT devices whose configuration data is contained in the file. The contents of the file is used to extend the MC4N's built-in dictionary of EtherCAT devices.

Each Nanotec Controller has its own *identity object* (register 1018h:00 h in the object ditionary) which contains the following:

- vendor ID •
- product code •
- revision number •

To read this object, use the software Plug&Drive Studio to connect to the Nanotec Controller.

In the tab Object dictionary search for the mentioned identity object and copy the values of the three entries, which you need to enter manually in *EC_EXTEND* later.

A Home	<u>گ</u> ا	Home Diplect Dictionary 🛛									
		Description	Ind	ex Sub-Ind	ex Access	Type	Value	Decimal Value	Binary Value	Cat	egory
Setup		ident	0	Y	YV	7 Y	Y	Y	,	Y	Y
	1	identity Object - Highest sub-index supported	101	8 00	read only	UNSIGNEDS	04	4	1 0000 (0100 no	
Coperation	2	Identity Object - Vendor-ID	101	B 01	read only	UNSIGNED32	0000260	620	0 0000 0000 0000 0000 0000 0010 0110	1100 no	
	- 3	Identity Object - Product code	101	8 02	read only	UNSIGNED32	000004F	79	0000 0000 0000 0000 0000 0000 0100	1111 no	
Object dictionary	4	Identity Object - Revision number	101	8 03	read only	UNSIGNED32	7210000	119603200	0000 0111 0010 0001 0000 0000 0000 0	0000 no	
	5	Identity Object - Serial number	101	8 04	read only	UNSIGNED32	2F120003	789708803	0010 1111 0001 0010 0000 0000 0000 0	0011 no	
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The three entries correspond to the EC_EXTEND parameters Vid, Pid and Rev respectively.

Vid

Pid

Rev

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Nanotec Controller EC_EXTEND

- Vendor ID
 - Product code ٠
- Revision number



1. Open the EC_EXTEND file.

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Controller 💌 A 🗙	EXAMPLE_POSITION HOMM	ING	Releas	e Notes	EC_EXTEND	≗ ×				
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Axis Status: OK Reset MC System: OK Flash: O	Vendors And Profiles	Ven	dors A	nd Profile	25					
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💟 stop 🛛 🔍 enable 💷 programs		▲ Nar	notec Ele	ctronic Gm	bH & Co. KG	(0x00000	26c)			
Programs	ESC Configurations	0	N5-1-1	0x000026c	0x0000007	06720000	POSITION	0	<u>0</u>	\times
B HOMING	Initialization Commands									
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Max. Aves: 32 Max. Physical Axes: 8 Max. On-board Axes: 0 Max. Remote Axes: 8 Max. Analogue Axes: 8 Configured Axes: 2 Show/hide axes Axes parameters	Parameter editing is not enabled and editor is in read-only mode. <u>Click to enable editing</u>									

2. Add the values in *EC_EXTEND* and save.





5.3 Synchronize master and slave

1. Open the Intelligent drives configuration window.



- 2. Click **re-initialize the drives** to synchronize the master and slave controllers.
- 3. If Motion Perfect shows a "System error", you need to reset the MC4N to enable the connection to the Nanotec Controller. To do so, simply click on **Reset MC**.

💯 Motion Perfect v4.3.3 (Development build 1752	(3)			
Project Controller Edit Search File/Program	m Build/Run Tools Window He	łp		
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 EC_EXTEND Axes 	PDO Definitions Master st	tate: Init ▼		
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After the reset of the controller the **Intelligent drives** window shows that the master is synchronized to the slave Nanotec Controller, the Master state is **Operational**.

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6 Description of the example project

6.1 HOMING

This example demonstrates the use of the homing mode.

You can use any of the homing methods described in the technical manual of the N5-1-1. To select the homing method, enter the desired method number as a parameter of CO_WRITE_AXIS in the example code, click the save button and compile by clicking the question mark symbol.



Without connecting additional external home switches, you can use the following methods:

CO_WRITE_AXIS(ax,\$6098,\$00,2,-1,33) : homing method 33, references to the next index pulse on the left.

CO_WRITE_AXIS(ax,\$6098,\$00,2,-1,34) : homing method 34, references to the next index pulse on the right.

The prerequisite for these two methods is that the connected motor is equipped with an encoder with an index pulse.

CO_WRITE_AXIS(ax,\$6098,\$00,2,-1,35) : homing method 35, references to the current position



6.2 EXAMPLE_POSITION

The program **EXAMPLE_POSITION** demonstrates the use of the position mode; the motor moves between two relative target positions.

To start the program, click on the **Start** symbol \blacktriangleright . The motor runs at the set speed (parameter **SPEED**, in motor revolutions per second) between the 2 target positions (argument of function MOVE, in motor revolutions) until you stop the program.

To stop the program, click the **Halt** icon .





6.3 Checking the status of the slave

The tab **Status** shows the current status of the connected slave drive, giving data about the drive and motor including the drive status flags and stored alarms. A button is provided to reset the drive.

Double-clicking on a drive icon, a motor icon associated with a drive, or a line in the **Drives** grid will bring up the **EtherCAT device** window for the corresponding drive.

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laster state: Operational ▼	EtherCAT device @ slot 0, address 1, axis 0			→ □ X
Address: 1	Status CoE Objects			
Avis: 0	EtherCAT Info Position 0 Alias 0 Address 1 State Operational Device Info Vendor ID \$0000026C Vendor ID \$0000026C	Control Flags Mask: \$0006 Switch On Fnable Voltage Quick Stop Enable Operation Mode Specific Mode Specific Mode Specific Fault Reset	Halt Mode Specific Reserved Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer Manufacturer	Fault Reset Movement Controller 0 Position (MPOS * UNITS) Drive 0 0 Position 0 Velocity 0 Torque
Axis Ctrl Mode Model Pos Alias Config 7 0 EthCAT Pos 0 0 1	Product code \$0000004F Model ? Revision \$07860000 Serial number 0 Software ver. FIR-v1825-B577172 Hardware ver. W002	Status Flags Mask: \$1321 Ready To Switch On Switched On Operation Enabled Fault Voltage Enabled Quick Stop Switch On Disabled Warning	Manufacturer Remote Mode Specific Internal Limit Active Mode Specific Mode Specific Manufacturer Manufacturer	



7 Liability

This Application Note is based on our experience with typical user requirements in a wide range of industrial applications. The information in this Application Note is provided without guarantee regarding correctness and completeness and is subject to change by Nanotec without notice.

It serves as general guidance and should not be construed as a commitment of Nanotec to guarantee its applicability to all customer applications without additional tests under the specific conditions and – when necessary – modifications by the customer.

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