

Application Note

E Series EtherCAT Drive Complete Setup with Beckhoff TwinCAT 3

> www.hiwinmikro.tw MD38UE01-2307_V1.0

Revision History

The version of the manual is also indicated on the bottom of the front cover.

MD38UE01-2307_V1.0



Release Date	Version	Applicable Product	Revision Contents
Jul. 15 th , 2023	1.0	E series EtherCAT drive	First edition.

Related Documents

Through related documents, users can quickly understand the positioning of this manual and the correlation between manuals and products. Go to HIWIN MIKROSYSTEM's official website \rightarrow Download \rightarrow Manual Overview for details (<u>https://www.hiwinmikro.tw/Downloads/ManualOverview_EN.htm</u>).

Preface

This manual provides detailed information on the operation of software TwinCAT 3 when E series EtherCAT drive is used with Beckhoff EtherCAT motion control products. For detailed information on E series servo drive, please refer to the related user manuals.

Specifications of Software/Hardware

Name	Version of Software/Firmware			
	Software (Thunder): 1.9.16.0 or above			
E1 Series EtherCAT Drive	Firmware: 2.8.16 or above			
	ESI file: HIWIN_MIKROSYSTEM_ED1F_20230607 or above			
	Software (Thunder): 1.9.17.0 or above			
E2 Series EtherCAT Drive	Firmware: 3.9.16 or above			
	ESI file: HIWIN_MIKROSYSTEM_ED2F_20230614 or above			
	Software (TwinCAT 3): Build 4024.22 or above (The version			
Beckhoff Motion Controller	must be the same as the firmware's)			
	Firmware: Build 4024.22 or above			

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1. Communication and module setup

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1.1 Introduction of human machine interface

Test - TcXaeShell (Administrator)		Quick Launch (Ctrl+C	х в – в ×
File Edit View Project Build Debug TwinCAT TwinSAFE	PLC learn scope loois Window Help		
	• TwinCAT KT (x04) • • Attach_•		
Build 4024.22 (Loaded) • 🛫 🔐 🛄 🗳 🔍 🐨 🔍 🖓 🐾 🌾 T	est · CP-4866EA · s test · · · · · · · · · · · · · · · · · · ·		
Solution Explorer 👻 🖣 🗙	MAIN Test	Properties	- # ×
0 0 🙆 🗄 - To - 8 👂 🗕	General EtharCAT DC Process Data Plc Startup CoE. Online Online	 Test Solution Property 	erties •
Search Solution Explorer (Ctrl+;)	Elefort De Fridest das Fre Jamen Grande	: : : *	
Solution 'Test' (1 project)	Name: Drive1 (E1 CoE Drive) Id: 1	Misc	
🖌 🛄 Test	Object M. Dv03020001	(Name)	Test
SYSTEM		Active config	Release TwinCAT RT (x64
MOTION	Type: E1 CoE Drive	Description	
Im NC-Task 1 SAF	Comment	Path	C:\Users\chikenyee\Docu
Image			
Tables			
Objects			
⊿ 🚔 Axes			
D But Axis 1			
A PLC	Disabled Create symbols		
A Test Project			
External Types			
References			
DUTs			
GVLs			
		-	
PlcTask (PlcTask)	Name Online Type Size >Addr In/Out User Linked to		
0 test Instance	* Error code 0 UINT 2.0 71.0 Input 0		
SAFETY SAFETY	Statuword X 1616 UINT 2.0 73.0 Input 0 rState1, rState2		
G C++	Provide of opera X S SINI 1.0 73.0 input 0 instates, in inputs		
ANALYTICS	Touris Or actual A 100 UN1 4.0 70.0 input 0 notation i.m. inputs c Touris Or has tt. X 0 UNIX 2.0 80.0 input 0 notatian State Setate Seta		
A Stranger	Touch Probe 1 X 0 DINT 4.0 82.0 Input 0 nDatala, Inin Inputs E.		
Device 5 (EtherCAT)	Following error X 0 DINT 4.0 86.0 Input 0 nDatain1.in.inputs		
t Image	Pigital inputs 0 UDINT 4.0 90.0 Input 0		
‡ ₽ Image-Info	WcState X 0 BIT 0.1 1522.3 Input 0 nState4, nState4		
SyncUnits	Se InputToggle X 1 BIT 0.1 1524.3 Input 0 nState4, nState4		
Inputs	State 8 UINT 2.0 1548.0 Input 0		
b InfoData	RedsAddr 172.18.214.238.6 AMSADDR 8.0 1550.0 Input 0	× .	
Drive 1 (E1 CoE Drive)	Error List * 0	×	
TxPDO 1	Entire Solution * OPErrors A OWarrings Class Build + IntelliSence *	5 -	
RxPDO 1	critic solution Strong Construction Child		
WcState	Description • Project File LL	-	
P intoData			
AL NC-Task 1 SAF - Device 5 (EtherCAT) 1			
NC-Task 1 SAF - Device 5 (EtherCAT) Info		Misc	
	Parkana Managar Concola, Error List, Output	Properties Trailer	
	Package wanager consider consider and contract	Propentes Toolbox	
🗇 Ready			

Figure 1.1.1

Section A (Toolbar)

List of common features, right-click to customize the display of contents.

Section B (Solution Explorer)

Click object to enter the Editor Window and see the properties.

Classified as follows:

Table 1.1.1	
-------------	--

No	Name	Description
1	SYSTEM	System Manager planning
2	MOTION	SoftMotion NC planning
3	PLC	PLC program
4	SAFETY	Safety PLC program
5	\$ ₆₊ C++	C++ program
6		Data analysis planning
7	☑ I/O	I/O communication planning

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Communication and module setup

Section C (Editor Window)

Display the corresponding Editor Window based on the selected project object.

■ Section D (Message Window)

Display various messages, which are divided into Error List, Package Manager Console, and Output.

Section E (Properties Window)

Display the corresponding Properties Window based on the selected project object.

1.2 Connect to controller

1. Click the drop-down menu of **Target System** on TwinCAT toolbar. If a controller has been assigned before, TwinCAT would record the controller and display it here; if users want to assign a new controller, click "Choose Target System ...".

File Edit View Project Build Debug TwinCAT TwinSAFE	PLC Team Scope Tools Window Help	
O - O 習 - 白 - 🖕 🗳 🖉 从 印 白 ウ - マ - Release	- TwinCAT RT (x64) - Attach	- 🍠 PLC_EcatSdoRead - 😽 🖓 🛱 🏛 🎎 🎯 🗵 - 🖕
🛛 Build 4024.22 (Loaded) 🔹 🝦 🔛 🧧 🗖 🏹 🌾 🎯 🍡 🐔 🕇 T	est <local> = test</local>	- 辺》= 包 * ? * 桂 ひ 台 西 苗 む ひ。
Solution Explorer 🔹 म 🗙	Test + (I72 18 214 238 1 1)	
○ ○ ☆ ☵ - Ĭo - @ ≱ <mark>-</mark>	General Size / Offse CX-3C89EA (5.60.137.234.1.1)	(\mathbf{r})
Search Solution Explorer (Ctrl+;)	CX-474D5C (5.71.77.92.1.1)	22)
Solution 'Test' (1 project)	Name: Im Choose Target System	Id: 1

Figure 1.2.1

2. Click "Search Ethernet..." in the Choose Target System window.



Figure 1.2.2

3. Enter the **Add Route Dialog** window. Click the **Broadcast Search** button and tick the network interface card connected to the controller. Click OK.

Enter Host Name / IP:			Re	fres 1	Broade	cast Searc
Host Name Connected	Address AMS Net	ld TwinCAT	OS Version	Fingerprint	Comment	
Select Adapter(s)					×
Intel(R) Ether	net Connection (14) I2	19-V 10.190.	96.62 255.25	5.254.0		
Realtek PCIe 0	SbE Family Controller	169.254.207.	228 255.255.0	.0		-
					2	
loute N					2	
Toute N				OK	2	
Route N			(6) 5);	OK	2 Cance	я г
Route N ImsNet /intual A [ransport Type:	TCP_IP	~	● Sta	OK	Cance	el r
Route h ImsNet Fransport Type: Address Info:	TCP_IP	~	© Sta ⊖ Te	OK	Cance © Static O Temp	el r
ioute h miNet intual A ransport Type: ddress Info: O Host Name IP/	TCP_IP Address	~	● Sta ○ Te ☑ Adva	OK atic mporary nced Settings	Cance © Static O Temp	el r orary tional
Route h AmsNe Vistual & Iransport Type: Address Info: O Host Name () IP / Connection Timeout (s):	TCP_IP Address	~	© Sta ⊖ Te ⊠ Adva	OK atic mporary nced Settings	Cance © Static O Temp : Unidirec	el r orary

Figure 1.2.3

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4. After executing **Broadcast**, click the found device and **Add Route** to open **Add Remote Route** window. Enter User and Password in the **Remote User Credentials** window. After clicking OK, users can see a mark in the **Connected** window of the device, which means the connection has been established.

Note: The default User of Beckhoff is Administrator, and the Password is 1.

💽 Add Route Dialog					\times
Enter Host Name / IP:			R	efresh Status	Broado 1
Host Name Connected	Address	AMS NetId	TwinCAT	OS Version	Fingerprint
CP-4B66EA ×	169.254.85.79	172.18.214.238.1.1	3.1.4024	Windows 10 1607	2188870F341D231825C08
The Route					×
DS (Twin	CAT 3.1 >= 4024)				
- Remote User Credentials					
User:	Administrator		Passwo	rd: •	
				TwinCAT :	2.x Password Format
	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~			01	Cancel
Tanana Tanan			🔘 St	atic	<ul> <li>Static</li> </ul>
Transport Type:	או_יישר	~	O Te	emporary	<ul> <li>Temporary</li> </ul>
Address Info:	169.254.85.79		V Adv.	anced Settings	
Address Info: O Host Name	169.254.85.79 Address	2	Adv	anced Settings	Unidirectional
Address Info: O Host Name  IF Connection Timeout (s):	169.254.85.79 Address 5	÷ 2	Adv.	anced Settings	Unidirectional

Figure 1.2.4

5. Close the **Add Route Dialog** window and return to the **Choose Target System** window. Select the connected device and click OK to complete the controller connection setting.

Choose Target System	×
CP-4866EA (17218.214.238.1.1) CX-3289EA (5.60.137.234.1.1) CX-47405C (5.71.77.92.1.1)	OK Cancel
	Search (Ethernet)
	Set as Default
Connection Timeout (s):	

Figure 1.2.5

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Communication and module setup

## 1.3 Prepare ESI files

- Open Thunder installation location (default as C:\ Thunder) and open Release Note in Thunder\ doc\ ESI Files.
- 2. Confirm the firmware version of the drive and copy the corresponding **ESI file (.xml)** according to the **Release Note**.
- Store the copied ESI file in TwinCAT installation directory.
   (The default file path is C:\ TwinCAT\ 3.1\ Config\ lo\ EtherCAT)
- 4. Reload device descriptions in TwinCAT.

Test - TcXaeShell (Administrator)						
File Edit View Project Build Debug	Twi	nCAT TwinSAFE PLC Team Scope	Tools	Window	Help	
🕺 O - O   🏠 - 🖆 - 🚔 🗳   X 🗗 🏦		Windows	•	Attack	n •	- pLC_TestOK
Build 4024.22 (Loaded) 🔹 🚽 🔛 🔟 🥔	${\rm h}^{\rm b}_{\rm c}$	Activate Configuration		(ERROR)	🔹 🚽 🕴 test	
Solution Explorer	13	Restart TwinCAT System				
000H-10-0 #-		Restart TwinCAT (Config Mode)				
Search Solution Explorer (Ctrl+1)	3	Reload Devices				
Solution 'Test' (1 project)	1	Scan				
A Test		Toggle Free Run State		-		
SYSTEM		Show Online Data				
		Show Sub Items				
SAFETY	<b>%</b>	Hide Disabled Items		-		
6 C++	æ	Software Protection		-		
ANALYTICS	RE6	Access Bus Coupler/IP Link Register				
▶ 🛃 I/O		Update Firmware/EEPROM	•			
		Show Realtime Ethernet Compatible Devices				
		File Handling	•			
		Selected Item	•			
		EtherCAT Devices	•	Up	date Device Descr	iptions (via ETG Website)
	٩	TcProjectCompare		Re	load Device Descri	ptions
		Target Browser	•	Ma	anage User Define	d Whitelist
		AutomationML	•	Ma	anage User Define	d Blacklist
		Bode Plot	•			
		Filter Designer	•			
		About TwinCAT				
1	_					

Figure 1.3.1



Communication and module setup

## 1.4 Search for the devices

1. Switch the controller to **Config Mode**.

	Test - T	cXaeSh	ell (Admini	strator)										
File	Edit	View	Project	Build	Debug	TwinCAT	TwinSAFE	PLC	Team	Scope	Tools	Window	Hel	р
G	- 0	行 - 1	ia + 🏜 🖌	1 📲 🗌	¥ 🗗 🖞	19-6	- Release	-	TwinCA	r RT (x64)	-	Attach.	. •	
Bu	uild 4024	4.22 (Loa	ided) 🔹 📮	i 112 📕	1 🖪 🕏	2 🕲 🙋	) 🛼 🔏   Te	est		•	CP-4B66E	4	•	Ţ



2. In the **Solution Explorer**, right-click **Devices** and then click **Scan** to scan.





 After a few seconds, the scanned devices will be displayed. Tick the devices to be added (only [EtherCAT] would be displayed) and click OK. A window will pop up asking if users want to Scan for boxes. Click "OK."



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After scanning to the device, select "NC – Configuration" to link to Axis. 4.

EtherCAT drive(s) added						
Append linked axis to:	NC - Configuration CNC - Configuration	OK Cancel				

Figure 1.4.4

Click "OK" to Activate Free Run. 5.

TcXaeShell	×						
Activate Free Run							
OK	Cancel						
Fic	1.4.5						

## 2. Axis parameters setup

2.	Axis para	Axis parameters setup						
	2.1	Set unit	. 2-2					
	2.2	Set encoder parameter	. 2-3					
	2.3	Set Touch Probe homing parameter	. 2-4					
	2.4	Set motion parameter	. 2-6					
	2.5	Set monitor parameter	. 2-7					
	2.6	Update controller setting	. 2-7					

## 2.1 Set unit

Select the axis whose parameter is to be modified (Motion  $\rightarrow$  NC-Task 1 SAF  $\rightarrow$  Axes  $\rightarrow$  Axis 1). Switch the upper tab to **Settings** and select the unit (mm, m, °, Degree, s) for the device.

Solution Explorer	• 4 ×	Test ⊹⊨ ×				
◎ ◎ ☆ ᢡ -   *₀ - ☞   ≯ 🗕		General	Settings	Parameter D	Oynamics Or	line Function
Search Solution Explorer (Ctrl+;)	ρ-					
Solution 'Test' (1 project)		Link To	o I/O		Drive 1 (Et	1 CoE Drive)
<ul> <li>✓ Inst</li> <li>✓ Inst</li> <li>✓ Inst</li> <li>✓ Inst</li> </ul>		Link To	PLC			
III License ▷ 🧼 Real-Time		Axis Ty	pe: C	ANopen DS402	2/Profile MDP	742 (e.g. Ethe
▷ Tasks		Unit:	m	im 🗸	Display (C	)nly)
Type System			m	m	Position:	μm
TcCOM Objects  MOTION  MOLTASk 1 SAF			m D	egree	Velocity:	mm/min
NC-Task 1 SVB		Resul	s			
<b>≜</b> ∎ Image		Posit	tion:	Velocity	<i>c</i> .	Acceleration
Tables		mm		mm/s		mm/s2
Objects						
⊿ ⊒a Axes						
		-Axis (	Cycle Time	/ Access Divide	er	

Figure 2.1.1

### 2.2 Set encoder parameter

1. Select the encoder whose parameter is to be modified (Motion  $\rightarrow$  NC-Task 1 SAF  $\rightarrow$  Axes  $\rightarrow$  Axis 1  $\rightarrow$  Enc). Switch the upper tab to **Parameter** and expand **Encoder Evaluation**.





2. Set Scaling Factor according to the unit on the right. The controller uses Scaling Factor to calculate the relationship between the physical motion and Increment. While setting, users need to refer to the actual motor's encoder resolution, electronic gear ratio, pitch, etc. It is recommended that users refer to section 4.3.6.3 in "E Series Servo Drive Thunder Software Operation Manual" for electronic gear ratio and set Scaling Factor based on the displayed control units.

General NC-Encoder Parameter Time Compensation Online									
	Parameter	Offline Value	Online Value	T Unit					
-	Encoder Evaluation:								
Γ	Invert Encoder Counting Direction	FALSE	-	В					
	Scaling Factor Numerator	1.0		F mm/INC					
	Scaling Factor Denominator (default: 1.0)	10000.0		F					
	Position Bias	0.0		F mm					
	Modulo Factor (e.g. 360.0°)	360.0		F mm					
	Tolerance Window for Modulo Start	0.0		F mm					
	Encoder Mask (maximum encoder value)	0xFFFFFFF		D					
	Encoder Sub Mask (absolute range maximum value)	0x000FFFFF		D					
	Reference System	'INCREMENTAL'	-	E					

Figure 2.2.2



## 2.3 Set Touch Probe homing parameter

Select the encoder whose parameter is to be modified (Motion → NC-Task 1 SAF → Axes → Axis 1 → Enc). Expand Homing and select Reference Mode to determine home position latch method. The current supported Reference Mode is shown in table 2.3.1.

Table	2.3.1
Tuble	2.0.1

Reference Mode	Description				
Homing Sensor Only	Use homing sensor as a basis for homing.				
Hardware Sync	Use Z-phase signal as a basis for homing.				
Hardware Latch 1 (pos. edge)	Use the rising edge of external signal as a basis for homing.				
Hardware Latch 1 (neg. edge)	Use the falling edge of external signal as a basis for homing.				



#### Figure 2.3.1

### 2. Select Homing Sensor Source.

Gene	ral NC-Encoder Parameter Time Compensation C	Inline
	Parameter	Offline Value
+	Encoder Evaluation:	
+	Limit Switches:	
+	Filter:	
-	Homing:	
	Invert Direction for Homing Sensor Search	FALSE
	Invert Direction for Sync Impuls Search	TRUE
	Home Position (Calibration Value)	0.0
	Reference Mode (Sync condition)	'Hardware Latch 1 (pos. edge)'
	Homing Sensor Source	Default: PLC Cam (MC_Home)'

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Axis parameters setup

3. Set the motor rotation direction for searching for home position based on the user scenarios.

iene	ral NC-Encoder Parameter Time Compensation	Online
	Parameter	Offline Value
+	Encoder Evaluation:	
+	Limit Switches:	
+	Filter:	
-	Homing:	
	Invert Direction for Homing Sensor Search	FALSE .
	Invert Direction for Sync Impuls Search	TRUE
	Home Position (Calibration Value)	0.0
	Reference Mode (Sync condition)	'Hardware Latch 1 (pos. edge)'
	Homing Sensor Source	'Default: PLC Cam (MC_Home)'



 Select the axis whose parameter is to be modified (Motion → NC-Task 1 SAF → Axes → Axis 1) and switch the upper tab to Parameter. Expand Manual Motion and Homing and modify Homing Velocity according to the requirements.



Figure 2.3.4

## 2.4 Set motion parameter

This section describes the relevant parameter setting for test run, please be aware of the unit while setting.

 Select the axis whose parameter is to be modified (Motion → NC-Task 1 SAF → Axes → Axis 1) and switch the upper tab to **Parameter**. Expand **Maximum Dynamics** and set the reference velocity (rated velocity) and maximum velocity according to the motor specification; expand **Default Dynamics** and set acceleration/deceleration, maximum acceleration/deceleration, etc. according to the requirements.



Figure 2.4.1

2. Expand **Manual Motion and Homing**, modify **Manual Velocity** and **Jog Increment** according to the requirements.



Figure 2.4.2

## 2.5 Set monitor parameter

Set monitor parameter in the **Monitoring**, while setting, please set an appropriate range based on the user scenarios. If it is too small, the controller would easily trigger an alarm; if it is too large, the controller would have no effect in exception handling.

-	Monitoring:				
	Position Lag Monitoring	TRUE	TRUE	в	
	Maximum Position Lag Value	5.0	5.0	F	mm
	Maximum Position Lag Filter Time	0.02	0.02	F	s
	Position Range Monitoring	TRUE	TRUE	в	
	Position Range Window	5.0	5.0	F	mm
	Target Position Monitoring	TRUE	TRUE	в	
	Target Position Window	2.0	2.0	F	mm
	Target Position Monitoring Time	0.02	0.02	F	s
	In-Target Alarm	FALSE	FALSE	в	
	In-Target Timeout	5.0	5.0	F	s
	Motion Monitoring	FALSE	FALSE	В	
	Motion Monitoring Window	0.1	0.1	F	mm
	Motion Monitoring Time	0.5	0.5	F	s
				-	

Figure 2.5.1

## 2.6 Update controller setting

1. Click Activate Configuration to update the settings to the controller.

<b>e</b> .	Test - TcXaeShell (Administrator)													
File	Edit	View	Project	Build	Debug	TwinCAT	TwinSAFE	PLC	Team	Scope	Tools	Window	Hel	р
G	- 0	行 - 1	'a - 😩 li	- <b>-</b>	ች 🗗 🖞	3-6.	Release	-	TwinCAT	r RT (x64)		Attach.	•	
B	uild 4024	4.22 (Loa	aded) 🔹 🛫	11	1 🗖 🕫	🔍 🎯 🚫	🐛 🔏 🛛 Te	st		•	CP-4B66E	A	•	÷



2. Click "OK" to restart TwinCAT System in Run Mode.



Figure 2.6.2

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Axis parameters setup

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## 3. Test run

3.	Test run		3-1
	3.1	NC: Online	3-2
	3.2	NC: Function	3-4
	3.3	Coupling	3-6

## 3.1 NC: Online

**NC: Online** interface in TwinCAT provides simple forward/backward motion and point-to-point motion. The feedback status can be observed in this interface.

1. Switch the controller to **Run Mode**.



Figure 3.1.1

After selecting the device to perform test run (Devices → Device → Drive 1), switch the upper tab to NC: Online.



Figure 3.1.2

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Touch Probe homing

3. Click **Set** in **Enabling**. Tick **Controller**, **Feed Fw**, **Feed Bw** and click OK, and the motor will be enabled.

Solution Explorer	- ₽ × <mark>⊺</mark>	Test -# X	1
○ ○ ✿ 部 • · · · · · · · · · · · · · · · · · ·	0.	General EtherCAT DC Process Data Plc Startup CoE - Online Online NC: Online NC: Fu	unctions
Solution 'Test' (1 project)		0.5636	
<ul> <li>SYSTEM</li> <li>MOTION</li> </ul>		Lag Distance (min/max):         mm]         Actual Velocity:         [mm/s]         Setpoint Velocity:         [mm/s]           0.0000         -0.0000         -0.0000         0.0000	
<ul> <li>INC-Task 1 SAF</li> <li>NC-Task 1 SVB</li> </ul>	I	Override:         [%]         Total / Control Output:         [%]         Error:           100.0000 %         0.00 / 0.00 %         0 (0x0)	
image Tables IB Objects I Aves I Avis 1		Status (phys.)     Enabling       Ø Ready     Ø NOT Moving     Coupled Mode       Calibrated     Moving Fw     Ø Rotroller       Has Job     Moving Bw     Ø In Pos. Range	
♦ SEnc ♦ and Drive Image Ctrl		Controller Ku-Factor: [mm/s/mm] Reference Velocity: [mm/s]	
<ul> <li>Inputs</li> <li>Outputs</li> </ul>		Target Position:         [mm]         Target Velocity:         Set Enabling           0         1         0         0         0	×
Axis 2 \$ \$ \$ Enc \$ **{ Drive 1 Ctrl		Image: Product of the state of th	
P Unputs P Dutputs PLC	5	Name         Online         Type         Size         >Ad         In/Out         Oreande (%)           *Error code         0         UINT         2.0         71.0         Input         100         All	

Figure 3.1.3

4. Use the buttons to perform test run. For functions of the buttons, refer to the table below.

Button	Description
F1	Fast backward motion, move with <b>Manual Velocity (Fast)</b> set in section 2.4.
F2	Slow backward motion, move with <b>Manual Velocity (Slow)</b> set in section 2.4.
+ F3	Slow forward motion, move with <b>Manual Velocity (Slow)</b> set in section 2.4.
<b>++</b> F4	Fast forward motion, move with <b>Manual Velocity (Fast)</b> set in section 2.4.
€ F5	Perform point motion according to <b>Target Position</b> and <b>Target Velocity</b> set on <b>NC: Online</b> page.
<b>⊘</b> F6	Stop the motion.
R F8	Reset.

Table 3.1.1

## 3.2 NC: Function

**NC: Function** interface in TwinCAT provides various motion functions such as jog, point-to-point motion,

etc.

- 1. Continue step 3 in section 3.1.
- 2. Switch the upper tab to **NC: Functions**.

Solution Explorer	▼ ♯ × MAIN Test ↔ ×
○ ○ 🏠 🛱 -   ⁷ o - ₱   🔑 💻	General EtherCAT DC Process Data Plc Startup CoE - Online Online NC: Online NC: Functions
Search Solution Explorer (Ctrl+;)	
Solution 'Test' (1 project)	42.1643
Iest     System	Extended Start
MOTION	Start Mode: V Start
▶ 🛄 PLC	Target Position: 0 [mm] Stop
SAFETY	Target Velocity: 0 [mm/s]
ANALYTICS	Acceleration: 0 [mm/s2]
	Deceleration: 0 [mm/s2] Last Time: [s]
✓ The Devices	Uerk 0 [mm/s3] 0 00000
Image	
Image-Info	Raw Drive Output
SyncUnits	Output Mode: Percent V Start
Inputs	Output Value: 0 [96] Stop
Outputs	Set Actual Position
InfoData      Drive 1 (F1 CoF Drive)	Absolute V 0 Set
TxPDO 1	Set Target Position
RxPDO 1	Absolute V 0 Set
WcState	
P III InfoData	
Drive 2 (E2 COE Drive)	

Figure 3.2.1

3. Select the motion function, enter the motion parameters and click Start to start the test run.



Figure 3.2.2

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E Series EtherCAT Drive Complete Setup with Beckhoff TwinCAT 3

Touch Probe homing

Common features are described as follows:

#### Table 3.2.1

Name	Description			
Abaaluta	Absolute motion, moves to an absolute position at the speed set on NC:			
Absolute	Functions page.			
Polativo	Relative motion, moves to a relative position at the speed set on NC:			
Relative	Functions page.			
	Endless rotation in forward/backward direction, moves at the speed set on			
Endless +/-	NC: Function page.			
	Jog in forward/backward direction, its moving speed is set on NC: Function			
J0g +/-	page and its moving distance is set to <b>Jog increment</b> in section 2.4.			
Poversing Sequence	Point to point motion, moves back and forth between two absolute positions			
Reversing Sequence	at the speed set on <b>NC: Functions</b> page.			

## 3.3 Coupling

When using multiple axes, the **Coupling** function can make the motion planning of one axis follow the other axis.

1. Switch the controller to **Run Mode**.

File       Edit       View       Project       Build       Debug       TwinCAT       TwinSAFE       PLC       Team       Scope       Tools       Window       Help         Image:	1	Test -	TcXaeSh	ell (Admini	strator)										
Image: Second state of the second	File	Edit	View	Project	Build	Debug	TwinCAT	TwinSAFE	PLC	Team	Scope	Tools	Window	He	lp
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2. Click the axis parameter (Motion → NC-Task 1 SAF → Axes → Axis 2) and switch the upper tab to **Coupling**.



- 3. Set the axis to be coupled in **Master Axis.** Select **Coupling mode** and set the relevant parameters. Click **Couple** to complete axis coupling.
- 4. Enable all axes (refer to step 3 in section 3.1).
- 5. When Axis 1 is used for NC: Online/NC: Function, Axis 2 will move together in coupling mode.

## 4. Touch Probe homing

4.	Touch Probe homing	. 4-1
4.	Touch Probe homing	. 4

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This chapter introduces the setting of **MC_Home** homing with **Touch Probe** and limit switches. When using this method for homing, **PLC** programming is required. Please refer to the related documents of TwinCAT for **PLC** programming and **MC_Home** settings and methods.

- 1. Add object 60FD (Digital Input) to **TxPDO** and link the object to the **PLC** variable.
- 2. According to section 2.3, set the homing parameters of **Touch Probe**.
- According to the motor direction of Homing Sensor search, please configure the 60FD PLC variables Bit0 or Bit1 to bCalibrationCam in MC_Home. If the motor direction is positive, please configure Bit 1 (P_OT signal); if the motor direction is negative, please configure Bit 0 (N_OT signal).





Execute MC_Home and the motor will search for Homing Sensor at Homing Velocity (towards plc cam). After touching limit switch, motor will search for the home position at Homing Velocity (off plc cam) and latch it according to the Reference mode.

	≻	If the velocity for <b>Homing Sensor</b> search is too fast, the motor might be
		disabled after touching limit switch, which is a normal phenomenon. Please
Note		reduce the Homing Velocity (towards plc cam) and try again.
	۶	In firmware version 2.8.8~2.8.10, there might be a failure when using <b>Touch</b>
		Probe homing with limit switch. Please configure bCalibrationCam with other
		signals or using internal homing for homing.