AKD and TwinCAT 3 CNC EtherCAT Communication Test

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AKD 与 TwinCAT 3 CNC 通讯实验

Pre-Work

HW: AKD drive /AKM motor / network card support EtherCAT /EtherCAT cableSW: TwinCAT3 /AKD WorkbenchWiring: Reference to AKD installation manual, using cable with shield.

Configuration Step

1. Install Real-time Ethernet

Open TwinCAT 3 software, check whether Ethernet adapters has correctly installed firstly, if not, click install and enable.



Please be noted that not all of the PC support EtherCAT, you can check if your device support EtherCAT communication on Beckhoff website.

2. Add XML File

Add AKS.XML file in the folder C:\TwinCAT\3.1\Config\Io\EtherCAT, after that, you'd better restart the TwinCAT software before scan the IO device.

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ⓒ ○ ▼ ↓ ≪ 本地磁曲 (C:) → TwinCAT → 3.1 → Config → Io → EtherCAT → ▼ 4 搜索 EtherCAT >											
文件(F) 编辑(E) 查看(V) 工具(T) 帮助(H)											
组织 ▼ 包含到库中 ▼ 共享 ▼ 新建文件夹											
🚺 下载 🔷	名称	修改日期	类型	大小							
■ 桌面	퉬 Beckhoff AX5xxx	2016/7/13 8:44	文件夹	=							
🔄 最近访问的位置 🔄	AKD_TwinCAT.xml	2014/12/6 4:16	BaiduBrowser H	456 KI							
	Beckhoff AX2xxx.xml	2009/4/20 16:50	BaiduBrowser H	290 KI							
潯 库	Beckhoff AX5xxx.xml	2013/9/9 15:53	BaiduBrowser H	687 KI							
📄 PPTV视频	Beckhoff BKxxxx.xml	2013/6/19 9:33	BaiduBrowser H	970 KI							
🔚 暴风影视库	📄 Beckhoff CUxxxx.xml	2012/11/13 11:30	BaiduBrowser H	123 KI 🖕							
🚽 视频 🗸 🔻	•			•							
45 个项目			🌉 计算机	đ							

3. Create Project

Add new project on the get started page.

Start Page 🗙		
Twincat [®] version	3	
New TwinCAT Project	Get Started	Beckhoff News
New Measurement Project	at a protocolical following and a properties of the second s	a par las la gate pa
New Project		
🔁 Open Project	Barry of the second sec	
Recent Projects	primer, primer	S There is a second sec
✓ Close page after project load ✓ Show page on startup	A consistence of a constant of	
BECKHOFF		

4. Insert CNC Configuration



5. Add CNC Axis

Solution Explorer	- ₽ ×		
Search Solution Explorer (Ctrl+;) Solution 'TwinCAT Project2' (1 project) TwinCAT Project2 SYSTEM	- م	insert i	Item
 MOTION CNC Tasks Image 			Axis Parameter (achsmds'
PLC SAFETY C++ V			

6. Insert Channel

er (sda	a_mds1.lis)

7. Scan Device

On configuration mode, ensure right wiring and add a right version XML file, then scan device.



8. Link to CNC Axis

For NC control, you need to link to NC configuration, my document mainly talk about how to link to CNC.

EtherCAT drive(s) ad	×	
Append linked axis to:	○ NC - Configuration ④ CNC - Configuration	OK Cancel

9. Link to Drive and Choose Channel



10. Activation Configuration

TwinCAT Project2 - Microsoft Visual Studio (Administrator)	
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCAT	TWINSAFE PLC TOOLS SCOPE WINDOW HELP
🦲 - つ 📅 - 🗇 - 😭 🔛 🚰 👗 🗗 台 🗇 - ペ - 🗌	► Attach ▼
🗄 🔝 🖪 💆 🖄 💿 闷 🛼 🛛 <local> 🗸 🗸</local>	- 山 - 山 - 山 - 山 - 山 - 山 - 山 - 山 - 山 - 山
Solution Explorer 🔹 🕂 🗙	TwinCAT Project2 😕 🗙
○ ○ ☆ [•] ○ - ⓓ <i>▶</i> -	General Configuration Parameter Input Output Online Param List
Search Solution Explorer (Ctrl+;)	Link To
 Solution 'TwinCAT Project2' (1 project) TwinCAT Project2 	Axis Type: CANopen DS402/Profile MDP 742 (e.g. EtherCAT CoE Drive)
SYSTEM	Spindle
MOTION	Default Channel: Channel_1
CNC	Default Name: X Default Index: 0
↓ Image	Feed Axis
A Axes	
	Add/Delete Compensation Table
Utputs	
Channel_1	
PLC	
SAFETY	
r 💼 40	

11. Check Process data



12. Modify Axis Parameter

For my drive and motor feedback, 1 motor rev=2^20=1048576

Solution Explorer	≁ 4 ×	MAIN [Online] TwinCAT ProjectYS	Z2 ⊕ ×		-
000 0-0 1-		General Configuration Parameter Input	Output Online Param L	ist.	
Search Solution Explorer (Ctrl+;)	ρ.				
Solution 'TwinCAT ProjectYSZ2' (1 project)		Name	Value	Comment	^
A TwinCAT ProjectYSZ2		getriebe[0] beschl_kennlinie.n_grenz	0	(P-AXIS-00130 : [10-3degree/s] Limit speed from which onwards the acceleration is specified in a polynomial form	
SYSTEM		getriebe[0].beschl_kennlinie.a_konst	0	(P-AXIS-00007 : [degree/s2] Constant acceleration in the range n on_grenz	
MOTION		getriebe[0].beschl_kennlinie.typ	0	(P-AXIS-00202 : Type of the characteristic acceleration curve 0=not active, 1=hyperbola, 2=polynomial, 3=asyn	
A TO CNC		getriebe[0] beschl_kennlinie.a_min	0	(P-AXIS-00010 : [degree/s2] Minimum value of acceleration for high speed	
h Starke		getriebe[0] beschl_kennlinie b1	0	(P-AXIS-00026 : [1/s] Parameter 1 of the a(n) polynomial	
		getriebe[0] beschl_kennlinie b2	0	(P-AXIS-00027 : [1/degree] Parameter 2 of the a(n) polynomial	
in ange		getriebe[0].beschl_kennlinie.b3	0	(P-AXIS-00028 : [1/degree2] Parameter 3 of the a(n) polynomial	
Axes		#	P		
P AXIS_1	_	getriebe[0].vb_min_null	10	(P-AXIS-00216 : [10-3degree/s] Limit for spindle speed "zero"	
Channel_1		getriebe[0].vb_eilgang	100000	(P-AXIS-00209 : [um/s] or [10-3degree/s] Rapid mode velocity	
		getriebe[0].vb_max_red	5000	(P-AXIS-00214 : [um/s] or [10-3degree/s] Reduced maximum speed at active G01,G2,G3	
Tc3_1CNCPLCBase		getriebe[0] rapid_speed_red	10000	(P-AXIS-00155 : [um/s] or [10-3degree/s] Reduced maximum speed at active G00	
SAFETY		getriebe[0].vb_refmax	20000	(P-AXIS-00219 : [um/s] or [10-3degree/s] Maximum homing velocity	
5 C++		getriebe[0].vb_reflow	2000	(P-AXIS-00218 : [um/s] or [10-3degree/s]Minimum homing velocity	
▲ 🔄 I/O		getriebe[0] vb_regelgrenze	3600000	(P-AXIS-00220 : [um/s] or [10-3degree/s] Limiting velocity for the measuring system	
▲ ^{QUI} Devices		getriebe[0].kv	4000	(P-AXIS-00099 : [0.01/s] Proportional factor kv for positional control in CNC	
🔺 🗯 Device 2 (EtherCAT)		getriebe[0] multi_gain_z	1800	(P-AXIS-00129 : Manipulated variable of drive (numerator)	
Image		getriebe[0].multi gain n	1	(P-AXIS-00128 : Manipulated variable of drive (denominator)	
Image-Info		getriebe[0].wegaufz	1048576	(P-AXIS-00234 ; [Incr.] Path resolution of the measuring system (numerator)	
Þ 😎 SyncUnits		getriebe[0].wegaufn	3600000	(P-AXIS-00233 : [0.1um] or [10-4degree]Path resolution of the measuring system (denominator)	
P D Inputs		getriebe[0].window	1000	(P-AXIS-00236 : [0.1um] or [10-4degree] Control window at "Accuracy Stop" G60	
P Dutnuts		getriebe[0] pos_refpkt	0	(P-AXIS-00152 : [0.1um] or [10-4degree] Position of the reference point with CNC controlled homing	
b InfoData		getriebe[0] getr_schalt_pos	0	(P-AXIS-00078 : [0.1um] or [10-4degree] Gear change postion, when switching is permitted	
A the Drive 1 (AKD)		getriebe[0].achs_position[0]	0	(P-AXIS-00017 : Special axis positions - not used at the moment	
h Diver (AKD)		getriebe[0] achs_position[1]	0	(P-AXIS-00017 : Special axis positions - not used at the moment	
v 🔄 inputs		getriebe[0] achs_position[2]	0	(P-AXIS-00017 : Special axis positions - not used at the moment	
Utputs		getriebe[0].wsi_meldung	0	(P-AXIS-00237 : [mm] or [Degree] or [Rev.] Traverse distance	
Position demand value	e	#	R		
Controlword		getriebe[0].moduloo	3600000	(P-AXIS-00126 : [10-4degree] Upper modulo limit	*
WcState					
P 🛁 InfoData		Import Export	Append	inset	
 Mappings 		Download [Joload]	ommant Delate	Edu	
CNC - Device 2 (EtherCAT) 1		Upload	Delete.	a de la constante de	
		L			
		100			

13. Add CNC Program

Solution Explorer	. † ×	MAIN [Online]	TwinCAT ProjectYSZ2 🕫 🗙		<u> </u>
0 0 🖞 10 - 🗗 🕨 🗕		Project Settings			
Search Solution Explorer (Ctrl+;) Solution 'TwinCAT ProjectYSZ2' (1 project)	- م	Project Name:	Tc3_1CNCPLCBase	ld: 1	
 TwinCAT ProjectYSZ2 		Project Path:	Tc3_1CNCPLCBase		
A CONTION		Project Type:	Plc Project	Port: 851	
CNC		Project Guid:	{62C75926-3CF3-4344-9365-004252958C49}		
Tasks		Encryption:	No boot project encryption (default)	•	
■ Inage ■ Axes			Autostart Boot Project		
Axis_1 Axis_1 D		Comment:		<u>م</u>	
▷ ■ Outputs Channel 1					
PLC				-	
Tc3_1CNCPLCBase					
IO_ICINCPECEASEINStance					
Standard_Task Inputs					
SAFETY					
6 C++		l			
Þ 🔤 1/0					
1					

14. Programming G-Code in HMI

Channel 1	P Axes		Actual position	Lag distance Dis	tance to go					Override		
	х	mm	1681.873	-0.002	0.000					S		
										F	120%	Single Block
										Feed Act :	m/min 0.00 0.00	
										Spindel Act :	U/min 0 0 0.00°	Block Ignore
	Operation Mode	- MDI								Technology Da	ta	
	1 G01 G91 X3	60 F3600								G G1 G17 G4	0 G52 G53 G91 G150 G12	Stop Enable
	inpu	It G-co	de here							S T 0		
										н		10
												Backwards
												test
CNC												
Channels											Enable Drive	
										Techno Block S	earch Syntax Check Teachin	Enable
Administrator Le	vel: Administrator (En	jish)	1.53	0.54	10.6	ALC: NO	NIS.		10	1.540	0.54	1.50
					1		11					1 112
		-		Operation Mode	Start	Stop	Peset	Delete Failure		Graphik		Back 😏

Trouble Shooting

1. Following Error so Big:



Set maximum following error bigger or disable following error monitor

2. F125 in AKD Drive

Check EtherCAT cable or Check AKD drive Fieldbus.Parameter set up.