TwinCAT3 环境下 EtherCAT 通讯控制 CMMT-EC

(Festo PtP Library)



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关键词:

CMMT-AS-EC, TwinCAT3, Beckhoff, TwinCAT3

摘要:

文档介绍倍福 Twincat3 软件中如何使用 Festo 开发的 P2P 功能库控制 CMMT 驱动器。内容包括从站设备连接、功能块的调用、PLC 数据映射以及与倍福功能库的差别等。

目标群体:

本文仅针对有一定自动化设备调试基础的工程师,需要对 Festo 伺服以及 TwinCAT3 有一定了解。

声明:

本文档为技术工程师根据官方资料和测试结果编写,旨在指导用户快速上手使用 Festo 产品,如果发现描述与官方正式 出版物冲突,请以正式出版物为准。

我们尽量罗列了实验室测试的软、硬件环境,但现场设备型号可能不同,软件/固件版本可能有差异,请务必在理解文档内容和确保安全的前提下执行测试。

我们会持续更正和更新文档内容, 恕不另行通知。

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1 安装 Beckhoff 软件

上 Beckhoff 官网 https://www.beckhoff.com/下载 Twincat3 下载新版本的 Twin CAT3 软件。

🐉 \leftarrow C \supset - 🗋 🛛 https://www.beckhoff.com/english.asp?download/tc3-downloads.htm Home Contact Support Download German BECKHOFF News Product finder Beckhoff Solutions Training BECKHOFF + TwinCA Motion + Automation + Applications & Solutions = Support + Training Download + Application Notes Dinformation media TwinCAT 3 Download – Engineering + + 🚞 Multimedia + Documentation Earlier TwinCAT 3 versions are available upon inquiry with the Support department 🗉 🗀 Data sheets + 🚞 Technical Drawings Product Version Description 🛨 🧰 Macros TwinCAT 3.1 – eXtended Automation Engineering (XAE) 3.1.4024.4 TwinCAT Engineering contains the Software engineering environment of the TwinCAT 3 control software: TwinCAT 3 TExxxx | Engineering integration into Visual Studio® 2010/2012/2013/2015/2017 (if TE1xxx | Engineering Re TC1xxx | Runtime available) E C TFxxxx | Functions - support for the native Visual TF1xxx | System Studio® interfaces (e.g. connection to source code TF2xxx | HMI TF3xxx | Measureme management systems) - IEC 61131-3 (IL, FB, LD, AS, ST) TF4xxx | Controller and CFC editors TF5xxx | Motion Cor compiler for the IEC 61131-3 TE6xxx | Connectivit languages TF8xxx | Industry sp - integrated system manager for the 在线帮助可访问网站: <u>http://infosys.beckhoff.com</u> 集成到 twincat3 的离线帮助文件需单独下载 InfoSys 扩展包安装,链接如下: https://www.beckhoff.com/english.asp?download/tc3-downloads.htm Contact German Home Support Download BECKHOFF Beckhoff News Solutions Training Product finde 🗄 🚞 Beckhoff 🗄 🚞 IPC 0/1 **Download Infosystem** + + Motion + Automation The Beckhoff Information System is a constantly growing reference source for Beckhoff + Applications & Solutions products. It contains technical information, manuals, example code, the Knowledge Base and + Support much more. The hierarchical arrangement of the documents makes it easy to find the + Training required information. Download

Download

Application Notes The Beckhoff Information System is available in German, English, Spanish and Italian. **[+]** Information media For the Beckhoff Information System the Internet Explorer (version 4.x or higher) must be + Multimedia ± 🗀 Documentation installed Download Microsoft Internet Explorer + Data sheets **[+]** Technical Drawings 🗄 🗀 Macros 🛨 🧀 Software Beckhoff Information System (TwinCAT 2 included) + Configuration files Link Description Language Version Size General terms and conditions + Beckhoff Information System Data Privacy Policy Beckhoff InfoSys Installation 05/2018 2.0 GB all InfoSys.exe Search 🖹 Home Furthermore the online version of the Beckhoff Information System may be found under http://infosys.beckhoff.com

Beckhoff TwinCAT 3 Information System				
Description	Language	Version	Size	Link
TwinCAT 3 Information System 32 bit and 64 bit	english	2.0.1910	514 MB	TC3-InfoSys.exe

Furthermore the online version of the Beckhoff Information System may be found under http://infosys.beckhoff.com.

2 安装 XML 设备描述文件

上 Festo 官网"支持和下载"页面下载 CMMT 设备描述文件,下载链接如下(2020.8.27 更新):

https://www.festo.com/net/en-gb_gb/SupportPortal/Downloads/477680/525654/CMMT-AS-EC%20FW%20V018.0.5.zip

	<mark>,</mark> Смм	т				
	产品 3	支持/下载 136	主题 5			
Firmware Firmware and Eth	erCAT XML ESI data	a for the servo drive CMMT-	ASEC (EtherCAT)			
New Features:						
Homing with	out Power ON					
Fixed Bugs:						
 Master / Slav Touch-probe Dropping of 2 Wrong calcul Correction of 	ve jump in target po position calculatio Z-axis when enablin ation of the modul CiA402 PDO mapp	osition on error ng the drive o function bing				
Supported systems: • servo drive CMMT-AS-C2-3A-EC-S1 (5340819) • servo drive CMMT-AS-C4-3A-EC-S1 (5340820) • servo drive CMMT-AS-C2-11A-P3-EC-S1 (5340821) • servo drive CMMT-AS-C3-11A-P3-EC-S1 (5340822) • servo drive CMMT-AS-C5-11A-P3-EC-S1 (5340823) • servo drive CMMT-AS-C7-11A-P3-EC-S1 (8133354) • servo drive CMMT-AS-C12-11A-P3-EC-S1 (8133355)						
■ Vo18.0.5 (valid since 19	9/06/2020)					

CMMT-AS-EC FW Vo18.0.5.zip

→

将 XML 格式的描述文件存放在 Twincat 安装目录下指定路径,比如 C:\TwinCAT\3.1\Config\lo\EtherCAT

, › 此电脑 › Windov	vs (C:) \rightarrow TwinCAT \rightarrow 3.1 \rightarrow Config \rightarrow 10 \rightarrow 1	EtherCAT	√ Č	م ا	ł
^	名称	修改日期	类型	大小	
	Festo-CMMT-AS-EC.xml	2018/4/26 18:01	XML 文档	3,571 KB	
	Festo-CMMT-AS-CiA402-20190627.xml	2019/6/27 19:57	XML 文档	1,826 KB	
*	Festo-CMMT-AS-CiA402-20180822.xml	2018/8/22 17:01	XML 文档	1,360 KB	
*	🖭 Beckhoff ILxxxx-B110.xml	2015/2/4 12:57	XML 文档	8 KB	
*	🖭 Beckhoff FCxxxx.xml	2015/2/4 12:57	XML 文档	21 KB	

不同日期标示的 XML 文件匹配 CMMT 不同版本的固件。建议更新 CMMT 固件并使用最新日期的 XML 文件。或者将所有版本 的 XML 均放在此目录下,以确保设备扫描时匹配到正确 XML 的版本。老版本的 XML 设备描述文件可在下载包的 Archive 文 件夹下找到。

注意:存放好 XML 文件后重启 Twincat 软件才生效。

3 下载功能块库

此功能库具有 PLCopen 指令集,由 Festo 封装。到 Festo 官网支持下载专区下载(2020.8.27 更新链接)。

https://www.festo.com/net/en-gb_gb/SupportPortal/Downloads/477678/525652/Festo_PointToPoint_TwinCAT_3.5.10.48.zip

	÷	配置您的产品	附件	技术参数	支持/下载
--	---	--------	----	------	-------

Function blocks Beckhoff TwinCAT

PtP function blocks for Beckhoff TwinCAT 3

Function blocks

Point-to-point (PtP) library for servo drives with EtherCAT (CiA4o2) in the TwinCAT 3 development environment from Beckhoff.

Supported systems:

- Servo drive CMMT-ST-C8-1C-EC-So (8084005)
- Servo drive CMMT-AS-C2-3A-EC-S1 (5340819)
- Servo drive CMMT-AS-C4-3A-EC-S1 (5340820)
- Servo drive CMMT-AS-C2-11A-P3-EC-S1 (5340821)
- Servo drive CMMT-AS-C3-11A-P3-EC-S1 (5340822) •
- Servo drive CMMT-AS-C5-11A-P3-EC-S1 (5340823)

3.5.10.48 (valid since 01/07/2020)

连接 PLC 4

新建	XAE	Proje	ect
New D	roject		

New	Project	

New Project		? ×
▷ Recent	.NET Framework 4.5 Sort by: Default	🗸 🏢 🔚 Search Installed 🔎 -
 ✓ Installed ✓ Templates ▷ Other Project Types ▷ TwinCAT Measurement TwinCAT Projects 	TwinCAT XAE Projec TwinCAT Projects	Type: TwinCAT Projects TwinCAT XAE System Manager Configuration
▶ Online 搜索 PLC,SYSTEM→Cho Solution Explorer	ose Target→Search(Ethernet), → 및 x <mark>NC_XYZ → x</mark> Start Page GVL	
Search Solution Explorer (Ctrl+;) Solution 'NC' (1 project)	General Settings Data Types Interface	PS Functions
Image: Constraint of the system of the s	Val. (Build 4143) Version Choose Target System	Choose larget 4020.32)
	Connection Timeout (s): 5	Set as Default

广播搜索,指定 PC 网卡

I Add Route Dialog		×
Enter Host Name / IP:	Refresh Status	Broadcast Search
Host Name Connected Address AMS N	letId TwinCAT	OS Version Comment
Select Adapter(s) Intel(R) Ethernet Connection (5) I219-LM 169.254.2 VirtualBox Host-Only Ethernet Adapter 192.168.56. Route I	201.43 255.255.0.0 1 255.255.255.0	× ,
	ок	Cancel
Address Info:	 Static Temporary 	 Static Temporary
Connection Timeout (s): 5 Max Fragment Size (kByte): 0	Add Route	Close

若广播搜索不到,则直接输入网址来连接。Host Name为 CX-的是嵌入控制器,为 CP-的是工控机。Connected 下方空白表示 未连上,打叉表示已连接(成功添加 route 才会出现叉)。

II A Coute Dialog									\times
Enter Host Name / IP:	192.168.0	0.1		R	efresh Status		Broa	idcast Searc	h
Host Name	Connected	Address	AMS NetId		TwinCAT	OS Ve	ersion	Company	
CX-3D6836	Х	192.168.0.1	5.61.104.54	1.1.1	3.1.4022	Winde	ows 7 🧹	3	
<	_	_	_	_	_				>
Route Name (Target):	CX-3D68	36		Route	Name (Remote): [DESKTO)P-IMKBJDS	
AmsNetId:	5.61.104.	54.1.1		Targe	t Route		Remote	e Route	
Transport Type:	TCP_IP	~		OP	roject		⊖ Nor	ne	
Address Info:	192.168.0).1		(● SI () T	tatic emporary		● Stal ○ Ten	tic nporary	
Connection Timeout (s):	5	4							
Max Fragment Size (kByte	e): 0	-	5		Add Route			Close	

Add Route 时要求输入密码,默认密码为1。

Logon Information							
* *	Enter a user na remote system.	me and password that is valid for the					
User name: Administrator							
Password: •							
Encrypt Password (TwinCAT 3 only)							
OK Cancel							

备注:如果不知道 IP,可向倍福技术支持索要 NetScan 小软件扫描。或者将通过 DVI 口连接显示器,USB 口插入鼠标,像使用 Windows 一样在控制面板里查看网址。

Choose Target System	×						
□	OK Cancel						
	Search (Ethernet) Search (Fieldbus)						
	Set as Default						
Connection Timeout (s):							
以下是连接上 PLC 的状态。							
🔛 🔤 💆 🗢 💿 🔯 🐂	X-3D6836	+ _ PLC_Prg	- - - - - - -				
如果失去连接,彩色图标会变灰,且 PLC 名 CX-**后面追加 error 字样。							
🔛 🔤 🖉 🔨 🌀 <mark>🍳 </mark> ရ 🛛 CX-3D6836 (ERROR) 🔹 🚽 PLC_Prg 🔹 🔹 🖃							

如果连接就绪,PLC 名会变绿,如下图 CX-3D6836 图标,选中点击 OK。

5 扫描 EtherCAT 网络

I/O 菜单下,右击 Device,点击 Scan 扫描 Ethernet 网络。



如果 scan 处于灰色状态,请查看标签1指向的配置模式图标是否激活,只有在配置模式下才能扫描在线设备。

选择括号里为 EtherCat 的项扫描



成功扫描 CMMT 会弹出关联 NC 轴的提示框,选择 NC 项,点 Cancel。

EtherCAT drive(s) add	ded	×
Append linked axis to:	NC - Configuration ONC - Configuration	OK
	C CNC - Conliguiation	Cancel

之后 IO 列表会添加扫描到的 EtherCAT 设备, CMMT-AS 名称开头为 Drive, 版本在可在 EtherCAT 选项卡中看到。

Solution Explorer 🔹 🕀 🗙	NC_XYZ ⊅ ×									
○ ○ ☆ [*] o - ⓓ <i>⊁ -</i> =	General EtherCA	T DC	Process Data	Startup	CoE - Online	Diag H	listory	Online	NC: Online	NC: Functions
Search Solution Explorer (Ctrl+;)							,			
Jolution 'NC' (1 project)	Туре:	CMI	MT-AS							
A 📲 NC_XYZ	Dreduct/Revision	806	7722 / 2							
SYSTEM	Product/Revision	: 000	13372							
	Auto Inc Addr:	FFFF								
	EthorCAT Addr	L 100			Advan	ced Settir	nas			
	LuierCAT Addr:		- ·		Auvan	ceu setui	.93			
▲ ➡ Device 1 (EtherCAT)	Identification	0	-							
🛟 Image	Previous Port:	Terr	n 2 (FK1110) - B	'X1 OUT'	r.			\sim		
韋 Image-Info										
SyncUnits										
Inputs										
Outputs										
V 🛄 InfoData										
Drive 3 (CMMT-AS)										
► Inputs										
Outputs										
WcState										
🕨 🛄 InfoData	Name	Onli	ne	Туре	Size	>Add	In/Out	User	Linked to	
Drive 4 (CMMT-AS)	📌 Statusword	x		UINT	2.0	71.0	Input	0	nState1, n	State2
Drive 5 (CMMT-AS)	Modes of ope			SINT	1.0	73.0	Input	0		
Mappings		v		DINIT	4.0	74.0	1.1	•	N 1 1 4	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

<mark>注意:如果没有弹出添加 NC 轴的对话框,且 CMMT 被识别为 Box,比如下图所示,可能是因为 XML 文件缺失或者 XML 文件版本与在线设备固件版本不</mark> <mark>兼容,请査看第一步处理。</mark>

- Drive 3 (CMMT-AS)
- Box 4 (P007B1A95 R00000003)
- Box 5 (P007B1A95 R0000003)

6 新建 PLC 程序



		<u>Click here to go online and find templates.</u>			
Name:	pld				
Location:	C:\Users\ts\Des	ktop\test\CMMT\CMMT\ •	Browse		
				Add	Cancel

7 导入功能库

 ▲ I PLC ▲ I plc ▲ I Plc ▲ I Plc Project 		
👂 🚞 External Typ	bes	
 Reference DUTs GVLs 	Add library Placeholders	
MAIN MAIN POU VISUs	Set to Effective Version Set to Always Newest Version	

cation:	System	~	Edit Locations
	(C:\TwinCAT\3.1\Components\Plc\Managed Libraries)		
installed lib	raries:		Install
Company:	Festo AG & Co. KG	~	Uninstall
± 🖁 🗛	plication		
we			
w=. ••			
			Find
			Find Details
Group b	y category		Find Details Dependencies
Group b	ıy category		Find Details Dependencies

💼 Select Library			×
$\leftarrow \rightarrow \ \cdot \ \uparrow$ $\blacksquare \ \ll \ 20_Libraries$	> CMMT-AS_PointToPoint_TwinCAT_3.5.10.40	✓ ✓ ◆ 	AS_PointToPoi 🔎
组织 ▼ 新建文件夹			::: • 💷 😮
📲 视频	^ 名称 ^	修改日期	类型
■ 图片	Festo_PtP_Base.compiled-library	2019/9/17 20:22	COMPILED-LIBR
	Festo_PtP_CiA402.compiled-library	2019/9/17 20:23	COMPILED-LIBR
➡ 下载	Festo_PtP_CiA402_ETC.compiled-library	2019/9/17 20:23	COMPILED-LIBR
▶ 音乐	Festo_PtP_CiA402_ETC_CMMT_AS.compiled-library	2019/9/17 20:23	COMPILED-LIBR
■ 桌面	Festo_PtP_Virtual.compiled-library	2019/9/17 20:22	COMPILED-LIBR
 Windows (C:) FESTO (E:) FESTO (E:) 网络 	1		
	v <		>
文件名(N): 「Fe	sto_PtP_Base.compiled-library" "Festo_PtP_CiA402.compiled-library" "Festo_Pt	tP_CiA40; ~ All library fil 打开(O)	es (*.compiled-li ~ 取消

接下来添加库,将刚安装的5个库一起添加到程序

Add Library		×	
Enter a string for a fulltext search in all libraries			
Library	Company		
+ O Application			
BuildingAutomation			
BataAccess			
Intern			
B B Math			
e Measurement			
B System			
Advanced	OK	Cancel	
👔 Add Library			×
Enter a string for a fulltext search in all libraries			
Library Placeholder			
Company: Festo AG & Co. KG			\sim
Festo AG & Co. KG			^
Common			
*™ Festo_HomingLibrary 3.1.20.2 Festo AG &	& Co. KG		
• Festo_PtP_Base 3.5.10.40 Festo AG & Co.	.KG		
* Festo_PtP_CiA402 3.5.10.40 Festo AG&C	Co.KG		
* Festo_PtP_CiA402_ETC 3.5.10.40 Festo A	4 <i>G & Co. KG</i>		
*19 Festo_PtP_CiA402_ETC_CMMT_AS 3.5.10.4	0 Festo AG & Co. KG		
* Festo_PtP_Virtual 3.5.10.40 Festo AG&C	Co.KG		¥
<		>	
Group by category Display all versions (for experts on	у)		
Details Library Repository	Ok	C Cano	el

8 建立 PLC 控制程序

新建 POU 程序,语言选中 CFC。



并将其拖动到 PlcTask 任务列表,这样 PLC 运行时才会执行



在新建的 POU 中添加 Box,点击右侧方框,激活输入助手,调用 AXIS_REF_Cia402_CMMT_AS 功能块,建立一个 CMMT 轴 的实例,本例中命名为 CMMT1。



i ancaonbiocita	Name	Туре	0
Module Calls	- {} Festo_PtP_Base	Library	Festo_PtP
Keywords	AXIS_REF_FESTO	FUNCTION_BLOCK	Festo_PtP
Conversion Operators		INTERFACE	Festo_PtP
	I_ParameterCallback	INTERFACE	Festo_PtP
	😑 - 🗁 PLCopen		
	🖃 🗁 🗀 Administrative FBs		
	MC_Power_Festo	FUNCTION_BLOCK	Festo_PtP
	MC_ReadActualPosition_Festo	FUNCTION_BLOCK	Festo_PtP
	MC_ReadActualTorque_Festo	FUNCTION_BLOCK	Festo_PtP
	MC_ReadActualVelocity_Festo	FUNCTION_BLOCK	Festo_PtP
	MC_ReadAxisError_Festo	FUNCTION_BLOCK	Festo_PtP
	MC_ReadAxisInfo_Festo	FUNCTION_BLOCK	Festo_PtP
	🖳 📄 MC_ReadParameter_Festo	FUNCTION_BLOCK	Festo_PtP
	MC ReadStatus Festo	FUNCTION BLOCK	Festo PtP
Structured view			,
ocumentation:	✓ Insert with argument	Insert with nam	espace prefi
reamentation in			

本例中演示如下图所示。注意 PLC open 功能块的 Axis 引脚赋值为刚建立的轴实例 CMMT1.



9 映射 EtherCAT 物理 IO 数据



数据对应如下图中同色框标示。



10 激活配置

NC - Microsoft Visual Studio	
FILE EDIT VIEW PROJECT BUILD DEBUG TWINCA	т
- ○ 〒 - □ - □ = ₽ ★ ⊡ ☆ ♡ - ୯ - ↓	Atta PLC
Sc Activate Configuration → 부 × ○ ○ ☆ *○ - 司 ≠ -=	
▲ 弾出对话框,均选确定。	
Microsoft Visual Studio X	Microsoft Visual Studio X
(Old Configuration (Old Configurations will be overwritten!)	? Restart TwinCAT System in Run Mode
确定取消	确定 取消

11 程序调试



确认读取实际位置是否和 AutomationSuite 中的实际位置对应。

$\equiv \frac{\text{AUTOMATION SUITE}}{20191025^*} \bigstar \mathbf{Q} \textcircled{O} X-Axis \times$	- • × FESTO
PARAMETERISATION CONTROL DIAGNOSIS	
X-Axis CMMT-AS-C2-3A-EC-S1 Put: 192.168.0.12 Connected Disconnect Plug-in PLC Enabled Disabled Control Image: Constraint of the plug-in Powerstage Image: Constraint of the plug-in Plug-in	start device
Parameter pages < Drive configuration	> 🗈 🔿
Drive configuration Please select the components of your drive system Device settings Please select the components of your drive system	Watch window Active motion task Power on (1)
Fieldbus Digital I/O Analogue I/O Servo drive CMMT-AS-C2-3A-EC-S1 Sad0819 Licenses 6.00 A Sad00 V Guida Control Contro	Referencing status Drive NOT referenced (100) Setpoint Position
Encoder interface Axis 1 2 Operator unit EMME-AS-60-M-LS-AMB Type Holding brake Encoder protocol Encoder type Voltage Parameter list Motor Motor Servo motor (2) Yes Hiperface (0) Multi turn (2) 360.00 V Image: Construction of the serve motor (2)	-216627.5698543 mm Position actual value (encoder 1) -216627.5697946 mm
ELGC-TB-KF-60-300 Axis size Feed constant Working stroke 8062777 60 78.00 mm/r 300.00 mm 100 mm	-0.0000334 m/s Velocity actual value (encoder 1) 0.0001501 m/s
Axis	Active current setpoint 0.0226314 Arms
EAMM-U-65-T42-60P-87 Type Parallel Type Mounting kit Parallel	Actual active current 0.0207654 Arms Actual value I ² t monitoring mot 0.00 A ² e
20191025* X-Avis (Plug-in: CMMT-AS Plug-in V1 2.2.4)	E Select Festo Automation Suite V12.1.10

12 与 Beckhoff 的 PLCopen 库的差异

Festo P2P 功能库基于 PLCopen 开发,多数功能块接口与参数含义与 Beckhoff 的 PLCopen 库标准一致,但是根据 Festo 产品做了一定变更和拓展,使单轴控制更加便捷。不过只适用于点对点运动控制。

比如:寻零功能库引用了 CMMT 驱动器自带的寻零方式,寻零传感器需要接到 CMMT 驱动器而不是 PLC。 又比如: Jog 功能块可选择两种点动速度。

具体功能块使用请参照相应手册。

