通过西门子 ET200eco IO-Link 主站配置从站 SPAU&VTUG



曹鹏 Festo 技术支持 2020 年 8 月 13 日

关键词:

IO-LINK, ET200eco, SPAU, VAEM, VTUG

摘要:

本文介绍了使用西门子 1200PLC,通过 ET200eco IO-LINK 主站控制费斯托从站(传感器 SPAU,阀岛 VTUG)。

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,需要对西门子 TIA, PCT 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。

目录

1	软/	/硬件环境	.4
2	硬作	件拓扑结构	.4
3	ET2	200eco IO-LINK 主站相关设置	.4
4	S7-	-PCT 工具中配置从站	.7
	4.1	S7-PCT 通讯设置	.7
	4.2	IODD 文件下载及导入	.8
	4.3	从站配置	.9
	4.3.	8.1 根据实际物理接口,加载从站设备	.9
	4.3.	3.2 从站 I/O 地址分配	.9
	4.3.	3.3 从站参数设置	10
	4.3.	3.4 下载配置以及参数	12
5	PLC	C 数据处理	12
	5.1	SPAU 数据格式以及处理方式	12
	5.2	VAEM 输出验证	13

1 软/硬件环境

软/硬件	版本
TIA Portal	V16
S7-PCT - Port Configuration Tool	V3.51 SP1
S7-1200 CPU	V4.2
ET200eco IO-LINK MODULE	V1.1
SPAU-P10R-H-Q4D-L-PNK-PNVBA-M12D	IO-LINK 协议版本 V1.1
VTUG-10-VRLK-B1T-Q8-DT-Q4S-4J	REV 08

2 硬件拓扑结构

本文档适用于西门子 S7-1200 系列 PLC 在 TIA 环境下,通过 ProfiNet 控制 ET200eco IO-LINK 主站,系统构架如下:

PLC_1 CPU 1212C	Switch_1 SCALANCE XF208 PLC_1	IO device_1 0 ET 200eco PN 41 0 PLC_1 0

3 ET200eco IO-LINK 主站相关设置

设置 IP 地址,子网掩码,设备名:

IP协议	
IP 地址:	192.168.0.50
子网掩码:	255 . 255 . 255 . 0
	☑ 同步路由器设置与 IO 控制器
	── 使用路由器
路由器地址:	0.0.0
PROFINET	
	☑ 自动生成 PROFINET 设备名称
PROFINET设备名称:	io device_1
转换的名称:	ioxadevicexb1652a
设备编号:	1
根据实际硬件连接,设置启用端口	

Port Enable		
	Port 1	
	Port 2	
	Port 3	
	Port 4	

设置端口 1,此处连接的设备是 SPAU-P10R-H-Q4D-L-PNK-PNVBA-M12D,根据手册需配置 2Bytes/字节输入过程数据, PQI为循环数据,默认配置,如下图,

笎	□ 1			
100	— ·	协议版本	设备 V1.1	
	告告	型材	智能传感器配置文件	
<i>`</i>	市观	功能等级	二进制数据通道 (BDC)、过程数据变量 (PDV)、识别、诊断、示教通道	
		通信模式	COM2 (38.4 kBaud)	
		支持 SIO-Mode	是	
		端口类别	A	
		过程数据带宽 OUT	0 字节	
		过程数据带宽 IN	2 byte	
		过程数据内容	2 比特 BDC (压力监控), 14 比特 PDV (压力测量值)	
		最短循环时间	3 ms	
		数据在储雪莲	< 2 kByte	
		1000 10-1 ink 设备批	→ www.festo.com	
>	端口组态	— 述文件		
		端口奕型: 10-Link 21 + P	QI SPAU需要占用2 byte 输入	
	港口参数			
	3 4 11132 XX			
		操作模式:		
		(仕広商 ID・)		
		设备 ID:		
	检查 /	备份级别:		
>	参数			
-	诊断			
		📃 诊断:端口	1	
		□ 诊断:21.	钟生	
			WAX	
1	硬件甲断			
	事件			
		- L ekr -		
	硬件	- 屮胚川 - :		
		优先级:		
	NO ####			
>				
1	論入抽 扑			
		±2 1/4+1/1+1/1 1	0	
		结束地址: 2	.7	
		POI thttp://www.a		
		组织块: (自动更新)	
		过程映像: 自动更新		

设置端口 2,此处连接的设备是 VTUG-10-VRLK-B1T-Q8-DT-Q4S-4J,实际硬件组态的 IO-Link 通讯接口模块是 VAEM-L1-S-

8-PT,可以通过下面的方式查询通讯接口模块的具体型号:

1. 根据阀岛通讯端口模块上的产品标签确定(如下图)



2. 根据阀岛型号中阀片/阀位的数量确定

根据通讯接口型号, 需配置 2Bytes/字节输出数据, 实际端口类型里没有单独的 2Bytes/字节输出, 需要配置 2I/2O, 如下图,

端	□ 2					
>	常规					
				10-Link 接口	VAEM-L1-S-8-	PT型号中8代表8个阀
		名称: [端口_2	规格说明		V1.1 (兼容 V1.0)
		注释:	!	数据传输率		COM 2 (38.4 kBit)
			1	输出数据		2 字节(最多 8 个阀)
						4 字节(最多 16 个阀)
						6 字节(最多 24 个阀)
		,				
>	端口组态,					
		端口类型:	IO-Link 2	l/ 2 O + PQI		
	端口参数	ſ	数字里输。 数字里输。 IO-Link 1 IO-Link 21	入 出 I/10+PQI I+POI	此处VAEM-L1-S-8-PT只 需要2byte输出即可,由 于IO-LINK V1.1没有这	
			IO-Link 2	I/ 2 O + PQI	个给选坝,赵里只能选 	
		骤作模式:	IO-Link 4	1/ 8 O + POI	撺21/20。	
		供应商 ID: 🗌	IO-Link 16	5 I/ 16 O + PQ	l i i i i i i i i i i i i i i i i i i i	
		设备 ID: [IO-Link 32	2 I/ 32 O + PQ		

4 S7-PCT 工具中配置从站

启动 S7-PCT 之前,将组态下载至 PLC,否则 PCT 无法连接在线。

PLC_1 CPU 1212C	IO device_1 ET 200eco PN 41 <u>PLC_1</u>	. 0	1. 选择ET200ec 设备组态 更改设备 启动设备工具	○右键鼠标	选择设备工具 × 送择工具或访问点 57-PCT
	PN/IE_1		₩ 剪切(T) 2. 启动设备 ■ 复制(Y) ■ 粘贴(P)	工具 Ctrl+X Ctrl+C Ctrl+V	
		;	★ 删除(D) 重命名(N)	Del F2	
Switch_1		6	分配给新的 DP 主站/ 断开 DP 主站系统 / IC 实出显示 DP 主站系统	O 控制器) 系统连接 充 / IO 系统	Provides the configuration for IO-Link devices. 3. 点击开始 开始 取消

4.1 S7-PCT 通讯设置

设置 S7-PCT 之前,首先要设置通讯设置,如下图,

SIMATIC S7-PCT - PLC_1				
File Edit View Device	Options Help			
B 🖻 🛛 🗗 블 🗙 🗎 Č	Import IODD			
▼ PLC 1*	IODD Vendor List	🕅 Siemens Communication Settings 🛛 🗕		
PROFINET IO: PROFINET	Export Catalog	Constant Access points Access points		
▶ <u>ज</u> [192.168.0.50] IO devi	i Import Catalog	2. HARCESS Points		
	Restore Default Catalog	Set menory card pera On this property page you can assign "Access points" (names) to the interface parameter assignments of the CPs.		
	Supported Modules	PNIC Acapter The assignment of access points is intended for applications that access C programming interfaces directly.		
	User Role	Access part interface parameter assignment Macule		
		CP_12_1: FWLL0/D		
	- Language	D MP		
	Communication Settings	 STONUNE Microsoft WATEST Loopland, Adapter, SO. 1 Microsoft KM-TEST Loop 		
	1. 选择通讯设置	Access point 370% 按择电脑当前连接网卡,TCPIP. AUTO. 1 boodshift in the two parameter subjects: Intel(R) (211 Gigan Network Connection TCPIP Auto 1 Water Intel(R) (211 Gigan Network Connection ① If you change an access point of a PROFIBUS module to another interface around the point to the data memory of the same module, all other access points the point to the data interface parameter assignment will be remapped to the new interface parameter assignment will be remapped to the new interface parameter assignment Apply Cancel		
		4. 点击Apply		

4.2 IODD 文件下载及导入

IODD文件可以从Festo官网支持与下载页面下载:例如搜索SPAU,在Software选项中找到针对于SPAU-P10R-H-Q4D-L-PNK-PNVBA-M12D的IODD文件,下载之后解压得到IODD文件。

SPAU下载链接: <u>https://www.festo.com.cn/cn/zh/a/8001212/?q=8001212~:festoSortOrderScored</u> VAEM下载链接: <u>https://www.festo.com.cn/cn/zh/a/573384/?q=vaem~:festoSortOrderScored</u>

备注:由于前 FoX 官网更新 bug 的问题,下载页面的 IODD 文件无法查看相应 IODD 注释说明。

自动化 > 工厂自动化 > 传感器 > 压力和真空传感器 > SPAU > SPAU-P10R-H-Q4D-L-PNLK-PNVBA-M12D

P	压力传感器		
	SPAU-P10R-H-Q4D-L-PNLK-PNVBA-M12D 8001212 GTIN: 4052568276898	 打开 CAD 数据 备件目录 	▲ 请登录获取价格 ── 1 + 件/米
• • • •	SPAU_CN.PDF ±	产品文档 🎂 下载数据表	〕 计算交货日期 □ 添加到购物车
芊 配置您的产品	附件 技术参数 支持/下载 1. 点击支持/下载		
支术文档 [1]			Ø ^
Certificates [4]			٥
Software [9]			<

Software [9]	<
IO-Link IODD SPAU Pressure sensor 设备描述文件	
IO-Link IODD SPAU Pressure sensor 设备描述文件 2. 选择合适单位的IODD 文件进行下载	
IO-Link IODD SPAU Pressure sensor Device Description Files IO-Link Version 1.1 Device Description (IODD) for Pressure Sensor SPAU for unit MPa	

 1.07
 (valid since 22/01/2015)

1 占击Ontions 选取Import IODD	Festo-SPAU-P05-L_MPa-20150122-IODD1.1-de
	Festo-SPAU-P6_MPa-20150122-IODD1.1
File Edit View Device Options Help	Festo-SPAU-P6_MPa-20150122-IODD1.1-de
登 🖻 🔒 🗿 書 🗽 🧰 🏥 📕 Import IODD	Festo-SPAU-P6-L_MPa-20150122-IODD1.1
IODD Vendor List	Festo-SPAU-P6-L_MPa-20150122-IODD1.1-de
2.弹出以下窗口	Pesto-SPAU-P10_MPa-20150122-IODD1.1
Isport 100D Files	Festo SPAU-P10_MPa-20150122-IODD1.1-de
	Festo-SPAU-P10-L_MPa-20150122-IODD1.1
Select the directory of 1000 files: [.::(Vsers vier) of esetting Scholmer - 10001.1 (Srkomer - 10001.1 3.添加需要导入IODD的路径) Ereves	Festo-SPAU-P10-L_MPa-20150122-IODD1.1-de
Show warnings for: User 🗸	Festo-SPAU-P12_MPa-20150122-IODD1.1
IODD Files	Festo-SPAU-P12_MPa-20150122-IODD1.1-de
Selected IODD File Name Vendor Hane Device ID Device Family Device Hane Version. Device Details Status	Festo-SPAU-P12-L_MPa-20150122-IODD1.1
V Festo-SFAN-F10-L Festo AG & Co. EG 122 SFAU SFAN SFAN-F10-LJMFa 2015-01-2 Show	Festo-SPAU-P12-L_MPa-20150122-IODD1.1-de
	Festo-SPAU-P16_MPa-20150122-IODD1.1
	Festo-SPAU-P16_MPa-20150122-IODD1.1-de
	Festo-SPAU-P16-L_MPa-20150122-IODD1.1
	Festo-SPAU-P16-L_MPa-20150122-IODD1.1-de
	Festo-SPAU-P025_MPa-20150122-IODD1.1
	Festo-SPAU-P025_MPa-20150122-IODD1.1-de
2	Festo-SPAU-P025-L_MPa-20150122-IODD1.1
Select All Devaled DUD's from Internet with DUD'inder	Festo-SPAU-P025-L_MPa-20150122-IODD1.1-de
Import 5.点击Import进行导入	Festo-SPAU-V1_MPa-20150122-IODD1.1
	Festo-SPAU-V1_MPa-20150122-IODD1.1-de
	Festo-SPAU-V1-L_MPa-20150122-IODD1.1

同理,VAEM 选择下图 IODD 进行导入



4.3 从站配置

4.3.1 根据实际物理接口,加载从站设备

Com	ment:									Profile: V1.0 and V1.1
										🕨 🛅 IO Link V1.0
										✓ III IO Link V1.1
										🕶 🚺 Festo AG _Co. KG
Port	Info _									🗸 🗖 🛨 🖬 🗸 🗸 🗸 🗸
Co	umn Filter			根据实	SPAU-P10-L					
Port	Autosense	Mode		Name	IO-Link Version	Inspection Level		Backup Level	_	▼ TUG
1		10-Link	V	SPAU-P10-L	V1.1	Type compatible	~	Backup&Restore	\sim	VAEM-L1-S-8-PT
2		10-Link	\sim	VAEM-I 1-S-8-PT	V1.1	Type compatible	~	Backup&Restore	\sim	VAEM-L1-S-8-PTL
-		-	-						H	SIEMENS AG
3		Deactivated	~			No check	~	Off	~	🕨 🕨 🛄 STANDARD
4		Deactivated				No check		Off	Y	

4.3.2 从站 I/O 地址分配

点击 Addresses,选择 Port1 可以看到从站 SPAU 分配字节定义,如下图,

Ports	Addresses	Status	I&M	Commands										
General														
	Show PLC addresses													
Por	t Info													

Port	Input Start	Input End	Length	Output Start	Output End	Length
1	0.0	1.7	16 Bit + 1 Byte PQI			
2				0.0	1.7	16 Bit
3						
4						

Structure of Process Data _

All Ports	Port	Name	Data Type	Address
Create PLC data type	1	Port Qualifier	UlntegerT	(i) 2.0 - 2.7
source me	1	PDV (InA) - PDV (InA)	UIntegerT	(1) 0.0 - 0.7 / 1.2 - 1.7
	1	PDV (InA) - BDC1 (OutA)	BooleanT	(I) 1.0
	1	PDV (InA) - BDC2 (OutB)	BooleanT	(I) 1.1

选择 Port2 可以看到从站 VAEM 分配字节定义,如下图,

2		0.0	1.7	16 Bit
3				
4				

tructure of Process Data

All Ports	Port	Name	Data Type	Address
Create PLC data type	2	Port Qualifier	UIntegerT	()) 2.0 - 2.7
source me	2	Valves - Valve 1 solenoid 14	BooleanT	(O) 0.0
	2	Valves - Valve 1 solenoid 12	BooleanT	(O) 0.1
	2	Valves - Valve 2 solenoid 14	BooleanT	(O) 0.2
	2	Valves - Valve 2 solenoid 12	BooleanT	(O) 0.3
	2	Valves - Valve 3 solenoid 14	BooleanT	(O) 0.4
	2	Valves - Valve 3 solenoid 12	BooleanT	(O) 0.5
	2	Valves - Valve 4 solenoid 14	BooleanT	(O) 0.6
	2	Valves - Valve 4 solenoid 12	BooleanT	(O) 0.7
	2	Valves - Valve 5 solenoid 14	BooleanT	(O) 1.0
	2	Valves - Valve 5 solenoid 12	BooleanT	(0) 1.1
	2	Valves - Valve 6 solenoid 14	BooleanT	(0) 1.2
	2	Valves - Valve 6 solenoid 12	BooleanT	(0) 1.3
	2	Valves - Valve 7 solenoid 14	BooleanT	(0) 1.4
	2	Valves - Valve 7 solenoid 12	BooleanT	(O) 1.5
	2	Valves - Valve 8 solenoid 14	BooleanT	(O) 1.6
	2	Valves - Valve 8 solenoid 12	BooleanT	(0) 1.7

4.3.3 从站参数设置

选取左侧从站,可对从站参数进行修改,此处可根据实际需要进行相应修改。

•	Identification Parameters Monitoring	Diagnostics Connection				
DFINET IO: PROFINET IO-System	Column Filter					
[192.168.0.50] IO device_1	Parameter	Value	Icon	Unit	Status	Help
(11) SPAU-P10-L	-Parameters					
[2] VAEM-L1-S-8-PT	- Parameters					
•	-Device					
	Device Access Locks					
	Parameter (wri	Unlocked			loaded	
	Data Storage	Unlocked			loaded	
	Local Paramete	linl ocked			loaded	
	Local liser Int	lin] ocked			loaded	
	Restore Factory S	Protonic Protonic Catting				
		Restore Factory Setting	_			Offerst and the state of the second state of t
	Aajust zero	Adjust zero	_			Uliset calibration, available only if the user zero adjustment is on
	User zero adjust	off			loaded	Enables/disables adjust zero command
	InA unit	bar			loaded	Unit of process value on device display
	Filter response t	5 ms			Loaded	Smoothing of input signal
	Pin 2 selection	OutB - switch			Loaded	Output of pin 2
	Backlight duratio	Always on		z	Loaded	Always on or time since last key press to switch off backlight
	Sub-display (Sub. d)	Units			loaded	Show in sub-display (RUW mode)
	Lock code	off			loaded	Local parameter Lock: off or code 1 9999
	⊡OutA					
	Set points of BDC	0.600		MPa	Loaded	
	Set points of BDC	0.700		MPa	loaded	
	Switch parameters	Normally open (NO)			loaded	
	Switch parameters	Single point mode			loaded	Switch function
	Switch parameters	0.005		MPa	loaded	
	ADM max signal de	0.002		MPa	loaded	Difference monitoring: boundary value for constant signal observation
	ADM time delta (t	200		ms	loaded	Difference monitoring: time period for constant signal observation
	ADM switch point	0.020		MPa	loaded	Difference-monitoring: threshold for pressure difference
	Backlight control	allways blue			loaded	Display color
	⊡OutB					
	Set points of BDC	0. 600		MPa	loaded	
	Set points of BDC	0.700		MPa	loaded	
	Switch parameters	Normally open (NO)			loaded	
	Switch parameters	Single point mode			loaded	Switch function
	Switch parameters	0.005		MPa	loaded	
	ADM max signal de	0.002		MPa	loaded	Difference-monitoring: threshhold for constant signal observation
	ADM time delta (t	200		ms	loaded	Difference-monitoring: threshhold for constant signal observation
	ADM switch point	0. 020		MPa	loaded	Difference-monitoring: threshhold for pressure difference
	Backlight control	allways blue			loaded	Display color
	⊡OutD					
	OutD pressure ran	0		%	loaded	Scaling of analog output to input range start value (in percent of full scale)
	OutD pressure ran	100		%	loaded	Scaling of analog output to input range end value (in percent of full scale)
	OutD analog out type	420mA current output			loaded	
	⊡Teach-in					
	Teach channel	Default channel			loaded	Default channel is BDC1 (OutA)
	Teach selected ou	Teach selected output				
	Cancel teach	Cancel teach				
	-Teach-in status					
	Teach-in statu	Idle			Initial	
	Teach-in statu	Teachpoint is not taught or not succe			Initial	
	Teach-in statu	Teachpoint is not taught or not succe			Initial	
	Teach-in statu	Teachpoint is not taught or not succe			Initial	
	Teach-in statu	Teachpoint is not taught or not succe			Initial	
[Slot 1] 4 IO-I	Parameter	Value			Icon	n Vnit Status Help
(1] SPAU-P10-L	⊡Monitoring	1			1	
[2] VAEM-L1-S-8-PT						
	Error Count	0				Initial
	[STD_TN_V_ProcessDataOut	tput]				
	- Valves					
	Valves - Valve	1 solenoid 14 U				Initial
	Valves - Valve	2 solenoid 14 0				
	Valves - Valve	2 solenoid 12 0				Initial
	Valves - Valve	: 3 solenoid 14 0				Initial
	Valves - Valve	3 solenoid 12 0				Initial
	Valves - Valve	4 solenoid 14 0				Initial
	Valves - Valve	4 solenoid 12 0				Initial
	Valves - Valve	5 solenoid 14 0				Initial
	Valves - Valve	5 solenoid 12 0				Initial
	Valves - Valve	6 solenoid 14 0				Initial
	Valves - Valve	6 solenoid 12 0				Initial
	Valves - Valve	r / solenoid 14 0				Initial
	Valves - Valve	ersolenoid 12 U				
	Valves - Valve	8 solenoid 12 0				Initial

4.3.4 下载配置以及参数



5 PLC 数据处理

5.1 SPAU 数据格式以及处理方式

根据下图可知, 2-15 位用来传输测量压力 InA, 其精度为 2^14=16384, PLC 分配字节为 IW1。

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Significance	MSB													LSB		
Process data	Proce	rocessDataVariable (PDV)											BDC2	BDC1		
Data content	14-bi	t mea	surec	l valu	e (pre	essure	e mea	suren	nent v	value	InA)				OutB	OutA

由于该 14 位数据非标准结构,无法直接采集,需要进行移位处理,同时还需要将数据换算到 0-10bar 的量程内,具体处理方式如下图:



程序 注释	段 2:			根据精度以	以及量程处理数据				
			NORM_X Int to Real				SCALE_X Real to Real		
		EN	ENO			EN		- ENO	
	0 —	MIN		%MD102	0.0 —	MIN			%MD104
	%MW100		OUT	— "Tag_4"	%MD102			OUT	— "Tag_5"
	"SPAU_SHR" —	VALUE			"Tag_4" —	VALUE			
	16384 —	MAX			1.0 —	MAX			

编译下载 PLC 程序,并在线监控 PLC, MD104 的数值与 S7-PCT 获取的实际数值一致。



5.2 VAEM 输出验证

通过组态, VAEM 分配的地址为 01.0~2.7, 使用监控表强制阀岛输出, 对比 S7-PCT 监控, 输出位一致。

	地址	显示格式	监视值	Pl	C强制轴	育出 修改值	1		4	
]	%QW1	二进制 💽	2#1001_0	0101_0	0000_001	0 2#100	01_0101_00	00_0010	🗹 🔺	
In										
		2								
	Identification Mor	nitoring								
	Column Filter									
	Parameter			Valu	e Data	a Storage	Icon	Unit	Status	
	-Monitoring									
	-									
	Error	Count		0	excl	uded			loaded	
	[STD_TN_V]	_ProcessDataOutput]								
	-Valves		值							
		Valves - Valve 1 sole	noid 14	1	excl	uded			loaded	
		Valves - Valve 1 sole	noid 12	0	excl	uded			loaded	
		Valves - Valve 2 sole	noid 14	1	excl	uded			loaded	
		Valves - Valve 2 sole	noid 12	0	excl	uded			loaded	
		Valves - Valve 3 sole	noid 14	1	excl	excluded			loaded	
		Valves - Valve 3 sole	noid 12	0	excl	excluded			loaded	
		Valves - Valve 4 sole	noid 14	0	excl	uded			loaded	
		Valves - Valve 4 sole	noid 12	1	excl	uded			loaded	
		Valves - Valve 5 sole	noid 14	0	excl	uded			loaded	
		Valves - Valve 5 sole	noid 12	1	excl	uded			loaded	
		Valves - Valve 6 sole	noid 14	0	excl	uded			loaded	
		Valves - Valve 6 sole	noid 12	0	excl	uded			loaded	
		Valves - Valve 7 sole	noid 14	0	excl	uded			loaded	
		Valves - Valve 7 sole	noid 12	0	excl	uded			loaded	
		Valves - Valve 8 sole	noid 14	0	excl	uded			loaded	
		Valves - Valve 8 sole	noid 12	0	excl	uded			loaded	