Application Note



CMMT-AS-PN controlled by SINAPOS functions block with Siemens S7 1500 controller

This document describes which control figures are implemented in CMMT-AS-PN drives and how to use it in programming environment of Siemens in TIA portal. Specifically focus on how to use SINAPOS functions block(PtP non-interpolated motion) in SINAMICS Lib for point to point linear motion.

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Author	
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Type/Name	Version Software/Firmware	Date of manufacture
CMMT-AS-C4-3A-PN-S1	V015.0.8.38_release	
Automation Suite	1.1.1.610	
CMMT-AS Plug-in	1.1.0.110	
TIA Portal	V14 SP1	
SINA_POS	5.4	
Drive_Lib_S7_1200_1500	V5	

1 Components/Software used

Table 1.1 : Components/Software used



Information

This AppNote describes the procedure with the CMMT-AS motor controller. The CMMT-AS servo drive controller and CMMT-ST servo drive controller for extra-low voltage are based on the same software platform. Therefore, the described settings can also be used as a reference for its parameterization. It is hereby expressly pointed out, that this has not been explicitly tested and therefore the function cannot be guaranteed!

1.1 Topology of the tested system







Figure 1.1 : overview of tested system

Please refer to the picture above and make sure all wires are correctly placed and connected To confiture and run the system for commissioning, it is necessary to install named software in the table 1.1 above on your laptop or other PC system which you will do commissioning with.

2 Application Description

This part of the documentation describes a connectivity and configuration of the motor drive CMMT-AS-..-PN within a Profinet network controlled via Siemens S7-1500 PLC controller. The used bus protocol within this Application Note is an Application Class 3 and Telegram 111 which are specifically defined by Siemens for PtP non-interpolated motion over Profinet. It is targeted at people who are already familiar with this protocol, Festo Automation Suite and Siemens TIA Portal software.

3 Configuration of parameters in Automation Suite

3.1 Automation Suite related parameters

On the Fieldbus tab you can find the parameters that are related to the communication with the host system.

• Factor Group:

These settings allow you to change the resolution of the position, velocity, acceleration and jerk values. They are related to the 'Current user unit', for example Meters or RPM.

To default settings allow you to control your drive with a resolution of 0,001mm for positioning, while the velocity, acceleration and jerk values are with a resolution of 1mm.

Metric [n	n, m/s,] (6)	
0	-6	
	-3	
	-3	
	-3	
	Metric (n	Metric [m, m/s,] (6)

• Reference Values

The 'Base value speed' doesn't influence the speed of the drive, but it does change the way the 'actual speed' is displayed. It is a percentage in the SINA_POS function block, related to this base value.

For controlling the acceleration and deceleration of the drive these reference values are used, also as a percentage in the SINA_POS block.

Base value speed	0	5,00	m/s	
Base value acceleration	0	1,00	m/s²	
Base value deceleration	0	1,00	m/s²	

• Dynamic values

Using Telegram 111 the 'Jerk' of the movement can be modified under the 'Dynamic values', the acceleration and deceleration values have no function here.

Acceleration	1,00	m/s²	
Deceleration	1,00	m/s²	-
Jerk	100.00	m/s³	

Connection Parameters / Connection Properties

These parameters are Read Only from the Automation Suite, they have to be set from TIA portal.

4 Setting up TIA Portal

4.1 Installing the SINAMICS library to TIA portal

Download the latest version of the SINAMICS Drivelib from the Siemens website here: Link to SINAMICS Drivelib

SINAMICS Blocks DriveLib for the control in the TIA Portal

Make sure TIA portal is closed and execute the downloaded .MSI.

4.2 Making the Hardware Configuration in TIA portal

1. Create a new project and add your PLC:

Project tree 🛛 🔳 📢				
Devices				
	Device name:			
Application Note	PLC_1			
Y Add new device				
Devices & networks		- Tim CPU	Device	
Ungrouped devices		CPU 1511-1 PN	Device.	
Common data		CPU 1511C-1 PN		
 Documentation settings 		CPU 1512C-1 PN		an B
Languages & resources	Controllers	CPU 1513-1 PN		"8 U
Unine access		CPU 1515-2 PN		
Card Reader/USB memory		CPU 1516-3 PN/DP		CPU 1516F-3 PN/DP
		CPU 1517-3 PN/DP		
		CPU 1518-4 PN/DP	Article no.:	6ES7 516-3FN00-0AB0
	HMI	CPU 1518-4 PN/DP ODK	Marrian	1/1.0
		CPU 1511F-1 PN	version:	V 1.0
		CPU 1513F-1 PN	Description:	
		CPU 1515F-2 PN	Fail-safe CPL	J with display; work memory 1.5
		CPU 1516F-3 PN/DP	MB code and	d 5 MB data; can be used for
		6ES7 516-3FN00-	safety applic	ations; supports PROFIsafe V2; 10
	PC systems	6ES7 516-3FN01	concept, inte	egrated technology functions :
		CPU 1517F-3 PN/DP	motion cont	rol, closed-loop control,
		CPU 1518F-4 PN/DP	interface: PR	easuring; integrated tracing; 1st
		CPU 1518F-4 PN/DP ODK	RT/IRT, 2 port	s, MRP, transport protocol TCP/IP,
		CPU 1511T-1 PN	S7 commun	ication, Web server, constant bus
		CPU 1515T-2 PN	basic service	es, transport protocol TCP/IP, Web
	1000	CPU 1517T-3 PN/DP	server, routi	ng; 3rd interface: PROFIBUS DP
		CPU 1511TF-1 PN	master, con	stant bus cycle time, routing;
	1001	CPU 1515TF-2 PN	minware vi	.0
	01110	CPU 1517TF-3 PN/DP		
		Unspecified CPU 1500		
			·	

2. Go the the 'Device Configuration' tab, select 'Network View' and search for the CMMT in the Hardware Catalog. Drag and drop this to the middle screen:

roject tree 🛛 🔳 📢	Application Note > Devices & networks		_ # # X	Hardware catalog	10
Devices	🚰 Topology view	🛦 Network view 🛐	Device view	Options	
i 🗌 🖬	Network Connections HMI connection	Netwo	ork overv ∢ ▶		
		A A	wize	✓ Catalog	
Application Note			\$71500/FT200	CMM	641
Add new device	DIC 1	=	PLC_1	Eiter Brofiles Alla	
Devices & networks	CPU 1516F			Filter Prolife: <all></all>	
 L PLC_1 [CPU 1516F-3 PN/DP] 				Distributed I/O Power supply and distribution	
Device configuration				Field devices	
Program blocks				Other field devices	
Technology objects				Additional Ethernet devices	
External source files				PROFINET IO	
PLC tags				 Drives 	
PLC data types				🕨 🧊 Festo	
Watch and force tables		7		🗢 🋅 Festo AG & Co. KG	
Online backups		-	Deer	Festo CMMP-AS-M3	
🕨 🔄 Traces			Drag	 Festo CMMT-AS 	
Device proxy data				CMMT-AS V1	
Program info				Festo CMMI-SI	
PLC supervisions & alarms				Festo EMCA	
PLC alarm text lists				V Information	
Local modules					
Generation devices				Device:	
Common data					
Languages & resources				•	
Online access					
Card Reader/USB memory					
				CMMT-AS V1	
		×			
	< II > 100%		>	Article no.: CMMT-ASPN	
	Sector Properties	🗓 Info 😩 🗓 Diagnostic	s 📑 🖛	Version: (GSDML-V2.34-FESTO-CMMT-A	S-20 -
	General () Cross-references Compile	2		Description:	
	3 A C Show all messages			CMMT-AS V1	
Dotails view	I Path Description				
Details View					

3. To connect the CMMT with the PLC, click on 'Not Assigned' and select the Profinet interface. After this, a green line will show the connection between the PLC and CMMT:



4. Double click on the CMMT to get into the 'Device View' tab. Here we can select the different Telegrams. To use the CMMT in Point-to-Point mode with the SINAMICS Drivelib we need to select:

Siemens telegram 111, PZD-12/12			(C)rag	and	l drop	to th	e second empty slot)
Application Note Vungrouped devices CMMT-AS [CMMT	-AS V1]						_∎≡×	Hardware catalog
		🛃 Topology view	n N	etwork	view	Devic	e view	Options
👉 CMMT-AS [CMMT-AS V1] 💌 🖽 🔛 🚮 🕰 🛄 🍳 🛨		Device overview						
	^	W Module		Rack	Slot	I address	Q address	✓ Catalog
5		 CMMT-AS 		0	0			. cmmt
alt-h	=	PN-IO Interface		0	0 X1			Filter Profile: <all></all>
CMIL		 DO SERVO_1 		0	1			Head module
•		Module Access Point		0	11			
				0	12			Siemens telegram 111, PZD-12/12
				U	13			Standard telegram 1, PZD-2/2
				0	14			Standard telegram 2, PZD-4/4
				0	2			Standard telegram 3, PZD-5/9
				0	3			Standard telegram 7, PZD-2/2
				0	4			Standard telegram 9, PZD-10/5
		-						
	-							

5. Select the telegram you just dropped in and go to 'Properties' on the bottom of that screen. Make note of the 'Hardware identifier' value that has been given to this Telegram, as we will need it later.



Hardware identifier: 267 (e.g.)

(make sure you select the Telegram first!)

6. Right click on the CMMT and select 'Assign Device Name'. For this you need to have access to either the whole Profinet network or the X19 port on the CMMT.

Application Note	ed devices 🕨 C	MMT-AS [CI	MMT-AS V1]	
CMMT-AS [CMMT-AS V1]	- 🖽 🖭 🔚 🗉	: 🔲 🔍 ±		
EMPTAS 		FESTD	Change device Write IO-Device name to Micro	Memory Card
			Start device tool Cut Copy Paste	Ctrl+X Ctrl+C Ctrl+V
			🗙 Delete	Del
			😴 Go to topology view 🏭 Go to network view	
CMMT-AS [CMMT-AS V1]			Compile Download to device Go online Co offline Online & diagnostics	Ctrl+K Ctrl+M Ctrl+D
General IO tags Sys	tem constants	Texts	Receive alarms	
General PROFINET interface [X1]	Advanced optio	ns	Update and display forced opera	ands F11
General	 Interface opt 	tions	Cross-reference information	Shift+F11
Ethernet addresses Advanced options			Show catalog	Ctrl+Shift+C
Interface options	Prioritized s	tartup	🗟 Properties	Alt+Enter
Media redundancy	Use IEC V2.	2 LLDP mode	📑 Export module labeling strips	

7. Select the correct interface and click on 'Update List':

	ce name.					
		Configured		IET device		
		PROFINET dev	vice name:	cmmt-as		•
		De	evice type:	CMMT-AS V1		
		Online acc	ess			
		Type of the PG/PC	Cinterface:	PN/IE		-
	_	PG/PC	interface:	D-Link DUB-E100 USB2	.0 to Fast Ethernet Ad	💌 🖲 🔟
	_	Davidas filta				
8		Device filte	er			
		🛃 Only sho	w devices of	the same type		
		Only sho	w devices w	ith bad parameter settings		
		Only sho	ow devices w	ith bad parameter settings		
		Only sho	ow devices w ow devices w	ith bad parameter settings ithout names		
	Accessible de	Only sho	ow devices w ow devices w	ith bad parameter settings ithout names		
	Accessible de	Only sho Only sho vices in the network: MAC address	ow devices w ow devices w Device	th bad parameter settings thout names PROFINET device name	Status	
	Accessible de	Only sho	ow devices w ow devices w Device	th bad parameter settings thout names PROFINET device name	Status	
	Accessible de IP address	Only sho	ow devices w ow devices w Device	th bad parameter settings thout names PROFINET device name	Status	
	Accessible de IP address	Only sho	ow devices w ow devices w Device	PROFINET device name	Status	
I	Accessible de IP address	Only sho	ow devices w ow devices w Device	PROFINET device name	Status	
Flash LED	Accessible de IP address	Only sho	ow devices w ow devices w Device	PROFINET device name	Status	

8. The CMMT should appear with the status 'Device name is different'. Select the CMMT and click on 'Assign name'

Assign PROFINET device	name.				×
-		Configured	PROFINET	device	
		PROFINET dev	ice name: cm	imt-as	-
		De	vice type: CM	MT-AS V1	
		Online acc Type of the PG/PC	ess interface:	PN/IE	Errt Ethomat ()d
a		Device filte	er w devices of the s	ame type	
		Only sho	w devices with ba	d parameter settings	
		Only sho	w devices without	names	
	Accessible de	vices in the network:			
	IP address	MAC address	Device	PROFINET device name	Status
	0.0.0.0	00-0E-F0-12-03-6	Festo CMMT-AS	empty	🚹 Device name is different
Flash LED					
				Update	e list Assign name
					*

9. After the status switched to 'OK', close the dialog:

		IP address	MAC address	Device	PROFINET device name		Status		
	_	0.0.0.0	00-0E-F0-12-03-6	Festo CMMT-AS	cmmt-as	0	OK		
1									
F	Flash LED								
					Upd	ate lis	it 🗌	Assign name	
					Upd	ate lis	st 🗌	Assign name	
					Upd	ate lis	st 📃	Assign name	
					Upd	ate lis	it 🗌	Assign name	
					Upd	ate lis	it [Assign name	
line	e status informati	on:			Upd	ate lis	st	Assign name	
nline	e status informati Search complet	on: ed. 1 of 1 devices	were found.		Upd	ate lis	st	Assign name	
nline	e status informati Search complet The PROFINET c	on: ed. 1 of 1 devices Jevice name "cm	: were found. mt-as" was successfull	y assigned to MAC	Upd	ate lis	54".	Assign name	
line	e status informati Search complet The PROFINET c	on: ed. 1 of 1 devices device name "cmi	: were found. mt-as" was successfull	y assigned to MAC	Upd address "00-0E-F0-12	-03-	54".	Assign name	
nline	e status informati Search complet The PROFINET c	on: ed. 1 of 1 devices device name "cmi	: were found. mt-as" was successfull	y assigned to MAC	Upd address *00-0E-F0-12	-03-	54".	Assign name	
Iline	e status informati Search complet The PROFINET c	ion: ied. 1 of 1 devices device name "cmi	: were found. mt-as" was successfull	y assigned to MAC	Upd address *00-0E-F0-12	-03-	54".	Assign name	
line	e status informati Search complet The PROFINET c	ion: ied. 1 of 1 devices device name "cmi	: were found. mt-as" was successfull	y assigned to MAC	Upd address "00-0E-F0-12	-03-	64".	Assign name	

4.3 Configuring the SINAMICS function blocks

Make sure you first installed the SINAMICS DriveLib to your TIA portal, explained in part 4.1 of this document.

• From the Project Tree select 'Add new block' and create a Function Block. Fill in the name (e.g. CMMT_Function_Blocks), select 'Function block' and click 'OK'.



• After creating the function block it jumps straight into it. We now want to open the 'Libraries' tab (on the right), open the 'Drive_Lib_S7_1200_1500' and open the sub-folder '03_SINAMICS'.

Drag and drop the 'SINA_POS' function block to a network.

Project tree 🔲 🖣	n Note + PLC_1 [CPU 1516F	-3 PN/DP] 🕨 Prog	ram blocks 🔸	CMMT_Fund	tion_Blocks [FB1]	_ • • ×	Libraries	
Devices							Options	1
🖻 🔳 🖻	ы ы 🖻 🖹 🖣 🔚 🚍 🚍	💬 🖀 ± 🖀 ± 👹 ±	😑 😥 🥙 😡	oli 🕫 🕹	ς≡ '≡ ''≡ ς, ¢	e 🖓	🛃 Library view 🙆	
	CMMT_Function_Blocks	_					> Project library	The
 Application Note 	Name	Data type	Default value	Retain	Accessible f Writa.	. Visible in	× Global libraries	9
📑 Add new device	1 🚾 🔻 Input					-		Data Ima P
Devices & networks	2 Add new>			-		=		
PLC_1 [CPU 1516F-3 PN/DP]	3 📲 🔻 Output						▼ ↓↓ Drive_Lib_S7_1200_150	<u>30</u> 6
Device configuration	4 Add new>					· · · ·	 Master copies 	a
Online & diagnostics	<	1				>	01_57_General	sti
 Program blocks 							02_57_1200	G
🚔 Add new block							02_\$7_1500	
🛥 Main [OB1]	▼ Block title:						 B 03_SINAMICS 	
CMMT_Function_Blocks [FB1]	Comment						SINA_INFEED	
Technology objects							SINA_PARA	8
External source files	 Network 1: 						SINA_PARA_S	
PLC tags	Comment				Drag		SINA_POS	
PLC data types					Diws		SINA_SPEED	5
Watch and force tables							Languages & resource	es 🖁
Online backups							Drive_Lib_\$7_300_400	Te a
Traces							Long Functions	S
Device proxy data							 Documentation template 	is 🦯
Program info								
PLC supervisions & alarms								
PLC alarm text lists								
Local modules	1							
Distributed I/O	1							
La Ungrouped devices				100%				
Common data				100%			4	

• To automatically create the required data blocks, click 'OK':



• Festo strongly advises to enable the Software Limit monitoring by the CMMT. To do this, change the default 'ConfigEPos' value from '16#0000_0003' to '16#0000_000F' (activating bit 2 and bit 3). More information on this can be found in part <u>5.2</u> of this document.



• The function block requires the 'Hardware identifier' we made note of in part <u>4.2.4</u>. You can also find the value in the 'Default tag table' --> 'System constants'.

- Pevices

 Application Note

 Add new device

 Devices Anetworks

 Add new bock

 Add new tag table

 Add new tag table Devices Application Note → PLC_1 [CPU 1516F-3 PN/DP] → PLC tags → Default tag table [59] 💫 🗕 🛤 🗙 8,63 중 한 탄소 🐛 🗄 🗄 🗁 월호 월호 명호 🚍 😥 🕫 6,68 69 🖅 Tags 🖲 User constants 🖉 System constants CMMT_Function_Blocks Data type
 Default tag table
 Name
 Data type
 Value

 Name
 Data type
 Value
 52

 11
 Coal-Exec
 Hw, SuMModue
 52

 12
 Local-Exec
 Hw, SuMModue
 52

 13
 Local-Exec
 Hw, SuMModue
 53

 14
 Local-Peinerfrace_1
 Hw, Interface
 64

 15
 Local-ROFINET_interface_1-Hort, Hw, Interface
 65

 16
 Local-ROFINET_interface_1-Hort, Hw, Interface
 65

 16
 Local-ROFINET_interface_1-Hort, Hw, Interface
 61

 17
 Local-ROFINET_interface_2-Hw, Interface
 72

 18
 Local-ROFINET_interface_2-Hw, Interface
 73

 19
 O.R.Mini
 O.R_CYCLE
 1

 19
 Local-ROFINET_interface_2-Hw, Interface
 73
 23

 12
 CMT-AS-ProDy interface-Port_1 Hw, Interface
 73
 24

 15
 CMT-AS-ProDy Interface-Port_2 Hw, Interface
 259
 250

 15
 CMT-AS-ProDy Interface-Port_2 Hw, Interface
 216
 250

 25
 CMT-AS-DO SERVO_1 Hw Default value Retain Default tag table Name %DB1 "SINA POS DB" %FB284 "SINA_POS" SINA_F
 EN
 O ModePos
 O EnableAxis
 CancelTraversin
 1 - g
 IntermediateSto
 1 - p
 O Positive
 O Note: in a finite sector in Lockout → ... ActVelocity → ... ActPosition → ... 0 — Negative 0 — Jog1 0 — Jog2 ActMode -----EPosZSW1 — ... EPosZSW2 — ... 0 — FlyRef 0 — AckError 0 — ExecuteMode ActWarn ----ActFault -----0 — Position 0 — Velocity 00 — OverV Error ----100-Status -----< DiagID -----100 — OverAcc OverDec ConfigEPos 100-0007-267 -HWIDSTW Gonline access
 Gard Reader/USB memory 267 - HWIDZSW
- Set the value to both 'HWIDSTW' and 'HWIDZSW' on the SINA_POS block

• To make sure the function blocks will be executed we need to call it in the main task. Double click on the 'Main [OB1]':

Project tree	Application Note ▶ PLC_1 [CP	U 1516F-3 PN/DP] 🕨	Program blocks	Main [OB1]
Devices				
🖼 🔲 📑	ый 🖈 👻 💺 🗮 🚍 🖉	🖻 🖀 ± 📲 ± 📳 ± 📔	। 😰 🗠 🖓	≣ 李 두 != ≒ 두 안 용 ᄬ 🔒
	Main			
 Application Note 	Name	Data type	Default value Su	pervision Comment
📑 Add new device	1 📲 🔻 Input			
📩 Devices & networks	2 📲 🔹 Initial_Call	Bool		Initial call of this OB
PLC_1 [CPU 1516F-3 PN/DP]	3 💷 🔹 Remanence	Bool		=True, if remanent data are available
Device configuration	4 <u temp<="" th="" 🕶=""><th></th><th></th><th></th></u>			
Online & diagnostics	5 < <add new=""></add>			
Program blocks				
📑 Add new block				
🕮 Main [OB1]	▼ Block title: "Main Program Swee	p (Cycle)"		
CMMT_Function_Blocks [FB1]	Comment			
SINA_POS [FB284]				
SINA_POS_DB [DB1]	 Network 1: 			
Technology objects	Comment			
External source files				
PLC tags				
PLC data types				
Watch and force tables				
Image:				
🕨 🔄 Traces				
Device proxy data				
🔤 Program info				
🖙 PLC supervisions & alarms	Main [OB1]			
PLC alarm text lists				
Local modules	General			
Distributed I/O	General	_		
🕨 🔚 Ungrouped devices	Information	General		
🕨 🙀 Common data	Time stamps			
Documentation settings	Compilation		Name: Main	
Languages & resources	Protection	Con	stant name: OB Mair	1
Online access	Attributes	Con		
E Card Reader/USB memory	-		Type: OB	

• Now drag and drop the 'CMMT_Function_Blocks [FB1]' to Network 1, upon asked to create the Data Block click 'OK':



4.4 Compile and Download the program

• Right click on the PLC_1 and select 'Download' --> 'Hardware and software (only changes)':

Project tree		Appli	cation I	Note 🕨	PLC_1 [CPU 15	516F-3 PN/DF	P] ▶	Program	blocks 🕨	Main	[OB1]				
Devices																
	1	को कि	X 🖻 🖻) II., I	E 🚍 🗉	9	🗄 ± 🖓 ± 😫	± 😑	😰 🍋 (6 de 9	1 🕹 (<u></u> = ¹ = ¹	Ģ (1	00h	9.
		Ma	ain													
 Application Note 			Name				Data type		Default valu	e Sup	ervision	Comment				
💕 Add new device		1 🕣 💌 Input														
📩 Devices & networks		2 📶	• II	nitial_Call			Bool					Initial call	of this	OB		
PLC_1 [CPU 1516F-3 PN/DP]			2 - Pomaponco		Î.	Pool			1		=True, if r	emane	nt data	are ava	ailable	
Device configuration	C	hange d	levice			📑 Ext	port module lab	eling s	trips							
😼 Online & diagnostics	0	pen				🔍 Pro	perties		Alt+Enter							-
🔻 🛃 Program blocks	0	Open in new editor Open block/PLC data type F7														
💕 Add new block	0				F7											
📲 Main [OB1]	E	Export CAx data														
CMMT_Function_Blocks [FI	V	V cut			Ctel v											
SINA_POS [FB284]					Ctrl+C											
CMMT_Function_Blocks_D				Ctrl+V												
SINA_POS_DB [DB1]	UE Paste				Ctri+v											
Technology objects	XD	elete			Del											
External source files	R	ename			F2											
PLC tags	🚽 G	io to top	ology vie	w												
PLC data types	📥 G	io to net	work viev	v												
Watch and force tables	C	ompile			•											
Online backups		ownload	d to devic	e	Þ	Ha	rdware and soft	tware (only change	es)					-	
🕨 🔄 Traces	В	ackup fr	om online	e device		Ha	rdware configu	ration	. , ,	·						
Device proxy data	💋 G	io online	•		Ctrl+K	Sof	ftware (only cha	anges)								
Program info	G	o offline	2		Ctrl+M	Sof	ftware (all)									
PLC supervisions & alarms	% C	nline &	diagnosti	cs	Ctrl+D											
PLC alarm text lists	📃 R	eceive a	alarms													

• Start searching for the PLC:

Extended download	to device					×
	Confirmed and an					
	Configured access not	les of PLC_1	c 1 .	-		5 1 1
	Device	Device type	Slot	Туре	Address	Subnet
	PLC_1	CPU 15 16F-3 PN/	1 X3	PROFIBUS	2	
		CPU 1516F-3 PN/	1 1 1 2	PIN/IE DNI/IE	192.108.0.1	PIN/IE_1
		CFU 15 10F-5 FIV	1 / 2	FIN/IE	192.106.1.1	
	т	me of the PG/PC inter	ace.	PN/IE		-
	ر،	PG/PC inter			00 USB2 0 to East Ethor	not Ad
	Conn	raire interface/sub	ace.	Direct at clot '1 Y	do osbalo to rast ethen	
	Conne	ection to interface/suc	net:	Directatision		• •
		1st gate	way:			V
	Select target device:			4	Show all compatible de	vices 💌
	Device	Device type	Interface	e type 🛛 🛛 Add	ress	Target device
			PN/IE	Acce	ess address	
° E U						
_						
Flash LED						
Flash LED						
Flash LED						Start search
Flash LED					_	<u>S</u> tart search
Flash LED Online status informatio	n:			C	Display only error me	<u>Start search</u> Issages
Flash LED Online status informatio	n:			C	Display only error me	<u>S</u> tart search issages
Flash LED Online status informatio	n:			C	Display only error me	Start search
Flash LED Online status informatio	n:			C	Display only error me	Start search essages
Flash LED Online status informatio	n:				Display only error me	Start search
Flash LED Online status informatio	n:				Display only error me	Start search

• Select the PLC and load the project:

		Select target device	2:		Show all compatib	ole devices 💌
		Device	Device type	Interface type	Address	Target device
		PLC_1	CPU 1516F-3 PN/	PN/IE	192.168.2.1	PLC_1
				PN/IE	Access address	
۳8	1					
📄 Flash Li	ED					
						<u>S</u> tart search
Online status	information:				Display only err	or messages
Found ac	ccessible dev	vice cmmt-as [192.1	68.2.2]			^
 Scan con 	npleted. 1 co	mpatible devices of	3 accessible devices four	nd.		
Retrievin	ig device info	ormation				
Scan and	d information	retrieval completed	l.			~
						ad <u>C</u> ancel

• Select 'Load' on the Load preview and 'Finish' on the dialog that comes after.

status	1	Target	Message	Action	
†[]	%	▼ PLC_1	Ready for loading.		1
	▲	 Protection 	Protection from unauthorized access		
	4		Devices connected to an enterprise network or directly to the internet must be appropriately protected against unauthorized access, e.g. by use of firewalls and network segmentation. For more information about industrial security, please visit http://www.siemens.com/industrialsecurity		Ξ
	0	Stop modules	The modules are stopped for downloading to device.	Stop all	
	0	Device configurati	Delete and replace system data in target	Download to device	1
	Ū.	. Device conliguidan	belete and replace system data in larger	bounded to device	d
	\bigcirc	 Software 	Download software to device	Consistent download	
/					1

• While still selecting PLC_1 in the Project tree, go online:



• Make sure the Profinet Network is up and running by checking if all is green and with checkmarks:

Project tree 🔲 🖣	
Devices	
B B	
	1
🔻 📋 Application Note 🛛 🗹 🧲	i
💕 Add new device	
Devices & networks	
👻 🚰 PLC_1 [CPU 1516F-3 PN/DP] 🛛 🔽 🤇	1
Device configuration	
Online & diagnostics	
Program blocks	1
Technology objects	
External source files	
PLC tags	1
PLC data types	
 Watch and force tables 	
Add new watch table	
E. Force table	
Online backups	
Traces	
 Device proxy data 	
Program info	
PLC supervisions & alarms	
PLC alarm text lists	1
Les Unine card data	
Local modules	
The CIMINT-AS (CMINT-AS V	

4.5 Use the SINA_POS block with a 'Watch Table'

• Double click on 'Add new watch table':

Project tree		Applica	ation Note 🕨	PLC_1 [CPU 1516F	-3 PN/DP] 🕨 Wate	ch and force tab	les 🕨 Watch ta	ble_1
Devices								
	•	<u></u> ≝∛ ≝∛	11 ^{2%} 17 10	1 18 1 m m				
	_	i	Name	Address	Display format	Monitor value	Modify value	9
Application Note	4 🔵 🗖	• 1		🔳 <add new=""></add>				
🗳 Add new device								
Devices & networks								
🔻 🚺 PLC_1 [CPU 1516F-3 PN/DP]	4 🔍							
Device configuration								
Online & diagnostics								
 Rrogram blocks 								
- 💕 Add new block								
📲 Main [OB1]								
CMMT_Function_Bloc								
SINA_POS [FB284]								
CMMT_Function_Bloc								
SINA_POS_DB [DB1]								
System blocks								
Technology objects								
External source files								
PLC tags								
PLC data types								
Watch and force tables								
Add new watch table								
Force table								
Watch table_1								
Online backups			10)r				
🕨 🔛 Traces		Gene	ral Cros	s-references Co	mpile			

• Start typing the name 'SINA_POS_DB' and select it by pressing the 'Tab'-key:

Ap	Application Note PLC_1 [CPU 1516F-3 PN/DP] Watch and force tables Watch table_1														
2	🖆 🐳 🍂 🕪 🎣 🕫 🌮 🗣 📭														
_	i	Nar	ne			Address		Display format		Monitor valu	e	Modify value		9	
1		sin	а			<add new=""></add>									
			"SINA	_POS_	DB"	l.	Ins	stance DB of	DB1			>	^		

• Type 'ModePos' and press the 'Enter'-key:

Ap	Application Note ▶ PLC_1 [CPU 1516F-3 PN/DP] ▶ Watch and force tables ▶ Watch table_1										
2	· · · · · · · · · · · · · · · · · · ·										
	i	Name	Address	Display format	Monitor value	Modify value					
1		"SINA_POS_DB".ModePos 🔳		DEC+/-							
2											

• Drag down from the little square in the bottom right, it should show a + before dragging:

Drag down 34 lines to add all used variable

Ap	Application Note PLC_1 [CPU 1516F-3 PN/DP] Watch and force tables Watch table_1											
Í	# # In											
	1	i	Name	Address	Display format	Monitor value	Modify value					
1			"SINA_POS_DB".ModePos 🔳		DEC+/-							
2				<add new=""></add>								
				Drag dov	/n							
				34 lines	5							
				1								
				V								

• Click on the 'Monitor all' button to watch the variables online:

Application Note PLC_1 [CPU 1516F-3 PN/DP] Watch and force tables Watch table_1								
	<u></u>							
# # 1/ lo 9, 90 27 00 00								
i	Name	Address	Display format		Monitor value	Modify value		
	"SINA_POS_DB".ModePos		DEC+/-	-	0			
2	"SINA_POS_DB".EnableAxis		Bool		FALSE			
3	"SINA_POS_DB".CancelTraversing		Bool		TRUE			
ŧ.	"SINA_POS_DB".IntermediateStop		Bool		TRUE			
5	"SINA_POS_DB".Positive		Bool		FALSE			
5	"SINA_POS_DB".Negative		Bool		FALSE			
7	"SINA_POS_DB".Jog1		Bool		FALSE			
3	"SINA_POS_DB".Jog2		Bool		FALSE			
9	"SINA_POS_DB".FlyRef		Bool		FALSE			
10	"SINA_POS_DB".AckError		Bool		FALSE			
11	"SINA_POS_DB".ExecuteMode		Bool		FALSE			
12	"SINA_POS_DB".Position		DEC+/-		0			
3	"SINA_POS_DB".Velocity		DEC+/-		0			
4	"SINA_POS_DB".OverV		DEC+/-		100			
15	"SINA_POS_DB".OverAcc		DEC+/-		100			
16	"SINA_POS_DB".OverDec		DEC+/-		100			
17	"SINA_POS_DB".ConfigEPos		Hex		16#0000_0003			
18	"SINA_POS_DB".HWIDSTW		DEC		267			
9	"SINA_POS_DB".HWIDZSW		DEC		267			
20	"SINA_POS_DB".AxisEnabled		Bool		FALSE			
21	"SINA_POS_DB".AxisPosOk		Bool		FALSE			
22	"SINA_POS_DB".AxisRef		Bool		FALSE			
23	"SINA_POS_DB".AxisWarn		Bool		FALSE			
24	"SINA_POS_DB".AxisError		Bool		FALSE			
25	"SINA_POS_DB".Lockout		Bool		FALSE			
26	"SINA_POS_DB".ActVelocity		DEC+/-		0			
27	"SINA_POS_DB".ActPosition		DEC+/-		65			
28	"SINA_POS_DB".ActMode		DEC+/-		0			
29	"SINA_POS_DB".EPosZSW1		Hex		16#0000			
30	"SINA_POS_DB".EPosZSW2		Hex		16#0001			
31	"SINA_POS_DB".ActWarn		Hex		16#0000			
32	"SINA_POS_DB".ActFault		Hex		16#0000			
33	"SINA_POS_DB".Error		Bool		TRUE			
34	"SINA_POS_DB".Status		Hex		16#8202			
35	"SINA_POS_DB".DiagID		Hex		16#0000			

5 Using the SINAMICS function blocks

5.1 Enabling and stopping the Axis

The axis is switched on using input bit "**EnableAxis**" = 1. OFF2 and OFF3 are preassigned 1 using input "**ConfigEPos**" – and do not have to be written to for operation.

The axis is ready to start when there is no error – "**AxisError**" = "**0**" – and no switching on inhibited – "**Lockout**" = "**0**". Feedback signal "**AxisIEnabled**" goes to "**1**" after switching "**EnableAxis**".

The "**ModePos**" input is decisive for the mode selection. The required operating mode is selected via this input. A simultaneous, multiple mode selection is therefore not possible. However, it is possible to switch between various subordinate modes within the operating mode.

The input signals "**CancelTraversing**" (reject traversing task) and "**IntermediateStop**" (intermediate stop) are relevant for all modes except for jog and must be set to "**1**" when using EPos.

- 1. If the "**CancelTraversing**" bit is set to "**0**" this results in a ramp stop with 100% of the set deceleration. The task data is rejected and the axis can be assigned a new task from standstill. A mode change is possible in this state.
- 2. If the "IntermediateStop" bit is set to "0" this results in a ramp stop of the axis with the currently valid acceleration values. The task data is NOT rejected so that the axis continues with the motion when the bit is set to "1". A mode change is possible at standstill.

5.2 Activating the Software and Hardware position limits

By default the SINA_POS library deactivates the function of the CMMT to monitor the Software and Hardware position limits of the axis. Without this function it's possible to instruct the drive to move to a position which is beyond its reachable limit.

To ensure a safe operation with Software limit monitoring, it is required to enable bit 2 on the "**ConfigEPos**" variable.

For activating the Hardware Limit Switches, enable bit 3.

Since bit 0 and bit 1 are already set, input variable "ConfigEPos" must be set to 16#0000_000F.



Please pay attention that the required parameters in the Festo Automation Suite are also correct. These can be found in the 'Axis' tab:

▼ Axis 1			
Motor			
Gearbox	Axis configuration		
Axis			
Record list	Reversing the direction of rotation	🗘 🗌 Active	
Monitoring functions	Axis zero point offset	3,00 r	mm 🔳
Closed loop	Software limit positions active	Active	
Auto tuning	·		
Notch filter	- Negative software limit position	-3,00 r	mm 🔳
Feed forward control	+ Positive software limit position	4997,00 r	mm
Jog mode			

5.3 Monitoring the Actual speed

Where the setpoint velocity is directly set as user units, the actual drive speed is displayed different in the SINA_POS function block. The variable "**ActVelocity**" is used, where the value is scaled from 0 to 100% with 40000000hex = 100%. The base value can be modified in the Festo Automation Suite, as described in part <u>3.2.1</u> of this document. It can also be changed using PNU 60000 (which refers to this exact same parameter).

5.4 Modes of Operations

The CMMT-PN with the SINA_POS function block supports the following modes of operation:

ModePos 1: Relative Positioning ModePos 2: Absolute Positioning task ModePos 3: *Not Supported* ModePos 4: Referencing – Reference point approach ModePos 5: Referencing - Set reference point ModePos 6: Traversing blocks (record mode) ModePos 7: Jog ModePos 8: *Not Supported*

- Relative Positioning [ModePos 1]
 - 1. Requirements:
 - The mode is selected with "**ModePos**"=1.
 - The device is switched on via "EnableAxis"
 - The axis must be referenced
 - The axis is at standstill if selected by an operating mode greater than 3. A change within the operating modes (1,2) is possible at any time.
 - 2. Sequence:

The traversing path and dynamic responses are specified via the inputs "**Position**", "**Velocity**", "**OverAcc**" (acceleration override) and "**OverDec**" (deceleration override).

The operating conditions "**CancelTraversing**" and "**IntermediateStop**" must be set to "**1**". "**Jog1**" and "**Jog2**" have no effect and should be set to "**0**" (false).

The direction of travel in relative positioning always results from the sign of the traversing path.

Traversing motion is started with a positive edge at "ExecuteMode".

The block acknowledges when the end of the traversing path is reached successfully with "**AxisPosOk**". If an error occurs during the traversing motion, the output signal "**Error**" is issued.



Note

The current command can be replaced on-the-fly by a new command via "**ExecuteMode**". This is only possible for the "**ModePos**" 1 and 2.

• Absolute Positioning [ModePos 2]

1. Requirements:

- The mode is selected with "**ModePos**"=2
- The device is switched on via "EnableAxis"
- The axis must be referenced
- The axis is at standstill if selected by an operating mode greater than 3. A change within the operating modes (1,2) is possible at any time.
- 2. Sequence:

The traversing path and dynamic responses are specified via the inputs "**Position**", "**Velocity**", "**OverAcc**" (acceleration override) and "**OverDec**" (deceleration override).

The operating conditions "**CancelTraversing**" and "**IntermediateStop**" must be set to "**1**". "**Jog1**" and "**Jog2**" have no effect and must be set to "**0**".

Traversing motion is started with a positive edge at "ExecuteMode".

The block acknowledges when the end of the traversing path is reached successfully with "**AxisPosOk**". If an error occurs during the traversing motion, the output signal "**Error**" is issued.



Note

The current command can be replaced on-the-fly by a new command via "**ExecuteMode**". This is only possible for the "**ModePos**" 1 and 2

• Referencing - Reference point approach [ModePos 4]

The **Referencing – reference point approach** mode enables the reference point approach of the axis, selected in the Automation Suite.

1. Requirements:

- The mode is selected with "ModePos"=4
- The device is switched on using "EnableAxis".
- The axis is at standstill

2. Sequence:

All required parameters for homing (homing mode, velocity, etc) are set in the Automation Suite. The reference point approach is started with a positive edge at "**ExecuteMode**".

Output signal "**AxisRef**" is set if the reference point is appropriately found and evaluated. If an error occurs during traversing motion, the output signal "**Error**" is issued.

• Referencing – Set reference point [ModePos 5]

The **Referencing – set reference point** mode enables the referencing of the axis at the current position.

- 1. Requirements:
 - The mode is selected with "**ModePos**"=5
 - The axis can be in closed-loop control, but must be at a standstill.

2. Sequence:

The axis is at standstill and the reference point is set with a positive edge at "**ExecuteMode**". If an error occurs while setting the reference point, the output signal "**Error**" is issued.

• Traversing blocks (record mode) [ModePos 6]

The **Traversing blocks** mode is implemented via the "**Traversing blocks**" drive function. It enables the creation of automatic programs, velocity mode, force mode, travel to fixed stop and outputs to be set and reset. It uses the records that are created in the 'Record list' tab in the Automation Suite.

- 1. Requirements:
 - The mode is selected with "**ModePos**"=6
 - The device is switched on using "EnableAxis"
 - The axis is at standstill
 - The axis must be referenced
- 2. Sequence:

The selection of the traversing task to be started is set via the "**Position**" input. The value refers to the record list and can be between 0 and 127.

The operating conditions "**CancelTraversing**" and "**IntermediateStop**" must be set to "**1**". "**Jog1**" and "**Jog2**" have no effect and should be set to "**0**".

Traversing motion is started with a positive edge at "**ExecuteMode**".

The block displays the current command processing with "**AxisEnabled**" and acknowledges when the target position is reached successfully or the last task step completed with "**AxisPosOk**". If an error occurs during the traversing motion, the output signal "**Error**" is issued.

Jog [ModePos 7]

- 1. Requirements:
 - The mode is selected with "**ModePos**" = 7.
 - The device is switched on using "EnableAxis"
 - The axis is at standstill

2. Sequence:

"**Jog1**" and "**Jog2**" are the signal sources for the jog mode in EPos. The "**ExecuteMode**" signal is not required in this mode.

"**Jog1**" = Positive "**Jog2**" = Negative

The dynamic values for jogging are set in the Automation Suite on the 'Jog mode' tab. The corresponding parameters are:

- Velocity (slow)
- Acceleration (slow)
- Jerk (slow)

5.5 Diagnostic messages

The function block can give multiple types of diagnostic messages. The following chapter will explain how to handle or solve them.

• Drive Error

When the drive is in error, the output "**ActFault**" of the function block SINA_POS will provide a message number. This message number relates to the same number which is shown in the Festo Automation Suite.

After elimination of the fault, the error must be acknowledged using the bit "**AckError**" before enabling the axis again.

• Drive Warning

When the drive has a warning message, the output "**ActWarning**" will provide a message number. After elimination of the warning the message number will disappear.

• Function block faults

When an error on the function block has been detected, the "**Error**" group error and the "**ErrorId**" are set. The following errors are monitored:

Error number Status	Cause	Remedy	
16#7002	No error		
16#8600	Interruption of the communication to the SINAMICS drive: Error DPRD_DAT	Check the communication connections / settings (see DiagId)	
16#8601	Interruption of the communication to the SINAMICS drive: Error DPWR_DAT	Check the communication connections / settings (see DiagId)	
16#8202	Incorrect operating mode selected	Set "ModePos" from 1 to 8	
16#8203	Incorrect parameterization of the override inputs	Check the settings of the override inputs	
16#8204	Invalid traversing block number	Enter a traversing block number from 0 to 127	
16#8401	Alarm message(s) in the SINAMICS drive	Evaluation of the error code at the "ActFault" output	
16#8402	Switching on inhibited of the SINAMICS drive active	Check whether axis/encoder is parked, safety functions active, Parameter p $10 \neq 0$	
16#8403	Flying referencing could not be started	Check for pending alarms/faults in the drive,	

The following settings will help for text-transfer:

Options	Settings		
Pasting within the same document	Keep Source Formatting		
Pasting between documents	Use Destination Styles		
Pasting between documents when style definitions conflict	Use Destination Styles		
Pasting from other programs	Use Destination Styles		

Table 5.1: Word Options