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# Easy\_SINA\_Pos Function block in TIA Portal to control the SINAMICS basic positioner

SINAMICS / V1.0 / Easy\_SINA\_Pos / TIA V15

<https://support.industry.siemens.com/cs/ww/en/view/109747655>

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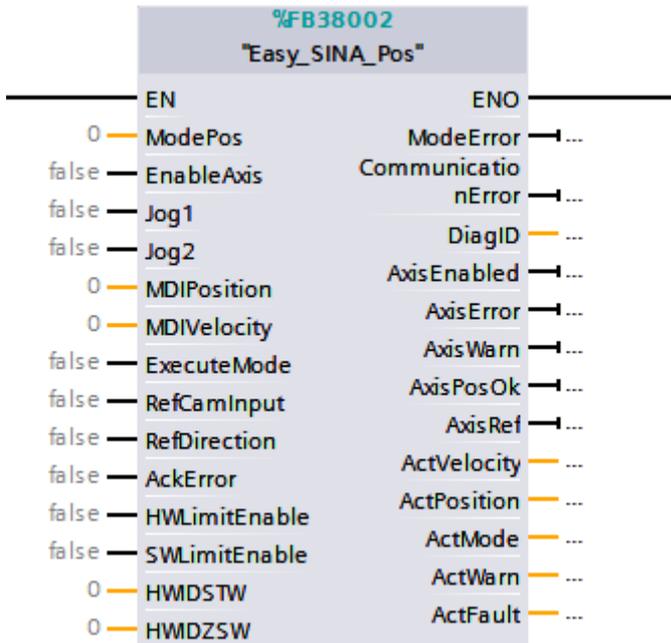
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# 1 Function block Easy\_SINA\_POS (FB38002)

## 1.1 Description

The appropriate instance DB is automatically created with the integration of the function block Easy\_SINA\_Pos (FB38002). Figure 1-1 shows the function block interface:

Figure 1-1



Can be used in SIMATIC S7-1200/1500 CPUs

### Calling OBs

The block can be inserted alternatively in the following OBs:

Cyclic task: OB1

Cyclic interrupt OB: e.g. OB32

### Called blocks

DPRD\_DAT / SFC14

DPWR\_DAT / SFC15

## 1.2 Function description – general

<b>NOTICE</b>	<b>Standard telegram 111 must be selected for the communication with the EPOs inside of the SINAMICS drives.</b>
---------------	--

### Input interface Easy\_SINA\_Pos

The input interface consists 12 inputs with various data formats.

When the function block is inserted the first time in the program, the inputs are set up with initial values. An overview of the input interface is shown subsequently in table 1-1:

Table 1-1

Input signal	Type	Default value	Meaning
ModePos	INT	0	Operating mode: 1 = relative positioning 2 = absolute positioning 4 = reference point approach 7 = jog mode
EnableAxis	BOOL	0	Switching command: 0=OFF1; 1= ON
Jog1	BOOL	0	Jog signal source 1
Jog2	BOOL	0	Jog signal source 2
MDIPosition	DINT	0 [LU]	Position setpoint in [LU] for direct setpoint input mode (MDI).
MDIVelocity	DINT	0 [LU/MIN]	Velocity in [LU/min] for MDI mode
ExecuteMode	BOOL	0	Activate MDI positioning or referencing
RefCamInput	BOOL	0	Reference cam signal
RefDirection	BOOL	0	Select the start direction for automatic referencing 0 = start in positive direction 1 = start in negative direction
AckError	BOOL	0	Acknowledging errors
HWLimitEnable	BOOL	0	Activate the hardware stop cams. 0 = deactivate the stop cams 1 = activate the stop cams
SWLimitEnable	BOOL	0	Activate the soft limit switch. 0 = deactivate the soft limit switch 1 = activate the soft limit switch
HWIDSTW	HW_IO	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1x00 of the setpoint slot
HWIDZSW	HW_IO	0	Symbolic name or HW ID/IO address on the SIMATIC S7-1x00 of the actual value slot

**Output interface Easy\_SINA\_Pos**

The output interface consist 13 outputs with various data formats.

When the function block is inserted the first time in the program, the outputs are set up with initial values. Table 1-2 is an overview about the output interface:

Table 1-2

Output signal	Type	Default value	Meaning
ModeError	BOOL	0	ModePos is not in the range between 1 and 7
CommunicationError	BOOL	0	SFC14/15 communication error
DiagID	WORD	0	Extended information for communication error using DPRD_DAT / DPWR_DAT
AxisEnabled	BOOL	0	Drive is ready and switched on
AxisError	BOOL	0	Drive is faulted
AxisWarn	BOOL	0	Drive alarm active
AxisPosOk	BOOL	0	Target position reached
AxisRef	BOOL	0	Reference point set
ActVelocity	DINT	0	Actual velocity (scaled 40000000H = 100% of parameter p2000)
ActPosition	DINT	0 [LU]	Actual position in LU
ActMode	INT	0	Currently active mode
ActWarn	WORD	0	Actual alarm number
ActFault	WORD	0	Actual fault number

### 1.3 Comparison between SINA\_POS and Easy\_SINA\_Pos

Table 1-3 shows the comparison of the input interface:

Table 1-3

SINA_POS	Easy_SINA_Pos	Comment (Easy_SINA_Pos)
ModePos	ModePos	Functionality is the same but only MDI (1,2), Jog (7) and approach reference point(4). <u>The setup mode (3), set reference point (5), traversing block (6) and incremental jogging function (8) are not supported.</u>
EnableAxis	EnableAxis	Function is the same
CancelTraversing	X	Function is defined permanently (Default value = 1)
IntermediateStop	X	Function is defined permanently (Default value = 1)
Positive	X	Function is not supported with this FB
Negative	X	Function is not supported with this FB
Jog1	Jog1	Function is the same
Jog2	Jog2	Function is the same
FlyRef	X	Function is not supported with this FB
AckError	AckError	Function is the same
ExecuteMode	ExecuteMode	Function is the same
Position	MDIPosition	Function is the same
Velocity	MDIVelocity	Function is the same
OverV	X	Function is defined permanently (Default value 100%)
OverACC	X	Function is defined permanently (Default value 100%)
OverDec	X	Function is defined permanently (Default value 100%)
ConfigEPos	RefCamInput	Yes (redefined with new Input)
	RefDirection	Yes (redefined with new Input)
	HWLimitEnable	Yes (redefined with new Input)
	SWLimitEnable	Yes (redefined with new Input)
	Reserve/EPos bits	No
		*Function is limited with the selected inputs*
HWIDSTW	HWIDSTW	Function is the same
HWIDZSW	HWIDZSW	

## 1 Function block Easy\_SINA\_POS (FB38002)

Table 1-4 shows the comparison of the output interface:

Table 1-4

SINA_POS	Easy_SINA_Pos	Comment (Easy_SINA_Pos)
AxisEnabled	AxisEnabled	Function is the same
AxisPosOk	AxisPosOk	Function is the same
AxisRef	AxisRef	Function is the same
AxisWarn	AxisWarn	Function is the same
AxisError	AxisError	Function is the same
Lockout	X	Function is not supported with this FB
ActVelocity	ActVelocity	Function is the same
ActPosition	ActPosition	Function is the same
ActMode	ActMode	Function is the same
EPosZSW1	X	Function is not supported with this FB
EPosZSW2	X	Function is not supported with this FB
ActWarn	ActWarn	Function is the same
ActFault	ActFault	Function is the same
Error	X	Function is not supported with this FB
Status	X	Function is not supported with this FB
DiagID	DiagID	Function is the same
X	ModeError	Only Easy_SINA_Pos support it
X	CommunicationError	Only Easy_SINA_Pos support it

## 1.4 Mode selection included in Easy\_SINA\_Pos

### General operating conditions

The axis is switched on using “EnableAxis” = “1”. OFF2 and OFF3 are preassigned to “1” in the function block and can’t be modified with the predefined inputs of the function block.

The axis is ready to start when there is no error (“AxisError” = “0”). The feedback signal “AxisEnabled” is switched to “1” after setting “EnableAxis” to “1”.

The “ModePos” input is decisive for the mode selection. The required operating mode is selected via this input. A simultaneous, multiple mode selection is not possible. However, it is possible to switch between various subordinate modes within the operating mode (only MDI mode 1 and 2).

<b>NOTICE</b>	For the configuration about the TIA Portal, you can refer to the manual about basic positioner (EPOS) in SINAMICS V90 PN. The paragraph 4.2 describes the details. You can download the manual from the following link: <a href="https://support.industry.siemens.com/cs/ww/en/view/109747750">https://support.industry.siemens.com/cs/ww/en/view/109747750</a>
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### 1.4.1 Relative positioning (ModePos = 1)

The relative positioning mode is implemented via the “MDI relative positioning” drive function. It enables the position-controlled traversing of traversing paths using the integrated position controller of the SINAMICS drive.

1. Requirements:

The mode is selected with ModePos=1.

The device is switched on via “EnableAxis”.

The axis does not need to be referenced or the encoder adjusted.

A change with the MDI operating modes (1, 2) is possible at any time.

2. Sequence:

The traversing path and dynamic responses are specified via the inputs “MDIPosition” and “MDIVelocity”.

The velocity override, acceleration override and the deceleration override is fixed to 100%.

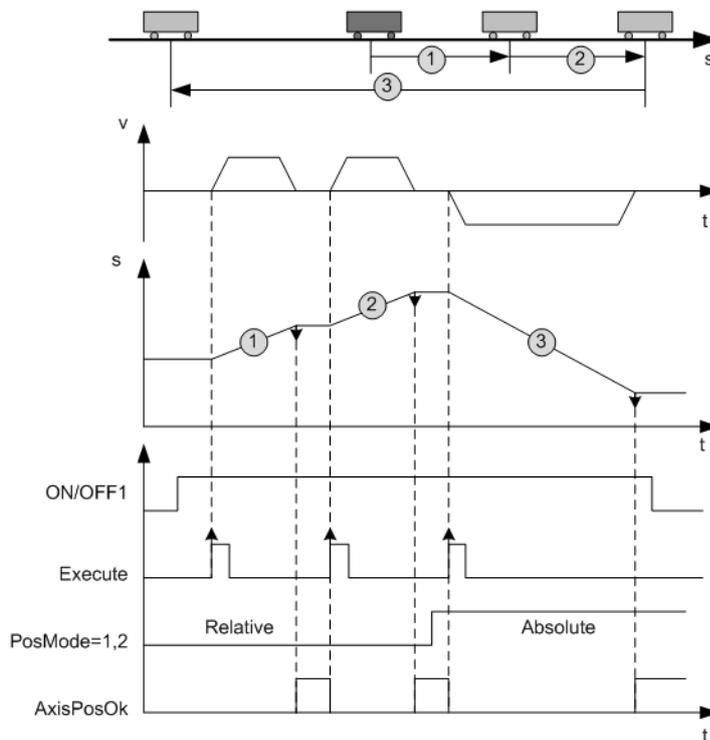
The operating conditions “Cancel traversing” and IntermediateStop” are set to “1”. “Jog1” and “Jog2” have no effect and should be set to “0”.

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

The traversing motion is started with a positive edge at “ExecuteMode”.

The block set an output when the end of the traversing path is reached successfully with “AxisPosOk” = “1”. If an error occurs during the traversing motion, the output signal “AxisError” is issued.

Figure 1-1



### 1.4.2 Absolute positioning (ModePos = 2)

The absolute positioning mode is implemented via the “MDI absolute positioning” drive function. It enables the position-controlled approach to absolute positions using the integrated position controller of the SINAMICS drive.

1. Requirements:

The mode is selected with ModePos = 2.

The device is switched on via “EnableAxis”

The axis need to be referenced or the encoder adjusted.

A change with the MDI operating modes (1, 2) is possible at any time.

2. Sequence:

The traversing path and dynamic responses are specified via the inputs “MDIPosition” and “MDIVelocity”. The velocity override, acceleration override and the deceleration override is fixed to 100%.

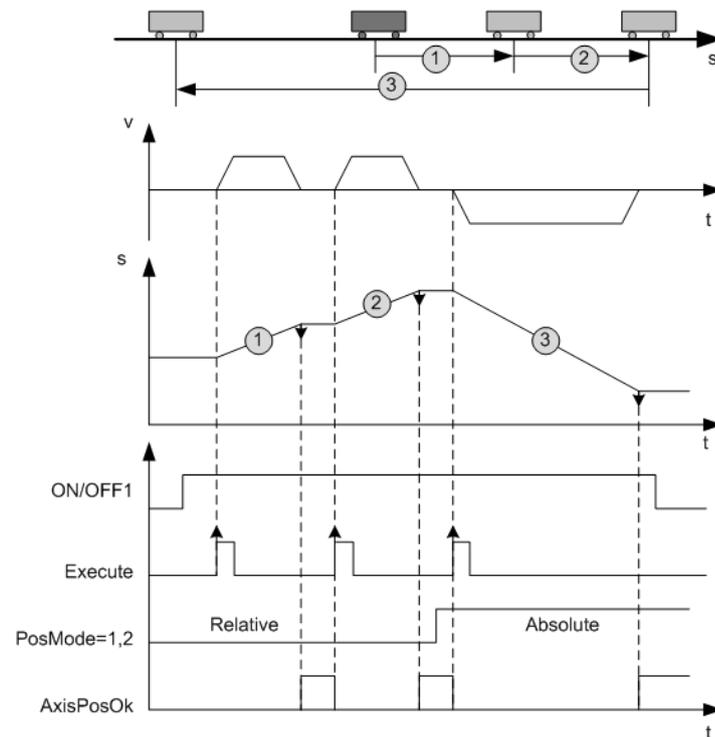
The operating conditions “Cancel traversing” and IntermediateStop” is set to “1”. “Jog1” and “Jog2” have no effect and should be set to “0”.

The travel direction in absolute positioning always results from the selected setpoint position to the actual position.

The 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” = “1”. If an error occurs during the traversing motion, the output signal “AxisError” is issued.

Figure 1-2



### 1.4.3 Referencing – reference point approach (ModePos = 4)

The referencing – reference point approach mode enables the reference point approach of the axis in positive or negative direction with preconfigured velocity and reference mode via the “Active referencing” drive function.

1. Requirements:

The mode is selected with “ModePos”=4.

The device is switched on using “EnableAxis”.

The axis is at standstill.

2. Optional:

The reference signal is connected to “RefCamInput”.

3. Sequence:

The required velocity is saved as a profile in the SINAMICS V90 drive.

Further the preset acceleration and deceleration values are active in the traversing profile of the axis. The velocity override affects the preconfigured traversing velocity.

The velocity override, acceleration override and the deceleration override is fixed to 100%.

The operating conditions “Cancel traversing” and IntermediateStop” is set to “1”. “Jog1” and “Jog2” have no effect and should be set to “0”.

The reference point approach is started with a positive edge at “ExecuteMode”.

The output signal “AxisRef” is set when the reference cam is appropriately found and evaluated.

If an error occurs during traversing motion, the output signal “AxisError” is issued.

**NOTE**

There are two modes in the V90 drive for reference point approach.

One is searching reference cam and encoder zero mark together, and the other is searching the encoder zero mark only. The selection of one of these variations is made via V-Assistant in the EPOs configuration.

# 1 Function block Easy\_SINA\_POS (FB38002)

Figure 1-3 is the homing working flow of the SINAMICS V90 PN drive with reference cam and encoder zero mark:

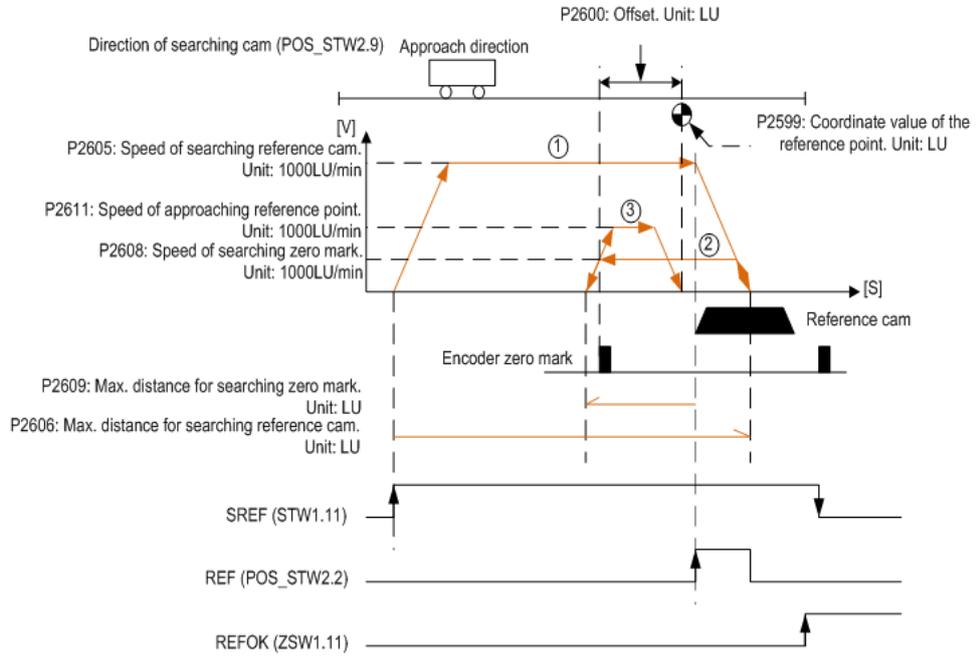
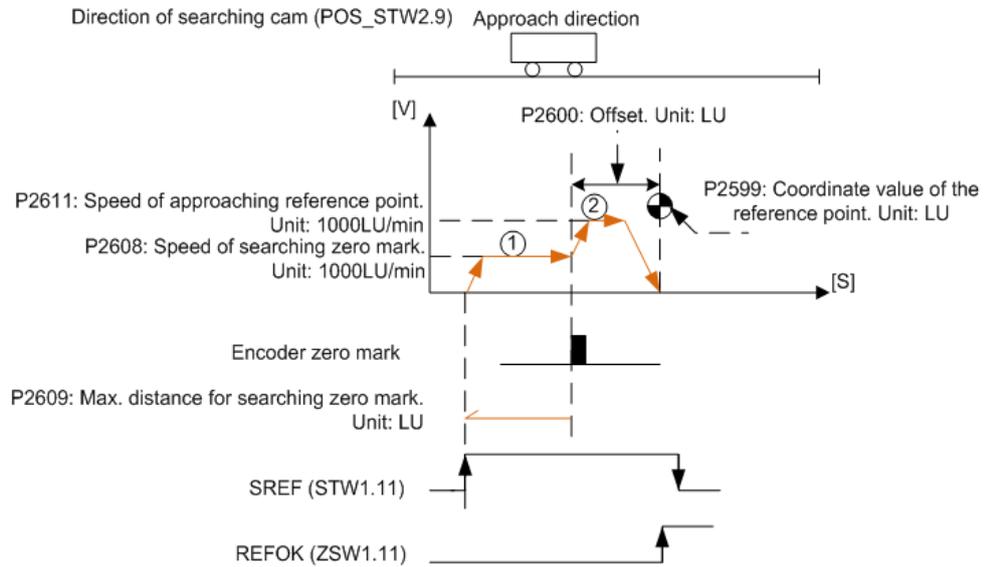


Figure 1-4 is the homing working flow of the SINAMICS V90 PN drive only with encoder zero mark:



### 1.4.4 Jog (ModePos = 7)

The Jog mode is implemented using the “Jog” EPos drive function. It enables the position-controlled velocity for traversing the axis using the integrated position controller of the SINAMICS V90 drive.

1. Requirements:

The mode is selected with “ModePos”=7.

The device is switched on using “EnableAxis”.

The axis is at standstill.

The axis doesn’t need to be referenced or adjusted.

2. Sequence:

The specification of the jog velocity is performed via the V-ASSISTANT or with an acyclic communication from a SIMATIC PLC.

The SINAMICS V90 drive uses the acceleration and deceleration set in the SINAMICS V90 drive for the dynamic responses of the axis.

The velocity override also applies in the operating mode and is set to 100%.

The operating conditions “CancelTraversing” and “IntermediateStop” are not relevant for the operating mode and are set to “1” (default value).

**NOTE**

“Jog1” and “Jog2” are the signal sources for the jog mode in Epos. The direction of the traversing motion is configured in the SINAMICS V90 drive.

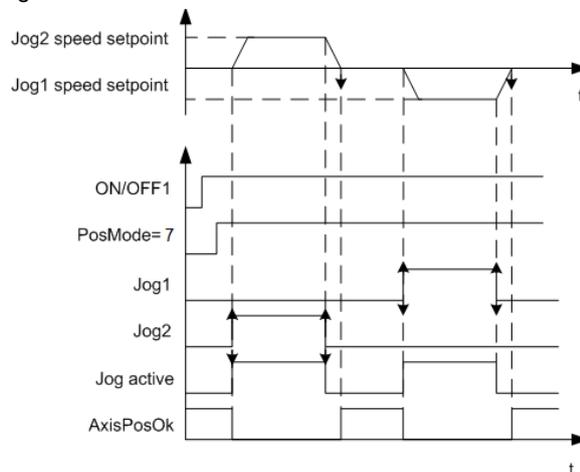
If the standard values are used then Jog1= negative (setting P2585 with a minus value) and Jog2 = positive (setting P2586 with a plus value).

The travel direction depends on the velocity set point.

The block displays the current command processing with “AxisEnabled” and acknowledges the termination of the jog function (“jog1” or “Jog2” = “0”) when the axis is at standstill with “AxisPosOk”. If an error occurs during the traversing motion, the output signal “AxisError” is issued.

Note: the current command can be replaced on-the-fly by a new command via “Jog1” or “Jog2”. This is only possible when you remain in the jog mode.

Figure 1-5



## 2 Task

### 2.1 Overview

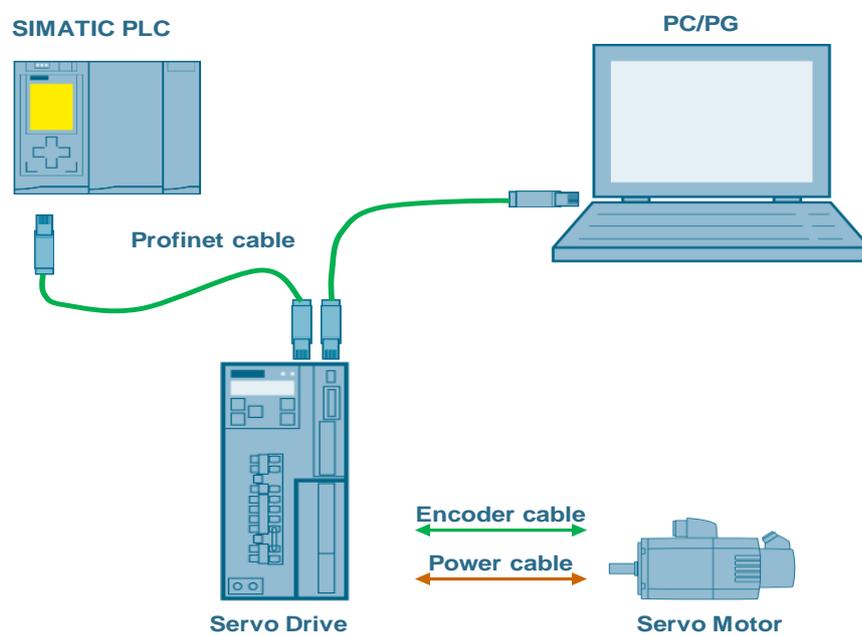
#### Introduction

Basic positioner (EPos) is one of the two basic control modes for SINAMICS V90 Profinet version. In this manual, the basic application of the basic positioner (EPos) in SINAMICS V90 PN will be used with the Easy\_SINA\_pos function block.

#### Overview of the automation task

The figure 2-1 provides an overview of the automation task.

Figure 2-1



### 2.1.1 Used Components

The application was generated with the following components:

#### Hardware components

Table 2-1

Component	No.	Article number	Note
SIMATIC S7-1500 CPU1511F 1-PN	1	6ES7511-1FK01-0AB0	V2.0
SINAMICS V90 PN 200V	1	6SL3210-5FB10-1UF0	0.4 kW
SIMOTICS S-1FL6 Li motor	1	1FL6024-2AF21-1AA1	0.4 kW

#### Standard software components

Table 2-2

Component	No.	Article number	Note
TIA Portal	1		V15
SINAMICS V-ASSISTANT	1		V1.05.01.00

## 2.2 Operation of the application

### 2.2.1 Configuration of SINAMICS V90 PN drive

<b>NOTICE</b>	<p>Standard telegram 111 must be selected for the communication when configuring the SINAMICS V90 PN drive.</p> <p>For the configuration about the V90 PN drive, you can refer to the manual about basic positioner (EPOS) in SINAMICS V90 PN. The paragraph 4.1 describes the details. You can download the manual from the following link:</p> <p><a href="https://support.industry.siemens.com/cs/ww/en/view/109747750">https://support.industry.siemens.com/cs/ww/en/view/109747750</a></p>
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### 2.2.2 Configuration of TIA Portal

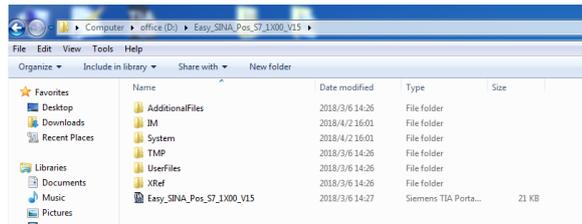
<b>NOTICE</b>	<p>For the configuration about the TIA Portal, you can refer to the manual about basic positioner (EPOS) in SINAMICS V90 PN. The paragraph 4.2 describes the details. You can download the manual from the following link:</p> <p><a href="https://support.industry.siemens.com/cs/ww/en/view/109747750">https://support.industry.siemens.com/cs/ww/en/view/109747750</a></p>
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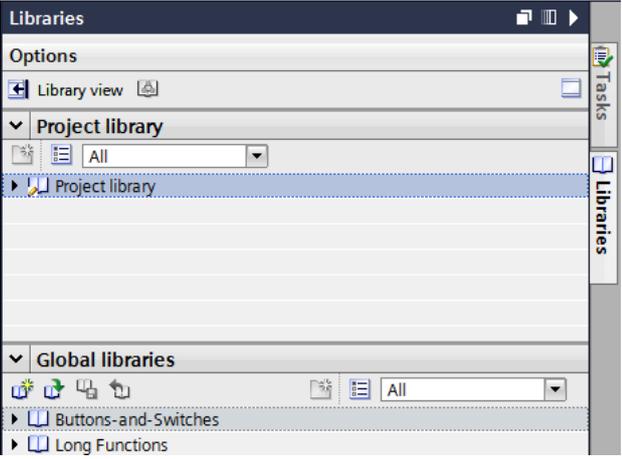
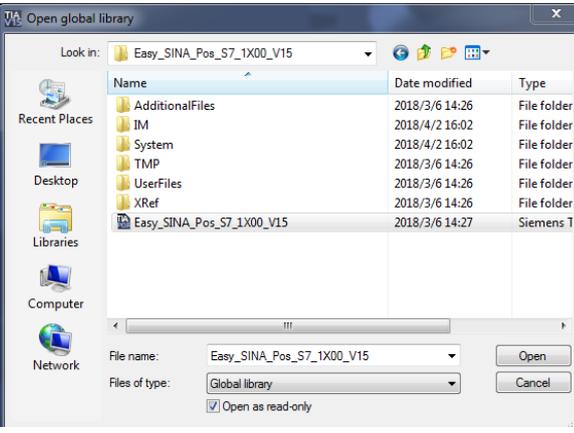
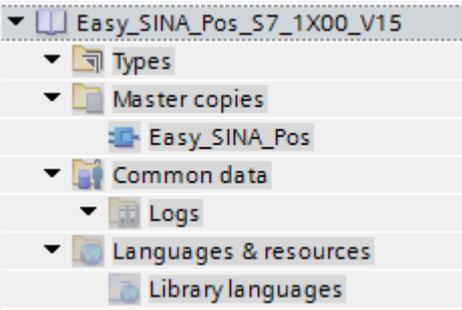
### 2.2.3 Configuration of blocks

<b>NOTICE</b>	<p>The Easy_SINA_Pos function block can be downloaded from the following link:</p> <p><a href="https://support.industry.siemens.com/cs/ww/en/view/109747655">https://support.industry.siemens.com/cs/ww/en/view/109747655</a></p>
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The table 2-3 is the description about installing the block to TIA Portal V14.

Table 2-3

No.	Action	Remark
1	Download the library from siemens product and information pages and unzip the library to an arbitrary directory	<a href="https://support.industry.siemens.com/cs/ww/en/view/109747655">https://support.industry.siemens.com/cs/ww/en/view/109747655</a>
2	Unzip the delivered library (inside of the *.zip file) into a self-defined folder	

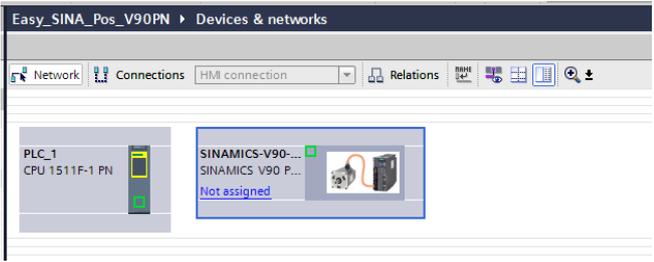
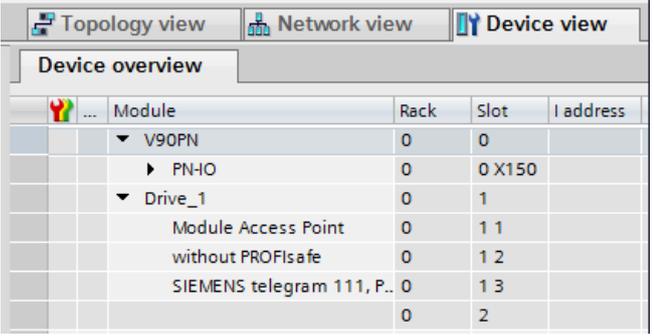
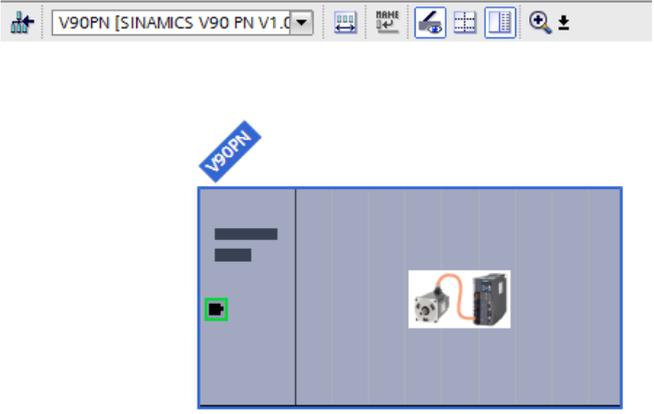
<p>3</p>	<p>Open a TIA project and load this library (which contains the function block) to global libraries</p>	
<p>4</p>	<p>Find the function block "Easy_SINA_Pos_S7_1X00_V15" in the "lib" folder and open it.</p>	
<p>5</p>	<p>View of the installed libraries for S7-1X00</p>	

### 2.2.4 Configuration of an example project

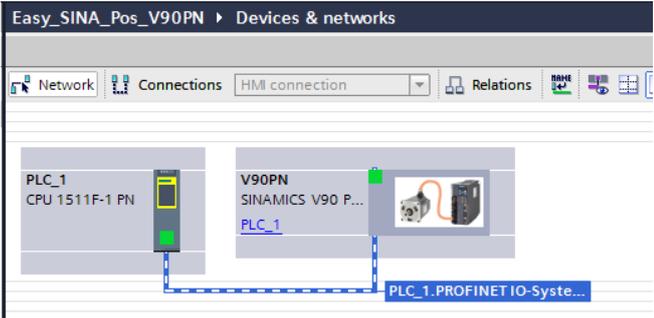
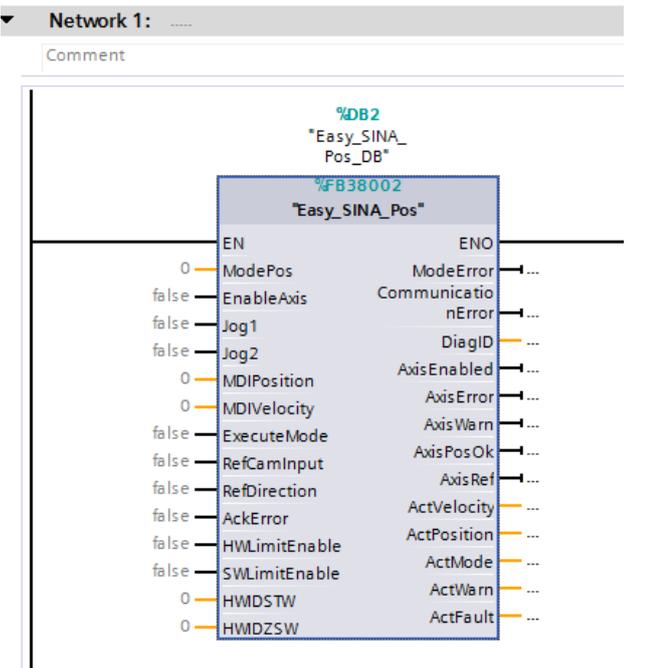
The table 2-4 shows the description about how to configure the project about this Easy\_SINA\_Pos function block:

**NOTE** The usage of the S7-1511 can be replaced with any other SIMATIC S7-1200 / S7-1500 PLC.

Table 2-4

No	Action	Remark																																
1.	Create a new project and insert CPU1511F and V90PN to this project.																																	
2.	Insert telegram 111 into the V90 drive from the hardware catalogue.	 <table border="1"> <thead> <tr> <th>Module</th> <th>Rack</th> <th>Slot</th> <th>I address</th> </tr> </thead> <tbody> <tr> <td>V90PN</td> <td>0</td> <td>0</td> <td></td> </tr> <tr> <td>  ▶ PN-IO</td> <td>0</td> <td>0 X150</td> <td></td> </tr> <tr> <td>  ▼ Drive_1</td> <td>0</td> <td>1</td> <td></td> </tr> <tr> <td>    Module Access Point</td> <td>0</td> <td>1 1</td> <td></td> </tr> <tr> <td>    without PROFI-safe</td> <td>0</td> <td>1 2</td> <td></td> </tr> <tr> <td>    SIEMENS telegram 111, P..</td> <td>0</td> <td>1 3</td> <td></td> </tr> <tr> <td></td> <td>0</td> <td>2</td> <td></td> </tr> </tbody> </table>	Module	Rack	Slot	I address	V90PN	0	0		▶ PN-IO	0	0 X150		▼ Drive_1	0	1		Module Access Point	0	1 1		without PROFI-safe	0	1 2		SIEMENS telegram 111, P..	0	1 3			0	2	
Module	Rack	Slot	I address																															
V90PN	0	0																																
▶ PN-IO	0	0 X150																																
▼ Drive_1	0	1																																
Module Access Point	0	1 1																																
without PROFI-safe	0	1 2																																
SIEMENS telegram 111, P..	0	1 3																																
	0	2																																
3.	Change the device name to "V90PN".																																	

2 Task

No	Action	Remark																																
4.	Connect the drive to the CPU network.	 <p>The screenshot shows the 'Easy_SINA_Pos_V90PN' project in the 'Devices &amp; networks' view. On the left is 'PLC_1 CPU 1511F-1 PN'. On the right is 'V90PN SINAMICS V90 P...' with 'PLC_1' assigned to it. A blue dashed line represents the 'PLC_1.PROFINET IO-System...' connection between the two devices.</p>																																
5.	Open the OB1 and insert the FB38002 into the project.	 <p>The screenshot shows the configuration of the 'Easy_SINA_Pos' function block (FB38002) within a network. The block is titled '%DB2 *Easy_SINA_Pos_DB*' and '%FB38002 "Easy_SINA_Pos"'. The inputs and outputs are as follows:</p> <table border="1" data-bbox="746 846 1337 1256"> <thead> <tr> <th>Input</th> <th>Output</th> </tr> </thead> <tbody> <tr> <td>EN</td> <td>ENO</td> </tr> <tr> <td>0 ModePos</td> <td>ModeError</td> </tr> <tr> <td>false EnableAxis</td> <td>CommunicationError</td> </tr> <tr> <td>false Jog1</td> <td>DiagID</td> </tr> <tr> <td>false Jog2</td> <td>AxisEnabled</td> </tr> <tr> <td>0 MDIPosition</td> <td>AxisError</td> </tr> <tr> <td>0 MDIVelocity</td> <td>AxisWarn</td> </tr> <tr> <td>false ExecuteMode</td> <td>AxisPosOk</td> </tr> <tr> <td>false RefCamInput</td> <td>AxisRef</td> </tr> <tr> <td>false RefDirection</td> <td>ActVelocity</td> </tr> <tr> <td>false AckError</td> <td>ActPosition</td> </tr> <tr> <td>false HWLimitEnable</td> <td>ActMode</td> </tr> <tr> <td>false SWLimitEnable</td> <td>ActWarn</td> </tr> <tr> <td>0 HWDSTW</td> <td>ActFault</td> </tr> <tr> <td>0 HWDZSW</td> <td></td> </tr> </tbody> </table>	Input	Output	EN	ENO	0 ModePos	ModeError	false EnableAxis	CommunicationError	false Jog1	DiagID	false Jog2	AxisEnabled	0 MDIPosition	AxisError	0 MDIVelocity	AxisWarn	false ExecuteMode	AxisPosOk	false RefCamInput	AxisRef	false RefDirection	ActVelocity	false AckError	ActPosition	false HWLimitEnable	ActMode	false SWLimitEnable	ActWarn	0 HWDSTW	ActFault	0 HWDZSW	
Input	Output																																	
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0 HWDZSW																																		

2 Task

No	Action	Remark
6.	Create the (example) program as it is shown in the right picture.	
7.	Download the project to the PLC.	

### 2.2.5 Operate the drive

Table 2-5 is the operation of relative positioning:

Table 2-5

No.	Action	Remark
1.	Set MW0=1	Select the relative positioning mode.
2.	Set M50.0=1	Enable the axis.
3.	Set MD4=20000	Set the target position.
4.	Set MD8=200	Set the target velocity.
5.	Set M50.3=1	Start to execute the positioning.
6.	After position finished, reset all settings	

Table 2-6 is the operation of approaching reference point:

Table 2-6

No.	Action	Remark
1.	Set MW0=4	Select the reference point approach mode.
2.	Set M50.0=1	Enable the axis.
3.	Set M50.5=1	Select the reference direction to negative direction.
4.	Set M50.3=1	Start to approach the reference point.
5.	Set M50.2=1	Simulate motor reaches the reference cam.
6.	Set M50.2=0	Simulate motor leaves the reference cam
7.	After position finished, reset all settings	

Table 2-7 is the operation of absolute positioning:

Table 2-7

No.	Action	Remark
1.	Set MW0=2	Select the absolute positioning mode.
2.	Set M50.0=1	Enable the axis.
3.	Set MD4=20000	Set the target position.
4.	Set MD8=200	Set the target velocity.
5.	Set M50.3=1	Start to execute the positioning.
6.	After position finished, reset all settings	

## 2 Task

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Table 2-8 is the operation of Jog:

Table 2-8

No.	Action	Remark
1.	Set MW0=7	Select the jog mode.
2.	Set M50.0=1	Enable the axis.
3.	Set M50.1=1 Set M50.2=0	Jog the motor with the Jog1 velocity setpoint.
4.	Set M50.1=0 Set M50.2=1	Jog the motor with the Jog2 velocity setpoint.
5.	After position finished, reset all settings	

## 3 Related literature

Table 3-1

	Topic	Title / Link
\1\	Siemens Industry Online Support	<a href="http://support.industry.siemens.com">http://support.industry.siemens.com</a>
\2\	Download page of this entry	<a href="https://support.industry.siemens.com/cs/ww/en/view/109747655">https://support.industry.siemens.com/cs/ww/en/view/109747655</a>
\3\	Manual SINAMICS V90 PN	<a href="https://support.industry.siemens.com/cs/ww/en/view/109747750">https://support.industry.siemens.com/cs/ww/en/view/109747750</a>

## 4 Contact

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## 5 History

Table 5-1

Version	Date	Modifications
V1.0	07 / 2018	First version