AKD2G PNU Reads and Writes Application Note Revision A. 1/12/2021

Overview

This application note demonstrates AKD2G parameter access from a S7-1500 PLC using the SinaPara function block for multi-parameter access and the SinaParaS for single parameter access.

Please sign into your Siemens Support Portal to download these function blocks and follow their instructions for importation. The link and versions are controlled by Siemens and may change at any time.

This application note uses the DriveLib V600 for SIMATIC STEP 7 Professional V16 for S7 1200/S7 1500.

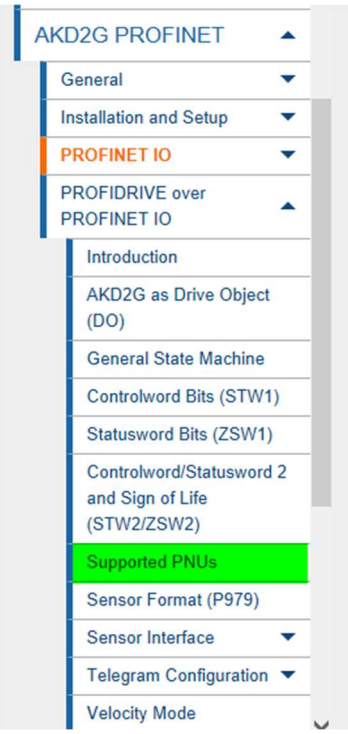
Summary of PNU Object Access Demo

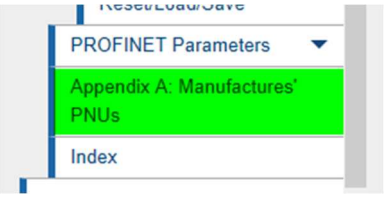
The following drive parameters with their corresponding PNU Numbers were selected for demonstration purposes. See the AKD2G Profinet Manual embedded in the AKD2G Workbench or Online WebHelp for an exhaustive list of available PNUs.

Single Read Examples	PNU Number	Data Type	Access	Using SinaParaS
VBUS.VALUE	2500	Float	Read Only	
Multiple Read				Using SinaPara
AXIS#.HOME.DIST	6104	Signed32	Read/Write	
VBUS.VALUE	2500	Float	Read Only	
USER.INT1	3200	Signed16	Read/Write	
Single Write Examples				Using SinaParaS
AXIS#.HOME.P	6109	Signed32	Read/Write	
Multiple Write Examples				Using SinaPara
AXIS#.HOME.P	6109	Signed32	Read/Write	
USER.INT3	3202	Signed16	Read/Write	
USER.INT4	3203	Signed16	Read/Write	

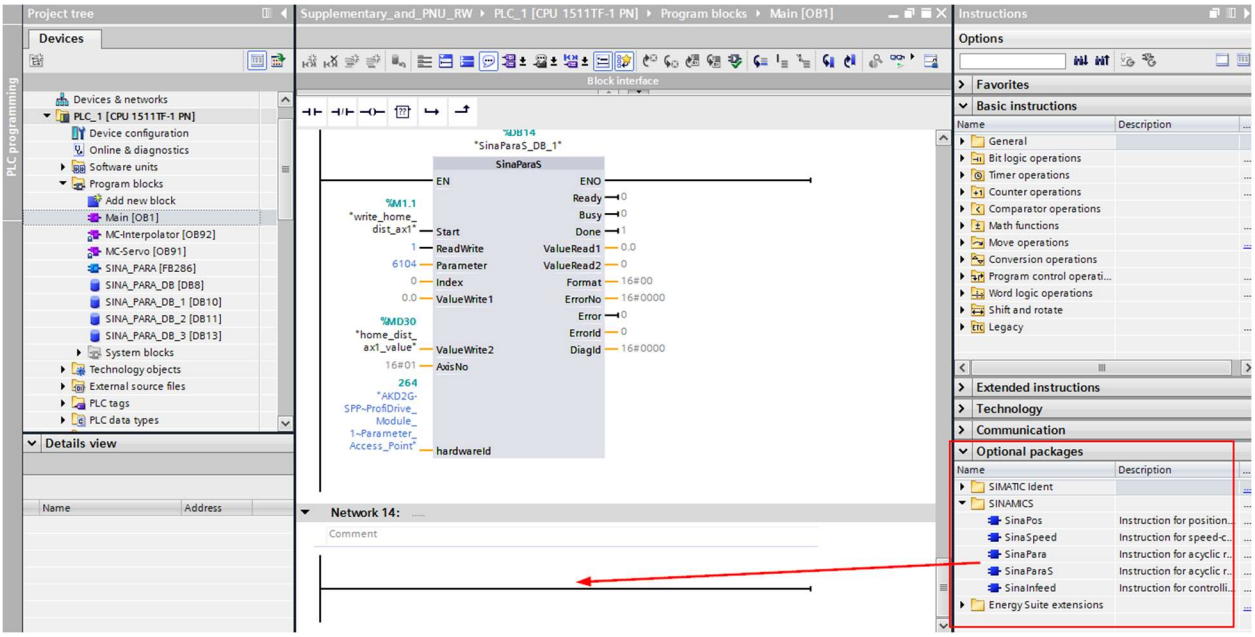
There are two lists in the manual in 2 locations in the WebHelp tree.

- Supported PNUs
- Appendix A: Manufacturer's PNUs





Note this application note defers the logic and timing of the function block's inputs and outputs to the programmer and their application specific programming. The minimum configuration will be demonstrated. To add the SinaParaS and SinaPara function block functionality to your program in TIA Portal follow the procedures in the support documentation for the library. To add one of the function blocks to your ladder expand Instructions->Option Packages and drag and drop the function block into a rung.



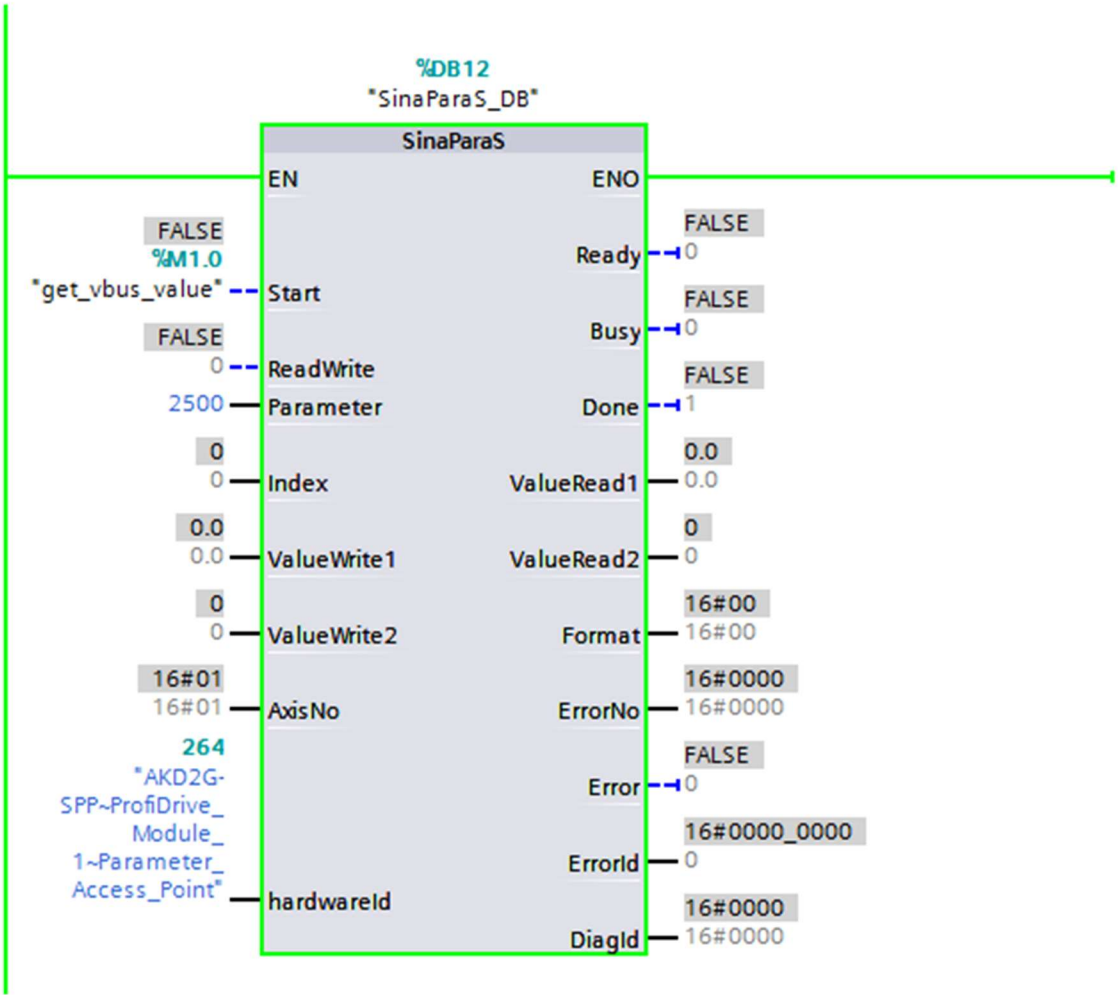
Example#1: Single PNU access Read using SinaParaS.

In this example the AKD2G drive's bus voltage is read (VBUS.VALUE).

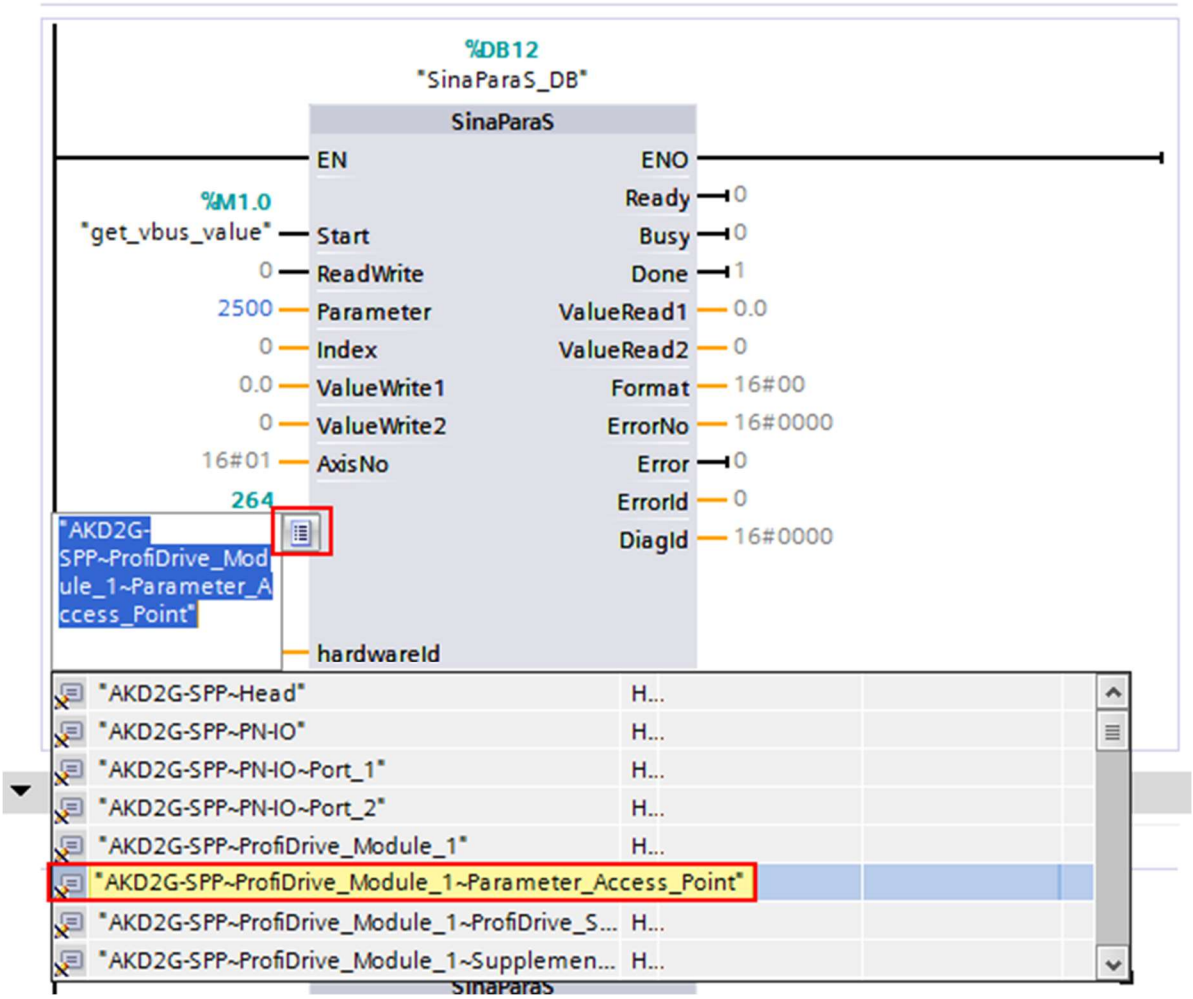
Single Read Examples	PNU Number	Data Type	Access	Using SinaParaS
VBUS.VALUE	2500	Float	Read Only	

The SinaParaS block was setup with the following inputs:

- A tag "get_vbus_value" for a manual trigger of the Start input to command a read.
- 0 or False for the ReadWrite input (where 0=Read, 1=Write).
- A value of 16#01 for the AxisNo input.
- A hardware ID of 264 which in this example points to the AKD2G Profidrive Module 1-Parameter Access Point which is setup in the Device View of the AKD2G drive (more on this shortly).

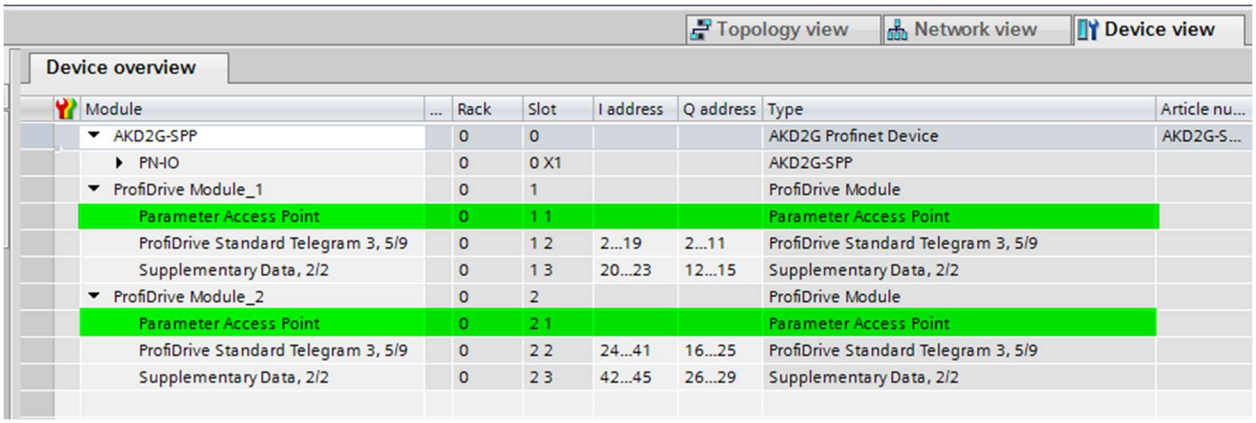


Offline when you click on the entry for the hardware id a browse icon appears and a list of available tags.


%DB12
"SinaParaS_DB"
SinaParaS
EN
ENO
%M1.0
"get_vbus_value"
Start
Ready
0
Busy
0
0
ReadWrite
Done
1
2500
Parameter
ValueRead1
0.0
0
Index
ValueRead2
0
0.0
ValueWrite1
Format
16#00
0
ValueWrite2
ErrorNo
16#0000
16#01
AxisNo
Error
0
264
ErrorId
0
"AKD2G-SPP~ProfiDrive_Module_1~Parameter_Access_Point"
DiagId
16#0000
hardwareId
"AKD2G-SPP~Head"
H...
"AKD2G-SPP~PN-IO"
H...
"AKD2G-SPP~PN-IO~Port_1"
H...
"AKD2G-SPP~PN-IO~Port_2"
H...
"AKD2G-SPP~ProfiDrive_Module_1"
H...
"AKD2G-SPP~ProfiDrive_Module_1~Parameter_Access_Point"
"AKD2G-SPP~ProfiDrive_Module_1~ProfiDrive_S...
H...
"AKD2G-SPP~ProfiDrive_Module_1~Supplemen...
H...
SinaParaS

This corresponds to one of the parameter access points available in the AKD2G's Device View.

Note with a dual axis drive there are 2 Parameter Access Points: one for each axis.



Module	...	Rack	Slot	I address	Q address	Type	Article nu...
AKD2G-SPP		0	0			AKD2G Profinet Device	AKD2G-S...
PN-IO		0	0 X1			AKD2G-SPP	
ProfiDrive Module_1		0	1			ProfiDrive Module	
Parameter Access Point		0	1 1			Parameter Access Point	
ProfiDrive Standard Telegram 3, 5/9		0	1 2	2...19	2...11	ProfiDrive Standard Telegram 3, 5/9	
Supplementary Data, 2/2		0	1 3	20...23	12...15	Supplementary Data, 2/2	
ProfiDrive Module_2		0	2			ProfiDrive Module	
Parameter Access Point		0	2 1			Parameter Access Point	
ProfiDrive Standard Telegram 3, 5/9		0	2 2	24...41	16...25	ProfiDrive Standard Telegram 3, 5/9	
Supplementary Data, 2/2		0	2 3	42...45	26...29	Supplementary Data, 2/2	

For AKD2G dual axes drives there are PNUs designated:

- PNUs/Drive Parameters common to the Drive and not axis specific (i.e. VBUS.VALUE)
- PNUs/Drive Parameters specific to a given axis (i.e. AXIS#.HOME.DIST)

For PNU access to a parameter common to the drive and not axis specific the value will be returned (read) or written (write) from/to the drive parameter ***from either axis' acyclic channel (Parameter Access Point).*** What is important in this case (Example#1: Read VBUS.VALUE) is the SinaParaS block' AxisNo and hardware id are in agreement (in this example AxisNo=1 and hardware id points to Profidrive Module_1's Parameter Access Point).

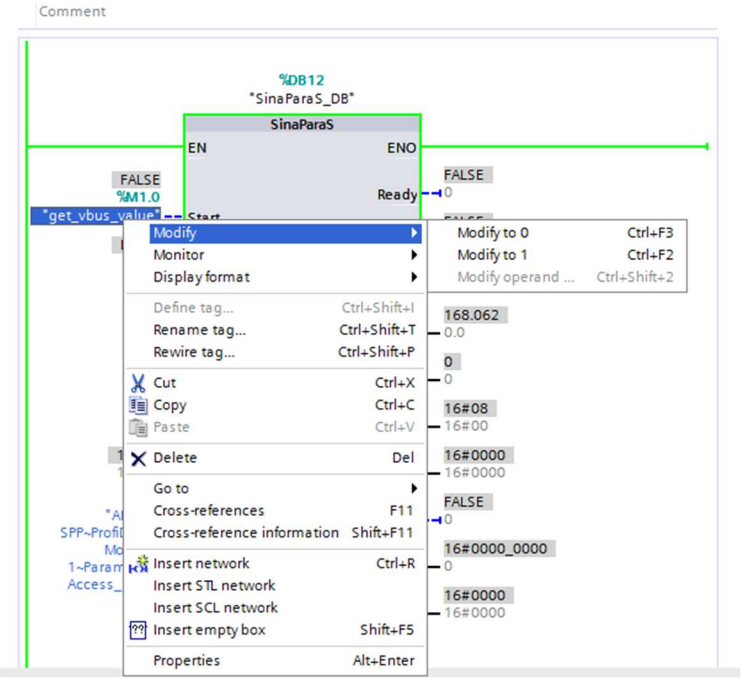
On toggle of the Start Input from false to true (0->1) the value is read.

There are 2 data outputs on the SinaParaS function block one for a floating point number (0.0) and one for a DINT (0). The following rule applies as to which output is used when accessing AKD2G PNUs.

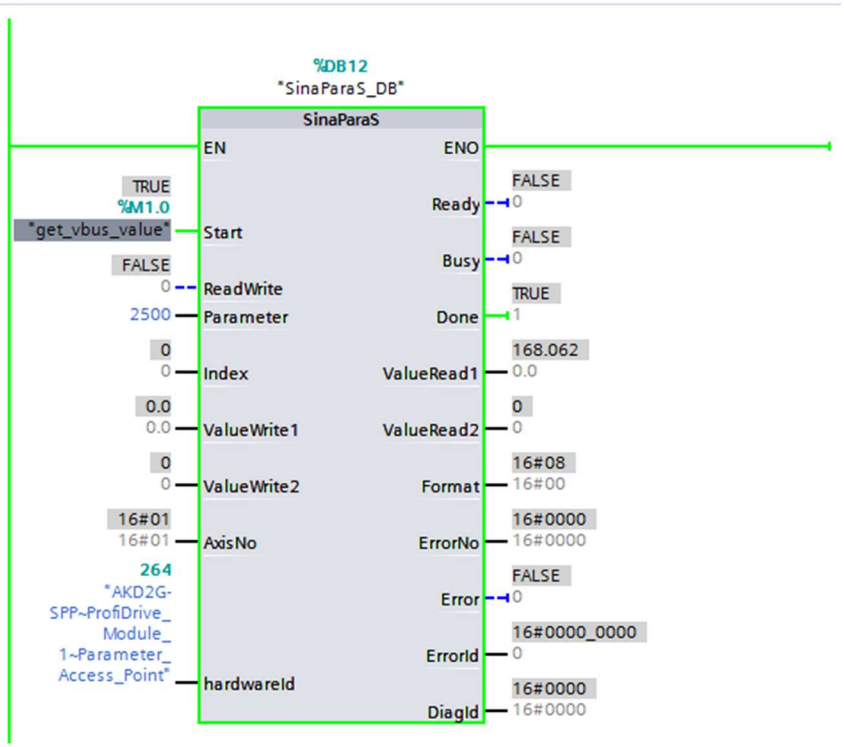
If the data type is a FLOAT then the float output is used.

If the data type is a Signed32 or Unsigned32 then the DINT output is used.

For all other data types (i.e. Unsigned8, Unsigned16, Signed16, etc.) the float output is used (therefore there will be a data conversion from the drive's data type to the output value of the SinaParaS function block).



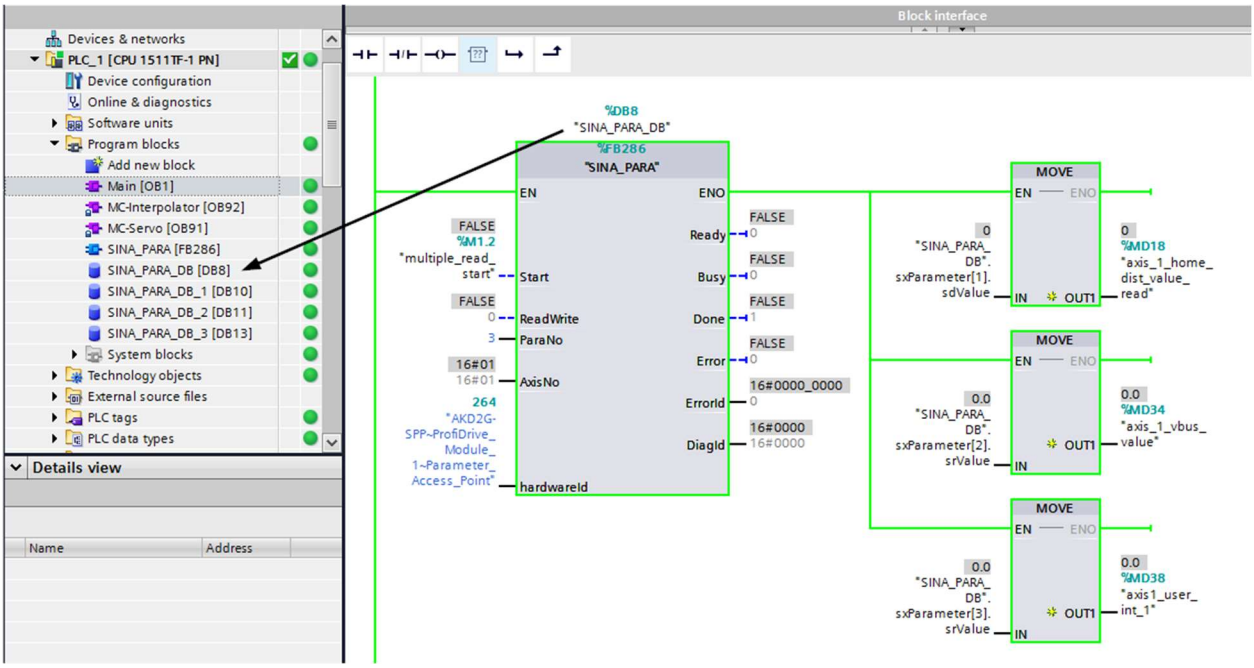
The current VBUS value is read as shown below. In this case the value given in the ValueRead1 output and at that time was 168.062 VDC.



Example#2: Multiple PNU access Read using the SinaPara function block.

Multiple Write Examples				Using SinaPara
AXIS#.HOME.P	6109	Signed32	Read/Write	
USER.INT3	3202	Signed16	Read/Write	
USER.INT4	3203	Signed16	Read/Write	

When an instance of the SINA_PARA function block is added to a rung a data block with the same name is created in the project tree under Program Blocks (in this example both are called “SINA_PARA_DB”.

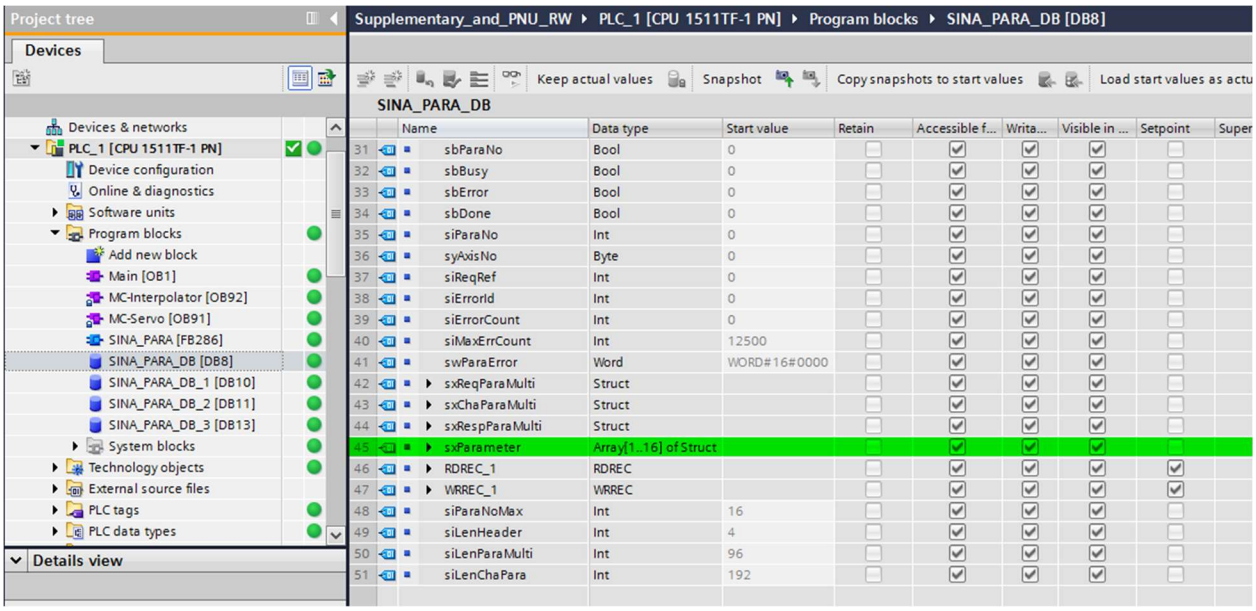


In the example above the SINA_PARA_DB was set with the following inputs:

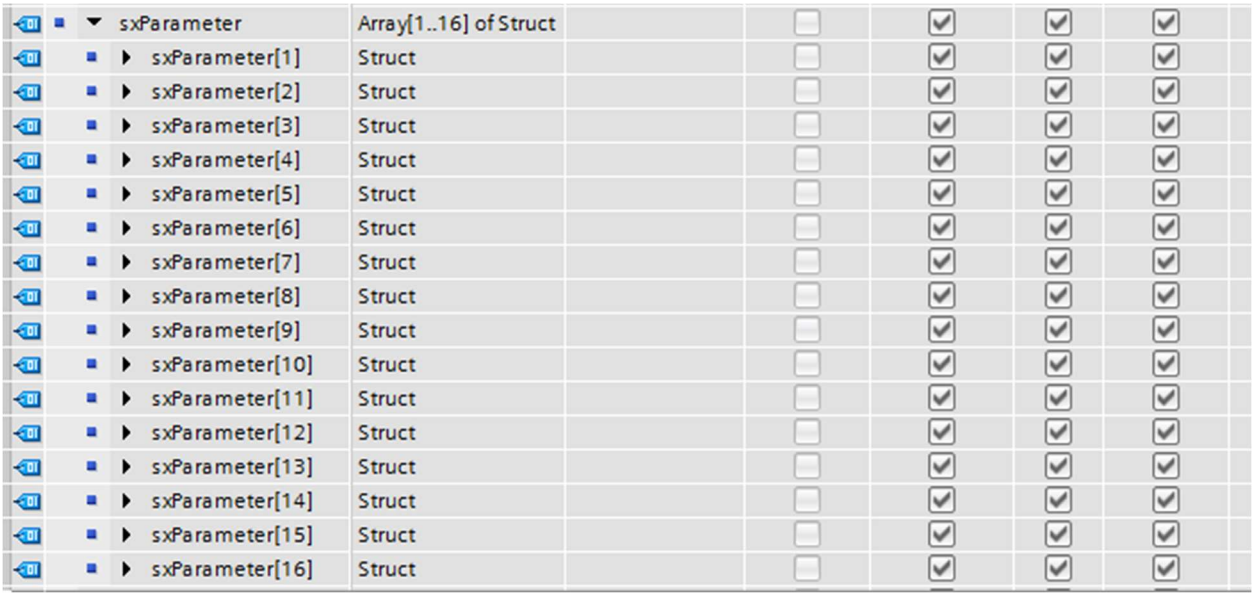
- A tag “multiple_read_start” for manually triggering the read during Online run-time.
- A 0 or “False” for the ReadWrite input where 0 or False=Read and 1 or True=Write).
- A value of 3 for the number of parameters to be read in this case (up to 16 parameters can be read with the SINA_PARA instance).
- A value of 1 to select which axis to be read. This should agree with which Profidrive Module and Axis is used for the hardware id input of the SinaPara instance.
- The hardware id that points to the “Parameter Access Point” of the given axis.

Additionally for demonstrational purposes and convenience while monitoring, 3 move blocks are shown in the rung above to move the read values from the SINA_PARA_DB data block to tags whose values can be monitored in the ladder during Online run-time.

To configure which PNU numbers will be accessed, open the given data block instance and select and expand the sxParameter group.



A structure of with an array of 1 to 16 elements (sxParameters) are shown.



Expanding sxParameter[1], sxParameter[2], sxParameter[3] the siParaNo can be used to enter the desired PNU numbers.

With the SINA_PARA setup as a read each parameter has one of two possible output values (as previously mentioned):

- sxParameter[x].sdValue which is observed below as the Dint data type
- sxParameter[x].srValue which is observed below as a Real (or float) data type.

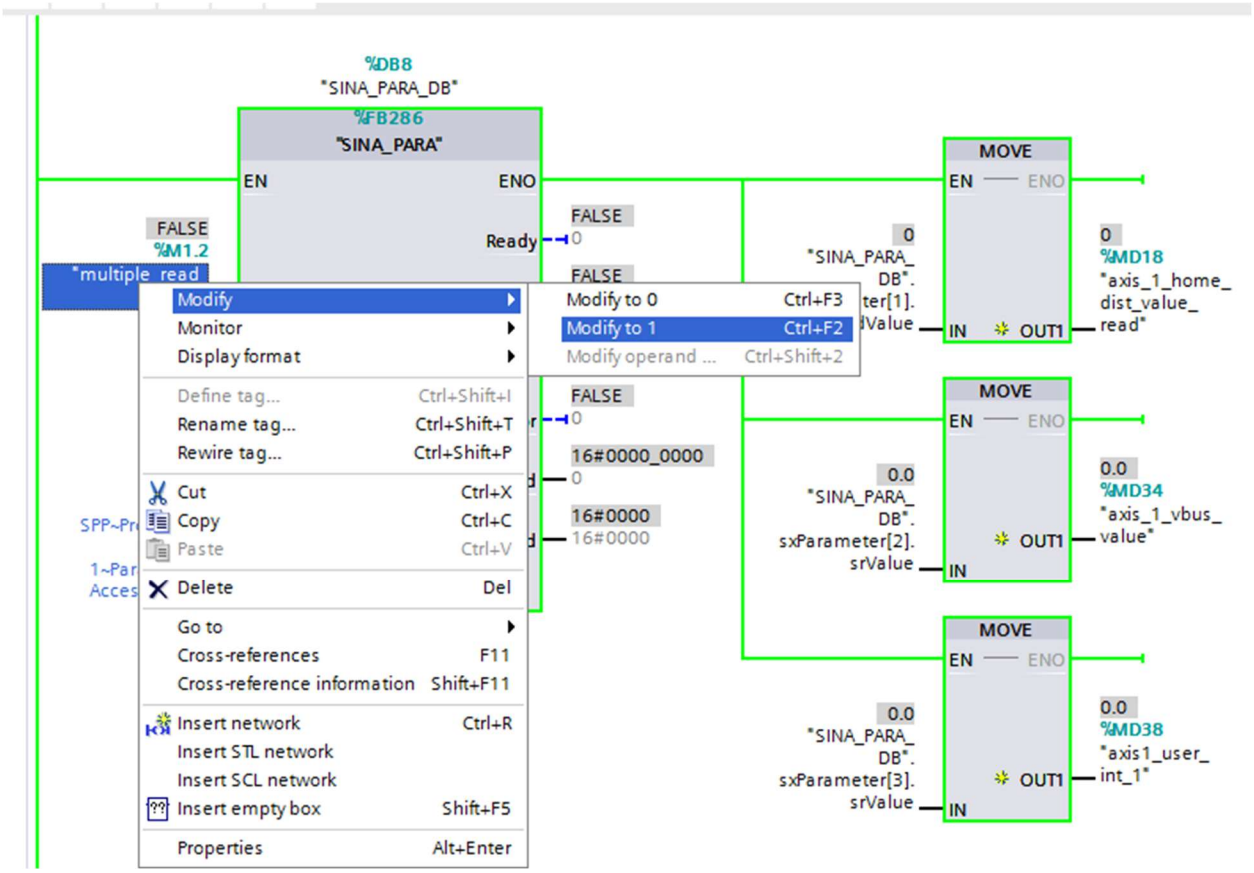
The data block was configured as follows. An observation when changing the siParaNo of a data block required not only the program to be recompiled and downloaded but the PLC to switch from RUN to STOP and back to RUN again to reinitialize before the new parameter address would take effect.

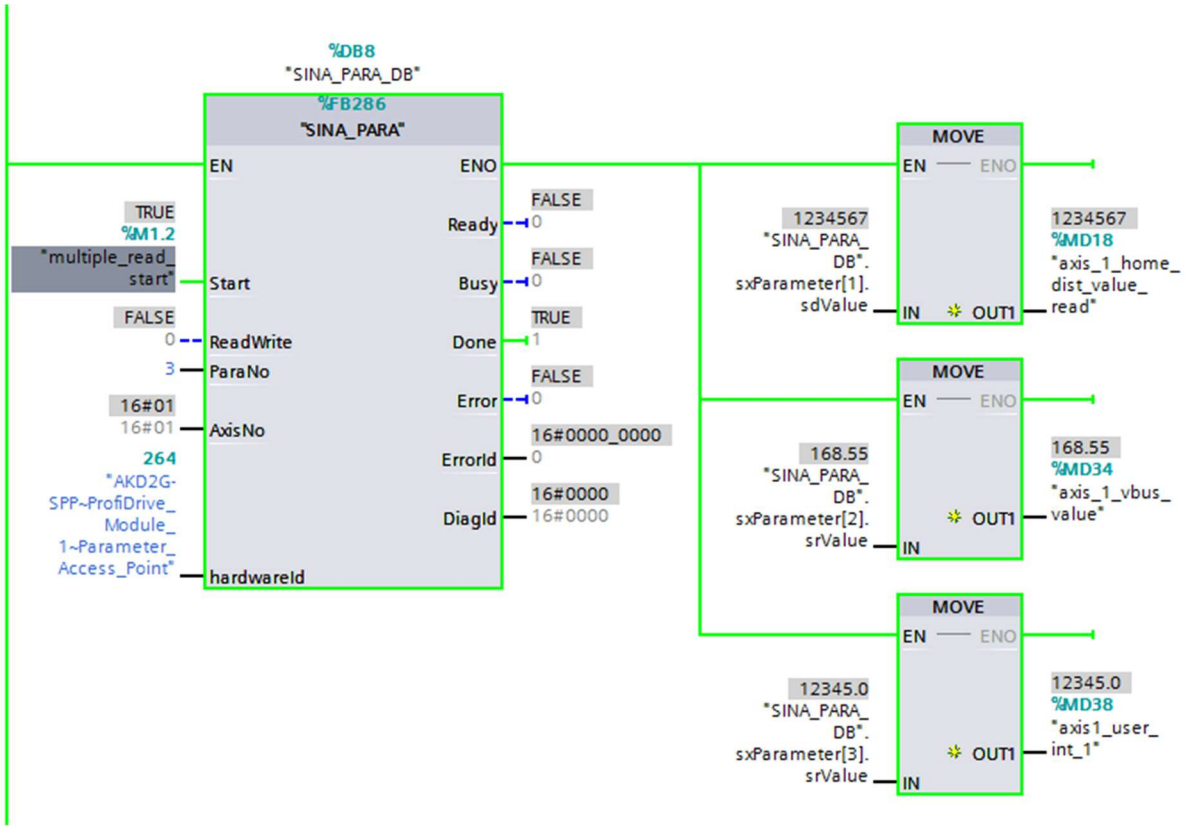
SINA_PARA_DB

	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Supervis...
45	sxParameter	Array[1..16] of Struct			☑	☑	☑		
46	sxParameter[1]	Struct			☑	☑	☑		
47	siParaNo	Int	6104		☑	☑	☑		
48	siIndex	Int	0		☑	☑	☑		
49	srValue	Real	0.0		☑	☑	☑		
50	sdValue	DInt	0		☑	☑	☑		
51	syFormat	Byte	BYTE#16#00		☑	☑	☑		
52	swErrorNo	Word	WORD#16#0000		☑	☑	☑		
53	sxParameter[2]	Struct			☑	☑	☑		
54	siParaNo	Int	2500		☑	☑	☑		
55	siIndex	Int	0		☑	☑	☑		
56	srValue	Real	0.0		☑	☑	☑		
57	sdValue	DInt	0		☑	☑	☑		
58	syFormat	Byte	BYTE#16#00		☑	☑	☑		
59	swErrorNo	Word	WORD#16#0000		☑	☑	☑		
60	sxParameter[3]	Struct			☑	☑	☑		
61	siParaNo	Int	3200		☑	☑	☑		
62	siIndex	Int	0		☑	☑	☑		
63	srValue	Real	0.0		☑	☑	☑		
64	sdValue	DInt	0		☑	☑	☑		
65	syFormat	Byte	BYTE#16#00		☑	☑	☑		
66	swErrorNo	Word	WORD#16#0000		☑	☑	☑		
67	sxParameter[4]	Struct			☑	☑	☑		

Using Workbench the AXIS1.HOME.DIST was set to 1234567 and the USER.INT1 was set to 12345.

On toggle from 0->1 (false->true) the values are read.




%DB8
"SINA_PARA_DB"
%FB286
"SINA_PARA"
EN
ENO
TRUE
%M1.2
"multiple_read_start"
Start
FALSE
0
ReadWrite
3
ParaNo
16#01
16#01
AxisNo
264
"AKD2G-SPP~ProfiDrive_Module_1~Parameter_Access_Point"
hardwareId
Ready
FALSE
0
Busy
FALSE
0
Done
TRUE
1
Error
FALSE
0
ErrorId
16#0000_0000
0
DiagId
16#0000
16#0000
MOVE
EN
ENO
1234567
"SINA_PARA_DB".sxParameter[1].sdValue
IN
OUT1
1234567
%MD18
"axis_1_home_dist_value_read"
MOVE
EN
ENO
168.55
"SINA_PARA_DB".sxParameter[2].srValue
IN
OUT1
168.55
%MD34
"axis_1_vbus_value"
MOVE
EN
ENO
12345.0
"SINA_PARA_DB".sxParameter[3].srValue
IN
OUT1
12345.0
%MD38
"axis1_user_int_1"

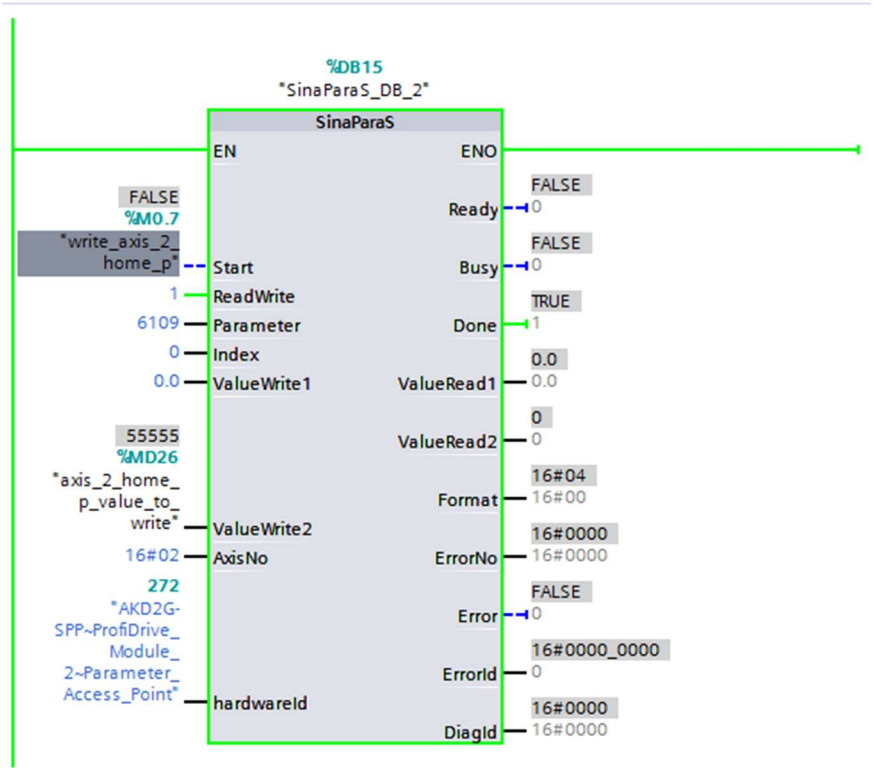
Example#3: Single PNU access Write using SinaParaS.

In this example the AKD2G drive's axis#2 home position (AXIS2.HOME.P) is written to from the PLC.

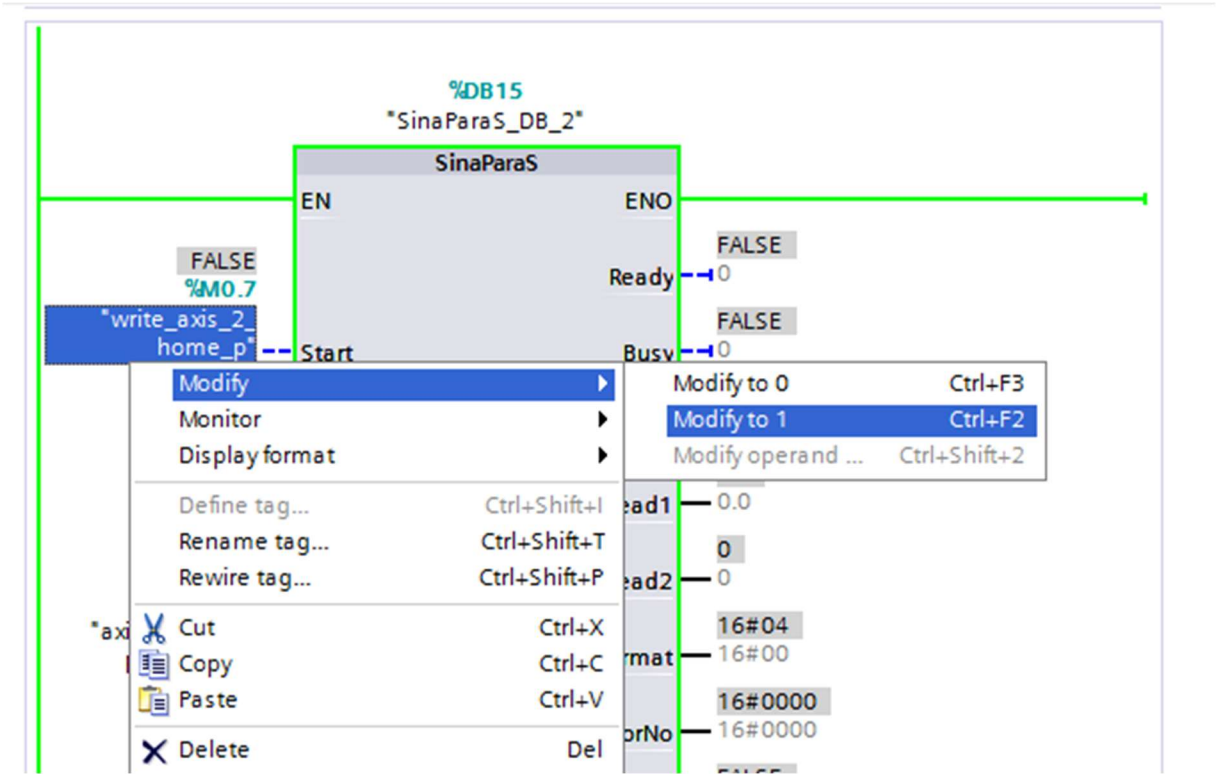
Single Write Examples				Using SinaParaS
AXIS#.HOME.P	6109	Signed32	Read/Write	

The SinaParaS block was setup with the following inputs:

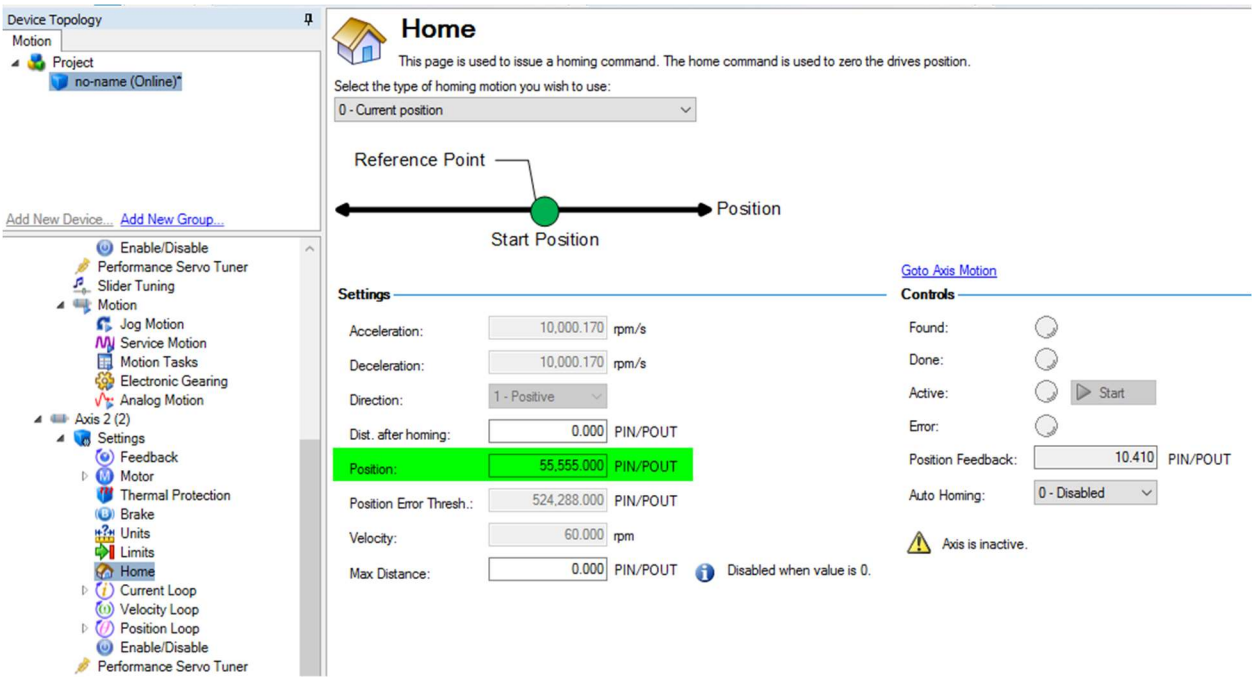
- A tag "write_axis_2_home_p" was created for a manual trigger of the Start input to command a write.
- 1 or True for the ReadWrite input (where 0=Read, 1=Write).
- The PNU number for AXIS#.HOME.P 6109 is entered as the Parameter input.
- A value of 16#02 for the AxisNo input.
- The same rules as the read apply for determining whether to source the value to write from the function block's Real input (ValueWrite1) or DINT input (ValueWrite2). In this case the AXIS#.HOME.P is a signed32 or DINT so the tag to hold the value to write called "axis_2_home_p_value_to_write is located on ValueWrite2 (Dint) as shown below.
- A hardware ID of 264 which in this example points to the AKD2G Profidrive Module 2-Parameter Access Point which is setup in the Device View of the AKD2G drive. This is in agreement with the function block's AxisNo. Input (16#02) in this case.



On toggle from 0->1 (false->true) the value of 55555 is written.



Verifying with Workbench:

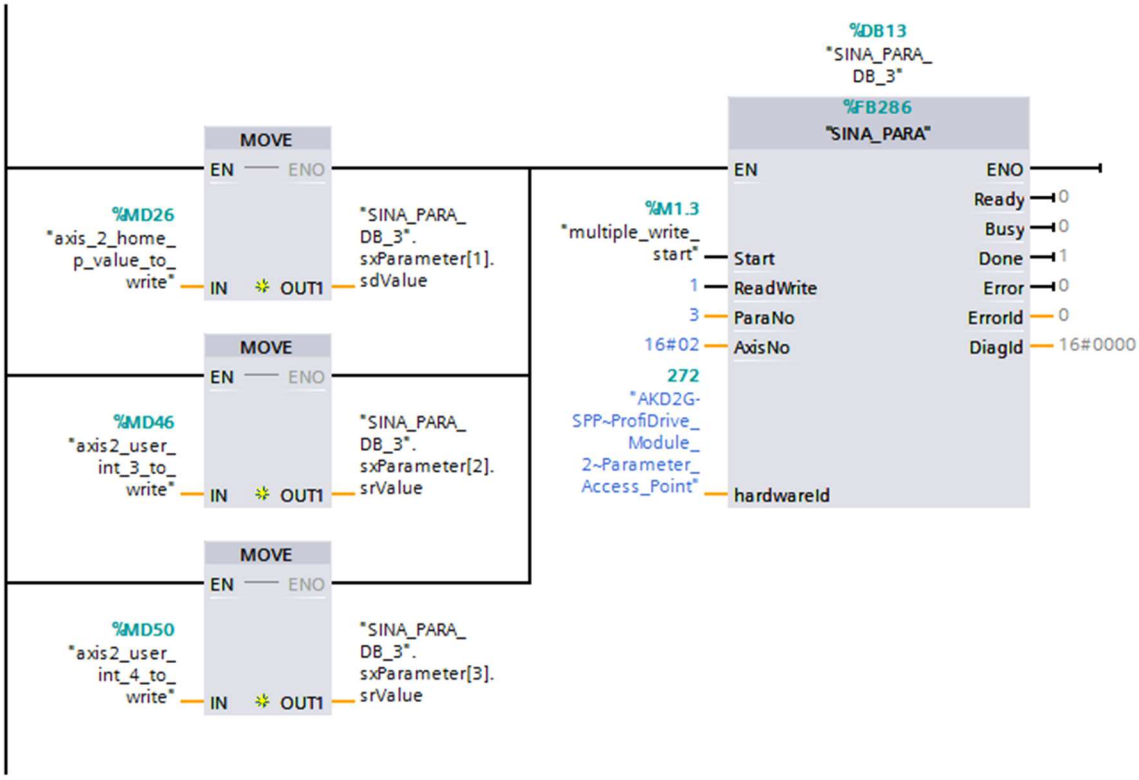


Example#4: Multiple PNU access Write using SinaPara.

Multiple Write Examples				Using SinaPara
AXIS#.HOME.P	6109	Signed32	Read/Write	
USER.INT3	3202	Signed16	Read/Write	
USER.INT4	3203	Signed16	Read/Write	

The SinaParaS block was setup with the following inputs:

- The following tags were created:
  - “axis_2_home_p_value_to_write”; DINT
  - “axis_user_int_3_to_write”; INT
  - “axis_user_int_4_to_write”; INT
- Move Blocks were added for convenience and visibility in the rung so the values can easily be altered online. The values are moved to the holding element in the data block associated with the instance of the SINA_PARA function block (data block#3 in this example).
- A tag “multiple_write_start” was added for a manual trigger of the Start input to command a write.
- 1 or True for the ReadWrite input (where 0=Read, 1=Write).
- A value of 3 of the ParaNo input for a write of 3 parameters.
- A value of 16#02 for the AxisNo input.
- A hardware ID of 272 which in this example points to the AKD2G Profidrive Module 2-Parameter Access Point which is setup in the Device View of the AKD2G drive.

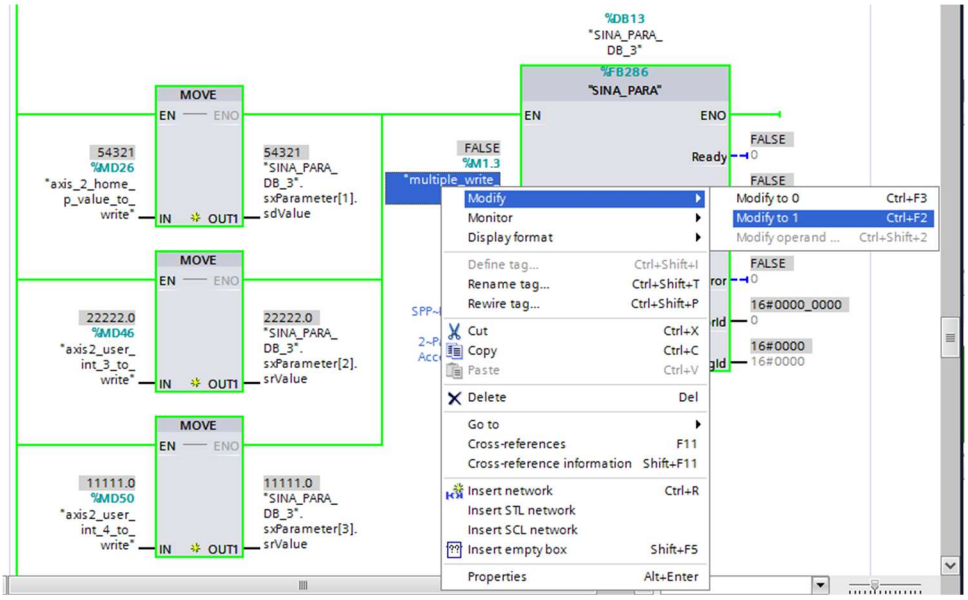


The data block was configured as follows. An observation when changing the siParaNo of a data block required not only the program to be recompiled and downloaded but the PLC to switch from RUN to STOP and back to RUN again to reinitialize before the new parameter address would take effect.

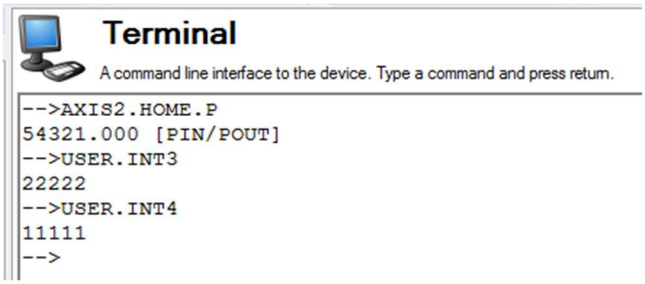
SINA_PARA_DB_3

	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint	Supervis...	Co...
46	sxParameter[1]	Struct			☑	☑	☑			List of
47	siParaNo	Int	6109		☑	☑	☑			Numb
48	siIndex	Int	0		☑	☑	☑			Subin
49	srValue	Real	0.0		☑	☑	☑			Value
50	sdValue	DInt	0		☑	☑	☑			Value
51	syFormat	Byte	BYTE#16#00		☑	☑	☑			Forma
52	swErrorNo	Word	WORD#16#0000		☑	☑	☑			Error r
53	sxParameter[2]	Struct			☑	☑	☑			List of
54	siParaNo	Int	3202		☑	☑	☑			Numb
55	siIndex	Int	0		☑	☑	☑			Subin
56	srValue	Real	0.0		☑	☑	☑			Value
57	sdValue	DInt	0		☑	☑	☑			Value
58	syFormat	Byte	BYTE#16#00		☑	☑	☑			Forma
59	swErrorNo	Word	WORD#16#0000		☑	☑	☑			Error r
60	sxParameter[3]	Struct			☑	☑	☑			List of
61	siParaNo	Int	3203		☑	☑	☑			Numb
62	siIndex	Int	0		☑	☑	☑			Subin
63	srValue	Real	0.0		☑	☑	☑			Value
64	sdValue	DInt	0		☑	☑	☑			Value
65	syFormat	Byte	BYTE#16#00		☑	☑	☑			Forma
66	swErrorNo	Word	WORD#16#0000		☑	☑	☑			Error r
67	sxParameter[4]	Struct			☑	☑	☑			List of
68	sxParameter[5]	Struct			☑	☑	☑			List of

During Runtime Online and toggling of the “multiple_write_start” tag from 0->1 the write is triggered.



From Workbench the values are confirmed to have successfully been written to with the values set in the PLC.



Appendix A: Data Types

When monitoring the data block's internal values online the data type will be automatically read from the drive when the PNU access (read or write) is executed. From the October 2015 Technical Specification for Profibus and Profinet the Data Type Numeric Identifiers are defined for the types applicable to the AKD2G as follows.

Data Type used with the Profile Profidrive	Data Type Numeric Identifier
Integer16	3
Integer32	4
Unsigned8	5
Unsigned16	6
Float	8

For example when the multiple write was executed the syformat for each sxParameter returned a value. These parameters are Integer32, Integer16, and Integer16 and returned a 16#04, 16#03, and 16#03 respectively.

SINA_PARA_DB_3

	Name	Data type	Start value	Monitor value	Retain	Accessible f...
46	sxParameter[1]	Struct				
47	siParaNo	Int	6109	6109		
48	siIndex	Int	0	0		
49	srValue	Real	0.0	0.0		
50	sdValue	DInt	0	54321		
51	syFormat	Byte	BYTE#16#00	16#04		
52	swErrorNo	Word	WORD#16#0000	16#0000		
53	sxParameter[2]	Struct				
54	siParaNo	Int	3202	3202		
55	siIndex	Int	0	0		
56	srValue	Real	0.0	22222.0		
57	sdValue	DInt	0	0		
58	syFormat	Byte	BYTE#16#00	16#03		
59	swErrorNo	Word	WORD#16#0000	16#0000		
60	sxParameter[3]	Struct				
61	siParaNo	Int	3203	3203		
62	siIndex	Int	0	0		
63	srValue	Real	0.0	11111.0		
64	sdValue	DInt	0	0		
65	syFormat	Byte	BYTE#16#00	16#03		
66	swErrorNo	Word	WORD#16#0000	16#0000		
67	sxParameter[4]	Struct				