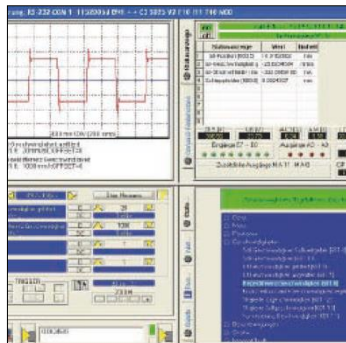




Application Note

Electromechanical Automation Europe
Application Team Offenburg

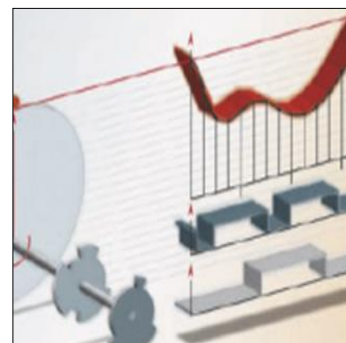


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PSD - Communication

ControlManager FB50 for TIA-Portal



Author: K. Woloschin
Application: PSD_Comm_AN0030
Version: V1.1
Last change: 10 February 2017



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1. Device supplement

1.1. With the option

- PSD1S....B2



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- PSD1M....B2

1.2. And the master plc

- SIMATIC S7-1500
- SIMATIC S7-1200

2. Purpose of the Block

2.1. Overview

Absolute	Symbol	Comment	Vers	Date	Device	Application
FB50	C3ControlManager For TIA -Portal	PSD1..B2 ControlManager	1.1	2017-02-07	PSD	Positioning, absolute / relative

2.2. Restrictions and application

This block simplifies the control of a PSD DRIVE (with PROFIdrive profile) with the S7. The block needs the commands and set values. The block distributes messages and actual values from the drive. The channels PZD and PKW are used in both directions.



This block is only usable with PPO14 (APA_IO = 8BYTE, PD_IO = 18BYTE)

2.3. History of modifications

V1.1 2017-02-07 First version

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3. Setting up

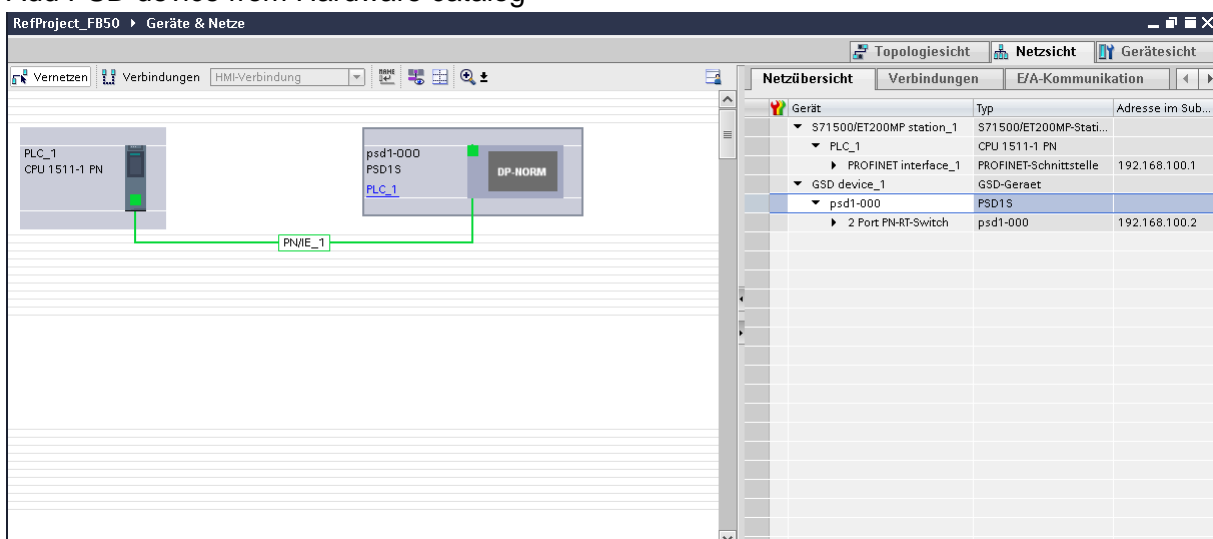
3.1. PSD configuration

With PSDServoManager perform following adjustments:

PROFINET-Settings	
Selected Operation mode	2 Positioning mode with submode MDI (Manual Data Input)
Acyclic Parameter Access (APA)	ParameterChannel_4words
FBI timeout 0x7583	Stop_drive_disabled
PROFINET-Mapping	
APA_IO [16bit words]	4
PD_IO [16bit words]	9
R-PDO: 9 words	
RPDO 1	0x6040.0 Control word 1 (STW1, PNU 967) [16b]
RPDO 2	0x607A.0 MDI target position (MDI_TARPOS) [incr] [32b]
RPDO 3	0x6081.0 MDI velocity (MDI_VELOCITY) [incr/s] [32b]
RPDO 4	0x6083.0 MDI acceleration [incr/s ²] [32b]
RPDO 5	0x6084.0 MDI deceleration [incr/s ²] [32b]
T-PDO: 9 words	
TPDO 1	0x6041.0 Status word 1 (ZSW1, PNU 968) [16b]
TPDO 2	0x6064.0 Position actual value A (XIST_A) [incr] [32b]
TPDO 3	0x606C.0 Speed actual value B (NIST_B) [incr/s] [32b]
TPDO 4	0x0007.0 DummyObj_32Bit [32b]
TPDO 5	0x0007.0 DummyObj_32Bit [32b]

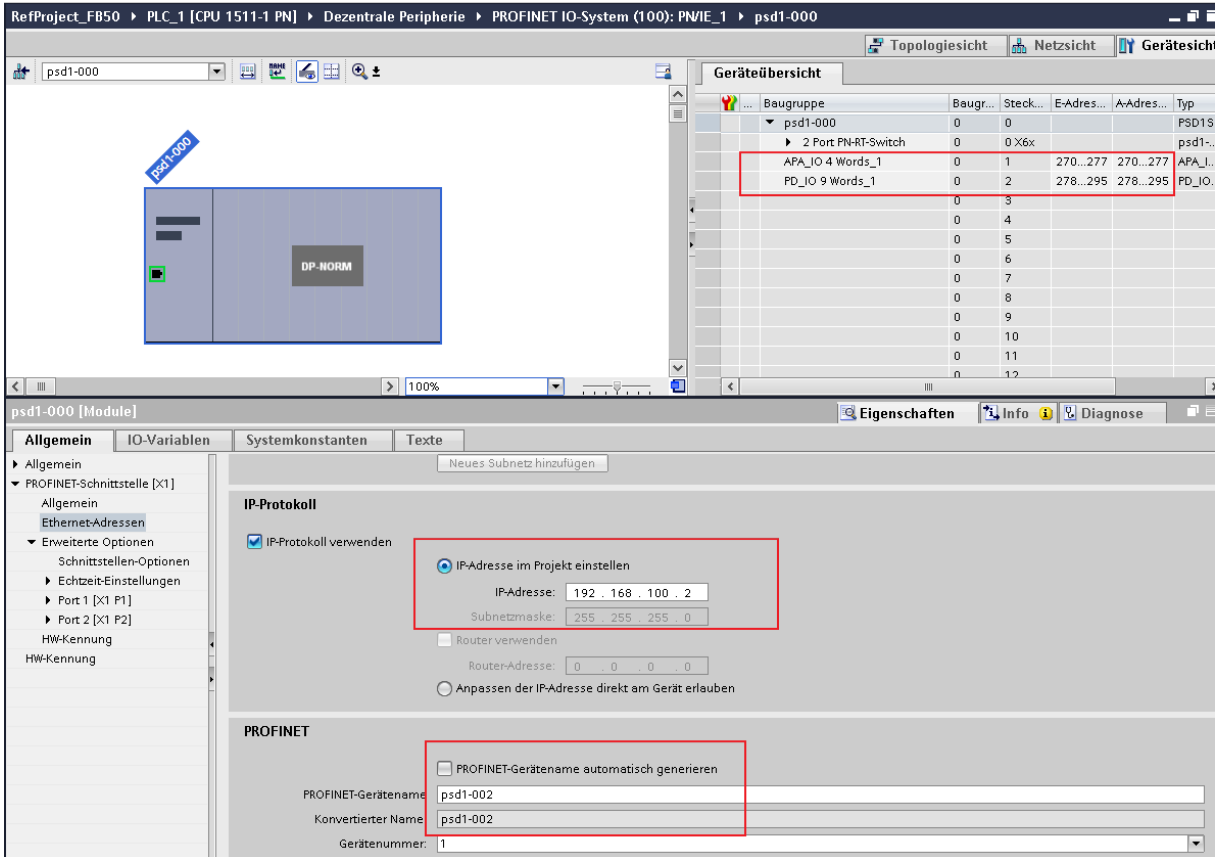
3.2. SIMATIC - HW Config

Add PSD device from Hardware catalog



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Assign IP-address and device name. Check device module configuration (APA_IO =4 words, PD_IO = 9 words).



The screenshot displays the Siemens TIA Portal interface for configuring a PSD module. The top section shows a hardware rack diagram with a 'psd1-000' module. The bottom section shows the 'Geräteübersicht' (Device Overview) table and the 'Eigenschaften' (Properties) dialog for the 'psd1-000' module.

Geräteübersicht Table:

Baugruppe	Baugr...	Steck...	E-Adres...	A-Adres...	Typ
psd1-000	0	0			PSD1S
2 Port PN-RT-Switch	0	0 X6x			psd1-
APA_IO 4 Words_1	0	1	270...277	270...277	APA_I...
PD_IO 9 Words_1	0	2	278...295	278...295	PD_IO...

Eigenschaften Dialog (psd1-000 [Module]):

IP-Protokoll

☒ IP-Protokoll verwenden

☒ IP-Adresse im Projekt einstellen

IP-Adresse: 192 . 168 . 100 . 2

Subnetzmaske: 255 . 255 . 255 . 0

☐ Router verwenden

Router-Adresse: 0 . 0 . 0 . 0

☐ Anpassen der IP-Adresse direkt am Gerät erlauben

PROFINET

☐ PROFINET-Gerätename automatisch generieren

PROFINET-Gerätename: psd1-002

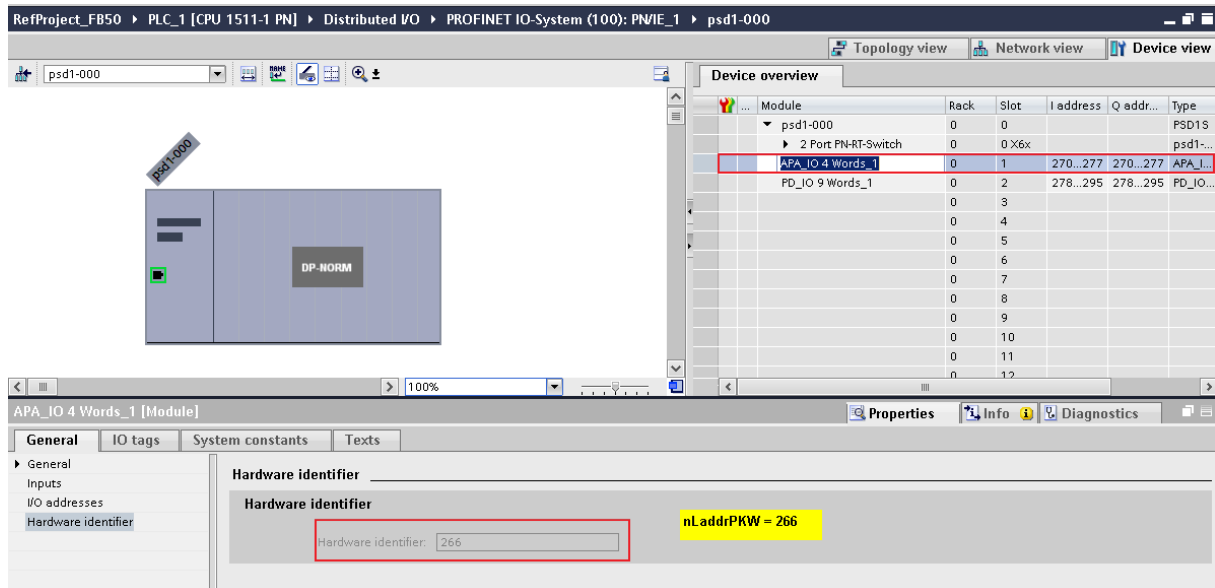
Konvertierter Name: psd1-002

Gerätenummer: 1

Edit HardwareID of APA_IO and PD_IO modules (here 265 PZD and 267 PKW) in Instance Variable.

Adjust hardware identifier for APA_IO in <nLaddrPKW> (DB50.DBW8).

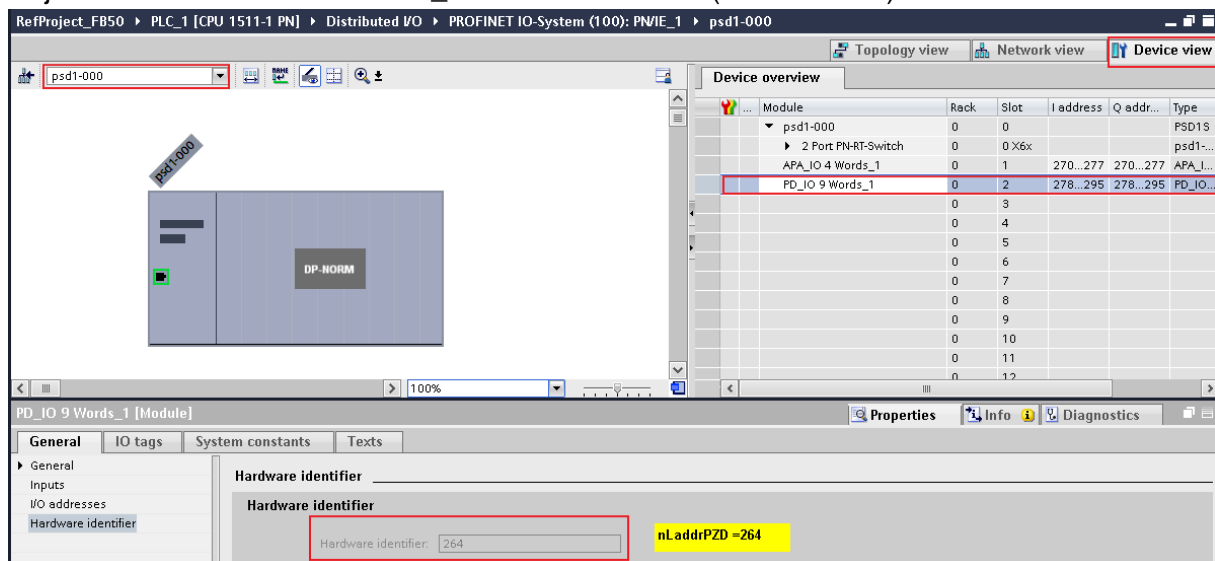
PSD - Communication



The screenshot shows the TIA Portal interface with the project path: RefProject_FB50 > PLC_1 [CPU 1511-1 PN] > Distributed I/O > PROFINET IO-System (100): PN/IE_1 > psd1-000. The 'Device overview' table is visible, showing the configuration of the psd1-000 module. The 'APA_IO 4 Words_1' module is highlighted in red. The 'Hardware identifier' field is set to 266, and the 'nLaddrPKW' is set to 266.

Module	Rack	Slot	I address	Q address	Type
psd1-000	0	0			PSD1S
2 Port PN-RT-Switch	0	0 X6x			psd1...
APA_IO 4 Words_1	0	1	270...277	270...277	APA_I...
PD_IO 9 Words_1	0	2	278...295	278...295	PD_IO...

Adjust hardware identifier for PD_IO in <nLaddrPZD> (DB50.DBW6).



The screenshot shows the TIA Portal interface with the project path: RefProject_FB50 > PLC_1 [CPU 1511-1 PN] > Distributed I/O > PROFINET IO-System (100): PN/IE_1 > psd1-000. The 'Device overview' table is visible, showing the configuration of the psd1-000 module. The 'PD_IO 9 Words_1' module is highlighted in red. The 'Hardware identifier' field is set to 264, and the 'nLaddrPZD' is set to 264.

Module	Rack	Slot	I address	Q address	Type
psd1-000	0	0			PSD1S
2 Port PN-RT-Switch	0	0 X6x			psd1...
APA_IO 4 Words_1	0	1	270...277	270...277	APA_I...
PD_IO 9 Words_1	0	2	278...295	278...295	PD_IO...

3.3. Application interface of "PSDControlManager"

3.3.1. Schematic drawing for in- and output Areas of FB50 / DB50

PSD - Communication

in input	out output	in_out In- and Output	stat Static Memory
----------	------------	-----------------------	--------------------

DB50

	EN	ENO	
DBX0.0	bEnable	bEnabled	DBX2.0
DBX0.1	bAbsoluteRelative	bDriveErr	DBX2.1
DBX0.2	bPositionResetMode	bPosRunning	DBX2.2
DBX0.3	bHold	bInPosition	DBX2.3
DBX0.4	bStop	bPosErr	DBX2.4
DBX0.5	bFaultReset	bHomingRunning	DBX2.5
DBX0.6	bJogP	bHomingAttained	DBX2.6
DBX0.7	bJogN	bHomingErr	DBX2.7
DBX1.0	bExDataTransfer	bCommErr	DBX3.0
DBX4.0	bStartPositioning		
DBX4.1	bChangeSetImmediate	stRd.iPositionValue	DBD46
DBX4.2	bStartHoming	stRd.iVelocityValue	DBD50
DBW6	nLaddrPZD	stRd.nActualError	DBW54
DBW8	nLaddrPKW		
DBD10	iPosition		
DBD14	iVelocity		
DBD18	iAcceleration		
DBD22	iDeceleration		
DBD26	iInPosWindowAbs		
DBW30	nCmd	bTransErr	DBX3.1
DBW32	nObjectIndex		
DBW34	nObjectSubindex		
DBD36	iParameterValue	iParameterValue	DBD34
DBD40	TonTimer1		
DBD44	TonTimer2		
DBX56.0 Word 4	stC3PKWInDint.nPKE	stC3PKWOutDint.nPKE	DBX64.0 Word 4
DBX72.0 Word 7	stC3PZDIn.nStatus	stC3PZDOut.nControl	DBX86.0 Word 7

3.3.2. Declaration of In- and Output

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Parameter	Declaration	Data type	description
bAbsoluteRelative	IN	BOOL	=0 absolute, =1 relative movement
bEnable	IN	BOOL	=1 energise =0 disenergize with AUS3 - Ramp (Not-Stop)
bExDataTransfer	IN	BOOL	=0 internal DP interface with DPWR_DAT/DPRD_DAT (internal Master in S7 CPU) =1 external DP interface with FC2/FC1 (external Master CP 342-5)
bFaultReset	IN	BOOL	Acknowledge with rising edge, after that it is necessary to activate energise <bEnable> (caused by the edge detection it is needed to be set to 0 first)
bHold	IN	BOOL	=1 Temporary stop (the movement function is still available), =0 continue
bJogN	IN	BOOL	manual negative: JOG – movement within positioning end limits as long as true
bJogP	IN	BOOL	manual positive: JOG – movement within positioning end limits as long as true
bPositionResetMode	IN	BOOL	=0 Normal-, =1 Reset mode selected (in C3Mgr \\\I20T11 drive Configuration \units... positioning reset distance and positioning reset distance denominator is different from 0 (Not supported with PSD drives yet)
bStop	IN	BOOL	=1 Stop (movement function cancelled)
bChangeSetImmediate	IN_OUT	BOOL	With the Rising edge, a new position profile is activated; <bChangeSetImmediate> is reseted from the block itself. This command is acknowledged from the block with <bPosRunning>. A new command is also accepted if the actual movement is not finished (<bInPosition> =1). (Not supported with PSD drives yet)
bStartHoming	IN_OUT	BOOL	rising edge starts referencing movement, if permitted, neg. edge stops referencing movement, bStartHoming may only be reseted with <bHomingAttained>.
bStartPositioning	IN_OUT	BOOL	With the Rising edge a new position profile is activated, <bChangeSetImmediate> is reseted from the block itself. This command is acknowledged from the block with <bPosRunning>. A new command is not

PSD - Communication

Parameter	Declaration	Data type	description
			accepted if the actual movement is not finished (<bInPosition> =1).
bCommErr	OUT	BOOL	=1 communication failure (Failure from DPWR_DAT / DPRD_DAT) (all other messages are invalid)
bDriveErr	OUT	BOOL	=1 failure from PSD (device / motor)
bEnabled	OUT	BOOL	=1 Axis energised =0 Axis not energised
bHomingAttained	OUT	BOOL	=1 reference ok.
bHomingErr	OUT	BOOL	=1 watchdog/ timeout for Reference -run (occasionally TonTimer2 correct)
bHomingRunning	OUT	BOOL	=1 reference run active
bInPosition	OUT	BOOL	=1 axis in target position
bPosErr	OUT	BOOL	=1 watchdog timeout for position -order (occasionally. TonTimer1 correct)
bPosRunning	OUT	BOOL	=1 position or active
bTransErr	OUT	BOOL	=1 format-, commando failure at transfer from / to PSD
iAcceleration	STATIC	DINT	acceleration in U32 -Format (integer)
iDeceleration	STATIC	DINT	deceleration in U32 -Format (integer)
iInPosWindowAbs	STATIC	DINT	Position window in additional monitoring of <bInPosition> with absolute positioning. The actual position value compared with the position set value. That is only possible with absolute positioning (<bAbsoluteRelative> = false) and position Reset mode (<bPositionResetMode> = false) is not activated.
iParameterValue	STATIC	DINT	PSD object value (source and destination) - write-/read value of the Parameters, with INT-/WORD -format only one word used.
iPosition	STATIC	DINT	target position / distance in increments
iVelocity	STATIC	DINT	speed in increments
stRd.iPositionValue	STATIC	DINT	actual position in increments
stRd.iVelocityValue	STATIC	DINT	actual speed in increments
nCmd	STATIC	INT	PSD object transfer: command: 1 read

PSD - Communication

Parameter	Declaration	Data type	description
			2 write WORD 3 write DWORD
nObjectIndex	STATIC	INT	PSD object index
nObjectSubindex	STATIC	INT	PSD object subindex
TonTimer1	STATIC	TIME	time value for timeout of Positioning
TonTimer2	STATIC	TIME	time value for timeout Reference run
nLaddrPZD	STATIC	WORD	= 0100 _{hex} (=256 _{dez}) Hardware identifier of the (PD_IO) Process Data module.
nLaddrPKW	STATIC	WORD	= 0100 _{hex} (=256 _{dez}) Hardware identifier of the APA_IO (Acyclic Parameter Access) data module.
stRd.nActualError	STATIC	WORD	Actual Failure (see PSD - Manual) in WORD - Format =1 no Error!
stPSDPKWInDint.nPKE	STATIC	Word 4	Local PKW - input area for external CP
stPSDPKWOutDint.nPKE	STATIC	Word 4	Local PKW - output area for external CP
stPSDPZDIn.nStatus	STATIC	Word 9	Local PZD - input area for external CP
stPSDPZDOut.nControl	STATIC	Word 9	Local PZD - output area for external CP

3.3.3. Sequence of process data

3.3.3.1. Settings of the static Operands at the Block

1. <nLaddrPZD>and<nLaddrPKW>

- Parameter from (System constants): HW-ID of the IO-device for PZD and PKW channel.
- Forward the values to <nLaddrPZD> and <nLaddrPKW>.

2. <bExDataTransfer>

- Low: settings for CPU with integrated Master
- High: settings for CPU with external Master

PSD - Communication

3. *<InPosWindowAbs>*
 - additional control window for the message *<InPosition>*
4. *<TonTimer1>*
 - Time value for watchdog positioning, if this time is too short there is shown the error message *<bPosError>*.
5. *<TonTimer2>*
 - Time value for watchdog homing, if this time is too short there is shown the error message *<bHomingErr>*.

3.3.3.2. Settings of dynamic Operands at the Block

1. Switch on
 - Set *<bEnable>*: the block notifies *<bEnabled>*
 - Set *<bStartHoming>*, the block notifies *<bHomingRunning>*. If the homing finished, the block notifies *<bHomingAttained>*.
 - Now reset *<bStartHoming>*.
 - At reaching home position, the message *<InPosition>* is set.
 - With some home modes (e.g. MN-M 35) and high velocity *<bHomingRunning>* is set so short, that is not visible.
 - If there is a motor with absolute position feedback (SinCos©), it is only one time needed to activate homing. *<bHomingAttained>* remains at True even if the drive is switch off and on again. Attention: With activating, the homing from PSD–Optimisation *<bHomingAttained>* is not set.
2. Positioning
 - Set Parameters for Positioning
 - *<bAbsoluteRelative>*
 - *<iPosition>*
 - *<iVelocity>*
 - *<iAcceleration>*
 - *<iDeceleration>*
 - Start the positioning with activating : *<bStartPositioning>*
 - *<bStartPositioning>* is reseted by the block itself
 - The block notifies *<bPosRunning>*
 - With reaching the target position, the message *<InPosition>* is set.
 - A new target position is only possible after *<InPosition>* was set.

3.3.3.3. Other Operands at Block

- *<bFaultReset>* acknowledgement of failures of function block (watchdog) or drive (PSD).
- *<bStop>* stops a positioning with rising edge
- *<bHold>* interrupt of positioning command, as long as Bit it is *true*; positioning will be finished when the bit is *false* again.

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- <bJogN> manual mode negative direction, as long as Bit it is *true*.
- <bJogP> manual mode positive direction, as long as Bit it is *true*.

3.3.3.4. Messages and display

- <bCommErr> communication with PSD not possible
- <bDriveErr> PSD is in failure status
- <stRd.nActualError> actual Failure number of PSD (see C3 Help)
- <stRd.iPositionValue> actual position
- <stRd.iVelocityValue> actual velocity

3.3.3.5. Read and write drive objects

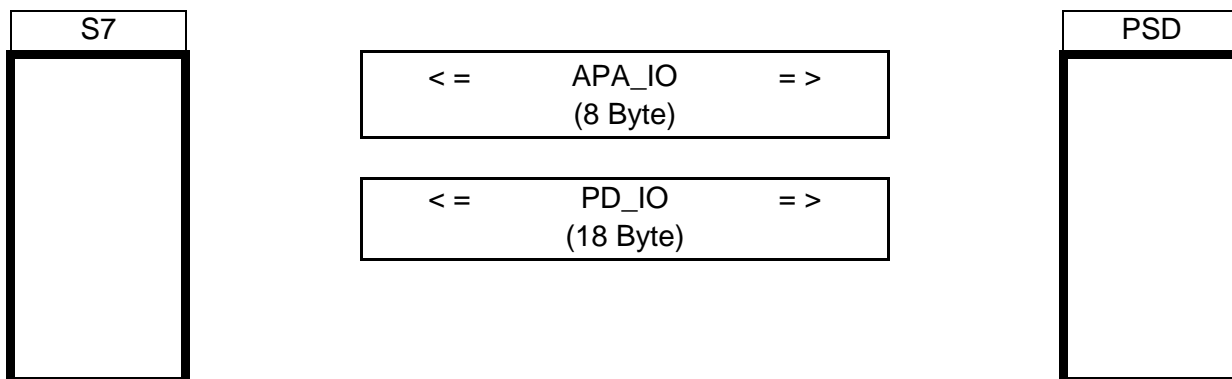
- the objects are selected with <nObjectIndex> and <nObjectSubindex>
- the value is at <iParameterValue>
- nCmd is the command for the transfer
 - 1 command for read
 - 2 command for write word parameter (16 Bit)
 - 3 command for write double word Parameter (32 Bit)Datatype 16 Bit or 32 Bit is shown in the object info "Bus format".
- <bTransErr> shows if there is failure with the data transfer.

4. Application example

4.1. Overview of the connection:

Connection between one PLC SIMATIC S7 1500 as IO-CONTROLLER and one drive PSD as IO-DEVICE.

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4.2. Cyclic channel (PD_IO)

The in- and output objects are selected in the PSD servo manager wizard. All tags are either word or double word format. The settings are instructed in the following order to assure the FB is working.

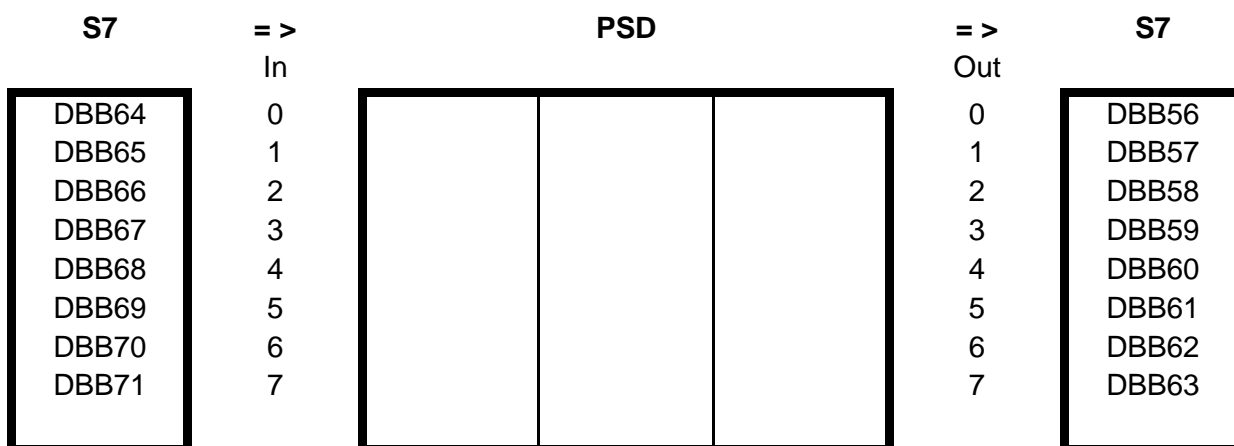
S7	= > In	PSD	= > Out	S7
DBB86	0	STW1	0	DBB72
DBB87	1		1	DBB73
DBB88	2	Position set point value A	2	DBB74
DBB89	3	XSOLL_A	3	DBB75
DBB90	4		4	DBB76
DBB91	5	Commanded motion speed	5	DBB77
DBB92	6	NSOLL_D	6	DBB78
DBB93	7		7	DBB79
DBB94	8		8	DBB80
DBB95	9		9	DBB81
DBB96	10	Set point acceleration B	10	DBB82
DBB97	11		11	DBB83
DBB98	12		12	DBB84
DBB99	13		13	DBB85

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4.3. Acyclic channel (PKW)

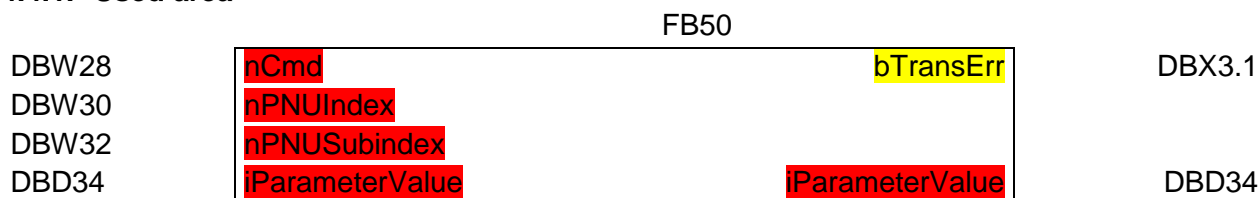
Via the 8 Byte APA_IO interface the user is able to transfer additional objects to or from PSD. The block is using this interface to transfer Failure number.



4.4. Parameter channel

The PLC (HMI) is asking for the value of actual torque [683.1]
Also the value of stiffness [2100.2] should be changed. The procedure is explained with help of SIMATIC Variable table.

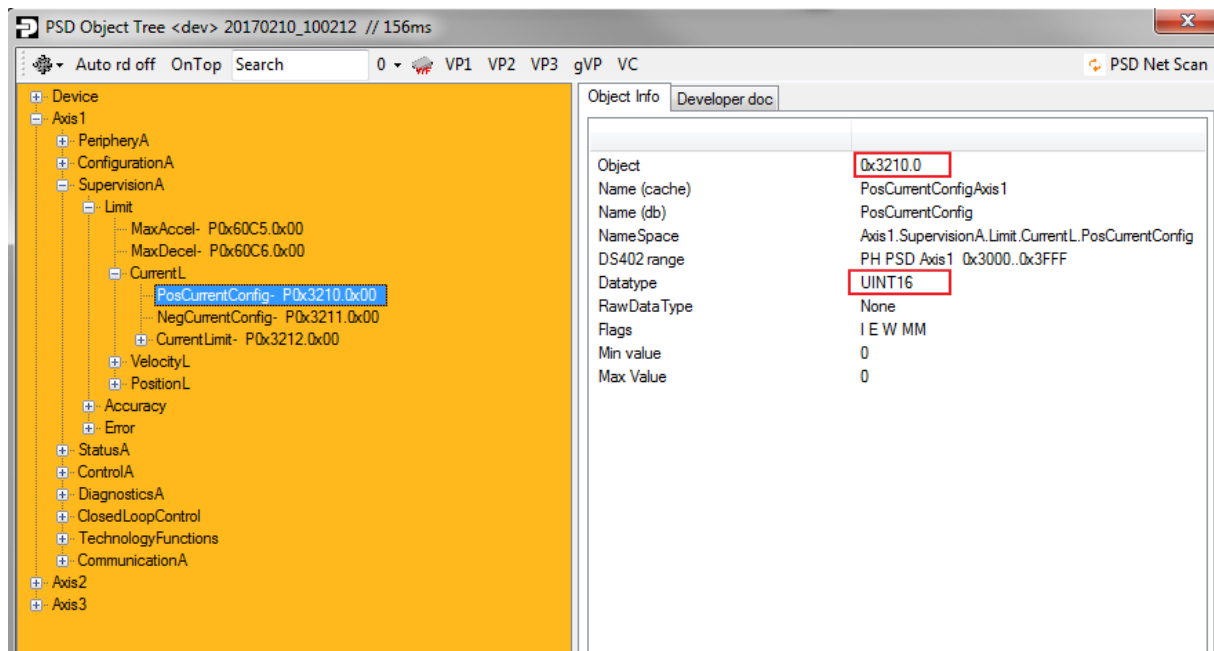
4.4.1. Used area



4.4.2. Procedure for reading and writing of current limit positive object [0x3210.0]

1. Open Object Tree→object info:

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2. Set requested object index and subindex:

nObjectIndex <3210>
nObjectSubindex <0>

3. Next edit the commando for "read" (1) !

nCmd <1>

4. Check object value

iObjectValue e.g.<2000>

5. Next set new object value

iObjectValue e.g.<1000>

6. Edit new commando for "write 16b" (2) !

nCmd <2>

7. Verify the result in PSD ServoMgr (object value 0x3210.1).

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Caution:

VP and WF use system resources, which decrease the effectiveness of internal communication. This may have the effect that there occur error messages like „cycle time overrun“. So you should use these two commands not too often.

Try to use them during the axis is not energized. It would be better to change first a couple of parameters and activate them together by writing VP only one time.