

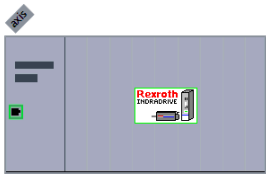
EN-Profinet IndraDrive (TIA FB's) (TIA, new CPU's 12xx, 15xx)

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Place:	Lohr am Main
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Version:	V1.2.1

EN-S7Profinet IndraDrive

General important hint for Profinet with IndraDrive:

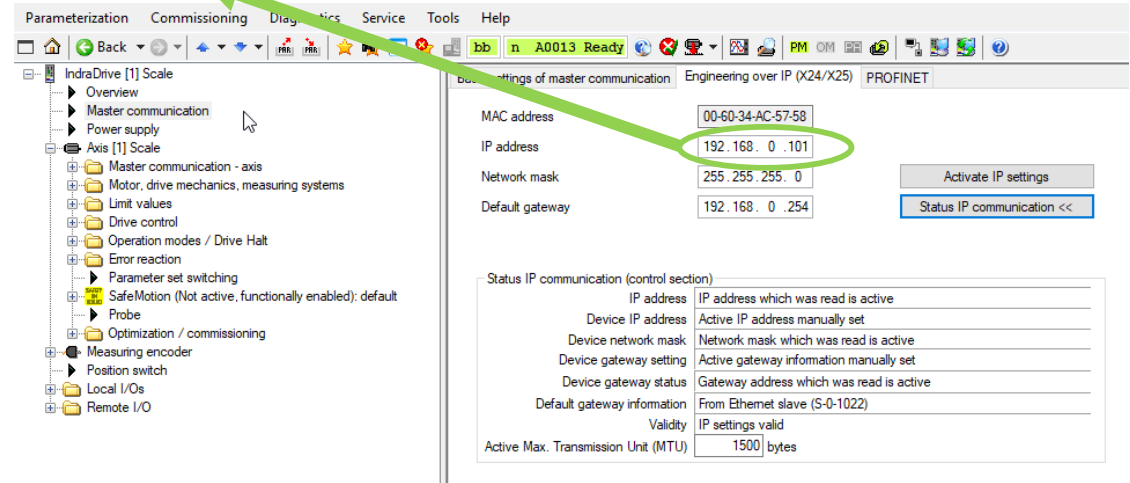
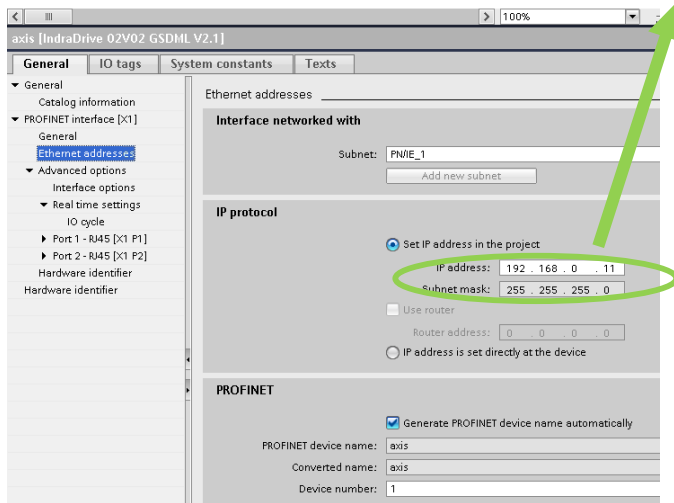
→ The master communication engineering IP address must be **different** to the Profinet IP address (automatically set by Siemens PLC)!



192.168.0.11 = 192.168.0.11



192.168.0.11 ≠ 192.168.0.101



AGENDA

1. Profinet function blocks / example project TIA
2. Hint for double axis controller with Profinet
3. FAQ's Profinet. (in preperation)
4. Attachments, Screenshots Details.

General important hint for Profinet with IndraDrive:

→ The master communication engineering IP address must be **different** to the Profinet IP address (automatically set by Siemens PLC)!

EN-S7Profinet IndraDrive

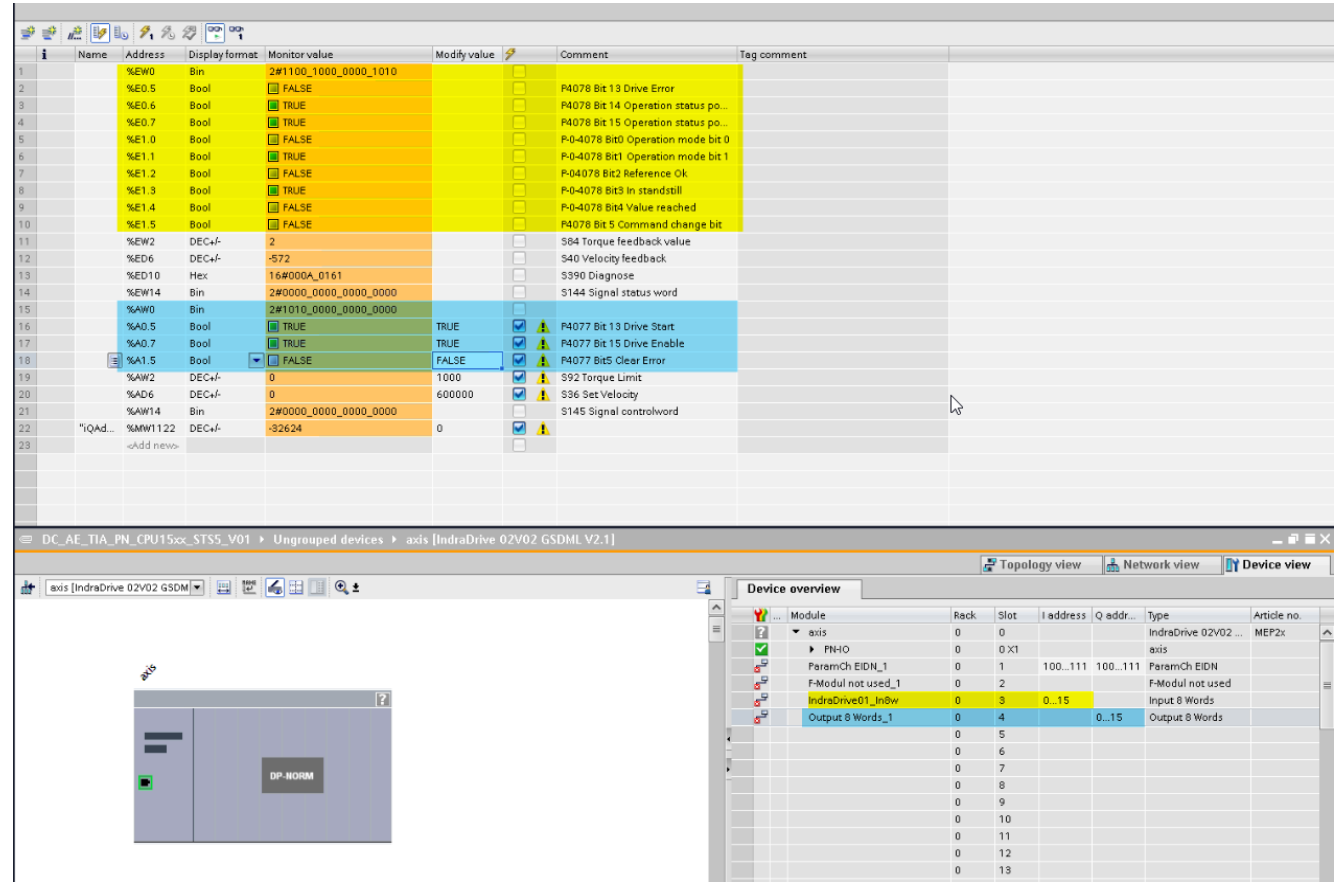
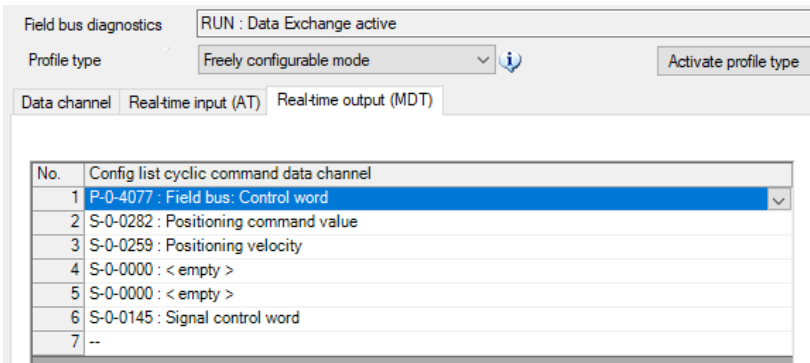
1. Profinet Function modules or example projects

- a) Data interface without function block.
- b) What is there and where?
- c) What use for what?
- d) What is the (small) parameter file for?
- e) How do I extend a function module?
- f) Interface test, notes before automatic operation.
- g) Where can I get drive error message list?
- h) Interface description function bloc.
- i) Time diagram drive controlled positioning.

EN-S7Profinet IndraDrive

1a. Data transfer without function block

- Process data is transmitted via input / output addresses.
- On the IndraDrive page these are assigned to the parameters.
- MDT = Master Data Telegram from S7
- AT = Antriebs Data Telegram to S7



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1b. What is there where?

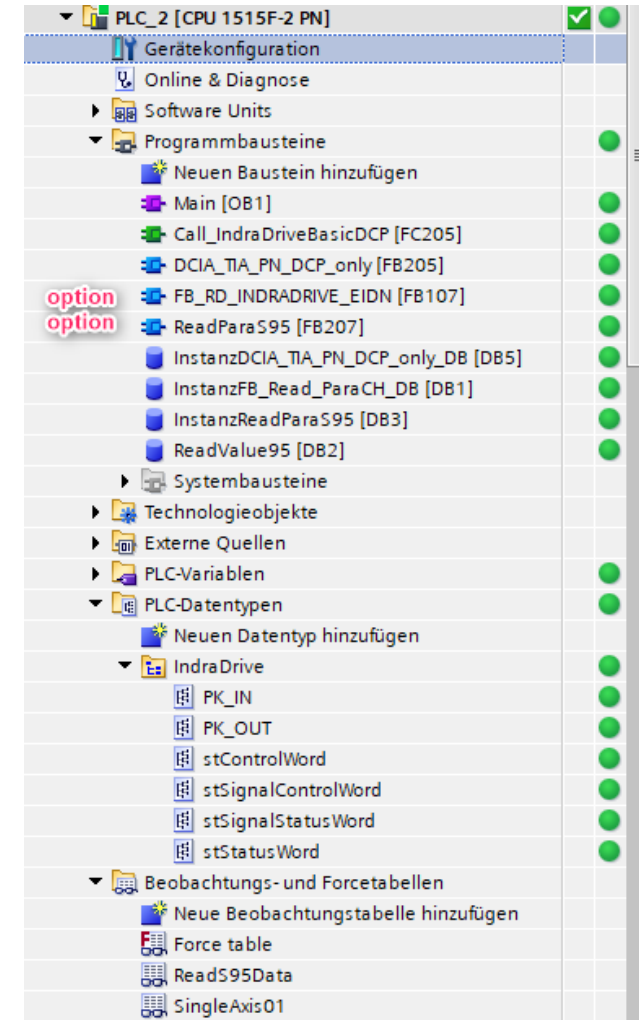
- There are several sample projects for Step5.4, TIA14 and TIA16.
 - "Old" sample projects for Step5.4, TIA14 are currently available on the internet and will not be described further here.
 - "Current" example projects for TIA16 (SP1) (April 2019) blocks are written in SCL :
 - DCAE_TIA_PN_DCP_CPU1515_STS_Vxx , Application example Supplement to the basic version.
 - TIA14SP1_PN_DCP_V1.2.0.0 , DCP = Drive Controlled Positioning BasisVersion.
 - Others on request.
- Where? Link and Screenshot.
 - Internet Product Catalog .
 - Link:
 - https://www.boschrexroth.com/ics/cat/?cat=Electric-Drives-and-Controls-Catalog&m=XC&u=si&o=Desktop&q=0&p=p790611&vd=&pi=A9D0AFFD-CE9E-4D35-14706C0748AC2765_ICS_82&language=en



EN-S7Profinet IndraDrive

1c. What do I use for what?

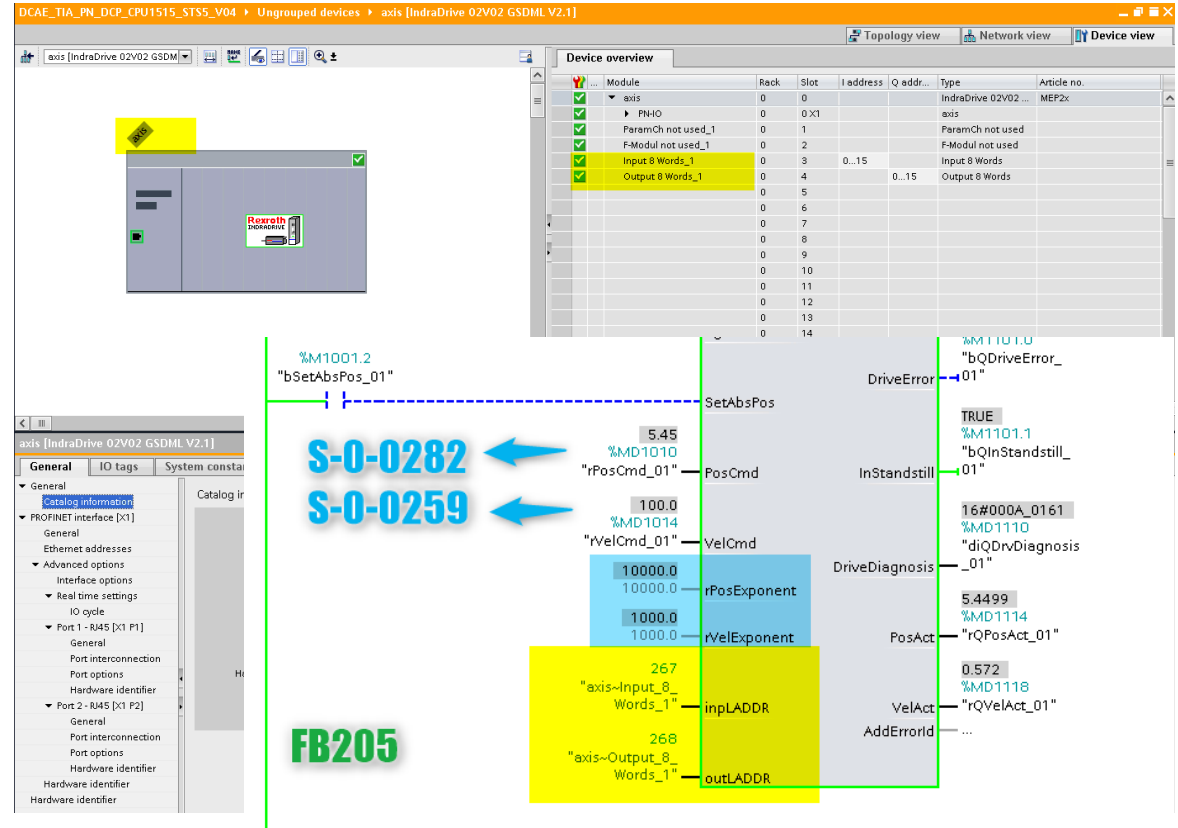
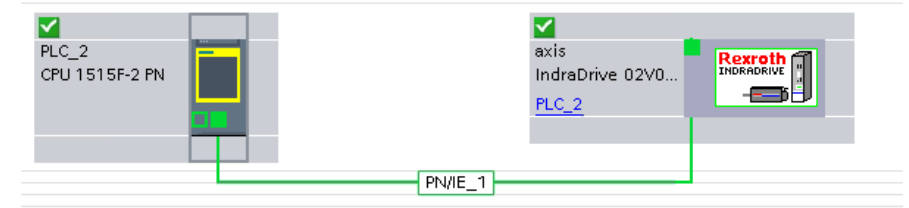
- Drive Controlled Positioning (DCAE_TIA_PN_DCP_CPU1515_STS5):
 - Is used to control the drive-controlled positioning, mostly used drive operating mode in external PLC control.
 - The following blocks are included in the sample project :
 - FC205 Calling the application program, example networks Referencing and positioning.
 - FB205 Application block, supplement or change to FB105 (basic version).
 - FB207, FB107 **option** parameter channel to read S-0-0095 diagnostic message.
- The FB205 can be used for single axis, double axis modules or in CCD system mode.



EN-S7Profinet IndraDrive

1c. What do I use for what?

- Details and notes about the FB205 :
 - Connection Block for hardware configuration, see yellow.
 - Setting the decimal places of position setpoint and speed setpoint, see blue.
 - Setpoint in S7 Real, in drive DINT for control View parameter S-0-0282 Positioning setpoint in IndraWorks (parameter editor). 4 decimal places = 10000 rPosExponent.
 - Speed setpoint S-0-0259 Check decimal places.



EN-S7Profinet IndraDrive

1c. What do I use for what?

- Details and notes about the FB205:
 - With absolute encoders, the reference position is set via the signal control word Bit15.
 - In this way further commands (example, open holding brake) can be addressed via the block, must be extended accordingly (note ByteOrder).



DCAE_TIA_PN_DCP_CPU1515_STS_V04 ▶ PLC_2 [CPU 1515F-2 PN] ▶ PLC data types ▶ stSignalControlWord

Name	Data type	Default value	Accessible ...	Writa...	Visible in ...	Setpoint	Comment
Reserved0	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved1	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved2	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved3	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved4	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved5	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved6	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
SetAbsPos	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Set absolute position command
Reserved7	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved8	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved9	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved10	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved11	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved12	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved13	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved14	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Reserved15	Bool	false	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

Hint:
Byteorder High/Low – Byte twist!
Only binary (word) – parameters relevant (P4077,S145, P4078,S144).

IndraWorks Ds - Signal control word - Axis [1] Scale

Parameterization Commissioning Diagnostics Service Tools Help

Back ready for open PM OM

IndraDrive [1] Scale

- Overview
- Master communication
- Power supply
- Axis [1] Scale
 - Master communication - axis
 - Settings
 - Multiplex channel
 - Signal control word
 - Signal status word
 - Motor, drive mechanics, measuring systems
 - Limit values
 - Drive control
 - Operation modes / Drive Halt
 - Error reaction
 - Parameter set switching
 - SafeMotion (Not active, functionally enabled): default
 - Probe
 - Optimization / commissioning
 - Measuring encoder
 - Position switch
 - Local I/Os
 - Remote I/O

Status Target parameter Bit number

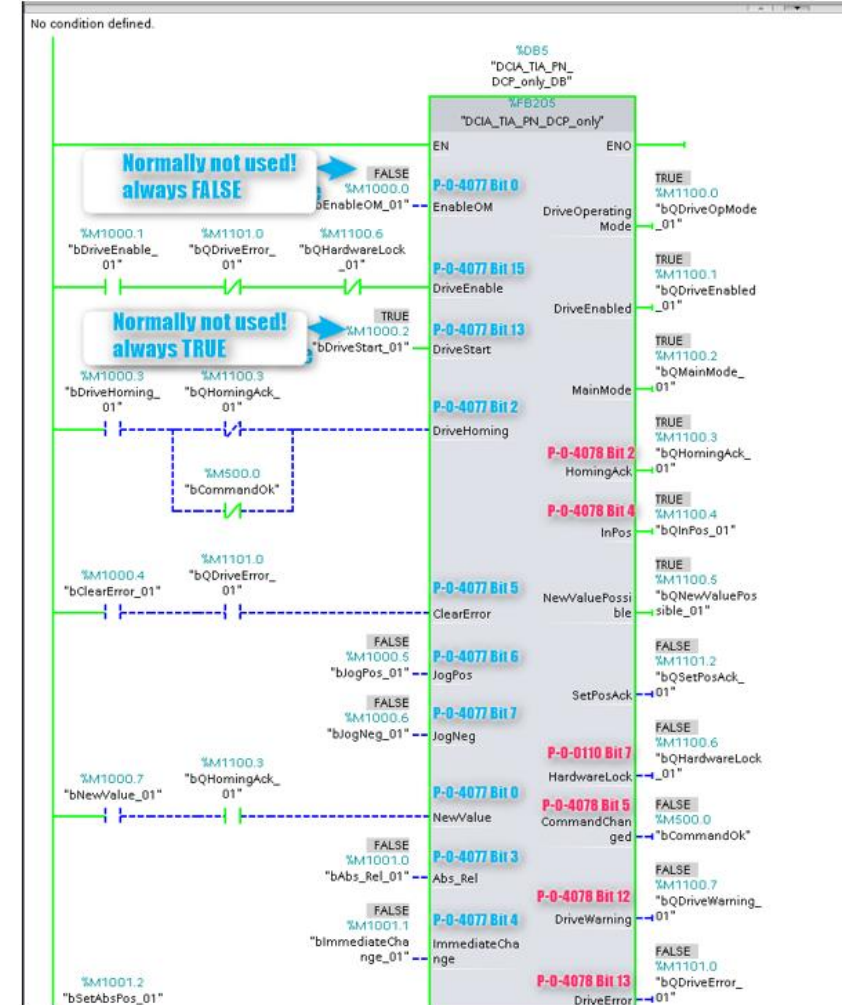
Bit 0	S-0-0000: <empty>	0
Bit 1	S-0-0000: <empty>	0
Bit 2	S-0-0000: <empty>	0
Bit 3	S-0-0000: <empty>	0
Bit 4	S-0-0000: <empty>	0
Bit 5	S-0-0000: <empty>	0
Bit 6	S-0-0000: <empty>	0
Bit 7	S-0-0000: <empty>	0
Bit 8	S-0-0000: <empty>	0
Bit 9	S-0-0000: <empty>	0
Bit 10	S-0-0000: <empty>	0
Bit 11	S-0-0000: <empty>	0
Bit 12	S-0-0000: <empty>	0
Bit 13	S-0-0000: <empty>	0
Bit 14	S-0-0000: <empty>	0
Bit 15	S-0-0447: C0300 Set absolute position procedure command	0

IndraDrive [1] Scale (192.168.0.1, S/IP)

EN-S7Profinet IndraDrive

1c. What do I use for what?

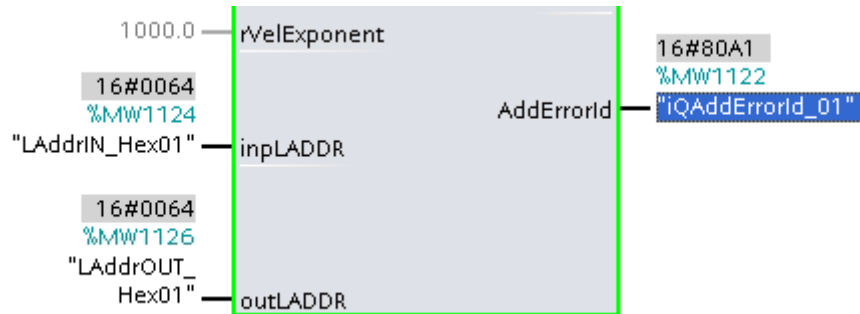
- Details and notes about the FB205 :
 - The main drive is controlled via parameter P-0-4077 Fieldbus control word.
 - The example interface does not take into account all status messages from the drive, can or must be extended.
 - The wiring of the DriveEnable in connection with "error-free" and "driver not locked" (HardwareLock) is a recommendation, especially in connection with safety technology.
 - Example wiring in conjunction with "Command Change Bit" is also important for the handshake to work properly.
 - For more information on connecting the block, see the example project.



EN-S7Profinet IndraDrive

1c. What do I use for what?

- Details and notes about the FB205 :
 - The FB output „AddErrorId“ shows the error of internal Siemens functions!
 - SFC14 bzw. SFC 15 CPU 3xx, interpret in HEX and use TIA help.
 - DPRD_Dat bzw. DPWR_Dat CPU 12xx, 15xx, interpret in HEX and use TIA help.

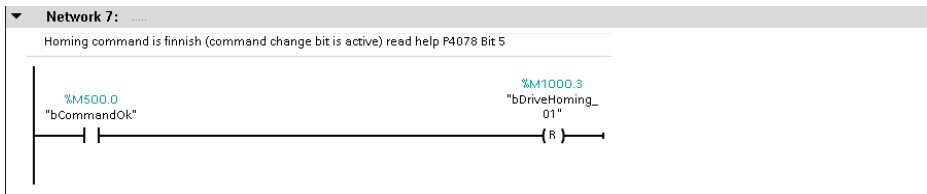


**ErrorID from Siemens system
function SFC14/15
(DPRD_Dat, DPWR_DAT),
check error code in Siemens
help!!**

DE-S7Profinet IndraDrive

1c. What do I use for what?

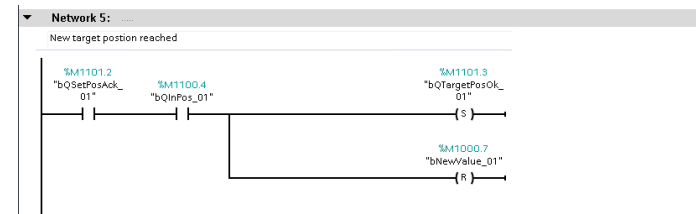
- Details and notes about the FB205 :
 - It contains a case sequencer that moves back and forth between two positions.
- Network 7, stops referencing.



Network 3:
Only an example!!! how can handle the positionning with this function bloc

```
1 CASE "iStep_01" OF
2   10: // Init step
3   IF NOT "bNewValue_01" AND NOT "bStartCycle_01" THEN
4     "iStep_01" := 11;
5     END_IF;
6
7   11: // First SetValue
8     "rPosCmd_01" := 5.45;
9     "rVelCmd_01" := 100;
10  IF "bQNewValuePossible_01" THEN
11    "bNewValue_01" := TRUE;
12    "iTimer_01" := 0;
13  END_IF;
14  // Acknowledge SetValue
15  IF "bQSetPosAck_01" THEN
16    "iStep_01" := 12;
17  END_IF;
18  12: // Wait till Setpoint reached
19  IF "bQInPos_01" THEN
20    "iStep_01" := 13;
21    "bNewValue_01" := false;
22  END_IF;
23  13: // Wait Time before start next SetValue
24    "iTimer_01" := "iTimer_01" + 1;
25  IF ("iTimer_01" > 5000) AND "bQNewValuePossible_01" THEN
26    "bNewValue_01" := true;
27    "rPosCmd_01" := 25.45;
28    "rVelCmd_01" := 55;
29    // Acknowledge SetValue
30    IF "bQSetPosAck_01" THEN
31      "iStep_01" := 14;
32    END_IF;
33  END_IF;
34  14: // Wait till Setpoint 2 reached
35    "iTimer_01" := 0;
36  IF "bQInPos_01" THEN
37    "bNewValue_01" := false;
38    "iStep_01" := 11;
39  END_IF;
40
41 END_CASE;
```

Variable	Address
"iStep_01"	%MW210
"bNewValue_01"	%M1000.7
"iStep_01"	%MW210
"rPosCmd_01"	%MD1010
"rVelCmd_01"	%MD1014
"bQNewValuePoss..."	%M1000.5
"bNewValue_01"	%M1000.7
"iTimer_01"	%MW212
"bQSetPosAck_01"	%M1101.2
"iStep_01"	%MW210
"bQInPos_01"	%M1000.4
"iStep_01"	%MW210
"bNewValue_01"	%M1000.7
"iTimer_01"	%MW212
"iTimer_01"	%MW212
"bNewValue_01"	%M1000.7
"rPosCmd_01"	%MD1010
"rVelCmd_01"	%MD1014
"bQSetPosAck_01"	%M1101.2
"iStep_01"	%MW210
"iTimer_01"	%MW212
"bQInPos_01"	%M1000.4
"bNewValue_01"	%M1000.7
"iStep_01"	%MW210



EN-S7Profinet IndraDrive

1d. What is the (small) parameter file for?

- Loading this parameter file describes the necessary interface parameters:

- The following parameters are relevant:

- P-0-4084 , P-0-4080 , P-0-4081
- S-0-0027 ,S-0-0329; S-0-0026 ,S-0-0328;
- S-0-0032 main operation mode
- helpful
- S-0-0446 , Helpful here to adjust default
- P-0-0171 , Helpful here to adjust default



FB205_ProfinetInterface.par

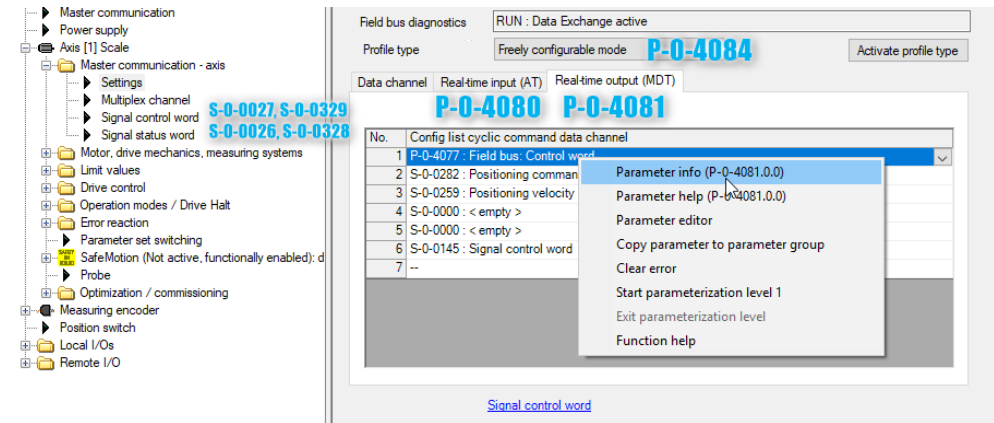
- Option parameter channel load this file:



AddParameterChannelProfinet.par

- How do I create my interface Par - File?

- Open parameter group in IndraWorks.
- Add desired parameters.
- Parameter group stored as .par File.



Parameter group - ParaGroupProfinetInterface.jpg

IDN	Name	#	Value	Unit	Comment
P-0-4089.0	Master communication: Protocol	4		--	
P-0-4083.0	Parameter channel: Configuration	0		--	
P-0-4074.0	Field bus: Data format	0b0000.0000.0000.0000		--	
P-0-4084.0	Application: Profile type	0xFFFF		--	
P-0-4080.0	Field bus: Config. list of cyclic actual value data ch.	0	P-0-4078	--	
P-0-4081.0	Field bus: Config. list of cyclic command value data ch.	0	P-0-4077	--	
S-0-0026.0	Configuration list for signal status word	0	S-0-0000	--	
S-0-0328.0	Assign list signal status word	0	0	--	
S-0-0027.0	Configuration list for signal control word	0	S-0-0000	--	
S-0-0329.0	Assign list signal control word	0	0	--	
S-0-0446.0	Ramp reference velocity for acceleration data	10.000		mm/min	
P-0-0171.0	Drive optimization, velocity	10.000		mm/min	

EN-S7Profinet IndraDrive

1e. How do I extend a function module?

- Recommendation: Copy block and data type and name it as application block.
- Individual bits can be extended via the signal control word (signal status word):
 1. Adjust the data type.
 2. Parameterize corresponding bit (function).
 3. In the block Add input (output).
 4. Use the bit in the block accordingly.
- Add further parameters of the interface :
 1. Expand hardware configuration.
 2. Adjust the data type.
 3. In the block Add input (output).
 4. Use new value in the block accordingly.
 5. Add parameters to IndraWorks.

EN-S7Profinet IndraDrive

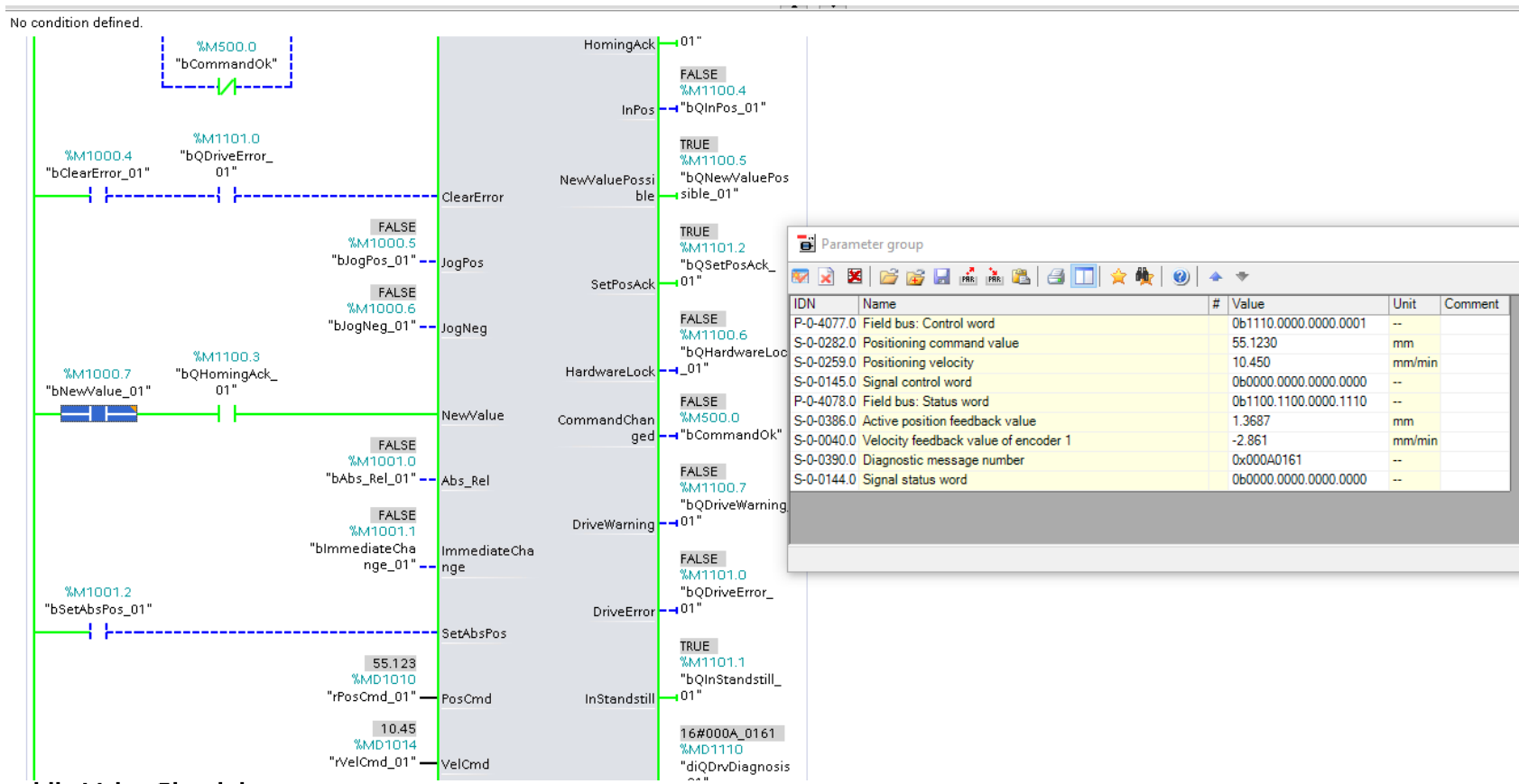
1f. Interface test, notes before automatic operation

- Before you move the axis for the first time, the following should be done or checked:
 1. Drive controller commissioning carried out
 - Scaling, units, gears (number of decimal places, etc.) is parameterized.
 - Limit values are meaningfully parameterized (recommendation Activate position limit values).
 - Torque limits are parameterized (protection of the mechanics).
 - Axis is referenced or type of referencing is clear.
 - Axis moves correctly via setpoint box or Easystartup.
 2. Check interface between S7 and IndraDrive.
 - Best use parameter group to check interface parameters.
 - It is important that the decimal places of the setpoints fit and that one starts on both sides of the same unit.
 - First tests with jogging function.

EN-S7Profinet IndraDrive

1f. Interface test, notes before automatic operation

Parameter group for commissioning makes sense.



ParaGroupProfinetInterfaceWatchlistValueCheck.ipg

EN-S7Profinet IndraDrive

1g. Where can I get the drive error message list?

There is a file for each drive firmware that provides all operating states errors, warnings, etc. as a CSV or XML file.

Please sign this disclaimer and send the request to the following address:

- helpdesk.service@boschrexroth.de

Hint: mask bit 20 in program !!

(bit 20 give the state of the diagnostic S-0-0390).

If this bit is masked then all messages of the list works correct with the diagnostic number of S-0-0390.

Erklärung zur Weitergabe von produktbeschreibender Information in elektronischer Form

Der Empfänger ist lediglich zur Vornahme von Formatierungsänderungen an der Datei / dem Datensatz befugt.
Schutzvermerk DIN 34 ist zu beachten.
Der Empfänger hat sich fortwährend über den neuesten Stand der Dateiversion bei Bosch Rexroth AG zu informieren.
Ferner stellt der Empfänger Bosch Rexroth AG von allen Ansprüchen Dritter und allen Rechtsverfolgungskosten frei, die auf von ihm an der übermittelten Datei vorgenommenen Inhalt- und oder Formatierungsänderungen beruhen.
Der Empfänger trägt für sämtliche von ihm vorgenommenen Änderungen die alleinige Verantwortung.
Dem Empfänger wird die Nutzung der in der Datei aufgeführten Marke ausdrücklich untersagt.
Daten dürfen nur im Zusammenhang mit von Bosch Rexroth AG gelieferten zugehörigen Komponenten verwendet werden.
Widernut wird vorbehalten.
Jede weitere Nutzung bedarf der vorherigen schriftlichen Zustimmung seitens Bosch Rexroth AG.
Für den Fall der Zweckerhandlung wird die Geltendmachung von Schadensersatzansprüchen ausdrücklich vorbehalten.

Datum, Unterschrift des Empfängers

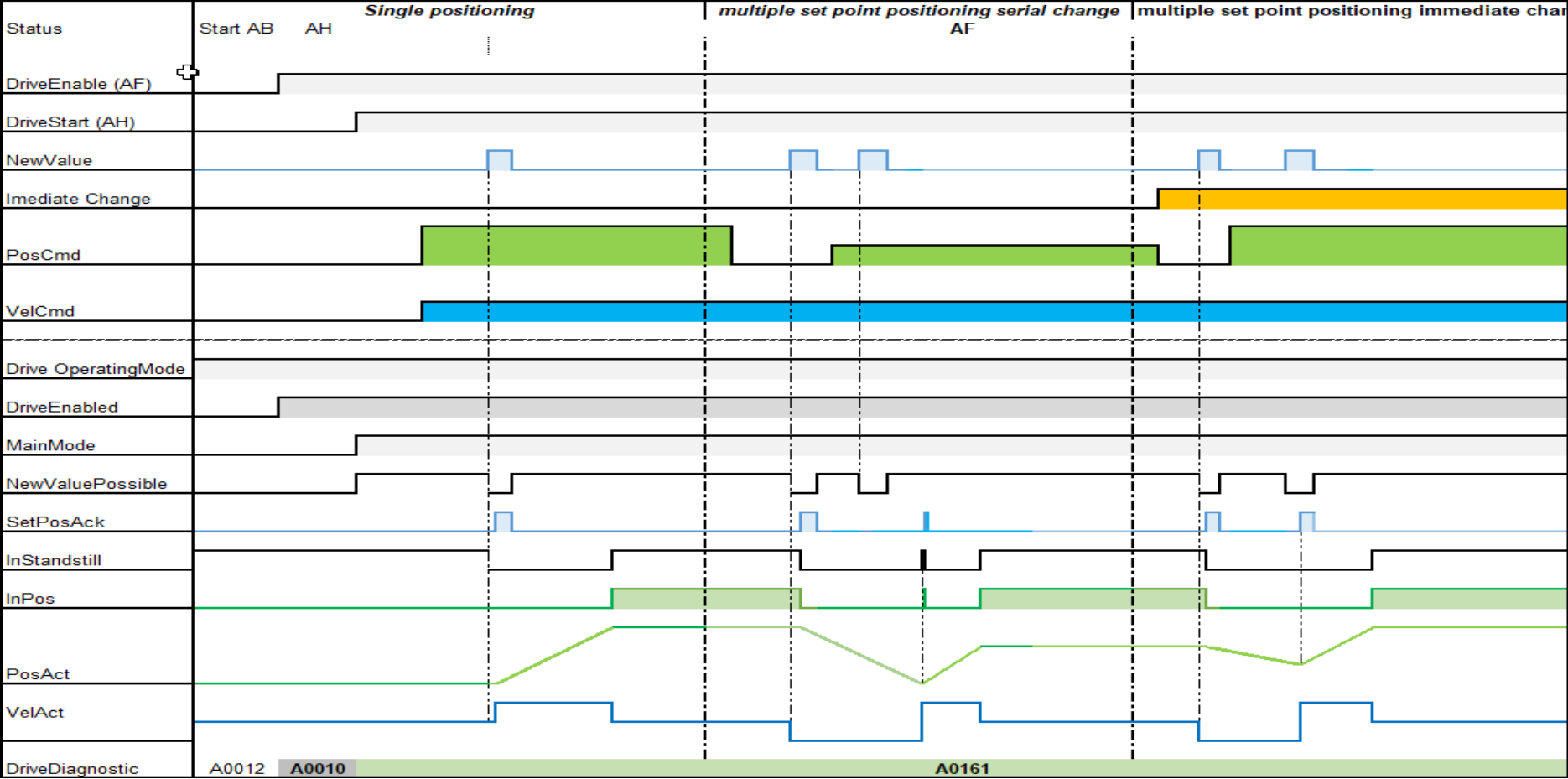
EN-S7Profinet IndraDrive

1h. Interface description, function bloc

Var_Input	Variable name	Data Type	Drive parameter	Description
	Enable OM	Bool	P-0-4077 Bit 1	Enable drive to move to OM, PM -> OM
	Drive Enable	Bool	P-0-4077 Bit 15	Command to power ON the drive. Drive switches to "AH" mode.
	Drive Start	Bool	P-0-4077 Bit 13	Drive in operation. Drive switches to "AH" -> "AF" mode.
	Drive Homing	Bool	P-0-4077 Bit 2	Drive controlled homing procedure starts at rising edge.
	Clear Error	Bool	P-0-4077 Bit 5	Drive error acknowledgement command start at rising edge.
	JogPos	Bool	P-0-4077 Bit 6	Endless Jog motion in the positive direction.
	JogNeg	Bool	P-0-4077 Bit 7	Endless Jog motion in the negative direction.
	New Value	Bool	P-0-4077 Bit 0	New command values are accepted by drive at the rising edge of this input.
	Abs Rel	Bool	P-0-4077 Bit 3	Position Command value type, 0 - Absolute ; 1 - Relative
	ImmediateChange	Bool	P-0-4077 Bit 4	New command values are accepted immediately if this input is TRUE.If false, command will be taken over after current movement is completed
	Second Operationmode	Bool	P-0-4077 Bit 8	Activate the Second operation mode in the Drive.
	SetAbsPos	Bool	S-0-0145 Bit 15	Set absolute position command.
	PosCmd	Real	S-0-0282	Position Command Value.
	VelCmd	Real	S-0-0259	Velocity Command Value
	inLAddr	HW IO		Hardware identifier of sub module
	outLAddr	HW IO		Hardware identifier of sub module
Var_Output	DriveOperationMode	Bool	P-0-4078 Bit 0/1	Drive is ready for operation..0 - PM ; 1 – OM
	Drive Enabled	Bool	P-0-4078 Bit 14/15	Drive Powered ON (with torque).
	MainMode	Bool	P-0-4078 Bit 8/9	Primary Operating mode active and drive follows the command value.
	HomingAck	Bool	P-0-4078 Bit 2	Drive is referenced.
	InPos	Bool	P-0-4078 Bit 4	Last position command has been reached. Drive In Position.
				Drive is ready for new command value. Command values can be accepted with rising edge of New_Value input.This does not indicate that the new command values will be taken for control. That depends of the command "IMMEDIATE CHANGE" or last command completed.
	NewValuePossible	Bool		
	SetPosAck	Bool	P-0-4078 Bit 10	Position set point is taken by the drive
	DriveStatusMessage	Bool	P-0-4078 Bit 11	Drive has a new information message.
	DriveWarning	Bool	P-0-4078 Bit 12	The bit is set if a class 2 diagnostics warning is present.
	DriveError	Bool	P-0-4078 Bit 13	The bit is set if a class 1 diagnostics error is present (drive lock-out).
	InStandstill	Bool	P-0-4078 Bit 3	Drive is in Standstill Actual Velocity < Velocity Window
	DriveDiagnostic	Dword	S-0-0390	Drive Diagnostic
	PosAct	Real	S-0-0386	Actual position
	VelAct	Real	S-0-0040	Actual velocity
	AddErrorID	Dword		Siemens Errorcode, see Help SFC 14/15 or DPRD Dat/DPWR Dat

DE-S7Profinet IndraDrive

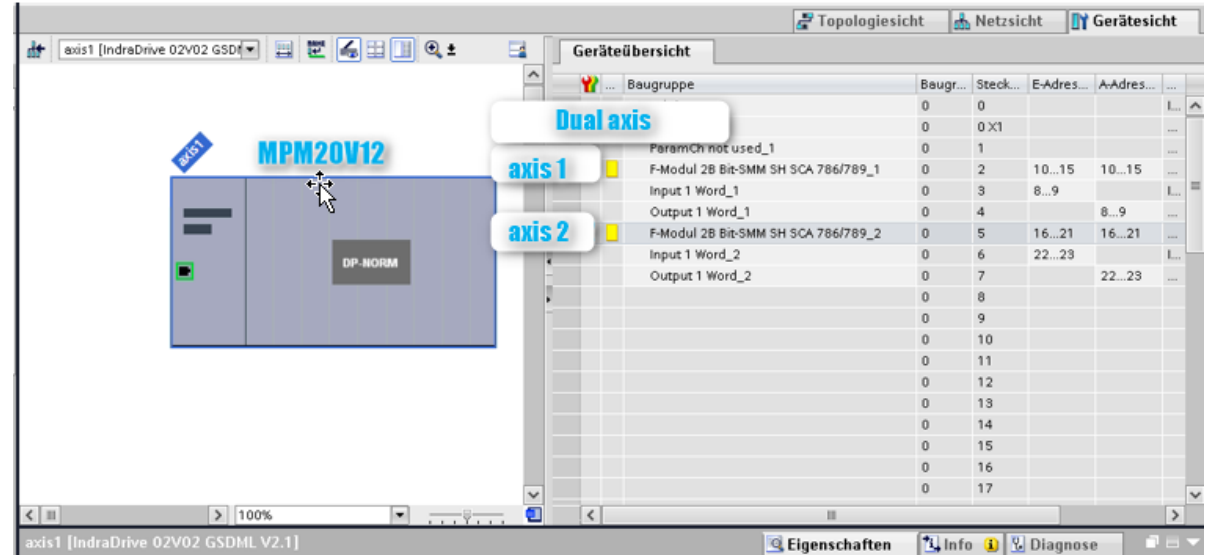
1i. Time diagram drive controlled positioning



EN-S7Profinet IndraDrive

2. Hint Dual drive controller with Profinet

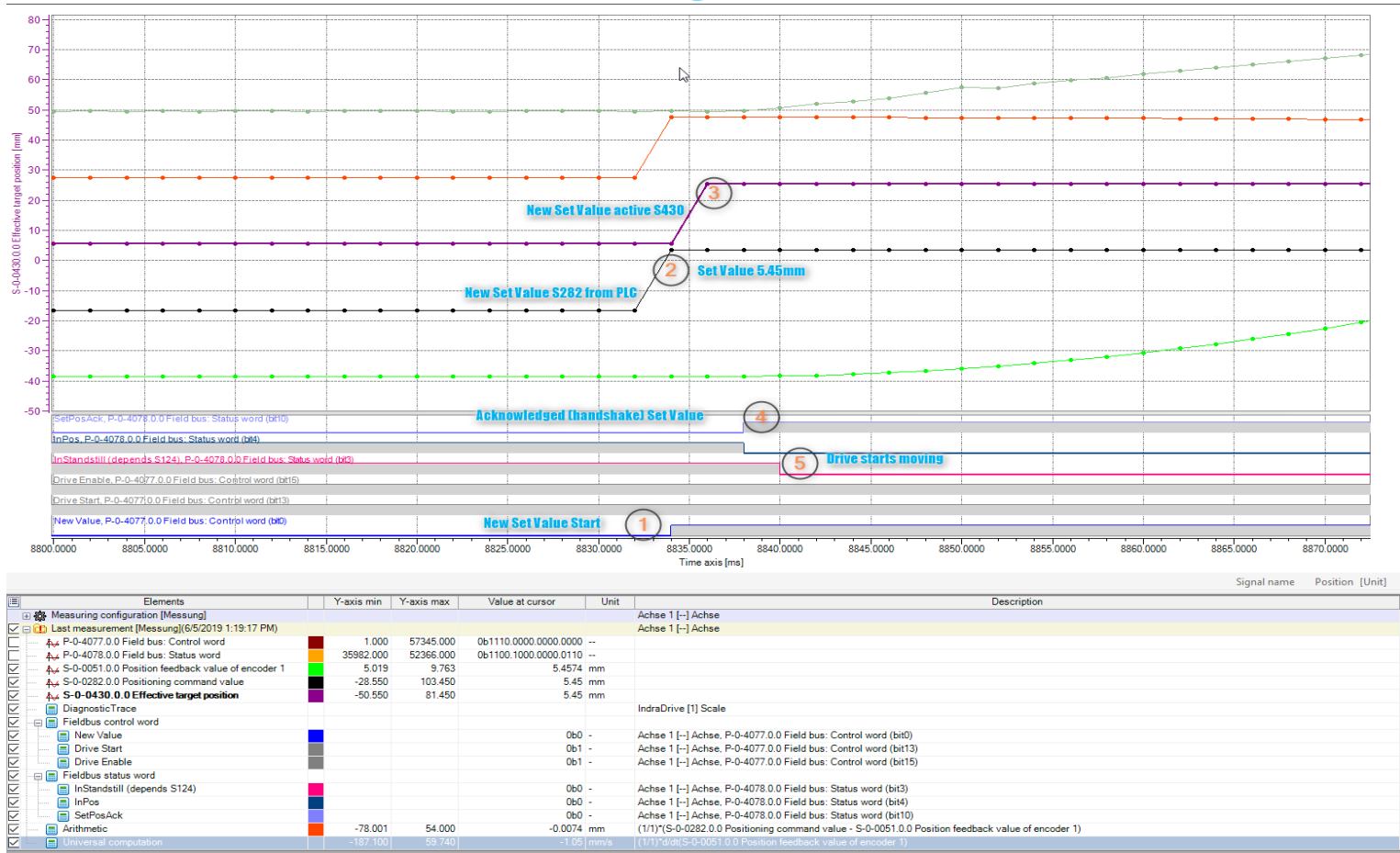
- Double-axis modules are supported as of MPM18VRS firmware.
- PROFIsafe on PROFINET as of MPM20VRS
- Master-side configuration:
 - Each axis has an F-, input- and output-module.
 - Thus each axis has its own address range.
 - The FB 205 is thus used once each axis.



EN-S7Profinet IndraDrive

3. Attachment, Oscilloscope positioning starts

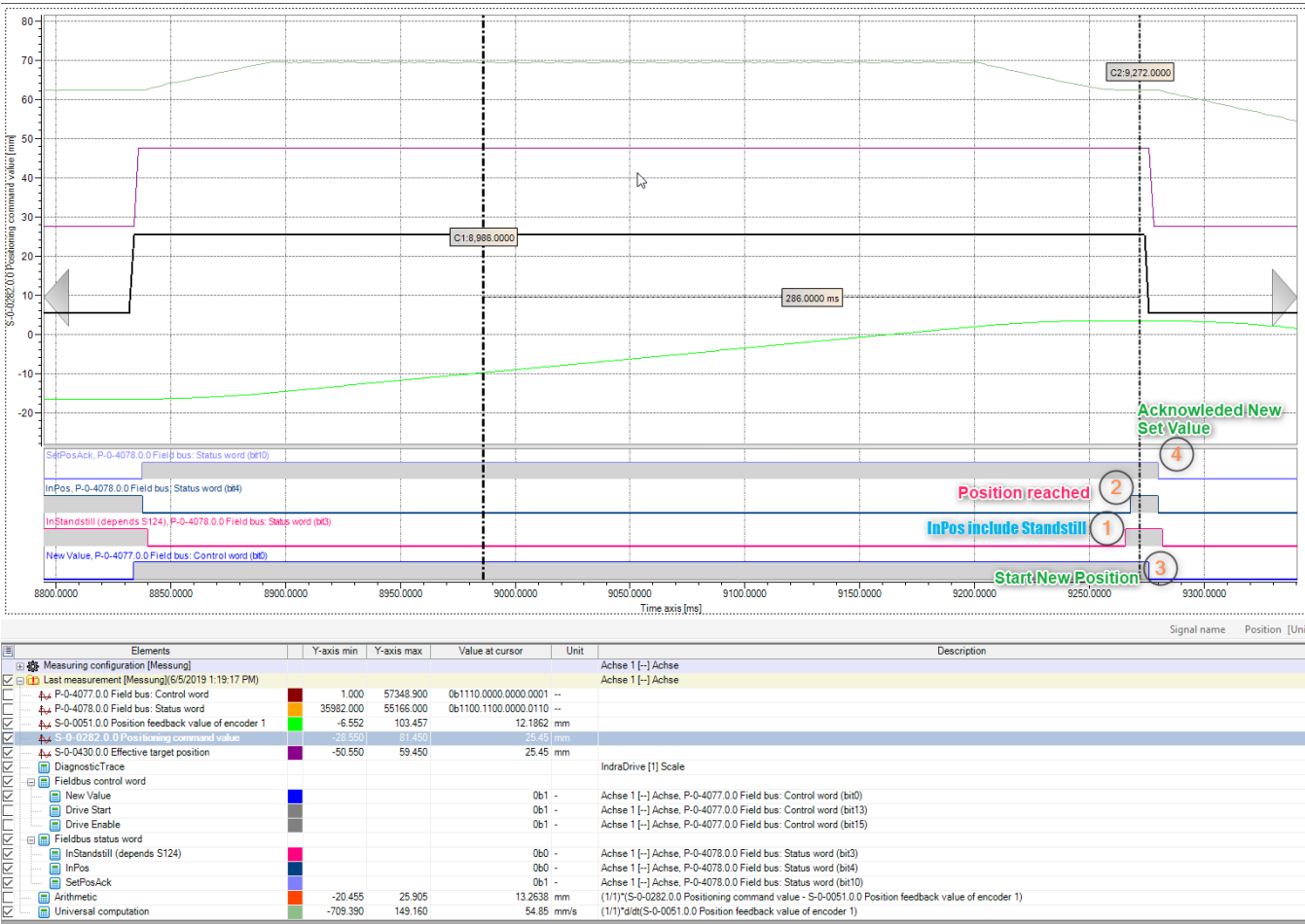
Result of handshake in the example project.



EN-S7Profinet IndraDrive

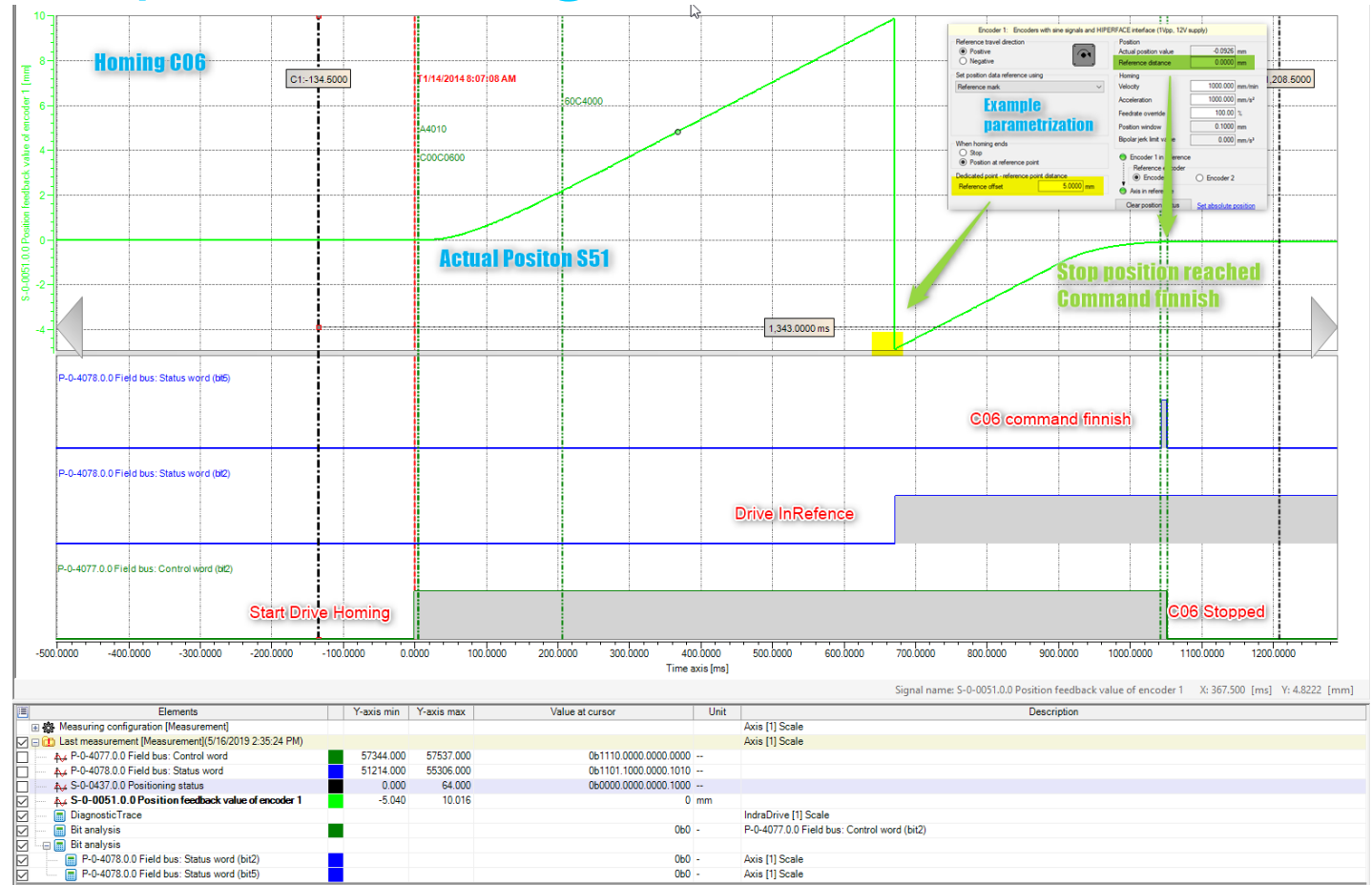
3. Attachment, Oscilloscope positioning ends

Result of handshake in the example project.



3. Attachment, Oscilloscope referencing.

Result of handshake in the example project.



EN-S7Profinet IndraDrive

3. Attachment, Oscilloscope positioning stop

Control of the positioning stop via both jog bits.

