

# SIMOTION

## Frequently asked Questions

**Hydraulic Axis with SIMOTION D410**

(Use of the Onboard Encoder Interface without Power Unit PM340)

**SIEMENS**

## FAQ SIMOTION D410

Project subject to technical modifications.

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## FAQ SIMOTION D410

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## FAQ SIMOTION D410

e.g.:

- with the training or instruction or authorization to switch on and off, ground and label electrical circuits and equipment according to the technical safety standards.
- with the training or instruction in the care and use of appropriate safety equipment according to the technical safety standards.
- with training in first aid.

Warnings are not given explicitly in this documentation but there is express reference to the warnings in the operating manual for the respective product.

### **Note on export identification**

AL: N

ECCN: N

FAQ SIMOTION D410

## Table of Contents

1	Question .....	6
2	Solution .....	6
3	Demo project .....	11
	Annex.....	15
4	Revisions .....	15
5	Contact .....	16

## FAQ SIMOTION D410

### 1 Question

How can a hydraulic axis without a power unit be controlled with a SIMOTION D410 whilst still using the existing sensor interface?

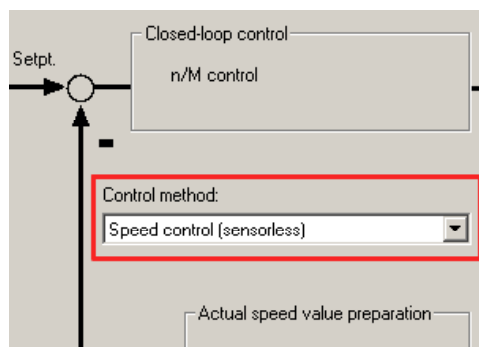
### 2 Solution

The following steps must be carried out:

(Description refers to the SIMOTION version V4.1 SP1)

1. Use SIMOTION SCOUT to create a new project with a SIMOTION D410 and then parameterize the drive offline in SINAMICS Integrated as follows:

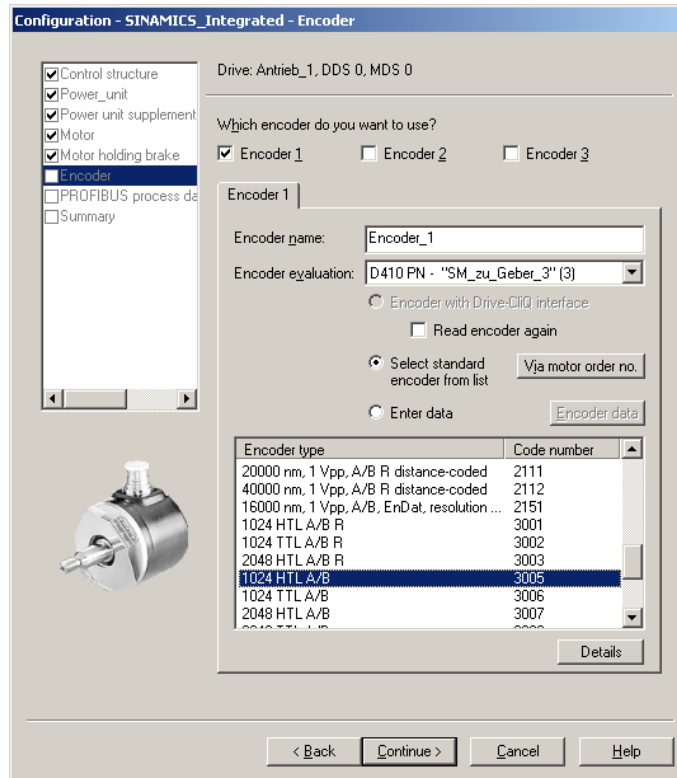
- Servo axis
- Sensorless speed control



- Select any power unit (e.g. 6SL3120-1SE11-3Uxx)
- Select the first 1FK7 motor from the list for example as a motor
- Without parking brake
- Either parameterize the encoder used for the hydraulic control manually or select a sensor from the list.

## FAQ SIMOTION D410

Example for a 1024 HTL encoder via onboard interface of the D410:

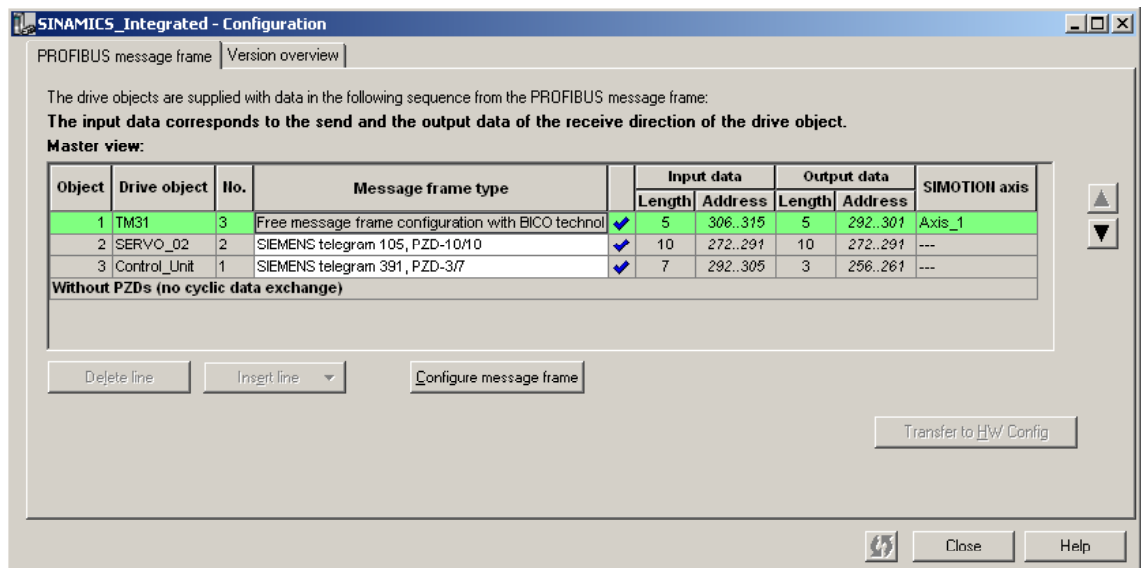


- Select SIEMENS telegram 105 for example as a telegram type
- Then deactivate the power unit of the axis in the expert list of the drive with p125 = 0.

Parameter	D	+	+	Parameter text	Value SERVO_02	Unit	Modifiab	Acc	Minimu	Maximu
p124[0]	P			Power unit detection vi	0		Operation	2	0	1
p125[0]	P			Activate/de-activate po	De-activate compon		Ready to	2		
r126[0]	P			Power unit component	Component inactive (0)			2		
r127[0]	P			Power unit version EP	0			3		
r128[0]	P			Power unit, firmware v	2503200			3		
p130				Number of Motor Data	1		Commissi	2	1	16
p139[0]		+		Copy Motor Data Set M	0		Commissi	2	0	31
p140				Number of Encoder Dat	1		Commissi	2	1	16

2. Insert the Terminal Module TM31 in the input/output components
3. The input and output address range must be defined for the Terminal Module TM31 in the configuration mask for the PROFIBUS telegram. A length of 5 (= 5 words) must be defined for the input and output range. The telegram 391 can be selected for the onboard inputs and outputs of the CU. Then the configuration must be compared with the HW Config with the "Transfer to HW Config" button.

## FAQ SIMOTION D410



- For the TM31 the value r2050[0] IF1 PZD1 must be parameterized in p4071 (analog output signal source).

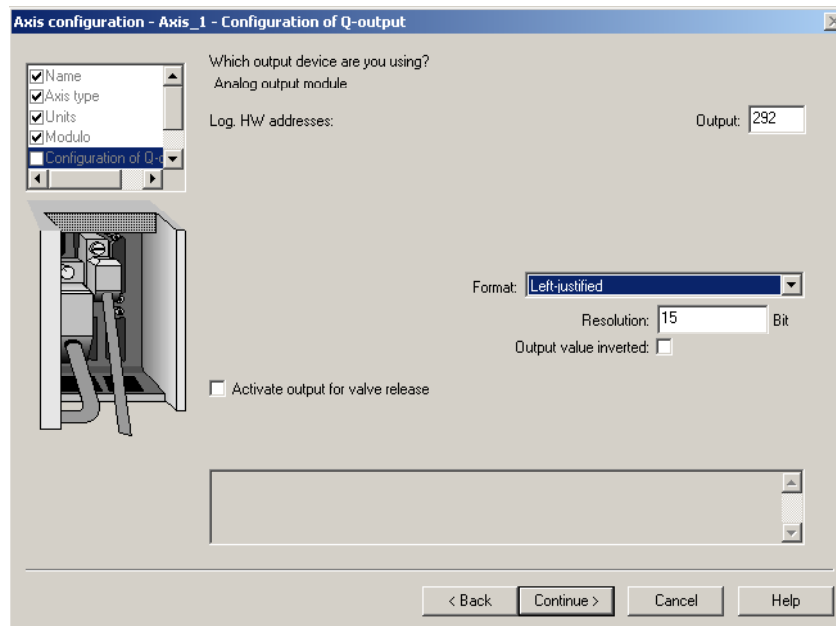
Parameter	D	+	Parameter text	Value TM31	Unit
p4069[0]		+	TM31 analog inputs, signal source for enable, AI 0 (	1	
p4071[0]		+	TM31 analog outputs, signal source, AO 0 (X522.1,	TM31 : r2050[0]	
r4072[0]		+	TM31 analog outputs, output value actually referred	0.00	%
p4073[0]		+	TM31 analog outputs, smoothing time constant, AO	0.0	ms
r4074[0]		+	TM31 analog outputs, actual output voltage/current,	0.017	
p4075[0]		+	TM31 analog outputs, activate absolute value gener	No absolute value generation (0)	

- Then the TO axis can be configured as a hydraulic axis:
  - The axis is speed and position controlled.
  - Hydraulic axis, Q-valve, standard control

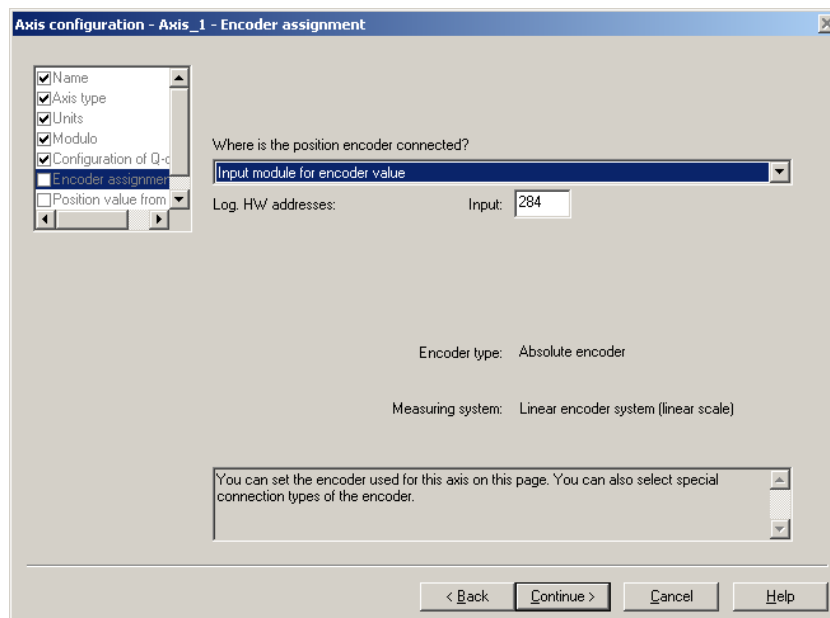


## FAQ SIMOTION D410

- The start HW address of the TM31 module must be specified for the first analog output (channel 0) in the mask for the Q-valve. → Address 292 in the example



- The “Input module for encoder value” must be selected in the encoder selection mask. The HW address for the encoder position actual value must be specified as an input address (for telegram 105 and start address 272 this is the address from PZD7 → address 284)



- The number of useful bits must be changed to 31 because the position actual value is a double word. The minimum and maximum raw value

## FAQ SIMOTION D410

as well as factor and offset can be adapted as required (a factor of  $1.0e-005$  is used for the example)

6. After configuration of the TO axis has been completed, the project can be saved and loaded into the target system.

There is a small demo project for the FAQ which is explained below.

### 3 Demo Project

Used SIMOTION version: V4.1 SP1

Used hardware: SIMOTION D410 PN

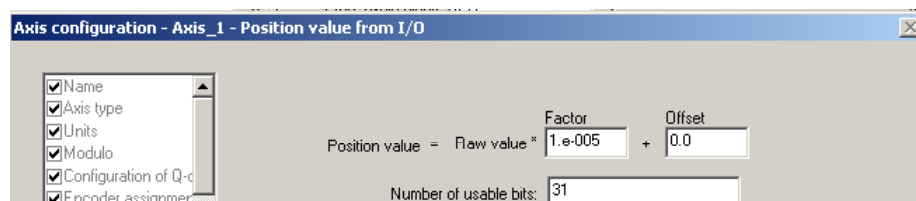
The travel of the hydraulic axis must be “simulated” by turning the encoder by hand for the following demo project.

To make this possible at all "without technological errors (e.g. dynamic following error monitoring), various values must be adapted (adaptation may be dependent on the encoder used, a 1024 HTL encoder was used in the example.)

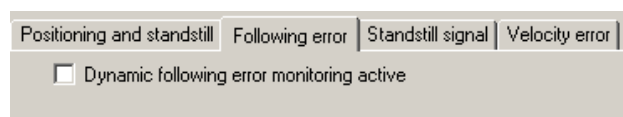
**The suggested values are suitable for a simulation – the values must be adapted application-specifically for a real hydraulic axis.**

#### Settings for simulation:

1. Set factor for encoder from 1.0 to 1.e-005.

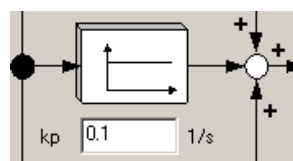


2. Deactivate dynamic following error monitoring.



3. Reduce gain of the P-proportion  $k_p$  from 10 to 0.1

(Reduction is necessary because otherwise the controller sets the positioning value too fast and the travel cannot be simulated fast enough by turning the encoder)



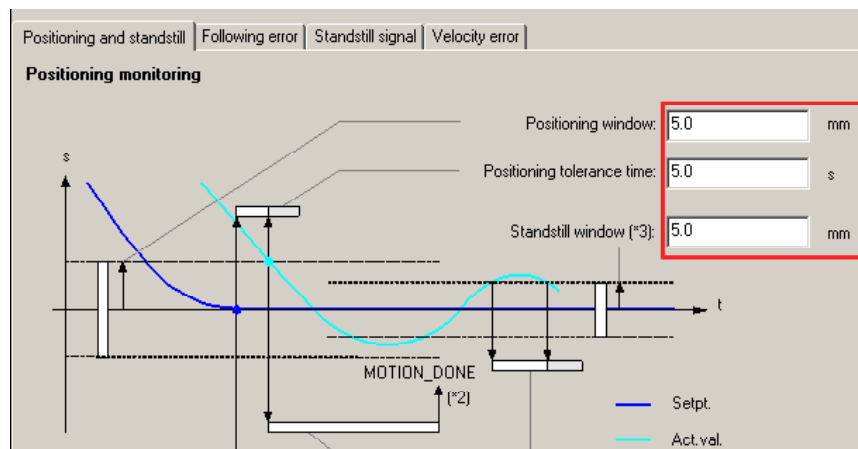
## FAQ SIMOTION D410

### 4. Set monitors “more generously” in the value range

Position window: 5.0 mm

Positioning tolerance time: 5 s

Standstill window (\*3): 5 mm



## FAQ SIMOTION D410

### Simulation:

The program is controlled by a watch table:

Control:								
	Name	Plain text	I/O address	Data type	Unit	Status value	Display	Control value
1	D410_to_Axis_1_sensordata[1].position	Absolute actual value		LREAL	mm	49.848	DEC	
2	D410_to_Axis_1_sensordata[1].incrementalposition	Measuring system increments		DINT	-	4984832	DEC	
3	D410_to_Axis_1_positioningstate.actualposition	Actual position of axis		LREAL	mm	49.848	DEC	
4	D410_to_Axis_1_positioningstate.commandposition	Set position of the axis		LREAL	mm	50.0	DEC	
5	D410_to_Axis_1_positioningstate.differencecommandtoactual	Difference between the setpoint		LREAL	mm	0.151	DEC	
6	D410.programm_step			INT		3	DEC	3
7	D410_to_Axis_1.control	Operational status		'enumactiveln	-	active	TEXT	
8	D410.analog_output		PGW 292	INT		0	DEC	
9								

There are 4 program steps which can be called by entering "1, 2, 3 and 4" and then "Control immediately".

#### Step 1:

Activate control by PLC

#### Step 2:

Switch QF axis release

#### Step 3:

Start positioning;

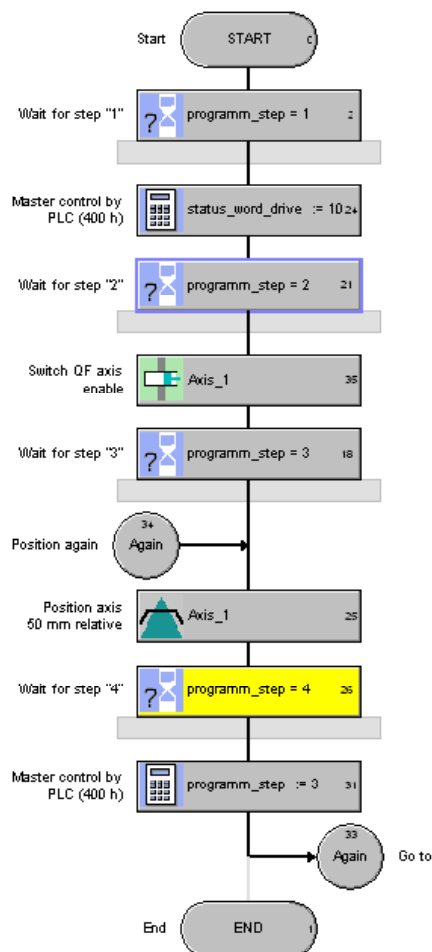
The axis is positioned relative to 50 mm, the variable D410.analog.output represents the positioning value. The encoder must be turned in positive direction for a positive positioning value.

The smaller the difference "ACTUAL- / NOMINAL position", the smaller the manipulating variable at the analog output.

If the encoder is turned too fast in positive direction, the manipulating variable may also become negative.

#### Step 4:

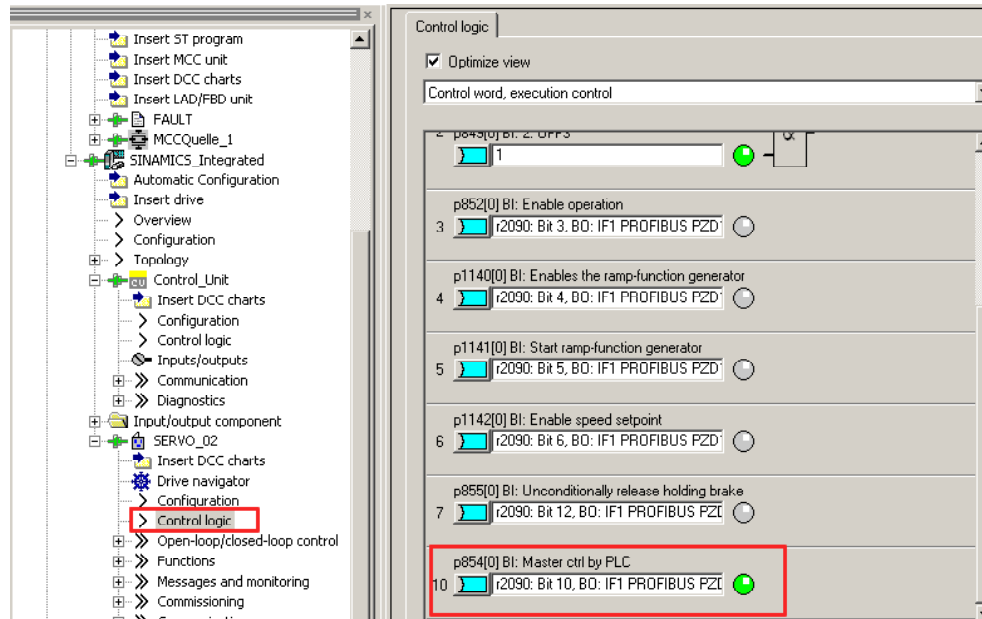
Repeat the positioning procedure. Step 3 is called again and the axis moved 50 mm again (relative positioning).



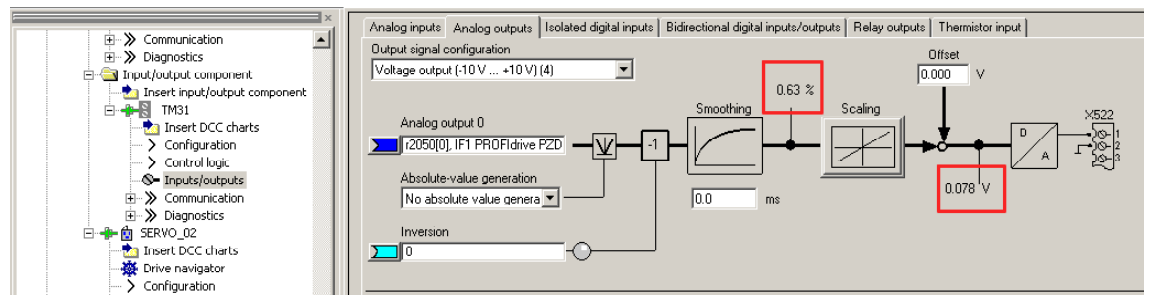
## FAQ SIMOTION D410

### Miscellaneous:

The control by the PLC is activated with step 1.



The analog value output of TM31 can also be observed under TM31.



## Annex

### 4 Revisions

Table 4-1: Revisions/Authors

Version	Date/Revision
V0.1 (1 <sup>st</sup> edition)	12/2007 / A&D MC PM SP
V1.0	18.01.2008 / A&D MC PM SP

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## 5 Contact

*Application Center*

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