



FAQ-0FCH9454 • 12/2015

# V90 controlled by EM253

SINAMICS V90, SIMATIC S7-200

---

This entry is from the Siemens Industry Online Support. The general terms of use ([http://www.siemens.com/terms\\_of\\_use](http://www.siemens.com/terms_of_use)) apply.

**Security information**

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, solutions, machines, equipment and/or networks. They are important components in a holistic industrial security concept. With this in mind, Siemens' products and solutions undergo continuous development. Siemens recommends strongly that you regularly check for product updates.

For the secure operation of Siemens products and solutions, it is necessary to take suitable preventive action (e.g. cell protection concept) and integrate each component into a holistic, state-of-the-art industrial security concept. Third-party products that may be in use should also be considered. For more information about industrial security, visit <http://www.siemens.com/industrialsecurity>.

To stay informed about product updates as they occur, sign up for a product-specific newsletter. For more information, visit <http://support.industry.siemens.com>.

## Table of contents

<b>1</b>	<b>Overview .....</b>	<b>3</b>
<b>2</b>	<b>Device conditions .....</b>	<b>4</b>
<b>3</b>	<b>EM253 Brief .....</b>	<b>5</b>
<b>4</b>	<b>Operation Guide.....</b>	<b>6</b>
4.1	V90 Parameterization.....	6
4.1.1	Introduction of main parameters: .....	6
	(1) Electronic gear ratio .....	6
	(2) Pulse form .....	7
4.2	EM253 position control by using position Wizard .....	8

# 1 Overview

SINAMICS V90 can be applied in position control when combined with SIMATIC S7-200. There are 3 methods as below:

Configuring S7-200 CPU Pulse Train Output (PTO) function of Q0.0 and Q0.1 in STEP7 Micro/WIN "Position wizard" to control V90 to realize position control.

Using "MAP SERV" Library Function Block, make Q0.0 and Q0.2 or Q0.1 and Q0.3 output pulse train to control V90 to realize position control.

Using EM253 Position Block, Configure EM253 and motion profile by Wizard in STEP7 Micro/WIN, to realize position control.

This document will show you the steps of using an EM253 to control a V90 via PTI.

Quantity of extended EM253 from S7-200 depends on CPU's ability. According to the difference of CPU type, a group of extended EM253 from CPU can be used for controlling maximum 7 V90s. Table 1-1 indicates max. number of EM253 extended by CPU.

Table 1-1 max. number of EM253 extended by CPU

TYPE OF CPU	NUMBER OF EM253
CPU 221	0
CPU 222	1
CPU 224 ( XP	3
CPU 226	5

## 2 Device conditions

Software and hardware of S7-200:

Hardware:

- PC
- A PC/PPI cable with USB port (MLFB: 6ES7901-3DB30-0XA0)
- S7-200 PLC CPU and EM253 position module (EM253 MLFB: 6ES7 253-1AA22-0XA0)
- V90 (MLFB: 3210-5FE10-4UA0) and Motor (MLFB: 1FL6042-1AF61-0AG0)

Software:

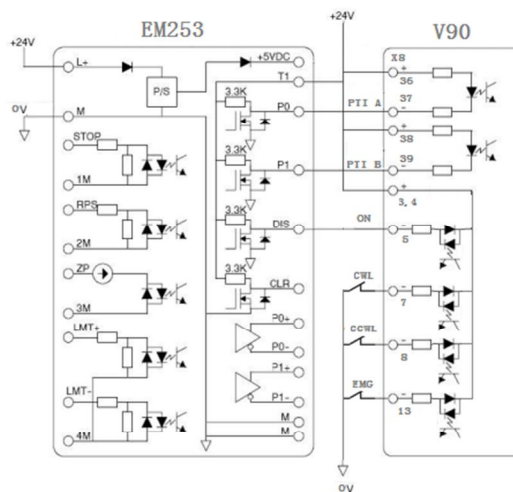
STEP7 Micro/WIN V4 SP6

Connection between EM253 and V90:

Connect the power cable and encoder cable to U/V/W and X9 on V90. Refer to Operating Instructions of V90 if necessary.

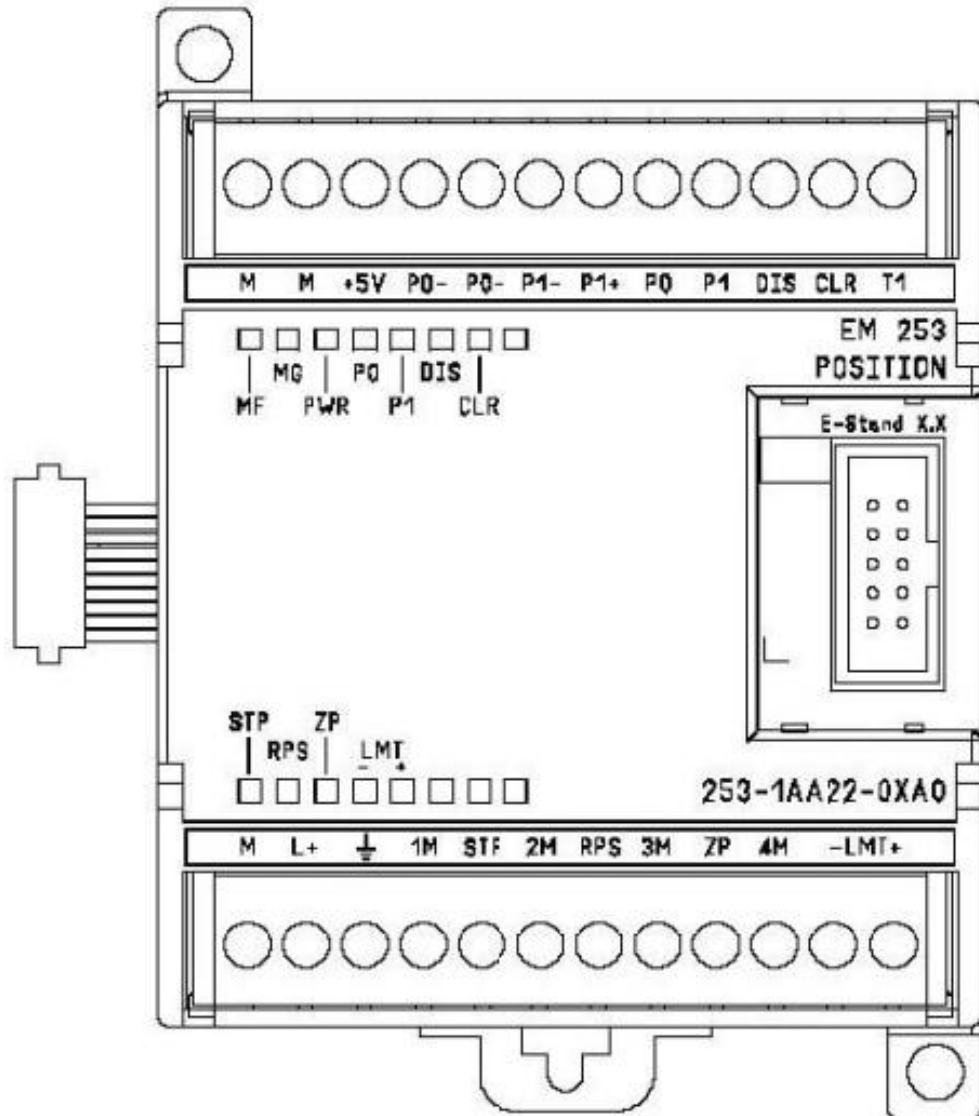
The controlling signals between EM253 and V90 can be connected like diagram below:

Figure 2-1 Controlling signals connection between EM253 and SINAMICS V90



### 3 EM253 Brief

Figure 3-1 EM253 sketch



Position Module EM 253 integrates:

5 DI (STP, Stop; RPS, Reference switch; ZP, Zero pulse signal; LMT+, Forward limitation switch; LMT-, Backward limitation switch)

6 DO (4 signals : DIS , CLR , P0 , P1 , or P0+, P0- , P1+ , P1-),

Applying in positioning system of S7-200, V90 connected to servo motor can be controlled with high speed PTI, and realize the speed control and position control. Communication with CPU can be established via the extension interface.

It is easy to use the EM253 in position control. STEP 7-Micro/Win provides a wizard for EM253 position control. Operation can be completed in a few minutes. It is saved in S7-200 PLC's V area. Meanwhile, STEP 7-Micro/Win provides a friendly interface for positioning commissioning and monitoring (EM 253 Control panel).

## 4 Operation Guide

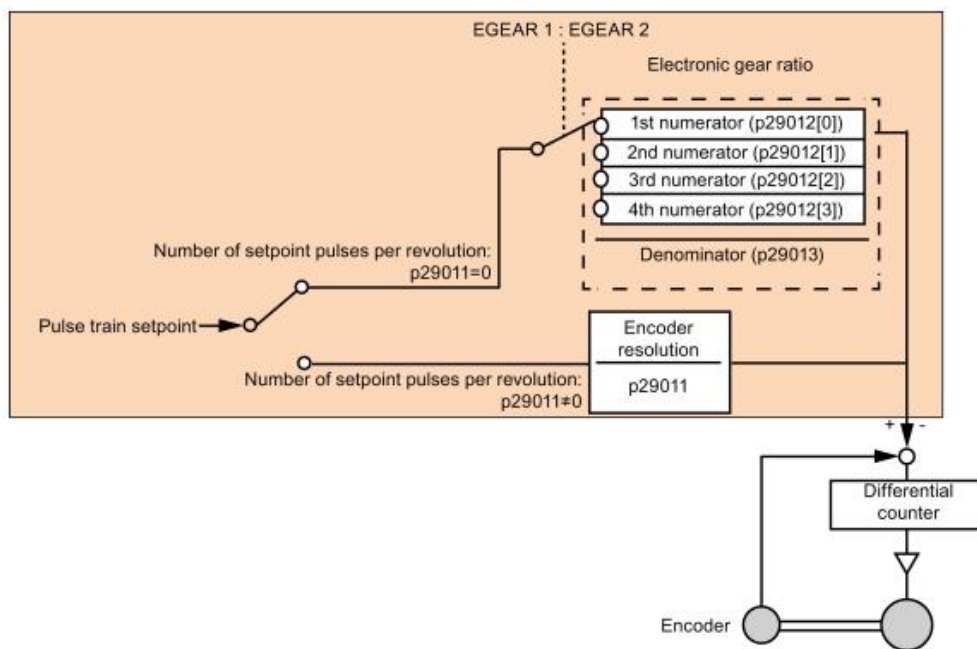
### 4.1 V90 Parameterization

#### 4.1.1 Introduction of main parameters:

##### (1) Electronic gear ratio

SINAMICS V90 supports gear ratio setting. Gear ratio is used for pulse set-point multiplication factor. It is realized by numerator and denominator. There are two methods:

Figure 4-1 V90 electronic gear ratio



Method 1:

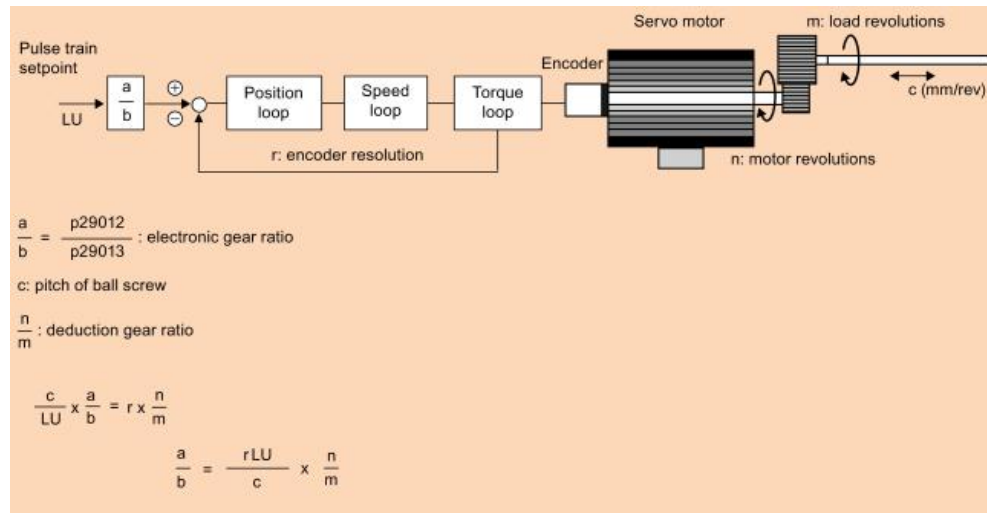
$P29011=0$  (Setting pulse number per revolution expected), Electronic gear ratio =  $P29012/P29013$ .

Method 2:

$P29011 \neq 0$ , Electrical gear ratio = Encoder resolution /  $P29011$ .

Formula for electronic gear ratio calculation:

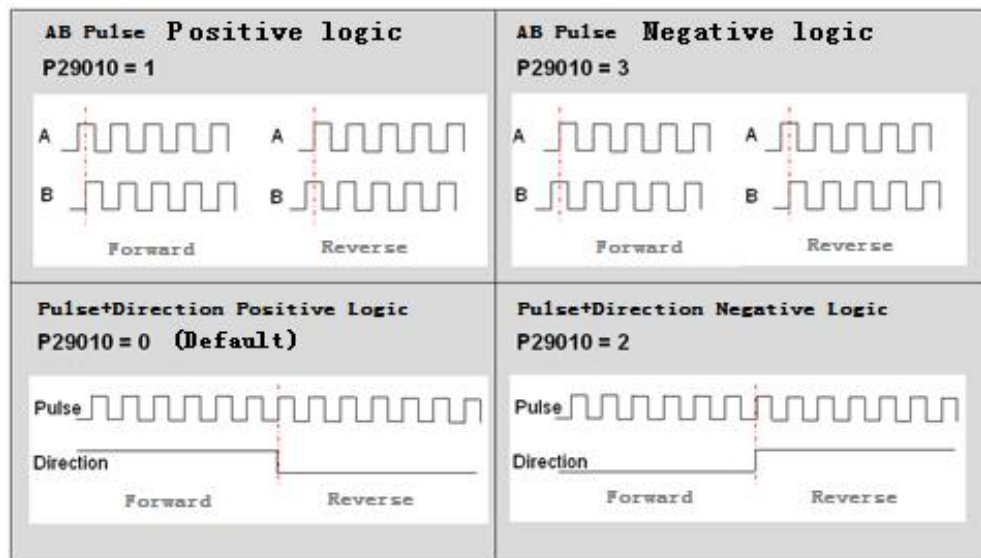
Figure 4-2 Electronic gear ratio calculation



**(2) Pulse form**

SINAMICS V90 accepts two forms of pulse: A/B trains, Pulse + Direction. Both two forms have positive logic and negative logic.

Figure 4-3 Pulse forms of V90





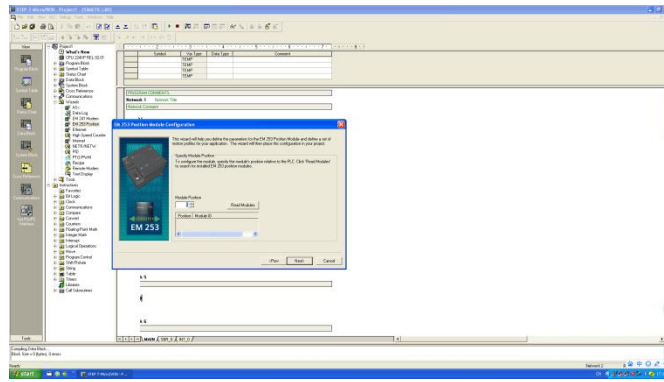
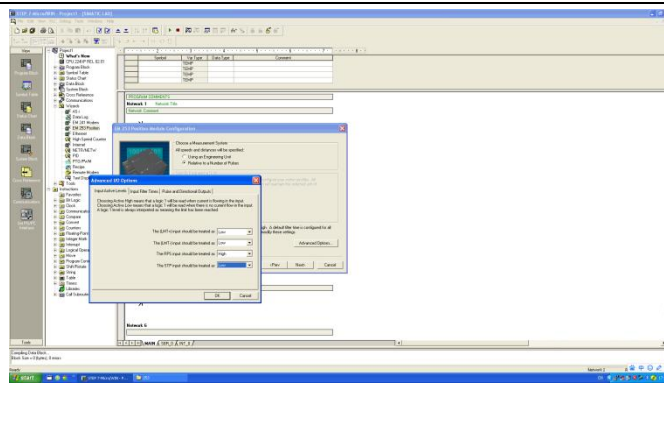
In this sample, set parameters as table below:

Table 4-1 Setting V90 in PTI mode

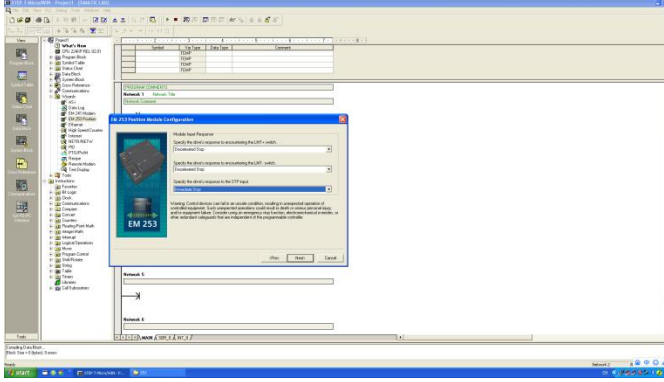
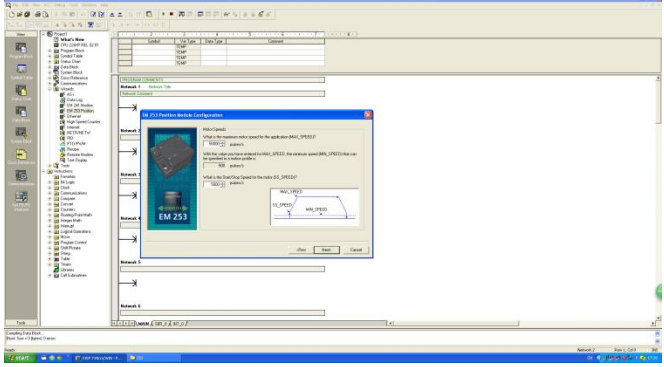
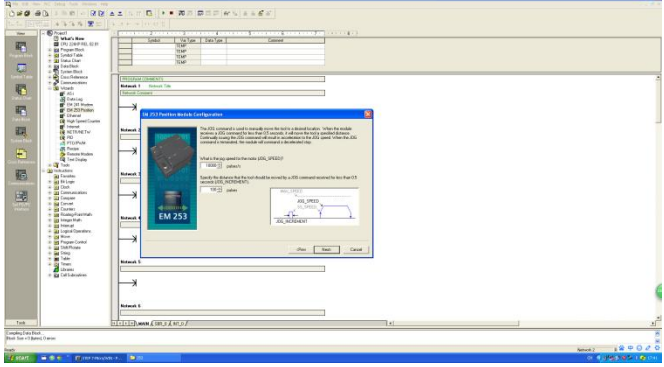
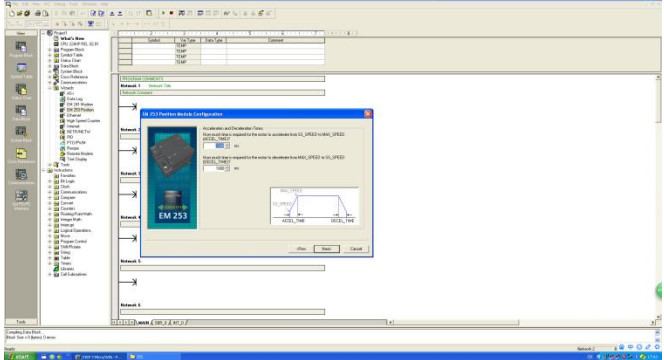
Parameterization	Description
P29000	Motor ID
P29003=0	Sets in PTI mode
P29010=0	Input form: Pulse train + Direction
P29011=1000	Expect 1000 pulses per revolution.
P29014=1	Pulses input Electrical Level:24V
P2544=40	Sets the positioning window as 40 LU

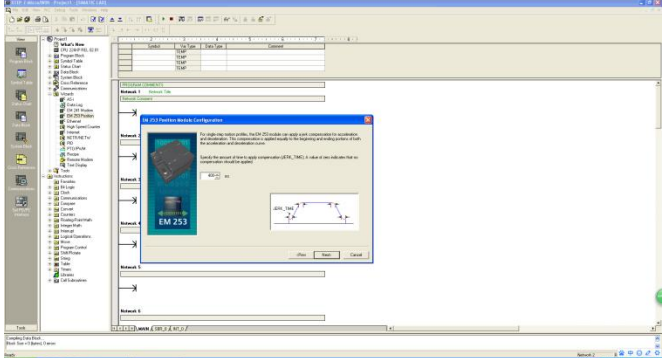
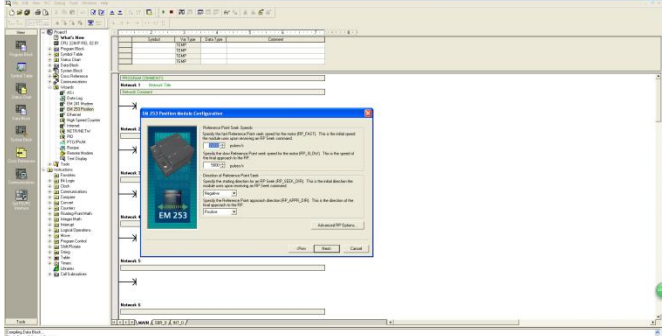
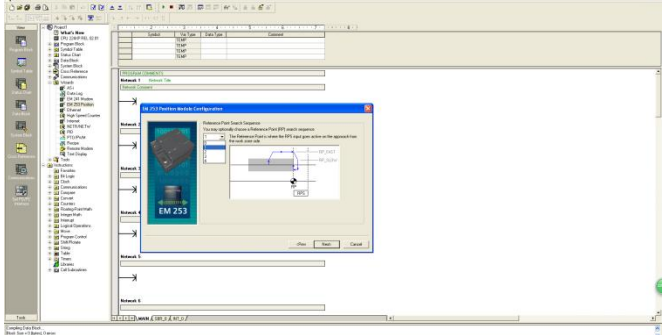
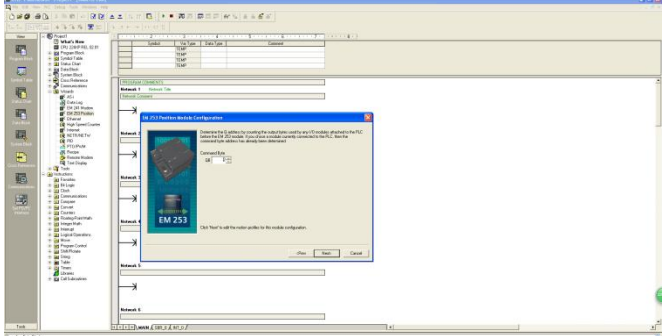
## 4.2 EM253 position control by using position Wizard

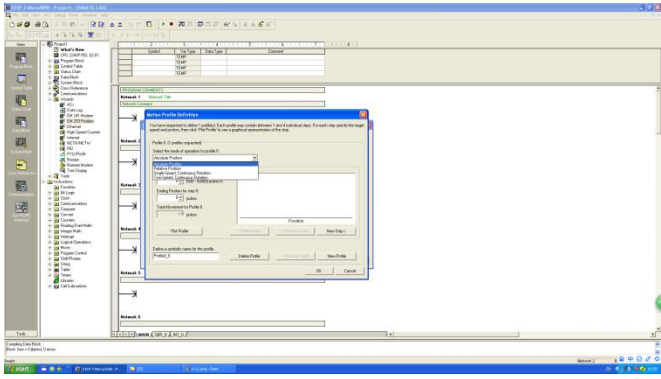
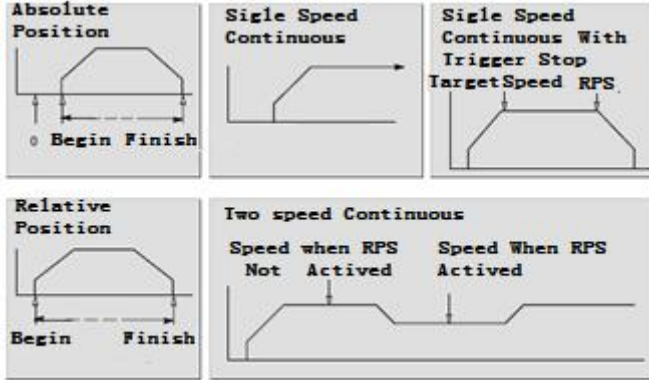
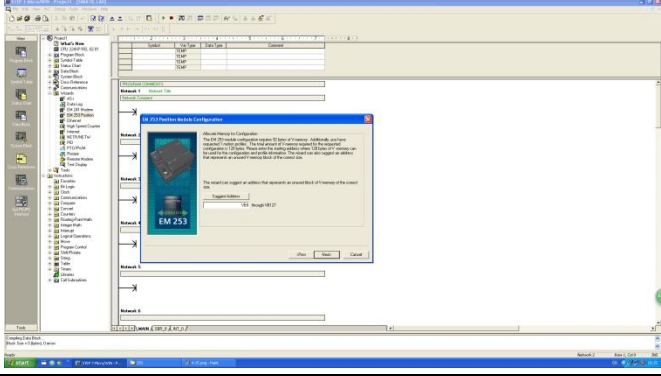
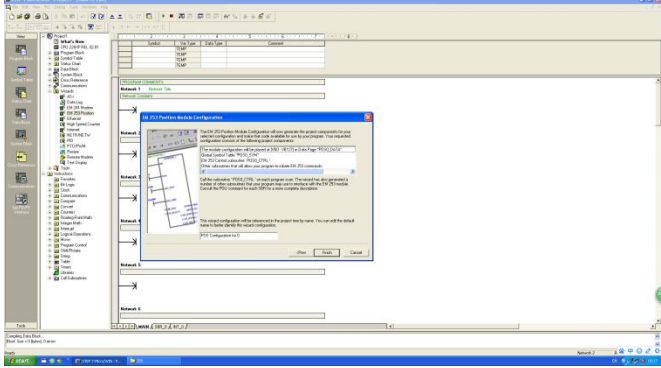
Table 4-2

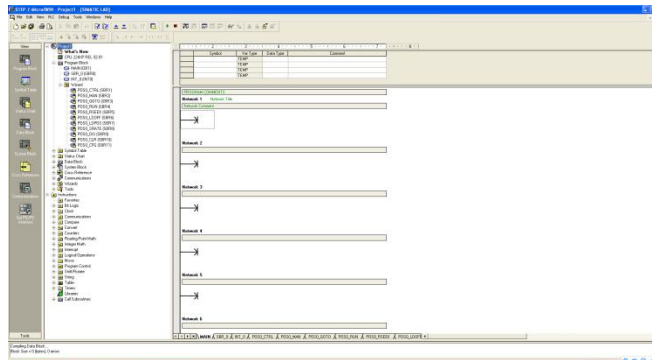
Step	Description	Screen shot
1.	<p>double click "EM253 position", pop out EM253 Position Module Configuration.</p> <p>First, assign the module position of EM253. If it is placed next to CPU, the position will be 0. The other way is to read it by clicking the Read Module button to read the module position when online. Click "Next".</p>	
2.	<p>select Relative to a Number of Pulses.</p> <p>Then click Advanced Option.</p> <p>In pop out window, select the Input Active Levels.</p> <p>Set the active levels of Limit+, Limit-, reference point and Emergency stop. Because we use the NC contact for Limit+, Limit-, and Emergency stop, we select Low Active level for them. High active level is selected for Reference point because we use a NO contact for it.</p> <p>Click "OK" and "Next".</p>	



Step	Description	Screen shot
3.	select Module Input Response, set decelerated Stop for reaching the Limit+ and Limit-, set immediate Stop for Emergency Stop been activated. Click "Next".	
4.	set Max_speed, Min_Speed and Start/Stop_Speed. Click "Next".	
5.	set Jog_Speed. Click "Next".	
6.	set acceleration and deceleration time. Click "Next".	

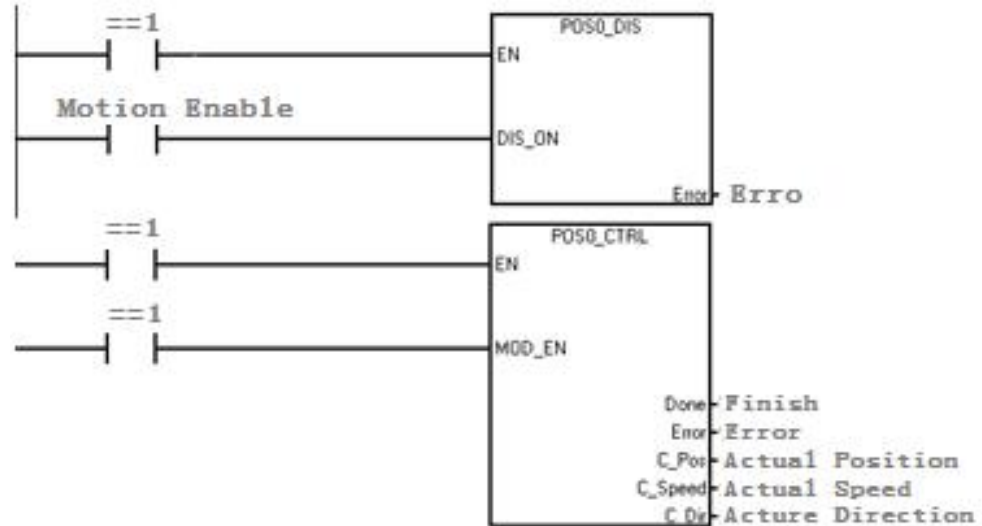
Step	Description	Screen shot
7.	set Jerk compensation. Click "Next". Select Reference Point Configuration in Pop-up window, Click "Next".	
8.	set reference point seek speed and direction for the motor. Details related to reference seek please refer to "S7-200 PLC system manual Chapter 9, S7-200 open loop control". Click "Next".	
9.	select reference point search sequence. There are 5 items. The change can be watched by modifying the configuration after configuration. Click "Next".	
10.	select Command byte. Click "Next".	

Step	Description	Screen shot
11.	set Motion Profile Definition	
12.	<p>“Absolute Position”,                      “Relative Position”,                      “Single-Speed Continuous Rotation”,                      “Two speed, Continuous Rotation”.</p> <p>These 4 types of motion profile can create different motion curves. The details about motion profile definition can be referred to “S7-200 PLC system manual” Chapter 9“S7-200 Open loop control”.</p> <p>Click “OK” After definition finished.</p>	
13.	configure V-memory for EM253. Click “Next”.	
14.	click “Finish” to complete EM253 configuration.	

Step	Description	Screen shot
15.	After EM253 configuration finished, the subroutine will be added in the project tree,	

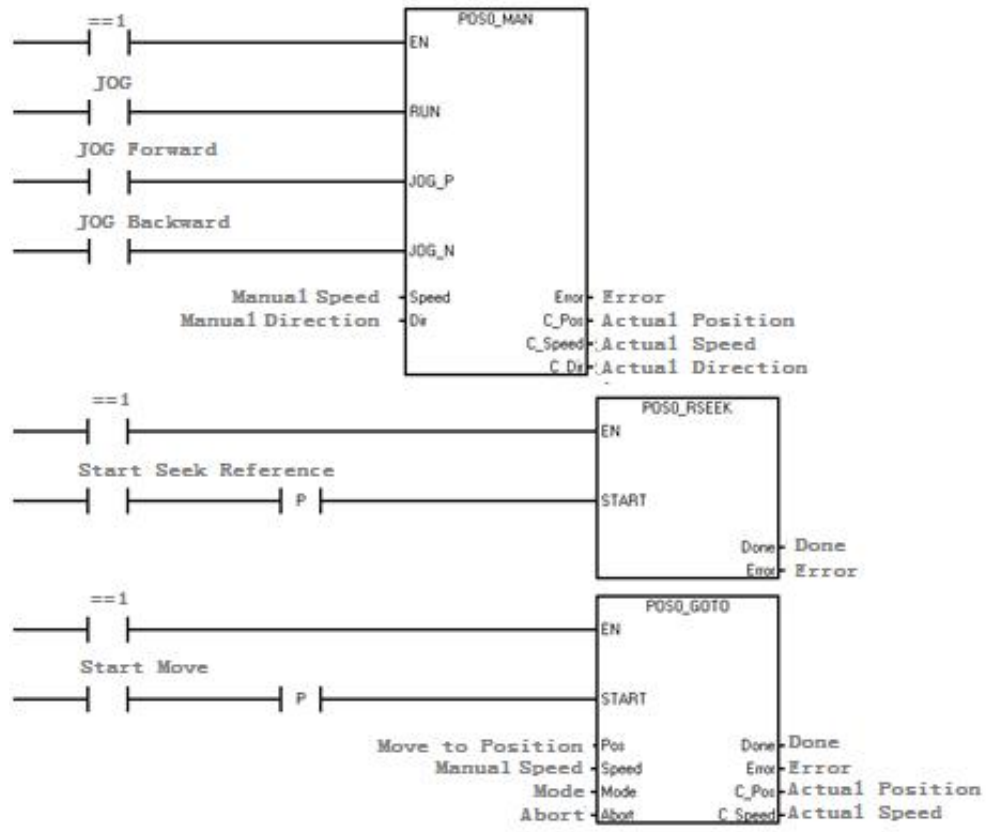
To use EM253 subroutine to realize the position control, it is necessary to call the POSx\_DIS and POSx\_CTRL at first,

Figure 4-4



Then, call POSx\_MAN to run the motor manually, call POSx\_RSEEK to search reference point, and call POSx\_GOTO to move to defined position,

Figure 4-5



Different seek types and subroutine parameter variations affect the position control, more details please test based on "S7-200 PLC System manual" Chapter 9 "S7-200 Open Loop Control".