Handling the Demo Case

SINAMICS G120 with CU250S-2 Vector

FAQ • October 2013

Service & Support

Answers for industry.

SIEMENS

The following link takes you directly to the download page for this document.

http://support.automation.siemens.com/WW/view/en/82210020

Caution

The functions and solutions described in this article are limited primarily to the implementation of the automation task. Please also note that in case of networking your plant area with other parts of the plant, the company network or the Internet, appropriate protective measures within the framework of industrial security must be adopted. For more information, see the entry ID 50203404.

http://support.automation.siemens.com/WW/view/de/50203404

Question

How is the SINAMICS G120 CU250S-2 demo case operated?

Answer

To fully answer this question, follow the handling instructions and notes listed in this document.

Table of contents

1 Connection

1.1 Terminal assignment

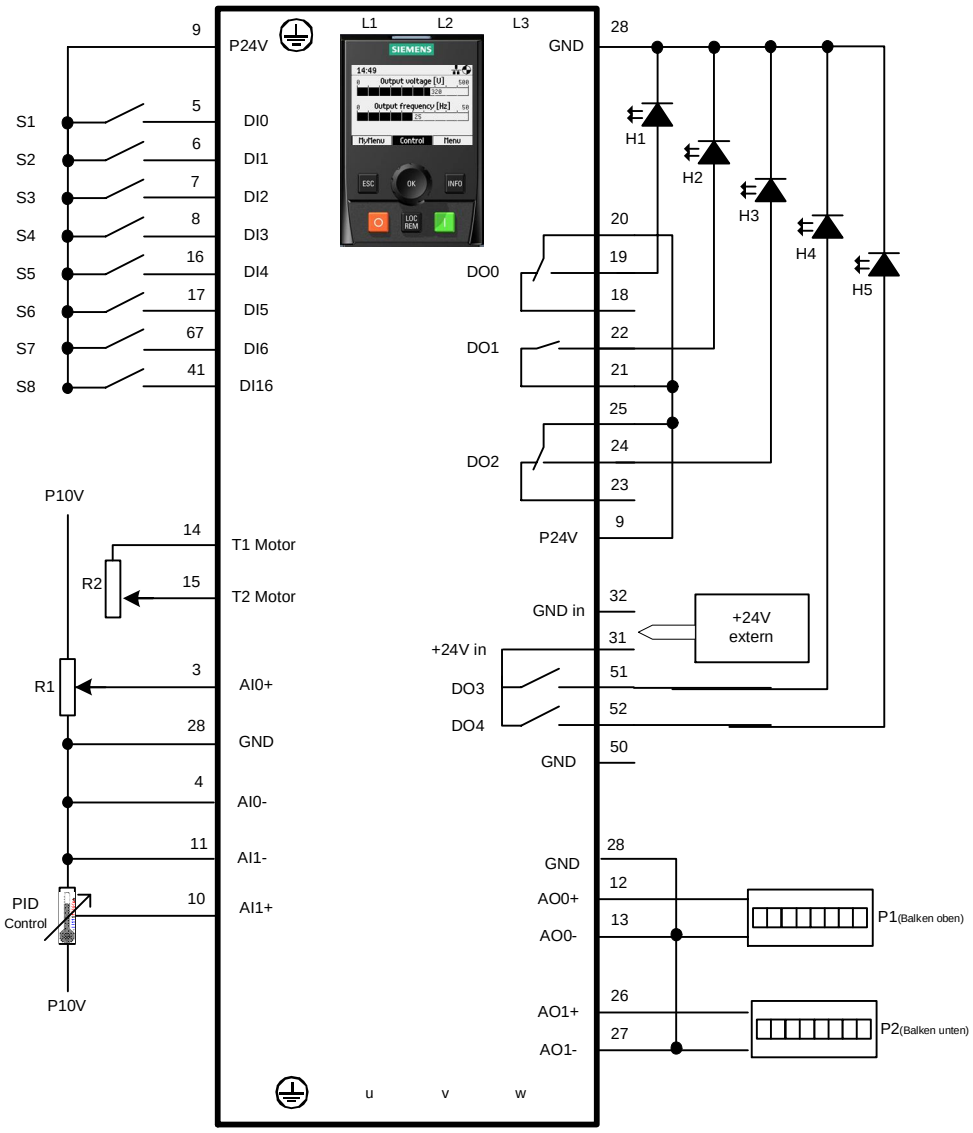


Fig. 1: Wiring of the operator controls on the Control Unit CU250S-2

1.2 Arrangement of the operator controls

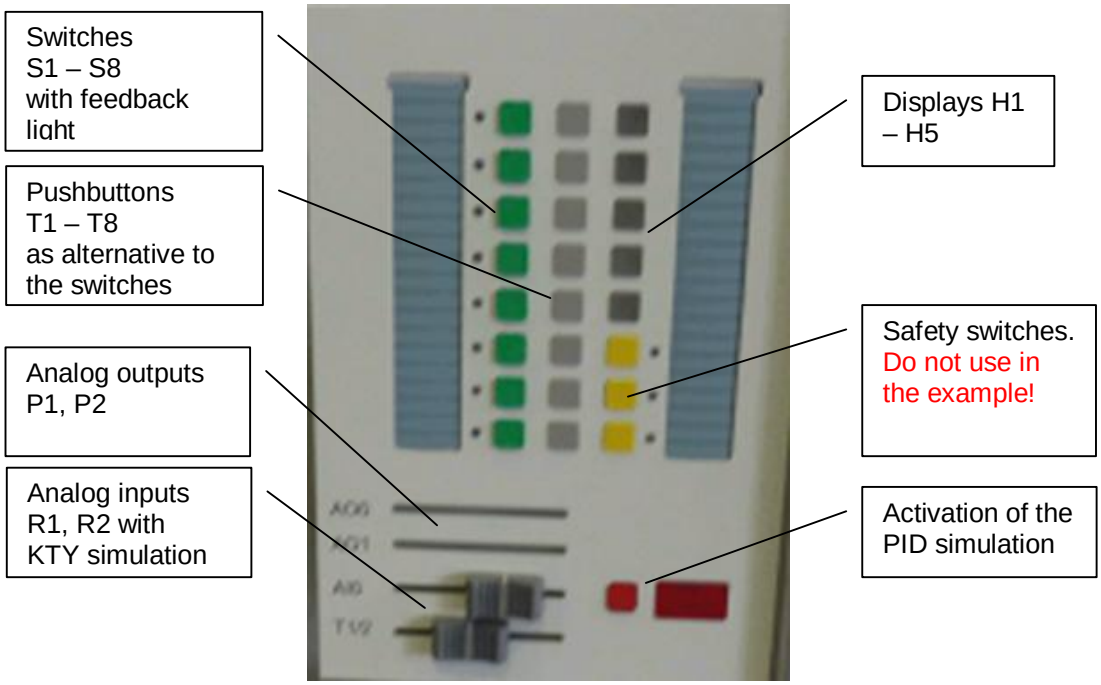


Fig. 2: Arrangement of the operator controls

R1 – Potentiometer to AI0
R2 – Motor temperature simulation via PTC/KTY84
PID – Switch and PID control display (ext. temperature sensor on the motor) to AI1
S1 – Switch for DI0
S2 – Switch for DI1
S3 – Switch for DI2
S4 – Switch for DI3
S5 – Switch for DI4
S6 – Switch for DI5
S7 – Switch for DI6
S8 – Switch for DI16
P1 – LED bar to AO0
P2 – LED bar to AO1
H1 – Display DO0
H2 – Display DO1
H3 – Display DO3
H4 – Display DO4
H5 – Display DO5

2 Basic setting

2.1 Hardware and firmware used

Devices used

a. CU250S-2 PN Vector (FW at least V4.6 HF4)
b. Power unit D1 (PM340)
c. Induction motor (AM)

This means connect the jumpers for the power output between D1 and AM.

2.2 Factory settings and sample project

The specified applications are based with their settings on a sample project that has to be loaded to the CU250S-2.
The factory settings should first be restored on the CU.

The sample project can be loaded in two ways:

1. Loading of the sample project with STARTER

   Connect STARTER via the USB cable to the CU250S-2.
   Dearchive the "Democase_CU250S_Vector.zip" sample project in STARTER.
   Then make an online connection with STARTER to the CU and download the project to the CU. Then copy RAM to ROM.

2. Load the finished project directly to an SD card

   To do this, insert the SD card in a card reader and transfer the entire "User" directory out of the archive “SD_Card_User.zip” **(unzipped)** to the card.
   Switch the CU off, insert the SD card with the loaded project into the de-energized CU and switch it on again. The drive then powers up with the project from the SD card.

All the parameter settings listed in the following are documented.
All the required settings are of course part of the sample project.
The sample project only has to be loaded to perform the functions. Additional parameter settings are not required.

2.3 Adapting the supply voltage

The PM340 power units used in the modular G120 Demo case are intended for connection to 230 V 1-phase AC.

This means that the available DC-link voltage corresponds to this.

NOTICE:

The connected induction motor has a delta connection.
Please take this into account when entering the motor data.

2.4 Setting the inputs/outputs

The input/output connection is established by selecting macro 12 (standard I/O with analog setpoint) in parameter P15.

2.4.1 Setting analog inputs

The SINAMICS CU250S-2 has two analog inputs that are wired to a potentiometer and the temperature sensing of the PID simulation. The analog inputs AI0 and AO1 must be set to 0 … 10 V.

Parameter	Value	Comment
P0756[0]	0	Set AI0 to 0 … 10 V
P0756[1]	0	Set AI1 to 0 … 10 V

2.4.2 Setting analog outputs

The two analog outputs of the CU250S-2 are wired to two LED segment displays. The setting with current output made in the factory settings must be changed to an output with 0 … 10 V.

Parameter	Value	Comment
P0776[0]	1	Set AO0 to 0 … 10 V
P0776[1]	1	Set AO1 to 0 … 10 V

2.5 Communication interface

NOTICE:
To avoid unnecessary alarms, the protocol selection in parameter P2030 has been set to "No protocol" in the sample project.

Parameter	Value	Comment
P2030	0	Protocol selection: "No protocol"

If you have loaded the training project and want to link the CU250S-2 PN via PROFINET to a SIMATIC CPU, then you must reactivate the PROFINET protocol via parameter P2030.

3 Demonstrating the sample application

3.1 Basic functions

Switches S1 to S3 (mapped on the digital inputs DI0 to DI2) are assigned according to the G120 standard, as are the display lamps/LEDs H1 to H3 (mapped on the digital outputs DO0 to DO2).
They always have the same function irrespective of the selected control mode.

A fault can be acknowledged via switch S3 or pushbutton T3 (after the cause has been rectified).

The required speed is set via the upper slide potentiometer.
The lower slide potentiometer has no function.

The actual speed and the actual current are output via the upper and lower LED bars.

The following states are displayed via the lamps/LEDs H1 to H3:

H1: Alarm present
H2: Error/fault present
H3: Drive is in operation / switched on

3.2 Simulation of the motor temperature (alarm, fault)

A KTY84 sensor to measure the motor temperature can be simulated via the lower slide potentiometer T1/T2.

If the T1/T2 slider is moved to the right, a temperature between 20° C and 150° C is simulated by the KTY sensing in the CU.

The CU is parameterized with two signal thresholds for the motor temperature monitoring.

100° C → motor temperature alarm → slider in the middle
140° C → motor temperature fault → slider at the right endstop

In this way, an alarm and a fault can be created easily with the aid of the T1/T2 slider.

3.3 "Pure speed control" mode:

The following functions can be demonstrated in the speed control mode:

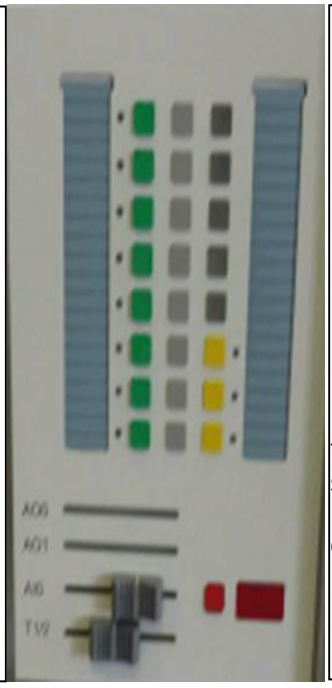
1. The drive is switched on via switch S1.

2. The speed setpoint is specified via the upper slide potentiometer.
   Ramp-up is via the integrated ramp-function generator.
   The ramp-up and ramp-down time is set to 0.2 s.

3. CW/CCW switchover
   The motor direction of rotation can be switched over via switch S2.

4. Jog right (only functions when switch S1 = OFF)
   The drive switches on automatically and the motor traverses to the right with the set jog velocity as long as switch S5 or pushbutton T5 is pressed.

5. Jog left (only functions when switch S1 = OFF)
   The drive switches on automatically and the motor traverses to the left with the set jog velocity as long as switch S6 or pushbutton T6 is pressed.

S1 : ON/OFF (DI0) S2: CW/CCW rotation (DI1) S3: Acknowledge fault (edge) (DI2) S4: Not assigned (DI3) S5: Jog 1 (right) (DI4) S6: Jog 2 (left) (DI5) S7: PID controller enable (DI6) Feed back signal is activated via red "PID control" switch **S8: Speed-controlled operation (DI16 == low)** Top pot.: n setpoint can be controlled via analog pot. (AI0)		H1: "1" == Fault present H2: "1" == Alarm present H3: "1" == Operation H4: "1" == PID controller enabled H5: "1" == Position control active Top LED bar: (AO0): Actual speed value Bottom LED bar: (AO1): Actual current value RED illuminated: PID temperature simulation active

3.4 "Speed control with higher-level technology control" mode:

The lamp/LED H4 *) is illuminated during the speed control with higher-level technology control mode.

A higher-level PID controller can also be activated as technology controller within the speed control mode via the S7 switch. In this case the technology controller is used as temperature controller and the output of the PID controller is switched directly to the speed controller as main setpoint, i.e. the upper slide potentiometer has no effect. A fixed value of 65% is set as setpoint on the PID controller. The PID controller receives its actual value from a temperature measuring element which is connected to analog input AI1.

Two conditions must be satisfied for the temperature control to function:

(1) Switch S7 must be on. It activates the PID controller. → The lamp/LED H4 *) should be illuminated.

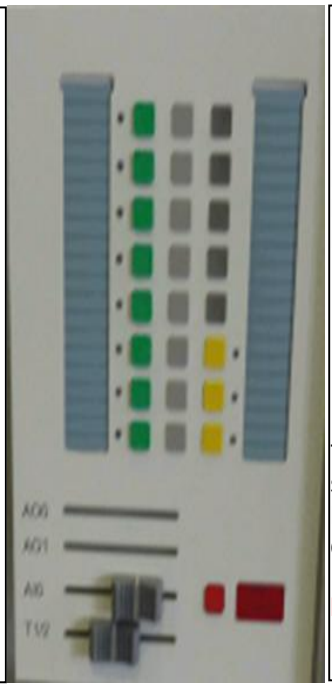
(2) In addition to the PID controller (S7), the red PID control switch must be actuated so that the red "PID control" display is illuminated. This heats up the thermocouple connected to analog input AI1. The PID controller now controls the speed of the motor in such a way that air flow of the motor fan ensures that the temperature of the thermocouple does not increase further.
→ With a set value of 65%, this state is attained at approximately the average rated speed of the motor.

The upper slide potentiometer as speed setpoint does NOT function during PID control.
The speed is steady within the temperature balance and can only be changed by changing the fixed setpoint in parameter Pxxxx (e.g. via the IOP or STARTER).

NOTICE:
Do not activate the red switch on its own, i.e. without the drive switched on. This results in the thermocouple overheating and the drive shutting down with an error message.
Recommended sequence:
1. Switch on the drive
2. Activate the PID control with switch S7
3. Activate the PID temperature generation circuit with the red switch

S1 : ON/OFF (DI0)
S2: CW/CCW rotation (DI1)
S3: Acknowledge fault (edge) (DI2)
S4: No function (DI3)
S5: Jog 1 (right) (DI4)
S6: Jog 2 (left) (DI5)
S7: PID controller enable (DI6)
Feed back signal is activated via red "PID control" switch
S8: Speed-controlled operation (DI16 == low)

Top pot.: No function;
→ setpoint source: PID
Bottom pot.: Motor temperature



H1: "1" == Fault present
H2: "1" == Alarm present
H3: "1" == Operation
H4: "1" == PID controller enabled
H5: "1" == Position control active

Top LED bar: (AO0): Actual speed value
Bottom LED bar: (AO1): Actual current value

RED illuminated:
PID temperature simulation active

Footnote: *) With some adapter cables for the CU250S-2, the two lamps/LEDs H4 and H5 are not wired correctly and therefore do not function.

3.5 "Positioning with EPOS" mode

The EPOS function is activated via switch S8. The lamp/LED H5 *) is illuminated during activated position control with EPOS.

Please only switch over to EPOS when the motor is at standstill.
Otherwise there is a shutdown with error.

The following functions can be demonstrated with EPOS:

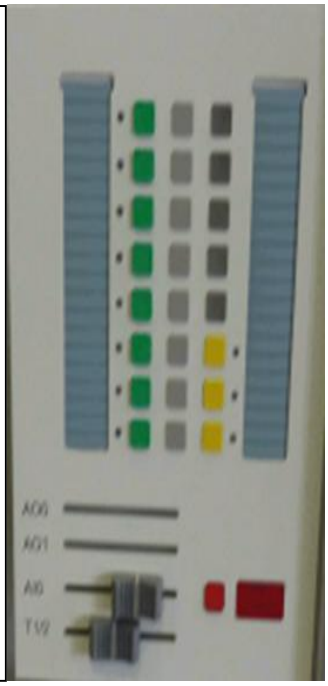
1. Position-controlled jogging
   The motor traverses with the set jog velocity as long as switch S5 or pushbutton T5 is pressed.
   The jog velocity can be changed via the top slide switch. The slide acts on the override.

2. Incremental jogging
   When switch S6 is on, incremental jogging can be performed with pushbutton T5.
   The motor is rotated precisely through 90° to the right with each edge.

3. Relative positioning to the target position via MDI
   The motor is traversed precisely through 360° to the right when switch S4 or pushbutton T4 is pressed.
   The traversing/positioning velocity can be changed via the top slide switch. The slide acts on the override.

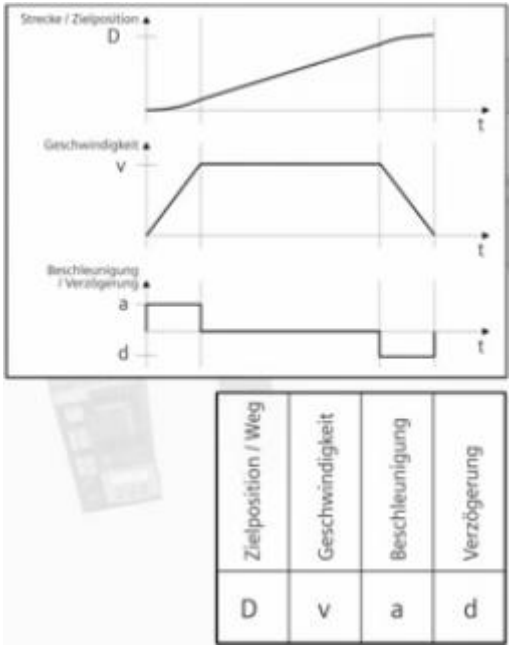
4. Traversing blocks
   Switch S7 or pushbutton T7 can be used to start the execution of permanently stored traversing blocks.
   Four traversing blocks have been programmed. A one second wait has been programmed between the traversing blocks.
   The traversing profile is executed as follows:
   1. Quick positioning through 720° to the right
   2. Short wait
   3. Slow positioning through a further 270° to the right
   4. Short wait
   5. Slow positioning through 360° to the left
   6. Short wait
   7. Quick repositioning to the original position

   The traversing/positioning velocity can be changed via the top slide switch. The slide acts on the override.

S1 : ON/OFF (DI0) S2: No function S3: Acknowledge fault (edge) (DI2) S4: Not assigned (DI3) S5: Jog 1 (forward) (DI4) S6: Incremental jogging (DI5) S7: Activation of the traversing blocks (DI6) Traversing profile is started with traversing block 1 **S8: Positioning operation (DI16 == high)** Top pot.: Override can be controlled		H1: "1" == Fault present H2: "1" == Alarm present H3: "1" == Operation H4: "1" == PID controller enabled H5: "1" == Position control active Top LED bar: (AO0): Actual speed value Bottom LED bar: (AO1): Actual current value RED illuminated: PID temperature simulation active

Footnote: *) With some adapter cables for the CU250S-2, the two lights H4 and H5 are not wired correctly and therefore do not function.

Positioning is performed according to the following time diagram: Acceleration, deceleration and the target positions are set via fixed parameters.
The velocity can be varied with the override (top slide potentiometer).



4 Application settings

4.1 Basic settings

The basic settings for the speed and positioning operation are established by selecting macro 12 (standard I/O with analog setpoint) in parameter P15.

4.2 Settings for the motor temperature simulation

The CU is parameterized with two signal thresholds for the motor temperature monitoring.

Parameter	Value	Comment
P0601[0]	2	Sensor type KTY84
P0604[0]	100	Motor temperature alarm threshold
P0605[0]	140	Motor temperature shutdown threshold (fault)

In this way, an alarm and a fault can be created easily with the aid of the lower T1/T2 slider.

4.3 Settings for the speed control

After entering the motor and encoder data and selecting macro 12, the drive can be traversed via switches S1, S2 and the slide potentiometer R1.

Parameter	Value	Comment
P0840[0]	722.0	ON command via switch S1
P1311[0]	722.1	Direction reversal via switch S2
P2103[0]	722.2	Fault acknowledgement via pushbutton T3
P1055[0]	722.4	Jog 1 (forward) via pushbutton T5
P1056[0]	722.5	Jog 2 (backward) via pushbutton T6
P1070[0]	755.0	Speed setpoint via analog input AI0

The jog function and the normal ON command are mutually exclusive, i.e. use either jog OR the ON command.

4.4 PID controller with fixed setpoint

The drive can be operated with the PID controller by means of a scaled fixed setpoint and analog input AI1.
The PID controller is activated via switch S7 on digital input 6.

Parameter	Value	Comment
P2200[0]	722.6	PID controller enable via switch S7
P2251	0	PID controller as main setpoint
P2255	65%	Scaling the fixed setpoint
P2253[0]	100%	Setpoint fixed setpoint
P2264[0]	755.1	Actual value via analog input AI1

The behavior of the PID controller can be checked through simulation of the actual value via the temperature sensing at analog input AI1.
The red "PID control" switch must be switched on for this purpose.

4.5 Positioning with EPOS

The position controller and EPOS are activated with switch S8 at digital input 16.

The positioning velocity can be influenced by the override with the slide potentiometer R2.

Parameter	Value	Comment
P0840[0]	722.0	ON command via switch S1
P2103[0]	722.2	Fault acknowledgement via pushbutton T3
P2650	722.3	Activation of the MDI mode
P2647	722.3	Positioning via MDI – fixed position 360° relative
P2589	722.4	Jog 1 position-controlled (forward) via pushbutton T5
P2591	722.5	Sequential jogging via switch S6
P2625	722.6	Activation of the traversing blocks as of traversing block 0
P2631	722.6	Start edge for execution of the traversing blocks
P2550	722.16	Activation of the position controller
P2646	755.0	Override via analog input AI0
P2642	2690	Fixed position 1
P2643	2691	Fixed velocity 1
P2644	2692	Fixed acceleration
P2645	2693	Fixed deceleration
P2616[0-6]	1 to 7	Traversing blocks 1 to 7 (see training description)

The EPOS can be demonstrated via the switches/pushbuttons with these settings. The switchover from speed control to position control should be performed at speed "0". Otherwise there is a positioning error.

5 Additional notes

5.1 Orders

No.	Order number	Note
1	Modular demo case: 6AG1067-2AA00-0AA3 CU250S-2 incl. adapter cable: 6AG1067-2AA00-0AB7	**Modular G120 demo case with CU250S-2** **Org. ID SIDEMO** **Contact:** **I IA CE SE MF RS FDS** **Peter Breitschuh** **Phone: +49 (911) 750-9919** **Fax: +49 (911) 750-2411** **E-mail: peter.breitschuh@siemens.com ;** **www.siemens.com/sidemo**
2		
3		