CANopen with SINAMICS G120

SINAMICS G120 with speed setpoint and CAopen interface

FAQ • November 2011

Service & Support

Answers for industry.

SIEMENS

Question

How can a SINAMICS G120 be operated using CANopen and the speed setpoint interface?

Answer

To respond to this question with the appropriate amount of detail, follow the instructions and notes listed in this document.

Table of contents

1 Hardware and software used

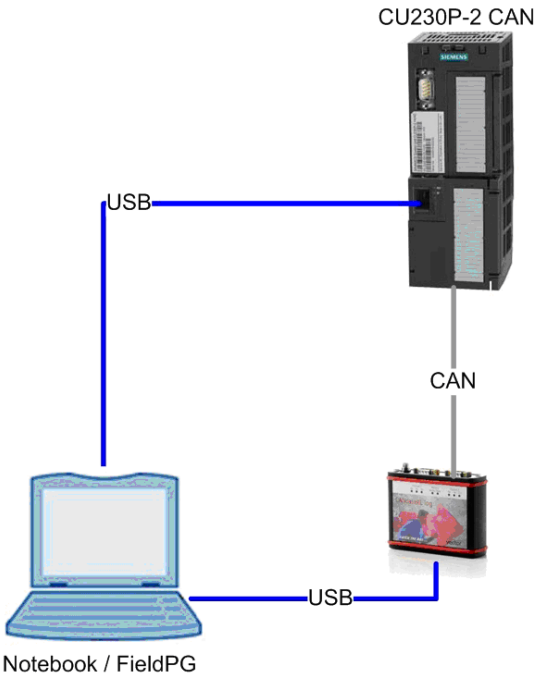
1.1 Hardware

SINAMICS CU230P-2 CAN; 6SL3243-0BB30-1CA1
SINAMICS Power Module PM240 or PM230, and motor as required
Vector CANcaseXL
Field PG M2

NOTICE The 6SL3243-0BB30-***1CA1*** module was discontinued effective 01.10.2011. As a result of the differences in the hardware and software, this application cannot be used for the successor module 6SL3243-0BB30-***1CA2***!

1.1.1 Hardware configuration

Figure 1-1: Hardware configuration



1.2 Software

Windows XP SP3
Starter V4.1.5
CANalyzer V7.1.81 SP4
SINAMICS FW < V4.0 (6SL3243-0BB30-1CA1)

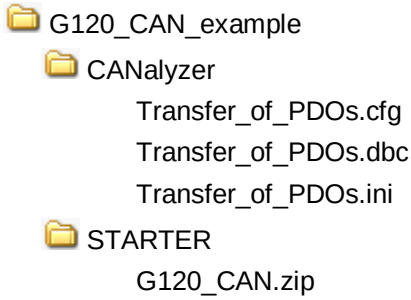
2 Configuring / parameterizing

2.1 Using the project example

The archive contains a runnable STARTER project with the "free PDO mapping", and a runnable configuration for control using the CANcaseXL log mentioned above.

In order to be able to use the project example, the archive must first be unzipped.

The archive contains the following directory / file structure:



2.1.1 STARTER

In order to be able to use the SINAMICS G120 project in the STARTER software, proceed as follows:

- Call the STARTER program
- Select the menu "Project" → "Dearchive…"
- Select the file "FAQ_CAN_with_G120.zip"
- Check the PG/PC interface as to whether the correct COM port and speed have been set (refer to the G120 operating instructions Chapter 4.5 Commissioning with STARTER)
- Establish the ONLINE connection
- Set the operating mode of the CAN module to "Preoperational"
- "Control Unit" → "Communication" → "CAN" → tab "Network Management" → "Preoperational"
- Transfer the project using the button or menu "Target system" → "Load" → "Transfer project to target device"
- Execute the "RAM to ROM" function using the button or menu "Target system" → "RAM to ROM"
- Set the CAN module mode to "Operational"
- "Control Unit" → "Communication" → "CAN" → tab "Network Management" → "Operational"

2.2 CANalyzer

Note

The CANcaseXL log hardware cannot be used in a virtual machine (VMware or others) as the USB hardware is not supported as dongle.

- You can open the configuration example in the CANalyzer user interface.
- Menu "File" → "Load configuration…"
- The module "IG" (Control) can be used to send the predefined process data to the drive unit.

The following send process data are preconfigured in the "IG" module:

SPDO 1 with control word1, speed setpoint, control word2 and the supplementary speed setpoint

SPDO 2 with PZD5 to PZD8

- The module "Data" can be used to monitor the predefined process data that is sent from the drive unit.
- The following receive process data are preconfigured in the "Data" module:
- RPDO 1 with status word1, speed actual value, status word2 and output voltage
- RPDP 2 with current actual value, motor temperature, DC link voltage and status word, closed-loop control

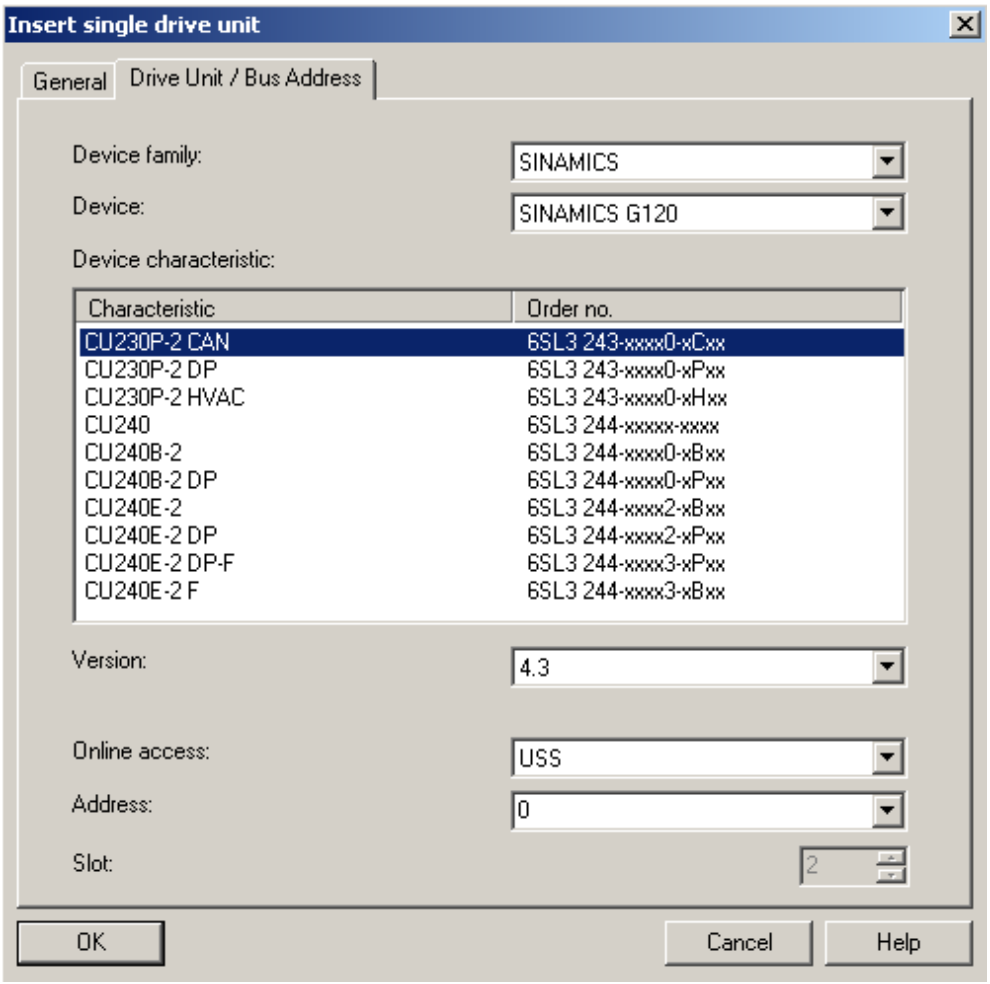
2.3 Configuring SINAMICS G120

2.3.1 Basic settings

To configure the SINAMICS G120, a new project is first created in the STARTER engineering tool.

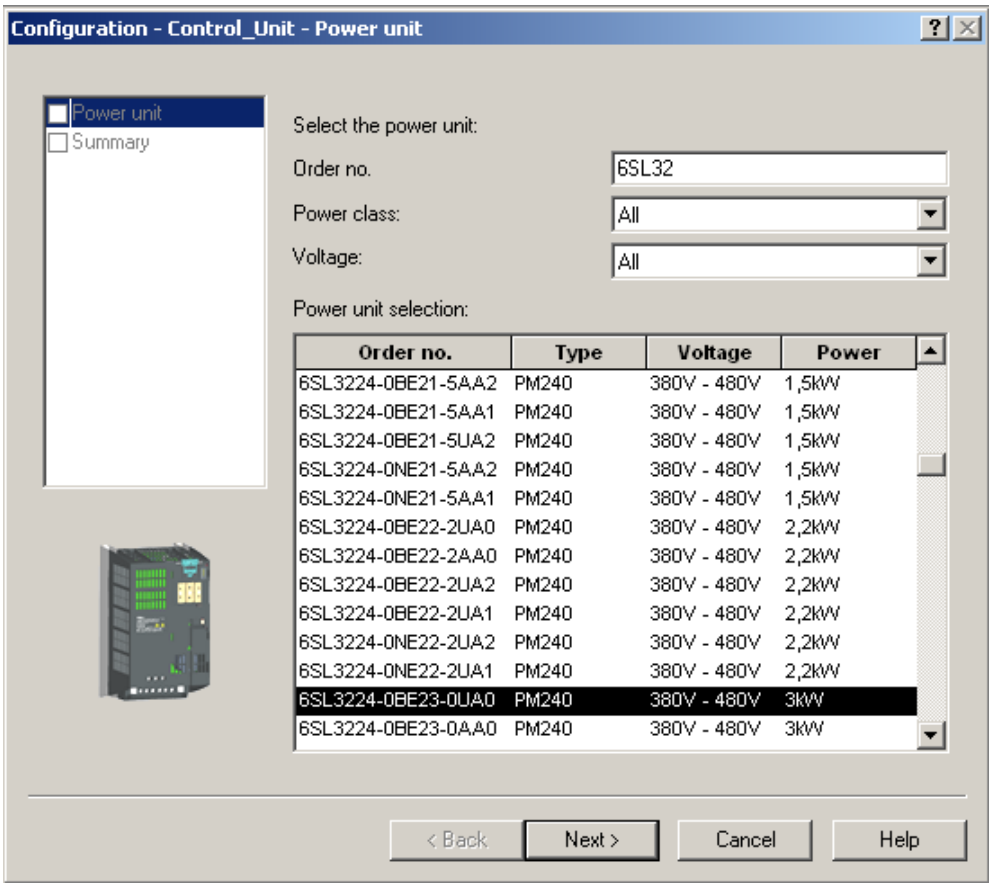
The "single drive unit" function is then called in the tree structure and the corresponding device selected.

Figure 2-1 Insert single drive



Using the "Configure drive unit" function, the power module used is selected and the configuration is completed using the "Complete" button on the following window.

Figure 2-2 Configuring the power unit



The following steps are necessary to establish the online connection:

- Insert the USB cable between the Control Unit and the PG/PC
- Right-click on the SINAMICS device -> "Properties" -> "Drive device/bus address"
- Select "Online access = USS" and "Address = 2"
- (Note: The address can also differ depending on the particular configuration)
- Press the button "Connect to target system"

After the online connection has been established, it is recommended to restore the factory setting. This therefore ensures that the previous configuration is overwritten with the factory setting. To do this, proceed as follows:

Right-click in the tree-type diagram on the SINAMICS device -> "Target device" -> "Restore factory setting"

The data for the connected motor can now be entered. To do this, call the device configuration:

- Select "Drive Navigator" in the tree view below the Control Unit
- Press the "Device configuration" button -> "Execute configuration"

Using the wizard, the closed-control mode, the command sources, motor data and most important parameters are entered.

Before the configuration is completed with "Complete", the "RAM to ROM" option should be selected to permanently save the settings in the device.

2.3.2 CAN – interface configuration

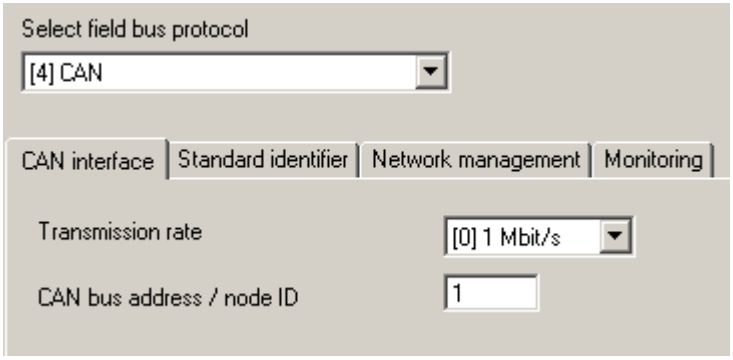
To configure the CAN interface, the item “CAN” under "Communication” is selected, and then the fieldbus protocol "[4] CAN" is selected in the selection list.

CAN interface

The data transfer rate and the node ID can be entered under the "CAN interface" tab.

(Note: The data is only accepted if the setting has been copied into the ROM and the device has been restarted with a "POWER-ON" reset.)

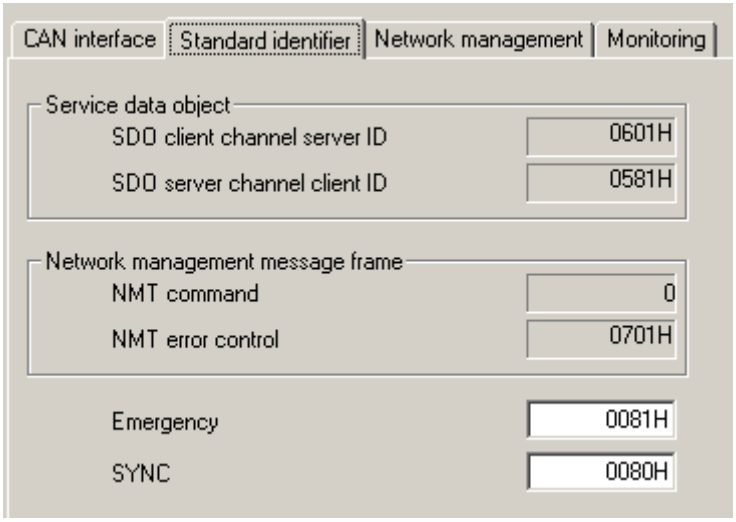
Figure 2-3 Configuring the CAN interface



Standard identifier

Under the "Standard-Identifier" tab, data regarding the emergency and SYNC identifier can be entered. The device itself specifies the settings for the SDOs and the NMT and nothing can be changed.

Figure 2-4 Standard CAN identifier



PDO telegram

Under the "PDO telegram" tab, for Control Units with several axes, the telegrams of the individual axes can be defined. In this particular case, there is only one axis, and therefore no settings have to be made here.

Network management

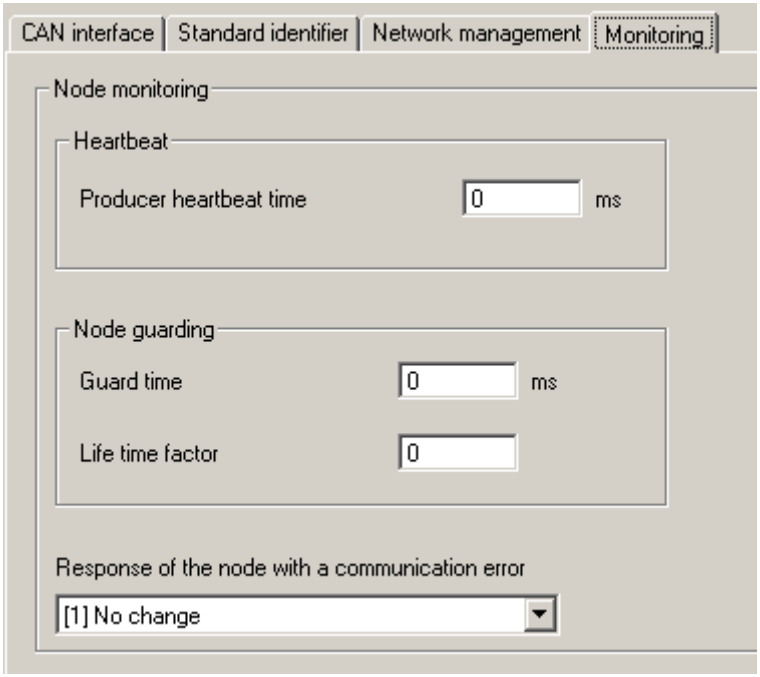
The operating state of the CAN interface can be selected under the "Network-Management" tab. The operating state should be set to "Preoperational" for the next configuration steps.

Monitoring functions

The node monitoring functions can be set and therefore activated under the "Monitoring functions" tab. However, only one monitoring function can be activated at any one time. "0ms" must be entered to deactivate monitoring functions.

Further, the behavior of the interface in the case of a communication error can be specified.

Figure 2-5 CAN monitoring functions



2.3.3 CAN parameters

The expert list is called to access parameters for the CAN communication. Right-click on the Control Unit -> "Experts" -> "Expert list".

Two options are available to configure data transfer.

Predefined Connection Set

Receive data:	Control word1 / speed setpoint
Send data:	Status word 1 / speed actual value

Free PDO mapping

Receive data:	maximum 16 words (4x4 words) – can be freely interconnected
Send data:	maximum 16 words (4x4 words) – can be freely interconnected

2.3.4 Predefined Connection Set

The first option is to use the "Predefined Connection Set". This means that the control word of the sequence control and the speed setpoint is automatically interconnected as receive data – and the status word of the sequence control as well as the speed actual value are automatically interconnected as send data for communication.

Receive data

PDO1

1st word = control word of the sequence control

PDO2

1st word = control word of the sequence control

2nd word = speed setpoint (whereby the units correspond to revolutions/minute)

Send data

PDO1

1st word = status word of the sequence control

PDO2

1st word = status word of the sequence control

2nd word = speed actual value (whereby the units correspond to revolutions/minute)

To use this option, proceed as follows:

The interface must be set to the "Preoperational" operating mode. Then select the operating mode either under the "Network-Management" tab under "Communication" -> "CAN" – or directly using parameter p8685 = [127] "Preoperational". Then, in parameter p8744, select the option "[1] Predefined Connection Set" and confirm the configuration with p8741 = [1].

The individual control signals of the drive as well as the speed setpoint and the speed actual value should still be interconnected.

Example:

p701 = 0 (withdrawal pre-assignment dig. input 1)

p840 = r2090.0 (ON/OFF1 from PROFIdrive PZD1 bit 0)

p1070 = r2050.1 (speed setpoint from PROFIdrive PZD2)

p2051.0 = r52 (status word on PROFIdrive PZD1)

p2051.1 = r21 (smoothed speed actual value on PROFIdrive PZD2)

etc.

After this, the operating mode must be changed from "Preoperational" to "Operational" in order to permit data transfer.

2.3.5 Free PDO mapping

The second option involves using free PDO mapping. In this case, the receive and send data can be defined using the freely interconnectable communication objects.

Freely interconnectable send process data:

OV index (hex)	Description	Data type per PZD
5800 … 580F	16 freely interconnectable receive process data	Integer 16
5810 … 581F	**16 freely interconnectable send process data**	**Integer 16**
5820 … 5827	8 freely interconnectable receive process data	Integer 32
5828 … 582F	Reserved	
5830 … 5837	**8 freely interconnectable send process data**	**Integer 32**
5838 … 583F	Reserved	

Table 2-1: Freely interconnectable send process data

Freely interconnectable receive process data:

OV index (hex)	Description	Data type per PZD
5800 … 580F	**16 freely interconnectable receive process data**	**Integer 16**
5810 … 581F	16 freely interconnectable send process data	Integer 16
5820 … 5827	**8 freely interconnectable receive process data**	**Integer 32**
5828 … 582F	Reserved	
5830 … 5837	8 freely interconnectable send process data	Integer 32
5838 … 583F	Reserved	

Table 2-2: Freely interconnectable receive process data

As example, 2 PDOs each with four words (16 bit) are parameterized as receive data and 2 PDOs each with four words are parameterized as send data.

To use this option, proceed as follows:

The interface must be set to the "Preoperational" operating mode. Then select the operating mode either under the "Network-Management" tab under "Communication" -> "CAN" – or directly using parameter p8685 = [127] "Preoperational". In parameter p8744, then select the "[0] Free PDO mapping" function.

The following parameter values must be adapted:

CAN communication

Parameter	Value	Description
p8710[0]	5800 0010H	Free receive data object1 (5800) 16 bits long (0010H)
p8710[1]	5801 0010H	Free receive data object2 (5801) 16 bits long (0010H)
p8710[2]	5802 0010H	Free receive data object3 (5801) 16 bits long (0010H)
p8710[3]	5803 0010H	Free receive data object4 (5801) 16 bits long (0010H)
p8711[0]	5804 0010H	Free receive data object5 (5801) 16 bits long (0010H)
p8711[1]	5805 0010H	Free receive data object6 (5801) 16 bits long (0010H)
p8711[2]	5806 0010H	Free receive data object7 (5801) 16 bits long (0010H)
p8711[3]	5807 0010H	Free receive data object8 (5801) 16 bits long (0010H)
p8700[0]	201H	COB-ID Receive PDO 1
p8700[1]	301H	COB-ID Receive PDO 2
p8730[0]	5810 0010H	Free send data object1 (5810) 16 bits long (0010H)
p8730[1]	5811 0010H	Free send data object2 (5810) 16 bits long (0010H)
p8730[2]	5812 0010H	Free send data object3 (5810) 16 bits long (0010H)
p8730[3]	5813 0010H	Free send data object4 (5810) 16 bits long (0010H)
p8731[0]	5814 0010H	Free send data object5 (5810) 16 bits long (0010H)
p8731[1]	5815 0010H	Free send data object6 (5810) 16 bits long (0010H)
p8731[2]	5816 0010H	Free send data object7 (5810) 16 bits long (0010H)
p8731[3]	5817 0010H	Free send data object8 (5810) 16 bits long (0010H)
p8720[0]	4000 0281H	COB-ID send PDO1
p8721[0]	4000 0381H	COB-ID send PDO2
p701	0	Deactivate preassignment digital input 1
p840	r2090.0	ON/OFF1 from PROFIdrive PZD1 bit 0
p1070	r2050.1	Main setpoint from PROFIdrive PZD2
p1075	r2050.3	Supplementary setpoint from PROFIdrive PZD4
p2051[0]	r52	Status word 1 on PZD 1
p2051[1]	r21	Speed actual value on PZD 2
p2051[2]	r53	Status word 2 on PZD 3
p2051[3]	r25	Output voltage on PZD 4
p2051[4]	r27	Current actual value on PZD 5
p2051[5]	r35	Motor temperature on PZD 6
p2051[6]	r70	DC link voltage on PZD 7
p2051[7]	r56	Status word closed-loop control on PZD 8

Table 2-3: Free PDO mapping parameter CAN communication

Interconnecting process data

Parameter	Value	Description
p701	0	Deactivate preassignment digital input 1
p840	r2090.0	ON/OFF1 from PROFIdrive PZD1 bit 0
p1070	r2050.1	Main setpoint from PROFIdrive PZD2
p1075	r2050.3	Supplementary setpoint from PROFIdrive PZD4
p2051[0]	r52	Status word 1 on PZD 1
p2051[1]	r21	Speed actual value on PZD 2
p2051[2]	r53	Status word 2 on PZD 3
p2051[3]	r25	Output voltage on PZD 4
p2051[4]	r27	Current actual value on PZD 5
p2051[5]	r35	Motor temperature on PZD 6
p2051[6]	r70	DC link voltage on PZD 7
p2051[7]	r56	Status word closed-loop control on PZD 8

Table 2-4: Free PDO mapping parameter process data

3 Attachment

3.1 Glossary

CANopen	Controller Area Network: a protocol defined by the CiA - user organization
CAN	Defines the first 2 layers of the ISO OSI layer model
CU	Control Unit
DDS configuration	Drive Data Set configuration: accessible via SERVO_03: Configuration: DDS configuration
p/r parameters	p- parameters that can be changed / r- parameters that cannot be changed, pure display parameters
PDO channel	Channel for process data exchange
RDO	Receive Data Object
SDO	Send Data Object
SDO channel	Channel for parameter access

3.2 History

Version	Date	Change
V1.0	2011-12-15	First Edition