

Micro Application Example



applications & TOOLS

Simple and comfortable Speed Control of Motors
(with LOGO!, and SINAMICS G110)

SIEMENS

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Foreword

Micro Automation Sets are fully functional and tested automation configurations based on A&D standard products for easy, fast and inexpensive implementation of automation tasks in small-scale automation. Each of these Micro Automatic Sets covers a frequently used subtask of a typical customer problem in the low-end range.

The sets help the customer to obtain answers with regard to required products and the question how they function when combined.

However, depending on the system requirements, a variety of other components (e.g. other CPUs, power supplies, etc.) can be used to implement the functionality on which this set is based. Please refer to the respective SIEMENS A&D catalogs for these components.

The Micro Automation Sets are also available by clicking the following link:

<http://www.siemens.de/microset>

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1 Application Areas and Usage

Fields of application

The configuration is particularly suitable for the following applications:

- Pump and ventilation control
- small variable-speed drives in branches such as:
 - Food
 - Textile
 - Packaging
- Applications in conveyor technology
- Factory gate and garage gate engine
- Universal engine for moving advertising media

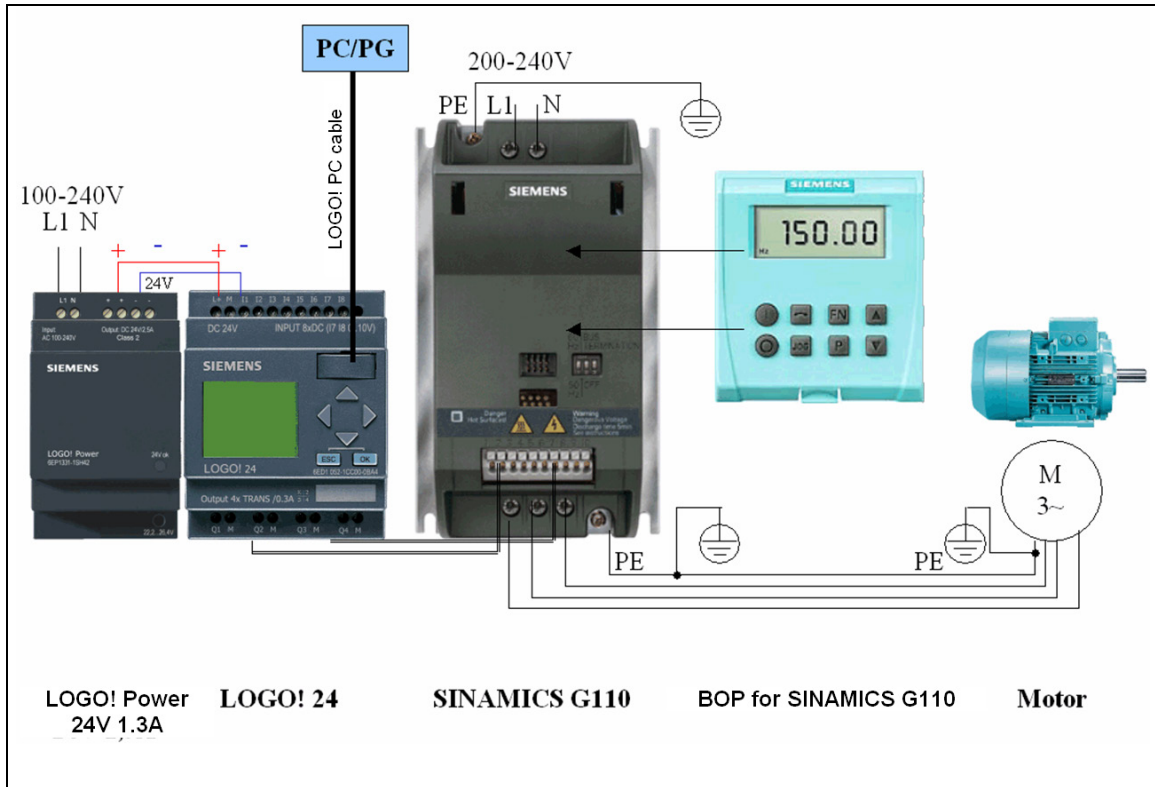
Benefit

- Low-noise motor operation due to high pulse frequencies
- Self-cooling due to heat dissipator (no fan), thus suitable for noise-sensitive applications (only frame size A)
- Intelligent linking of process data (digital/analog inputs) optimizes speed adjustment and saves energy.
- Together with SET 8, distributed, monitored and reliable motor control becomes possible in building installation networks.
- Existing three-phase motors can be used on single-phase networks.
- Extensive assortment of frequency inverter parameters permitting the configuration to be used in a wide variety of applications
- Parameters (e.g., times) can be changed during operation directly on the LOGO!.
- An extensive assortment of inverters and motors permits customization to your requirements.

2 Structure

The configuration of Micro Automation Set 12a is shown in the figure below.

Figure 2-1



3 Required hardware and software components

Products

Component	Type	MLFB / Order information	No.	Manufacturer
Power supply	LOGO!Power 24 V/1.3 A	6EP1331-1SH02	1	SIEMENS A&D
Logic module	LOGO! 24V (transistor outputs)	6ED1052-1CC00-0BA5 (Testcode from ...-0BA3)	1	
Motor	Three-phase asynchronous motor (e.g. 230V/400V, 120W)	1LA7060-4AB10	1	
Frequency inverters	SINAMICS G110 (without filter) 230V; 750W; AIN	6SL3211-0AB17-5UA1*	1	

Note

Internal sales note:

Note on operating the SINAMICS G110 frequency inverter in America

The American (domestic) electricity networks have a voltage of approx. 110V.

Industrial plants normally have a 230V network

The SINAMICS G110 frequency inverter has been designed for 230 Volts application.

The following options exist for realizing the application for a 110V network:

1. A transformer can be used for adjusting the voltage.
2. A MICROMASTER 410, also available for 110 V, can be used instead of the SINAMICS G110. Please note, that the Micromaster 410 covers a smaller power range (0.16hp to 0.75hp /120W to 550W) than the SINAMICS G110.
3. Irrespective of SINAMICS G110 or MICROMASTER 410, 230V must be applied to both inverter types.
This also applies for the 110V version of the MICROMASTER 410.

Adaptation to 50/60Hz applications:

Select the used motor with the DIP switch at the front of the inverter!

Do not use the parameter P0100, as the power specification / frequency selected in the P0100 parameter is overwritten by the selection made with the DIP switch after ON/OFF of the inverter power supply.

If the Dip switch is not set to the correct frequency, and only parameter 0100 is adapted during commissioning, this may cause problems later on in the application, as the value selected with the Dip switches becomes active after a power failure.

If e.g. the switch is used in the basic position (=kW/50Hz) and a 60Hz motor is used, the motor does not reach its full speed.

When operating with NEMA motors, the switch must be set to hp/60Hz (flip switch upwards)!

* available in other services / versions

Note

Note on SINAMICS frequency inverters

The SINAMICS G110 frequency inverter is available in different performance classes with different standard features. The frequency inverter can thus be ordered to suit the application purpose/location.

[SINAMICS G110 Frequenzumrichtertypen in der A&D-Mall](#)

Note

Note on the used motors

When operating at the frequency inverter, the self-ventilating motors in continuous operation cannot be operated with the full rated torque throughout the entire speed range. Depending on the speed correcting range, self-ventilated motors require a respective reduction in speed, i.e. in power. This speed reduction depends on the motor and inverter used.

Generally, these values are known at the manufacturer. Please enquire if you wish to use other motors than the here described.

Accessories

Component	Type	MLFB / Order information	No.	Manufacturer
Button (optional)	Basic operator panel for SINAMICS G110	6SL3255-0AA00-4BA0	1	SIEMENS A&D
Network filter	Network filter class B, for low leakage currents	6SE6400-2FL01-0AB0*	1	
Adapter	Installation on DIN hat rail, size 1 (FS A)	6SL3261-1BA00-0AA0	1	

Note on network filter

The SINAMICS G110 can also be ordered with integrated network filter class B, then the connection of the above listed filter is not necessary!

Configuration software/tools

Component	Type	MLFB / Order information	No.	Manufacturer
LOGO! Soft Comfort	from V4.0	6ED1058-0BA00-0YC3	1	SIEMENS A&D
Connection cable	LOGO!/PC cable	6ED1057-1AA00-0BA0	1	
SINAMICS PC commissioning (optional)	Starter from V3.0 SP2	http://support.automation.siemens.com/WW/view/de/26233208	1	
Connection cable (SINAMICS G110 – PC/PG; optional)	SINAMICS G110 PC inverter connection block	6SL3255-0AA00-2AA0	1	

4 Function Principle

The sample configuration consists of 3 basic components:

- The drive, a three-phase asynchronous motor
- The frequency inverter (SINAMICS G110)
- And the LOGO! - logic module

The SINAMICS G110 frequency inverter is a device for controlling motors. From the current single-phase network with a constant frequency, the frequency inverter generates speed with a variable frequency. Consequently the speed of the motor is variable. The following functions, among others, can be implemented with the device:

- Accelerate/decelerate motor (can be controlled by LOGO!)
- Soft starter/slowdown of motor
- Motor braking (DC braking, can be controlled by LOGO!)
- Change in direction of rotation (can be controlled by LOGO!)
- Motor on/off (can be controlled by LOGO!)
- Motor protection

The frequency inverter has a maximum of 4 digital inputs, which are controlled by LOGO!. Using logic operations, the LOGO! is able to react to changes in the process (e.g. by changing the speed).

5 Configuring the Startup Software

5.1 Preliminary Remark

For the startup we provide software examples with test code and test parameters as download. The software examples support you during the first steps and tests with your Micro Automation Sets. They enable quick testing of the hardware and software interfaces between the products described in the Micro Automation Sets.

The software examples are always assigned to the components used in the set and show their basic interaction. However, they are not a real application in the sense of a technological problem solution with definable properties.

5.2 Download of the startup code

The software examples are available on the HTML page from which you downloaded this document.

Table 5-1

File name	Contents
Set12_LOGO!_V1d0.zip	LOGO! Soft Comfort project
Set12_STARTER_V1d0_en.zip	G110: Parameterization

5.3 Configuring Components

Note

It is assumed here that the necessary software has been installed on your computer and that you are familiar with handling the software.

Warning

Please carefully read all safety and warning notices given in the operating instructions on the converter and all warning labels attached to the device before doing any installation and commissioning procedures. Please maintain warning labels in a legible condition and do not remove them from the device.

LOGO! Logic module LOGO! Configuring Soft Comfort

Table 5-2

No.	Function	Comment
1.	Wire all components as illustrated in the layout diagram.	
2.	Connect the PC and the LOGO! with a serial RS232 cable via the serial interface COM1. When using a different COM interface, this has to be considered accordingly in LOGO! Soft Comfort .	
3.	Open the LOGO! project with the help of LOGO! Soft Comfort	
4.	Load the program to the LOGO! logic module and start the LOGO!	

Parameterizing the SINAMICS frequency inverter

As an alternative to the following parameterization of the SINAMICS G110 you can also use the starter project file.

Table 5-3

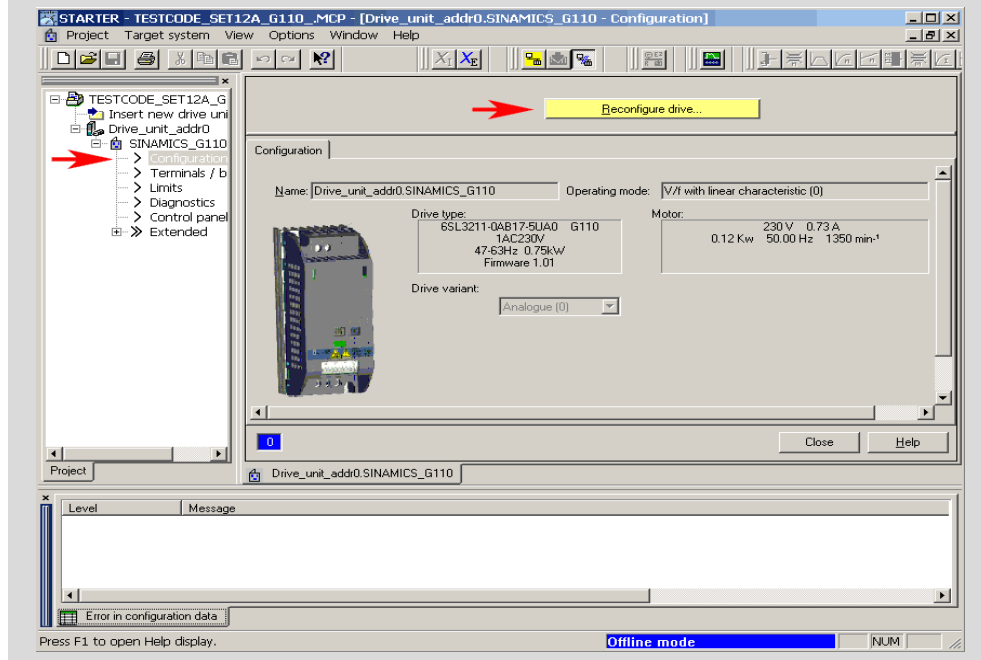
Step	Parameter	Index	Value (to be parameterized)	Comment
5.	P0003		3	Access level
6.	P0010		30	Startup parameters on default settings
7.	P0970		1	
8.	P0010		1	Quick startup
9.	P0100		0	Europe 50Hz power in kW
10.	P0304		Motor rating plate	Rated motor voltage
11.	P0305			Rated motor current
12.	P0307			Rated motor output
13.	P0310			Rated motor frequency
14.	P0311			Rated motor speed
15.	P0700		2	Command source digital inputs
16.	P1000		1	Frequency setpoint value MOP (= motor potentiometer)
17.	P1080		0..0 HZ	Minimum frequency (affects control behavior)
18.	P1082		50Hz	Maximum motor frequency
19.	P1120		1,00	Startup ramp
20.	P1121		1,00	Slowdown ramp
21.	P3900		1	End quick startup
22.	P0003		3	Access level
23.	P0701		1	Digital input 1 to ON/OFF
24.	P0702		12	Digital input 2 on reserve
25.	P0703		14	Digital input 3 on speed reduction (MOP down)
26.	P0704		13	Digital input 4 on speed increase (MOP up)
27.	P0731		52.3	Digital output converter error active
28.	P1040		0,00	MOP nominal value (start frequency at ON)

Step	Parameter	Index	Value (to be parameterized)	Comment
29.	P0971		1	Save the data in the E ² PROM

* 0=Europe 50Hz power in kW -> Make your selection with the Dip-switch on the front of the SINAMICS G110(!) These values are preset depending on the position of the dip switch on the front of the SINAMICS G110.

Note Some of the parameters can only be set during quick startup P0010=1.

Note **Note on the STARTER project file**
If you use this project you must reconfigure the drive !



6 Live Demo

All control states are displayed on the LOGO! display. Additionally, the relay output of the converter (programmed to conversion errors) is evaluated and a possible error is signaled on the LOGO! display.

Table 6-1

No.	Function	Activity
1.	Motor ON/OFF	LOGO! input I1
2.	Change direction of rotation	LOGO! input I2
3.	Reduce speed	LOGO! Input I3
4.	Increase speed	LOGO! Input I4

Micro Automation Set 12

Entry ID 23753479

7 Technical data

LOGO! 24

Parameter	Number/Size/Range	Comments
Supply voltage	24 V DC	
Inputs	8 (of which 2 analog 0-10V)	
Outputs	4	
Dimensions (W x H x D) in mm	72 (4 width modules) × 90 × 55	

LOGO! Power 24V 1.3A

Parameter	Number/Size/Range	Comments
Supply voltage	AC 100-240V	
Output voltage	DC 24V	
Output current	1.3A	
Dimensions (W x H x D) in mm	54 (3 width modules) × 90 × 55	

Motor 230V/400V Δ /Y 50Hz 0.12kW

Parameter	Number/Size/Range	Comments
Rated speed	1350min ⁻¹	
Performance factor cos φ	0,75	
Rated current at 230V	0.73A	
Rated torque	0.85Nm	
Moment of inertia	approx. 0.00029kgm ²	
Weight	approx. 4.0kg	

SINAMICS G110 frequency converter

Parameter	Number/Size/Range	Comments
Network frequency	1 AC 200 V up to 240 V ±10 %	47 to 63 Hz
Output frequency	0 to 650 Hz	
Converter efficiency		for devices <0.75kW 90% to 94% for devices >0.75 kW >95%
Overload capability	Overload current 1.5 x rated output current	(i.e. 150 % overload) for 60 s, afterwards 0.85 x rated output current for 240 s, cycle time 300 s
Digital inputs	3	4 if analog input used as digital input; parameterizable digital inputs potential bound; PNP type, SIMATIC compatible
Analog inputs	1 (version)	0-10V; for setpoint value (0 V to 10 V, scalable or usable as 4th digital input)
Digital output	1	Electrically isolated optocoupler output (DC 24 V, 50 mA, ohmic, NPN-type)
Protection system	IP20	