Set for Drive Technology

applications & TOOLS

Changing Speed and Positioning with Standard Drives

Micro Automation Set 1

SIEMENS

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csweb@ad.siemens.de

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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 occurring subtask of a typical customer problem in the low-end range.

The sets help you 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 Fields of Application and Benefit

Fields of application

This configuration is suitable for the following task:

- Changing the speed of three-phase motors
- Positioning with three-phase motors

The configuration is particularly suitable for:

- The drive of pumps and fans
- Applications in conveyor technology

Benefit

- The integrated communication in SIMATIC S7-200 enables to control drives without using analog modules or digital inputs/outputs.
- The bus system enables to easily connect further drives without additional components.
- Simple commands for controlling, monitoring, and parameterizing the drives ensure quick and convenient engineering.
- The MICROMASTER 420 inverter features a complete motor protection function.
- The optional remote maintenance reduces the downtimes of the plants. This option is described in Micro Automation Set 13.

2 Required Hardware and Software Components

Products

Component	Type	MLFB / Order Number	No.	Manufacturer
Single-phase inverter	MICROMASTER 420	6SE6420-2UC11-2AA1*	1	SIEMENS A&D
S7-200 CPU	SIMATIC S7-CPU 226	6ES7216-2BD22-0XB0*	1	
Motor	3-phase NS asynchronous motor	1LA7060-4AB10*	1	
Text display	SIMATIC TD (200 incl. connection cable to S7-200, only approximately 2m!)	6ES7272-0AA30-0YA0	1	

Accessories

Component	Type	MLFB / Order Number	No.	Manufacturer
Operation Micromaster	Basic Operator Panel (BOP)	6SE6400-0BP00-0AA0	1	SIEMENS A&D
or				
Inverter/PC interface	PC/inverter connecting kit	6SE6400-1PC00-0AA0		
Filter for low leakage currents (e.g. for operation in public networks)	Additional filter 200V-240V 1AC 10A under body mounting FSA – class B	6SE6400-2FL01-0AB0	1	
Gland plate	For housing FSA	6SE6400-0GP00-0AA0	1	
Connection cable 1	PROFIBUS cable	6XV1 830-0EH10	1	
Bus connector	Connector for PROFIBUS cable	6ES7 972-0BA12-0XA0	1	
Encoder optional, for definition of position/position control	Shaft-angle encoder 100 pulses/revolution	6FX2001-4SA10	1	
	Shaft-angle encoder 500 pulses/revolution	6FX2001-4SA50		
	Connection cable/ signal line (3m) S7-200⇔encoder	6FX5002-2CA12-1AD0	1	

Configuration software/tools

Component	Type	MLFB / Order Number	No.	Manufacturer
STEP 7Micro/WIN 32	V3.2 SP4	6ES7810-2BC02-0YX0	1	SIEMENS A&D
STEP 7Micro/WIN 32 Instruction Library	V1.1	6ES7830-2BC00-0YX0	1	
Starter startup software for Micromaster	V3.0	http://www.ad.siemens.de/support	1	
Connection cable 2	PC/PPI cable	6ES7901-3CB30-0XA0	1	

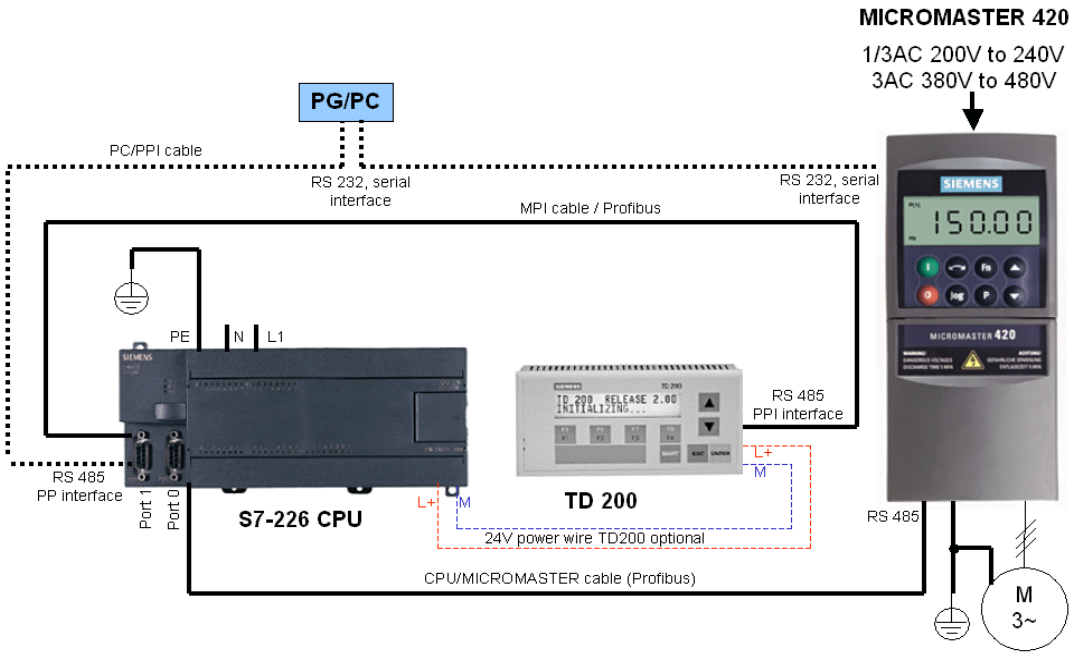
Note A SIMATIC PG or a standard PC is required to use the configuration software/tools!

* Available with different power ratings/in different versions

3 Configuration

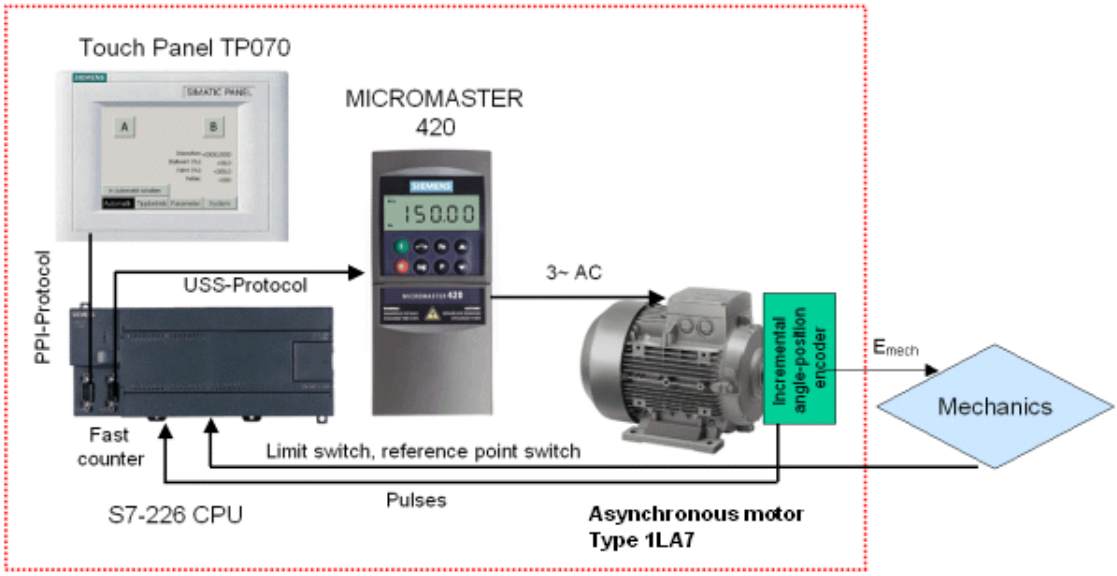
The configuration of Micro Automation Set 1 is shown in the figure below.

Figure 3-1



The figure below shows a possible expansion of Micro Automation Set 1 with shaft-angle encoder. With this expansion, an open-loop controlled/closed-loop controlled positioning can be realized. Micro Application Example 1 describes closed-loop controlling,

Figure 3-2



4 Principle of Operation

S7-200 CPU and MICROMASTER 420 are connected via the RS 485 interface and the USS protocol.

With a simple configuration, the motor can be turned ON/OFF and its speed can be controlled in two steps.

The user can intervene in the process with the TD200 text display.

Danger

Please observe the following: The respective data have to be adapted to <u>your motor and your mains supply</u>!

5 Software Example for Startup

Preliminary remark

For the startup, we offer you 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 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 real applications in the sense of technological problem solving with definable properties.

Download

The software example is available on the HTML page from which you downloaded this document.

The download is a ZIP file which can be unzipped with any unzip program. The ZIP file contains the files:

Table 5-1

File name	Content
Set1_S7-200_v1d4_en.mwp	S7-200: Program code[1]
Set1_MM_v1d4_en.MCP	MICROMASTER: Parameterization

Functionality

The software example enables the following:

- Motor ON/OFF (M1.0)
- Changing direction of rotation (M1.4)
- Setting speed to 0 (M2.1)
- Setting speed to 30% (M2.2)
- Setting speed to 90% (M2.3)

The above functions are also possible via TD200.

[1] To open it, click the file if you work with “STEP 7 Micro/WIN 3.2 SP4” or higher.

Operation

The set is configured and programmed with the files of the software example (see Download).

Parameterization MICROMASTER

You can parameterize the MICROMASTER in two ways:

- Manually via the display of the MICROMASTER
- Automatically via the PC interface of the MICROMASTER

The test parameters for the MICROMASTER 420 are listed in the table:

Table 5-2

Step	**Parameter**	**Index**	**Value** (to be parameterized)	**Comment**
1.	P0003		3	Access step
2.	P0010		30	Startup parameters on default settings
3.	P0970		1	
4.	P0010		1	Quick startup
5.	P0100		0	Europe 50Hz output in kW -> Make your selection with the DIP switch on the front of SINAMICS G110 (!) [2]
6.	P0304		*Motor rating plate*	Rated motor voltage
7.	P0305			Rated motor current
8.	P0307			Rated motor output
9.	P0310			Rated motor frequency
10.	P0311			Rated motor speed
11.	P0700		5	Command source
12.	P1000		5	Frequency setpoint
13.	P1080		0, 0 Hz	Minimum frequency
14.	P1082		60Hz	Maximum motor frequency
15.	P1120		1.00	Startup ramp
16.	P1121		1.00	Slowdown ramp
17.	P3900		1	End quick startup
18.	P0003		3	Access step
19.	P2000		60.00	Reference frequency 60 Hz (1 to 650 Hz)
20.	P2009	0	0	USS normalization 0 to 65 535 ms
21.	P2010	0	7	Data rate: 19200 baud
22.	P2011	0	1	Address (slave)
23.	P2012	0	2	USS PZD length
24.	P2013	0	127	USS PKW length
25.	P2014	0	300	Communication monitoring: Value 0 is without monitoring. If you change this value it is required that the PLC already executes the USS protocol since otherwise error 72 occurs. It is also required that you change the value with the down arrow since, with the up arrow, the first value would be 1 ms causing an error message immediately.
26.	P0971		1	Saving data in E²PROM

[2] These values are preset depending on the DIP switch position on the front of SINAMICS G110.

6 Performance Data

MICROMASTER 420

Parameter	Number/Size/Range	Comments
Input voltage	1 AC 200V – 240V ±10%	
Rated motor output	0.12 kW	
Input, max. output current	2 A; 0.9 A	
Inverter efficiency	96 to 97%	
Serial interfaces	RS-232 and RS-485	
Inputs and outputs	Analog and digital	

SIMATIC CPU S7-226

Parameter	Number/Size/Range	Comments
Supply voltage	AC 85V to 264V	
Integrated inputs/outputs	24/16	
Program memory/data memory	4096/2560 words	
Programming language	LAD/FBD/STL	
Interfaces	2x RS485 communication port	Expansion bus for modules
Degree of protection	IP 20 according to IEC 529	

Three-phase NS asynchronous motor

Parameter	Number/Size/Range	Comments
Rated voltage; rated frequency	Δ/Y 230/400 V; 50 Hz	
Rated output, rated current	0.12 kW; 0.73/0.42 A	
Cos φ; rated speed	0.75; n=1350/min	

SIMATIC TD 200 text display

Parameter	Number/Size/Range	Comments
Display	LCD backlit, two-line, 20 characters/line (ASCII)	
Interface	1 PPI (RS485), connection to S7-200, OP, TP, TBP, PG/PC	
Power supply	DC 24 V, 120 mA	
Ambient temperature	0 to 60 °C	
Dimensions (W x H x D) in mm / mass	148 x 76 x 27 / 250 g	
Degree of protection	IP 65 at the front	

Shaft-angle encoder (optional)

The shaft-angle encoder is not required for the software example.

Parameter	Number/Size/Range	Comments
Supply voltage	10V .. 30V DC	Rated voltage 24V DC
Signal level	HTL	24V
Signal type	A/B counter	90° phase shift
Resolution	100 or 500 pulses/revolution	2500 and 1000 pulses also available