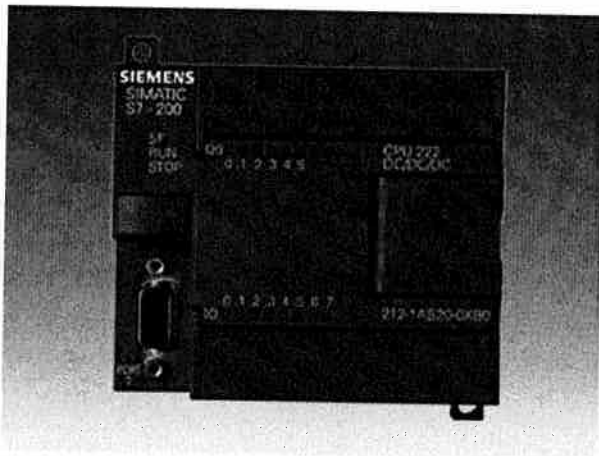


CPUs - CPU 222



Overview

Overview

- The inexpensive entry model into the SIMATIC S7-22x series
- An all-rounder with a wide range of connectable expansion modules
- With analog value processing

Application

The CPU 222 is the inexpensive entry option into the SIMATIC S7-22x series

A wide range of connectable expansion modules not only opens the world of analog value processing, but also makes the CPU versatile.

Design

Mechanical features

- Horizontal or vertical assembly on standard rail or panel mount with integrated screwholes
- Removeable terminal blocks (optional)

The CPU 222 includes:

- Integrated 24 V transmitter/load power supply; for the direct connection of sensors and transmitters. With 180 mA it can also be used as a load power supply.
- 2 device variants; with various supply and control voltages
- Integrated digital inputs/outputs; 8 inputs and 6 outputs
- Interrupt inputs; for extremely rapid reactions to increasing or decreasing process signal slopes
- High-speed counters; 4 high-speed counters (30 KHz), with parameterizable enable and reset input, simultaneously as forward and reverse counters with 2 independent inputs, can be used for the connection of incremental encoders with 2 pulse sequences with 90° offset
- Trouble-free expandability through digital and analog expansion modules (EMs)
- Simulator (optional); for the simulation of integrated inputs and the testing of user programs

- Analog potentiometer
1 analog potentiometer, can be used as a user-friendly setpoint adjuster during everyday operation, such as for setting timers
- Pulse outputs;
2 high-frequency pulse outputs (max. 20 kHz);
For use in positioning tasks and the control of frequency controlled motors and stepper motors via power circuits
- Real-time clock (optional);
As a pluggable module, for example for adding time stamps to messages, for registering machine running times or for the time-control of processes
- EEPROM cartridge (optional);
allows rapid program change (even without a programming device) and additional program archiving
- Battery module for long-duration battery backup;
To increase holding time to typically 200 days (10 years „shelf life“). Without the battery module, user data (e.g. memory bit statuses, data blocks, times, counters) are saved by an internal high-power capacitor for around 5 days. The battery module is inserted into the memory submodule port

Device variants				
Variant	Supply voltage	Input voltage	Output voltage	Output current
• DC outputs	24 V DC	24 V DC	24 V DC	0.5 A, Transistor
• Relay outputs	85 to 264 V AC	24 V DC	24 V DC, 24 to 230 V AC	2 A, Relay

Functions

- Extensive set of instructions;
A multiplicity of **basic operations** such as binary logic operations, result allocation, save, count, create times, load, transfer compare, shift, rotate, create complement, call sub-program, integrated communication commands (eg. NETE, NETW, RECEIVE-Freeport) and **enhanced functions** such as pulse-duration modulation, pulse sequence function, arithmetic functions, floating point arithmetic, PID closed-loop control, jump functions, loop functions and code conversions simplify the programming task
- Counting;
user-friendly counting functions in conjunction with the integrated counters open up new application areas for the user
- Interrupt processing;
 - slope-controlled interrupts (triggered by increasing or falling process signal slopes at interrupt inputs) allow extremely rapid reactions to process events
 - Time-controlled interrupts can be set in at 1 ms increments from 5 ms to 255 ms.
 - Counter interrupts can be triggered when a specified value is reached or if the counter direction changes.
 - Communication interrupts allow the rapid and easy exchange of information with peripheral devices such as printers or bar code readers.
- Direct interrogation and control of inputs/outputs;
Inputs and outputs can also be interrogated and set independently of the cycle. Thus the controller can react quickly to process events (e.g. direct reset of outputs in the case of an interrupt event).
- Password protection;
The three-level password protection concept allows efficient protection of know-how. The protection concept has the following options for access to the user program:
 - Full access: The program can be altered as desired.
 - Read only: The program is protected against unauthorized alteration. Testing, adjustment of system parameters and copying of the program is allowed.
 - Complete protection: The program is protected against alteration and unauthorized readout and copying. Adjustment of parameters is allowed.

- Test and diagnostic functions;
User-friendly functions support testing and diagnostics: the complete program is run over a predetermined number of cycles and analyzed. Internal parameters such as memory bits, timers or counters are logged at the same time over a maximum of 124 cycles.
- „Forcing“ of inputs and outputs during test and diagnostic operation;
Inputs and outputs can be set independently of cycle and thus permanently, for example to test the user program.

Programming

The programming software STEP 7-Micro/WIN32 V3.0 is available exclusively for the comprehensive programming of all of the CPU 222's functions.

The STEP 7-Micro/WIN16 V2.6 software package can also be used, but it only supports the programming of those functions which are also present in the S7-21x series.

The CPU 222 cannot be programmed with STEP 7-Micro/DOS.

If programming is to take place via the serial interface of the PG/PC, the PC/PPI cable is also required.

If the STEP 7-Micro/WIN32 V3.0 programming software is used, programming can also be carried out via the SIMATIC CP 5511 or CP 5611. In this case communication speeds of up to 187 kbit/s are possible.

Technical data

CPU 222	
Program memory	4 kbytes / typically 1.3 K instructions
Data memory	1024 words
Memory cartridge (optional)	1 pluggable memory cartridge; content identical to the integrated EEPROM
Program backup	Entire program maintenance-free in the integrated EEPROM
Data backup	Entire DB 1 maintenance-free in the integrated EEPROM Current DB 1 values in RAM, retentive memory bits, times, counters etc. maintenance-free through super capacitor; optional battery for long-term backup.
Backup time (typical).	50 hr (minimum 8 hr at 40 °C); 200 days (typ.) with optional battery module
Charge time for super capacitor	20 min. (to 60% capacity)
Programming language	Ladder logic, FBD and STL
Program organization	1 organisation block (which can contain subroutines)
Program execution	<ul style="list-style-type: none"> • free scan cycle (OB 1) • interrupt controlled • time controlled (1 to 255 ms)
Sub-program levels	8
User program protection	3-level password protection
Instruction set	
• Basic operations	Binary logic operations, result allocations, save, count, load, transfer, compare, shift, rotate, form complement, call subroutines with parameter passing
• Enhanced functions	Pulse duration modulation, pulse sequence commands, jump commands, loop instructions, code conversions, mathematical functions (addition, subtraction,

	multiplication, division, square-root), fixed and floating point math
Processing times for bit operations	0.37 μ s
Cycle time monitoring	300 ms (retriggerable)
Memory bits	256
• of which retentive	0 to 112 in EEPROM, selectable; 0 to 256, via super capacitor or battery, selectable
Counters	256
• of which retentive	256, via super capacitor or battery, selectable
• Counting range	0 to 32767
Timers	256
• of which retentive	64, via super capacitor or battery, selectable
• Timing range	4 timers, 1 ms to 30 s 16 timers, 10 ms to 5 min 236 timers, 100 ms to 54 min
Integrated high-speed functions	
• Interrupt inputs	4 (with positive and/or negative input slope, programmable interrupt reaction)
• Counters	4 high-speed counters (each 30 kHz), 32 bit (inc. sign), useable as up/down counters or for interfacing 2 incremental transmitters with 2 quadrature encoders; Parameterizable enable and reset input; Interrupt options (inc. calling a subroutine with any content) on reaching a specified value; Reversal of counting direction etc.
• Pulse outputs	2 high-speed outputs, 20 kHz with interrupt option; pulse width and frequency modulation possible
Interfaces	<p>1 RS 485 communication interface, optionally:</p> <ul style="list-style-type: none"> • as PPI interface with <ul style="list-style-type: none"> – PPI protocol for programming device functions, HMI functions (TD 200, OP), S7-200 internal CPU/CPU communication – Baud rates 9.6/19.2/187.5 kbit/s • or as MPI slave for data exchange with MPI masters (S7-300/S7-400 CPU's, OP's, TDs, push-button panels); S7-200 internal CPU/CPU communication is not possible on the MPI network <ul style="list-style-type: none"> – Baud rates 19.2/187.5 kbit/s • or as freely programmable interface with interrupt option for serial data exchange with external devices, e.g. using ASCII protocol <ul style="list-style-type: none"> – Baud rates 0.3/0.6/1.2/2.4/4.8/9.6/19.2/38.4 kbit/s – at 1.2 to 38.4 kbit/s the PC/PPI cable can be used as an RS232/RS458 converter <p>Backplane bus</p> <ul style="list-style-type: none"> – connection of expansion modules (EMs)¹. Only EMs from the S7-22x series may be used

Connectable programming units/PC	PG 720P, PG 740, PG 760 and PC (AT)	
Integrated inputs/outputs <ul style="list-style-type: none"> • Pluggable I/O terminals • Digital inputs • Digital outputs • Analog potentiometer 	No 8; of which 4 channels can be used as hardware interrupts and 6 for high-speed functions 6, of which 2 channels can be used for integrated functions 1 Analog potentiometer; 8 bit resolution	
Connectable I/O <ul style="list-style-type: none"> • digital inputs/outputs • analog inputs/outputs • IM interface inputs/outputs, max. 	max. 24 inputs and 22 outputs (including integrated input/output); further expansion using 16DI/16DO expansion modules in preparation 6 inputs and/or 4 outputs; max. 8 in total currently no IM interface expansion modules available	
Expansion, max.	2 expansion modules ¹ . Only expansion modules from the S7-22x series may be used	
Degree of protection	IP 20 according to EN 60529	
Ambient temperature <ul style="list-style-type: none"> • with horizontal installation • with vertical installation 	0 to 55 °C 0 to 45 °C	
Relative humidity	5 to 95% (RH stress level 2 according to IEC 1131-2)	
Air pressure	860 to 1080 hPa	
Other environmental conditions	see „S7-200 automation system, system manual“	
Supply:	24 V DC	100 to 230 V AC
Inputs:	24 V DC	24 V DC
Outputs:	24 V DC	Relay
Supply voltage L+/L1		
• nominal value	24 V DC	120 to 230 V AC
• permitted range	20.4 bis 28.8 V	85 to 264 V AC (47 to 63 Hz)
Input current		
• Starting current inrush, max.	10 A at 28.8 V	20 A at 264 V
• Current input, max.	70 (CPU only) to 600 mA (Max., incl.load)	25 to 180 mA
Output voltage for sensors and transmitters		
• nominal value	L+ (24 V DC)	24 V DC

• permitted range	15.4 to 28.8 V	20.4 bis 28.8 V
Output current for sensors (24 V DC)		
• nominal value	180 mA	180 mA
• short-circuit protection	electronic at 600 mA, non-latching	electronic at 600 mA, non-latching
Output current for expansion modules (5 V DC)	340 mA	340 mA
Integrated inputs		
• type	8 current sinking or sourcing	8 current sinking or sourcing
Input voltage		
• nominal value	24 V DC	24 V DC
• with signal „1“	15 to 30 V	15 to 30 V
• with signal „0“	0 to 5 V	0 to 5 V
Isolation		
• in groups of	Optocoupler 2 and 4	Optocoupler 2 and 4
Input current		
• with signal „1“	4 mA	4 mA
Input delay (at nominal input voltage)		
• for standard inputs max.	All inputs 0.2 to 12.8 ms, selectable	All inputs 0.2 to 12.8 ms, selectable
• for interrupt inputs - typ./max.	(I0.0 to I0.3) 0.2 to 12.8 ms, selectable	(I0.0 to I0.3) 0.2 to 12.8 ms, selectable
• For high-speed counter 0 max.	(I0.0 to I0.5) 30 kHz	(I0.0 to I0.5) 30 kHz
• For high speed counters 1, 2, typ./max.	--	--
Connection of 2-wire BERO		
• permitted closed-circuit current , max.	1 mA	1 mA
Cable lengths		
• Unshielded (not for high-speed signals)	300 m	300 m
• shielded standard input	500 m	500 m
interrupt inputs, high-speed counters	50 m	50 m
Integrated outputs		
	6 (transistor)	6 (relay)
Nominal load voltage L+/L1	24 V DC	24 V DC/ 24 to 230 V AC
• permitted range	20.4 to 28.8 V DC	5 to 30 V DC/ 5 to 250 V AC
ON Resistance		
ON Resistance	0.3 Ω	0.2 Ω
Isolation	Optocoupler	Relay

• In groups of	6	3
Output current, max.		
• with signal „1“		
– nominal value at 40 °C	0.75 A	2 A
– nominal value at 55 °C	0.75 A	2 A
– Minimum current	--	--
• with signal „0“	10 µA	0 mA
Sum of all output currents per common		
• at 40 °C, max.	4.5 A	6.0 A
• at 55 °C, max. (horizontal installation)	4.5 A	6.0 A
ON delay		
• standard outputs, max.	(Q0.2 to Q0.5) 15 µs	all outputs 10 ms
• pulse outputs, max.	(Q0.0 to Q0.1) 2 µs	--
OFF delay		
• standard outputs, max.	(Q0.2 to Q0.5) 100 µs	all outputs 10 ms
• pulse outputs, max.	(Q0.0 to Q0.1) 10 µs	--
Operating frequency of pulse outputs	(Q0.0 to Q0.1)	(Q0.0 to Q0.1)
• with resistive load	20 kHz	--
Switching capacity of outputs ²		
• with resistive load	0.75 A	2 A
• with lamp load	5 W	300 W for DC 200 W for AC
Lifespan of contacts (number of operating cycle)		
• mechanical	--	10 million
• at rated load	--	100,000
Limiting of voltage induced on circuit interruption, min.	L+ -48 V	--
Short-circuit protection	to be provided externally	to be provided externally
Cable lengths		
• unshielded	150 m	150 m
• shielded	150 m	500 m
Isolation		
• between 24 V DC and 24 V DC	500 V DC	500 V DC
• between 24 V DC and 230 V AC	---	1500 V AC

Dimensions (W x H x D) in mm	90 x 80 x 62	90 x 80 x 62
Weight, approx.	270 g	310 g

- 1) Because of the limited output current the use of expansion modules is subject to limitations
- 2) 1 output to 40 °C