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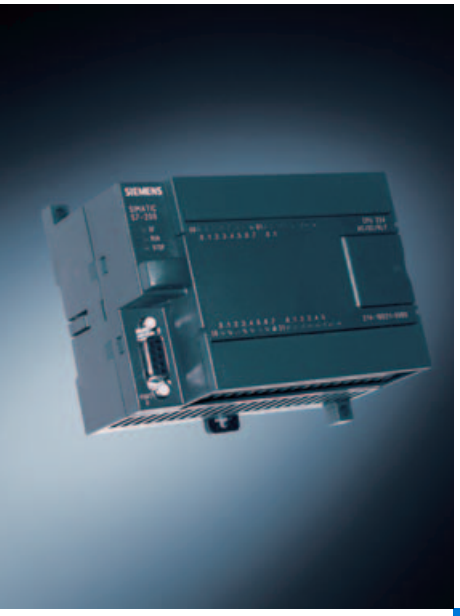
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SIMATIC S7-200

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3/2	General
3/3	Central processing units
3/16	Digital expansion modules
3/20	Analog expansion modules
3/24	Function modules
3/25	Communication
3/29	Power supplies
3/31	Human Machine Interface
3/33	Software



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Overview



- The micro PLC that offers maximum automation at minimum cost
- Extremely simple installation, programming and operation
- Large-scale integration, space-saving, powerful
- Can be used both for simple controls and for complex automation tasks
- All CPUs can be used in stand-alone mode, in networks and within distributed structures
- Suitable for applications where programmable controllers would not have been viable in the past
- With outstanding real-time performance and powerful communications (PPI, PROFIBUS-DP, AS-Interface)

- American Bureau of Shipping (ABS)
- Bureau Veritas (BV)
- Des Norske Veritas (DNV)
- Germanischer Lloyd (GL)
- Lloyds Register of Shipping (LRS)
- Registro Italiano Navale (RINA)
- Nippon Kaiji Kyokai (NK)

General technical specifications

Degree of protection	IP 20 acc. to IEC 529
Ambient temperature	
• Operation (95% air humidity)	
- with horizontal mounting	0 to 55 °C
- with vertical mounting	0 to 45 °C
• Storage and transport	-40 to +70 °C
- for 95% air humidity	25 to 55 °C
Isolation	
• 5/24 V DC circuits	Test voltage 500 V AC
• 115/230 V AC circuits to earth	Test voltage 1500 V AC
• 115/230 V AC circuits to 115/230 V AC circuits	Test voltage 1500 V AC
• 230 V AC circuits to 5/24 V DC circuits	Test voltage 1500 V AC
• 115 V AC circuits to 5/24 V DC circuits	Test voltage 1500 V AC
Electromagnetic compatibility	Requirements of the EMC Guideline
• Interference immunity to EN 50082-2	Tested acc. to : IEC 801-2, IEC 801-3, IEC 801-4, EN 50141, EN 50204, IEC 801-5, VDE 0160
• Emitted interference according to EN 50081-1 and EN 50081-2	Tested acc. to : EN 55011, Class A, Group 1 and EN 55011, Class B, Group 1
Mechanical stress	
• Vibrations, tested according to / tested with	IEC 68, Part 2-6: 10 to 57 Hz; constant amplitude 0.3 mm; 58 to 150 Hz; constant acceleration 1 g (for standard rail mounting) or 2 g (for control panel mounting); Type of vibration: Frequency progressions changing at 1 octave per minute; Duration of vibration: 10 frequency progressions per axis in each direction of the three mutually perpendicular axes
• Shock, tested acc. to / tested with	IEC 68, Part 2-27/semisinusoidal: Shock strength 15 g (peak value), duration 11 ms, 6 shocks on each of the mutually perpendicular axes

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Overview
CPU 221



- The smart compact solution
- With 10 inputs/outputs on board
- Not expandable

Overview
CPU 222



- The superior compact solution
- With 14 inputs/outputs on board
- Expansion capability for max. 2 expansion units

Overview
CPU 224



- The compact high-performance CPU
- With 24 inputs/outputs on board
- Expansion capability for max. 7 expansion units

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CPU 221, 222, 224, 226, 226 XM

Overview
CPU 226



- The high-performance package for complex technical tasks
- With additional PPI port for added flexibility and communication options
- With 40 inputs/outputs on board
- Expansion capability for max. 7 expansion units

Overview
CPU 226 XM



- The high-performance package for large-scale technical tasks
- With an additional PPI connection for increased flexibility and communication options
- 40 on-board inputs/outputs
- Expansion capability for max. 7 expansion units
- Enhanced program and data memory

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Technical specifications CPU 221

Program memory	4 KB
Data memory	2 KB
Memory cartridge (optional)	1 memory module; contents identical to integrated EEPROM
Program backup	Entire program maintenance-free in the integrated EEPROM, programmable using CPU
Data backup	Entire DB 1 loaded from PG/PC in integral EEPROM; maintenance-free Current value of DI 1 in RAM, retentive bit memories, timers, counters, etc. maintenance-free over high-performance capacitor; Battery for long-term buffering, optional
Backup time typ.	50 h (min. 8 h at 40 °C); 200 days (typ.) with optional battery module
Programming language	Ladder logic, FBD and STL
Program organization	1 OB, 1 DB, 1 SDB subroutines with/without parameter passing
Program execution	Free cycle (OB 1) • interrupt-controlled • time controlled (1 to 255 ms)
No. of subroutines, max.	64
User program protection	3-level password protection
Instruction set	Bit (logic) instructions, comparison instructions, timer instructions, counter instructions, clock instructions, fixed-point arithmetic, floating-point arithmetic, numeric functions, transfer instructions, table instructions, binary logic instructions, shift and rotate instructions, conversion instructions, program control instructions, system interrupt and communications instructions, stack instructions
Execution times for bit operations	0.37 µs
Cycle time monitoring	At 300 ms, can be retriggered
Bit memories	256
• Of these retentive	0 to 112 in EEPROM, adjustable; 0 to 256, over high-performance capacitor or battery, selectable
Counter	256
• Of these retentive	256, using high-performance capacitor or battery, selectable
• Counting range	0 to 32767
Timers	256
• Of these retentive	64, using high-performance capacitor or battery, selectable
• 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 (4 positive-going edges and/or 4 negative-going edges)
• Counter	4 quick counters (each 30 kHz), 32-bit (incl. sign), usable as up/down counter or to connect 2 incremental encoders with 2 pulse trains offset at a 90° angle (max. 20 kHz (A/B counter); configurable enable and reset input; interrupt possibilities (incl. call to a subprogram with desired content) when the setpoint value is reached; Counter direction change, etc.
• Pulse outputs	2 quick outputs, 20 kHz, with interrupt possibility; pulse width and frequency can be modulated
Interfaces	1 RS 485 communications interface, optionally: As PPI interface with PPI protocol for programming 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 CPUs, OPs, TDs, push button panels); S7-200 internal CPU/CPU communication is possible but limited in the MPI network; baud rates 19.2/187.5 kbit/s • Or as freely programmable interface with interrupt possibility for serial data exchange with third-party devices with ASCII protocol baud rates: 0.3/0.6/1.2/2.4/4.8/9.6/19.2/38.4 kbit/s; At rates ranging from 1.2 to 38.4 kbit/s the PC/PPI cable can be used as RS232/RS485 converter
Connectable programming units/PCs	SIMATIC PG/PC, standard PC
Onboard I/Os	
• Plug-in I/O terminals	No
• Digital inputs	6
• Digital outputs	4
• Analog potentiometers	1 analog potentiometer; resolution 8 bits
Max. number of inputs/outputs	
• Digital inputs/outputs	Max. 6 inputs and 4 outputs (integrated I/Os); expansion not possible
• Analog inputs/outputs	-
• AS-Interface inputs/outputs, max.	-
Expansion, max.	-
Degree of protection	IP 20 in accordance with IEC 529
Ambient temperature	
• With horizontal installation	0 to 55°C
• When mounted vertically	0 to 45 °C
Relative humidity	5 to 95 % (RH severity level 2 in accordance with IEC 1131-2)
Atmospheric pressure	860 to 1080 hPa
Other environmental conditions	See "S7-200 Programmable Controller System Manual"

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Technical specifications CPU 221 (continued)

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Supply voltage C L+/L1		
• Rated value	24 V DC	100 C 230 V AC
• Permitted range	20.4 to 28.8 V	85 to 264 V AC (47 to 63 Hz)
Input current		
• Max. incl. load	10 A at 28.8 V	20 A at 264 V
• Power consumption max.	80 to 900 mA	15 to 60 mA (240 V) 30 to 120 mA (120 V)
Output voltage for sensors		
• Rated value	L+ (24 V DC)	24 V DC
• Permitted range	15.4 to 28.8 V	20.4 to 28.8 V
Output current for sensors (24 V DC)		
• Rated value	180 mA	180 mA
• Short-circuit protection	Electronic at 600 mA	Electronic at 600 mA
Integrated inputs	**6**	**6**
• Type	Current sinking or sourcing	Current sinking or sourcing
Input voltage		
• Rated value	24 V DC	24 V DC
• At “1” signal , min.	15 V	15 V
• At "0" signal	0 to 5 V	0 to 5 V
Electrical isolation	Optocoupler	Optocoupler
• In groups of	2 and 4	2 and 4
Input current		
• Nominal value at “1” signal	4 mA	4 mA
Input delay (at rated value of the input voltage)		
• For standard inputs, max.	Every 0.2 to 12.8 ms, settable	Every 0.2 to 12.8 ms, settable
• For interrupt inputs, typ./ max.	(E0.0 to E0.3) -	(E0.0 to E0.3) -
• For fast counters, typ./max.	(E0.0 to E0.5) 30 kHz	(E0.0 to E0.5) 30 kHz
Connection of 2-wire BERO®		
• Permissible quiescent 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
- high-speed counters	50 m	50 m
On-board outputs	**4 (transistors)** Can be switched in parallel for high output currents	**4 (relays)**
Rated 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

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Output voltage		
• At "1" signal, min.	20 V DC	L+/L1
Output current, max.		
• At "1" signal		
- rated value at 40°C	0.75 A	2 A
- rated value at 55°C	0.75 A	2 A
- min. current	-	-
• At "0" signal	0.1 mA	0 mA
Sum of all output currents		
• At 40°C, max.	3.0 A	6.0 A
• At 55°C, max. (horizontal installation)	3.0 A	6.0 A
ON delay		
• Of the standard outputs, max.	(A0.2 to A0.3) 15 µs	All outputs 10 ms
• Of the pulse outputs, max.	(A0.0 to A0.1) 2 µs	-
OFF delay		
• Of the standard outputs, max.	(A0.2 to A0.3) 100 µs	All outputs 10 ms
• Of the pulse outputs, max.	(A0.0 to A0.1) 10 µs	-
Operating frequency of pulse outputs	(A0.0 to A0.1)	(A0.0 to A0.1)
• For resistive load	20 kHz	-
Switching capacity of the outputs		
• For resistive load	0.75 A	2 A
• For a lamp load	5 W	30 W DC 200 W AC
Service life of the contacts (number of switching cycles to VDE 0660, Part 200)		
• Mechanical	-	10 Mio.
• At rated voltage	-	100,000
Limitation of voltage induced on circuit interruption, max.	1 W	-
Short-circuit protection	Provide externally	Provide externally
Cable lengths		
• Unshielded	150 m	150 m
• Shielded	500 m	500 m
Isolation		
• Between 24 V DC and 5 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

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Technical specifications CPU 222

Program memory	4 KB
Data memory	2 KB
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 loaded from programming device/PC in integral EEPROM; maintenance-free Current DB 1 values in RAM, retentive flags, timers, counters etc. maintenance-free through super capacitor; optional battery for long-term backup
Backup time typ.	50 hr (minimum 8 hr at 40°C); 200 days (typ.) with optional battery module
Programming language	LAD, FBD and STL
Program organization	1 OB, 1 DB, 1 SDB subroutines with/without parameter passing
Program execution	free cycle (OB 1) • Interrupt-controlled • Time controlled (1 to 255 ms)
Subroutine levels	64
User program protection	3-level password protection
Operation set	Bit (logic) instructions, comparison instructions, timer instructions, counter instructions, clock instructions, fixed-point arithmetic, floating-point arithmetic, numeric functions, transfer instructions, table instructions, binary logic instructions, shift and rotate instructions, conversion instructions, program control instructions, system interrupt and communication instructions, stack instructions
Execution times for bit operations	0.37 µs
Cycle time monitoring	300 ms (retriggerable)
Bit memories	256
• Of these retentive	0 to 112 in EEPROM, selectable 0 to 256, using super capacitor or battery, selectable
Counter	256
• Of these retentive	256, using super capacitor or battery, selectable
• Counting range	0 to 32767
Timers	256
• Of these retentive	64, using super capacitor or battery, selectable
• 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 (4 positive-going edges and/or 4 negative-going edges)
Counter	4 fast counters (each with 30 kHz), 32 bits (incl. sign), can be used as up/down counters or for connecting 2 incremental encoders with 2 pulse trains offset by 90° (max. 20 kHz (A/B counters)); with parameterizable enable and reset inputs; interrupt capability (incl. calling a subroutine with random contents) on reaching a setpoint; reversal of direction of counting etc.
• Pulse outputs	2 high-speed outputs, 20 kHz with interrupt option; pulse width and frequency modulation possible
Interfaces	1 RS 485 communication interface, optionally: As PPI interface with PPI protocol for programming functions, HMI functions (TD 200, OP), S7-200 internal CPU/CPU communication; transmission rates 9.6, 19.2, 187.5 kbit/s • Or as MPI slave for data exchange with MPI masters (S7-300/S7-400 CPUs, OPs, TDs, push-button panels); S7-200-internal CPU/CPU communication is possible to a limited extent on the MPI network; transmission rates 19.2/187.5 kbit/s • or as user-programmable interface with interrupt capability for serial data exchange with non-Siemens devices at ASCII protocol transmission 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 adapter Expansion bus • Connection of expansion modules (EM)[1] Only series S7-22x EMs can be used.
Connectable programming units/PC	SIMATIC PG/PC, Standard-PC
Onboard I/Os	
• Plug-in I/O terminals	No
• Digital inputs	8
• Digital outputs	6
• Analog potentiometer	1 analog potentiometer; 8 bit resolution
Max. number of inputs /outputs	
• Digital inputs/outputs	Max. 40 inputs and 38 outputs (CPU and EM)
• Analog inputs/outputs	Max. 8 inputs and 2 outputs (EM) or max. 0 inputs and 4 outputs (EM)
• AS-Interface inputs/outputs, max.	Max. 31 AS-Interface slaves (CP 243-2)
Expansion, max.	2 expansion boards[1]. Only expansion modules from the S7-22x series may be used
Degree of protection	IP 20 in accordance with IEC 529

1) Because of the limited output current, the use of expansion modules can be subject to restrictions.

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Technical specifications CPU 222 (continued)

Ambient temperature		
• With horizontal installation	0 to 55 °C	
• When mounted vertically	0 to 45 °C	
Relative humidity	5 to 95% (RH severity level 2 in accordance with IEC 1131-2)	
Atmospheric pressure	860 to 1080 hPa	
Other environmental conditions	See "S7-200 Programmable Controller System Manual"	
Power 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		
• Rated value	24 V DC	100 to 230 V AC
• Permitted range	20.4 to 28.8 V	85 to 264 V AC (47 to 63 Hz)
Input current		
• Max. incl. load	10 A at 28.8 V	20 A at 264 V
• Power consumption max.	85 to 500 mA	20 to 70 mA (24 V) 40 to 140 mA (120 V)
Output voltage for sensors		
• Rated value	L+ (24 V DC)	24 V DC
• Permitted range	25.4 to 28.8 V	20.4 to 28.8 V
Output current for sensors (24 V DC)		
• Rated value	180 mA	180 mA
• Short-circuit protection	Electronic at 600 mA	Electronic at 600 mA
Output current for expansion modules (5 V DC)	340 mA	340 mA
Integrated inputs	**8**	**8**
• Type	Current sinking or sourcing	Current sinking or sourcing
Input voltage		
• Rated value	24 V DC	24 V DC
• At "1" signal	15 V	15 V
• At "0" signal	0 to 5 V	0 to 5 V
Electrical isolation	Optocoupler	Optocoupler
• In groups of	4	4
Input current		
• Nominal value at "1" signal	4 mA	4 mA
Input delay (at rated value of the input voltage)		
• For standard inputs	Every 0.2 to 12.8 ms (settable)	Every 0.2 to 12.8 ms (settable)
• For interrupt inputs	(I0.0 to I0.3) -	(E0.0 to E0.3) -
• For fast counters, max.	(I0.0 to I0.5) 30 kHz	(E0.0 to E0.5) 30 kHz
Connection of 2-wire BERO		
• Permissible quiescent current, max.	1 mA	1 mA

Power supply:	**24 VDC**	**100 to 230 V AC**
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Cable lengths		
• Unshielded (not for high-speed signals)	300 m	300 m
• Shielded		
- standard input	500 m	500 m
- high-speed counters	50 m	50 m
On-board outputs	**6 (transistors)** Can be switched in parallel for high output currents	**6 (relays)**
Rated 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
Output voltage		
• At "1" signal , min.	20 V DC	L+/L1
Electrical isolation	Optocoupler	Relay
• In groups of	6	3
Output current, max.		
• At "1" signal		
- rated value at 40°C	0.75 A	2 A
- rated value at 55°C	0.75 A	2 A
- min. current	-	-
• At "0" signal	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		
• Of the standard outputs, max.	(A0.2 to A0.5) 15 µs	(all outputs) 10 ms
• Of the pulse outputs, max.	(A0.0 to A0.1) 2 µs	-
OFF delay		
• Of the standard outputs, max.	(A0.2 to A0.5) 100 µs	(all outputs) 10 ms
• Of the pulse outputs, max.	(A0.0 to A0.1) 10 µs	-
Operating frequency of pulse outputs	(A0.0 to A0.1)	(A0.0 to A0.1)
• For resistive load	20 kHz	-
Switching capacity of the outputs		
• For resistive load	0.75 A	2 A
• For a lamp load	5 W	30 W for 200 W DC for AC
Service life of the contacts (number of switching cycles to VDE 0660, Part 200)		
• Mechanical	-	10 million
• At rated voltage	-	100,000
Limitation of voltage induced on circuit interruption, max.	1 W	-
Short-circuit protection	Provide externally	Provide externally

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Technical specifications CPU 222 (continued)

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Cable lengths		
• Unshielded	150 m	150 m
• Shielded	150 m	500 m
Isolation		
• Between 24 V DC and 5 V DC	500 V DC	500 V DC
• Between 24 V DC and 230 V AC	-	1500 V AC

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Dimensions (W x H x D) in mm	90 x 80 x 62	90 x 80 x 62
Weight, approx.	270 g	310 g

Technical specifications CPU 224

Program memory	8 KB
Data memory	5 KB
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 loaded from programming device/PC in integral EEPROM; maintenance-free
	Current DB 1 values in RAM, retentive flags, timers, counters etc. maintenance-free through super capacitor; optional battery for long-term backup
Backup time typ.	190 hr (minimum 120 hr at 40°C); 200 days (typ.) with optional battery module
Programming language	LAD, FBD and STL
Program organization	1 OB, 1 DB, 1 SDB subroutines with/without parameter passing
Program execution	Free cycle (OB 1) • Interrupt-controlled • Time controlled (1 to 255 ms)
Subroutine levels	64
User program protection	3-level password protection
Operation set	Bit (logic) instructions, comparison instructions, timer instructions, counter instructions, clock instructions, fixed-point arithmetic, floating-point arithmetic, numeric functions, transfer instructions, table instructions, binary logic instructions, shift and rotate instructions, conversion instructions, program control instructions, system interrupt and communication instructions, stack instructions
Execution times for bit operations	0.37 µs
Cycle time monitoring	300 ms (retriggerable)

Bit memories	256
• Of these retentive	0 to 112 in EEPROM, selectable 0 to 256, using super capacitor or battery, selectable
Counter	256
• Of these retentive	256, using super capacitor or battery, selectable
• Counting range	0 to 32767
Timers	256
• Of these retentive	64, using super capacitor or battery, selectable
• 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 (4 positive-going edges and/or 4 negative-going edges)
• Counter	6 fast counters (each with 30 kHz), 32 bits (incl. sign), can be used as up/down counters or for connecting 2 incremental encoders with 2 pulse trains offset by 90° (max. 20 kHz (A/B counters)); with parameterizable enable and reset inputs; interrupt capability (incl. calling a subroutine with random contents) on reaching a setpoint; reversal of direction of counting etc.
• Pulse outputs	2 high-speed outputs, 20 kHz with interrupt option; pulse width and frequency modulation possible

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Technical specifications CPU 224 (continued)

Interfaces	1 RS 485 communication interface, optionally: As PPI interface with PPI protocol for programming functions, HMI functions (TD 200, OP), S7-200 internal CPU/CPU communication; transmission rates 19.2/187.5 kbit/s • Or as MPI slave for data exchange with MPI masters (S7-300/S7-400 CPUs, OPs, TDs, push-button panels); S7-200-internal CPU/CPU communication is possible to a limited extent on the MPI network; transmission rates 19.2/187.5 kbit/s • Or as user-programmable interface with interrupt capability for serial data exchange with non-Siemens devices at ASCII protocol transmission 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 adapter Expansion bus • Connection of expansion modules (EM) [1] Only series S7-22x EMs can be used
Connectable programming units/PC	SIMATIC PG/PC, Standard-PC
Onboard I/Os	
• Plug-in I/O terminals	Yes
• Digital inputs	14
• Digital outputs	10
• Analog potentiometers	2 analog potentiometers; 8 bit resolution
Max. number of inputs / outputs	
• Digital inputs/outputs	94 inputs and 74 outputs
• Analog inputs/outputs	28 Inputs and 7 outputs or 0 inputs and 14 outputs
• AS-Interface inputs/outputs, max.	Max. 31 AS-Interface slaves (CP 243-2)
Expansion, max.	7 expansion boards[1]. Only expansion modules from the S7-22x series may be used
Degree of protection	IP 20 in acc. with IEC 529
Ambient temperature	
• With horizontal installation	0 to 55 °C
• When mounted vertically	0 to 45 °C
Relative humidity	5 to 95% (RH severity level 2 in accordance with IEC 1131-2)
Atmospheric pressure	860 to 1080 hPa
Other environmental conditions	See "S7-200 Programmable Controller System Manual"

1) Because of the limited output current, the use of expansion modules can be subject to restrictions.

Power 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		
• Rated value	24 V DC	100 to 230 V AC
• Permitted range	20.4 to 28.8 V	85 AC to 264 V (47 to 63 Hz)
Input current, typ.	-	-
• Max. incl. load	10 A at 28.8 V	20 A at 264 V
• Power consumption max.	110 to 700 mA	30 to 100 mA (240 V) 60 to 200 mA (120 V)
Output voltage for sensors		
• Rated value	L+ (24 V DC)	24 V DC
• Permitted range	15.4 to 28.8 V	20.4 to 28.8 V
Output current for sensors (24 V DC)		
• Rated value	280 mA	280 mA
• Short-circuit protection	Elektronic at 600 mA	Electronic at 600 mA
Output current for expansion modules (5 V DC)	660 mA	660 mA
Integrated inputs	**14**	**14**
• Type	Current sinking or sourcing	Current sinking or sourcing
Input voltage		
• Rated value	24 V DC	24 V DC
• At signal “1”, min.	15 V	15 V
• At "0" signal	0 to 5 V	0 to 5 V
Electrical isolation	Optocoupler	Optocoupler
• In groups of	6 and 8	6 and 8
Input current		
• At "1" signal	4 mA	4 mA
Input delay (at rated value of the input voltage)		
• For standard inputs	Every 0.2 to 12.8 ms (settable)	Every 0.2 to 12.8 ms (settable)
• For interrupt inputs	(I0.0 to I0.3) -	(I0.0 to I0.3) -
• For fast counters, max.	(I0.0 to I1.5) 30 kHz	(I0.0 to I1.5) 30 kHz
Connection of 2-wire BERO		
• Permissible quiescent 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
- high-speed counters	50 m	50 m

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Technical specifications CPU 224 (continued)

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
On-board outputs	**10 (transistors)** Can be switched in parallel for high output currents	**10 (relays)**
Rated 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
Output voltage		
• At "1" signal , min.	20 V DC	L+/L1
Electrical isolation	Optocoupler	Relay
• In groups of	5 and 5	3, 3 and 4
Output current, max.		
• At "1" signal		
- rated value at 40°C	0.75 A	2 A
- rated value at 55°C	0.75 A	2 A
- min. current	-	-
• At "0" signal	10 µA	0 mA
Sum of all output currents (horizontal mounting)		
• At 40 °C, max.	3.75 A	8.0 A
• At 55 °C, max.	3.75 A	8.0 A
ON delay		
• Of the standard outputs, max.	(A0.2 to A1.1) 15 µs	(all outputs) 10 ms
• Of the pulse outputs, max.	(A0.0 to A0.1) 2 µs	-

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
OFF delay		
• Of the standard outputs, max.	(Q0.2 to Q1.1) 100 µs	(all outputs) 10 ms
• Of the pulse outputs, max.	(Q0.0 to Q0.1) 10 µs	-
Operating frequency of pulse outputs	(Q0.0 to Q0.1)	(A0.0 to A0.1)
• For resistive load	20 kHz	-
Switching capacity of the outputs		
• For resistive load	0.75 A	2 A
• For a lamp load	5 W	30 W for DC 200 W for AC
Service life of the contacts (number of switching cycles to VDE 0660, Part 200)		
• Mechanical	-	10 million
• At rated voltage	-	100,000
Limitation of voltage induced on circuit interruption, max.	1 W	-
Short-circuit protection	Provide externally	Provide externally
Cable lengths		
• Unshielded	150 m	150 m
• Shielded	500 m	500 m
Isolation		
• Between 24 V DC and 5 V DC	500 V DC	1500 V AC
• Between 24 V DC and 230 V AC	-	1500 V AC
Dimensions (W x H x D) in mm	120.5 x 80 x 62	120.5 x 80 x 62
Weight, approx.	360 g	410 g

Technical specifications CPU 226, CPU 226 XM

Program memory	
• CPU 226	8 KB
• CPU 226 XM	16 KB
Data memory	
• CPU 226	5 KB
• CPU 226 XM	10 KB
Memory cartridge (optional)	1 plug-in memory module; contents identical to integrated EEPROM
Program backup	Entire program maintenance-free in integral EEPROM, programmable using CPU
Data backup	Entire DB 1 loaded from PG/PC in integral EEPROM; maintenance-free
	Current values of DB 1 in RAM, retentive bit memories, timers, counters, etc. maintenance-free using power capacitor; Battery for long-term backup optional
Backup time	190 h (at least 120 h at 40°C); 200 days (typically) with optional battery module

Programming language	LAD, FBD and STL
Program organization	1 OB, 1 DB, 1 SDB subroutines with/without parameter passing
Program execution	Free cycle (OB 1) • Interrupt-controlled • Time-controlled (1 to 255 ms)
No. of subroutines, max.	64
User program protection	3-level password protection
Operation set	Bit (logic) instructions, comparison instructions, timer instructions, counter instructions, clock instructions, fixed-point arithmetic, floating-point arithmetic, numeric functions, transfer instructions, table instructions, binary logic instructions, shift and rotate instructions, conversion instructions, program control instructions, system interrupt and communication instructions, stack instructions

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Technical specifications CPU 226, 226 XM (continued)

Execution times for bit operations	0.37 µs
Scan time monitoring	At 300 ms, can be retriggered
Bit memories	256
• Of these retentive	0 to 112 in EEPROM, adjustable; 0 to 256, using high-performance capacitor or battery, selectable
Counters	256
• Of these retentive	256, using high-performance capacitor or battery, selectable
• Counting range	0 to 32767
Timers	256
• Of these retentive	64, using super capacitor or battery, selectable
• 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 (4 positive-going edges and/or 4 negative-going edges)
• Counters	6 high-speed counters (each 30 kHz), 32 bit (incl. sign), suitable for use as up/down-counter or for connection of 2 incremental encoder with 2 pulse trains offset at 90° (up to 20 kHz (A/B counter)); parameterizable enable and reset input; Interrupt features (including calling of subroutine of random contents) upon reaching the setpoint; reversal of count direction, etc.
• Pulse outputs	2 high-speed outputs, 20 kHz, with interrupt feature; pulse width and frequency modulation supported
Interfaces	Two RS 485 communications interfaces, optionally:
	As PPI interface with PPI protocol for PG functions, HMI functions (TD 200, OP), S7-200-internal CPU/CPU communication; Transmission speeds 9.6/19.2/187.5 kbit/s • Alternatively as MPI slave for data exchange with MPI masters (S7-300/S7-400-CPUs, OPs, TDs, push button panels); S7-200-internal CPU/CPU communication is possible to a limited extent in MPI network; Transmission speeds 19.2/187.5 kbit/s • Alternatively as freely programmable interface with interrupt feature for serial data exchange with non-Siemens devices having ASCII protocol 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 a RS232/RS485 adapter

1) Because of the limited output current, the use of expansion modules can be subject to restrictions.

Interfaces (continued)	Expansion bus - connection of expansion modules (EMs)[1]. Only EMs of the S7-22x series can be used	
Connectable programming units/PC	SIMATIC PG/PC, standard-PC	
Onboard I/Os		
• Plug-in I/O terminals	Yes	
• Digital inputs	24	
• Digital outputs	16	
• Analog potentiometers	2 analog potentiometers; 8 bit resolution	
Max. number of inputs /outputs		
• Digital inputs/outputs	128 inputs and 120 outputs	
• Analog inputs/outputs	28 Inputs and 7 outputs or 0 inputs and 14 outputs	
• AS-Interface inputs/outputs, max.	Max. 31 AS-Interface slaves (CP 243-2)	
Expansion, max.	7 expansion modules[1]. Only expansion modules of the S7-22x series can be used	
Degree of protection	IP 20 in accordance with IEC 529	
Ambient temperature		
• With horizontal mounting	0 to 55°C	
• When mounted vertically	0 to 45°C	
Relative humidity	5 to 95% (RH severity level 2 in accordance with IEC 1131-2)	
Atmospheric pressure	860 to 1080 hPa	
Other environmental conditions	See "S7-200 Programmable Controller System Manual"	
Power 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		
• Rated value	24 V DC	100 to 230 V AC
• Permissible range	20.4 to 28.8 V	85 to 264 V AC (47 to 63 Hz)
Input current, typically	-	-
• Max. incl. load	10 A at 28.8 V	20 A at 264 V
• Power consumption max.	150 to 1050 mA	40 to 160 mA (240 V) 80 to 320 mA (120 V)
Output voltage for sensors		
• Rated value	L+ (24 V DC)	24 V DC
• Permissible range	25.4 to 28.8 V	20.4 to 28.8 V
Output current for sensors (24 V DC)		
• Rated value	400 mA	400 mA
• Short-circuit protection	Electronic at approx. 1.5 A	Electronic at approx. 1.5 A
Output current for expansion modules	1000 mA	1000 mA

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Technical specifications CPU 226, 226 XM (continued)

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Integrated inputs	**24**	**24**
• Type	Current sinking or sourcing	Current sinking or sourcing
Input voltage		
• Rated value	24 V DC	24 V DC
• At “1” signal, min.	15 V	15 V
• At "0" signal	0 to 5 V	0 to 5 V
Electrical isolation	Optocoupler	Optocoupler
• In groups of	13 and 11	13 and 11
Input current		
• Nominal value at “1” signal	4 mA	4 mA
Input delay (at rated value of the input voltage)		
• For standard inputs	Every 0.2 to 12.8 ms (settable)	Every 0.2 to 12.8 ms (settable)
• For interrupt inputs	(I0.0 to I0.3) -	(I0.0 to I0.3) -
• For fast counters, max.	(I0.0 to I1.5) 30 kHz	(I0.0 to I1.5) 30 kHz
Connection of 2-wire BERO		
• Permissible quiescent 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
- High-speed counters	50 m	50 m
Integrated outputs	**16 (transistors)** Parallel circuit is possible for high output currents	**16 (relays)**
Rated load voltage L+/L1	24 V DC	24 V DC/24 to 230 V AC
• Permissible range	20.4 to 28.8 V DC	5 to 30 V DC/ 5 to 250 V AC
Output voltage		
• At “1" signal, min.	20 V DC	L+/L1
Electrical isolation	Optocoupler	Relay
• In groups of	8 and 8	4, 5 and 7
Output current, max.		
• At "1" signal		
- rated value at 40°C	0.75 A	2 A
- rated value at 55°C	0.75 A	2 A
- min. current	-	-
• At "0" signal	10 µA	0 mA

Power supply:	24 V DC	100 to 230 V AC
Inputs:	**24 V DC**	**24 V DC**
Outputs:	**24 V DC**	**Relay**
Sum of all output currents (horizontal mounting)		
• At 40°C, max.	6.0 A	10.0 A
• At 55°C, max.	6.0 A	10.0 A
ON delay		
• Of the standard outputs, max.	(Q0.2 to Q1.1) 15 µs	(all outputs) 10 ms
• Of the pulse outputs, max.	(Q0.0 to Q0.1) 2 µs	-
OFF delay		
• Of the standard outputs, max.	(Q0.2 to Q1.1) 100 µs	(all outputs) 10 ms
• Of the 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)
• For resistive load	20 kHz	-
Switching capacity of the outputs		
• For resistive load	0.75 A	2 A
• For lamp load	5 W	30 W for DC 200 W for AC
Service life of the contacts (number of switching cycles to VDE 0660, Part 200)		
• Mechanical	-	10 million
• At rated voltage	-	100,000
Limitation of voltage induced on circuit interruption, max.	1 W	-
Short-circuit protection	Provide externally	Provide externally
Cable lengths		
• Unshielded	150 m	150 m
• Shielded	500 m	500 m
Isolation		
• Between 24 V DC and 5 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	196 x 80 x 62	196 x 80 x 62
Weight, approx.	550 g	660 g

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CPU 221, 222, 224, 226, 226 XM

Ordering data	Order No.
CPU 221	
Compact CPU, main memory 4 Kbyte, power supply 24 V DC, 6 DI/4 DO integrated	**6ES7 211-0AA22-0XB0**
Compact CPU, main memory 4 Kbyte, power supply 100 to 230 V AC, 6 DI/ 4 DO integrated, relay outputs	**6ES7 211-0BA22-0XB0**
CPU 222	
Compact CPU, expandable, main memory 4 Kbyte, power supply 24 V DC, 8 DI/6 DO integrated	**6ES7 212-1AB22-0XB0**
Compact CPU, expandable, main memory 4 Kbyte, power supply 100 to 230 V AC, 8 DI/6 DO integrated, relay outputs	**6ES7 212-1BB22-0XB0**
CPU 224	
Compact CPU, expandable, main memory 8 Kbyte, power supply 24 V DC, 14 DI/ 10 DO integrated	**6ES7 214-1AD22-0XB0**
Compact CPU, expandable, main memory 8 Kbyte, power supply 100 to 230 V AC, 14 DI/ 10 DO integrated, relay outputs	**6ES7 214-1BD22-0XB0**
CPU 226	
Compact CPU, expandable, main memory 8 Kbyte, power supply 24 V DC, 24 DI/ 16 DO integrated	**6ES7 216-2AD22-0XB0**
Compact CPU, expandable, main memory 8 Kbyte, power supply 100 to 230 V AC, 24 DI/ 16 DO integrated, relay outputs	**6ES7 216-2BD22-0XB0**
CPU 226 XM	
Compact CPU, expandable, main memory 16 Kbyte, power supply 24 V DC, 24 DI/ 16 DO integrated	**6ES7 216-2AF22-0XB0**
Compact CPU, expandable, main memory 16 Kbyte, power supply 100 to 230 V AC, 24 DI/ 16 DO integrated, relay outputs	**6ES7 216-2BF22-0XB0**
MC 291 memory cartridge, EEPROM	
for CPU 221/222//224/226	**6ES7 291-8GE20-0XA0**
Grounding terminal	
10 units	**6ES5 728-8MA11**
Front flap set	
contains various cover flaps for CPUs and EMs; spare part	**6ES7 291-3AX20-0XA0**
SIM 274 simulator (optional)	
with 8 terminals for CPU 221/222	**6ES7 274-1XF00-0XA0**
with 14 terminals for CPU 224	**6ES7 274-1XH00-0XA0**

	Order No.
SIM 274 simulator (optional)	
with 24 terminals for CPU 226/226 XM	**6ES7 274-1XK00-0XA0**
Terminal block for field-level wiring (optional)	
12-pin, for CPU 221/222, 10 units	**6ES7 290-2AA00-0XA0**
for CPU 224, 10 units	**6ES7 290-2BA00-0XA0**
Pluggable terminal block (spare part)	
with 12 interfaces (for CPU 22x)	**6ES7 292-1AE20-0AA0**
with 14 interfaces (for CPU 226/ 226 XM)	**6ES7 292-1AF20-0AA0**
with 18 interfaces (for CPU 224)	**6ES7 292-1AG20-0AA0**
PC to PPI cable	**6ES7 901-3BF21-0XA0**
5 m; with integral RS 232C/RS 485 adapter, between S7-200 and PC or data terminal equipment such as printers, bar-code readers; Electrical isolation by optocouplers	
MPI cable	**6ES7 901-0BF00-0AA0**
5 m; for connecting the S7-200 to MPI	
Bus backplane extension cable	**6ES7 290-6AA20-0XA0**
for interconnection of the two rows of devices with double-row configuration, for CPU 222/224/ 226/226 XM	
Optional battery module	**6ES7 291-8BA20-0XA0**
Optional combined clock and battery module	**6ES7 297-1AA20-0XA0**
only for CPU 221/222	
S7-200 programmable controller, system manual	
for CPU 221/222/224/226 and STEP 7-Micro/Win32 V3.2	
German	**6ES7 298-8FA22-8AH0**
English	**6ES7 298-8FA22-8BH0**
French	**6ES7 298-8FA22-8CH0**
Spanish	**6ES7 298-8FA22-8DH0**
Italian	**6ES7 298-8FA22-8EH0**
SIMATIC Manual Collection	**6ES7 998-8XC01-8YE0**
Electronic manuals on CD-ROM, in 5 languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	
SIMATIC Manual Collection updating service for 1 year	**6ES7 998-8XC01-8YE2**
Current Manual Collection CD as well as the three following updates	
Programming software STEP 7-Micro/WIN32 V3.1	See Section 8

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Ordering data	Order No.
PROFIBUS IP 20 bus connector with 90° cable outlet	
• Without PG interface	**6ES7 972-0BA12-0XA0**
• With PG interface	**6ES7 972-0BB12-0XA0**
PROFIBUS IP 20 bus connector with 35° cable outlet	
• Without PG interface	**6ES7 972-0BA41-0XA0**
• With PG interface	**6ES7 972-0BB41-0XA0**

	Order No.
PROFIBUS-FC Standard Cable for connection to PPI; standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	**6XV1 830-0EH10**
RS 485 repeater for PROFIBUS	**6ES7 972-0AA01-0XA0**

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EM 221, EM 222, EM 223

Overview



- Digital inputs/outputs to supplement the integral I/Os of the CPUs
- For flexible adaptation of the controller to the task
- For subsequent upgrading of the system with additional inputs and outputs

Technical specifications EM 221

	DC	AC
6ES7 221-	1BF22-0XA0	1EF22-0XA0
Plug-in I/O terminals	CPU 22x	CPU 22x
Number of inputs	Yes	Yes
Type	8	8
Input voltage	Choice of sink input or source input per group	IEC type 1
• Rated value		
• At "1" signal	24 V DC	220/230 V AC (47 to 63 Hz)
• At "0" signal	15 to 30 V	79 V AC (at 2.5 mA min.)
Electrical isolation	0 to 5 V	20 V AC or 1 mA AC max.
• In groups of	Optocoupler	Optocoupler
Input current	4	1 (8 groups)
• At "1" signal		
Plug-in I/O terminals	4 mA	Min. 2.5 mA

	DC	AC
6ES7 221-	1BF22-0XA0	1EF22-0XA0
Input delay		
• For rated value of the input voltage	4.5 ms	15 ms
Connection of 2-wire BERO		
• Permissible quiescent current	1 mA	1 mA
Line length		
• Unshielded	300 m	300 m
• Shielded	500 m	500 m
Current consumption		
• From backplane bus	30 mA	30 mA
• From 24 V DC		
Power loss typ.	2 W	3 W
Dimensions (W x H x D) in mm	46 x 80 x 62	71.2 x 80 x 62
Weight	150 g	160 g

Technical specifications EM 222

	DC	Relay	AC
6ES7 222-	1BF22-0XA0	1HF22-0XA0	1EF22-0XA0
For connection to	S7-22x series	S7-22x series	S7-22x series
Plug-in I/O terminals	Yes	Yes	Yes
Number of outputs	8	8	8
Rated load voltage L+/L1	24 V DC	24 V DC, 24 to 230 V AC	220/230 V AC(47 to 63 Hz)
• Permitted range	20.4 to 28.8 V DC	5 to 30 V DC, 5 to 250 V AC	65 to 264 V AC
Output voltage			
• At "1" signal, min.	20 V	-	L_1 - 0.9 V
Electrical isolation	Optocoupler	Relay	Optocoupler
• In groups of	4	4	1 (8 Groups)
Output current, max.			
• At "1" signal			
- rated value at 40 °C	0.75 A	2.0 A	0.5 A (AC)
- rated value at 55 °C	0.75 A	2.0 A	0.5 A (AC)
- min. current	-	-	0.05 A
• At "0" signal	10 µA	0 mA	1.8 mA at 264 V AC

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Technical specifications EM 222 (continued)

	DC	Relay	AC
6ES7 222-	**1BF22-0XA0**	**1HF22-0XA0**	**1EF22-0XA0**
Sum of all output currents			
• At 40 °C	3.0 A	8.0 A	0.5 A/group
• At 55°C (mounted horizontally)	3.0 A	8.0 A	0.5 A/group
Maximum current per conductor/group (mounted horizontally and vertically)	3 A Parallel circuit is possible for high output currents	8 A	0.5 A
Switching capacity of outputs (1 output to 40 °C)			
• For resistive load	0.75 A	2 A	0,5 A
• For inductive load	0.75 A	2 A	0,5 A
• For lamp load	5 W	30/200 W (DC/AC)	60 W
Service life of the contacts			
• Mechanical	-	10×10^6	-
• At rated voltage	-	100,000	-
Voltage induced on circuit interruption limited to (internally)	L+ - 48 V	Provide externally (see manual "Configuring an S7-200")	Provide externally (see manual "Configuring an S7-200")
Short-circuit protection	Provide externally (see manual "Configuring an S7-200")	Provide externally	Provide externally
Line length			
• Unshielded	150 m	150 m	150 m
• Shielded	500 m	500 m	500 m
Current consumption			
• From backplane bus	50 mA	40 mA	110 mA
• From L+/L1	-	72 mA (9 mA per connected output)	-
Power loss typ.	2 W	2 W	4 W
Dimensions (W x H x D) in mm	45 x 80 x 62	45 x 80 x 62	71.2 x 80 x 62
Weight	150 g	170 g	170 g

Technical specifications EM 223

	4 I/4 O	8 I/8 O	16 I/16 O	4 I/4 O	8 I/8 O	16 I/16 O
6ES7 223-	**1BF22-0XA0**	**1BH22-0XA0**	**1BL22-0XA0**	**1HF22-0XA0**	**1PH22-0XA0**	**1PL22-0XA0**
Inputs:	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
Outputs:	24 V DC	24 V DC	24 V DC	Relay	Relay	Relay
For connection to	S7-22x series	S7-22x series	S7-22x series	S7-22x series	S7-22x series	S7-22x series
Plug-in I/O terminals	Yes	Yes	Yes	Yes	Yes	Yes
Inputs	**4**	**8**	**16**	**4**	**8**	**16**
Input voltage						
• Rated value	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC	24 V DC
• At "1" signal	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC
• At "0" signal	0 to 5 V	0 to 5 V	0 to 5 V	0 to 5 V	0 to 5 V	0 to 5 V
Isolation	Optocoupler	Optocoupler	Optocoupler	Optocoupler	Optocoupler	Optocoupler
• In groups of	4	4	4	4	4	8
• Tested for	500 V AC	500 V AC	500 V AC	500 V AC	500 V AC	500 V AC
Input current						
• At "1" signal	4 mA	4 mA	4 mA	4 mA	4 mA	4 mA
Input delay						
• For rated value of the input voltage	4.5 ms	4.5 ms	4.5 ms	Max. 4.5 ms	Max. 4.5 ms	Max. 4.5 ms

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Technical specifications EM 223 (continued)

	4 I/4 O	8 I/8 O	16 I/16 O	4 I/4 O	8 I/8 O	16 I/16 O
6ES7 223-	**1BF22-0XA0**	**1BH22-0XA0**	**1BL22-0XA0**	**1HF22-0XA0**	**1PH22-0XA0**	**1PL22-0XA0**
Connection of two-wire BEROs						
• Permissible quiescent current	1 mA	1 mA	1 mA	1 mA	1 mA	1 mA
Outputs	**4**	**8**	**16**	**4**	**8**	**16**
Rated load voltage L+/L1	24 V DC	24 V DC	24 V DC	24 V DC/24 to 230 V AC	24 V DC/24 to 230 V AC	24 V DC/24 to 230 V AC
• Permissible range	20.4 to 28.8 V DC	20.4 to 28.8 V DC	20.4 to 28.8 V DC	5 to 30 V DC/ 5 to 250 V AC	5 to 30 V DC/ 5 to 250 V AC	5 to 30 V DC/ 5 to 250 V AC
Output voltage						
• At "1" signal, min.	20 V	20 V	20 V	L+/L1	L+/L1	L+/L1
• At "0" signal, max. (with 10 kΩ load)	0.1 V DC	0.1 V DC	0.1 V DC	0.1 V DC	0.1 V DC	0.1 V DC
Isolation	Optocoupler	Optocoupler	Optocoupler	Relay	Relay	Relay
• In groups of	4	4	4/4/8	4	4	4
Output current, max.						
• At "1" signal	0.75 A	0.75 A	0.75 A	2 A	2 A	2 A
- minimum current	-	-	-	-	-	-
Max. current per conductor/group	3 A	3 A	3/3/6 A	8 A	8 A	8 A
Contact rating[1]						
• For resistive load	0.75 A per output	0.75 A per output	0.75 A per output	0.75 A per output	0.75 A per output	0.75 A per output
• For inductive load	0.75 A per output[2]	0.75 A per output[2]	0.75 A per output[2]	0.75 A per output[2]	0.75 A per output[2]	0.75 A per output[2]
• For lamp load	5 W	5 W	5 W	30/200 W (DC/AC)	30/200 W (DC/AC)	30/200 W (DC/AC)
Life of the contacts (no. of switching operations) to VDE 0660, Part 200						
• Mechanical	-	-	-	10 million	10 million	10 million
• For rated load voltage	-	-	-	100,000	100,000	100,000
Voltage induced on circuit interruption limited to (internally)	L+ - 48 V	L+ - 48 V	L+ - 48 V	-	-	-
General						
Short circuit protection	Provide externally	Provide externally	Provide externally	Provide externally	Provide externally	Provide externally
Line length						
• Unshielded	150 m	150 m	150 m	150 m	150 m	150 m
• Shielded	500 m	500 m	500 m	500 m	500 m	500 m
Current consumption						
• From backplane bus	40 mA	80 mA	160 mA	40 mA	80 mA	150 mA
• From sensor supply or external power supply (24 V DC)	-	-	-	72 mA	72 mA	72 mA
• From (24 V DC) coil current	-	-	-	9 mA per output at "1" signal	9 mA per output at "1" signal	9 mA per output at "1" signal
Power loss typically	2 W	3 W	6 W	2 W	3 W	6 W
Dimensions (W x H x D) in mm	46 x 80 x 62	71.2 x 80 x 62	137.5 x 80 x 62	46 x 80 x 62	71.2 x 80 x 62	137.5 x 80 x 62
Weight approx.	160 g	200 g	360 g	160 g	300 g	400 g

1) 1 output up to 40°C; request details of several outputs and higher temperatures
2) $0.5 \times F \times L \times I^2 < 1$ W (F: Frequency; L: Inductance; I: Current)

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Ordering data	Order No.
EM 221 digital input module	
for CPU 222/224/226/226 XM	
• 8 inputs, 24 V DC, electrically isolated, sink input and source input	**6ES7 221-1BF22-0XA0**
• 8 inputs, 120/230 V AC, electrically isolated, sink input and source input	**6ES7 221-1EF22-0XA0**
EM 222 digital output module	
for CPU 222/224/226/226 XM	
• 8 outputs, 24 V DC; 0.75 A, electrically isolated	**6ES7 222-1BF22-0XA0**
• 8 outputs, 24 V DC / 24 to 230 V AC; 2 A, electrically isolated, relay outputs	**6ES7 222-1HF22-0XA0**
• 8 outputs, 120/230 V AC; 0.5 A, electrically isolated	**6ES7 222-1EF22-0XA0**
EM 223 digital input/output module	
for CPU 222/224/226/226 XM	
• 4 inputs, 24 V DC, 4 outputs, 24 V DC; 0.75 A, electrically isolated	**6ES7 223-1BF22-0XA0**
• 8 inputs, 24 V DC, 8 outputs, 24 V DC; 0.75 A, electrically isolated	**6ES7 223-1BH22-0XA0**
• 16 inputs, 24 V DC, 16 outputs, 24 V DC; 0.75 A, electrically isolated	**6ES7 223-1BL22-0XA0**

	Order No.
EM 223 digital input/output module (continued)	
• 4 inputs, 24 V DC, 4 outputs, relay	**6ES7 223-1HF22-0XA0**
• 8 inputs, 24 V DC, 8 outputs, relay	**6ES7 223-1PH22-0XA0**
• 16 inputs, 24 V DC, 16 outputs, relay	**6ES7 223-1PL22-0XA0**
Front flap set	
contains various cover flaps for CPUs and EMs; spare part	**6ES7 291-3AX20-0XA0**
Pluggable terminal block (spare part)	
• with 7 terminals (for EM 221/222)	**6ES7 292-1AD20-0AA0**
• with 12 terminals (for EM 223)	**6ES7 292-1AE20-0AA0**
SIM 274 simulator (optional)	
with 8 terminals for EM 221 and EM 223	**6ES7 274-1XF00-0XA0**
S7-200 programmable system manual	
for CPU 221/222/224/226 and STEP 7-Micro/Win32 V3.2	
German	**6ES7 298-8FA22-8AH0**
English	**6ES7 298-8FA22-8BH0**
French	**6ES7 298-8FA22-8CH0**
Spanish	**6ES7 298-8FA22-8DH0**
Italian	**6ES7 298-8FA22-8EH0**

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EM 231, EM 232, EM 235

Overview



- Analog inputs and outputs for the SIMATIC S7-200
- With extremely short conversion times
- For connections of analog sensors and actuators without additional amplifier
- For solving the more complex automation tasks

Technical specifications EM 231

6ES7 231-	0HC22-0XA0
For connection to	S7-22x series
Plug-in I/O terminals	No
Number of inputs	4, differential
Polarity reversal protection	No
Input ranges/input resistance	0 to 5 V/10 MΩ 0 to 10 V/10 MΩ ±2.5 V/10 MΩ ±5 V/10 MΩ 0 to 20 mA/10 MΩ
Acceptable input voltage for voltage input, max.	30 V
Acceptable input current for current input, max.	32 mA
Isolation	No
Analog-to-digital conversion time	250 µs
Converter	12 bit
Resolution	Refer to manual

6ES7 231-	0HC22-0XA0
Noise voltage suppression	40 dB, DC to 60 V
For interference frequency	50/60 Hz
Common mode voltage, max.	12 V
Representable conversion range	
Unipolar signals	0 to 32,000
Bipolar signals	-32,000 to +32,000
Characteristic linearization	No
Temperature compensation	No
Diagnostics	LED, EXTF
Current consumption	
From backplane bus (5 V DC)	20 mA
From sensor supply or external power supply (24 V DC)	60 mA
Power loss typically	2 W
Dimensions (W x H x D) in mm	71.2 x 80 x 62
Weight	183 g

Technical specifications EM 232

6ES7 232-	0HB22-0XA0
For connection to	S7-22x series
Plug-in I/O terminals	No
Outputs	**2**
Output ranges	
• Voltage outputs	-10 to +10 V
• Current outputs	4 to 20 mA
Load resistor	
• Voltage outputs min.	5 kΩ
• Current outputs max.	0.5 kΩ
Electrical isolation	No
Resolution	
• For voltage output	12 bit
• For current output	11 bit
Transient recovery time	
• For voltage output	100 µs
• For current output	2 ms

6ES7 232-	0HB22-0XA0
Representable conversion range	
• Unipolar signals	0 to 32,000
• Bipolar signals	-32,000 to +32,000
Operating error limit (0 to 60°C, referred to the output range)	
• Voltage	2.0%
• Current	2.0%
Basic error threshold (operating error threshold at 25°C, with reference to output range)	
• Voltage	0.5%
• Current	0.5%
General	
Current consumption	
• From backplane bus (5 V DC)	20 mA
• From sensor supply or external power supply (24 V DC)	70 mA

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Technical specifications EM 232 (continued)

6ES7 232-	0HB22-0XA0
Power loss typ.	2.0 W
Dimensions (W x H x D) in mm	46 x 80 x 62
Weight	148 g

Technical specifications EM 235

6ES7 235-	0KD22-0XA0
For connection to	S7-22x series
Plug-in I/O terminals	No
Inputs	**4, differential**
Polarity reversal protection	-
Input ranges/input resistance	0 to 50 mV 0 to 100 mV 0 to 500 mV 0 to 1 V 0 to 5 V 0 to 10 V 0 to 20 mA ± 25 mV ± 50 mV ± 100 mV ± 250 mV ± 500 mV ± 1 V ± 2,5 V ± 5 V ± 10 V
Acceptable input voltage for voltage input, max.	30 V
Acceptable input current for current input, max.	32 mA
Isolation	No
Converter	12 bit
Analog-to-digital conversion time	< 250 µs
Resolution	Refer to manual
Noise voltage suppression	40 dB, DC to 60 Hz
• For interference frequency	None
Common mode voltage, max.	12 V
Representable conversion range	
• Unipolar signals	0 to 32,000
• Bipolar signals	-32,000 to + 32,000
Characteristic linearization	No
Temperature compensation	No
Diagnostics	LED, EXTF

6ES7 235-	0KD22-0XA0
Outputs	**1**
Output ranges	
• Voltage outputs	-10 to +10 V
• Current outputs	0 to 20 mA
Load resistor	
• Voltage outputs min.	5 kΩ
• Current outputs max.	0.5 kΩ
Isolation	No
Resolution	
• For voltage output	12 bit
• For current output	11 bit
Transient recovery time	
• For voltage output	100 µs
• For current output	2 ms
Representable conversion range	
• Unipolar signals	0 to 32,000
• Bipolar signals	-32,000 to +32,000
Operating error limit (0 to 60°C, referred to the output range)	
• Voltage	± 2%
• Current	± 2%
Basic error limits (basic error limit at 25°C, referred to output range)	
• Voltage	± 0.5%
• Current	± 0.5%
General	
Current consumption	
• From backplane bus (5 V DC)	30 mA
• From sensor power supply or external power supply (24 V DC)	60 mA
Power loss typically	2.0 W
Dimensions (W x H x D) in mm	71.2 x 80 x 62
Weight	186 g

Ordering data

	Order No.
EM 231 analog input module for CPU 222/224/226; 4 inputs, 0-10 V, resolution 12 bit	**6ES7 231-0HC22-0XA0**
EM 232 analog output module for CPU 222/224/226; 2 outputs, ± 10 V, resolution 12 bit	**6ES7 232-0HB22-0XA0**
EM 235 analog input/output module for CPU 222/224/226; 4 inputs, 1 output, ±10 V DC, resolution 12 bit	**6ES7 235-0KD22-0XA0**

	Order No.
Grounding terminal 10 units	**6ES5 728-8MA11**
Front flap set contains various cover flaps for CPUs and EMs; spare part	**6ES7 291-3AX20-0XA0**
S7-200 programmable controller, system manual	See page 3/14

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EM 231 thermocouple module

3

Overview



- For user-friendly acquisition of temperatures with high precision
- 7 standard types of thermocouple can be used
- For measuring low-level analog signals (±80 mV), as well
- Easy to install in an existing system

Technical specifications

Suitable for connection to	S7-222/224/226
Plug-in I/O terminals	No
Number of inputs	**4, analog**
Input ranges/ input impedance	TC types: S, T, R, E, N, K, J/ > 1 MΩ, Voltage range ± 80 mV/ > 1 MΩ
Acceptable input voltage for voltage input, max.	30 V DC
Electrical isolation	Yes
• Field side to logic	500 V AC
• Field side to 24 V DC	500 V AC
• 24 V DC to logic	500 V AC
Update time	405 ms (all channels)
Principle of measurement	SIGMA-DELTA
Resolution	15 bit + sign
• Temperature	0.1 °C/0.1 °F
• Voltage	15 bit + sign
Noise suppression for noise frequency	85 dB
• For noise frequency	50/60/400 Hz

Common-mode voltage	120 V AC
Common-mode rejection, min.	120 dB at 120 V AC
Displayable conversion value range	
• Bipolar signals	-27,648 to +27,648
Basic error	0.1% FS (voltage)
Repeatability	0.05% FS
Cold junction error	±1.5 °C
Diagnostics	LED: EXTF, SF
Cable length, max.	100 m to sensor
Cable loop resistance, max.	100 Ω
Current consumption	
• From backplane bus (5 V DC)	87 mA
• From L+	60 mA
Power loss	1.8 W
Dimensions (W x H x D) in mm	71.2 x 80 x 62
Weight	210 g

Ordering data

	Order No.
EM 231 thermocouple module 4 inputs +/- 80 mV, resolution 15 bit + sign, thermocouple elements type J, K, S, T, R, E, N	**6ES7 231-7PD22-0XA0**
Grounding terminal 10 units	**6ES5 728-8MA11**

	Order No.
Bus backplane extension cable for interconnection of the two rows of devices with double-row configuration, for CPU 222/224/226/226 XM	**6ES7 290-6AA20-0XA0**
S7-200 programmable controller, system manual for CPU 221/222/224/226 and STEP 7-Micro/Win32 V3.2	
German	**6ES7 298-8FA22-8AH0**
English	**6ES7 298-8FA22-8BH0**
French	**6ES7 298-8FA22-8CH0**
Spanish	**6ES7 298-8FA22-8DH0**
Italian	**6ES7 298-8FA22-8EH0**

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Overview



- For user-friendly acquisition of temperatures with high precision
- Supports 31 standard resistance temperature sensors
- Easy to install in an existing system

Technical specifications

Suitable for connection to	S7-222/224/226
Plug-in I/O terminals	No
Number of inputs	**2, analog**
Input ranges/ input impedance	RTD types: • Pt 100 Ω, 200 Ω, 500 Ω, 1000 Ω (α = 3850 ppm, 3920 ppm, 3850,55 ppm, 3916 ppm, 3902 ppm) • Pt 10000 Ω (α = 3850 ppm) • Cu 9.035 Ω (α = 4270 ppm) • Ni 10 Ω, 120 Ω, 1000 Ω (α = 6720 ppm, 6178 ppm) • R 150 Ω, 300 Ω, 600 Ω FS
Input resistance	min. 10 MΩ
Acceptable input voltage for voltage input, max.	30 V DC (sensor) 5 V DC (source)
Electrical isolation	Yes
• Field side to logic	500 V AC
• Field side to 24 V DC	500 V AC
• 24 V DC to logic	500 V AC
Update time	405 ms (all channels) (700 ms for Pt 10000)
Principle of measurement	SIGMA-DELTA

Resolution	15 bit + sign
• Temperature	0.1°C/0.1°F
• Resistance	15 bit + sign
Noise suppression for noise frequency	85 dB
• For noise frequency	50/60/400 Hz
Common-mode voltage	0
Common-mode rejection, min.	120 dB at 120 V AC
Displayable conversion value range	
• Bipolar signals	-27.648 to +27.648
Basic error	0.1% FS (voltage)
Repeatability	0.05% FS
Diagnostics	LED: EXTF, SF
Cable length, max.	100 m to sensor
Cable loop resistance	20 Ω (max. 2.7 Ω for copper)
Current consumption	
• From backplane bus (5 V DC)	87 mA
• From L+	60 mA
Power loss	1.8 W
• Sensor, max.	1 mW
Dimensions (W x H x D) in mm	71.2 x 80 x 62
Weight	210 g

Ordering data

	Order No.
EM 231 RTD module 2 inputs for resistance temperature sensors Pt100/200/500/1000/10000, Ni100/120/1000, Cu10; resistance 150/300/600 Ohm, resolution 15 bit + sign	**6ES7 231-7PB22-0XA0**
Grounding terminal 10 units	**6ES5 728-8MA11**

	Order No.
Bus backplane extension cable for interconnection of the two rows of devices with double-row configuration, for CPU 222/224/226/226 XM	**6ES7 290-6AA20-0XA0**
S7-200 programmable controller, system manual for CPU 221/222/224/226 and STEP 7-Micro/Win32 V3.2	
German	**6ES7 298-8FA22-8AH0**
English	**6ES7 298-8FA22-8BH0**
French	**6ES7 298-8FA22-8CH0**
Spanish	**6ES7 298-8FA22-8DH0**
Italian	**6ES7 298-8FA22-8EH0**

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EM 253 positioning module

3

Overview



- Function modules for simple positioning tasks (1 axis)
- Stepper motors and servo motors from the Micro Stepper to the high-performance servo drive can be connected
- Flexible connection possibilities
- Full support from STEP 7-Micro/WIN with parameterization and start-up

Technical specifications

General specifications	
Number of modules that can be used (limited by current input from the backplane bus)	
• With CPU 222, max.	1
• With CPU 224, max.	3
• With CPU 226/226XM, max.	5
Supply voltage	11 to 30 V DC
Current consumption	
• From backplane bus	190 mA
• From 12/24 V DC, max.	12V DC: 300mA/24V DC: 130mA
Isolation	
• L+ to the logic	500 V AC
• I+ to the inputs	500 V AC
• L+ to the outputs	-
Dimensions (W x H x D) in mm	71.2 x 80 x 62
Weight, approx.	190 g
Drive interface	
Signal outputs	
Number of inputs	4
Type	RS422/RS485 or 5 V DC
Output signals	
• RS422	P0+, P0-, P1+, P1-
• 5 V DC	P0, P1, DIS, CLR
Electrical isolation	Yes
Switching frequency, max.	200 kHz (P0+,P0-,P1+,P1-,P0,P1)
Line length	
• Unshielded	1 m
• Shielded	10 m
RS422	
Differential output voltage, min.	2.8 V (R_L = 200 Ω)
DC 5 V	
Output voltage, max.	30 V DC
Output current, max.	50 mA
Output delay (DIS, CLR), max.	30 µs
Digital inputs	
Number of inputs	5
Type	According to IEC Type 1, sink
Functions	• Stop (STP) • Reference point switch (RPS) • Upper limit (LMT+) • Lower limit (LMT-) • Zero point (ZP)
Electrical isolation	Yes
• In groups of	1 (STP, RPS, ZP)/2 (LMT-, LMT+)
Input delay	
• STP, RPS, LMT+, LMT-	0.2 to 12.8 ms (parameterizable)
• ZP	Min. 2 µs
Input voltage	
• Rated value	24 V DC
• At "0" signal, max.	
- STP, RPS, LMT+, LMT-	5 V DC
- ZP	1 V DC
• At "1" signal, min.	
- STP, RPS, LMT+, LMT-	15 V DC
- ZP	3 V DC
Input current, min.	
Connection of two-wire BEROs	Yes
• Leakage current, max.	1 mA
Line length	
• Unshielded	
- STP, RPS, LMT+, LMT-	30 m
- ZP	Not recommended
• Shielded	
- STP, RPS, LMT+, LMT-	100 m
- ZP	10 m

Ordering data

	Order No.
EM 253 positioning module for control of stepper motors or servo drives	**6ES7 253-1AA22-0XA0**
Grounding terminal 10 units	**6ES5 728-8MA11**
Bus backplane extension cable	**6ES7 290-6AA20-0XA0**
S7-200 programmable controller, system manual	See page 3/14

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Overview



- Modem expansion module for SIMATIC S7-200
- The Plug&Play solution for all classical modem tasks in the PLC field
- Used for remote maintenance/remote diagnostics, CPU-to-CPU/PC communication or SMS/pager messaging
- Minimal engineering outlay required
- Replaces external modems connected to the communications interface of the CPU
- Easy to retrofit

Technical specifications

Outputs (process image)	8, for internal modem functions
Rated load voltage L+/L1	24 V DC
• Permitted range	20.4 to 28.8 V DC
Telephone connection	RJ11 (4 wires, 6 contacts)
Dialling mode	Pulse dialling mode Tone dialling mode
Communication protocols	PPI, Modbus
Modem standards	Bell 103, Bell 212, V. 21, V. 22, V. 22 to, V. 23c, V. 32, V. 32 to, V. 34 (preset)

Isolation	
• Telephone cable to logic or field side	1500 V AC
• Field side to logic	500 V AC
Current consumption	
• From expansion bus	80 mA
• From L+/L1	70 mA
Power losses, typically	2.1 W
Dimensions (W x H x D) in mm	71.2 x 80 x 62
Weight	190 g

Ordering data

	Order No.
EM 241 modem Analog modem for remote maintenance/diagnostics; CPU-CPU/PC communication, transmission of SMS/pager messages	**6ES7 241-1AA22-0XA0**
Grounding terminal 10 units	**6ES5 728-8MA11**

	Order No.
Bus backplane extension cable for interconnection of the two rows of devices with double-row configuration, for CPU 222/224/226/226 XM	**6ES7 290-6AA20-0XA0**
S7-200 programmable controller, system manual for CPU 221/222/224/226 and STEP 7-Micro/Win32 V3.2	
German	**6ES7 298-8FA22-8AH0**
English	**6ES7 298-8FA22-8BH0**
French	**6ES7 298-8FA22-8CH0**
Spanish	**6ES7 298-8FA22-8DH0**
Italian	**6ES7 298-8FA22-8EH0**

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EM 277 PROFIBUS-DP module

Overview



- For connection of the S7-22x to PROFIBUS-DP (as slave) and MPI
- Can be simultaneously operated as MPI slave and DP slave
- Transmission rate max. 12 Mbit/s
- Can be used with CPU from version 6ES7 22x-xxx**21**-xxxx

Technical specifications

Suitable for connection to	CPU 22x
• Plug-in I/O terminals	No
• Number of outputs	1
Type	RS 485
Isolation	
• Between external signal and control circuits	500 V AC (electrical)
Signal and diagnostic displays (LEDs)	• CPU fault • Power supply • DP fault • DX mode
Power supply using communications port	
• 5 V DC	
- output current	90 mA
- isolation between output and module and between output and 24 V DC power supply	500 V AC (max. 1 min.)
• 24 V DC	
- voltage range	20.4 to 28.8 V
- output current	120 mA
- overcurrent protection	0.7 to 2.4 A
- isolation	No; same circuit as for 24 V DC power supply
Protocols	• PROFIBUS DP (slave) • MPI (slave)

Current consumption	
• Over backplane bus (5 V DC)	150 mA
• External supply using sensor power supply (24 V DC)	30 to 180 mA
Power loss	2.5 W
Dimensions (W x H x D) in mm	71 x 80 x 62
Weight	175 g
Communication	
PROFIBUS DP transmission rates (self-setting)	9.6/19.2/45.45/93.75/187.5/500/1000/1500/3000/6000/ 12000 kbit/s
Cable lengths	100 to 1200 m, depending on transmission rate
DP station address	0 to 99, programmable
Number of stations per segment, max.	32
Number of stations in the network, max.	126, max. 99 of which EM 277
MPI connections, max.	6; 1 each reserved for programming device and OP
Connectable nodes	• TD 200 Version 2.0 or higher • OP • TP • Programming device/PC • S7-300/-400 • PROFIBUS DP master

Ordering data

	Order No.
EM 277 PROFIBUS DP input module for CPU 222/224/226/226 XM, for connection to PROFIBUS DP (slave) and MPI	**6ES7 277-0AA22-0XA0**

	Order No.

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Overview



The CP 243-2 is the AS-Interface master for the innovative generation of SIMATIC S7-200. The new communications processor (6GK1 243-2AX01-0AX0) supports the expanded AS-Interface Specification V2.1 and has the following functions:

- Connection of up to 62 AS-Interface slaves and integrated analog value transmission (according to expanded AS-Interface Specification V2.1)
- Supports all AS-Interface master functions according to expanded AS-Interface Specification V2.1
- Display of operating status and operational readiness of the connected slaves through LEDs in the frontplate
- Display errors (e.g. AS-Interface voltage errors, configuration errors) using LEDs in the frontplate
- Compact housing in the design of the innovative SIMATIC S7-200 generation

Technical specifications

AS-Interface Specification	V2.1
Interfaces	
• Address space used in the PLC	Corresponding to 2 I/O modules (8 DI/8 DO and 8 AI/8 AO)
• AS-Interface connection	Terminal
Current consumption	
• Through AS-Interface	Max. 100 mA
• Through backplane bus	Typ. 220 mA at DC 5V
Power loss	Approx. 2 W

Permissible ambient conditions	
• Operating temperature	
- horizontal installation	0 °C to +55 °C
- vertical installation	0 °C to +45 °C
• Transport/storage temperature	- 40 °C to +70 °C
• Relative humidity	Max. 95% at +25 °C
Design	
• Module format	S7-22x expansion module
• Dimensions (W x H x D) in mm	71.2 x 80 x 62 (H+16 mm with holes for fixing to the wall)
• Weight	Approx. 250 g
• Space required	1 slot

Ordering data

	Order No.
CP 243-2 communications processor for connecting SIMATIC S7-200 to AS-Interface	**6GK7 243-2AX01-0XA0**

	Order No.
CP 243-3 manual incl. AS-Interface basics and diskette with example programs	
German	**6GK7 243-2AX00-8AA0**
English	**6GK7 243-2AX00-8BA0**
French	**6GK7 243-2AX00-8CA0**
Spanish	**6GK7 243-2AX00-8DA0**
Italian	**6GK7 243-2AX00-8EA0**

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CP 243-1

Overview



- For connecting to Industrial Ethernet with
  - 10/100 Mbit/s
  - Half/Full Duplex
  - RJ45 socket connector
  - TCP/IP
- Configuring, remote programming and service with STEP 7-Micro/WIN using Industrial Ethernet possible (programm up-/ download, status)
- CPU/CPU communication possible with Industrial Ethernet (client + server, 8 connections)
- Further processing of PLC data in PC applications by linnking into S7-OPC possible
- Exchange of modules possible without PG

Technical specifications

Transmission rate	10/100 Mbit/s
Interfaces	
• connection toIndustrial Ethernet	RJ45
Versorgungsspannung	24 V DC
Current consumption	
• From backplane bus	55 mA
• From 24 V DC external	60 mA
Power loss at 24 V DC	1.75 W
Permissible ambient conditions	
• Operating temperature	
- horizontal installation	0 °C to +55 °C
- vertical installation	0 °C to +45 °C

Permissible ambient conditions (continued)	
• Transport/storage temperature	- 40 °C to +70 °C
• Relative humidity	95% at +25 °C
Design	
• Dimensions (W x H x D) in mm	71.2 x 80 x 62
• Weight	150 g
Performance data	
S7 communication/ PG communication	
• Number of operational connections	8
Configuring	with STEP 7-Micro/WIN

Ordering data

	Order No.
CP 243-1 communications processor for connecting SIMATIC S7-200 to Industrial Ethernet; for S7 communication, PG communication	**6GK7 243-1EX00-0XE0**

	Order No.

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Overview



The regulated load power supply for the SIMATIC S7-200.

- Coordinated design and functionality, allowing simple integration in the PLC network.
- For reliably powering the controller, encoders and sensors with 24 V DC, 3.5 A
- Flexible implementation, either in industry or in the domestic supply system

Technical specifications

Type	**3.5 A**
Order No.	**6EP1 332-1SH31**
Input	Single-phase AC
Rated voltage $V_{in\ rated}$	**120/230 V AC** selected by wire jumper
Voltage range	93 to 132 V/187 to 264 V AC
Surge strength	2.3 U_{in} rated, 1.3 ms
Mains buffering at $I_{out\ rated}$	> 20 ms at V_{in} = 187 V
Rated line frequency, range	50/60 Hz, 47 to 63 Hz
Rated current $I_{in\ rated}$	1.65/0.95 A
Inrush current limiting (+25 °C)	< 33 A, < 3 ms (V_{in} = 230 V)
I^2t	< 1.0 A^2s
Integral input fuse	T 2.5 A/250 V (not accessible)
Recommended circuit-breaker (IEC 898) in the supply cable	Two-pole circuit-breaker, from 10 A, Characteristic C or from 6 A Characteristic D
Output	Regulated, floating direct voltage
Rated voltage $V_{out\ rated}$	**24 V DC**
Total tolerance	± 5 % (typ. ± 2 %)
• Steady-state line compensation	± 0.1 %
• Steady-state load compensation	± 0.2 %
Residual ripple (switching frequency: approx. 50 kHz)	< 150 mV_{pp} (typ. 30 mV_{pp})
Spikes (bandwidth: 20 MHz)	< 240 mV_{pp} (typ. 110 mV_{pp})
Setting range	-
Status indicator	-
Turn-on/off response	No overshoot of V_{out} (soft starting)
Starting delay/voltage rise	< 1 s/typ.80 ms
Rated current $I_{out\ rated}$	**3.5 A**
Current range	
• Up to +45 °C	0-3.5 A
• Up to +60 °C	0-3.5 A

Dynamic V/I for	
• Starting into short-circuit	Typ. 5 A for 100 ms
• Short-circuit in operation	Typ. 5 A for 100 ms
Parallel connection to increase power	Yes, up to 5 units
Efficiency	
Efficiency at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 84 %
Power loss at $V_{out\ rated}$, $I_{out\ rated}$	Approx. 16 W
Regulation	
Dynamic line compensation ($V_{in\ rated}$ ±15 %)	± 0.3 % V_{out}
Dynamic load compensation (I_{out}: 50/100/50 %)	< ± 10 % V_{out} (typ. ± 2.1 % V_{out})
Correction time	
• Load step 50 to 100 %	< 5 ms
• Load step 100 to 50 %	< 5 ms
Protection and monitoring	
Output overvoltage protection	
Current limiting typ.	3.8 A
Short-circuit protection	Constant current characteristic up to typ. 14 V; electronic shut-down at less than that value, auto. restart
Continuous short-circuit RMS current	< 4 A
Overload/short-circuit indicator	-
Safety	
Isolation primary/secondary	Yes, SELV output voltage V_{out} to EN 60 950
Protection class (IEC 536; VDE 0106 T1)	Class I
Leakage current	< 3.5 mA
Technical Inspectorate type testing	Yes
CE marking	Yes
UL/cUL (CSA) approval	Yes, UL/cUL-Listed (UL 508, CSA 22.2), File E143289
FM approval	-
Shipbuilding approval	-
Degree of protection (EN 60 529; VDE 0470 T1)	IP 20

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S7-200 type

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Technical specifications (continued)

EMC	
Emitted interference	EN 50 081-1, EN 55 022 Class B
Line harmonic limiting	-
Interference immunity	EN 50 082-2, IEC 801-2, -3, -4, -5
Operating specifications	
Ambient temperature range	0 to +60 °C with natural convection
Non-operating temperature range	-25 to +85 °C
Humidity class	Humidity class to DIN 40 040: relative humidity up to 75 % mean value, 95 % on 30 days/year, no condensation

Mechanical specifications	
Terminals	
• Supply input L, N, PE	One screw terminal each for 0.5 to 1 mm^2 stranded, 0.5 to 1.5 mm^2 solid
• Output L+	1 screw terminal for 0.5 to 1 mm^2
• Output M	1 screw terminal for 0.5 to 1 mm^2
Dimensions (W x H x D) in m	160 x 80 x 62
Approx. weight	0.5 kg
Installation	Snap-mounting on DIN rail to DIN EN 50 022-35 x 15/7.5
Accessories	Mounting bracket

Ordering data

	Order-No.
SITOP® power 3.5 A regulated load power supply 120/230 V AC, 24 V DC/3.5 A	**6EP1 332-1SH31**

	Order-No.
Mounting bracket for space-saving assembly of power supply on rear wall of control cabinet (the power supply is connected together with the side panel to the rear wall); for control cabinets with depth of 240 mm or more	**6EP1 971-1AA01**

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Overview



- The user-friendly text display for the S7-200
- For control and monitoring: message text display,intervention in PLC program, setting of inputs and outputs
- Direct connection to CPU interface using the cable supplied, or integration into the network (likewise using EM 277)
- No separate power supply required
- No separate parameterization software required
- On request with customized front design
- Addressing and contrast adjustment by means of supplied menu

Technical specifications

Display	LCD backlit, 2-line, 20 characters/line (ASCII, Cyrillic), 10 characters/line (Chinese), 5 mm character height
Interfaces	1 PPI (RS 485) max.to set up a network with max. 126 stations (S7-200, OP, TP, TBP, PG/PC); Transmission speeds 9.6, 19.2, 187.5 kbit/s
Power supply	24 V DC, 120 mA; Powered from S7-200 communication interface or optional external power pack. Sensor power supply (24 V DC) of CPU is not affected

Ambient temperature	0 to 60 °C
Transport/storage temperature	-40 to +70 °C
Degree of protection	IP 65 front
Dimensions (W x H x D) in mm	148 x 76 x 27
Installation opening (standard cut-out) in mm	138 x 68
Cabinet/control panel thickness in mm	0.3 to 4
Weight	250 g

Ordering data

	Order-No.
TD 200 text display for connection to SIMATIC S7-200	**6ES7 272-0AA20-0YA0**
TD 200 manual	
German	**6ES7 272-0AA20-8AA0**
English	**6ES7 272-0AA20-8BA0**
French	**6ES7 272-0AA20-8CA0**
Spanish	**6ES7 272-0AA20-8DA0**
Italian	**6ES7 272-0AA20-8EA0**

	Order-No.
PROFIBUS IP 20 bus connector with 90° cable outlet	
• Without PG interface	**6ES7 972-0BA12-0XA0**
• With PG interface	**6ES7 972-0BB12-0XA0**
PROFIBUS IP 20 bus connector with 35° cable outlet	
• Without PG interface	**6ES7 972-0BA41-0XA0**
• With PG interface	**6ES7 972-0BB41-0XA0**
PROFIBUS-FC standard cable for connection to PPI; standard type with special design for quick mounting, 2-core, shielded, sold by the meter, max. delivery unit 1000 m, minimum ordering quantity 20 m	**6XV1 830-0EH10**

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SIMATIC TP 070

Overview



- Touch device specially designed for the SIMATIC S7-200 (point-to-point connection)
- Human machine interface for small machines and plants
- Connection using MPI or PROFIBUS DP cable
- Configuration with the STEP 7-Micro/Win V3.1 and STEP 7-Micro/Win Toolbox configuring software
- Configuration download through PPI adaptor
- Future-proof through the innovative Windows CE standard operating system

Technical specifications

Display	STN Liquid Crystal Display (LCD)
• Size	5.7"
• Resolution (pixels)	320 x 240
• Colors	4 blue levels
• MTBF of display and background lighting (at 25 °C)	Approx. 50,000 hours
Control elements	Touch screen
• Numeric/alphanumeric input	Yes/-
Processor	RISC 66 MHz
Operating system	Win CE
Memory	
• Type	Flash / RAM
• Memory available for user data	128 KB
Interfaces	1 x RS485
Printer	No
Interface with PLC	S7-200
Supply voltage	24 V DC
• Rated voltage	24 V
• Permitted range	+18 to +30 V DC
• Current input, typ.	0.24 A
Backup battery	No
Clock	Software clock
Degree of protection	
• Front	IP 65 (when mounted)
• Rear	IP 20
Certification	FM, UL, CSA, CE

Dimensions	
• Front w x h (mm)	212 x 156
• Mounting cutout/depth w x h x d (mm)	198 x 142 x 45
Weight (kg)	0.7
Ambient conditions	
• Mounting position	
- max. permissible angle of inclination without assisted ventilation	35°
• Temperature	
- operation (vertical installation)	0 to +50 °C
- operation (max. inclination)	0 to +40 °C
- transport, storage	-20 to +60 °C
• Relative humidity	85%
Functions	
Process diagrams	20
• Text objects	200 text elements
• Variables per diagram	10
• Graphics objects	Bitmaps, icons, background images
• Dynamic objects	Bars
Variables	50
Online languages	1
• Standard languages	English, French, German, Italian, Spanish
Character set	Tahoma, freely scalable
Configuration tool	MicroWin TP-Designer from version 3.1, executable under Windows 98/SE/ME/NT/2000 (must be ordered separately)
• Configuration transfer	Serial

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Ordering data

	Order-No.
SIMATIC TP 070 with 5.7" STN display, resistive analog touch panel, numerical system keyboard, RS 485 interface	**6AV6 545-0AA15-2AX0**
TP 070 equipment manual	
German	**6AV6 591-1DC01-0AA0**
English	**6AV6 591-1DC01-0AB0**
French	**6AV6 591-1DC01-0AC0**
Italian	**6AV6 591-1DC01-0AD0**
Spanish	**6AV6 591-1DC01-0AE0**
Configuration software STEP 7-Micro/Win, TP-Designer for TP 070	See Section 8
TP 070 protective plastic cover (10 units)	**6AV6 574-1AD00-4AX0**
TP 070 protective hood (2 units)	**6AV6 574-1AE00-4AX0**

	Order-No.
TP 070 service pack comprising gaskets, clamps, 2-pin connector (power supply)	**6AV6 574-1AA00-4AX0**
PC/PPI cable 5 m long	**6ES7 901-3BF20-0XA0**
MPI cable 3 m long	**6XV1 830-1CH30**
PROFIBUS bus cables, accessories	See page 3/14

Overview

- Software for the SIMATIC S7-200
- Functions for all phases of an automation project:
  - Planning, engineering, configuring, and parameter assignment of hardware and communications
  - Creation of user program
  - Documentation
  - Test, startup, service
  - Process control
  - Archiving

Available are:

- STEP 7-Micro/WIn
- STEP 7-Micro/WIn command library
- TP-Designer for TP 070
- SIMATIC MicroComputing

For further information see Section 8.

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Software

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