

## SIMATIC S7-200



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# SIMATIC S7-200

## Introduction

### S7-200

#### Overview



#### **SIMATIC S7-200**

- 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 economically viable in the past.
- With outstanding real-time performance and powerful communication options (PPI, PROFIBUS DP, AS-Interface)
- Shipbuilding certification from
  - 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)

#### **SIPLUS S7-200**

- The PLC for use under extremely harsh environmental conditions
- With enhanced temperature range from -25 °C to +70 °C
- Use in environments with pollutant gases (corrosive gas atmospheres)
- Occasional short-term condensation and enhanced mechanical stress permissible
- With the proven PLC technology of the S7-200
- Easy handling, programming, maintenance and service
- Ideal for use in automobile construction, environmental technology, mining, chemical plants, conveying technology, food & beverages industry etc.
- The substitute for expensive special solutions

For more information, go to:

<http://www.siemens.com/siplus>

For brochures serving as selection guides for SIMATIC products refer to:

<http://www.siemens.com/simatic/printmaterial>

### Technical specifications

General technical specifications SIMATIC S7-200	
Degree of protection	IP20 in accordance with IEC 529
Ambient temperature	
<ul style="list-style-type: none"> <li>• Operation (95 % relative humidity)               <ul style="list-style-type: none"> <li>- With horizontal mounting</li> <li>- With vertical mounting</li> </ul> </li> <li>• Transport and storage               <ul style="list-style-type: none"> <li>- with 95 % relative humidity</li> </ul> </li> </ul>	0 ... 55°C 0 ... 45°C -40 ... +70 °C 25 ... 55 °C
Isolation	
<ul style="list-style-type: none"> <li>• 5/24 V DC circuits</li> <li>• 115/230 V AC circuits to ground</li> <li>• 115/230 V AC circuits to 115/230 V AC circuits</li> <li>• 230 V AC circuits to 5/24 V DC circuits</li> <li>• 115 V AC circuits to 5/24 V DC circuits</li> </ul>	Test voltage 500 V AC Test voltage 1500 V AC Test voltage 1500 V AC Test voltage 1500 V AC Test voltage 1500 V AC
Electromagnetic compatibility	Requirements of EMC law
<ul style="list-style-type: none"> <li>• Noise immunity to EN 50082-2</li> <li>• Emitted interference according to EN 50081-1 and EN 50081-2</li> </ul>	Tested according to: IEC 801-2, IEC 801-3, IEC 801-4, EN 50141, EN 50204, IEC 801-5, VDE 0160  Tested according to EN 55011, Class A, Group 1 and EN 55011, Class B, Group 1
Mechanical rating	
<ul style="list-style-type: none"> <li>• Vibrations, tested according to/tested with</li> <li>• Shock, tested according to/tested with</li> </ul>	IEC 68, Part 2-6: 10 to 57 Hz; constant amplitude 0.3 mm; 58 ... 150 Hz; constant acceleration 1 g (mounted on DIN rail) or 2 g (mounted in control cabinet); type of vibration: frequency cycles with a rate of change of 1 octave/minute; vibration duration: 10 frequency cycles per axis in each direction of the 3 mutually perpendicular axes  IEC 68, Part 2-27/half-sine: shock strength 15 g (peak value), duration 11 ms, 6 shocks on each of the 3 mutually perpendicular axes

General technical specifications SIPLUS S7-200	
<b>Climatic environmental conditions</b>	
Temperature	Horizontal installation: -25 °C to 70 °C vertical installation: -25 °C to 50 °C
Relative humidity	5 to 95%; short-term condensation permissible, corresponds to relative humidity (RH) load 2 according to IEC 1131-2 and IEC 721 3-3 Cl. 3K5
Short-term ice formation	-25 °C to 0 °C IEC 721 3-3 Cl. 3K5
Air pressure	1080 to 795 hPa corresponds to an altitude of -1000 to 2000 m
Contaminant concentration	SO <sub>2</sub> : < 0.5 ppm; relative humidity < 60% test: 10 ppm, 4 days H <sub>2</sub> S: < 0.1 ppm; relative humidity < 60% test: 1 ppm, 4 days (to IEC 721 3-3; Class 3C3)
<b>Mechanical environmental conditions</b>	
Vibrations	Type of vibration: Frequency sweeps with a rate of change of 1 octave/minute. 2 Hz ≤ f ≤ 9 Hz, constant amplitude 3.0 mm, 9 Hz ≤ f ≤ 150 Hz, constant acceleration 1 g, duration of oscillation: 10 frequency cycles per axis in each of the three mutually perpendicular axes Vibration tests according to IEC 68 Part 2-6 (sine wave) and IEC 721 3-3, Class 3M4
Shock	Type of shock: Half-sine, intensity of shock: 15 g peak value, 11 ms duration, direction: 3 shocks each in +/- direction in each of the 3 perpendicular axes Shock testing in accordance with IEC 68 Part 2-27
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes <sup>1)</sup>

<sup>1)</sup> Does not apply to:  
 6AG1 214-2AD23-2XB0, 6AG1 214-2BD23-2XB0,  
 6AG1 232-0HB22-2XB0, 6AG1 235-0KD22-2XB0,  
 6AG1 231-7PB22-2XA0, 6AG1 901-3CB30-2XA0

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Overview CPU 221



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

### Overview CPU 224



- The compact high-performance CPU
- With 24 inputs/outputs on board
- Expandable with up to 7 expansion modules

### Overview CPU 222



- The superior compact solution
- With 14 inputs/outputs on board
- Expandable with up to 2 expansion modules

### Overview CPU 224 XP / CPU 224 XPsi



- The power CPU
- With 24 digital and 3 analog inputs/outputs onboard
- Expandable with up to 7 expansion modules

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### 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 racks

### Technical specifications

	6ES7 211-0AA23-0XB0	6ES7 211-0BA23-0XB0	6ES7 212-1AB23-0XB0	6ES7 212-1BB23-0XB0
<b>Supply voltages</b>				
Rated value				
• DC 24 V	Yes		Yes	
• permissible range, lower limit (DC)	20.4 V		20.4 V	
• permissible range, upper limit (DC)	28.8 V		28.8 V	
• AC 120 V		Yes		Yes
• AC 230 V		Yes		Yes
• permissible range, lower limit (AC)		85 V		85 V
• permissible range, upper limit (AC)		264 V		264 V
• permissible frequency range, lower limit		47 Hz		47 Hz
• permissible frequency range, upper limit		63 Hz		63 Hz
<b>Load voltage L+</b>				
• Rated value (DC)	24 V	24 V	24 V	24 V
• permissible range, lower limit (DC)	20.4 V	5 V	20.4 V	5 V
• permissible range, upper limit (DC)	28,8 V	30 V	28.8 V	30 V
<b>Load voltage L1</b>				
• Rated value (AC)		100 V; 100 to 230 V AC		100 V; 100 to 230 V AC
• permissible range, lower limit (AC)		5 V		5 V
• permissible range, upper limit (AC)		250 V		250 V
• permissible frequency range, lower limit		47 Hz		47 Hz
• permissible frequency range, upper limit		63 Hz		63 Hz

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 211-0AA23-0XB0	6ES7 211-0BA23-0XB0	6ES7 212-1AB23-0XB0	6ES7 212-1BB23-0XB0
<b>Current consumption</b>				
Inrush current, max.	10 A; at 28.8 V	20 A; at 264 V	10 A; at 28.8 V	20 A; at 264 V
from supply voltage L+, max.	450 mA; 80 to 450 mA		500 mA; 85 to 500 mA, output current for expansion modules (DC 5 V) 340 mA	
from supply voltage L1, max.		120 mA; 15 to 60 mA (240 V); 30 to 120 mA (120 V); output current for expansion modules (5 V DC) 340 mA		140 mA; 20 to 70 mA (240 V); 40 to 140 mA (120 V); output current for expansion modules (5 V DC) 340 mA
<b>Backup battery</b>				
• Backup time, max.	50 Hours; (min. 8 h at 40 °C); 200 days (typ.) with optional battery module	50 Hours; (min. 8 h at 40 °C); 200 days (typ.) with optional battery module	50 Hours; (min. 8 h at 40 °C); 200 days (typ.) with optional battery module	50 Hours; (min. 8 h at 40 °C); 200 days (typ.) with optional battery module
<b>Memory</b>				
Type of storage				
Number of memory modules (optional)	1; pluggable memory module, content identical with integral EEPROM; can additionally store recipes, data logs and other files	1; pluggable memory module, content identical with integral EEPROM; can additionally store recipes, data logs and other files	1; pluggable memory module, content identical with integral EEPROM; can additionally store recipes, data logs and other files	1; pluggable memory module, content identical with integral EEPROM; can additionally store recipes, data logs and other files
Data and program memory				
• Data memory, max.	2 Kibyte	2 Kibyte	2 Kibyte	2 Kibyte
• Program memory, max.	4 Kibyte	4 Kibyte	4 Kibyte	4 Kibyte
<b>Backup</b>				
• present	Yes; Program: Entire program maintenance-free on integral EEPROM, programmable via CPU; data: Entire DB 1 loaded from PG/PC maintenance- free on integral EEPROM, current values of DB 1 in RAM, retentive memory bits, timers, counters, etc. maintenance-free via high- performance capacitor; optional battery for long- term buffering	Yes; Program: Entire program maintenance-free on integral EEPROM, programmable via CPU; data: Entire DB 1 loaded from PG/PC maintenance- free on integral EEPROM, current values of DB 1 in RAM, retentive memory bits, timers, counters, etc. maintenance-free via high- performance capacitor; optional battery for long- term buffering	Yes; Program: Entire program maintenance-free on integral EEPROM, programmable via CPU; data: Entire DB 1 loaded from PG/PC maintenance- free on integral EEPROM, current values of DB 1 in RAM, retentive memory bits, timers, counters, etc. maintenance-free via high- performance capacitor; optional battery for long- term buffering	Yes; Program: Entire program maintenance-free on integral EEPROM, programmable via CPU; data: Entire DB 1 loaded from PG/PC maintenance- free on integral EEPROM, current values of DB 1 in RAM, retentive memory bits, timers, counters, etc. maintenance-free via high- performance capacitor; optional battery for long- term buffering
<b>CPU/processing times</b>				
for bit operations, max.	0.22 µs	0.22 µs	0.22 µs	0.22 µs
<b>Times/counters and their remanence</b>				
S7 counter				
• Number	256	256	256	256
• of which remanent with battery				
- adjustable	Yes; via high-performance capacitor or battery	Yes; via high-performance capacitor or battery	Yes; via high-performance capacitor or battery	Yes; via high-performance capacitor or battery
- lower limit	1	1	1	1
- upper limit	256	256	256	256
• Counting range				
- lower limit	0	0	0	0
- upper limit	32 767	32 767	32 767	32 767

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 211-0AA23-0XB0	6ES7 211-0BA23-0XB0	6ES7 212-1AB23-0XB0	6ES7 212-1BB23-0XB0
S7 times				
• Number	256	256	256	256
• of which remanent with battery				
- adjustable	Yes; via high-performance capacitor or battery	Yes; via high-performance capacitor or battery	Yes; via high-performance capacitor or battery	Yes; via high-performance capacitor or battery
- upper limit	64	64	64	64
• Time range				
- lower limit	1 ms	1 ms	1 ms	1 ms
- upper limit	54 min; 4 timers: 1 ms to 30 s; 16 timers: 10 ms to 5 min; 236 timers: 100 ms to 54 min	54 min; 4 timers: 1 ms to 30 s; 16 timers: 10 ms to 5 min; 236 timers: 100 ms to 54 min	54 min; 4 timers: 1 ms to 30 s; 16 timers: 10 ms to 5 min; 236 timers: 100 ms to 54 min	54 min; 4 timers: 1 ms to 30 s; 16 timers: 10 ms to 5 min; 236 timers: 100 ms to 54 min
<b>Data areas and their remanence</b>				
Flag				
• Number, max.	32 byte	32 byte	32 byte	32 byte
• Remanence available	Yes; M 0.0 to M 31.7	Yes; M 0.0 to M 31.7	Yes; M 0.0 to M 31.7	Yes; M 0.0 to M 31.7
• of which remanent with battery	0 to 255, via high-performance capacitor or battery, adjustable	0 to 255, via high-performance capacitor or battery, adjustable	0 to 255, via high-performance capacitor or battery, adjustable	0 to 255, via high-performance capacitor or battery, adjustable
• of which remanent without battery	0 to 112 in EEPROM, adjustable	0 to 112 in EEPROM, adjustable	0 to 112 in EEPROM, adjustable	0 to 112 in EEPROM, adjustable
<b>Hardware config.</b>				
Connectable programming devices/PCs	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC
Expansion devices, max.			2; Only expansion modules of the S7-22x series can be used. Due to the limited output current, the use of expansion modules may be limited.	2; Only expansion modules of the S7-22x series can be used. Due to the limited output current, the use of expansion modules may be limited.
Extension of distributed I/O				
• Analog inputs/outputs, max.			10; max. 8 inputs and 2 outputs (EM) or max. 0 inputs and 4 outputs (EM)	10; max. 8 inputs and 2 outputs (EM) or max. 0 inputs and 4 outputs (EM)
• Digital inputs/outputs, max.			78; max. 40 inputs and 38 outputs (CPU + EM)	78; max. 40 inputs and 38 outputs (CPU + EM)
• AS interface inputs/outputs max.			62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)
<b>Connection point</b>				
pluggable I/O terminals	No	No	No	No
<b>1st interface</b>				
Type of interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface
Physics	RS 485	RS 485	RS 485	RS 485
Functionality				
• MPI	Yes; 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 in the MPI network with restrictions; transmission rates: 19.2/187.5 Kbit/s			
• PPI	Yes; with PPI protocol for program functions, HMI functions (TD 200, OP), S7-200-internal CPU/CPU communication ; transmission rates 9.6/19.2/187.5 kbit/s			
• serial data exchange	Yes; as freely programmable interface with interrupt facility for serial data exchange with third-party devices with ASCII protocol transfer rates: 1.2 / 2.4 / 4.8 / 9.6 / 19.2 / 38.4 / 57.6 / 115.2 Kbit/s; the PC/PPI cable can also be used as RS232/RS485 converter			



# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 211-0AA23-0XB0	6ES7 211-0BA23-0XB0	6ES7 212-1AB23-0XB0	6ES7 212-1BB23-0XB0
MPI				
• Transmission speeds, max.	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s
• Transmission speeds, min.	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s
<b>CPU/programming</b>				
Programming language				
• LAD	Yes	Yes	Yes	Yes
• FUP	Yes	Yes	Yes	Yes
• AWL	Yes	Yes	Yes	Yes
Operational stocks	Bit logic instructions, compare instructions, timer instructions, counter instructions, clock instructions, transmissions instructions, table instructions, logic instructions, shift and rotate instructions, conversion instructions, program control instructions, interrupt and communications instructions, logic stack instructions, integer maths, floating-point math instructions, numerical functions	Bit logic instructions, compare instructions, timer instructions, counter instructions, clock instructions, transmissions instructions, table instructions, logic instructions, shift and rotate instructions, conversion instructions, program control instructions, interrupt and communications instructions, logic stack instructions, integer maths, floating-point math instructions, numerical functions	Bit logic instructions, compare instructions, timer instructions, counter instructions, clock instructions, transmissions instructions, table instructions, logic instructions, shift and rotate instructions, conversion instructions, program control instructions, interrupt and communications instructions, logic stack instructions, integer maths, floating-point math instructions, numerical functions	Bit logic instructions, compare instructions, timer instructions, counter instructions, clock instructions, transmissions instructions, table instructions, logic instructions, shift and rotate instructions, conversion instructions, program control instructions, interrupt and communications instructions, logic stack instructions, integer maths, floating-point math instructions, numerical functions
User program protection/password protection	Yes; 3-stage password protection	Yes; 3-stage password protection	Yes; 3-stage password protection	Yes; 3-stage password protection
Program processing	free cycle (OB 1), interrupt-controller, time-controlled (1 to 255 ms)	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer
Program organization	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer
Number of subroutines, max.	64	64	64	64
<b>Digital inputs</b>				
Number of digital inputs	6; integrated	6; integrated	8	8
m/p-reading	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group
Input voltage				
• Rated value, DC	24 V	24 V	24 V	24 V
• for signal "0"	0 to 5 V	0 to 5 V	0 to 5 V	0 to 5 V
• for signal "1"	min. 15 V	min. 15 V	min. 15 V	min. 15 V
Input current				
• for signal "1", typ.	2.5 mA	2.5 mA	2.5 mA	2.5 mA
Input delay (for rated value of input voltage)				
• for standard inputs				
- programmable	Yes; all	Yes; all	Yes; all	Yes; all
- at " to "1", min.	0.2 ms	0.2 ms	0.2 ms	0.2 ms
- at "0" to "1", max.	12.8 ms	12.8 ms	12.8 ms	12.8 ms
• for interrupt inputs				
- programmable	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3
• for counter/technological functions				
- programmable	Yes; (E0.0 to E0.5) 30 kHz	Yes; (E0.0 to E0.5) 30 kHz	Yes; (E0.0 to E0.5) 30 kHz	Yes; (E0.0 to E0.5) 30 kHz
Cable length				
• cable length, shielded, max.	500 m; Standard input: 500 m, high-speed counters: 50 m	500 m; Standard input: 500 m, high-speed counters: 50 m	500 m; Standard input: 500 m, high-speed counters: 50 m	500 m; Standard input: 500 m, high-speed counters: 50 m
• cable length unshielded, max.	300 m; not for high-speed signals	300 m; not for high-speed signals	300 m; not for high-speed signals	300 m; not for high-speed signals



# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 211-0AA23-0XB0	6ES7 211-0BA23-0XB0	6ES7 212-1AB23-0XB0	6ES7 212-1BB23-0XB0
<b>Digital outputs</b>				
Number of digital outputs	4; Transistor	4; Relay	6; Transistor	4; Relay
Short-circuit protection of the output	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally
Limitation of inductive shutdown voltage to	1 W		1 W	
Switching capacity of the outputs				
• with resistive load, max.	0.75 A	2 A	0,75 A	2 A
• on lamp load, max.	5 W	30 W DC; 200 W AC	5 W	30 W DC; 200 W AC
Output voltage				
• for signal "1", min.	20 V DC	L+ / L1	DC 20 V	L+ / L1
Output current				
• for signal "1" rated value	750 mA	2 A	750 mA	2 A
• for signal "0" residual current, max.	0.1 mA	0 mA	10 µA	0 mA
Output delay with resistive load				
• "0" to "1", max.	15 µs; of the standard outputs, max. (Q0.2 to Q0.3) 15 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 2 µs	10 ms; all outputs	15 µs; of the standard outputs, max. (Q0.2 to Q0.5) 15 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 2 µs	10 ms; all outputs
• "1" to "0", max.	130 µs; of the standard outputs, max. (Q0.2 to Q0.3) 100 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 10 µs	10 ms; all outputs	130 µs; of the standard outputs, max. (Q0.2 to Q0.5) 100 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 10 µs	10 ms; all outputs
Parallel switching of 2 outputs				
• for increased power	Yes	No	Yes	No
Switching frequency				
• of the pulse outputs, with resistive load, max.	20 kHz; Q 0.0 to Q 0.1		20 kHz; Q 0.0 to Q 0.1	
Aggregate current of the outputs (per group)				
• horizontal installation - up to 55 °C, max.	3 A	6 A	4.5 A	6 A
• up to 40 °C, max.	3 A	6 A	4.5 A	6 A
• cable length, shielded, max.	500 m	500 m	500 m	500 m
• Cable length unshielded, max.	150 m	150 m	150 m	150 m
<b>Relay outputs</b>				
Number of operating cycles		1E7; mechanically 10 million, at rated load voltage 100,000		1E7; mechanically 10 million, at rated load voltage 100,000
<b>Analog inputs</b>				
Number of analog potentiometers	1; Analog potentiometer; resolution 8 bit	1; Analog potentiometer; resolution 8 bit	1; Analog potentiometer; resolution 8 bit	1; Analog potentiometer; resolution 8 bit
<b>Encoder supply</b>				
24 V encoder supply				
• 24 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 20.4 bis 28.8 V
• Short-circuit protection	Yes; electronic at 600 mA	Yes; electronic at 600 mA	Yes; electronic at 600 mA	Yes; electronic at 600 mA
• Output current, max.	180 mA	180 mA	180 mA	180 mA

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 211-0AA23-0XB0	6ES7 211-0BA23-0XB0	6ES7 212-1AB23-0XB0	6ES7 212-1BB23-0XB0
<b>Encoder</b>				
Connectable encoders				
• 2-wire BEROS - permissible quiescent current (2-wire BEROS), max.	Yes 1 mA	Yes 1 mA	Yes 1 mA	Yes 1 mA
<b>Integrated Functions</b>				
Number of counters	4; High-speed counters (30 kHz each), 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)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.			
Counter frequency (counter) max.	30 kHz	30 kHz	30 kHz	30 kHz
Number of alarm inputs	4; 4 rising edges and/or 4 falling edges			
Number of pulse outputs	2; high-speed outputs, 20 kHz, with interrupt option; pulse-width and frequency modulation option		2; high-speed outputs, 20 kHz, with interrupt option; pulse-width and frequency modulation option	
Limit frequency (pulse)	20 kHz		20 kHz	
<b>Isolation</b>				
Galvanic isolation, digital inputs				
• between the channels	Yes	Yes	Yes	Yes
• between the channels, in groups of	2 and 4	2 and 4	4	4
Isolation, digital outputs				
• between the channels	Yes; Optocoupler	Yes; Relay	Yes; Optocoupler	Yes; Relay
• between the channels, in groups of	4	1 and 3	6	3
<b>Permissible potential difference</b>				
between different circuits	500 V DC between 24 V DC and 5 V DC	500 V DC between 24 V DC and 5 V DC; 1500 V AC between 24 V DC and 230 V AC	500 V DC between 24 V DC and 5 V DC	500 V DC between 24 V DC and 5 V DC; 1500 V AC between 24 V DC and 230 V AC
<b>Environmental requirements</b>				
Environmental conditions	For further environmental conditions, see "Automation System S7-200, System Manual"			
Operating temperature				
• vertical installation, min.	0 °C	0 °C	0 °C	0 °C
• vertical installation, max.	45 °C	45 °C	45 °C	45 °C
• horizontal installation, min.	0 °C	0 °C	0 °C	0 °C
• horizontal installation, max.	55 °C	55 °C	55 °C	55 °C
Air pressure				
• permissible range, min.	860 hPa	860 hPa	860 hPa	860 hPa
• permissible range, max.	1 080 hPa	1 080 hPa	1 080 hPa	1 080 hPa
Relative humidity				
• Operation, min.	5%			
• Operation, max.	95%; RH class 2 in accordance with IEC 1131-2			
<b>Degree of protection</b>				
IP20	Yes	Yes	Yes	Yes
<b>Dimensions</b>				
Dimensions				
• Width	90 mm	90 mm	90 mm	90 mm
• Height	80 mm	80 mm	80 mm	80 mm
• Depth	62 mm	62 mm	62 mm	62 mm
Weights				
• Weight, approx.	270 g	310 g	270 g	310 g

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
<b>Supply voltages</b>							
Rated value							
• DC 24 V	Yes		Yes		Yes	Yes	
• permissible range, lower limit (DC)	20.4 V		20.4 V		20.4 V	20.4 V	
• permissible range, upper limit (DC)	28.8 V		28.8 V		28.8 V	28.8 V	
• AC 120 V		Yes		Yes			Yes
• AC 230 V		Yes		Yes			Yes
• permissible range, lower limit (AC)		85 V		85 V			85 V
• permissible range, upper limit (AC)		264 V		264 V			264 V
• permissible frequency range, lower limit		47 Hz		47 Hz			47 Hz
• permissible frequency range, upper limit		63 Hz		63 Hz			63 Hz
<b>Load voltage L+</b>							
• Rated value (DC)	24 V	24 V	24 V	24 V	24 V	24 V	24 V
• permissible range, lower limit (DC)	20.4 V	5 V	20.4 V	5 V	20.4 V	20.4 V	5 V
• permissible range, upper limit (DC)	28.8 V	30 V	28.8 V	30 V	28.8 V	28.8 V	30 V
<b>Load voltage L1</b>							
• Rated value (AC)		100 V; 100 to 230 V AC		100 V; 100 to 230 V AC			100 V; 100 to 230 V AC
• permissible range, lower limit (AC)		5 V		5 V			5 V
• permissible range, upper limit (AC)		250 V		250 V			250 V
• permissible frequency range, lower limit		47 Hz		47 Hz			47 Hz
• permissible frequency range, upper limit		63 Hz		63 Hz			63 Hz
<b>Current consumption</b>							
Inrush current, max.	12 A; at 28.8 V	20 A; at 264 V	12 A; at 28.8 V	20 A; at 264 V	12 A; at 28.8 V	10 A; at 28.8 V	20 A; at 264 V
from supply voltage L+, max.	700 mA; 110 to 700 mA, output current for expansion modules (DC 5 V) 660 mA		900 mA; 120 to 900 mA, output current for expansion modules (DC 5 V) 660 mA		900 mA; 120 to 900 mA, output current for expansion modules (DC 5 V) 660 mA	1 050 mA; 150 to 1050 mA output current for expansion modules (DC 5 V) 1000 mA	
from supply voltage L1, max.		200 mA; 30 to 100 mA (240 V); 60 to 200 mA (120 V); output current for expansion modules (5 V DC) 600 mA		220 mA; 35 to 100 mA (240 V); 70 to 220 mA (120 V); output current for expansion modules (5 V DC) 600 mA			320 mA; 40 to 160 mA (240 V); 80 to 320 mA (120 V); output current for expansion modules (5 V DC) 1000 mA

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
<b>Backup battery</b>							
• Backup time, max.	100 Hours; (min. 70 h at 40 °C); 200 days (typ.) with optional battery module						
<b>Memory</b>							
Type of storage							
Number of memory modules (optional)	1; pluggable memory module, content identical with integral EEPROM; can additionally store recipes, data logs and other files						
Data and program memory							
• Data memory, max.	8 Kibyte	8 Kibyte	10 Kibyte	10 Kibyte	10 Kibyte	10 Kibyte	10 Kibyte
• Program memory, max.	12 Kibyte; 8 KB on active run-time edit	12 Kibyte; 8 KB on active run-time edit	16 Kibyte; 12 KB for active run-time edit	16 Kibyte; 12 KB for active run-time edit	16 Kibyte; 12 KB for active run-time edit	24 Kibyte; 16 KB with active run-time edit	24 Kibyte; 16 KB with active run-time edit
<b>Backup</b>							
• present	Yes; Program: Entire program maintenance-free on integral EEPROM, programmable via CPU; data: Entire DB 1 loaded from PG/PC maintenance-free on integral EEPROM, current values of DB 1 in RAM, retentive memory bits, timers, counters, etc. maintenance-free via high-performance capacitor; optional battery for long-term buffering						
<b>CPU/processing times</b>							
for bit operations, max.	0.22 µs	0.22 µs	0.22 µs	0.22 µs	0.22 µs	0.22 µs	0.22 µs
<b>Times/counters and their remanence</b>							
<b>S7 counter</b>							
• Number	256	256	256	256	256	256	256
• of which remanent with battery	Yes; via high-performance capacitor or battery						
- adjustable	1						
- lower limit	256						
- upper limit							
• Counting range							
- lower limit	0	0	0	0	0	0	0
- upper limit	32 767	32 767	32 767	32 767	32 767	32 767	32 767
<b>S7 times</b>							
• Number	256	256	256	256	256	256	256
• of which remanent with battery	Yes; via high-performance capacitor or battery						
- adjustable	64						
- upper limit							
• Time range	1 ms						
- lower limit	54 min; 4 timers: 1 ms to 30 s; 16 timers: 10 ms to 5 min; 236 timers: 100 ms to 54 min						
- upper limit							
<b>Data areas and their remanence</b>							
<b>Flag</b>							
• Number, max.	32 byte						
• Remanence available	Yes; M 0.0 to M 31.7						
• of which remanent with battery	0 to 255, via high-performance capacitor or battery, adjustable						
• of which remanent without battery	0 to 112 in EEPROM, adjustable						
<b>Hardware config.</b>							
Connectable programming devices/PCs	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC	SIMATIC PG/PC, standard PC
Expansion devices, max.	7; Only expansion modules of the S7-22x series can be used. Due to the limited output current, the use of expansion modules may be limited.						

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPSi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
Extension of distributed I/O							
• Analog inputs/outputs, max.	35; max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)	35; max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)	38; 2 onboard inputs and 1 output, also max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)	38; 2 onboard inputs and 1 output, also max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)	38; 2 onboard inputs and 1 output, also max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)	35; max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)	35; max. 28 inputs and 7 outputs (EM) or max. 0 inputs and 14 outputs (EM)
• Digital inputs/outputs, max.	168; max. 94 inputs and 74 outputs (CPU + EM)	168; max. 94 inputs and 74 outputs (CPU + EM)	168; max. 94 inputs and 74 outputs (CPU + EM)	168; max. 94 inputs and 74 outputs (CPU + EM)	168; max. 94 inputs and 74 outputs (CPU + EM)	148; max. 128 inputs and 120 outputs (CPU+EM)	148; max. 128 inputs and 120 outputs (CPU+EM)
• AS interface inputs/outputs max.	62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)	62; AS-Interface A/B slaves (CP 243-2)
<b>Connection point</b>							
pluggable I/O terminals	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>1st interface</b>							
Type of interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface
Physics	RS 485	RS 485	RS 485	RS 485	RS 485	RS 485	RS 485
Functionality							
• MPI	Yes; 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 in the MPI network with restrictions; transmission rates: 19.2/187.5 Kbit/s						
• PPI	Yes; with PPI protocol for program functions, HMI functions (TD 200, OP), S7-200-internal CPU/CPU communication ; transmission rates 9.6/19.2/187.5 kbit/s						
• serial data exchange	Yes; as freely programmable interface with interrupt facility for serial data exchange with third-party devices with ASCII protocol transfer rates: 1.2 / 2.4 / 4.8 / 9.6 / 19.2 / 38.4 / 57.6 / 115.2 Kbit/s; the PC/PPI cable can also be used as RS232/RS485 converter						
MPI							
• Transmission speeds, max.	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s
• Transmission speeds, min.	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s
<b>2nd interface</b>							
Type of interface			Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface	Integral RS 485 interface
Physics			RS 485	RS 485	RS 485	RS 485	RS 485
Functionality							
• MPI	Yes; as MPI slave for data exchange with MPI masters (S7-300/S7-400-CPU, OPs, TDs, Push Button Panels); S7-200-internal CPU/CPU communication is possible in the MPI network with restrictions; transmission rates: 19.2/187.5 kbit/s						
• PPI	Yes; with PPI protocol for program functions, HMI functions (TD 200, OP), S7-200-internal CPU/CPU communication ; transmission rates 9.6/19.2/187.5 kbit/s						
• serial data exchange	Yes; as a freely programmable interface with an interrupt option for serial data transmission with external units with ASCII protocol baud rates: 1.2/2.4/4.8/9.6/19.2/38.4/57.6/115.2 kbit/s; the PC/PPI cable can be used as an RS232/RS485 converter						

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
MPI							
• Transmission speed, max.			187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s	187.5 kBit/s
• Transmission speed, min.			19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s	19.2 kBit/s
<b>CPU/programming</b>							
Programming language							
• LAD	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• FUP	Yes	Yes	Yes	Yes	Yes	Yes	Yes
• AWL	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Operational stacks	Bit logic instructions, compare instructions, timer instructions, counter instructions, clock instructions, transmissions instructions, table instructions, logic instructions, shift and rotate instructions, conversion instructions, program control instructions, interrupt and communications instructions, logic stack instructions, integer maths, floating-point math instructions, numerical functions						
User program protection/password protection	Yes; 3-stage password protection						
Program processing	free cycle (OB 1), interrupt-controller, time-controlled (1 to 255 ms)						
Program organization	1 OB, 1 DB, 1 SDB subroutines with/without parameter transfer						
Number of subroutines, max.	64	64	64	64	64	64	64
<b>Digital inputs</b>							
Number of digital inputs	14	14	14	14	14	24	24
m/p-reading	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group	Yes; optionally, per group
Input voltage							
• Rated value, DC	24 V	24 V	24 V	24 V	24 V	24 V	24 V
• for signal "0"	0 to 5 V	0 to 5 V	0 to 5 V; 0 to 1 V (I 0.3 to I 0.5)	0 to 5 V; 0 to 1 V (I 0.3 to I 0.5)	0 to 5 V; 0 to 1 V (I 0.3 to I 0.5)	0 to 5 V	0 to 5 V
• for signal "1"	min. 15 V	min. 15 V	min. 15 V; min. 4 V (I 0.3 to I 0.5)	min. 15 V; min. 4 V (I 0.3 to I 0.5)	min. 15 V; min. 4 V (I 0.3 to I 0.5)	min. 15 V	min. 15 V
Input current							
• for signal "1", typ.	2.5 mA	2.5 mA	2.5 mA; 8 mA for I 0.3 to I 0.5	2.5 mA; 8 mA for I 0.3 to I 0.5	2.5 mA; 8 mA for I 0.3 to I 0.5	2.5 mA	2.5 mA
Input delay (for rated value of input voltage)							
• for standard inputs							
- programmable	Yes; all	Yes; all	Yes; all	Yes; all	Yes; all	Yes; all	Yes; all
- at " to "1", min.	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms	0.2 ms
- at "0" to "1", max.	12.8 ms	12.8 ms	12.8 ms	12.8 ms	12.8 ms	12.8 ms	12.8 ms
• for interrupt inputs							
- programmable	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3	Yes; I 0.0 to I 0.3
• for counter/technological functions							
- programmable	Yes; (E0.0 to E1.5) 30 kHz	Yes; (E0.0 to E1.5) 30 kHz	Yes; (E0.0 to E1.5) up to 200 kHz	Yes; (E0.0 to E1.5) up to 200 kHz	Yes; (E0.0 to E1.5) up to 200 kHz	Yes; (E0.0 to E1.5) 30 kHz	Yes; (E0.0 to E1.5) 30 kHz
Cable length							
• cable length, shielded, max.	500 m; Standard input: 500 m, high-speed counters: 50 m						
• cable length unshielded, max.	300 m; not for high-speed signals						

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPSi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
<b>Digital outputs</b>							
Number of digital outputs	10; Transistor	10; Relay	10; Transistor	10; Relay	10; Transistor current sinking	16; Transistor	16; Relay
Short-circuit protection of the output	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally
Limitation of inductive shutdown voltage to	1 W		1 W		1 W	1 W	
Switching capacity of the outputs							
• with resistive load, max.	0.75 A	2 A	0.75 A	2 A	0.75 A	0.75 A	2 A
• on lamp load, max.	5 W	200 W; 30 W DC; 200 W AC	5 W	200 W; 30 W DC; 200 W AC	5 W	5 W	200 W; 30 W DC; 200 W AC
Output voltage							
• for signal "1", min.	20 V DC	L+/L1	L+ (-0.4 V (5 V / 20.4 V for A 0.0 to A 0.4; 20.4 V A 0.5 to A1.1))	L+/L1	1M -0.4 V	20 VDC	L+/L1
Output current							
• for signal "1" rated value	750 mA	2 A	750 mA	2 A	750 mA	750 mA	2 A
• for signal "0" residual current, max.	10 µA	0 mA	10 µA	0 mA	10 µA	10 µA	0 mA
Output delay with resistive load							
• "0" to "1", max.	15 µs; of the standard outputs, max. (Q0.2 to Q1.1) 2 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 2 µs	10 ms; all outputs	15 µs; of the standard outputs, max. (Q0.2 to Q1.1) 15 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 0.5 µs	10 ms; all outputs	15 µs; of the standard outputs, max. (Q0.2 to Q1.1) 15 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 0.5 µs	15 µs; of the standard outputs, max. (Q0.2 to Q1.1) 2 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 2 µs	10 ms; all outputs
• "1" to "0", max.	130 µs; of the standard outputs, max. (Q0.2 to Q1.1) 10 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 10 µs	10 ms; all outputs	130 µs; of the standard outputs, max. (Q0.2 to Q1.1) 130 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 1.5 µs	10 ms; all outputs	130 µs; of the standard outputs, max. (Q0.2 to Q1.1) 130 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 1.5 µs	130 µs; of the standard outputs, max. (Q0.2 to Q1.1) 10 µs; of the pulse outputs, max. (Q0.0 to Q0.1) 10 µs	10 ms; all outputs
Parallel switching of 2 outputs							
• for increased power	Yes	No	Yes	No	Yes	Yes	No
Switching frequency							
• of the pulse outputs, with resistive load, max.	20 kHz; Q 0.0 to Q 0.1	1 Hz	100 kHz; Q 0.0 to Q 0.1	1 Hz	100 kHz; Q 0.0 to Q 0.1	20 kHz; Q 0.0 to Q 0.1	1 kHz
Aggregate current of the outputs (per group)							
• horizontal installation - up to 55 °C, max.	6 A	10 A	3,75 A	10 A	3,75 A	6 A	10 A
• up to 40 °C, max.	6 A	10 A	3,75 A	10 A	3,75 A	6 A	10 A
• cable length, shielded, max.	500 m	500 m	500 m	500 m	500 m	500 m	500 m
• cable length unshielded, max.	150 m	150 m	150 m	150 m	150 m	150 m	150 m



# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
<b>Relay outputs</b>							
Number of operating cycles		1E7; mechanically 10 million, at rated load voltage 100,000		1E7; mechanically 10 million, at rated load voltage 100,000			1E7; mechanically 10 million, at rated load voltage 100,000
<b>Analog inputs</b>							
Number of analog potentiometers	2; Analog potentiometer; resolution 8 bit	2; Analog potentiometer; resolution 8 bit	2; Analog potentiometer; resolution 8 bit	2; Analog potentiometer; resolution 8 bit	2; Analog potentiometer; resolution 8 bit	2; Analog potentiometer; resolution 8 bit	2; Analog potentiometer; resolution 8 bit
<b>Encoder supply</b>							
24 V encoder supply							
• 24 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 20.4 bis 28.8 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 20.4 bis 28.8 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 15.4 to 28.8 V	Yes; permissible range: 20.4 bis 28.8 V
• Short-circuit protection	Yes; electronic at 280 mA	Yes; electronic at 280 mA	Yes; electronic at 280 mA	Yes; electronic at 280 mA	Yes; electronic at 280 mA	Yes; electronic at 400 mA	Yes; electronic at 400 mA
• Output current, max.	280 mA	280 mA	280 mA	280 mA	280 mA	400 mA	400 mA
<b>Encoder</b>							
Connectable encoders							
• 2-wire BEROS - permissible quiescent current (2-wire BEROS), max.	Yes 1 mA	Yes 1 mA	Yes 1 mA	Yes 1 mA	Yes 1 mA	Yes 1 mA	Yes 1 mA
<b>Integrated Functions</b>							
Number of counters	6; High-speed counters (30 kHz each), 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)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.	6; High-speed counters (30 kHz each), 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)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.	6; High-speed counters (2 to 200 kHz and 4 to 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. 1 to 100 kHz and 3 to 20 kHz (A/B counters)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.	6; High-speed counters (2 to 200 kHz and 4 to 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. 1 to 100 kHz and 3 to 20 kHz (A/B counters)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.	6; High-speed counters (2 to 200 kHz and 4 to 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. 1 to 100 kHz and 3 to 20 kHz (A/B counters)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.	6; High-speed counters (30 kHz each), 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)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.	6; High-speed counters (30 kHz each), 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)); parameterizable enable and reset input; interrupt facilities (incl. call of subroutine with any content) when the setpoint is reached; reversal in counting direction, etc.
Counter frequency (counter) max.	30 kHz	30 kHz	200 kHz	200 kHz	200 kHz	30 kHz	30 kHz

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPSi, CPU 226

### Technical specifications (continued)

	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0	6ES7 214-2AS23-0XB0	6ES7 216-2AD23-0XB0	6ES7 216-2BD23-0XB0
Number of alarm inputs	4; 4 rising edges and/or 4 falling edges						
Number of pulse outputs	2; high-speed outputs, 20 kHz, with interrupt option; pulse-width and frequency modulation option		2; high-speed outputs, 20 kHz, with interrupt option; pulse-width and frequency modulation option		2; high-speed outputs, 20 kHz, with interrupt option; pulse-width and frequency modulation option		2; high-speed outputs, 20 kHz, with interrupt option; pulse-width and frequency modulation option
Limit frequency (pulse)	20 kHz		20 kHz		20 kHz		20 kHz
<b>Isolation</b>							
Galvanic isolation, digital inputs							
• between the channels	Yes	Yes	Yes	Yes	Yes	Yes	Yes; Optocoupler
• between the channels, in groups of	6 and 8	6 and 8	6 and 8	6 and 8	6 and 8	13 and 11	13 and 11
Isolation, digital outputs							
• between the channels	Yes; Optocoupler	Yes; Relay	Yes; Optocoupler	Yes; Relay	Yes; Optocoupler	Yes; Optocoupler	Yes; Relay
• between the channels, in groups of	5	3 and 4	5	3 and 4	10	8 and 8	4, 5 and 7
<b>Permissible potential difference</b>							
between different circuits	500 V DC between 24 V DC and 5 V DC	500 V DC between 24 V DC and 5 V DC; 1500 V AC between 24 V DC and 230 V AC	500 V DC between 24 V DC and 5 V DC	500 V DC between 24 V DC and 5 V DC; 1500 V AC between 24 V DC and 230 V AC	500 V DC between 24 V DC and 5 V DC	500 V DC between 24 V DC and 5 V DC; 1500 V AC between 24 V DC and 230 V AC	500 V DC between 24 V DC and 5 V DC
<b>Environmental requirements</b>							
Environmental conditions	For further environmental conditions, see "Automation System S7-200, System Manual"						
Operating temperature							
• vertical installation, min.	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
• vertical installation, max.	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C	45 °C
• horizontal installation, min.	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C	0 °C
• horizontal installation, max.	55 °C	55 °C	55 °C	55 °C	55 °C	55 °C	55 °C
Air pressure							
• permissible range, min.	860 hPa	860 hPa	860 hPa	860 hPa	860 hPa	860 hPa	860 hPa
• permissible range, max.	1 080 hPa	1 080 hPa	1 080 hPa	1 080 hPa	1 080 hPa	1 080 hPa	1 080 hPa
Relative humidity							
• Operation, min.	5%						
• Operation, max.	95%; RH class 2 in accordance with IEC 1131-2						
<b>Degree of protection</b>							
IP 20	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>Dimensions</b>							
Dimensions							
• Width	120,5 mm	120,5 mm	140 mm	140 mm	140 mm	196 mm	196 mm
• Height	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm	80 mm
• Depth	62 mm	62 mm	62 mm	62 mm	62 mm	62 mm	62 mm
Weights							
• Weight, approx.	360 g	410 g	390 g	440 g	390 g	550 g	660 g

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPsi, CPU 226

Ordering Data	Order No.	Order No.
<b>CPU 221</b>		
Compact CPU, main memory 4 KB, power supply 24 V DC, 6 DI/4 DO integrated	<b>6ES7 211-0AA23-0XB0</b>	
Compact CPU, main memory 4 KB, power supply 100 V to 230 V AC, 6 DI/4 DO integrated, relay outputs	<b>6ES7 211-0BA23-0XB0</b>	
<b>CPU 222</b>		
Compact CPU, expandable, main memory 4 KB, power supply 24 V DC, 8 DI/6 DO integrated	<b>6ES7 212-1AB23-0XB0</b>	
Compact CPU, expandable, main memory 4 KB, power supply 100 V to 230 V AC, 8 DI/6 DO integrated, relay outputs	<b>6ES7 212-1BB23-0XB0</b>	
<b>CPU 224</b>		
Compact CPU, expandable, main memory 8/12 KB program, 8 KB data, power supply 24 V DC, 14 DI/10 DO integrated	<b>6ES7 214-1AD23-0XB0</b>	
Compact CPU, expandable, main memory 8/12 KB program, 8 KB data, power supply 100 V to 230 V AC, 14 DI/10 DO integrated, relay outputs	<b>6ES7 214-1BD23-0XB0</b>	
<b>CPU 224 XP</b>		
Compact CPU, expandable, main memory 12/16 KB program, 10 KB data, power supply 24 V DC, 14 DI/10 DO/ 2 AI/1 AO integrated	<b>6ES7 214-2AD23-0XB0</b>	
Compact CPU, expandable, main memory 12/16 KB program, 10 KB data, power supply 100 V to 230 V AC, 14 DI/10 DO (relay outputs)/ 2 AI/1 AO integrated	<b>6ES7 214-2BD23-0XB0</b>	
<b>CPU 224 XPsi</b>		
Compact CPU, with current-sinking outputs, expandable, main memory 12/16 KB program, 10 KB data, power supply 24 V DC, 14 DI/10 DO/ 2 AI/1 AO integrated	<b>6ES7 214-2AS23-0XB0</b>	
<b>CPU 226</b>		
Compact CPU, expandable, main memory 16/24 KB program, 10 KB data, power supply 24 V DC, 24 DI/16 DO integrated	<b>6ES7 216-2AD23-0XB0</b>	
Compact CPU, expandable, main memory 16/24 KB program, 10 KB data, power supply 100 V to 230 V AC, 24 DI/16 DO integrated, relay outputs	<b>6ES7 216-2BD23-0XB0</b>	
<b>S7-200 True Power Box</b>		
Complete package, comprising CPU 222, STEP 7 Micro/WIN V4, simulator, intelligent USB/PPI multi-master cable, manual; delivered in a practical box		
German	B9	<b>6ES7 298-0AA20-0AA3</b>
English	B9	<b>6ES7 298-0AA20-0BA3</b>
<b>MC 291 memory module, EEPROM</b>		
for CPU 221/222//224/224 XP/226		
64 KB		<b>6ES7 291-8GF23-0XA0</b>
256 KB		<b>6ES7 291-8GH23-0XA0</b>
<b>Ground terminal</b>		
10 units		<b>6ES5 728-8MA11</b>
<b>Front flap set</b>		
contains various cover flaps for CPUs and EMs; spare part		
<b>SIM 274 simulator (optional)</b>		
with 8 terminals for CPU 221/222		<b>6ES7 274-1XF00-0XA0</b>
with 14 terminals for CPU 224/224 XP		<b>6ES7 274-1XH00-0XA0</b>
with 24 terminals for CPU 226		<b>6ES7 274-1XK00-0XA0</b>
<b>Pluggable terminal block (spare part)</b>		
With 12 terminals (for CPU 22x)	B7	<b>6ES7 292-1AE20-0AA0</b>
With 18 terminals (for CPU 224/224 XP)	B7	<b>6ES7 292-1AG20-0AA0</b>
With 14 terminals (for CPU 226)	B7	<b>6ES7 292-1AF20-0AA0</b>
<b>Intelligent RS 232/PPI multi-master cable</b>		
For connecting devices with an RS 232 interface to SIMATIC S7-200 or the PPI network; master in the multi-master PPI network		
<b>Intelligent USB/PPI multi-master cable</b>		
For connecting devices with an USB interface to SIMATIC S7-200 or the PPI network; master in the multi-master PPI network		
<b>MPI cable</b>		
5 m; for connecting the S7-200 to MPI		<b>6ES7 901-0BF00-0AA0</b>
<b>Backplane bus expansion cable</b> B7		
For interconnection of the two rows of modules with double-tier configuration, for CPU 222/224/224 XP/226		
<b>Optional battery module</b>		
		<b>6ES7 291-8BA20-0XA0</b>
<b>Optional combined clock and battery module</b>		
		<b>6ES7 297-1AA23-0XA0</b>
only for CPU 221/222		

B7: Subject to export regulations: AL: N and ECCN: EAR99H  
B9: Subject to export regulations: AL: N and ECCN: EAR99T

# SIMATIC S7-200

## Central processing units

CPU 221, CPU 222, CPU 224, CPU 224 XP,  
CPU 224 XPSi, CPU 226

Ordering Data (continued)	Order No.	Order No.
<b>S7-200 Programmable Controller, System Manual</b> for CPU 221/222/224/224 XP/226 and STEP 7 Micro/Win V4 German English French Spanish Italian Chinese	<b>6ES7 298-8FA24-8AH0</b> <b>6ES7 298-8FA24-8BH0</b> <b>6ES7 298-8FA24-8CH0</b> <b>6ES7 298-8FA24-8DH0</b> <b>6ES7 298-8FA24-8EH0</b> <b>6ES7 298-8FA24-8FH0</b>	<b>STEP 7-Micro/WIN V4 programming software</b> <i>Target system:</i> All CPUs of the SIMATIC S7-200 <i>Prerequisite:</i> Windows 2000/XP on programming device or PC <i>Type of delivery:</i> German, English, French, Spanish, Italian, Chinese; with online documentation Single license B8 <b>6ES7 810-2CC03-0YX0</b> Upgrade Single License <sup>1)</sup> B8 <b>6ES7 810-2CC03-0YX3</b>
<b>SIMATIC Manual Collection</b> B3 Electronic manuals on DVD, five languages: S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, engineering software, runtime software, PCS 7, SIMATIC HMI, SIMATIC NET	<b>6ES7 998-8XC01-8YE0</b>	<b>PROFIBUS bus connector, IP20 with 90° cable outlet</b> <ul style="list-style-type: none"> <li>Without PG connection <b>6ES7 972-0BA12-0XA0</b></li> <li>With PG connection <b>6ES7 972-0BB12-0XA0</b></li> </ul>
<b>SIMATIC Manual Collection update service for 1 year</b> B3 Current "Manual Collection" DVD and the three subsequent updates	<b>6ES7 998-8XC01-8YE2</b>	<b>PROFIBUS bus connector, IP20 with 35° cable outlet</b> <ul style="list-style-type: none"> <li>Without PG connection <b>6ES7 972-0BA41-0XA0</b></li> <li>With PG connection <b>6ES7 972-0BB41-0XA0</b></li> </ul>
		<b>PROFIBUS FC standard cable</b> 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 <b>6XV1 830-0EH10</b>
		<b>RS 485 repeater for PROFIBUS</b> <b>6ES7 972-0AA01-0XA0</b>

1) Upgrade for all previous STEP 7-Micro/WIN and STEP 7-Micro/DOS versions

B3: Subject to export regulations: AL: N and ECCN: 5D992B1

B8: Subject to export regulations: AL: N and ECCN: EAR99S

# SIMATIC S7-200

## SIPLUS Central processing units

**SIPLUS CPU 221, CPU 222, CPU 224, CPU 224 XP, CPU 226**

### Overview SIPLUS CPU 221



- The clever compact solution
- With 10 input/outputs on board
- Cannot be expanded

SIPLUS CPU 221		
<b>Order No.</b>	<b>6AG1 211-0AA23-2XB0</b>	<b>6AG1 211-0BA23-2XB0</b>
<b>Order No. based on</b>	<b>6ES7 211-0AA23-0XB0</b>	<b>6ES7 211-0BA23-0XB0</b>
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible	
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes
Approvals	CE, cUL	
Technical specifications	The technical data are identical with those of the based-on modules.	

### Overview SIPLUS CPU 222



- The superior compact solution
- With 14 input/outputs on board
- Expandable with up to 2 expansion modules

SIPLUS CPU 222		
<b>Order No.</b>	<b>6AG1 212-1AB23-2XB0</b>	<b>6AG1 212-1BB23-2XB0</b>
<b>Order No. based on</b>	<b>6ES7 212-1AB23-0XB0</b>	<b>6ES7 212-1BB23-0XB0</b>
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible	
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes
Approvals	CE, cUL	
Technical specifications	The technical data are identical with those of the based-on modules.	

# SIMATIC S7-200

## SIPLUS Central processing units

SIPLUS CPU 221, CPU 222, CPU 224, CPU 224 XP, CPU 226

### Overview SIPLUS CPU 224



- The compact high-performance CPU
- With 24 input/outputs on board
- Expandable with up to 7 expansion modules

SIPLUS CPU 224		
Order No.	6AG1 214-1AD23-2XB0	6AG1 214-1BD23-2XB0
Order No. based on	6ES7 214-1AD23-0XB0	6ES7 214-1BD23-0XB0
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible	
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes
Approvals	CE, cUL	
Technical specifications	The technical data are identical with those of the based-on modules.	

### Overview SIPLUS CPU 224 XP



- The power CPU
- With 24 digital and 3 analog I/Os onboard
- Expandable with up to 7 expansion modules

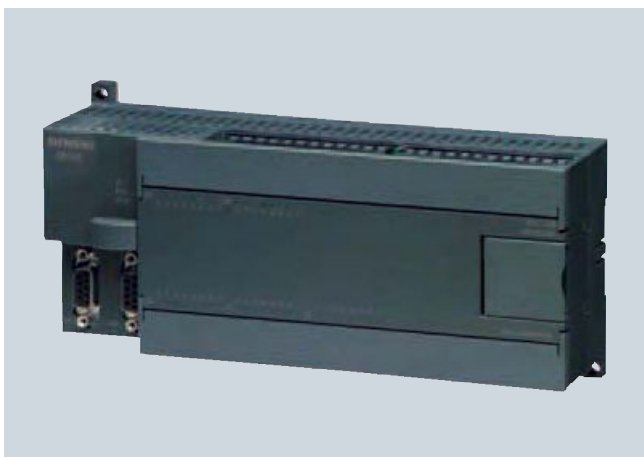
SIPLUS CPU 224 XP		
Order No.	6AG1 214-2AD23-2XB0	6AG1 214-2BD23-2XB0
Order No. based on	6ES7 214-2AD23-0XB0	6ES7 214-2BD23-0XB0
Ambient temperature range	-25 ... +70 °C; condensation permitted	
Ambient conditions	Suited for exceptional medial exposure (e. g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	No	No
Certifications and approvals	CE	
Technical data	The technical data are identical with those of the based on modules.	

# SIMATIC S7-200

## SIPLUS Central processing units

SIPLUS CPU 221, CPU 222, CPU 224, CPU 224 XP, CPU 226

### Overview SIPLUS CPU 226



- The power packet for larger technical tasks
- With additional PPI connection for even more flexibility and communication facilities
- With 40 input/outputs on board
- Expandable with up to 7 expansion modules

SIPLUS CPU 226		
Order No.	<b>6AG1 216-2AD23-2XB0</b>	<b>6AG1 216-2BD23-2XB0</b>
Order No. based on	<b>6ES7 216-2AD23-0XB0</b>	<b>6ES7 216-2BD23-0XB0</b>
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible	
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes
Approvals	CE, cUL	
Technical specifications	The technical data are identical with those of the based-on modules.	

### Ordering Data

#### SIPLUS CPU 221

(extended temperature and media exposure)

Compact CPU, main memory 4 KB, power supply 24 V DC, 6 DI/4 DO integrated B7 **6AG1 211-0AA23-2XB0**

Compact CPU, main memory 4 KB, power supply 100 to 230 V AC, 6 DI/4 DO integrated, relay outputs B7 **6AG1 211-0BA23-2XB0**

#### SIPLUS CPU 222

(extended temperature and media exposure)

Compact CPU, expandable, main memory 4 KB, power supply 24 V DC, 8 DI/6 DO integrated B7 **6AG1 212-1AB23-2XB0**

Compact CPU, expandable, main memory 4 KB, power supply 100 to 230 V AC, 8 DI/6 DO integrated, relay outputs B7 **6AG1 212-1BB23-2XB0**

#### SIPLUS CPU 224

(extended temperature and media exposure)

Compact CPU, expandable, main memory 8 KB, power supply 24 V DC, 14 DI/10 DO integrated B7 **6AG1 214-1AD23-2XB0**

Compact CPU, expandable, main memory 8 KB, power supply 100 to 230 V AC, 14 DI/10 DO integrated, relay outputs B7 **6AG1 214-1BD23-2XB0**

#### SIPLUS CPU 224 XP

(extended temperature and media exposure)

Compact CPU, expandable, main memory 12/16 KB program, 10 KB data, power supply 24 V DC, 14 DI/10 DO/2 AI/1 AO integrated B7 **6AG1 214-2AD23-2XB0**

Compact CPU, expandable, main memory 12 KB program, 8 KB data, power supply 100 to 230 V AC, 14 DI/10 DO (relay outputs)/2 AI/1 AO integrated B7 **6AG1 214-2BD23-2XB0**

#### SIPLUS CPU 226

(extended temperature and media exposure)

Compact CPU, expandable, main memory 16/24 KB program, 10 KB data, power supply 24 V DC, 24 DI/16 DO integrated B7 **6AG1 216-2AD23-2XB0**

Compact CPU, expandable, main memory 16/24 KB program, 10 KB data, power supply 100 to 230 V AC, 24 DI/16 DO integrated, relay outputs B7 **6AG1 216-2BD23-2XB0**

#### Accessories

see SIMATIC S7-200 central processing units, page 3/18

B7: Subject to export regulations: AL: N and ECCN: EAR99H



### Overview



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

### Technical specifications EM 221

	6ES7 221-1BH22-0XA0	6ES7 221-1BF22-0XA0	6ES7 221-1EF22-0XA0
<b>Current consumption</b>			
from backplane bus DC 5 V, max.	70 mA	30 mA	30 mA
<b>Current consumption/power loss</b>			
Power loss, typ.	3 W	2 W	3 W
<b>Connection point</b>			
pluggable I/O terminals	Yes	Yes	Yes
<b>Digital inputs</b>			
Number of digital inputs	16	8	8
m/p-reading	Yes	Yes	
Input characteristic curve to IEC 1131, type 1	Yes		Yes
Input voltage			
• Rated value, AC			230 V; 220/230 V AC (47 to 63 Hz)
• Rated value, DC	24 V	24 V	
• for signal "0"	0 to 5 V	0 to 5 V	up to 20 V AC
• for signal "1"	15 to 30 V	15 to 30 V	79 V AC or more
Input current			
• for signal "1", typ.	4 mA	4 mA	2,5 mA
Input delay (for rated value of input voltage)			
• for standard inputs - at "0" to "1", max.	4.5 ms	4.5 ms	15 ms
Cable length			
• cable length, shielded, max.	500 m	500 m	500 m
• cable length unshielded, max.	300 m	300 m	300 m
<b>Encoder</b>			
Connectable encoders			
• 2-wire BEROS - permissible quiescent current (2-wire BEROS), max.	Yes 1 mA	Yes 1 mA	Yes 1 mA
<b>Isolation</b>			
Galvanic isolation, digital inputs			
• galvanic isolation, digital inputs • between the channels, in groups of	Yes; Optocoupler 4	Yes; Optocoupler 4	Yes; Optocoupler 1; (8 groups)

# SIMATIC S7-200

## Digital modules

### EM 221, EM 222, EM 223

#### Technical specifications EM 221 (continued)

	6ES7 221-1BH22-0XA0	6ES7 221-1BF22-0XA0	6ES7 221-1EF22-0XA0
<b>Dimensions</b>			
Dimensions			
• Width	71.2 mm	46 mm	71.2 mm
• Height	80 mm	80 mm	80 mm
• Depth	62 mm	62 mm	62 mm
<b>Weights</b>			
• Weight, approx.	160 g	150 g	160 g

#### Technical specifications EM 222

	6ES7 222-1BD22-0XA0	6ES7 222-1BF22-0XA0
<b>Supply voltages</b>		
Load voltage L+		
• Rated value (DC)	24 V	24 V
• permissible range, lower limit (DC)	20,4 V	20,4 V
• permissible range, upper limit (DC)	28.8 V	28.8 V
<b>Current consumption</b>		
from backplane bus DC 5 V, max.	40 mA	50 mA
<b>Current consumption/power loss</b>		
Power loss, typ.	3 W	2 W
<b>Connection point</b>		
pluggable I/O terminals	Yes	Yes
<b>Digital outputs</b>		
Number of digital outputs	4	8
Short-circuit protection of the output	No	No; to be provided externally (see manual package "Setting up an S7-200")
Limitation of inductive shutdown voltage to	L+ (-48 V)	L+ (-48 V)
<b>Output voltage</b>		
• for signal "1", min.	20 V DC	20 V
<b>Output current</b>		
• for signal "1" permissible range for 0 to 55 °C, max.	5 A	750 mA
• for signal "0" residual current, max.	30 µA	10 µA
<b>Parallel switching of 2 outputs</b>		
• for increased power		Yes
<b>Aggregate current of the outputs (per group)</b>		
• horizontal installation - up to 55 °C, max.	20 A	3 A
• up to 40 °C, max.	20 A	3 A
• maximum current per conductor/group	5 A	3 A
• cable length, shielded, max.	500 m	500 m
• cable length unshielded, max.	150 m	150 m
<b>Relay outputs</b>		
Switching capacity of the contacts		
• with inductive load, max.	5 A	0,75 A
• on lamp load, max.	50 W	5 W
• with resistive load, max.	5 A	0,75 A
<b>Isolation</b>		
Isolation, digital outputs		
• Galvanic isolation, digital outputs	Yes	Yes; Optocoupler
• between the channels, in groups of	1	4

**Technical specifications EM 222 (continued)**

	6ES7 222-1BD22-0XA0	6ES7 222-1BF22-0XA0
<b>Dimensions</b>		
Dimensions		
• Width	45 mm	45 mm
• Height	80 mm	80 mm
• Depth	62 mm	62 mm
<b>Weights</b>		
• Weight, approx.	120 g	150 g

	6ES7 222-1HD22-0XA0	6ES7 222-1HF22-0XA0	6ES7 222-1EF22-0XA0
<b>Supply voltages</b>			
Load voltage L+			
• Rated value (DC)	24 V	24 V	
• permissible range, lower limit (DC)	12 V	5 V	
• permissible range, upper limit (DC)	30 V	30 V	
Load voltage L1			
• Rated value (AC)	24 V; 24 to 230 V AC	24 V; 24 to 230 V AC	230 V; 220/230 V AC
• permissible range, lower limit (AC)	12 V	5 V	65 V
• permissible range, upper limit (AC)	250 V	250 V	264 V
• permissible frequency range, lower limit		47 Hz	47 Hz
• permissible frequency range, upper limit		63 Hz	63 Hz
<b>Current consumption</b>			
from backplane bus DC 5 V, max.	30 mA	40 mA	110 mA
Digital outputs			
• from load voltage L+, max.	80 mA; 20 mA per switched output	72 mA; 9 mA per switched output	
<b>Current consumption/power loss</b>			
Power loss, typ.	4 W	2 W	4 W
<b>Connection point</b>			
pluggable I/O terminals	Yes	Yes	Yes
<b>Digital outputs</b>			
Number of digital outputs	4; Relay	8; Relay	8
Short-circuit protection of the output	No; to be provided externally (see manual package "Setting up an S7-200")	No; to be provided externally (see manual package "Setting up an S7-200")	No; to be provided externally (see manual package "Setting up an S7-200")
Limitation of inductive shutdown voltage to	to be provided externally (see manual package "Setting up an S7-200")	to be provided externally (see manual package "Setting up an S7-200")	to be provided externally (see manual package "Setting up an S7-00")
<b>Output voltage</b>			
• for signal "1", min.			L1 (-0,9 V)
<b>Output current</b>			
• for signal "1" permissible range for 0 to 55 °C, max.	10 A	2 A	500 mA; AC
• for signal "1" minimum load current			50 mA
• for signal "0" residual current, max.	0 mA	0 mA	1.8 mA; at 264 V AC
<b>Aggregate current of the outputs (per group)</b>			
• horizontal installation - up to 55 °C, max.	20 A	8 A	0,5 A
• up to 40 °C, max.	40 A	8 A	0,5 A
• maximum current per conductor/group	10 A	8 A	0,5 A
• cable length, shielded, max.	500 m	500 m	500 m
• cable length unshielded, max.	150 m	150 m	150 m

# SIMATIC S7-200

## Digital modules

### EM 221, EM 222, EM 223

#### Technical specifications EM 222 (continued)

	6ES7 222-1HD22-0XA0	6ES7 222-1HF22-0XA0	6ES7 222-1EF22-0XA0
<b>Relay outputs</b>			
Number of operating cycles	3E7; mechanically 30 million, at rated load voltage 30,000	1E7; mechanically 10 million, at rated load voltage 100,000	
Switching capacity of the contacts			
• with inductive load, max.	3 A; 2 A (DC), 3 A (AC)	2 A	0,5 A
• on lamp load, max.	1 000 W; 100/1000 W (DC/AC)	200 W; 30 W DC; 200 W AC	60 W
• with resistive load, max.	10 A	2 A	0,5 A
<b>Isolation</b>			
Isolation, digital outputs			
• Galvanic isolation, digital outputs	Yes; Relay	Yes; Relay	Yes; Optocoupler
• between the channels, in groups of	1; 4 groups	4	1; 8 groups
<b>Dimensions</b>			
Dimensions			
• Width	45 mm	45 mm	71.2 mm
• Height	80 mm	80 mm	80 mm
• Depth	62 mm	62 mm	62 mm
Weights			
• Weight, approx.	150 g	170 g	170 g

#### Technical specifications EM 223

	6ES7 223-1BF22-0XA0	6ES7 223-1BH22-0XA0	6ES7 223-1BL22-0XA0	6ES7 223-1BM22-0XA0
<b>Supply voltages</b>				
Load voltage L+				
• Rated value (DC)	24 V	24 V	24 V	24 V
• permissible range, lower limit (DC)	20.4 V	20.4 V	20.4 V	20.4 V
• permissible range, upper limit (DC)	28.8 V	28.8 V	28.8 V	28.8 V
<b>Current consumption</b>				
from backplane bus DC 5 V, max.	40 mA	80 mA	160 mA	240 mA
from sensor current supply or external current supply (DC 24 V), max.				128 mA; ON: 4 mA/input
<b>Current consumption/power loss</b>				
Power loss, typ.	2 W	3 W	6 W	9 W
<b>Connection point</b>				
pluggable I/O terminals	Yes	Yes	Yes	Yes
<b>Digital inputs</b>				
Number of digital inputs	4	8	16	32
Input voltage				
• Rated value, DC	24 V	24 V	24 V	24 V
• for signal "0"	0 to 5 V	0 to 5 V	0 to 5 V	0 to 5 V
• for signal "1"	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC
Input current				
• for signal "1", typ.	4 mA	4 mA	4 mA	4 mA
Input delay (for rated value of input voltage)				
• for standard inputs - at "0" to "1", max.	4.5 ms	4.5 ms	4.5 ms	4.5 ms

**Technical specifications EM 223 (continued)**

	6ES7 223-1BF22-0XA0	6ES7 223-1BH22-0XA0	6ES7 223-1BL22-0XA0	6ES7 223-1BM22-0XA0
<b>Digital outputs</b>				
Number of digital outputs	4	8	16	32
Short-circuit protection of the output	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally
Limitation of inductive shutdown voltage to	L+ (-48 V)	L+ (-48 V)	L+ (-48 V)	L+ (-48 V)
Output voltage				
• for signal "0" (DC), max.	0.1 V	0.1 V	0.1 V	0.1 V
• for signal "1", min.	20 V	20 V	20 V	20 V
Output current				
• for signal "1" rated value	750 mA	750 mA	750 mA	750 mA
Aggregate current of the outputs (per group)				
• maximum current per conductor/group	3 A	3 A	3 A; 3 / 3 / 6	0.75 A; 10 A per group
• cable length, shielded, max.	500 m	500 m	500 m	500 m
• cable length unshielded, max.	150 m	150 m	150 m	150 m
<b>Relay outputs</b>				
Switching capacity of the contacts				
• with inductive load, max.	0.75 A; each output	0.75 A; each output	0.75 A; each output	0.75 A; each output
• on lamp load, max.	5 W	5 W	5 W	5 W
• with resistive load, max.	0.75 A; each output	0.75 A; each output	0.75 A; each output	0.75 A; each output
<b>Encoder</b>				
Connectable encoders				
• 2-wire BEROS	Yes	Yes	Yes	Yes
- permissible quiescent current (2-wire BEROS), max.	1 mA	1 mA	1 mA	1 mA
<b>Isolation</b>				
Isolation checked with	500 V AC	500 V AC	500 V AC	500 V AC
<b>Isolation</b>				
Galvanic isolation, digital inputs				
• galvanic isolation, digital inputs	Yes; Optocoupler	Yes; Optocoupler	Yes; Optocoupler	Yes; Optocoupler
• between the channels, in groups of	4	4	4	16; 2 groups with 16 inputs each
Isolation, digital outputs				
• Galvanic isolation, digital outputs	Yes; Optocoupler	Yes; Optocoupler	Yes; Optocoupler	Yes; Optocoupler
• between the channels, in groups of	4	4	4; 4 / 4 / 8	16; 2 groups with 16 outputs each
<b>Dimensions</b>				
Dimensions				
• Width	46 mm	71.2 mm	137.5 mm	196 mm
• Height	80 mm	80 mm	80 mm	80 mm
• Depth	62 mm	62 mm	62 mm	62 mm
Weights				
• Weight, approx.	160 g	200 g	360 g	500 g

# SIMATIC S7-200

## Digital modules

### EM 221, EM 222, EM 223

#### Technical specifications EM 223 (continued)

	6ES7 223-1HF22-0XA0	6ES7 223-1PH22-0XA0	6ES7 223-1PL22-0XA0	6ES7 223-1PM22-0XA0
<b>Supply voltages</b>				
Load voltage L+				
• Rated value (DC)	24 V	24 V	24 V	24 V
• permissible range, lower limit (DC)	5 V	5 V	5 V	5 V
• permissible range, upper limit (DC)	30 V	30 V	30 V	30 V
Load voltage L1				
• Rated value (AC)	230 V; 24 to 230 V AC	230 V; 24 to 230 V AC	230 V; 24 to 230 V AC	230 V; 24 to 230 V AC
• permissible range, lower limit (AC)	5 V	5 V	5 V	5 V
• permissible range, upper limit (AC)	250 V	250 V	250 V	250 V
<b>Current consumption</b>				
from backplane bus DC 5 V, max.	40 mA	80 mA	150 mA	205 mA
from coil current, max.	9 mA; for each output on signal "1"	9 mA; for each output on signal "1"	9 mA; for each output on signal "1"	9 mA; for each output on signal "1"
from sensor current supply or external current supply (DC 24 V), max.	72 mA	72 mA	72 mA	128 mA
<b>Current consumption/power loss</b>				
Power loss, typ.	2 W	3 W	6 W	13 W
<b>Connection point</b>				
pluggable I/O terminals	Yes	Yes	Yes	Yes
<b>Digital inputs</b>				
Number of digital inputs	4	8	16	32
Input voltage				
• Rated value, DC	24 V	24 V	24 V	24 V
• for signal "0"	0 to 5 V	0 to 5 V	0 to 5 V	0 to 5 V
• for signal "1"	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC	15 to 30 V DC
Input current				
• for signal "1", typ.	4 mA	4 mA	4 mA	4 mA
Input delay (for rated value of input voltage)				
• for standard inputs - at "0" to "1", max.	4.5 ms	4.5 ms	4.5 ms	4.5 ms
<b>Digital outputs</b>				
Number of digital outputs	4; Relay	8; Relay	16; Relay	32; Relay
Short-circuit protection of the output	No; to be provided externally	No; to be provided externally	No; to be provided externally	No; to be provided externally
Output voltage				
• for signal "0" (DC), max.	0.1 V; with 10 kOhm load	0.1 V; with 10 kOhm load	0.1 V; with 10 kOhm load	0.1 V; with 10 kOhm load
• for signal "1", min.	L+/L1	L+/L1	L+/L1	L+/L1
Output current				
• for signal "1" rated value	2 000 mA	2 000 mA	2 000 mA	2 000 mA
Aggregate current of the outputs (per group)				
• maximum current per conductor/group	8 A	8 A	8 A	2 A; 10 A per group
• cable length, shielded, max.	500 m	500 m	500 m	500 m
• cable length unshielded, max.	150 m	150 m	150 m	150 m

**Technical specifications EM 223 (continued)**

	6ES7 223-1HF22-0XA0	6ES7 223-1PH22-0XA0	6ES7 223-1PL22-0XA0	6ES7 223-1PM22-0XA0
<b>Relay outputs</b>				
Number of operating cycles	1E7; mechanically 10 million, at rated load voltage 100,00	1E7; mechanically 10 million, at rated load voltage 100,000	1E7; mechanically 10 million, at rated load voltage 100,000	1E7; mechanically 10 million, at rated load voltage 100,000
Switching capacity of the contacts				
• with inductive load, max.	0.75 A; each output	0.75 A; each output	0.75 A; each output	0.75 A; each output
• on lamp load, max.	200 W; 30 W DC; 200 W AC	200 W; 30 W DC; 200 W AC	200 W; 30 W DC; 200 W AC	200 W; 30 W DC; 200 W AC
• with resistive load, max.	0.75 A; each output	0.75 A; each output	0.75 A; each output	2 A; each output
<b>Encoder</b>				
Connectable encoders				
• 2-wire BEROS	Yes	Yes	Yes	Yes
- permissible quiescent current (2-wire BEROS), max.	1 mA	1 mA	1 mA	1 mA
<b>Isolation</b>				
Isolation checked with	500 V AC	500 V AC	500 V AC	500 V AC
<b>Isolation</b>				
Galvanic isolation, digital inputs				
• galvanic isolation, digital inputs	Yes; Optocoupler	Yes; Optocoupler	Yes; Optocoupler	Yes; Optocoupler
• between the channels, in groups of	4	4	8	16
Isolation, digital outputs				
• Galvanic isolation, digital outputs	Yes; Relay	Yes; Relay	Yes; Relay	Yes; Relay
• between the channels, in groups of	4	4	4	11; 11/11/10
<b>Dimensions</b>				
Dimensions				
• Width	46 mm	71.2 mm	137.5 mm	196 mm
• Height	80 mm	80 mm	80 mm	80 mm
• Depth	62 mm	62 mm	62 mm	62 mm
Weights				
• Weight, approx.	160 g	300 g	400 g	580 g



# SIMATIC S7-200

## Digital modules

EM 221, EM 222, EM 223

Ordering Data	Order No.	Order No.												
<b>Digital input module EM 221</b> for CPU 221/222/224/224 XP/226 <ul style="list-style-type: none"> <li>• 8 inputs, 24 V DC, isolated, current sourcing/sinking</li> <li>• 16 inputs, 24 V DC, isolated, current sourcing/sinking</li> <li>• 8 inputs, 120/230 V AC, isolated, current sourcing/sinking B7</li> </ul>	<b>6ES7 221-1BF22-0XA0</b>  <b>6ES7 221-1BH22-0XA0</b>  <b>6ES7 221-1EF22-0XA0</b>	<b>Front flap set</b> contains various cover flaps for CPUs and EMs; spare part <b>6ES7 291-3AX20-0XA0</b>												
<b>Digital output module EM 222</b> for CPU 221/222/224/224 XP/226 <ul style="list-style-type: none"> <li>• 4 outputs, 24 V DC; 5A, isolated B7</li> <li>• 8 outputs, 24 V DC; 0.75 A, isolated</li> <li>• 4 outputs, 24 V DC, 24 to 230 V AC; 10 A, isolated, relay outputs B7</li> <li>• 8 outputs, 24 V DC, 24 to 230 V AC; 2 A, isolated, relay outputs</li> <li>• 8 outputs, 120/230 V AC; 0.5 A, isolated</li> </ul>	<b>6ES7 222-1BD22-0XA0</b> <b>6ES7 222-1BF22-0XA0</b>  <b>6ES7 222-1HD22-0XA0</b>  <b>6ES7 222-1HF22-0XA0</b>  <b>6ES7 222-1EF22-0XA0</b>	<b>Pluggable terminal block (spare part)</b> <ul style="list-style-type: none"> <li>• With 7 terminals (for EM 221/222) B7 <b>6ES7 292-1AD20-0AA0</b></li> <li>• With 12 terminals (for EM 223) B7 <b>6ES7 292-1AE20-0AA0</b></li> </ul>												
<b>Digital input/output module EM 223</b> for CPU 221/222/224/224 XP/226 <ul style="list-style-type: none"> <li>• 4 inputs 24V DC, 4 outputs 24 V DC; 0.75 A, isolated</li> <li>• 8 inputs, 24V DC, 8 outputs 24 V DC; 0.75 A, isolated</li> <li>• 16 inputs, 24V DC, 16 outputs 24 V DC; 0.75 A, isolated</li> <li>• 32 inputs, 24V DC, 32 outputs 24 V DC; 0.75 A, isolated</li> <li>• 4 inputs, 24 V DC; 4 outputs, relays</li> <li>• 8 inputs, 24 V DC; 8 outputs, relays</li> <li>• 16 inputs, 24 V DC; 16 outputs, relays</li> <li>• 32 inputs, 24 V DC; 32 outputs, relays</li> </ul>	<b>6ES7 223-1BF22-0XA0</b>  <b>6ES7 223-1BH22-0XA0</b>  <b>6ES7 223-1BL22-0XA0</b>  <b>6ES7 223-1BM22-0XA0</b>  <b>6ES7 223-1HF22-0XA0</b>  <b>6ES7 223-1PH22-0XA0</b>  <b>6ES7 223-1PL22-0XA0</b>  <b>6ES7 223-1PM22-0XA0</b>	<b>SIM 274 simulator (optional)</b> with 8 terminals for EM 221 and EM 223 <b>6ES7 274-1XF00-0XA0</b>												
		<b>S7-200 programmable controller, System Manual</b> for CPU 221/222/224/224 XP/226 and STEP 7 Micro/Win V4 <table> <tr> <td>German</td> <td><b>6ES7 298-8FA24-8AH0</b></td> </tr> <tr> <td>English</td> <td><b>6ES7 298-8FA24-8BH0</b></td> </tr> <tr> <td>French</td> <td><b>6ES7 298-8FA24-8CH0</b></td> </tr> <tr> <td>Spanish</td> <td><b>6ES7 298-8FA24-8DH0</b></td> </tr> <tr> <td>Italian</td> <td><b>6ES7 298-8FA24-8EH0</b></td> </tr> <tr> <td>Chinese</td> <td><b>6ES7 298-8FA24-8FH0</b></td> </tr> </table>	German	<b>6ES7 298-8FA24-8AH0</b>	English	<b>6ES7 298-8FA24-8BH0</b>	French	<b>6ES7 298-8FA24-8CH0</b>	Spanish	<b>6ES7 298-8FA24-8DH0</b>	Italian	<b>6ES7 298-8FA24-8EH0</b>	Chinese	<b>6ES7 298-8FA24-8FH0</b>
German	<b>6ES7 298-8FA24-8AH0</b>													
English	<b>6ES7 298-8FA24-8BH0</b>													
French	<b>6ES7 298-8FA24-8CH0</b>													
Spanish	<b>6ES7 298-8FA24-8DH0</b>													
Italian	<b>6ES7 298-8FA24-8EH0</b>													
Chinese	<b>6ES7 298-8FA24-8FH0</b>													

B7: Subject to export regulations: AL: N and ECCN: EAR99H

### 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

SIPLUS EM 221 digital input modules for CPU 22x		
	8 DI	16 DI
<b>Order No.</b>	<b>6AG1 221-1BF22-2XA0</b>	<b>6AG1 221-1BH22-2XB0</b>
<b>Order No. based on</b>	<b>6ES7 221-1BF22-0XA0</b>	<b>6ES7 221-1BH22-0XA0</b>
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible	
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes
Approvals	CE, cUL	
Technical specifications	The technical data are identical with those of the based-on modules.	

SIPLUS EM 222 digital output modules for CPU 22x		
	8DO	8RO
<b>Order No.</b>	<b>6AG1 222-1BF22-2XB0</b>	<b>6AG1 222-1HF22-2XB0</b>
<b>Order No. based on</b>	<b>6ES7 222-1BF22-0XB0</b>	<b>6ES7 222-1HF22-0XB0</b>
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible	
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).	
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes
Approvals	CE, cUL	
Technical specifications	The technical data are identical with those of the based-on modules.	

# SIMATIC S7-200

## SIPLUS digital modules

### SIPLUS EM 221, EM 222, EM 223

#### Overview (continued)

SIPLUS EM 223 digital input/output modules for CPU 22x			
	4 DI / 4 DO	8 DI / 8 DO	16 DI / 16 DO
Order No.	6AG1 223-1BF22-2XB0	6AG1 223-1BH22-2XB0	6AG1 223-1BL22-2XB0
Order No. based on	6ES7 223-1BF22-0XA0	6ES7 223-1BH22-0XA0	6ES7 223-1BL22-0XA0
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible		
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).		
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes	Yes
Approvals	CE, cUL		
Technical specifications	The technical data are identical with those of the based-on modules.		

SIPLUS EM 223 digital input/output modules for CPU 22x			
	4 DI / 4 DO	8 DI / 8 DO	16 DI / 16 DO
Order No.	6AG1 223-1HF22-2XB0	6AG1 223-1PH22-2XB0	6AG1 223-1PL22-2XB0
Order No. based on	6ES7 223-1HF22-0XA0	6ES7 223-1PH22-0XA0	6ES7 223-1PL22-0XA0
Ambient temperature range	-25 ... +70 °C; -25 to +55 °C (for applications with cUL approval), condensation permissible		
Environmental conditions	Suited for exceptional medial exposure (e.g. by chlorine sulfur atmosphere).		
Conforms with standard for electronic equipment used on rolling stock (EN 50155, temperature T1, category 1).	Yes	Yes	Yes
Approvals	CE, cUL		
Technical specifications	The technical data are identical with those of the based-on modules.		

#### Ordering Data

Ordering Data	Order No.	Ordering Data	Order No.
<b>Digital input module</b> <b>SIPLUS EM 221</b> (extended temperature and medial exposure) for CPU 222/224/224 XP/226 <ul style="list-style-type: none"> <li>• 8 inputs, 24 V DC, isolated, source/sink output</li> <li>• 16 inputs, 24 V DC, isolated, source/sink output</li> </ul>	B7 <b>6AG1 221-1BF22-2XB0</b>  B7 <b>6AG1 221-1BH22-2XA0</b>	<b>Digital input/output module</b> <b>SIPLUS EM 223</b> (extended temperature and medial exposure) for CPU 222/224/224 XP/226 <ul style="list-style-type: none"> <li>• 4 inputs 24 V DC, 4 outputs 24 V DC; 0,75 A, isolated</li> <li>• 8 inputs, 24 V DC, 8 outputs, 24 V DC; 0,75 A, isolated</li> <li>• 16 inputs, 24 V DC, 16 outputs, 24 V DC; 0,75 A, isolated</li> <li>• 4 inputs 24 V DC, 4 outputs, relay</li> <li>• 8 inputs, 24 V DC, 8 outputs, relay</li> <li>• 16 inputs, 24 V DC, 16 outputs, relay</li> </ul>	B7 <b>6AG1 223-1BF22-2XB0</b>  B7 <b>6AG1 223-1BH22-2XB0</b>  B7 <b>6AG1 223-1BL22-2XB0</b>  B7 <b>6AG1 223-1HF22-2XB0</b>  B7 <b>6AG1 223-1PH22-2XB0</b>  B7 <b>6AG1 223-1PL22-2XB0</b>
<b>Digital input module</b> <b>SIPLUS EM 222</b> (extended temperature and medial exposure) for CPU 222/224/224 XP/226 <ul style="list-style-type: none"> <li>• 8 outputs, 24 V DC; 0,75 A, isolated</li> <li>• 8 outputs, 24 V DC/24 to 230 V AC; 2 A, isolated, relay outputs</li> </ul>	B7 <b>6AG1 222-1BF22-2XB0</b>  B7 <b>6AG1 222-1HF22-2XB0</b>	<b>Accessories</b> see S7-200 digital modules, page 3/30	

B7: Subject to export regulations: AL: N and ECCN: EAR99H

# SIMATIC S7-200

## Analog modules

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	6ES7 231-0HF22-0XA0
<b>Current consumption</b>		
from load voltage L+ (without load), max.	60 mA	60 mA
from backplane bus DC 5 V, max.	20 mA	20 mA
<b>Current consumption/power loss</b>		
Power loss, typ.	2 W	2 W
<b>Connection point</b>		
pluggable I/O terminals	No	No
<b>Analog inputs</b>		
Number of analog inputs	4; Difference	8; Difference
cable length, shielded, max.	100 m; to the sensor	100 m; to the sensor
Input ranges (rated values), voltages		
• 0 to +5 V	Yes	Yes
• 0 to +10 V	Yes	Yes
• -2.5 V to +2.5 V	Yes	Yes
• -5 V to +5 V	Yes	Yes
• -80 mV to +80 mV		No
Input ranges (rated values), currents		
• 0 to 20 mA	Yes	Yes; for channels 6 and 7 only

	6ES7 231-0HC22-0XA0	6ES7 231-0HF22-0XA0
Input ranges (rated values), thermoelements		
• Type E		No
• Type J		No
• Type K		No
• Type N		No
• Type R		No
• Type S		No
• Type T		No
Input ranges (rated values), resistance thermometers		
• Cu 10		No
• Ni 10		No
• Ni 1000		No
• Ni 120		No
• Pt 100		No
• Pt 1000		No
• Pt 10000		No
• Pt 200		No
• Pt 500		No
Input ranges (rated values), resistors		
• 0 to 150 Ohm		No
• 0 to 300 Ohm		No
• 0 to 600 Ohm		No
• permissible input frequency for voltage input (destruction limit), max.	30 V	30 V
• permissible input current for current input (destruction limit), max.	32 mA	40 mA

# SIMATIC S7-200

## Analog modules

### EM 231, EM 232, EM 235

#### Technical specifications EM 231 (continued)

	6ES7 231-0HC22-0XA0	6ES7 231-0HF22-0XA0
<b>Characteristic curve linearization</b>		
• for voltage measurement	No	No
• for current measurement	No	No
<b>Temperature compensation</b>		
• programmable	No	No
<b>Analog value creation</b>		
Integration and conversion time/resolution per channel		
• Resolution with overload area (bit including sign), max.	12 Bit	12 Bit
• Interference voltage suppression for interference frequency $f_1$ in Hz	40 dB, DC to 60 V for interference frequency 50 / 60 Hz	40 dB, DC up to 60 V for interference frequency
• Conversion time (per channel)	250 $\mu$ s	250 $\mu$ s
<b>Displayable conversion value range</b>		
• bipolar signals	-32,000 to +32,000	-32,000 to +32,000
• unipolar signals	0 to 32,000	0 to 32,000

	6ES7 231-0HC22-0XA0	6ES7 231-0HF22-0XA0
<b>Errors/accuracies</b>		
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$ , $f_1$ = interference frequency		
• common mode voltage, max.	12 V	12 V
<b>Isolation</b>		
Isolation, analog inputs		
• Isolation, analog inputs	No	No
<b>Dimensions</b>		
Dimensions		
• Width	71,2 mm	71,2 mm
• Height	80 mm	80 mm
• Depth	62 mm	62 mm
<b>Weights</b>		
• Weight, approx.	183 g	190 g

#### Technical specifications EM 232

	6ES7 232-0HB22-0XA0	6ES7 232-0HD22-0XA0
<b>Current consumption</b>		
from backplane bus DC 5 V, max.	20 mA	20 mA
from sensor current supply or external current supply (DC 24 V), max.	70 mA	70 mA
<b>Current consumption/power loss</b>		
Power loss, typ.	2 W	2 W
<b>Connection point</b>		
pluggable I/O terminals	No	No
<b>Analog outputs</b>		
Number of analog outputs	2	4
<b>Output ranges, voltage</b>		
• -10 to +10 V	Yes	Yes
<b>Output ranges, current</b>		
• 4 to 20 mA	Yes	Yes
<b>Load impedance (in rated range of output)</b>		
• with voltage outputs, min.	5 k $\Omega$	5 k $\Omega$
• with current outputs, max.	0.5 k $\Omega$	0.5 k $\Omega$

	6ES7 232-0HB22-0XA0	6ES7 232-0HD22-0XA0
<b>Analog value creation</b>		
Integration and conversion time/resolution per channel		
• Resolution (incl. overload area)	V/12 bits, I/11 bits	V/12 bits, I/11 bits
<b>Settling time</b>		
• for voltage output	100 $\mu$ s	100 $\mu$ s
• for current output	2 ms	2 ms
<b>Displayable conversion value range</b>		
• bipolar signals	-32,000 to +32,000	-32,000 to +32,000
• unipolar signals	0 to 32,000	0 to 32,000
<b>Errors/accuracies</b>		
Operational limit in overall temperature range		
• Voltage, relative to output area	+/- 2 %	+/- 2 %
• Current, relative to output area	+/- 2 %	+/- 2 %
<b>Basic error limit (operational limit at 25 °C)</b>		
• Voltage, relative to output area	+/- 0.5 %	+/- 0.5 %
• Current, relative to output area	+/- 0.5 %	+/- 0.5 %

### Technical specifications EM 232 (continued)

	6ES7 232-0HB22-0XA0	6ES7 232-0HD22-0XA0
<b>Isolation</b>		
Isolation, analog outputs		
• Galvanic isolation, analog outputs	No	No

	6ES7 232-0HB22-0XA0	6ES7 232-0HD22-0XA0
<b>Dimensions</b>		
Dimensions		
• Width	46 mm	71.2 mm
• Height	80 mm	80 mm
• Depth	62 mm	62 mm
<b>Weights</b>		
• Weight, approx.	148 g	190 g

### Technical specifications EM 235

	6ES7 235-0KD22-0XA0
<b>Current consumption</b>	
from backplane bus DC 5 V, max.	30 mA
from sensor current supply or external current supply (DC 24 V), max.	60 mA
<b>Current consumption/power loss</b>	
Power loss, typ.	2 W
<b>Connection point</b>	
pluggable I/O terminals	No
<b>Analog inputs</b>	
Number of analog inputs	4; Difference
• Voltage	Yes
• Current	Yes
Input ranges (rated values), voltages	
• 0 to +50 mV	Yes
• 0 to +100 mV	Yes
• 0 to +500 mV	Yes
• 0 to +1 V	Yes
• 0 to +5 V	Yes
• 0 to +10 V	Yes
• -1 V to +1 V	Yes
• -10 V to +10 V	Yes
• -100 mV to +100 mV	Yes
• -2.5 V to +2.5 V	Yes
• -25 mV to +25 mV	Yes
• -250 mV to +250 mV	Yes
• -5 V to +5 V	Yes
• -50 mV to +50 mV	Yes
• -500 mV to +500 mV	Yes
Input ranges (rated values), currents	
• 0 to 20 mA	Yes
• permissible input frequency for voltage input (destruction limit), max.	30 V
• permissible input current for current input (destruction limit), max.	32 mA

	6ES7 235-0KD22-0XA0
<b>Characteristic curve linearization</b>	
• for voltage measurement	No
• for current measurement	No
<b>Temperature compensation</b>	
• programmable	No
<b>Analog outputs</b>	
Number of analog outputs	1
<b>Output ranges, voltage</b>	
• -10 to +10 V	Yes
<b>Output ranges, current</b>	
• 0 to 20 mA	Yes
<b>Load impedance (in rated range of output)</b>	
• with voltage outputs, min.	5 kΩ
• with current outputs, max.	0.5 kΩ
<b>Analog value creation</b>	
<b>Integration and conversion time/resolution per channel</b>	
• Resolution with overload area (bit including sign), max.	12 Bit; 11 bits for current output
• Basic conversion time, ms	< 0.25 ms
• Interference voltage suppression for interference frequency f1 in Hz	40 dB, DC to 60 Hz
<b>Settling time</b>	
• for voltage output	100 μs
• for current output	2 ms
<b>Displayable conversion value range</b>	
• bipolar signals	-32,000 to +32,000
• unipolar signals	0 to 32,000
<b>Errors/accuracies</b>	
<b>Operational limit in overall temperature range</b>	
• Voltage, relative to output area	+/- 2 %
• Current, relative to output area	+/- 2 %

# SIMATIC S7-200

## Analog modules

### EM 231, EM 232, EM 235

#### Technical specifications EM 235 (continued)

6ES7 235-0KD22-0XA0	
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to output area	+/- 0.5 %
• Current, relative to output area	+/- 0.5 %
Interference voltage suppression for $f = n \times (fl \pm 1 \%)$ , $fl =$ interference frequency	
• common mode voltage, max.	12 V
<b>Isolation</b>	
Isolation, analog inputs	
• Isolation, analog inputs	No
Isolation, analog outputs	
• Galvanic isolation, analog outputs	No
<b>Dimensions</b>	
Dimensions	
• Width	71.2 mm
• Height	80 mm
• Depth	62 mm
Weights	
• Weight, approx.	186 g

#### Ordering Data

#### Order No.

##### Analog input module EM 231

for CPU 221/222/224/224 XP/226

4 inputs, 0 to 10 V,  
12 bit resolution

**6ES7 231-0HC22-0XA0**

8 inputs, 0 to 10 V, of which  
max. 2 inputs also 0 to 20 mA,  
11/12 bit resolution

**6ES7 231-0HF22-0XA0**

##### Analog output module EM 232

for CPU 221/222/224/224 XP/226

2 outputs,  $\pm 10$  V, 12 bit resolution

**6ES7 232-0HB22-0XA0**

4 outputs,  $\pm 10$  V, 12-bit resolution

**6ES7 232-0HD22-0XA0**

##### Analog input/output module EM 235

for CPU 222/224/224 XP/226;  
4 inputs, 1 output,  $\pm 10$  V DC,  
12 bit resolution

**6ES7 235-0KD22-0XA0**

##### Ground 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

for CPU 221/222/224/224 XP/226  
and STEP 7 Micro/Win V4

German

**6ES7 298-8FA24-8AH0**

English

**6ES7 298-8FA24-8BH0**

French

**6ES7 298-8FA24-8CH0**

Spanish

**6ES7 298-8FA24-8DH0**

Italian

**6ES7 298-8FA24-8EH0**

Chinese

**6ES7 298-8FA24-8FH0**



# SIMATIC S7-200

## Analog modules

### EM 231 thermocouple module

#### Overview



- For user-friendly, high precision temperature detection
- 7 standard types of thermocouple can be used
- For measuring low-level analog signals ( $\pm 80$  mV), as well
- Easy to install in an existing system

#### Technical specifications

	6ES7 231-7PD2-0XA0	6ES7 231-7PF2-0XA0
<b>Current consumption</b>		
from load voltage L+ (without load), max.	60 mA	60 mA
from backplane bus DC 5 V, max.	87 mA	87 mA
<b>Current consumption/power loss</b>		
Power loss, typ.	1.8 W	1.8 W
<b>Connection point</b>		
pluggable I/O terminals	No	No
<b>Analog inputs</b>		
Number of analog inputs	4	8
cable length, shielded, max.	100 m; to the sensor	100 m; to the sensor
Loop resistance cable	100 $\Omega$	100 $\Omega$
Updating time (all channels)	405 ms	810 ms
Input ranges (rated values), voltages		
• -80 mV to +80 mV	Yes	Yes
Input ranges (rated values), thermoelements		
• Type E	Yes	Yes
• Type J	Yes	Yes
• Type K	Yes	Yes
• Type N	Yes	Yes
• Type R	Yes	Yes
• Type S	Yes	Yes
• Type T	Yes	Yes
Input ranges (rated values), resistors		
• permissible input frequency for voltage input (destruction limit), max.	30 V	30 V

	6ES7 231-7PD2-0XA0	6ES7 231-7PF2-0XA0
<b>Analog value creation</b>		
Measurement principle	Sigma Delta	Sigma Delta
Integration and conversion time/resolution per channel		
• Resolution with overload area (bit including sign), max.	16 Bit; Temperature 0.1 °C / 0.1 °F	16 Bit; T Temperature 0.1 °C / 0.1 °F
• Interference voltage suppression for interference frequency f1 in Hz	85 dB at 50 / 60 / 400 Hz	85 dB at 50 / 60 / 400 Hz
Displayable conversion value range		
• bipolar signals	-27,648 to +27,648	-27,648 to +27,648
<b>Errors/accuracies</b>		
cold connection point	+/- 1.5 °C	+/- 1.5 °C
Repeat accuracy in settled status at 25 °C (relative to input area)	+/- 0.05 %	+/- 0.05 %
Operational limit in overall temperature range		
• Voltage, relative to output area	+/- 0.1 %	+/- 0.1 %
Interference voltage suppression for $f = n \times (f1 \pm 1 \%)$ , f1 = interference frequency		
• common mode voltage, max.	120 V; AC	120 V; AC
• common mode voltage, min.	120 db; at 120 V AC	120 db; at 120 V AC

# SIMATIC S7-200

## Analog modules

### EM 231 thermocouple module

#### Technical specifications (continued)

	6ES7 231-7PD22-0XA0	6ES7 231-7PF22-0XA0
<b>Isolation</b>		
Isolation, analog inputs		
• Isolation, analog inputs	Yes	Yes
<b>Dimensions</b>		
Dimensions		
• Width	71.2 mm	71.2 mm
• Height	80 mm	80 mm
• Depth	62 mm	62 mm
<b>Weights</b>		
• Weight, approx.	210 g	210 g

#### Ordering Data

#### Order No.

<b>Thermocouple module EM 231</b>	
Inputs +/- 80 mV, resolution 15 bit + sign, thermocouples J, K, S, T, R, E, N	
4 inputs	<b>6ES7 231-7PD22-0XA0</b>
8 inputs	<b>6ES7 231-7PF22-0XA0</b>
<b>Ground terminal</b>	<b>6ES5 728-8MA11</b>
10 units	
<b>Backplane bus expansion cable</b>	B7 <b>6ES7 290-6AA20-0XA0</b>
For interconnection of the two rows of devices with double-row configuration, for CPU 222/224/224 XP/226	
<b>S7-200 Programmable Controller, System Manual</b>	
for CPU 221/222/224/224 XP/226 and STEP 7 Micro/Win V4	
German	<b>6ES7 298-8FA24-8AH0</b>
English	<b>6ES7 298-8FA24-8BH0</b>
French	<b>6ES7 298-8FA24-8CH0</b>
Spanish	<b>6ES7 298-8FA24-8DH0</b>
Italian	<b>6ES7 298-8FA24-8EH0</b>
Chinese	<b>6ES7 298-8FA24-8FH0</b>

B7: Subject to export regulations: AL: N and ECCN: EAR99H

# SIMATIC S7-200

## Analog modules

### EM 231 RTD module

#### Overview



- To measure temperatures easily and with high accuracy
- 2 versions with 2 or 4 inputs
- The latest resistance temperature detectors can be used
- Easy to retrofit in existing systems

#### Technical specifications

	6ES7 231-7PB22-0XA0	6ES7 231-7PC22-0XA0
<b>Current consumption</b>		
from load voltage L+ (without load), max.	60 mA	60 mA
from backplane bus DC 5 V, max.	87 mA	87 mA
<b>Current consumption/power loss</b>		
Power loss, typ.	1.8 W; Sensor: 1 mW	1.8 W; Sensor: 1 mW
<b>Connection point</b>		
pluggable I/O terminals	No	No
<b>Analog inputs</b>		
Number of analog inputs	2	4
cable length, shielded, max.	100 m; to the sensor	100 m; to the sensor
Loop resistance cable	20 Ω max. 2.7 Ohm for Cu	20 Ω max. 2.7 Ohm for Cu
Updating time (all channels)	405 ms; 700 ms with Pt10000	810 ms; 1400 ms with Pt10000
Input ranges (rated values), resistance thermometers		
• Cu 10	Yes	Yes
• Ni 10	Yes	Yes
• Ni 1000	Yes	Yes
• Ni 120	Yes	Yes
• Pt 100	Yes	Yes
• Pt 1000	Yes	Yes
• Pt 10000	Yes	Yes
• Pt 200	Yes	Yes
• Pt 500	Yes	Yes

	6ES7 231-7PB22-0XA0	6ES7 231-7PC22-0XA0
Input ranges (rated values), resistors		
• 0 to 150 Ohm	Yes	Yes
• 0 to 300 Ohm	Yes	Yes
• 0 to 600 Ohm	Yes	Yes
• permissible input frequency for voltage input (destruction limit), max.	30 V; 30 V DC (probe), 5 V DC (source)	30 V; 30 V DC (probe), 5 V DC (source)
<b>Analog value creation</b>		
Measurement principle	Sigma Delta	Sigma Delta
Integration and conversion time/resolution per channel		
• Resolution with overload area (bit including sign), max.	16 Bit; Temperature 0.1 °C / 0.1 °F	16 Bit; Temperature 0.1 °C / 0.1 °F
• Interference voltage suppression for inter- ference frequency f1 in Hz	85 dB at 50 / 60 / 400 Hz	85 dB at 50 / 60 / 400 Hz
Displayable conversion value range		
• bipolar signals	-27,648 to +27,648	-27,648 to +27,648
<b>Errors/accuracies</b>		
Repeat accuracy in settled status at 25 °C (relative to input area)	+/- 0.05 %	+/- 0.05 %
Operational limit in overall temperature range		
• Voltage, relative to output area	+/- 0.1 %	+/- 0.1 %
Interference voltage suppression for f = n x (fl +/- 1 %), fl = interference frequency		
• common mode voltage, max.	0 V	0 V
• common mode voltage, min.	120 db; at 120 V AC	120 db; at 120 V AC

# SIMATIC S7-200

## Analog modules

### EM 231 RTD module

#### Technical specifications (continued)

	6ES7 231-7PB22-0XA0	6ES7 231-7PC22-0XA0
<b>Isolation</b>		
Isolation, analog inputs		
• Isolation, analog inputs	Yes	Yes
<b>Dimensions</b>		
Dimensions		
• Width	71.2 mm	71.2 mm
• Height	80 mm	80 mm
• Depth	62 mm	62 mm
<b>Weights</b>		
• Weight, approx.	210 g	210 g

#### Ordering Data

#### Order No.

<b>RTD module EM 231</b>	
2 inputs for resistance temperature detector Pt100/200/500/1000/10000, Ni100/120/1000, Cu10; resistor 150/300/600 Ohm, resolution 15 Bit + sign	<b>6ES7 231-7PB22-0XA0</b>
4 inputs for resistance temperature detector Pt100/200/500/1000/10000, Ni100/120/1000, Cu10; 14 GOST temperature resistance sensors, resistor 150/300/600 ohm, resolution 15 bit + sign	<b>6ES7 231-7PC22-0XA0</b>
<b>Ground terminal</b>	<b>6ES5 728-8MA11</b>
10 units	
<b>Backplane bus expansion cable</b>	<b>6ES7 290-6AA20-0XA0</b>
For interconnection of the two rows of devices with double-row configuration, for CPU 222/224/224 XP/226	
<b>S7-200 Programmable Controller, System Manual</b>	
for CPU 221/222/224/224 XP/226 and STEP 7 Micro/Win V4	
German	<b>6ES7 298-8FA24-8AH0</b>
English	<b>6ES7 298-8FA24-8BH0</b>
French	<b>6ES7 298-8FA24-8CH0</b>
Spanish	<b>6ES7 298-8FA24-8DH0</b>
Italian	<b>6ES7 298-8FA24-8EH0</b>
Chinese	<b>6ES7 298-8FA24-8FH0</b>

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