	Description	Ordering Information
	The SIMATIC S7-200 Micro PLC system offers a complete range of products to fit almost any control or automation application. Each compact S7-200 CPU unit is completely self-contained and includes the CPU, power supply, and input/output points (I/O). The S7-200 Micro PLC is capable of simple discrete control, or analog control with PID and floating-point math capability. Larger systems, with additional I/O, communications, or operator interface requirements, can easily be configured by adding expansion modules or our cost effective operator interface products.	<ul style="list-style-type: none"> ▶ Use complete catalog number. ▶ See page 660 for a list of available models.

Complete Automation Solution

The SIMATIC S7-200 Micro PLC is a full-featured programmable logic control system offering stand-alone CPUs, micro-modular expansion capability, and operator interface solutions. Almost any application that requires automation, from basic discrete or analog control, to intelligent networked solutions, can benefit by using the powerful S7-200 family of products. Here are just a few examples of S7-200 applications:

- Conveyor systems
- Elevators
- Woodworking machinery
- Packaging equipment
- Placement systems
- Car wash automation
- Remote monitoring & control for water/wastewater
- Test stations

Value for OEMs

Wherever central controllers or expensive custom electronic control systems are used, the SIMATIC S7-200 offers a significantly more economical alternative. Our off-the-shelf, compact solution is packed with features, and is accepted around the world as a Micro PLC standard.

Real-time Speed & Versatility

The SIMATIC S7-200 offers real-time control with Boolean processing speeds of 0.37µs per instruction. This fast execution speed, combined with our 20KHz high-speed counters, interrupts, and 20KHz pulse outputs, provide quick responses in demanding real-time applications. The S7-200 has over 200 instructions, including math, PID, For/Next loops, subroutines, sequence control, and more!

Integrated Communications

All S7-200 CPUs offer at least one RS485 communication port with speeds up to 187.5Kbaud. This not only provides fast access for programming and maintenance, but also allows you to build master/slave networks with up to 31 stations.

Non-S7-200 devices, such as bar code readers, intelligent machines, etc. can also be connected by using our FreePort capability. With FreePort, you can easily adapt the S7-200 CPU to virtually any serial ASCII protocol.

PROFIBUS-DP & AS-Interface Connections

The S7-200 can also be an intelligent slave on a PROFIBUS-DP network, or a host for an AS-Interface network, simply by adding expansion modules. This provides a convenient way to use the S7-200 with larger PLC systems, or intelligent field devices.

Easy Programming & Maintenance

With our STEP7-Micro/WIN software, you have a complete development environment for all phases of the application including program development, documentation, and machine startup. If you are familiar with Windows, then you already know how to get started with STEP7-Micro/WIN.

Key Features

- Several models of CPUs
 - CPU221, 6in/4out 2Kw program
 - CPU222, 8in/6out 2Kw program
 - CPU224, 14in/10out 4Kw program
 - CPU226, 24in/16out 4Kw program, 2 communication ports
- Up to 256 digital I/O
- Up to 32 analog channels
- 256 timers, 256 counters
- Built-in EEPROM memory
- Over 200 powerful instructions, including math, PID, FOR/NEXT loops, Interrupts, Subroutines, Sequence Control, etc.
- Real-time clock/calendar
- Built-in communications
- High-speed counters, pulse outputs, interrupt inputs, timed interrupts
- Password protection
- Memory module
- Removable I/O connectors
- Wide range of expansion modules
 - 8 pt. Input & Output
 - 4/4, 8/8, & 16/16 In/Out Combination
 - 4 ch. Analog In, 2 ch. Analog Out
 - 4 ch./1 ch. Analog In/Out Combination
 - 2 ch. RTD In
 - 4 ch. Thermocouple In
 - PROFIBUS-DP Slave
 - AS-Interface Master





CPU Selection Chart

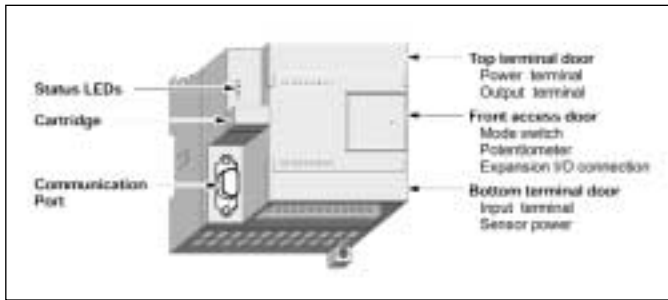
Use this quick selection guide to help choose the proper CPU for your application.



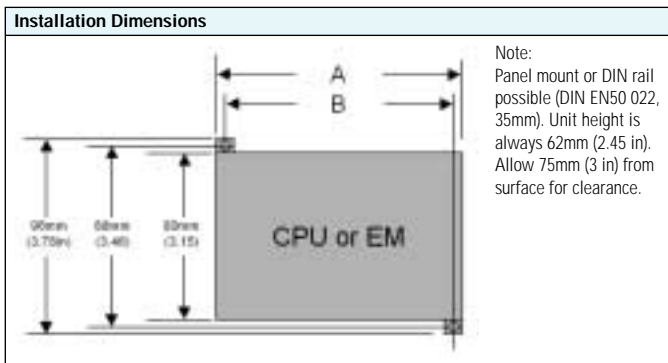
Feature	CPU 221	CPU 222	CPU 224	CPU 226
Physical Size of Unit	90 mm x 80 mm x 62 mm	90 mm x 80 mm x 62 mm	120.5 mm x 80 mm x 62 mm	190 mm x 80 mm x 62 mm
Memory				
Program	2048 words	2048 words	4096 words	4096 words
User data	1024 words	1024 words	2560 words	2560 words
User program storage type	EEPROM	EEPROM	EEPROM	EEPROM
Data backup (super capacitor) (optional battery)	50 hours typical 200 days typical	50 hours typical 200 days typical	190 hours typical 200 days typical	190 hours typical 200 days typical
Local I/O				
Local I/O	6 In/4 Out	8 In/6 Out	14 In/10 Out	24 In/16 Out
Number of expansion modules	none	2 modules	7 modules	7 modules
Total I/O				
Digital I/O image size	256 (128 In/128 Out)	256 (128 In/128 Out)	256 (128 In/128 Out)	256 (128 In/128 Out)
Analog I/O image size	none	16 In/16 Out	32 In/32 Out	32 In/32 Out
Actual I/O count that can be realized with each CPU may be limited by image register size, module count, 5V power, and the physical number of I/O points on each product. Refer to the User Manual for detailed information.				
Instructions				
Boolean execution speed	0.37 μ s/ instruction	0.37 μ s/ instruction	0.37 μ s/ instruction	0.37 μ s/ instruction
I/O Image Register	128 I and 128 Q	128 I and 128 Q	128 I and 128 Q	128 I and 128 Q
Internal relays	256	256	256	256
Counters/Timers	256/256	256/256	256/256	256/256
Word In/Word Out	None	16/16	32/32	32/32
Sequential control relays	256	256	256	256
For/Next loops	Yes	Yes	Yes	Yes
Integer math (+ - * /)	Yes	Yes	Yes	Yes
Real math (+ - * /)	Yes	Yes	Yes	Yes
Enhanced Features				
Built-in high-speed counter	4 H/W (20 KHz)	4 H/W (20 KHz)	6 H/W (20 KHz)	6 H/W (20 KHz)
Analog adjustments	1	1	2	2
Pulse outputs	2 (20 KHz, DC only)	2 (20 KHz, DC only)	2 (20 KHz, DC only)	2 (20 KHz, DC only)
Communication interrupts	1 transmit/2 receive	1 transmit/2 receive	1 transmit/2 receive	2 transmit/4 receive
Timed interrupts	2 (1 ms to 255 ms)	2 (1 ms to 255 ms)	2 (1 ms to 255 ms)	2 (1 ms to 255 ms)
Hardware input interrupts	4, input filter	4, input filter	4, input filter	4, input filter
Real-time clock	Yes (cartridge)	Yes (cartridge)	Yes (built-in)	Yes (built-in)
Password protection	Yes	Yes	Yes	Yes
Communications				
Number of comm ports: PPI, DP/T Baud rate Freeport Baud rate Protocols supported	1 (RS485) up to 187.5Kbaud up to 38.4Kbaud	1 (RS485) up to 187.5Kbaud up to 38.4Kbaud	1 (RS485) up to 187.5Kbaud up to 38.4Kbaud	2 (RS485) up to 187.5Kbaud up to 38.4Kbaud
Port 0: Port 1:	PPI, DP/T, Freeport N/A	PPI, DP/T, Freeport N/A	PPI, DP/T, Freeport N/A	PPI, DP/T, Freeport PPI, DP/T, Freeport
Peer-to-peer	Yes, NETR/NETW	Yes, NETR/NETW	Yes, NETR/NETW	Yes, NETR/NETW



CPU Technical Specifications



Environmental Conditions		
Storage Environment	-40° to +70°C, 25° to 55°C 95% humidity	
Ambient Operating Environment	0° to 55° C horizontal mounting 0° to 45° C vertical mounting 95% non-condensing humidity, no corrosive gas	
Mechanical shock	15 G, 11 ms pulse, 6 shocks in each of 3 axes	
Sinusoidal vibration	0.30 mm peak-to-peak 10 to 57 Hz; 2 G panel mount, 1 G DIN rail mount, 57 Hz to 150 Hz; 10 sweeps each axis, 1 octave/minute	
Mechanical Protection	IP20	
Agency Approvals	UL, CSA, FM, CE	
Input Power Supply	24V DC Power	115/230V AC Power
Line voltage-permissible range	20.4 - 28.8 VDC	85 - 264 VAC, 47 - 63 Hz
Input current CPU only/max load	80/900 mA at 24 VDC	15/60 mA at 240 VAC 30/120 mA at 120 VAC
In-rush current (max)	10 A at 28.8 VDC	20 A at 264 VAC
Isolation (input power to logic)	Not isolated	1500 VAC
Hold-up time (after power loss)	10 ms at 24 VDC	80 ms at 240 VAC, 20 ms at 120 VAC
Internal fuse, not replaceable	2 A, 250 V, Slow Blow	2 A, 250 V, Slow Blow
24 VDC Sensor Power Output		
Voltage range	15.4 - 28.8 VDC	20.4 - 28.8 VDC
Maximum current	180 mA	180 mA
Ripple noise	Same as input line	Less than 1 V p-p max.
Current limit	600 mA	600 mA
Isolation (sensor power to logic)	Non-isolated	Non-isolated



Product	A	B	Product	A	B
CPU221	90mm (3.54in)	82mm (3.23in)	Analog Input	71.2mm (2.80in)	63.2mm (2.49in)
CPU222	90mm (3.54in)	82mm (3.23in)	Analog Output	46mm (1.81in)	38mm (1.5in)
CPU224	120.5mm (4.74in)	112.5mm (4.43in)	Analog Combo	71.2mm (2.80in)	63.2mm (2.49in)
CPU226	196mm (7.84in)	188mm (7.52in)	RTD	71.2mm (2.80in)	63.2mm (2.49in)
8pt	46mm (1.81in)	38mm (1.5in)	Thermocouple	71.2mm (2.80in)	63.2mm (2.49in)
8/8pt.	71.2mm (2.80in)	63.2mm (2.49in)	PROFIBUS	71.2mm (2.80in)	63.2mm (2.49in)
16/16pt.	137.3mm (5.41in)	129.3mm (5.09in)	AS-Interface	71.2mm (2.80in)	63.2mm (2.49in)

DC Input Features		
Input type	Sink/Source (IEC Type 1 sink)	
Input Voltage	30 VDC	
Maximum continuous	35 VDC for 0.5 s	
Surge	24 VDC at 4 mA, nominal	
Rated value	15 VDC at 2.5 mA, minimum	
Logic 1 signal (minimum)	5 VDC at 1 mA, maximum	
Logic 0 signal (maximum)	500 VAC for 1 minute	
Isolation (Field Side to Logic)	—	
Optical isolation (galvanic)	—	
Input Delay & HSC Rate	0.2 to 12.8 ms, user-selectable	
Filtered Inputs and Interrupts	—	
Single Phase HSC	—	
Logic 1 Level = 15 to 30 VDC	20 kHz	
Logic 1 Level = 15 to 26 VDC	30 kHz	
Quadrature HSC	—	
Logic 1 Level = 15 to 30 VDC	10 kHz	
Logic 1 Level = 15 to 26 VDC	20 kHz	
2-Wire Prox. Leakage	1 mA, maximum	
Output Specifications	DC Output	Relay Output
General	Solid State-MOSFET	
Output Type	20.4 to 28.8 VDC	
Permissible range	24 VDC	
Rated value	20 VDC, minimum	
Logic 1 signal at max. current	0.1 VDC, maximum	
Logic 0 signal with 10 K Ω load	—	
Output Current	—	
Logic 1 signal	0.75 A	2.00 A
Max. current per common/group	—	
CPU221	3.0 A	6.0 A
CPU222	4.5A	6.0 A
CPU224	3.75A	8.0 A
CPU226	6.0 A	10.0 A
Lamp load	5.0 W	30 W DC/200 W AC
ON state resistance (contact)	0.3 Ω	0.2 Ω , max. when new
Leakage current per point	10 μ A, maximum	—
Surge current	8 A for 100 ms, max.	7 A w/ contacts closed
Overload protection	No	No
Isolation	—	
Optical isolation (galvanic)	500 VAC for 1 minute	—
Isolation resistance	—	100 M Ω , min. when new
Isolation coil to contact	—	1500 VAC for 1 minute
Isolation between open contacts	—	750 VAC for 1 minute
Inductive Load Clamping	—	
Repetitive Energy dissipation < 0.5 L ² x switch. rate	1 W, all channels	—
Clamp voltage limits	L+ minus 48 V	—
Output Delay & Frequency	—	
Off to On (Q0.0 & Q0.1)	2 μ s, maximum	—
On to Off (Q0.0 & Q0.1)	10 μ s, maximum	—
Off to On (Q0.2 & Q0.3)	15 μ s, maximum	—
On to Off (Q0.2 & Q0.3)	100 μ s, maximum	—
Pulse Train Output (Q0.0 & Q0.1)	20 kHz, maximum	1 Hz, maximum
Relay Life	—	
Switching delay	—	10 ms, maximum
Lifetime mechanical (no load)	—	10,000,000 open/close
Lifetime contacts at rated Load	—	100,000 open/close



Expansion I/O Modules

The S7-200 Micro PLC system can be expanded to cover applications up to 256 I/O points by adding I/O expansion modules. There are several types of expansion modules:

- Discrete Input/Output
- Discrete Input/Output Combination
- Analog Input/Output
- Analog Input/Output Combination
- RTD/Thermocouple Input
- PROFIBUS-DP Slave
- AS-Interface Master

Modules can be added directly next to the CPU, or in an extended arrangement with a 0.8m Expansion Cable, either with panel mounting or standard DIN rail mounting.

Maximum Configurations

As shown in the CPU selection guide, there is a maximum number of expansion modules that can be connected to any given CPU. Another item to consider is the available power budget. Each expansion module consumes +5V DC power from the CPU I/O bus, so this can determine the maximum I/O configuration as well. The tables show the power budget and maximum I/O configurations for the S7-200 Micro PLC system.

CPU 22x	5VDC Current	Expansion Module	5VDC Current Consumption - mA
CPU 222	340	EM 221 DI8 x DC24V	30
CPU 224	660	EM 222 DO8 x DC24V	50
CPU 226	1000	EM 222 DO8 x Rly	40
		EM 223 DI4/DO4 x DC24V	40
		EM 223 DI4/DO4 x DC24V/Rly	40
		EM 223 DI8/DO8 x DC24V	80
		EM 223 DI8/DO8 x DC24V/Rly	80
		EM 223 DI16/DO16 x DC24V	160
		EM 223 DI16/DO16 x DC24V/Rly	150
		EM 231 AI4 x 12 Bit	20
		EM 231 AI4 x Thermocouple	60
		EM 231 AI4 x RTD	60
		EM 232 AO2 x 12 Bit	20
		EM 235 AI4/AQ1 x 12 Bit	30
		EM 277 PROFIBUS-DP	150



Module	5V ma	Digital Inputs	Digital Outputs	Analog Inputs	Analog Outputs
CPU 221					
No expansion possible					
CPU 222					
Max Digital In/Out					
CPU	+340	8	6		
2 x EM 223 DI16/DO16 x DC24V	-320	32	32		
or					
2 x EM 223 DI16/DO16 x DC24V/Rly	-300				
Total=	>0	40	38		
Max Analog In					
CPU	+340	8	6	8	2
2 x EM 235 AI4/AQ1	-60				
Total=	>0	8	6	8	2
Max Analog Out					
CPU	+340	8	6	0	4
2 x EM 232 AO2	-40				
Total=	>0	8	6	0	4
CPU 224					
Max Digital In/Rly Out					
CPU	+660	14	10		
4 x EM 223 DI16/DO16 x DC24V/Rly	-600	64	64		
2 x EM 221 DI8 x DC24V	-60	16			
Total=	>0	94	74		
Max Digital In/DC Out					
CPU	+660	14	10		
4 x EM 223 DI16/DO16 x DC24V	-640	64	64		
Total=	>0	78	74		
Digital In/Max Rly Out					
CPU	+660	14	10		
4 x EM 223 DI16/DO16 x DC24V/Rly	-600	64	64		
1 x EM 222 DO8 x Rly	-40		8		
Total=	>0	78	82		
CPU 226					
Max Digital In/Rly Out					
CPU	+1000	24	16		
6 x EM 223 DI16/DO16 x DC24V/Rly	-900	96	96		
1 x EM 223 DI8/DO8 x DC24V/Rly	-80	8	8		
Total=	>0	128	120		
Max Digital In/DC Out					
CPU	+1000	24	16		
6 x EM 223 DI16/DO16 x DC24V	-960	96	96		
1 x EM 221 DI8 x DC24V	-30	8			
Total=	>0	128	112		
CPU 224 or CPU 226					
Max Analog In					
CPU	>660	14 (24)	10 (16)	28	7
7 x EM 235 AI4/AQ1	-210				
Total=	>0	14 (24)	10 (16)	28	7
Max Analog Out					
CPU	>660	14 (24)	10 (16)	0	14
7 x EM 232 AO2	-140				
Total=	>0	14 (24)	10 (16)	0	14



Discrete I/O Module Specifications

There are a wide range of discrete input, discrete output, and discrete combination expansion modules available in the S7-200 Micro PLC family. Regardless of the combination of points, the modules all share the same basic characteristics.

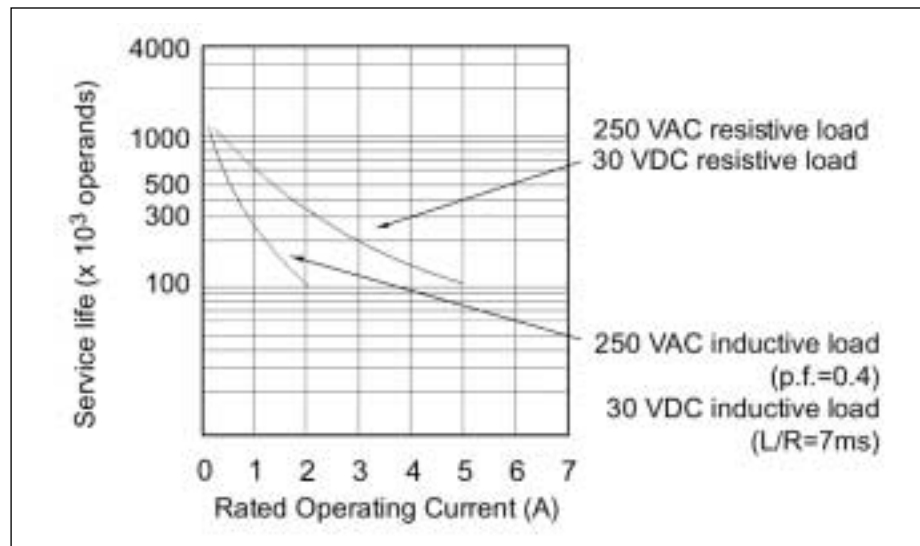
Discrete Input Module Specifications

DC Input Features	
Input type	Sink/Source (IEC Type 1 sink)
Input Voltage	
Maximum continuous	30 VDC
Surge	35 VDC for 0.5 s
Rated value	24 VDC at 4 mA, nominal
Logic 1 signal (minimum)	15 VDC at 2.5 mA, minimum
Logic 0 signal (maximum)	5 VDC at 1 mA, maximum
Isolation (Field Side to Logic)	Optical (galvanic), 500 VAC for 1 minute
Input Delay Times	4.5 ms
2-Wire Prox. Leakage	1 mA, maximum

Discrete Output Module Specifications

Output Specifications	DC Output	Relay Output
General		
Output type	Solid State-MOSFET	Relay, dry contact
Permissible range	20.4 to 28.8 VDC	5-30VDC or 5-250 VAC
Rated value	24 VDC	—
Logic 1 signal at max. current	20 VDC, minimum	—
Logic 0 signal with 10 K Ω load	0.1 VDC, maximum	—
Output Current		
Logic 1 Signal	0.75 A	2.00 A
Max. current per common/group	3A	8A
Lamp load	5.0 W	30 W DC/200 W AC
ON state resistance (contact)	0.3 Ω	0.2 Ω , max. when new
Leakage current per point	10 μ A, maximum	—
Surge current	8 A for 100 ms, max.	7 A w/contacts closed
Overload protection	No	No
Isolation		
Optical isolation (galvanic)	500 VAC for 1 minute	—
Isolation resistance	—	100 M Ω , min. when new
Isolation coil to contact	—	1500 VAC for 1 minute
Isolation between open contacts	—	750 VAC for 1 minute
Inductive Load Clamping		
Repetitive Energy Dissipation < 0.5 L ² x switch. rate	1 W, all channels	—
Clamp voltage limits	L+ minus 48 V	—
Output Delay		
Off to On	50 μ s, max.	—
On to Off	200 μ s, max.	—
Relay Life		
Switching delay	—	10 ms, maximum
Lifetime mechanical (no load)	—	10,000,000 open/close
Lifetime contacts at rated Load	—	100,000 open/close

The following chart shows typical performance data supplied by relay vendors. Actual performance may vary depending upon your specific application.





Analog I/O Module Specifications

Analog I/O modules are used in a wide variety of applications to measure current or voltage changes.

Description	EM 231 AI4 x 12 Bit	EM 232 AO2 x 12 Bit	EM 235 AI4/AQ1 x 12 Bit
General Specifications			
Power Consumption From +5 VDC (I/O bus) From L+ L+ voltage range, Class 2 or DC sensor supply	20 mA 60mA 20.4 to 28.8	20 mA 70 mA (both outputs at 20 mA) 20.4 to 28.8	30 mA 60 mA (with output at 20 mA) 20.4 to 28.8
LED indicator	24 VDC Power Supply Good, ON = no fault, OFF = no 24 VDC Power	24 VDC Power Supply Good, ON = no fault, OFF = no 24 VDC Power	24 VDC Power Supply Good, ON = no fault, OFF = no 24 VDC Power
Analog Input Specifications			
Data word format Bipolar, full-scale range Unipolar, full-scale range	-32000 to +32000 0 to 32000		-32000 to +32000 0 to 32000
Input impedance	≥10 MΩ		≥ 10 MW
Input filter attenuation	-3 db @ 3.1 KHz		-3 db @ 3.1 KHz
Maximum input voltage	30 VDC		30 VDC
Maximum input current	32 mA		32 mA
Resolution	12 bit A/D converter		12 bit A/D converter
No. of Analog Input Points	4		4
Isolation (Field side to logic)	None		None
Input type	Differential		Differential
Input ranges Voltage (unipolar) Voltage (bipolar) Current	0 to 10 V, 0 to 5 V, ±5 V, ± 2.5 V 0 to 20 mA		0 to 10 V, 0 to 5 V, 0 to 1 V, 0 to 500 mV, 0 to 100 mV, 0 to 50 mV ± 10 V, ± 5 V, ± 2.5 V, ± 1 V, ± 500 mV, ± 250 mV, ± 100 mV, ± 50 mV, ± 25 mV 0 to 20 mA
Analog to digital conv. time	< 250 ∞s		< 250 ∞s
Analog input step response	1.5 ms to 95%		1.5 ms to 95%
Common mode rejection	40 dB, DC to 60 Hz		40 dB, DC to 60 Hz
Common mode voltage	Signal voltage plus common mode voltage (must be ≤ 12 V)		Signal voltage plus common mode voltage (must be ≤ 12 V)
Analog Output Specifications			
Isolation (Field side to logic)		None	None
Signal range Voltage output Current output		± 10 V 0 to 20 mA	± 10 V 0 to 20 mA
Resolution, full-scale Voltage Current		12 bits 11 bits	12 bits 11 bits
Data word format Voltage Current		-32000 to +32000 0 to +32000	-32000 to +32000 0 to +32000
Accuracy Worst case, 0° to 55° C Voltage output Current output Typical, 25° C Voltage output Current output		± 2% of full-scale ± 2% of full-scale ± 0.5% of full-scale ± 0.5% of full-scale	± 2% of full-scale ± 2% of full-scale ± 0.5% of full-scale ± 0.5% of full-scale
Settling time Voltage output Current output		100 μS 2 mS	100 μS 2 mS
Maximum drive Voltage output Current output		5000 Ω min. 500 Ω max.	5000 Ω min. 500 Ω max.



RTD & Thermocouple Module Specifications

The RTD & Thermocouple modules are most often used in applications involving temperature control.

Thermocouple Module

The EM 231 Thermocouple module provides a convenient, isolated interface for the S7-200 family to seven thermocouple types: J, K, E, N, S, T, and R. It also allows the S7-200 to monitor low level analog signals, in the 80mV range. The module has DIP switches to select the thermocouple type, open wire check, temperature scale, cold junction compensation and burnout direction. All thermocouples attached to the module must be of the same type. The EM 231 Thermocouple module can report temperatures in Celsius or Fahrenheit.

RTD Module

The EM 231 RTD module provides a convenient interface for the S7-200 family to several different RTDs. It also allows the S7-200 to measure three different resistance ranges. You use DIP switches to select RTD type, wiring configuration, temperature scale, and burnout direction. Both RTDs attached to the module must be of the same type.

Description	EM 231 AI 4 x Thermocouple	EM 231 AI 2 x RTD
General Specifications		
Power Consumption From +5 VDC (I/O bus) From L+ L+ voltage range, Class 2 or DC sensor supply	87 mA 60 mA 20.4 to 28.8 VDC	87 mA 60 mA 20.4 to 28.8 VDC
LED indicator	24 VDC Power Supply Good ON = no fault OFF = no 24 VDC power SF ON = module failure BLINKING = input signal error OFF = no faults	24 VDC Power Supply Good ON = no fault OFF = no 24 VDC power SF ON = module failure BLINKING = input signal error OFF = no faults
Analog Input Specifications		
Isolation Field side to logic Field side to 24 VDC 24 VDC to logic	500 VAC 500 VAC 500 VAC	500 VAC 500 VAC 500 VAC
Common mode input range	120 VAC (input channel to channel)	0
Common mode rejection	> 120 dB @ 120 VAC	> 120 dB @ 120 VAC
Input type	Floating TC	Module ground referenced RTD
Input ranges	TC types (select one): S, T, R, E, N, K, J Voltage range: +/- 80 mV	RTD types (select one): Pt -100 Ω , 200 Ω , 500 Ω , 1000 Ω (with α = 3850 ppm, 3920 ppm, 3850.55 ppm, 3916 ppm, 3902 ppm) Pt -10000 Ω (α = 3850 ppm) Cu -9.035 Ω (α = 4720 ppm) Ni -10 Ω , 120 Ω , 1000 Ω (with α = 6720 ppm, 6178 ppm) R -150 Ω , 300 Ω , 600 Ω FS
Input Resolution Temperature Voltage Resistance	0.1° C / 0.1° F 15 bits plus sign	0.1° C / 0.1° F 15 bits plus sign
Measuring Principle	Sigma-delta	Sigma-delta
Module update time: All ch.	405 ms	405 ms (700 ms for Pt10000)
Wire length	100 meters to sensor max	100 meters to sensor max
Wire loop resistance	100 Ω max	20 Ω , 2.7 Ω for Cu max
Suppression of interference	85 dB @ 50 Hz/60 Hz/400 Hz	85 dB @ 50 Hz/60 Hz/400 Hz
Data word format	Voltage: -27648 to + 27648	Resistance: -27648 to +27648
Maximum sensor dis.		1m W
Input impedance	>1 M Ω	>10 M Ω
Maximum input voltage	30 VDC	30 VDC (sense), 5 VDC (source)
Resolution	15 bit + sign	15 bit + sign
Input filter attenuation	-3 dB @ 21 kHz	-3 dB @ 3.6 kHz
Basic error	0.1% FS (voltage)	0.1% FS (resistance)
Repeatability	0.05% FS	0.05% FS
Cold junction error	±1.5° C	



Communications

The S7-200 Micro PLC system provides a wide range of communication choices which allow connections to:

- Personal computers for programming and monitoring
- Operator panels
- PROFIBUS-DP networks
- AS-Interface networks
- Other intelligent devices

CPU Port Protocols

The S7-200 CPU ports support several protocols:

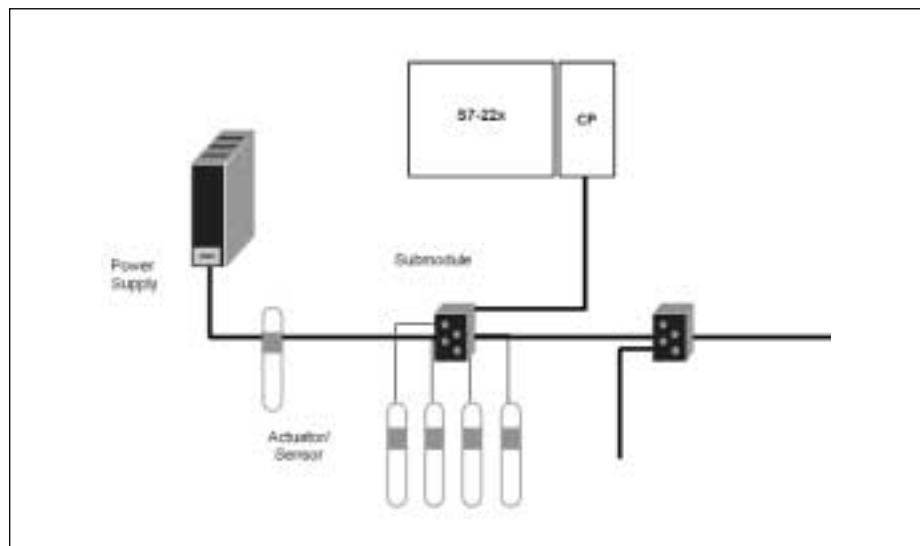
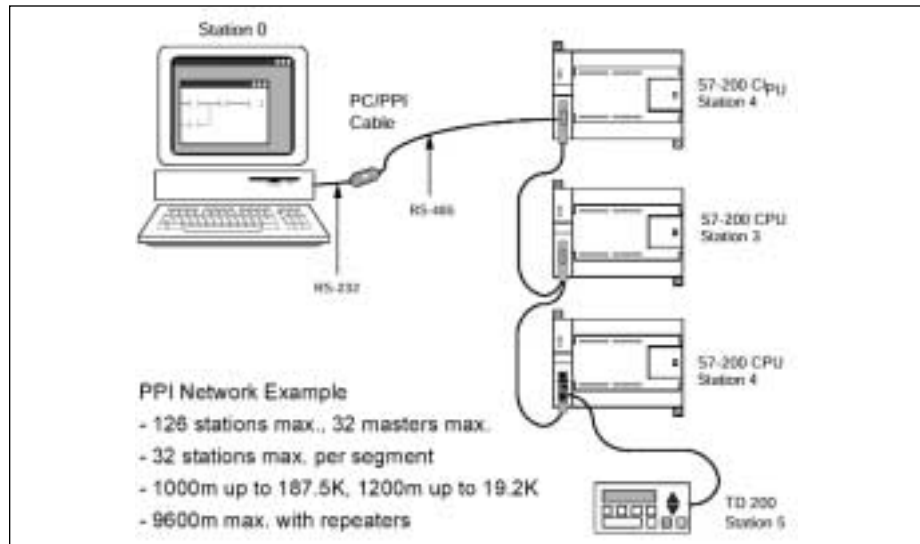
- **PPI** – proprietary master/slave protocol, up to 187.5Kbaud, most often used for programming, building networks of S7-200 CPUs, or to connect operator interfaces.
- **MPI** – proprietary protocol, up to 187.5Kbaud, most often used by the S7-300/400 CPUs and other SIMATIC devices, to communicate with the S7-200 CPUs. When a S7-200 CPU is communicating to a MPI master it cannot be a PPI Master.
- **FreePort** – a mode of operation through which the CPU program can literally define the protocol of the CPU communications port, most often used to connect other intelligent devices that support a serial ASCII protocol at speeds up to 38.4Kbaud.

AS-Interface Expansion Module

The CP243-2 is the AS-Interface Master for the S7-200 Micro PLC system. By using AS-Interface, you can dramatically reduce the wiring costs in almost any application. (Refer to the AS-Interface section of this catalog for additional information on AS-Interface.)

When bi-directional slaves are implemented, up to 248 binary elements can be activated via 31 AS-Interface slaves which significantly increase the I/O capacity of an S7-200 system. The CP243-2 features:

- a terminal block for direct connection of the AS-Interface cable
- front panel LEDs for displaying the operating state as well as the connected and activated slaves and their availability
- one pushbutton for changing the operating states and the status/slave display as well as accepting the existing configuration



The CP243-2 can be used in two operating modes:

- **Standard mode** – Only the data bits of the slaves may be addressed in this operating mode. No master calls are executed. Up to 248 Input/Outputs (Max. 124 inputs & 124 outputs) may be addressed via the 8 AI/AO area.
- **Extended mode** – The CP243-2 offers access to master calls in accordance with AS-Interface specification V2.0 (i.e. writing parameters).

CP243-2 Specifications	
AS-Interface master profile	M0e (appropriate Complete AS-Interface Specification V2.0)
AS-Interface update cycle	5 ms for 31 slaves
Interfaces	
Allocation of address area in PLC	2 I/O modules (DI/8 DO8 and AI/8/AO8)
Connection to AS-Interface	Terminal connection
Power consumption	
via AS-Interface	100 mA, max.
via backplane bus	220 mA at DC 5 V, typically
Power loss	2 W, approximately
Environmental conditions	
Operating temperature	
horizontal mounting	0° C to +55° C
vertical mounting	0° C to +45° C
Transport/storage temperature	-40° C to +70° C
Relative humidity	95% at +25° C



PROFIBUS-DP Slave Module

The PROFIBUS-DP module is an extremely versatile communications module. It can be used to connect:

- an S7-200 CPU (as a slave) to a PROFIBUS-DP network
- other peripherals capable of being an MPI master

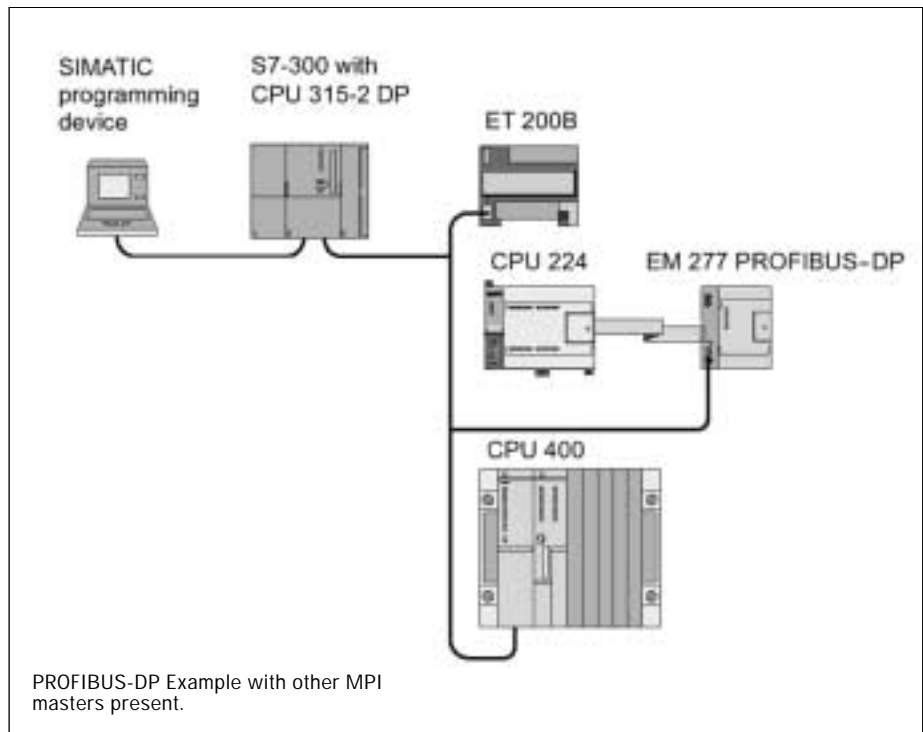
Unlike many DP devices, the EM 277 module does not transfer only I/O data. The EM 277 moves data to and from a block of variable memory defined in the S7-200 CPU. This allows you to exchange any type of data with the master (inputs, counter values, timer values, data memory, etc.).

The EM 277 can also be used as a communication interface to other MPI masters, whether or not it is being used as a PROFIBUS-DP slave. Example connections are:

- S7-300/400 to the S7-200 using the XGET/XPUT
- STEP 7-Micro/WIN and a network card (such as the CP5511) for programming, monitoring, etc.
- TD200 or TP070 operator interface panels.

A maximum of six connections (devices) are allowed; one connection is reserved for a programming device and one is reserved for an operator panel. The other four connections can be used by any MPI master. In order for the module to communicate with multiple masters, all masters must be operating at the same baud rate. There are limitations including:

- cannot be used for communication between S7-200 PLCs using NETR/NETW.
- cannot be used for FreePort communication



Description	EM 277 PROFIBUS-DP
Communication Features	
Number of Ports	1 port
Electrical interface	RS-485
Isolation (external signal to PLC logic)	500 VAC (Galvanic)
PROFIBUS-DP/MPI baud rates (set automatically)	9.6, 19.2, 45.45, 93.75, 187.5, and 500K baud; 1, 1.5, 3, 6, and 12M baud
Protocols	PROFIBUS-DP slave and MPI slave
Cable Length	
Up to 93.75K baud	1200 m
187.5K baud	1000 m
500K baud	400 m
1 to 1.5M baud	200 m
3 to 12M baud	100 m
Network Capabilities	
Station address settings	0 - 99 (set by rotary switches)
Maximum stations per segment	32
Maximum stations per network	126, up to 99 EM277 stations
MPI Connections	6 total, 2 reserved (1 for PG and 1 for OP)
Power Requirements	
Power Consumption	
+5 VDC (from I/O bus)	150 mA
24 VDC Input Power Requirements	
Voltage range	20.4 to 28.8 VDC (Class 2 or sensor power from PLC)
Maximum current	
Module only with port active	30 mA
Add 90 mA of 5V port load	60 mA
Add 120 mA of 24V port load	180 mA
Ripple noise (<10 MHz)	<1 V peak to peak (maximum)
Isolated (input power to module logic)	500 VAC for 1 minute
5 VDC Power on Communication Port	
Maximum current per port	90 mA
Transformer isolation from module logic and from 24 VDC input power	500 VAC for 1 minute
24 VDC Power on Communication Port	
Voltage range	20.4 to 28.8 VDC
Maximum current per port	120 mA
Current limit	0.7 to 2.4 A
Isolated	Not isolated, same circuit as input 24 VDC



Operator Panels

TD200 Text Display

The TD200 text display is the perfect choice for simple text display and offers:



- 2-line x 20 character back-lit LCD display
- 8 function keys, with removable label panel
- up to 80 messages, all stored in the S7-200 CPU
- up to four embedded variables per message
- Allows adjustment of designated program variables
- Ability to force/unforce I/O points
- Ability to set time and date for CPU real-time clock
- Menus and prompts in six languages (English, German, French, Spanish, Italian, and Chinese)
- Multiple character sets to support English, Western European, Slavic, and Chinese languages
- Easy, step-by-step message configuration with STEP7-Micro/WIN wizard

The TD 200 communicates at up to 187.5Kbaud and functions as a network master when it is connected to one or more S7-200 CPUs. The TD 200 is also designed to operate with other masters in a network. Multiple TD 200s can be used with one or more S7-200 CPUs connected to the same network.

TD200 Specifications	
Dimensions	
Front panel (h x w x d)	76 x 148 x 28 mm (3 x 5.8 x 1.1 in.)
Panel cutout (h x w)	68 x 138 mm (2.7 x 5.44 in.)
Display	STN-Graphic Display with LED back-lighting
Keyboard	Membrane keypad / 9 keys / Tab inserts for customer specific labeling
CPU Interface	RS 485 (PPI); 9.6 / 19.2 / 187.5 Kbits/s
Supply voltage	24VDC, (15VDC...30VDC, safety extra low voltage, supplied by PLC, mains adapter, or a 24VDC external supply)
Current consumption	typ. 70 mA, (terminating resistors switched off), max. 120 mA at UN 24V (2A fuse in TD 200)
Inrush current	Max. 0.6A / 15ms
Temperature / Humidity	
operation	0° to 60° C / 5% - 85% non-condensing at 30° C
storage	-20° to 70° C / 5%-93% non-condensing at 40° C
Degree of protection	IP65 (panel mount with gasket), IP20 rear
Agency approvals	UL, CSA, FM, CE
Configuration	STEP7-Micro/WIN32 V3.1 or later

TP070 Touch Panel

For touch applications the TP070 offers a very economical solution.

- 5.7" blue-mode display
- Connection to one S7-200 CPU only at 19.2Kbaud
- Input / Output fields
- State buttons (setting PLC bits, changing screens, online/offline, etc.)
- Overlay bit map graphics on buttons to show different on/off images
- Fixed text up to 2.4cm (0.9in) in height



In general, TP070 projects can contain:

- 10 graphic images per project
- 30 screens per project
- 64 tags
- 10 tags per screen
- 30 controls per screen
- 3 bar graphs per screen
- 100 text strings per project

TP070 Specifications	
Dimensions	
Front panel (w x h)	221 x 156mm (8.7 x 6.2 in.)
Panel cutout (w x h x d)	198 x 142 x 45mm (7.8 x 5.6 x 1.8 in.)
Display	STN, CCFL backlit
MTBF	50,000 hours, display and background
Resolution	320 x 240
Screen area	5.7" blue mode
Keyboard	Touch (analog resistive, 1 million operations)
User Memory	Flash, 128Kb
Clock	Yes, no battery, auto compare with S7-200 clock
CPU Interface	RS 485 MPI at 19.2Kbaud, one CPU only
Supply voltage	24VDC, (18 to 30 VDC)
Current consumption	typ. 200 mA, at 24V
Inrush current	Max. 0.6A / 15ms
Temperature	
installed vertical	0° to 50° C
installed 35° angle	0° to 40° C
storage	-20° to 60° C
humidity / air	<85%, non-condensing / no corrosive gases
Degree of protection	IP65 (panel mount with gasket), IP20 rear
Agency approvals	UL, CSA, FM, CE
Configuration	STEP7-Micro/WIN TP Designer (presently included in the STEP7-Micro/WIN Toolbox)

The TP070 screens are configured with the easy-to-use STEP7-Micro/WIN TP Designer software. This software is included in the STEP7-Micro/WIN V1.0 Toolbox.



Software

STEP7-Micro/WIN32 V3.1

Programming Software

Programming and maintenance for the S7-200 Micro PLC is made easy with our inexpensive STEP7-Micro/WIN32 programming software. This powerful software is very easy to learn, but also offers several features that make it easy to solve even the most difficult automation applications. STEP7-Micro/WIN32 offers:

- The power of Windows, with the easy-to-learn look and feel of common office applications
- IEC-1131 compliance
- Flexible editor choices to suit most any programming preference; STL, Ladder, and Function Block Diagram
- Simple and straightforward program structure
- Symbolic programming, with address and symbol visible simultaneously
- Fast editing with a convenient instruction browser and drag & drop, double-click, or function key placement
- The ability to create your own custom "instructions" by building reusable subroutines and interrupt routines.
- Complete documentation and printing capabilities
- Powerful tools for startup and debugging including on-line status, multiple status charts (with name), memory forcing, program download during run mode (selected CPUs)
- Comprehensive on-line help
- On-line user manuals for the complete S7-200 family of PLC products

STEP7-Micro/WIN32 is a true 32-bit application that runs under Windows 95, Windows 98, or Windows NT V4.0. Hardware that provides acceptable operating performance for these operating systems is recommended. We recommend a minimum of an 80386DX processor or higher, 8MB RAM and 10MB free space on the hard disk. A PC/PPI cable or MPI card is required for communication with an S7-200 CPU.

STEP7-Micro/WIN Toolbox V1.0

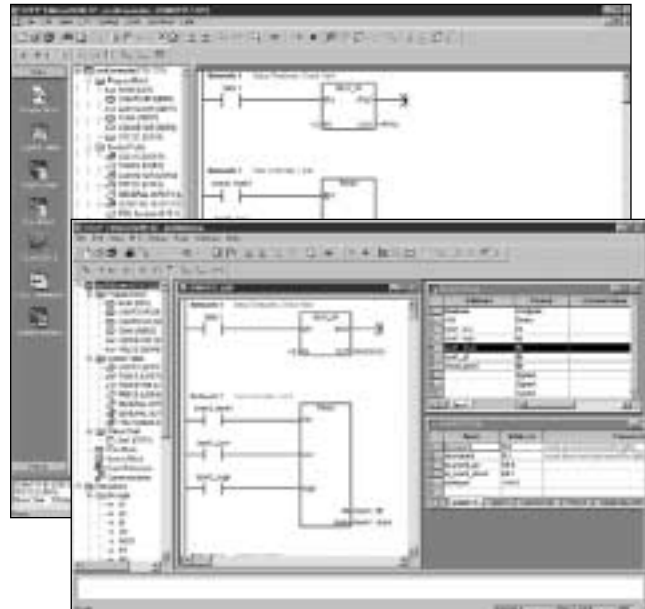
The introductory version of this optional software package contains:

- TP Designer Software
- USS Protocol Instructions

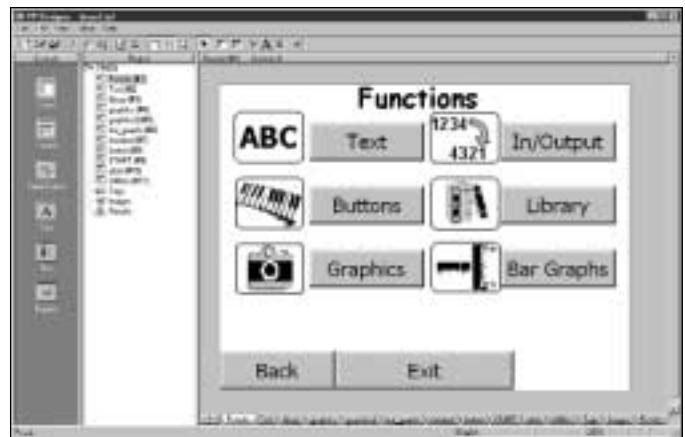
The TP Designer software is used to configure the TP070 Touch Panel display screens. This package provides "what you see is what you get" look at the TP screens as you build them.

If you're using an S7-200 CPU with a MicroMaster drive, then our USS Protocol Instructions can dramatically reduce your program development time. These new instructions are designed to both control the drive and read/write drive parameters.

Windows Look & Feel



Flexible Viewing Options



TP Designer Software for TP070



S7-200 Ordering Information

Model	Description	Catalog No	Price \$
CPUs			
CPU 221	24 VDC Power Supply, 6 x 24 VDC Inputs, 4 x 24 VDC Outputs 120/220 VAC Power Supply, 6 x 24 VDC Inputs, 4 x Relay Outputs	6ES72110AA210XB0 6ES72110BA210XB0	180. 190.
CPU 222	24 VDC Power Supply, 8 x 24 VDC Inputs, 6 x 24 VDC Outputs 120/220 VAC Power Supply, 8 x 24 VDC Input, 6 x Relay Outputs	6ES72121AB210XB0 6ES72121BB210XB0	230. 250.
CPU 224	24 V DC Power Supply, 14 x 24 VDC Inputs, 10 x 24 VDC Outputs 120/220 VAC Power Supply, 14 x 24 VDC Input, 10 x Relay Outputs	6ES72141AD210XB0 6ES72141BD210XB0	330. 350.
CPU 226	24 V DC Power Supply, 24 x 24 VDC Inputs, 16 x 24 VDC Outputs 120/220 VAC Power Supply, 24 x 24 VDC Input, 16 x Relay Outputs	6ES72162AD210XB0 6ES72162BD210XB0	555. 590.
Starter Kits	Includes CPU, STEP7-Micro/WIN 32, S7-200 System Manual, Input Simulator, PC/PPI Cable, and promotional screwdriver. S7-221 AC/DC/RLY Starter Kit S7-221 DC/DC/DC Starter Kit S7-222 AC/DC/RLY Starter Kit S7-222 DC/DC/DC Starter Kit S7-224 AC/DC/RLY Starter Kit S7-224 DC/DC/DC Starter Kit S7-226 AC/DC/RLY Starter Kit S7-226 DC/DC/DC Starter Kit	6ES72980AA300BA0T 6ES72980AA350BA0T 6ES72980AA310BA0T 6ES72980AA360BA0T 6ES72980AA320BA0T 6ES72980AA370BA0T 6ES72980AA330BA0T 6ES72980AA380BA0T	399. 399. 499. 499. 599. 599. 799. 799.
Digital Expansion			
EM 221 Input	8 Points, 24 VDC Digital Input Module	6ES72211BF200XA0	90.
EM 222 Output	8 Points, 24 VDC Digital Output Module, 8 Points, Relay Output Module	6ES72221BF200XA0 6ES72221HF200XA0	100. 125.
EM 223 Combination	4 x 24 V DC Input and 4 x 24 V DC Outputs 4 x 24 V DC Input and 4 x Relay Outputs 8 x 24 V DC Input and 8 x 24 V DC Outputs 8 x 24 V DC Input and 8 x Relay Outputs 16 x 24 V DC Input and 16 x 24 V DC Outputs 16 x 24 V DC Input and 16 x Relay Outputs	6ES72231BF200XA0 6ES72231HF200XA0 6ES72231BH210XA0 6ES72231PH210XA0 6ES72231BL210XA0 6ES72231PL210XA0	135. 135. 170. 180. 320. 350.
Analog Expansion			
EM231 Input	4 Input points, 12 Bit Resolution, 0-5V, 0-10V, +/-2.5 / 5V, or 0 to 20 mA	6ES72310HC200XA0	195.
EM232 Output	2 Output points, 12 Bit Resolution, +/-10V or 0 to 20 mA	6ES72320HB200XA0	185.
EM235 Combination	4 Input points & 1 output point Inputs, 12-bit resolution, 0-50/100/500/100mV, +/-25/50/100/250/500mV, 0-5V, 0-10V, 0 to 20 mA, +/-2.5 / 5V, or +/-1/10V ranges Outputs, 12-bit Resolution, +/- 10 volts or 0 to 20 mA ranges	6ES72350KD200XA0	250.
EM231 RTD Input	2 Input, Resistance Temperature Detector (RTD)	6ES72317PB200XA0	250.
EM231 T/C Input	4 Input, Thermocouple (T/C)	6ES72317PD200XA0	250.
Communications			
EM277 PROFIBUS-DP	PROFIBUS-DP Slave Module, 1 Port, 9.6 Kb to 12 Mb rates, 0 to 99 stations (Requires CPUs with firmware Release 1.1 or later, see above part numbers)	6ES72770AA200XA0	225.
CP242-2	Communications Processor for connecting above listed CPUs to AS-Interface	6GK72432AX000XA0	505.
Software			
STEP-7 Micro/WIN 32	STEP 7 Micro/WIN 32 V3.1 Single License, on CD STEP 7 Micro/WIN 32 V3.1 Upgrade License, on CD STEP 7-Micro/WIN32 Toolbox V1.0 Single License, on CD	6ES78102BC010YX0 6ES78102BC010YX3 6ES78102TC010YX0	295. 150. 99.



S7-200 Ordering Information

Model	Description	Catalog No	Price \$
Operator Interfaces			
TD200 Text Display	2-line x 20 character LCD display with 8 function keys. Includes cable. Powered from CPU, optional external supply available.	6ES72720AA200YA0	250.
Optional TD200 Power Supply	External Power Supply 120 VAC/24VDC for TD200. Required only when the cable distance from PLC is greater than 8.2 ft (2.5m)	6ES77050AA001BA0	70.
TP070 Touch Panel	Touch panel with 5.7" STN blue mode display. Requires external 24V power source. (SITOP or LOGO! power recommended.) Requires PPI cable for download of configuration from PC, and MPI cable for connection to CPU.	6AV65450AA152AX0	495.
TP070 Protective Membrane	Protective Membranes for the TP070 display (pack of 10)	6AV65741AD004AX0	115.
Memory Cards			
MC 291 EEPROM	Optional Memory Transfer Cartridge, EEPROM for the S7-22x CPU Units (Useful for transfer of the user Program Logic and the V-Memory)	6ES72918GE200XA0	30.
MC 297 Clock/Calendar Cartridge	Optional Time of Day Clock/Calendar Cartridge, including 200 day Battery Backup for S7-22x CPU's	6ES72971AA200XA0	45.
Battery Cartridge	Battery Cartridge for S7-22x CPUs. Extends data memory backup (200 days) beyond normal super cap holdup during power outage	6ES72918BA200XA0	30.
Manuals			
S7-200 Manual	SIMATIC S7-200 System Manual for 22x CPUs & I/O (not 1st Gen S7-200)	6ES72988FA218BH0	35.
TD200 Manual	TD200 User Manual	6ES72720AA208BA0	35.
TP070 Manual	TP070 User Manual	6AV65911DC010AB0	35.
Cables			
PC/PPI Cable	Isolated PC/PPI Cable, 5m, converts RS232 (from PC) to RS485 (S7-200 CPU)	6ES79013BF200XA0	120.
MPI Cable	MPI Cable, 5m, used to connect TP070 to S7-200 CPU	6ES79011BF000XA0	32.
I/O Expansion Cable	22x CPU and I/O Bus expansion Cable, 0.8m. Only required when placing expansion modules non-adjacent to the CPU.	6ES72906AA200XA0	60.
Accessories			
SIM 274	8 Input Simulator Switches, for DC Inputs ONLY	6ES72741XF000XA0	110.
Input Simulators	14 Input Simulator Switches, for DC Inputs ONLY	6ES72741XH000XA0	140.
	24 Input Simulator Switches, for DC Inputs ONLY	6ES72741XK000XA0	210.
	Doors & Labels – 4 each, doors and Labels for 22x CPUs and Expansion I/O	6ES72913AX200XA0	50.
SP1	8pt. Connectors – 4 connectors for 8pt. I/O expansion modules	6ES72921AD200AA0	20.
SP3	16pt. Connectors – 4 connectors for 16pt. I/O expansion modules	6ES72921AE200AA0	20.
SP4	224 CPU Connectors – 4 connectors for 224 CPU	6ES72921AG200AA0	20.
PROFIBUS Connectors	PROFIBUS connectors are also used with S7-200 for building custom cables (CPU networks, CPU to operator interface, etc.)		
	90 degree cable outlet without programming port	6ES79720BA110XA0	45.
	90 degree cable outlet with programming port	6ES79720BB110XA0	60.
	90 degree cable outlet without programming port, fast connect capable	6ES79720BA500XA0	45.
	90 degree cable outlet with programming port, fast connect capable	6ES79720BB500XA0	60.
	35 degree cable outlet without programming port	6ES79720BA400XA0	45.
	35 degree cable outlet with programming port	6ES79720BB400XA0	60.

Questions? Try our Microsystems Hotline 1-800-333-7421