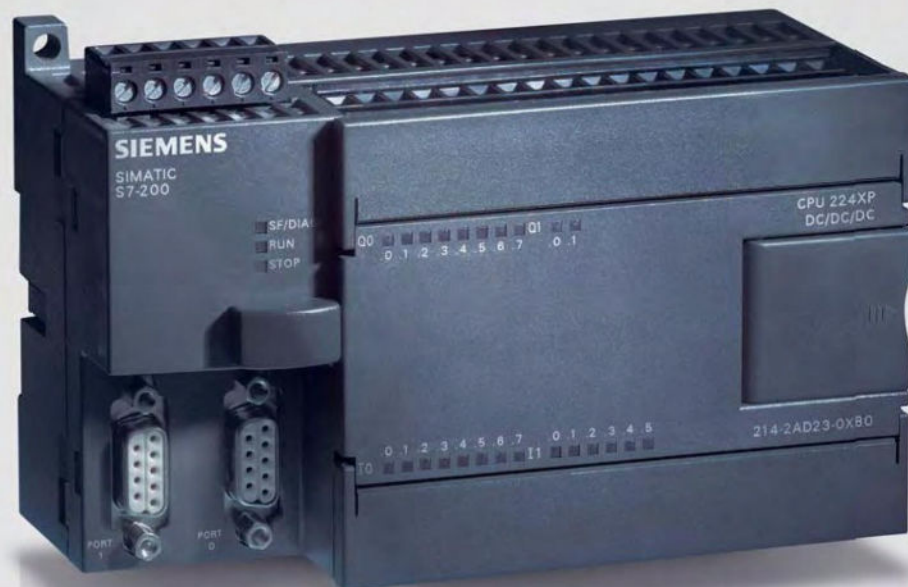# SIMATIC S7-200

Control technology a class of its own

SIMATIC Controller

Answers for industry.

SIEMENS

Connectivity, modularity, compact: So small – and so powerful

The Micro PLC SIMATIC S7-200 is truly in a class of its own: it's both compact and highly powerful – especially considering its real-time response – it's fast, features great communication options and comes with easy-to-operate software and hardware.

But there's more; the Micro PLC SIMATIC S7-200 has a compact modular design – for customized solutions which aren't too large, but flexible enough to be expanded anytime in the future.

All this makes the SIMATIC S7-200 a great choice for open-loop control in the lower performance range. Become one of the thousands of S7-200 customers that constantly benefit from Siemens PLC innovation and lower cost of ownership.

SIMATIC S7-200 delivers consistently economical solutions. The entire system family features
• powerful performance,
• optimum modularity and
• open communications.
In addition, the SIMATIC S7-200 programming tools make your job even easier: this Micro PLC is easy to program allowing fast and easy realization of applications – and the add-on software libraries accelerate special function configuration even more.

This Micro PLC has been in successful use in millions of applications around the world – in both stand-alone and networked solutions.

Find out for yourself what the SIMATIC S7-200 has to offer!
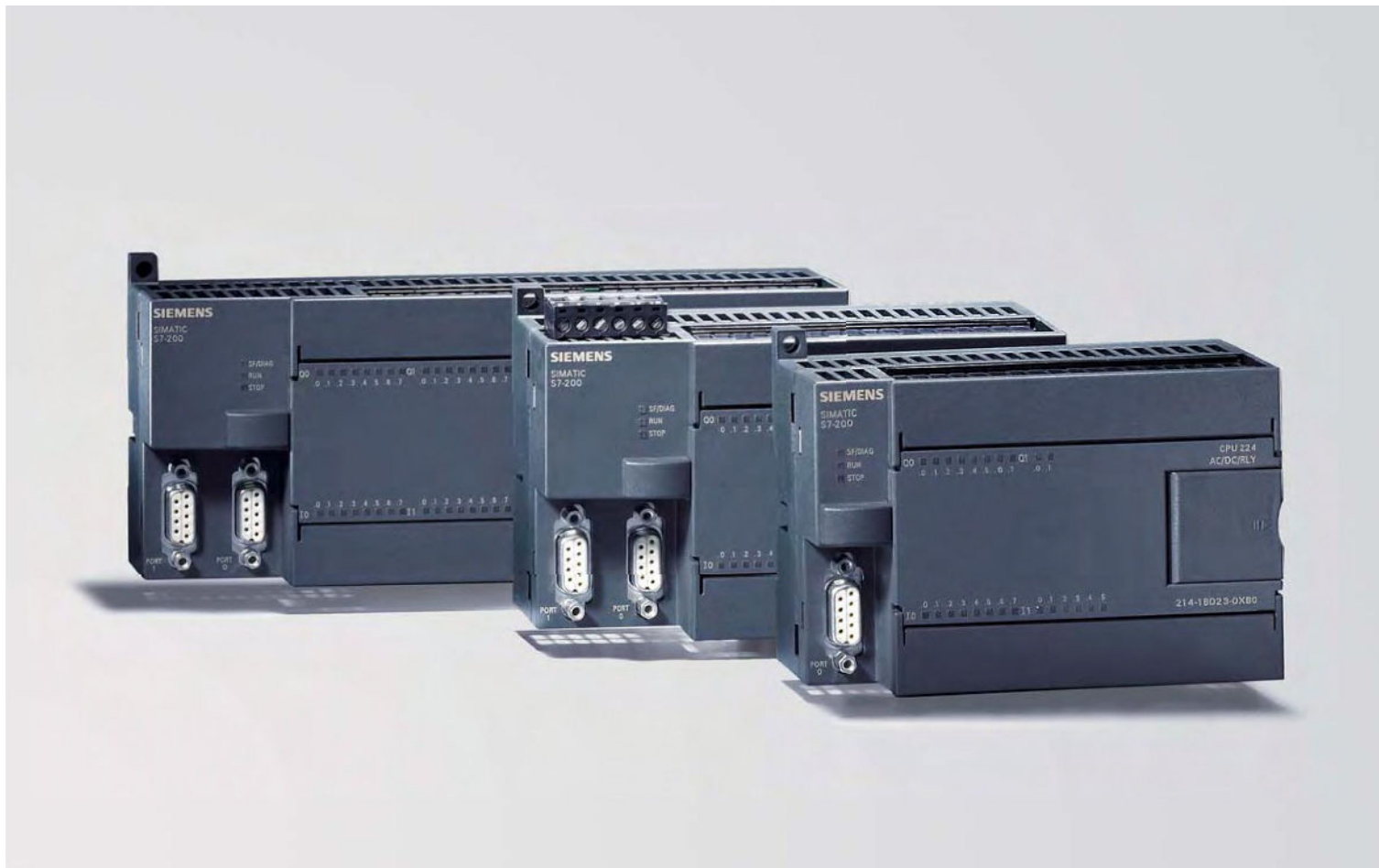
Open communication

- Built-in RS 485 interface with data transmission rates up to 187.5 kbit/s
- PPI protocol system bus for trouble-free networking
- Freeport mode programmable for user-specific protocols for any peripheral devices
- Fast connection to PROFIBUS using the slave module
- Powerful connection to AS-Interface using the master module
- Communications anywhere using the modem module (for remote maintenance, teleservice or telecontrol)
- Connection to Industrial Ethernet via the Ethernet module
- Internet connectivity, e-mail, HTTP, and FTP server functionality using the Internet module
- S7-200 PC Access – OPC Server for simple connection to the PC environment

Powerful performance

- Small and compact – ideal for any applications where space is tight
- Basic and advanced functionality in all CPU models
- Large program and data memory
- Outstanding real-time response – being in total command of the entire process at any time means increased quality, efficiency and safety
- Easy-to-use STEP 7-Micro/WIN engineering software – ideal for both beginners and experts

Optimal modularity

- Systems engineering:
- 5 distinct CPUs in the performance range with comprehensive basic functionality and integrated Freeport communications interface
- A wide range of expansion modules for various functions:
  - Digital/analog expansions, scalable to specific requirements
  - PROFIBUS communication as a slave
  - AS-Interface communication as a master
  - Exact temperature measurement
  - Positioning
  - Remote diagnostics
  - Ethernet/Internet communications
  - SIWAREX MS weighing module
- HMI functions
- STEP 7-Micro/WIN software with Micro/WIN add-on instruction library
- Compelling systems engineering – now featuring precise dimensioning and optimum solutions for a wide range of different requirements for the complete automation task

Fast, intelligent and well-planned:
A system of endless possibilities

Tried and tested worldwide featuring:
- Compact design
- Practical functionality
- Modular expansion options
- Built-in RS 485 serial networking port(s)
- Excellent real-time behavior
- Extremely fast and precise process and sequence control
- Seamless control of time-critical processes by means of timed interrupts
- Simple and user-friendly wiring with removable terminal strips on the CPU and expansion modules – permanent wiring

Highlights
- Memory card for data logging, recipe management, saving of STEP 7-Micro/WIN project, and storage of documentation in various formats
- PID auto-tune function
- 2 built-in serial ports for extended communication options, e.g. with other manufacturers' devices (CPU 224 XP, CPU 226)
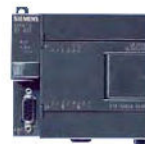- CPU 224 XP with built-in analog inputs/output

CPUs

CPU 221

6 inputs / 4 outputs
not expandable
10 I/O max.

CPU 222

8 inputs / 6 outputs
+ 2 expansion modules max.
94 I/O max.

CPU 224

14 inputs / 10 outputs
+ 7 expansion modules max.
224 I/O max.

Digital and analog expansions

Input modules

Output modules

Input/output modules

Specific expansions

RTD temperature measurement

TC temperature measurement

SIWAREX MS weighing module

Communication

AS-Interface master
CP 243-2
max. 2 modules

PROFIBUS DP slave
EM 277

Ethernet module
CP 243-1
max. 1 module

Operating and monitoring

TD 100C

TD 200 / TD 200C

TD 400C

4

CPU 224XP

14 inputs / 10 outputs
2 AI/1 AO
+ 7 expansion modules max.
224 I/O max.

CPU 224XPsi

14 inputs / 10 outputs
(current sinking digital outputs)
2 AI/1 AO + 7 expansion modules max.
224 I/O max.

CPU 226

24 inputs / 16 outputs
+ 7 expansion modules max.
256 I/O max.

STEP 7-Micro/WIN
• Easy to use
• Windows standard
• Configuration instead of
  programming using Wizards
• Powerful instruction set easy
  to use via drag-and-drop
• Status for LAD, FBD and STL

Input/output modules

• Modular building block system
• Expansion modules can be scaled
  according to requirements
• Digital expansion modules from 4/4 to
  32/32 inputs/outputs

• Analog expansion modules with 4 or 8
  inputs, 2 to 4 outputs, and 4 inputs and
  1 output
• Power modules for switching
  loads: 5 A DC or 10 A relay

Positioning module
EM 253

• Modules for exact temperature
  measurement to a tenth of a degree
  Celsius or Fahrenheit:
  – RTD module for measurement of
    resistance temperature sensors
  – TC module for measurements with
    thermocouples

• EM 253 positioning module for
  controlling stepper motors and servo
  drives
• SIWAREX MS compact weighing module
  for the SIMATIC S7-200

Internet Technology module
CP 243-1 IT
max. 1 module

Modem module
EM 241

GSM/GPRS modem
SINAUT MD720-3

• Integrated PPI interface as S7-200
  system bus or as freely programmable
  interface – for connecting printers,
  barcode scanners, etc.
• From CPU 222 upwards PROFIBUS-
  capable via PROFIBUS DP slave module
• From CPU 222 upwards functionality as
  AS-Interface master via AS-Interface
  module

• EM 241 modem module with complete
  functions for PLC communications such
  as remote maintenance, telecontrol,
  remote diagnostics, reporting, remote
  data transmission, etc.
• CP 243-IT, Internet Technology module
  for communication via FTP, e-mail or
  HTTP
• SINAUT MD720-3 GSM/GPRS modem;
  IP communication via GSM NET;
  quadband
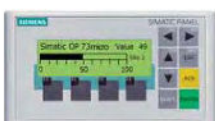
OP 73micro
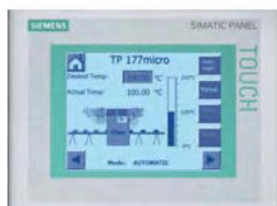
TP 177micro

TD 100C
• Reflective 4-line LCD screen
• Up to 14 configurable keys
• Customizable operator interface
TD 200
• Backlit 2-line LCD screen
• 8 programmable function keys
TD 200C
• Backlit 2-line LCD screen
• Up to 20 configurable keys
• Customizable operator interface
TD 400C
• Backlit 4-line LCD screen
• Up to 15 configurable keys with
  audible, visible, and tactile feedback
• Customizable operator interface

OP 73micro
• 3" pixel graphic LCD screen
• Signaling system with definable signal
  classes
• 5 online languages incl. Asian and
  Cyrillic scripts
TP 177micro
• 5.7" pixel graphic LCD screen, suitable
  for horizontal or vertical mounting
• Signaling system with definable signal
  classes
• 5 online languages incl. Asian and
  Cyrillic scripts

For service, networking, remote control and more: Communication at every level

The communications possibilities of the Micro PLC SIMATIC S7-200 are unique. The built-in RS 485 interfaces can operate at data transmission rates up to 187.5 kbit/s functioning as follows:

- As a system bus with a maximum of 126 stations. In this capacity, it is possible to network programming devices, SIMATIC HMI products and SIMATIC CPUs without a problem. The integrated PPI protocol is used for pure S7-200 networks supporting multiple masters from a single port. In a network consisting of other Siemens components (SIMATIC S7-300/400 and SIMATIC HMI, etc.), the S7-200 CPUs are integrated as MPI slaves.
- In Freeport mode (up to max. 115.2 kbaud) with user-specific protocols (e.g. ASCII protocol).
  This means the SIMATIC S7-200 is open for any connected device; for example, it enables connection of a modem, bar-code scanner, PC, non-Siemens PLC and much more.
  By means of the USS protocol for drives, as many as 32 Siemens frequency converters can be controlled without additional hardware.
- The Modbus RTU Library included in the package also enables connection to a Modbus RTU network as a Master or a Slave.

OPC Driver with PC Access

PC Access is the ideal basis for data exchange between S7-200 and a connected PC – regardless of the communication link selected (PPI, modem, Ethernet/IT CP). As an OPC Server, PC Access offers you the option of writing or reading S7-200 data with Microsoft Excel, or any other OPC client application. As an OPC Client, it can be used for ProTool Pro, WinCC flexible RT, Win CC, etc. With capability up to 8 connections, the configuration, programming and monitoring can be implemented from a central location, saving both time and money.

The Internet Technology module CP 243-1 IT also offers you fast access by permitting a simple universal connection of the PLC to different computers by means of FTP, HTTP, JAVA, and e-mail. The Ethernet module CP 243-1 allows you to access S7-200 process data quickly over Ethernet for archiving or further processing. The configuration support from STEP 7-Micro/WIN ensures simple commissioning and convenient diagnostic options.

Modem communications
The S7-200 CPUs can be accessed nearly anywhere in the world by modem via wired network or radio.
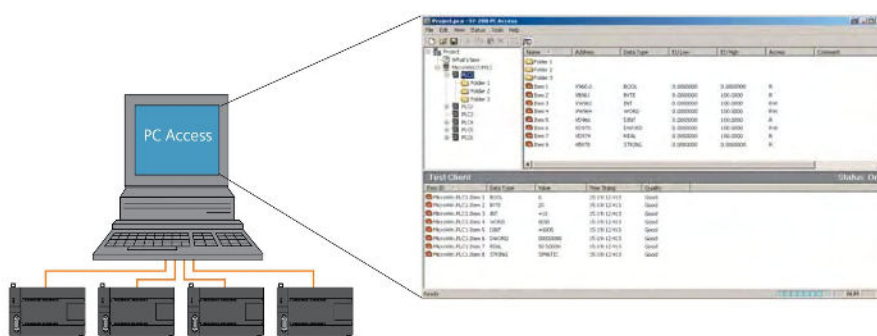
- Teleservice: the modem communication option is useful for avoiding expensive service calls. Two modems are all you need for remote use of the complete range of functions such as program transfer, status or control; the communications tools are integrated as a standard feature. External modems can be used as local modems.

- Telecontrol: you can call up messages and measured values via modem as well as define new setpoints or commands. In this case, one base station S7-200 can control a nearly unlimited number of remote stations. The protocols for data transmission are freely selectable, e.g. for text messages directly to a cell phone, error messages to a fax machine or Modbus RTU.
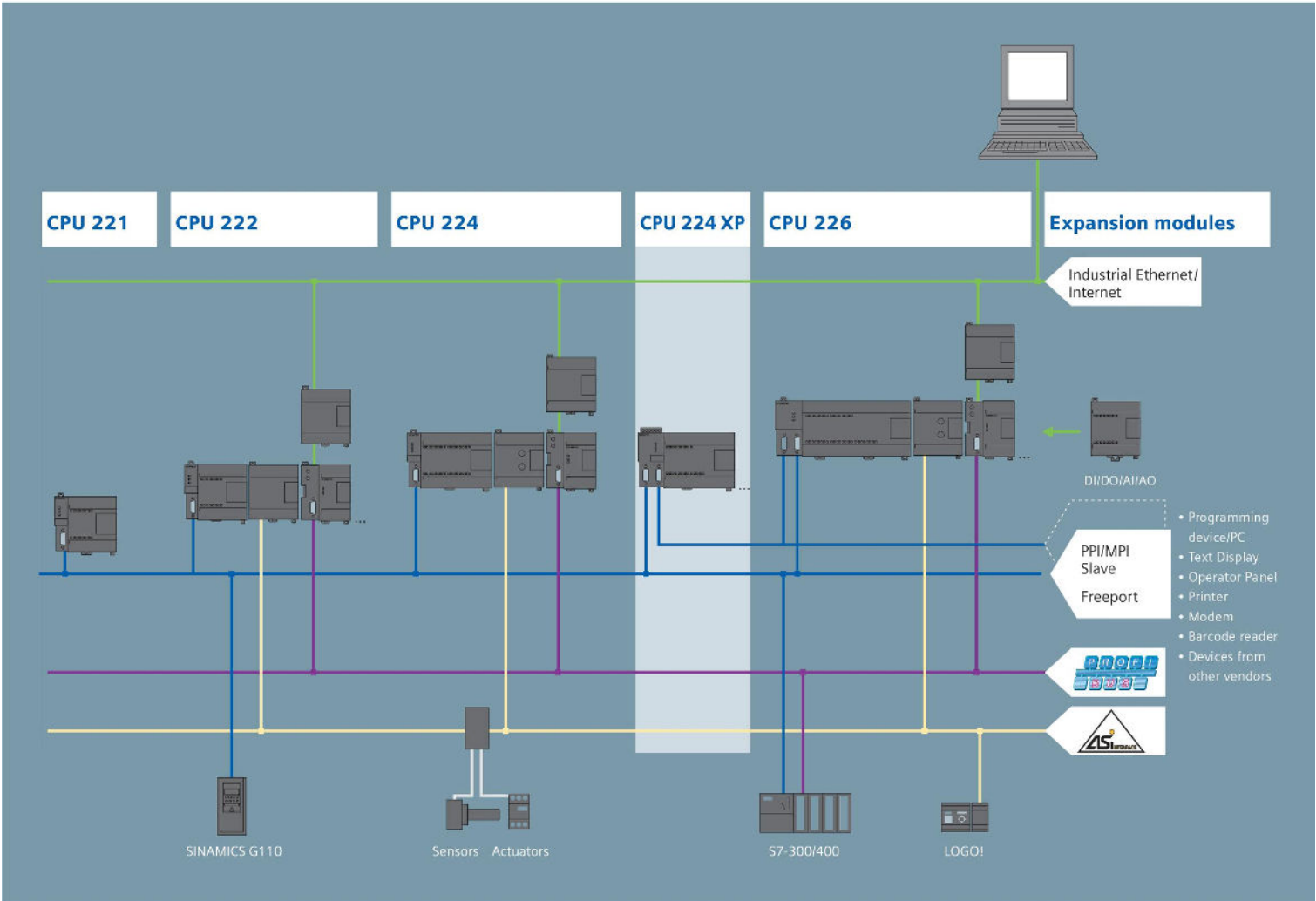
Speedy PROFIBUS connection
All CPUs from 222 upwards can be run via the EM 277 communications module as a norm slave on a PROFIBUS DP network with a transmission rate of up to 12 Mbit/s. This open feature of the S7-200 to higher-level PROFIBUS DP control levels ensures you can integrate individual machines into your production line. With the EM 277 expansion module, you can implement PROFIBUS capability of individual machines equipped with S7-200.

Powerful AS-Interface connection
The CP 243-2 turns all CPUs from 222 upwards into powerful masters on the AS-Interface network. According to the new AS-Interface specification V 2.1, you can connect up to 62 stations, making even analog sensors easy to integrate. With AS-Interface, you can connect up to 248 DIs + 186 DOs in the maximum configuration. The max. number of 62 stations can include up to 31 analog modules. The configuration of the slaves and reading/writing of data is supported by the handy AS-Interface Wizard.

CPU 221   CPU 222   CPU 224   CPU 224 XP   CPU 226   Expansion modules

Industrial Ethernet/
Internet

DI/DO/AI/AO

PPI/MPI
Slave

Freeport

- Programming
  device/PC
- Text Display
- Operator Panel
- Printer
- Modem
- Barcode reader
- Devices from
  other vendors

SINAMICS G110   Sensors   Actuators   S7-300/400   LOGO!

So easy to use:
The software for plug & play

The STEP 7-Micro/WIN programming software features time-saving and powerful tools – and that means great cost savings in your day-to-day work. Operation of the programming software is the same as standard Windows applications. Micro/WIN contains all the necessary tools for programming the entire S7-200 range of controllers. You have the powerful SIMATIC instruction set at your disposal and you can program in accordance with IEC 1131.

A host of functions such as Trend Charts and wizards now make programming even easier. And STEP 7-Micro/WIN 4.0 has even more to offer: e.g. segmented data memories, improved handling of the program and command structure or diagnostic functions such as a user-specific LED configuration error history, and runtime edit and online download.
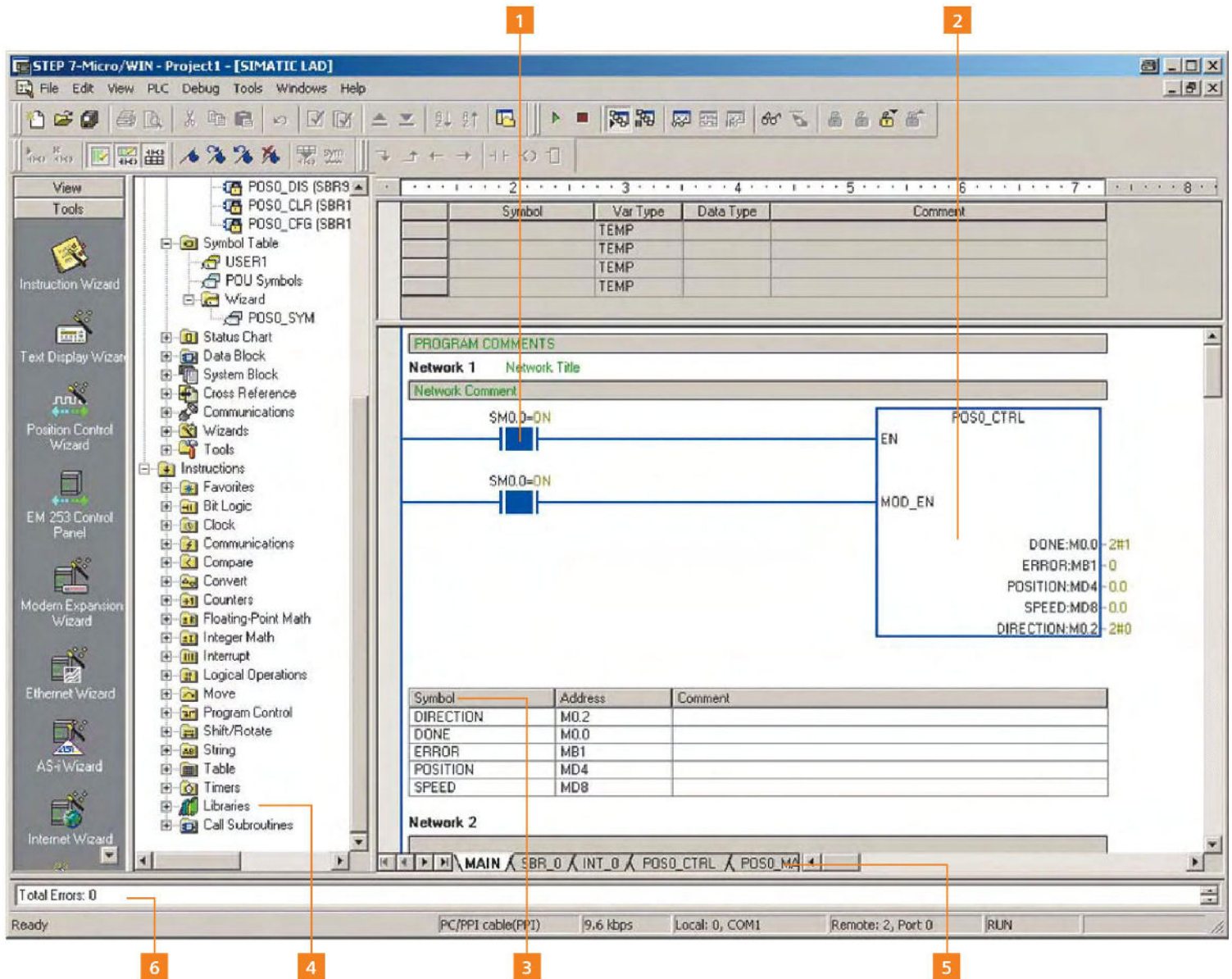
Programming in the standard editors LAD, FBD and STL – and it's easy to change between them.

1 Integrated online functions:
  • Runtime edit
  • Online status

2 Context-sensitive online help is possible for all functions

3 Clear and informative symbols and symbol table
  • Standard symbol table
  • User-defined table

4 Structured programming with libraries
  • USS protocol for actuating drives
  • Modbus library
  • User-defined libraries

5 Structured programming with subroutines
  • Parameterizable subroutines
  • Password-protected subroutines
  • Multiple calls of subroutines in user program
  • Import/export of subroutines possible

6 Debugging
  • Fast online debugging
  • Fault localization at the click of a mouse

Software add-ons
**SIMATIC WinCC flexible Micro –
OP 73micro and TP 177micro**
A special, low-cost engineering software has been developed for configuration of the OP 73micro and TP 177micro HMI panels with WinCC flexible: WinCC flexible Micro. It goes without saying that the Compact/Standard/Advanced versions can also be used. Simple and quick configuration possible by means of a clear user interface, pre-generated graphics objects, intelligent tools for graphic configuration and support of

STEP 7-Micro/WIN - Project1 - [SIMATIC LAD]

File Edit View PLC Debug Tools Windows Help

View

Tools

Instruction Wizard

Text Display Wizard

Position Control Wizard

EM 253 Control Panel

Modem Expansion Wizard

Ethernet Wizard

AS-i Wizard

Internet Wizard

POS0_DIS (SBR9
POS0_CLR (SBR1
POS0_CFG (SBR1
Symbol Table
USER1
POU Symbols
Wizard
POS0_SYM
Status Chart
Data Block
System Block
Cross Reference
Communications
Wizards
Tools
Instructions
Favorites
Bit Logic
Clock
Communications
Compare
Convert
Counters
Floating-Point Math
Integer Math
Interrupt
Logical Operations
Move
Program Control
Shift/Rotate
String
Table
Timers
Libraries
Call Subroutines

	Symbol	Var Type	Data Type	Comment
		TEMP		
		TEMP		
		TEMP		
		TEMP		

PROGRAM COMMENTS

Network 1   Network Title

Network Comment

SM0.0=ON   EN   POS0_CTRL

SM0.0=ON   MOD_EN

DONE:M0.0 - 2#1
ERROR:MB1 - 0
POSITION:MD4 - 0.0
SPEED:MD8 - 0.0
DIRECTION:M0.2 - 2#0

Symbol	Address	Comment
DIRECTION	M0.2	
DONE	M0.0	
ERROR	MB1	
POSITION	MD4	
SPEED	MD8	

Network 2

MAIN SBR_0 INT_0 POS0_CTRL POS0_MA

Total Errors: 0

Ready   PC/PPI cable(PPI)   9.6 kbps   Local: 0, COM1   Remote: 2, Port 0   RUN

multilingual configurations. A PC/PPI adapter cable is required for downloading the configuration.

SINAUT Micro SC –
GRPS modem SINAUT MD720-3
Wireless bi-directional communication between S7-200 controllers and the SINAUT MD720-3 modem is provided via GRPS and the new GRPS management with the aid of the OPC routing software SINAUT Micro SC. Using quadband modem technology, most mobile radio providers with GRPS network can be utilized.

GRPS and the Internet guarantee worldwide, fast communication and short transmission times – at low costs, as only the transferred data volume is charged.

SIWATOOL MS –
SIWAREX MS weighing module
SIWAREX weighing technology is easily integrated with the aid of the STEP 7-Micro/WIN program instructions that are included with the SIWATOOL engineering software. Ready-to-use "Getting Started" application examples are also provided. The SIWATOOL MS

software configures the SIWAREX MS weighing module using standard Windows dialogs – without requiring specific PLC knowledge. Fast troubleshooting is ensured in online mode with a host of diagnostic options provided by the SIWATOOL MS.

Easier than ever: Convenient wizards

STEP 7-Micro/WIN supports even the most complex automation solution with the following user-friendly wizards:

- TD 100C, TD 200, TD 200C, TD 400C
- PID loops
- High-speed counters
- NetRead-NetWrite
- AS-Interface Wizard
- Ethernet/Internet Wizard
- Positioning Wizard
- Positioning Control Panel
- Modem
- Data Logging
- PID Auto-Tune Control Panel
- PTO (pulse outputs)
- Recipe management
- SIWAREX MS
- Modbus RTU
- USS protocol

The most important benefits of the wizards

- Parameterization instead of programming
- Graphical configuration of complex tasks
- Automatic check of available memory area
- Automatic generation of program logic and subroutines
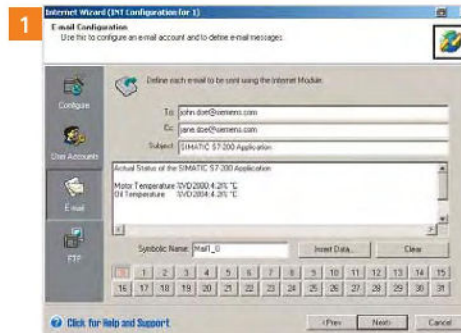
IT Wizard
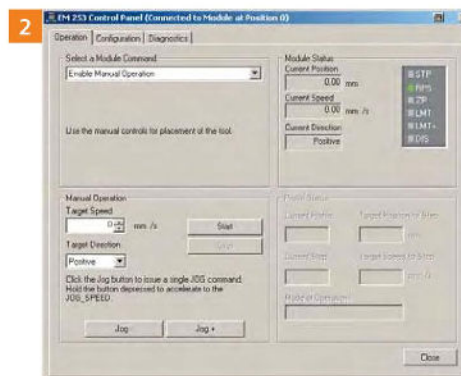
Control Panel
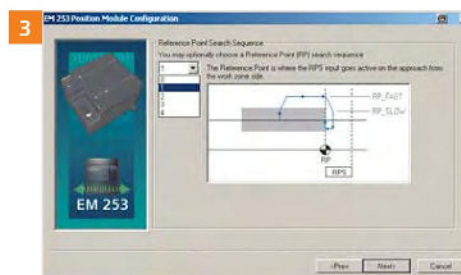
Positioning Wizard

IT Wizard

- Configuring of access authorization, e-mail, and FTP
- Parameterization of data exchange over Ethernet, i.e. CPU to CPU

Control Panel

- Start-up tool for motion applications
- Adaptation and testing of the position parameters
- Modification of traverse profiles

Positioning Wizard

- Parameterization of machine data
- Generation of different traverse profiles
- Selection of different types of reference point approaches

Perfect match:
# S7-200 and Micro Panels

With the SIMATIC Micro Panels, we can offer you an excellent solution for operator control and monitoring from a single supplier that was specially designed for SIMATIC S7-200. The panels perfectly match the S7-200 controller. For you this means less configuring expense. The panels' plug & play functionality ensures perfect interaction of all components. You decide which panel is right for you.*

For simple applications, there are TD panels which can be customized and used whenever narrow space requirements matter.

Coming with the matching software...
Using the innovative WinCC flexible Micro development software, the OP 73micro and TP 177micro panels can be easily configured – at the highest possible automation level.
Text displays TD 100C, TD 200, TD 200C, and TD 400C are configured using the SIMATIC STEP 7-Micro/WIN software.
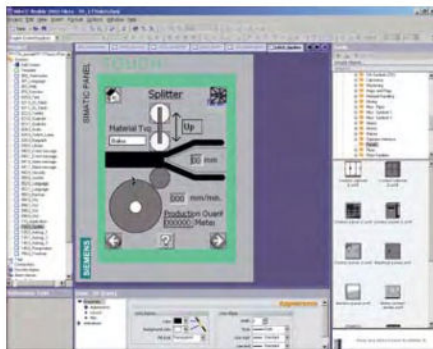
* We take compatibility very seriously – for this reason, you can of course connect any other panel from our SIMATIC HMI range to the S7-200.

**Text display
TD 100C**

- 4-line reflective backlit screen for viewing text with 16 characters per line
- Up to 14 user-configurable keys
- User-defined display layout
- Representation, position and size of the keys can be configured as desired
- Password protection of all functions
- Up to 40 alarms can be easily configured
- Simplified Asian and Cyrillic fonts
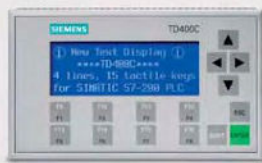

**Text displays
TD 200 and TD 200C**

- Backlit high-contrast LCD screen, 2-line
- Up to 80 text messages with integrated variables
- Configuration is saved on the S7-200: intervention in the control program is possible via input of setpoints
- Setting of inputs and outputs (password protection of all functions)
- 5 online languages
- Simplified Asian and Cyrillic fonts
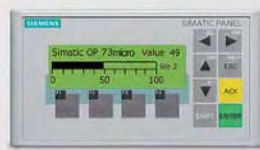
Extras for TD 200
- 8 user-configurable function keys in fixed arrangement
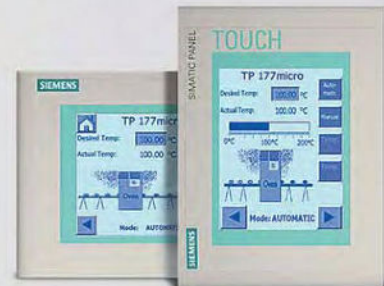
Extras for TD 200C
- Up to 20 user-configurable keys
- User-defined display layout
- Representation, position and size of the keys can be configured as desired

| Text display | Graphics Operator Panel | Touch Panel |
| TD 400C | OP 73micro | TP 177micro |

- Backlit, high-contrast LCD screen, 4-line
- Up to 80 text messages with integral variables
- Configuration stored in S7-200: Control program can be manipulated via setpoints
- Setting inputs and outputs (password protection for all functions)
- 6 online languages
- Simplified Asian and Cyrillic character sets
- Up to 15 permanently assigned tactile keys. Can be used for multiple functions
- Audible and visible feedback can be programmed with the TD 400C in addition to the tactile feature of the keys
- User-selectable operator interface layout
- Design (colors, images, text, etc.) of the operator interface can be defined individually

The compact kid among the panels. Simple in detail, but full of functionality.

- Full graphic 3" LCD screen: bitmaps, bars, different font sizes, Cyrillic font
- End-to-end message system with user-definable message classes (e.g. for operating and fault messages) and message history (128 entries)
- 5 online languages (incl. Asian and Cyrillic fonts)
- Access protection (password system)

For demanding users who appreciate a fully capable graphic display as well as touch functionality, the TP 177micro is the right solution containing all of the required basic functions.

- Intuitive use via 6" touch screen
- More choices of application through vertical installation
- Improved graphics options thanks to vector graphics blue mode (4 levels of blue)
- Efficient and flexible message system for increased plant transparency
- Display of machine and plant states for defined message classes
- Transparent process visualization
- Optimal readability
- **NEW:** Trend display

# Expandable, flexible and powerful: Extras to meet any needs

Real-time response

The advanced technology down to the last detail ensures our CPUs deliver excellent real-time response rates:

- 4 or 6 independent hardware counters, each with 30 kHz, 2 x 200 kHz with a CPU 224 XP, e.g. for precise path monitoring with incremental encoders or for high-speed counting of process events
- 4 independent alarm inputs, input filter time 0.2 ms to program action – for maximum process safety
- Pulse-capturing function for signals > 0.2 ms for fast events from the application
- 2 pulse outputs, each 20 kHz, or 2 x 100 kHz with CPU 224 XP with pulse-width modulation and pulse-no-pulse setpoint – e.g. for controlling stepper motors
- 2 timed interrupts starting at 1 ms and adjustable in increments of 1 ms – for bumpless control of rapidly changing processes
- Fast analog inputs – signal conversion with 25 µs, 12-bit resolution
- Real-time clock

Timed interrupts

- Between 1 and 255 ms, with a resolution of 1 ms
- For example: it is possible to record and process signals on screw insertion machine at 3000 RPM after just a quarter turn. This enables very precise recording, for instance, of tightening torques to ensure optimum fastening of the screw.

Schematic representation of a process with real-time requirements
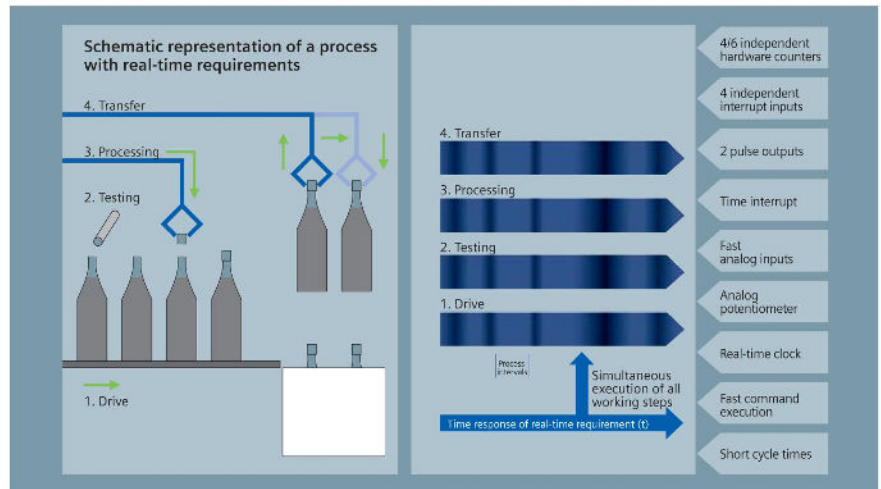
Fast counters

- Operating independently of each other, of other operations and of the program cycle
- Interrupt triggering when user selectable counted values are reached – reaction time from the detection of an input signal to switching of an output is 300 µs
- 4-edge evaluation when incremental position encoders are used for exact positioning

Alarm inputs

- 4 independent inputs
- For registering signals in rapid succession
- Response time of 200 µs–500 µs for signal detection/300 µs for signal output
- Response to positive-going and/or negative-going signal edge
- Max. 16 interrupts in one queue depending on prioritization

Feature	CPU 221	CPU 222	CPU 224 CPU 224XP CPU 224XPsi	CPU 226
Independent hardware counters	4	4	6	6
Independent alarm inputs	4	4	4	4
Pulse outputs	2	2	2	2
Time interrupts	1 to 250 ms	1 to 250 ms	1 to 250 ms	1 to 250 ms
Real-time clock	optional	optional	integrated	integrated
Binary processing speed	0.22 µs	0.22 µs	0.22 µs	0.22 µs

Great well-rounded technology

SITOP smart – optimally matched to SIMATIC S7-200

SITOP smart is one of the narrowest DIN rail mounted power supply units and exhibits an impressive overload behavior. Even high loads can be switched on without any problems. Nominal outputs of continuous 120 percent position the power supplies as the most reliable of their class. Numerous certifications simplify their universal and worldwide use, as well as their deployment under hazardous conditions.

For tough customers: SIPLUS extreme

Operating under extreme conditions? No problem! If you have to operate your system in an extended temperature range, require added condensation protection or demand other voltage ratings, then SIPLUS extreme is the solution for you. It lets you adapt your CPUs to your special requirements.

Memory cartridge

EEPROM memory modules

A small optional EEPROM memory module can save you a lot of time and cost. It makes it very easy to copy, update or exchange your user program on the device. And if necessary, you can use this module to send a program quickly and inexpensively to your customers. You just shut off the power, plug in the module, turn it all back on – and the program is instantly updated. Whether project documentation, recipe handling or data logging – our memory modules are available with 64 KB or 256 KB.

Available options
Project documentation
• Bitmap files, PDF files, DOC files
• Complete STEP 7-Micro/WIN projects can be transferred to the memory card with S7-200 Explorer – giving you onsite access to the current user data at all times even without STEP 7-Micro/WIN

Recipe handling
• Definition and download of the recipes, e.g. production data, machine parameters, etc.
• Better use of memory by occupying the data memory in the CPU with only one recipe: online updating and adaptation

Data logging
• Dynamic storage, e.g. of performance or statistics data and fault or error messages
• Optionally with time stamp
• Log file transferable to PC via S7-200 Explorer

Small and practical

Battery module

To ensure no user data is lost, you can use the optional battery module for long-term backups to extend backup time from the roughly 5 days of internal backup to, in general, a total of 200 days.

Real-time clock

Whether you need to count operating hours, warm up rooms or attach a time stamp to messages: the integrated real-time clock on the S7-200 runs to the minute and to the day via the software according to your settings – even in leap years. Including automatic daylight saving time switchover.

Analog potentiometers

With the integrated analog potentiometers on the S7-200, you can optimize the process sequence almost "according to feel" without a PC or HMI. They let you fine-tune the contents of data registries, time values, preassigned counter values or other parameters without meddling with the program. This is a practical way, for example, to change a welding time or delay time quickly and directly.

Further information ...

... about SIMATIC S7-200
on the Internet: www.siemens.com/s7-200
• Command list (Quick Reference Card)
• Tips & tricks
• Demo software
• Free software updates
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