S7-1500 Advanced Controllers

Advanced Controllers

siemens.com/controller

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Advanced Controller SIMATIC S7-1500

Increased productivity with the ultimate power

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The SIMATIC Controllers portfolio offers always the right controller – plus integrated added value!

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Engineered with TIA Portal

System performance

Advanced Controllers
SIMATIC S7-1500

Software Controllers
SIMATIC S7-1500

Distributed Controllers
SIMATIC ET 200 CPU

Basic Controllers
SIMATIC S7-1200

Application complexity

- **Efficient engineering**
- **Innovative design**
- **Reliable diagnostics**
- **Safety Integrated**
- **Security Integrated**
- **Technology Integrated**

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Performance ↑

Application Complexity →

S7-1500: Advanced Control

- Applications requiring higher memory, high speed, large number of communication connections

- Complex automation architectures that require many HMI's, drives and other field devices

   - *O&G, automotive, aerospace, railway, amusement park rides, printing, F&B, semiconductor, etc…*

S7-1200: Bas...

- Perfect for stand-alone s...

- *Waste Water treatment, ca... elevators/escalators, pump... compressor control systems, material handling and packaging, etc…*

SIMATIC S7-1500 Reference Applications
Industries across the board!

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✓ **O&G Ind.,** Blow Out Preventer (BOP)

✓ **Rubber Ind.,** Automation of Rubber Mixing Room

✓ **HVAC Ind.,** Fin Press Machine

✓ **Appliance Ind.,** Tub Production – Washing Machines

✓ **Gas/Steam Ind.,** Automation of Natural Gas Compressor

✓ **Aluminum Man. Ind.,** Assembly machine

✓ **Printing Ind.,** Cooling Water Re-circulation System
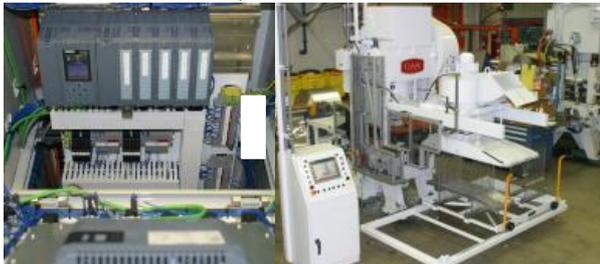
✓ **Waste Water Ind.,** Plant Automation

Advanced Controller – SIMATIC S7-1500 CPU
Increased productivity through ultimate power

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Security Integrated +

- Integrated copy and know-how protection function secures intellectual property
- Improved protection against manipulation and cyber threats (authentication)

Safety Integrated +

- One controller for standard and fail-safe tasks, one network for standard and failsafe communication
- High-density channels of a failsafe IO module can be directly addressed from the engineering

High Performance +

- Higher productivity and product quality thanks to the backplane bus and shortest reaction times
- PROFINET with deterministic time response ensure reproducibility and precision within µs
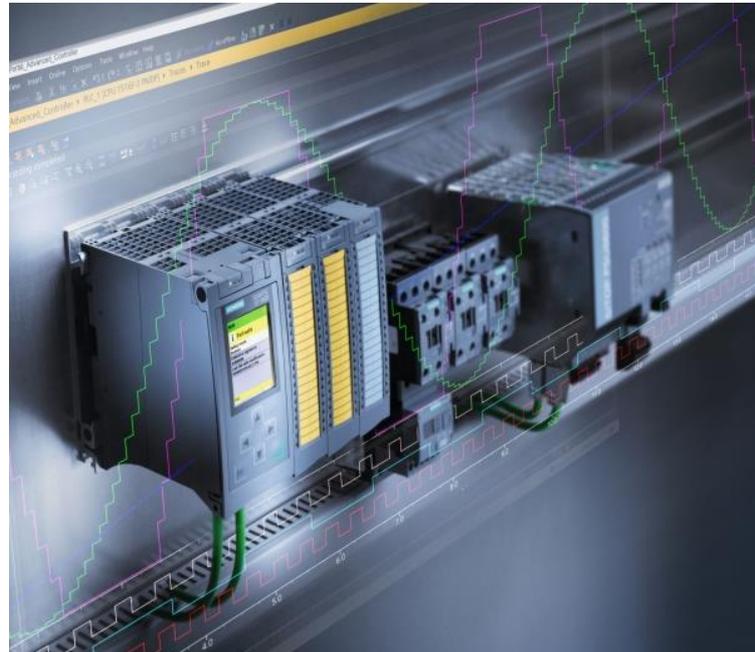
Efficient Engineering +

- Support of all IEC 61131-3 programming languages(LAD/FBD, STL, SCL and Graph)
- Integration of high-level language (C/C++) for Multifunctional Platform CPU 1518(F)-4 PN/DP MFP through SIMATIC ODK 1500S

Reliable Diagnostics +

- The automatic generation of system and user diagnostics enables quick error detection
- Any errors can be quickly localized on-site thanks to 1:1 LED channel assignment

Technology Integrated +

- Simple to complex Motion Control task can be programmed directly in the controller (e.g. speed-controlled axes, camming, …)
- A variety of technology functions can be implemented with I/O modules (e.g. PWM)

Innovative Design +

- CPU display supports diagnostics, initial commissioning and service (tag status, IP address assignment, backup, …)
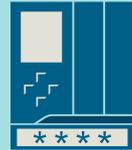- Convenient wiring thanks to pre-wiring position of the I/O modules and jumper links

Advanced Controller – SIMATIC S7-1500 CPU
Innovative system functions for more productivity!
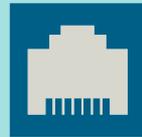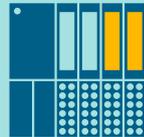
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Know-how and copy protection

Authentication and user administration

Firewall & VPN (Virtual Private Network)

Protection of the intellectual property and investment spent

… thanks to security integrated function, like access, know-how and manipulations protection

Completely integrated safety features

… a single engineering environment for the standard and the safety-related automation

Predictive maintenance and digital services through data analysis with Mindsphere (Siemens Cloud for Industry)

… continuous monitoring of the machine performance and precise planning of the service assignment

Advanced Controller – SIMATIC S7-1500 CPU
Increased productivity through ultimate power

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SIMATIC S7-1500

Feature / Function		Benefit
Efficient Engineering • Support of various programming languages (LAD/FBD, STL, SCL and Graph and C/C++[1])	▶	• Efficient commissioning and service through innovative download behavior • Flexible and free program design
Simplified Maintenance • Thanks to standardized machine and plant diagnosis ProDiag • Integrated system diagnosis possible throughout all system components	▶	• Efficient diagnostics of process disruptions • Fast spotting of automation system failures
Integrated Trace Feature • Trace Editor integrated in the engineering • Trace View also part of the web server	▶	• Program and application diagnostics in real time to spot even sporadic failures • Error debugging without engineering
Highest user-friendliness • Common front connector • Pre-wiring position	▶	• Simple handling of wiring and easy commissioning directly at the device
High connectivity • OPC UA data access on the CPU	▶	• Vertical connection also to 3rd party devices and up to the ERP level

[1] C/C++ as library function or independent applications with the Multifunctional Platform CPU 1518(F)-4 PN/DP MFP

Flexible Options for all applications
Overview

Models available:

- **Standard** – *base CPUs*

- **Safety** – *will fail in a safe state – rated for E-Stop buttons, etc…*

- **Redundant** – *for applications with requirements for high availability, (i.e. a backup PLC)*

- **Technology** – *high level motion control (absolute gearing, camming, kinematics, etc…)*

- **Multi-Functional Platform (MFP)** – *PLC and separate C/C++ cycle on one HW*

- **Compact** – *inputs/outputs "built into" CPU*

- **SIPLUS Extreme** – *ruggedized from factor for harsh environments*

SIMATIC controller

Advanced Controller – SIMATIC S7-1500 Compact CPU
The Advanced Controller in compact design and footprint

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SIMATIC S7-1500C:

- CPU 1511C-1 PN
- CPU 1512C-1 PN

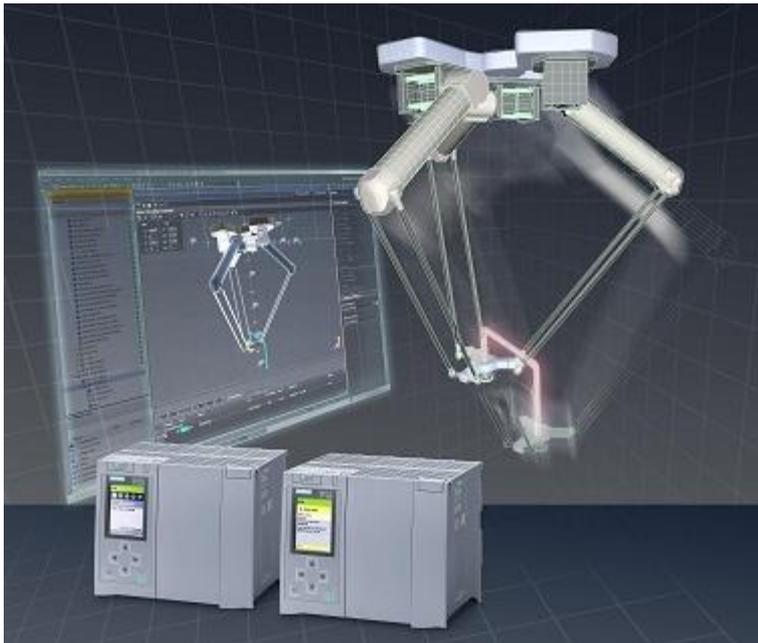| Feature / Function		Benefit
Two compact CPUs with integrated analogue and digital inputs and outputs • CPU 1511C-1PN • CPU 1512C-1PN	▶	• Well-priced entry level model of the S7-1500 system with periphery on board and a high number of integrated technological functions • Reduced variety of parts and types

• **Integrated counting measurement or frequency measurement with 100 kHz fast inputs**
 • **Integrated 100 kHz fast outputs, usable for:**
   • PTO – stepping motor control
   • PWM – pulse width modulation
   • Frequency output
	▶	• Technological functionality integrated with on-board periphery
		 • Integrated technological functions for an easy and direct device connection, e.g. step drives, valves, …

Less width with combined integrated inputs and outputs as 25 mm wide Push-In contacts	▶	• Especially space-saving construction form by retaining the system characteristics of the S7-1500

SIMATIC S7-1500, Technology CPU
Scalable motion control in the advanced controller portfolio

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SIMATIC S7-1500T:

- *CPU 1511T/TF*
- *CPU 1515 T/TF*
- *CPU 1516 T/TF*
- *CPU 1517T/TF*

TO Kinematics:

Feature / Function	Benefits
Extended Motion Control functions: • Speed-, positioning axis • Gearing • Camming • Kinematics with up to 4 interpolating axis	**Simple programming of sophisticated Motion Control functions:** • in the well known SIMATIC environment • for a high machine flexibility • E.g. Pick & Place, assembly or handling tasks based on PLCopen
Kinematic configurator and trace with path recording and kinematic control panel	**Simple 3D visualization and diagnosis** of movements as well as **comminsioning** of the kinematics
Cam editor integrated in the TIA Portal • Simple definition of non-linear dependencies between leading and following axes	**High engineering efficiency** through • graphic-based and tabular configuration • optimization of cams
Consistent functionality and programming of S7-1500 throughout to S7-1500 T-CPU	**Seamless extension** of the Motion Control functionality of a standard CPU in TIA Portal
Failsafe PLC with extended Motion Control functions	Standard automation, Motion Control and safety functions **inside one CPU**

SIMATIC S7-1500, Technology CPU
*Motion control functions and typical applications*

S7-1200 **S7-1500** **S7-1500 T-CPU** **SIMOTION**

Kinematics functions with conveyor tracking

Kinematics functions

- Cartesian gantries
- Roll pickers
- Articulated arm
- Delta pickers
- SCARA robots, …

Coordination (synchronous operation, cams)

- Synchronized axes
- Cross cutters
- Flying shears, ...

Positioning

- Palletizers, ...
- Hoisting + vertical conveyors
- Feeder + door control systems

Speed setpoint

- Pumps, fans, mixers
- Conveyor belts
- Auxiliary drives, ...

Advanced Controller – SIMATIC Multifunctional Platform
The S7-1500 Controller with flexible C/C++ Integration

Multifunctional Platform:
CPU 1518(F)-4 PN/DP MFP
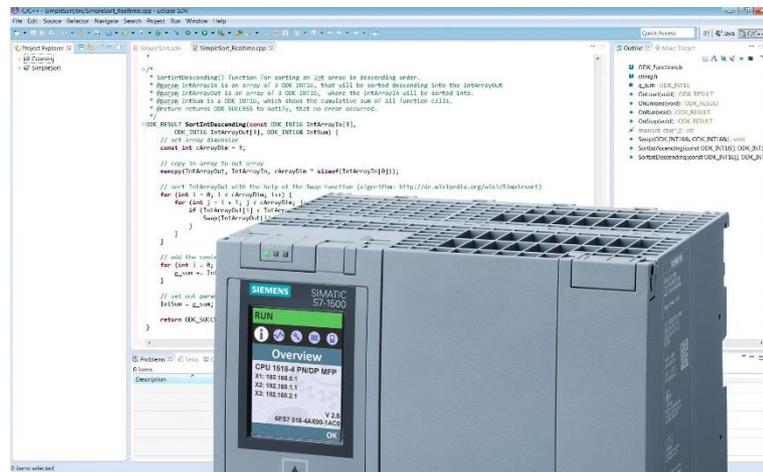
Standard- and Failsafe CPU

Feature / Function	Benefit
• Integration of high level language application and PLC program **into one hardware**	• **Reduced space** • **Robustness** of a SIMATIC S7
• **PLC independant applications** in C/C++ for any application (e.g. protocoll converter, database, …)	• **Simplified creation and reuse** of customer specific application in high level language
• Code generation with **model based development** tool, e.g. Matlab Simulink	• Direct integration of **complexe functions**
• Regular firmware updates stand for **highest security standards**	• Users solely care about the **implementation of the automation task**
• **Closed embedded operating systems**	• **Stability and long term availability**

SIMATIC S7-1500 Redundant systems
The easiest way to a redundant solution

Efficient Engineering

Integrated Engineering of controller and visualization in TIA Portal

Multiple execution levels

The application program can be structured into several execution levels

Smooth changeover

The changeover has no negative impact on the process

Automatic program and data synchronization

Simplifies the configuration and handling of both CPUs

System-IP

Simple connection via Ethernet to other devices (e.g. HMI, SCADA) like with single CPU systems

Higher Availability

The CPU-redundancy significantly increases the availability compared to single CPU systems

SIMATIC S7-1500R/H, Redundant systems
Always there when it counts

Source: iStock

Airport logistics	Tunnel	HVAC in Data centers
• Baggage transport • Storage	• Ventilation • Smoke extraction, • Light, • Traffic control	• Ventilation, • Air treatment (e.g. humidification) • Heating

SIPLUS Extreme
For harsh environments

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Ambient conditions	SIMATIC	SIPLUS extreme
Climatic	0 °C to 60 °C[1]	-40/-25 °C to +60/+70 °C[1]
Relative humidity	from 10 to 95 % with out condensation	100 % Condensation and Icing allowed
Chemically active substances	ISA S71.04 G3 SO2 0,5 ppm H2S 0,1 ppm	EN60721-3-3 3C4 and ISA S71.04 G1, G2, G3, GX continuous load limit [2] SO_2 4,8 ppm 14,8 ppm H_2S 9,9 ppm 49,7 ppm Cl 0,2 ppm 1,0 ppm HCl 0,66 ppm 3,3 ppm HF 0,12 ppm 2,4 ppm NH_3 49 ppm 247 ppm O_3 0,1 ppm 1,0 ppm NO_X 5,2 ppm 10,4 ppm
Salt mist	Not allowed	Salt mist test (EN 60068-2-52), severity level 3
Mechanically active substances • dust (suspended solids) • dust (deposition)	EN60721-3-3 3S2 0,2 mg/m³ 1,5 mg/m³ Without sand	EN60721-3-3 3S4 4,0 mg/m³ 40 mg/m³ Sand included
Biologically active substances	Not tested	EN60721-3-3 3B2 Growth of mold, sponge except fauna

Product overview – SIMATIC S7-1500
The right CPU for every application

CPU types	Compact		Standard						Technology				MFP	Redundant/ High available		
	1511C-1 PN	1512C-1 PN	1511F-1 PN	1513F-1 PN	1515F-2 PN	1516F-3 PN/DP	1517F-3 PN/DP	1518F-4 PN/DP	1511TF-1 PN	1515TF-2 PN	1516TF-3 PN/DP	1517TF-3 PN/DP	1518F-4 PN/DP MFP	1513R-1 PN	1515R-2 PN	1517H-3 PN
Interfaces	1 / 1	1 / 1	1 / 1	1 / 1	1 2 / 1	1 2 / 1 3	1 2 / 1 3	1 2 4 / 1 3	1 / 1	1 2 / 1	1 2 / 1 3	1 2 / 1 3	1 2 4 / 1 3	1 / 1	1 2 / 1	1 2 3 / 1 3
Work Memory	175 KB	250 KB	150/225 KB	300/450 KB	500/750 KB	1/1,5 MB	2/3 MB	4/6 MB	225/225 KB	750/750 KB	1,5/1,5 MB	3/3 MB	4/6 MB	300 KB	500 KB	2 MB
Data memory(MB)	1	1	1	1,5	3	5	8	20	1	3	5	8	20	1,8	3,5	8
													50/500 MB[1]			
Bit-Performance (ns)	60	48	60	40	30	10	2	1	60	30	10	2	1	40	30	2
Connections max.	96	128	96	128	192	256	320	384	96	192	256	320	384	128	192	320
Positioning axes																
- typical[2]	5	5	5	5	7	7	70	128	5	7	55	70	128	5	7	70
- maximum[3]	10	10	10	10	30	30	128	128	10	30	80	128	128	10	30	128
Width (mm)	85	110	35	35	70	70	175	175	35	70	175	175	175	35	70	175

1) additional 50 MB memory for C/C++ functions (ODK) / 500 MB for applications (Runtime, API)
2) at 4ms Servo/IPO clock pulse
3) no use of further TOs

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Advanced Controller SIMATIC S7-1500

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Product overview – SIMATIC S7-1500
CPU Display

Display Screens

1) Overview
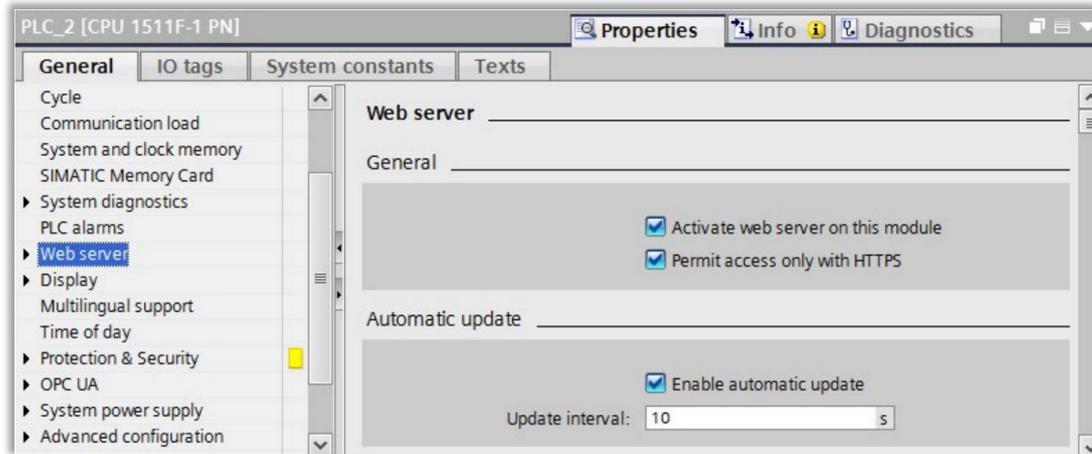2) Diagnostics
3) Settings
4) Modules
5) Display

✓ *CPU Information*
✓ *Diagnostics, Alarms*
✓ *Set IP Addresses, security*
✓ *View & modify watch tables*
✓ *Update FW, backup programs*
✓ *Display settings*
✓ *etc…*

Product overview – SIMATIC S7-1500
Webserver

Thank you for your attention!

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