

V2.8 FIRMWARE S7-1500 & ET200 CPUs

(365EVN - Source: Siemens)

Compatibility between SIMATIC S7-1500 CPU firmware and display firmware:

A SIMATIC S7-1500 CPU with a firmware version V2.8 can be operated with a display with a firmware version \leq V2.8.

Replacement case:

The STEP 7 project does not need to be changed when replacing a CPU with a firmware version \leq V2.6 with a CPU with firmware V2.8. Upgrade of the STEP 7 software is not required.

Configuration of a CPU with firmware V2.8 in TIA Portal versions < V16:

CPUs with firmware version V2.8 can also be used with TIA Portal Versions < V16. The procedure for configuration with TIA Portal Versions in which the current firmware cannot be selected can be found in the following entry: [109744163](#)

New properties of CPUs with firmware V2.8:

To use the new functionalities, the system must be configured in TIA Portal as of STEP 7 Professional V16. ([109771626](#))

In addition to the existing product properties, a SIMATIC S7-1500 CPU or an ET 200 CPU offers the following additional functionalities with Firmware Version 2.8:

New features with firmware V2.8 for S7-1500 and ET 200 CPUs (without S7-1500R/H):

- Direct exchange of data via PROFINET IRT ensures quick, isochronous data transfer between several S7-1500 CPUs or ET 200 CPUs.
- IP forwarding for CPUs with more than one interface, that is, IP telegrams are forwarded from an integrated PROFINET interface of the CPU to another integrated PROFINET interface, for example, for
 - IP-based communication to lower-level devices for diagnostics and commissioning, for example, via the S7-PCT tool or SIMATIC PDM
 - With S7-1500 CPUs, this function can also be combined with the IP accessibility via the CP 1543-1 communication module so that the OPC UA server of the CPU, for example, can also be reached via the CP 1543-1 or the CPU as OPC UA client can send data via CP 1543-1.
- The OPC UA server on the CPU only restarts if OPC UA-relevant data has been changed during the download from TIA Portal.

- The diagnostic options for the OPC UA server have been improved, for example, by listing the OPC UA connection resources separately. In the event of a surge of diagnostic messages relating to OPC UA, they can be combined and only appear once in the diagnostic buffer.
- With JSON RPC2.0, the Web server of the controller offers a web-compliant, modern data format for accessing data such as process values (variable values) or status and diagnostic data of the CPU for easy coupling of the controller to web data consumers, for example, MES systems or SCADA systems.
- The web server of the CPU provides graphical runtime information that makes it possible to react to CPU STOPS due to an excessively high program or communication load during commissioning or CPU runtime.
- The "Project trace" function in TIA Portal is supported, allowing for the diagnostics of system states across devices using the trace function (for example via the combination of traces from several devices).
- For motion control applications, the hardware limit switches can now be activated and deactivated during operation without "TO Restart".
- If required, the setpoints and actual values of the axes can now be calculated with six decimal places.
- Station width of 1.2 m for ET 200pro CPUs 1513pro (F)-2 PN and 1516pro (F)-2 PN
- Extension of the ambient temperature during operation to -25°C to +60°C for CPUs 1510 to 1516 for standard, fail-safe and compact. Details are provided in the technical specifications of the respective CPUs.
As before, the ambient temperature of -25°C to +55°C during operation also applies to the ET 200pro CPUs.

New and improved programming instructions with firmware V2.8:

- The new "File Delete" instruction can be used to delete existing files on the SIMATIC memory card.
- The existing "TMAIL_C" instruction has been extended so that data logs, recipes and user files located on the SIMATIC memory card can be sent as an e-mail attachment via an interface of the automation system.
- The performance for the instructions: "Serialize", "Deserialize" and "CMP" (comparator) has been improved.
- The "SET_TIMEZONE" block now works (in version V2.0) edge-controlled – as in the S7-1200.
- A new "MC-PreIPO" organization block is available for programming application programs that are called synchronously with the motion control clock.

New features with firmware V2.8 for S7-1500T(F) CPUs:

- The S7-1500 T(F) CPUs support master values and synchronous axes on different controllers, so that different servo/interpolator clocks can be used.

- This makes it possible to divide a high number of axes into different CPUs, for example, to implement a modular machine design. Coupling via PROFINET IO with IRT is required for this functionality.
- The S7-1500 T(F) CPUs now support succeeding synchronization over master value length.

New features with firmware V2.8 for S7-1500R/H CPUs:

- You can now also load and change programs in the Run-Redundant system state. The backup CPU no longer has to be switched to STOP. However, changes to the hardware configuration can still only be made in the STOP state of the R/H system.
- PROFINET devices without system redundancy can also be used as devices on an S7-1500R/H CPU.
- The STEP 7 Graph programming language is supported, which enables graphical creation of sequence control systems and sequential procedures on the S7-1500R/H CPUs.
- Programming of user messages and messages via ProDiag is supported, which means monitoring messages can be programmed or configured on the S7-1500R/H CPUs to detect possible system malfunctions in advance.
- Technological instructions, such as "PID_Compact", "PID_3Step" and "PID_Temp", for the implementation of control tasks are supported.
- Extended instructions such as "GETIO / GETIO_PART" for reading the process image and "SETIO / SETIO_PART" for writing the process image are supported.
- Information on the IO system or on the status of the module can be determined via the "GetStationInfo", "DeviceStates" instructions. The "GEN_DIAG" instruction makes it possible to generate diagnostic information via the user program.
- IP forwarding for CPUs with more than one interface, that is, IP telegrams are forwarded from an integrated PROFINET interface of the CPU to another integrated PROFINET interface, for example, for
 - IP-based communication to lower-level devices for diagnostics and commissioning, for example, via the S7-PCT tool or SIMATIC PDM
- S7 routing for transmitting data beyond the SIMATIC S7 subnet boundaries. Here you can send information from a transmitter over different S7 subnets to a receiver.

V2.9 FIRMWARE S7-1500 & ET200 CPUs

(365EVN - Source: Siemens)

Compatibility between SIMATIC S7-1500 CPU firmware and display firmware:

A SIMATIC S7-1500 CPU with a firmware version V2.9 can be operated with a display with a firmware version \leq V2.9.

Spare parts case:

The STEP 7 project does not need to be changed when replacing a CPU with a firmware version \leq V2.8 with a CPU with firmware V2.9. Upgrade of the STEP 7 software is not required.

Configuration of a CPU with firmware V2.9 in TIA Portal versions < V17:

CPUs with firmware version V2.9 can also be used with TIA Portal Versions < V17. The procedure to be applied for configuration with TIA Portal versions in which the current firmware cannot be selected is described in the following entry: [109744163](#)

New properties of the CPUs with Firmware 2.9:

To use the new functionalities, the system must be configured in TIA Portal as of STEP 7 Professional V17: [109784438](#)

In addition to the existing product properties, a SIMATIC S7-1500 CPU or an ET 200 CPU offers the following additional functionalities with Firmware Version 2.9:

New hardware and configuration limits:

- CPU 1518HF-4 PN (6ES7518-4JP00-0AB0), the new innovative SIMATIC S7-1500H CPU with integrated fail-safety – predestined for applications placing superior requirements on both availability and fail-safety.
- CPU 1518T/TF-4 PN/DP, the high-end S7-1500 technology controller for standard and fail-safe applications with very high requirements regarding program scope, networking and processing speed. With its quantity structure of up to 192 positioning axes, the CPU is suitable for demanding motion control applications. For distributed configuration via PROFINET IO and PROFIBUS DP with PROFIsafe. The additional integrated PROFINET interface with separate IP address can be used, for example, for network separation, for connecting further PROFINET IO RT devices, or for high-speed communication as an I-Device. With the third PROFINET interface with a separate IP address and Gbit Ethernet, network separation or coupling via Gbit Ethernet to a higher-level network can be achieved, for example. The current quantity structure of the respective CPU is documented in the technical data.
- CPU 1518 and derivatives with an extended memory quantity framework:

- The work memory of the CPUs 1518 and its derivatives (incl. CPU 1518HF) is being extended significantly. The current quantity structure of the respective CPU is documented in the technical data.
- For the CPUs 1517 and 1518, the number of UDP multicast circuits has been extended. The current configuration limit of the respective controller is documented in the technical specifications.
- For the controllers CPU 1510SP to CPU 1513 (including CPU 1513R) and CPU 1515 (including CPU 1515R), the configuration limit regarding the number of blocks (and UDTs) has been increased. The current configuration limit of the respective controller is documented in the technical specifications.

New functions with firmware V2.9 for all S7-1500 and ET 200 CPUs:

- Extended security:
 - Use of X.509 certificates and TLS (Transport Layer Security) for secure PG/PC and HMI communication
 - Protection of confidential configuration data
 - Advanced encryption for the CPU access level passwords with a default setting for full CPU protection.
 - Possibility to use a SIMATIC Memory Card to set or change the password to protect confidential PLC configuration data
- Support of MRP (Media Redundancy Protocol) -Interconnect

The function is integrated into the firmware and enables the coupling of multiple MRP rings (up to 11 rings), thus opening up the possibility of operating more nodes in MRP rings.

New functions with firmware V2.9 for S7-1500 and ET 200 CPUs (without R/H CPUs):

- OPC UA Alarms & Conditions:
The function OPC UA Alarms & Conditions makes it possible to transmit alarms including their associated values to OPC UA clients. Alarms that require acknowledgment can be acknowledged by the OPC UA client in the process. This function is enabled in the TIA Portal via the settings in the CPU properties.
- For modeling of the OPC UA server interfaces for S7-1500 and ET 200 CPUs, objects and folders can now also be created or added as OPC UA element using a drag-and-drop operation.
- Specifications can be imported as reference in the OPC UA server interface. These specifications can be used as a basis for mapping data types of a OPC UA reference namespace to an FB or UDT. With each new instance, the new nodes are automatically created in the previously defined OPC UA server interface.
- The handling of the CPU as OPC UA client is made easier. With TIA Portal V17, only three blocks are necessary (instead of 12 blocks): Read, Write and Method call.

- The S7-1500 and ET 200 CPUs support the handling of OPC UA certificates via GDS (Global Discovery Service). For the certificate update, you can use either the TIA Portal or a separate GSD server. Commissioning can be performed without a certificate already being installed on the CPU.
- The data types "LocalizedText" and "ByteString" that are mainly used for Companion specifications are now also supported by the OPC UA server of the S7-1500 and ET 200 CPUs.
- Rounding off the DNS (Domain Name System) functionality for OPC UA / OUC and in the web server
 - The feedback messages of the OPC UA server with the "Application Name" can now be made using the DNS.
 - The NTP client of the CPU can address its relevant NTP servers using the DNS. This makes it possible for clients to address a pool of NTP servers, for example.
 - The web server can continuously be reached via DNS addressing.
 - DNS is taken into account during certificate handling.
- Support of DHCP (Dynamic Host Configuration Protocol)
The DHCP communication protocol enables the CPU to assign the network configuration using a DHCP server. The CPU uses its client ID for identification on the DHCP server. The following parameters can be obtained:
 - IP Suite
 - DNS server
 - NTP server
- The CPU can also signal its host name to the DHCP server.
- With the introduction of DHCP, NTP servers can also be obtained via DHCP. The configuration has changed compared to previous versions. It must be specified in the configuration from where the NTP server(s) obtain their configuration:
 - using the configuration in the hardware properties of the CPU
 - via DHCP
 - via the T_CONFIG block*
 - * Compared to previous firmware versions, in addition to using the T_CONFIG block, it must now be specified that the NTP servers obtain their configuration via this block when upgrading the hardware to firmware V2.9.
- Deactivating / activating the iDevice in the user program:
It is possible to deactivate or activate the iDevice configuration with the "D_ACT_DP" instruction in the user program of the iDevice CPU. After deactivating the iDevice function, no error is displayed on the iDevice CPU when the IO Controller is not available.

- With MODBUS TCP, the newly supported mode 23 enables users to read and write data within a job.
- For programmed connections, the behavior when terminating TCP connections can be set individually (RST/FIN behavior) using the new "TCON_Settings" block. In addition, the TTL (Time-to-Live) of UDP multicast frames can be configured so that communication is possible via IP routers.
- PROFINET device name:
The topology-based assignment of device names is being extended so that PROFINET devices are renamed even when they have already a device name. A PROFINET device is also renamed when the device name is already being used by another device on the controller that is deactivated at this time. This is mainly applied to mobile equipment such as automated guided vehicles (AGVs).
- Improvement with PROFINET IO operation mode "IO device" with GSD file configuration.
In the PROFINET IO operating mode "IO-Device" , the PLC firmware version can be upgraded to V2.9 and newer without changing the configuration of the associated PROFINET IO controller.
The previous mandatory creation of a new GSD file with the version of the firmware update and the associated reconfiguration of the PROFINET IO controller is now optional.
- The display on the CPU web server is being extended to include information on "Program resource consumption" so that the user program can be changed accordingly when the available memory is not sufficient.
- User-defined web pages can be created for the SIMATIC S7-1500 and the ET 200 CPUs via WinCC Unified. This does not require special know-how regarding the creation of HTML pages; the web pages can be created as a screen in the WinCC Unified editor and then downloaded to the controller.
- User-defined web pages that were created with a random HTML editing tool can be downloaded to the S7-1500 or ET 200 CPU as HTML files directly via the new WEB API without having to use the TIA Portal. The pages are displayed via an HTTPS endpoint in the CPU.
- Connection and configuration of linear motors for linear axes
- Automatic backlash compensation at the axis technology object for compensation of the mechanical backlash.
- Automatic controller optimization with import of the controller parameters from SINAMICS Startdrive (One Button Tuning of the drive).
- Support of drive optimization through Bode diagram in the trace.

New functions with firmware V2.9 for S7-1500R/H CPUs:

- Extension of the options with the RH_CTRL instruction: The roles between primary CPU and backup CPU can be swapped and a new SYNCUP can be triggered.
- The recipe functions (RecipeImport, RecipeExport) can now also be used in S7-1500R/H CPUs.
- A redundancy loss in the sync cable is now signaled in S7-1500H via an OB72 call.
- The changeover times for non-redundant PROFINET devices (switched S1 mode) have been significantly reduced.

New functions with firmware V2.9 for S7-1500T(F) CPUs:

- Synchronous operation functions
 - Leading value-coupled correction profiles on the following axis (MC_PhasingAbsolute, MC_PhasingRelative, MC_OffsetAbsolute, MC_OffsetRelative) for gearing or camming
 - Replacement or scaling of a cam disk at the end of an active cam disk
 - Targeted desynchronization of synchronous operation and camming to position (MC_GearOut, MC_CamOut)
 - New cam disk type (10,000 breakpoints and 50 polynomial segments)
 - The cam editor has been extended to include new diagnostic options that allow for the display of detailed information and comparisons down to the element level in online and offline mode.
- Kinematics functions
 - Controlling kinematics with up to 4 interpolating axes including synchronization to moving belts
 - New instruction "MC_KinematicsMotionSimulation" to activate and deactivate the simulation mode of the TO Kinematics
 - The traveled distance and the total travel of path movements (linear, circular) without conveyor tracking are displayed in variables.
 - In the kinematics control panel, the "Dynamic adaptation without segmentation of the path" in the "Jog on target position" mode is active and the dynamic limits of the kinematics axes are taken into account.
 - Offline and online calibration of work zones in the TIA Portal
 - Configuration of rounding clearances greater than 50 % of the shorter distance
 - The number of prepared jobs in the job chain is displayed in a variable.