



SIMATIC S7-1500, CPU 1511-1 PN, central processing unit with work memory 300 KB for program and 1.5 MB for data, 1st interface: PROFINET IRT with 2-port switch, 25 ns bit performance, SIMATIC Memory Card required **** approvals and certificate according to entry 109815653 at support.industry.siemens.com to be observed! ****

| General information | |
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| Product type designation | CPU 1511-1 PN |
| HW functional status | FS01 |
| Firmware version | V3.0 |
| Product function | |
| <ul style="list-style-type: none"> I&M data | Yes; I&M0 to I&M3 |
| <ul style="list-style-type: none"> Isochronous mode | Yes; Distributed and central; with minimum OB 6x cycle of 500 µs (distributed) and 1 ms (central) |
| Engineering with | |
| <ul style="list-style-type: none"> STEP 7 TIA Portal configurable/integrated from version | V18 (FW V3.0); with older TIA Portal versions configurable as 6ES7511-1AK02-0AB0 |
| Configuration control | |
| via dataset | Yes |
| Display | |
| Screen diagonal [cm] | 3.45 cm |
| Control elements | |
| Number of keys | 8 |
| Mode buttons | 2 |
| Supply voltage | |
| Rated value (DC) | 24 V |
| permissible range, lower limit (DC) | 19.2 V |
| permissible range, upper limit (DC) | 28.8 V |
| Reverse polarity protection | Yes |
| Mains buffering | |
| <ul style="list-style-type: none"> Mains/voltage failure stored energy time | 5 ms |
| <ul style="list-style-type: none"> Repeat rate, min. | 1/s |
| Input current | |
| Current consumption (rated value) | 0.73 A |
| Current consumption, max. | 0.9 A |
| Inrush current, max. | 1.15 A; Rated value |
| I ² t | 0.5 A ² ·s |
| Power | |
| Infeed power to the backplane bus | 10 W |
| Power consumption from the backplane bus (balanced) | 5.5 W |
| Power loss | |
| Power loss, typ. | 7.5 W |
| Memory | |
| Number of slots for SIMATIC memory card | 1 |
| SIMATIC memory card required | Yes |
| Work memory | |


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| <ul style="list-style-type: none"> integrated (for program) integrated (for data) | 300 kbyte 1.5 Mbyte |
| Load memory | |
| <ul style="list-style-type: none"> Plug-in (SIMATIC Memory Card), max. | 32 Gbyte |
| Backup | |
| <ul style="list-style-type: none"> maintenance-free | Yes |
| CPU processing times | |
| for bit operations, typ. | 25 ns |
| for word operations, typ. | 32 ns |
| for fixed point arithmetic, typ. | 42 ns |
| for floating point arithmetic, typ. | 170 ns |
| CPU-blocks | |
| Number of elements (total) | 4 000; Blocks (OB, FB, FC, DB) and UDTs |
| DB | |
| <ul style="list-style-type: none"> Number range | 1 ... 60 999; subdivided into: number range that can be used by the user: 1 ... 59 999, and number range of DBs created via SFC 86: 60 000 ... 60 999 |
| <ul style="list-style-type: none"> Size, max. | 1.5 Mbyte; For DBs with absolute addressing, the max. size is 64 KB |
| FB | |
| <ul style="list-style-type: none"> Number range Size, max. | 0 ... 65 535 300 kbyte |
| FC | |
| <ul style="list-style-type: none"> Number range Size, max. | 0 ... 65 535 300 kbyte |
| OB | |
| <ul style="list-style-type: none"> Size, max. Number of free cycle OBs Number of time alarm OBs Number of delay alarm OBs Number of cyclic interrupt OBs Number of process alarm OBs Number of DPV1 alarm OBs Number of isochronous mode OBs Number of technology synchronous alarm OBs Number of startup OBs Number of asynchronous error OBs Number of synchronous error OBs Number of diagnostic alarm OBs | 300 kbyte 100 20 20 20; With minimum OB 3x cycle of 250 µs 50 3 2 2 100 4 2 1 |
| Nesting depth | |
| <ul style="list-style-type: none"> per priority class | 24 |
| Counters, timers and their retentivity | |
| S7 counter | |
| <ul style="list-style-type: none"> Number | 2 048 |
| Retentivity | |
| — adjustable | Yes |
| IEC counter | |
| <ul style="list-style-type: none"> Number | Any (only limited by the main memory) |
| Retentivity | |
| — adjustable | Yes |
| S7 times | |
| <ul style="list-style-type: none"> Number | 2 048 |
| Retentivity | |
| — adjustable | Yes |
| IEC timer | |
| <ul style="list-style-type: none"> Number | Any (only limited by the main memory) |
| Retentivity | |
| — adjustable | Yes |
| Data areas and their retentivity | |
| Retentive data area (incl. timers, counters, flags), max. | 256 kbyte; in total; available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 216 KB |
| Extended retentive data area (incl. timers, counters, flags), max. | 1.5 Mbyte; When using PS 6 0W 24/48/60 V DC HF |
| Flag | |
| <ul style="list-style-type: none"> Size, max. | 16 kbyte |

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| <ul style="list-style-type: none"> Number of clock memories | 8; 8 clock memory bit, grouped into one clock memory byte |
| Data blocks | |
| <ul style="list-style-type: none"> Retentivity adjustable Retentivity preset | Yes No |
| Local data | |
| <ul style="list-style-type: none"> per priority class, max. | 64 kbyte; max. 16 KB per block |
| Address area | |
| Number of IO modules | 2 048; max. number of modules / submodules |
| I/O address area | |
| <ul style="list-style-type: none"> Inputs Outputs | 32 kbyte; All inputs are in the process image 32 kbyte; All outputs are in the process image |
| per integrated IO subsystem | |
| <ul style="list-style-type: none"> Inputs (volume) Outputs (volume) | 8 kbyte 8 kbyte |
| per CM/CP | |
| <ul style="list-style-type: none"> Inputs (volume) Outputs (volume) | 8 kbyte 8 kbyte |
| Subprocess images | |
| <ul style="list-style-type: none"> Number of subprocess images, max. | 32 |
| Hardware configuration | |
| Number of distributed IO systems | 32; A distributed I/O system is characterized not only by the integration of distributed I/O via PROFINET or PROFIBUS communication modules, but also by the connection of I/O via AS-i master modules or links (e.g. IE/PB-Link) |
| Number of DP masters | |
| <ul style="list-style-type: none"> Via CM | 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total |
| Number of IO Controllers | |
| <ul style="list-style-type: none"> integrated Via CM | 1 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total |
| Rack | |
| <ul style="list-style-type: none"> Modules per rack, max. Number of lines, max. | 32; CPU + 31 modules 1 |
| PtP CM | |
| <ul style="list-style-type: none"> Number of PtP CMs | the number of connectable PtP CMs is only limited by the number of available slots |
| Time of day | |
| Clock | |
| <ul style="list-style-type: none"> Type Backup time Deviation per day, max. | Hardware clock 6 wk; At 40 °C ambient temperature, typically 10 s; Typ.: 2 s |
| Operating hours counter | |
| <ul style="list-style-type: none"> Number | 16 |
| Clock synchronization | |
| <ul style="list-style-type: none"> supported in AS, master in AS, slave on Ethernet via NTP | Yes Yes Yes Yes |
| Interfaces | |
| Number of PROFINET interfaces | 1 |
| 1. Interface | |
| Interface types | |
| <ul style="list-style-type: none"> RJ 45 (Ethernet) Number of ports integrated switch | Yes; X1 2 Yes |
| Protocols | |
| <ul style="list-style-type: none"> IP protocol PROFINET IO Controller PROFINET IO Device SIMATIC communication Open IE communication Web server Media redundancy | Yes; IPv4 Yes Yes Yes Yes; Optionally also encrypted Yes Yes |

| PROFINET IO Controller | |
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| Services | |
| — PG/OP communication | Yes |
| — Isochronous mode | Yes |
| — Direct data exchange | Yes; Requirement: IRT and isochronous mode (MRPD optional) |
| — IRT | Yes |
| — PROFIenergy | Yes; per user program |
| — Prioritized startup | Yes; Max. 32 PROFINET devices |
| — Number of connectable IO Devices, max. | 128; In total, up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET |
| — Of which IO devices with IRT, max. | 64 |
| — Number of connectable IO Devices for RT, max. | 128 |
| — of which in line, max. | 128 |
| — Number of IO Devices that can be simultaneously activated/deactivated, max. | 8; in total across all interfaces |
| — Number of IO Devices per tool, max. | 8 |
| — Updating times | The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data |
| Update time for IRT | |
| — for send cycle of 250 µs | 250 µs to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 500 µs of the isochronous OB is decisive |
| — for send cycle of 500 µs | 500 µs to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive |
| — for send cycle of 1 ms | 1 ms to 16 ms |
| — for send cycle of 2 ms | 2 ms to 32 ms |
| — for send cycle of 4 ms | 4 ms to 64 ms |
| — With IRT and parameterization of "odd" send cycles | Update time = set "odd" send clock (any multiple of 125 µs: 375 µs, 625 µs ... 3 875 µs) |
| Update time for RT | |
| — for send cycle of 250 µs | 250 µs to 128 ms |
| — for send cycle of 500 µs | 500 µs to 256 ms |
| — for send cycle of 1 ms | 1 ms to 512 ms |
| — for send cycle of 2 ms | 2 ms to 512 ms |
| — for send cycle of 4 ms | 4 ms to 512 ms |
| PROFINET IO Device | |
| Services | |
| — PG/OP communication | Yes |
| — Isochronous mode | No |
| — IRT | Yes |
| — PROFIenergy | Yes; per user program |
| — Shared device | Yes |
| — Number of IO Controllers with shared device, max. | 4 |
| — activation/deactivation of I-devices | Yes; per user program |
| — Asset management record | Yes; per user program |
| Interface types | |
| RJ 45 (Ethernet) | |
| • 100 Mbps | Yes |
| • Autonegotiation | Yes |
| • Autocrossing | Yes |
| • Industrial Ethernet status LED | Yes |
| Protocols | |
| PROFIsafe | No |
| Number of connections | |
| • Number of connections, max. | 128; via integrated interfaces of the CPU and connected CPs / CMs |
| • Number of connections reserved for ES/HMI/web | 10 |
| • Number of connections via integrated interfaces | 88 |
| • Number of S7 routing paths | 16 |
| Redundancy mode | |
| • H-Sync forwarding | Yes |
| Media redundancy | |
| — Media redundancy | only via 1st interface (X1) |
| — MRP | Yes; MRP Automanager according to IEC 62439-2 Edition 2.0, MRP |

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| <ul style="list-style-type: none"> — MRP interconnection, supported — MRPD — Switchover time on line break, typ. — Number of stations in the ring, max. | Manager; MRP Client Yes; as MRP ring node according to IEC 62439-2 Edition 3.0 Yes; Requirement: IRT 200 ms; For MRP, bumpless for MRPD 50 |
| SIMATIC communication | |
| <ul style="list-style-type: none"> • PG/OP communication • S7 routing • Data record routing • S7 communication, as server • S7 communication, as client • User data per job, max. | Yes; encryption with TLS V1.3 pre-selected Yes Yes Yes Yes See online help (S7 communication, user data size) |
| Open IE communication | |
| <ul style="list-style-type: none"> • TCP/IP <ul style="list-style-type: none"> — Data length, max. — several passive connections per port, supported • ISO-on-TCP (RFC1006) <ul style="list-style-type: none"> — Data length, max. • UDP <ul style="list-style-type: none"> — Data length, max. — UDP multicast • DHCP • DNS • SNMP • DCP • LLDP • Encryption | Yes 64 kbyte Yes Yes 64 kbyte Yes 2 kbyte; 1 472 bytes for UDP broadcast Yes; max. 78 multicast circuits Yes Yes Yes Yes Yes Yes Yes; Optional |
| Web server | |
| <ul style="list-style-type: none"> • HTTP • HTTPS | Yes; Standard and user pages Yes; Standard and user pages |
| OPC UA | |
| <ul style="list-style-type: none"> • Runtime license required • OPC UA Client <ul style="list-style-type: none"> — Application authentication — Security policies — User authentication — Number of connections, max. — Number of nodes of the client interfaces, recommended max. — Number of elements for one call of OPC-UA_NodeGetHandleList/OPC-UA_ReadList/C max. — Number of elements for one call of OPC-UA_NameSpaceGetIndexList, max. — Number of elements for one call of OPC-UA_MethodGetHandleList, max. — Number of simultaneous calls of the client instructions for session management, per connection, max. — Number of simultaneous calls of the client instructions for data access, per connection, max. — Number of registerable nodes, max. — Number of registerable method calls of OPC-UA_MethodCall, max. — Number of inputs/outputs when calling OPC-UA_MethodCall, max. • OPC UA Server <ul style="list-style-type: none"> — Application authentication — Security policies — User authentication — GDS support (certificate management) — Number of sessions, max. — Number of accessible variables, max. | Yes; "Small" license required Yes; Data Access (registered Read/Write), Method Call Yes Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256 "anonymous" or by user name & password 4 1 000 300 20 100 1 5 5 000 100 20 Yes; Data Access (Read, Write, Subscribe), Method Call, Alarms & Condition (A&C), Custom Address Space Yes available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256, Aes128Sha256RsaOaep, Aes256Sha256RsaPss "anonymous" or by user name & password Yes 32 50 000 |

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| — Number of registerable nodes, max. | 10 000 |
| — Number of subscriptions per session, max. | 50 |
| — Sampling interval, min. | 100 ms |
| — Publishing interval, min. | 200 ms |
| — Number of server methods, max. | 20 |
| — Number of inputs/outputs per server method, max. | 20 |
| — Number of monitored items, recommended max. | 4 000; for 1 s sampling interval and 1 s send interval |
| — Number of server interfaces, max. | 10 of each "Server interfaces" / "Companion specification" type and 20 of the type "Reference namespace" |
| — Number of nodes for user-defined server interfaces, max. | 15 000 |
| • Alarms and Conditions | Yes |
| — Number of program alarms | 100 |
| — Number of alarms for system diagnostics | 50 |
| Further protocols | |
| • MODBUS | Yes; MODBUS TCP |
| S7 message functions | |
| Number of login stations for message functions, max. | 32 |
| Program alarms | Yes |
| Number of configurable program messages, max. | 5 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH |
| Number of loadable program messages in RUN, max. | 2 500 |
| Number of simultaneously active program alarms | |
| • Number of program alarms | 600 |
| • Number of alarms for system diagnostics | 100 |
| • Number of alarms for motion technology objects | 160 |
| Test commissioning functions | |
| Joint commission (Team Engineering) | Yes; Parallel online access possible for up to 5 engineering systems |
| Status block | Yes; Up to 8 simultaneously (in total across all ES clients) |
| Single step | No |
| Number of breakpoints | 8 |
| Status/control | |
| • Status/control variable | Yes |
| • Variables | Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters |
| • Number of variables, max. | |
| — of which status variables, max. | 200; per job |
| — of which control variables, max. | 200; per job |
| Forcing | |
| • Forcing | Yes |
| • Forcing, variables | Peripheral inputs/outputs |
| • Number of variables, max. | 200 |
| Diagnostic buffer | |
| • present | Yes |
| • Number of entries, max. | 1 000 |
| — of which powerfail-proof | 500 |
| Traces | |
| • Number of configurable Traces | 4; Up to 512 KB of data per trace are possible |
| Interrupts/diagnostics/status information | |
| Diagnostics indication LED | |
| • RUN/STOP LED | Yes |
| • ERROR LED | Yes |
| • MAINT LED | Yes |
| • STOP ACTIVE LED | Yes |
| • Connection display LINK TX/RX | Yes |
| Supported technology objects | |
| Motion Control | Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool |
| • Number of available Motion Control resources for technology objects | 1 120 |
| • Required Motion Control resources | |
| — per speed-controlled axis | 40 |
| — per positioning axis | 80 |

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| — per synchronous axis | 160 |
| — per external encoder | 80 |
| — per output cam | 20 |
| — per cam track | 160 |
| — per probe | 40 |
| • Positioning axis | |
| — Number of positioning axes at motion control cycle of 4 ms (typical value) | 11 |
| — Number of positioning axes at motion control cycle of 8 ms (typical value) | 14 |
| Controller | |
| • PID_Compact | Yes; Universal PID controller with integrated optimization |
| • PID_3Step | Yes; PID controller with integrated optimization for valves |
| • PID-Temp | Yes; PID controller with integrated optimization for temperature |
| Counting and measuring | |
| • High-speed counter | Yes |
| Ambient conditions | |
| Ambient temperature during operation | |
| • horizontal installation, min. | -30 °C; No condensation |
| • horizontal installation, max. | 60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off |
| • vertical installation, min. | -30 °C; No condensation |
| • vertical installation, max. | 40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off |
| Ambient temperature during storage/transportation | |
| • min. | -40 °C |
| • max. | 70 °C |
| Altitude during operation relating to sea level | |
| • Installation altitude above sea level, max. | 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual |
| configuration / header | |
| configuration / programming / header | |
| Programming language | |
| — LAD | Yes |
| — FBD | Yes |
| — STL | Yes |
| — SCL | Yes |
| — GRAPH | Yes |
| Know-how protection | |
| • User program protection/password protection | Yes |
| • Copy protection | Yes |
| • Block protection | Yes |
| Access protection | |
| • protection of confidential configuration data | Yes |
| • Password for display | Yes |
| • Protection level: Write protection | Yes |
| • Protection level: Read/write protection | Yes |
| • Protection level: Complete protection | Yes |
| programming / cycle time monitoring / header | |
| • lower limit | adjustable minimum cycle time |
| • upper limit | adjustable maximum cycle time |
| Dimensions | |
| Width | 35 mm |
| Height | 147 mm |
| Depth | 129 mm |
| Weights | |
| Weight, approx. | 336 g |
| last modified: | 12/13/2022  |