SIEMENS

## Data sheet 6ES7511-1UL03-0AB0

Siemens EcoTech

SIMATIC S7-1500T, CPU 1511TF-1 PN, central processing unit with work memory 450 KB for program and 1.5 MB for data, 1st interface: PROFINET IRT with 2-port switch, 6 ns bit performance, SIMATIC Memory Card required



| | |
|---|---|
| **General information** | |
| Product type designation | CPU 1511TF-1 PN |
| HW functional status | FS04 |
| Firmware version | V4.1 |
| ● FW update possible | Yes |
| Product function | |
| ● I&M data | Yes; I&M0 to I&M3 |
| ● Isochronous mode | Yes; Distributed and central; with minimum OB 6x cycle of 500 µs (distributed) and 1 ms (central) |
| ● SysLog | Yes |
| Engineering with | |
| ● STEP 7 TIA Portal configurable/integrated from version | V21 (FW V4.1) / V18 (FW V3.0) or higher; configurable with older TIA Portal versions as 6ES7511-1UK01-0AB0 |
| **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 | |
| ● Mains/voltage failure stored energy time | 5 ms |
| ● Repeat rate, min. | 1/s |
| **Input current** | |
| Current consumption (rated value) | 0.56 A |
| Current consumption, max. | 0.94 A |
| Inrush current, max. | 1.15 A; Rated value |
| $I^2t$ | 0.5 $A^2 \cdot s$ |
| **Power** | |
| Infeed power to the backplane bus | 10 W |
| Power consumption from the backplane bus (balanced) | 5.5 W |


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|---|---|
| **Power loss** | |
| Power loss, typ. | 3.4 W |
| **Storage** | |
| Number of slots for SIMATIC memory card | 1 |
| SIMATIC memory card required | Yes |
| Work memory | |
| ● integrated (for program) | 450 kbyte |
| ● integrated (for data) | 1.5 Mbyte |
| Load memory | |
| ● Plug-in (SIMATIC Memory Card), max. | 32 Gbyte |
| Backup | |
| ● maintenance-free | Yes |
| **CPU processing times** | |
| for bit operations, typ. | 6 ns |
| for word operations, typ. | 7 ns |
| for fixed point arithmetic, typ. | 9 ns |
| for floating point arithmetic, typ. | 37 ns |
| **CPU-blocks** | |
| Number of elements (total) | 4 000; Blocks (OB, FB, FC, DB) and UDTs |
| DB | |
| ● 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 |
| ● Size, max. | 1.5 Mbyte; For DBs with absolute addressing, the max. size is 64 KB |
| FB | |
| ● Number range | 0 ... 65 535 |
| ● Size, max. | 450 kbyte |
| FC | |
| ● Number range | 0 ... 65 535 |
| ● Size, max. | 450 kbyte |
| OB | |
| ● Size, max. | 450 kbyte |
| ● Number of free cycle OBs | 100 |
| ● Number of time alarm OBs | 20 |
| ● Number of delay alarm OBs | 20 |
| ● Number of cyclic interrupt OBs | 20; With minimum OB 3x cycle of 250 µs |
| ● Number of process alarm OBs | 50 |
| ● Number of DPV1 alarm OBs | 3 |
| ● Number of isochronous mode OBs | 2 |
| ● Number of startup OBs | 100 |
| ● Number of asynchronous error OBs | 4 |
| ● Number of synchronous error OBs | 2 |
| ● Number of diagnostic alarm OBs | 1 |
| Nesting depth | |
| ● per priority class | 24; Up to 8 possible for F-blocks |
| **Counters, timers and their retentivity** | |
| S7 counter | |
| ● Number | 2 048 |
| Retentivity | |
| — can be set | Yes |
| IEC counter | |
| ● Number | Any (only limited by the main memory) |
| Retentivity | |
| — can be set | Yes |
| S7 timer | |
| ● Number | 2 048 |
| Retentivity | |
| — adjustable | Yes |
| IEC timer | |
| ● Number | Any (only limited by the main memory) |


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|---|---|
| Retentivity | |
| — adjustable | Yes |
| **Data areas and their retentivity** | |
| Retentive data area (incl. timers, counters, flags), max. | 216 kbyte; in total; for bit memories, timers, counters, DBs, and technology data (axes) |
| Extended retentive data area (incl. timers, counters, flags), max. | 1.5 Mbyte; When using PS 6 0W 24/48/60 V DC HF |
| Flag | |
| ● Size, max. | 16 kbyte |
| ● Number of clock memories | 8; 8 clock memory bit, grouped into one clock memory byte |
| Data blocks | |
| ● Retentivity adjustable | Yes |
| ● Retentivity preset | No |
| Local data | |
| ● 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 | |
| ● Inputs | 32 kbyte; All inputs are in the process image |
| ● Outputs | 32 kbyte; All outputs are in the process image |
| per integrated IO subsystem | |
| — Inputs (volume) | 8 kbyte |
| — Outputs (volume) | 8 kbyte |
| per CM/CP | |
| — Inputs (volume) | 8 kbyte |
| — Outputs (volume) | 8 kbyte |
| Subprocess images | |
| ● 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 | |
| ● Via CM | 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total |
| Number of IO Controllers | |
| ● integrated | 1 |
| ● via CM | 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total |
| Rack | |
| ● Modules per rack, max. | 32; CPU + 31 modules |
| ● Number of lines, max. | 1 |
| PtP CM | |
| ● Number of PtP CMs | the number of connectable PtP CMs is only limited by the number of available slots |
| **Time of day** | |
| Clock | |
| ● Type | Hardware clock |
| ● Backup time | 6 wk; At 40 °C ambient temperature, typically |
| ● Deviation per day, max. | 10 s; Typ.: 2 s |
| Operating hours counter | |
| ● Number | 64 |
| Clock synchronization | |
| ● supported | Yes |
| ● to DP, master | Yes; via PROFIBUS CM / CP |
| ● on DP, device | Yes; via PROFIBUS CM / CP |
| ● in AS, master | Yes |
| ● in AS, device | Yes |
| ● on Ethernet via NTP | Yes |
| **Interfaces** | |
| Number of PROFINET interfaces | 1 |


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| | |
|---|---|
| **1. Interface** | |
| Interface types | |
| ● RJ 45 (Ethernet) | Yes; X1 |
| ● Number of ports | 2 |
| ● integrated switch | Yes |
| Protocols | |
| ● IP protocol | Yes; IPv4 |
| ● PROFINET IO Controller | Yes |
| ● PROFINET IO Device | Yes |
| ● SIMATIC communication | Yes |
| ● Open IE communication | Yes; Optionally also encrypted |
| ● Web server | Yes |
| ● Media redundancy | Yes |
| PROFINET IO Controller | |
| Services | |
| — Isochronous mode | Yes |
| — Direct data exchange | Yes; Requirement: IRT and isochronous mode (MRPD optional) |
| — IRT | Yes |
| — Dynamic Frame Packing (DFP) | 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 |
| — 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 | |
| — Isochronous mode | No |
| — IRT | Yes |
| — Dynamic Frame Packing (DFP) | No |
| — PROFIenergy | Yes; per user program |
| — Prioritized startup | Yes |
| — 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 |
| — PROFINET Security Class | SNMP Configuration and DCP Read Only |
| **Interface types** | |
| RJ 45 (Ethernet) | |


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| | |
|---|---|
| ● 100 Mbps | Yes |
| ● Autonegotiation | Yes |
| ● Autocrossing | Yes |
| ● Industrial Ethernet status LED | Yes |
| **Protocols** | |
| PROFIsafe | Yes; V2.4 / V2.6 |
| 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 | |
| ● PROFINET system redundancy (S2) | No |
| ● PROFINET system redundancy (R1) | No |
| ● 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 Manager; MRP Client |
| — MRP interconnection, supported | Yes; as MRP ring node according to IEC 62439-2 Edition 3.0 |
| — MRPD | Yes; Requirement: IRT |
| — Switchover time on line break, typ. | 200 ms; For MRP, bumpless for MRPD |
| — Number of stations in the ring, max. | 50 |
| SIMATIC communication | |
| ● PG/OP communication | Yes; encryption with TLS V1.3 pre-selected |
| ● S7 routing | Yes |
| ● Data record routing | Yes |
| ● S7 communication, as server | Yes |
| ● S7 communication, as client | Yes |
| ● User data per job, max. | See online help (S7 communication, user data size) |
| Open IE communication | |
| ● TCP/IP | Yes |
| — Data length, max. | 64 kbyte |
| — several passive connections per port, supported | Yes |
| ● ISO-on-TCP (RFC1006) | Yes |
| — Data length, max. | 64 kbyte |
| ● UDP | Yes |
| — Data length, max. | 2 kbyte; 1 472 bytes for UDP broadcast |
| — UDP multicast | Yes; max. 78 multicast circuits |
| ● DHCP | Yes |
| ● DNS | Yes |
| ● SNMP | Yes |
| ● DCP | Yes |
| ● LLDP | Yes |
| ● Encryption | Yes; Optional |
| Web server | |
| ● HTTP | Yes; Standard and user pages |
| ● HTTPS | Yes; Standard and user pages |
| ● web API | |
| — Number of sessions, max. | 50 |
| — number of simultaneous HTTP calls, max. | 4 |
| — HTTP request body, max. | 131 072 byte |
| OPC UA | |
| ● Runtime license required | Yes; "Small" license required |
| ● OPC UA Client | Yes; Data Access (registered Read/Write), Method Call |
| — Application authentication | Yes |
| — Security policies | Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256 |
| — User authentication | "anonymous" or by user name & password |


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| | |
|---|---|
| — Number of connections, max. | 4 |
| — Number of nodes of the client interfaces, recommended max. | 1 000 |
| — Number of elements for one call of OPC_UA_NodeGetHandleList/OPC_UA_ReadList/OPC_U max. | 300 |
| — Number of elements for one call of OPC_UA_NameSpaceGetIndexList, max. | 20 |
| — Number of elements for one call of OPC_UA_MethodGetHandleList, max. | 100 |
| — Number of simultaneous calls of the client instructions for session management, per connection, max. | 1 |
| — Number of simultaneous calls of the client instructions for data access, per connection, max. | 5; for OPC_UA_MethodCall 50 in total (no limit per connection) |
| — Number of registerable nodes, max. | 5 000 |
| — Number of registerable method calls of OPC_UA_MethodCall, max. | 100 |
| — Number of inputs/outputs when calling OPC_UA_MethodCall, max. | 20 |
| ● OPC UA Server | Yes; data access (read, write, subscribe), method call, alarms & condition (A&C), custom address space, role-based access control |
| — Application authentication | Yes |
| — Security policies | available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256, Aes128Sha256RsaOaep, Aes256Sha256RsaPss |
| — User authentication | "anonymous" or by user name & password |
| — GDS support (certificate management) | Yes |
| — Number of sessions, max. | 32 |
| — Number of accessible variables, max. | 50 000 |
| — 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. | 500; max. 25 concurrently running jobs each for asynchronous instructions OPC_UA_ServerMethodPre and OPC_UA_ServerMethodPost |
| — 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 |
| number of subscriptions, max. | 250 |
| number of tags/attributes for subscriptions, max. | 2 000 |
| 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. | 5 000 |
| 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 |


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|---|---|
| Profiling | Yes |
| Status/control | |
| ● Status/control variable | Yes; without fail-safe |
| ● Variables | inputs/outputs, bit memories, DBs, peripheral I/Os (without fail-safe), times, counters |
| ● Number of variables, max. | |
| — of which status variables, max. | 200; per job |
| — of which control variables, max. | 200; per job |
| Forcing | |
| ● Forcing | Yes; without fail-safe |
| ● Forcing, variables | peripheral inputs/outputs (without fail-safe) |
| ● 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 |
| ● Memory size per trace, max. | 512 kbyte |
| **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 |
| — per synchronous axis | 160 |
| — per external encoder | 80 |
| — per output cam | 20 |
| — per cam track | 160 |
| — per probe | 40 |
| ● Number of available Extended Motion Control resources for technology objects | 90 |
| ● Required Extended Motion Control resources | |
| — per cam (1 000 points and 50 segments) | 2 |
| — per cam (10 000 points and 50 segments) | 20 |
| — per cam (50 points and 600 segments) | 2 |
| — per cam (50 points and 6 000 segments) | 20 |
| — for each set of kinematics | 30 |
| — per Interpreter | 60 |
| — Per leading axis proxy | 3 |
| ● kinematics functions | |
| — kinematics with up to 4 interpolating axes | Yes; max. 3D + orientation |
| — kinematics with 5 or more interpolating axes | No |
| — user-defined kinematics | No |
| — SIMATIC Safe Kinematics | No |
| ● 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 |


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| | |
|---|---|
| ● 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 |
| **Standards, approvals, certificates** | |
| Siemens Eco Profile (SEP) | Siemens EcoTech |
| Recycler Guide available | Yes |
| Ecological footprint | |
| ● environmental product declaration | Yes |
| Global warming potential | |
| — global warming potential, (total) [CO2 eq] | 80.1 kg |
| — global warming potential, (during production) [CO2 eq] | 23.8 kg |
| — global warming potential, (during operation) [CO2 eq] | 57.4 kg |
| — global warming potential, (after end of life cycle) [CO2 eq] | -1.29 kg |
| Highest safety class achievable in safety mode | |
| ● Performance level according to ISO 13849-1 | PLe |
| ● SIL acc. to IEC 61508 | SIL 3 |
| Probability of failure (for service life of 20 years and repair time of 100 hours) | |
| — Low demand mode: PFDavg in accordance with SIL3 | < 2.00E-05 |
| — High demand/continuous mode: PFH in accordance with SIL3 | < 1.00E-09 |
| **Security** | |
| PROFINET Security Class | 1 |
| signed firmware update | Yes |
| Secure Boot | Yes |
| safely removing data | 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** | |
| Programming | |
| Programming language | |
| — LAD | Yes; incl. failsafe |
| — FBD | Yes; incl. failsafe |
| — STL | Yes |
| — SCL | Yes |
| — CFC | Yes; either CFC or failsafe functionality |
| — 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 |


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|---|---|
| ● Protection level: Write protection for Failsafe | Yes |
| ● Protection level: Complete protection | Yes |
| ● User administration | Yes; device-wide and centralized |
| ● Number of users | 100 |
| ● Number of groups | 100 |
| ● Number of roles | 50 |
| Cycle time monitoring | |
| ● 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 |

**Classifications**

| | Version | Classification |
|---|---|---|
| eClass | 16 | 27-24-22-07 |
| eClass | 14 | 27-24-22-07 |
| eClass | 12 | 27-24-22-07 |
| eClass | 9.1 | 27-24-22-07 |
| eClass | 9 | 27-24-22-07 |
| eClass | 8 | 27-24-22-07 |
| eClass | 7.1 | 27-24-22-07 |
| eClass | 6 | 27-24-22-07 |
| ETIM | 10 | EC000236 |
| ETIM | 9 | EC000236 |
| ETIM | 8 | EC000236 |
| ETIM | 7 | EC000236 |
| IDEA | 4 | 3565 |
| UNSPSC | 15 | 32-15-17-05 |

**Approvals / Certificates**

**General Product Approval**

Miscellaneous | Manufacturer Declaration | Miscellaneous

**General Product Approval**

TUEV | Manufacturer Declaration | China RoHS

**General Product Approval** | **For use in hazardous locations**

FM | CCC-Ex | FM

**For use in hazardous locations** | **Functional Saftey**


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Miscellaneous

ATEX

IECEx

CCC-Ex

Type Examination Certificate

TUEV

| Functional Saftey | Test Certificates | Maritime application |
|---|---|---|

Type Examination Certificate

Type Test Certificates/Test Report

ABS

BUREAU VERITAS

DNV

LRS

| Maritime application | other | Environment |
|---|---|---|

NK / Nippon Kaiji Kyokai

RINA

CCS (China Classification Society)

KR (Korean Register of Shipping)

PROFINET

Siemens EcoTech

| Environment |
|---|

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