# SIEMENS

SIMATIC S7-1500F, CPU 1511F-1 PN, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 225 KB FOR PROGRAM AND 1 MB FOR DATA, 1. INTERFACE: PROFINET IRT WITH 2 PORT SWITCH, 60 NS BIT-PERFORMANCE, SIMATIC MEMORY CARD NECESSARY



Figure similar

| General information | |
|---|---|
| Product type designation | CPU 1511F-1 PN |
| HW functional status | FS01 |
| Firmware version | V1.8 |
| Engineering with | |
| • STEP 7 TIA Portal configurable/integrated as of version | V13 SP1 Update 4 |

| Display | |
|---|---|
| Screen diagonal (cm) | 3.45 cm |

| Control elements | |
|---|---|
| Number of keys | 6 |
| Mode selector switch | 1 |

| Supply voltage | |
|---|---|
| Type of supply voltage | 24 V DC |
| 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 |
| **Input current** | |
| Current consumption (rated value) | 0.7 A |
| Inrush current, max. | 1.9 A; Rated value |
| I²t | 0.02 A²·s |
| **Power** | |
| Power consumption from the backplane bus (balanced) | 5.5 W |
| Infeed power to the backplane bus | 10 W |
| **Power loss** | |
| Power loss, typ. | 5.7 W |
| **Memory** | |
| SIMATIC memory card required | Yes |
| **Work memory** | |
| • integrated (for program) | 225 kbyte |
| • integrated (for data) | 1 Mbyte |
| **Load memory** | |
| • Plug-in (SIMATIC Memory Card), max. | 32 Gbyte |
| **Backup** | |
| • maintenance-free | Yes |
| **CPU processing times** | |
| for bit operations, typ. | 60 ns |
| for word operations, typ. | 72 ns |
| for fixed point arithmetic, typ. | 96 ns |
| for floating point arithmetic, typ. | 384 ns |
| **CPU-blocks** | |
| Number of elements (total) | 2 000; Blocks (OB, FB, FC, DB) and UDTs |
| **DB** | |
| • Number, max. | 2 000; Number range: 1 to 65535 |
| • Size, max. | 1 Mbyte; For non-optimized block accesses, the max. size of the DB is 64 KB |
| **FB** | |
| • Number, max. | 1 998; Number range: 1 to 65535 |
| • Size, max. | 225 kbyte |
| **FC** | |
| • Number, max. | 1 999; Number range: 1 to 65535 |
| • Size, max. | 225 kbyte |
| **OB** | |

| | |
|---|---|
| • Size, max. | 225 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 |
| • Number of process alarm OBs | 50 |
| • Number of DPV1 alarm OBs | 3 |
| • Number of isochronous mode OBs | 1 |
| • Number of technology synchronous alarm 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 | |
| — adjustable | Yes |
| **IEC counter** | |
| • Number | Any (only limited by the main memory) |
| Retentivity | |
| — adjustable | Yes |
| **S7 times** | |
| • Number | 2 048 |
| Retentivity | |
| — adjustable | Yes |
| **IEC timer** | |
| • Number | Any (only limited by the main memory) |
| Retentivity | |
| — adjustable | Yes |

| Data areas and their retentivity | |
|---|---|
| **Flag** | |
| • Number, max. | 16 kbyte |
| • Number of clock memories | 8; 8 clock memory bits, 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 | 1 024; 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 | 5 |
| **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 | 8 |
| **Clock synchronization** | |
| • supported | Yes |
| • in AS, master | Yes |
| • in AS, slave | Yes |
| • on Ethernet via NTP | Yes |

## Interfaces

| Number of PROFINET interfaces | 1 |
|---|---|

## 1. Interface

### Interface types

| | |
|---|---|
| • Number of ports | 2 |
| • integrated switch | Yes |
| • RJ 45 (Ethernet) | Yes; X1 |

### Functionality

| | |
|---|---|
| • PROFINET IO Controller | Yes |
| • PROFINET IO Device | Yes |
| • SIMATIC communication | Yes |
| • Open IE communication | Yes |
| • Web server | Yes |
| • Media redundancy | Yes |

## Interface types

### RJ 45 (Ethernet)

| | |
|---|---|
| • 100 Mbps | Yes |
| • Autonegotiation | Yes |
| • Autocrossing | Yes |
| • Industrial Ethernet status LED | Yes |

## Protocols

### Number of connections

| | |
|---|---|
| • Number of connections, max. | 96; 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 | 64 |
| • Number of S7 routing paths | 16 |

### PROFINET IO Controller

#### Services

| | |
|---|---|
| — PG/OP communication | Yes |
| — S7 routing | Yes |
| — Isochronous mode | Yes |
| — Open IE communication | Yes |
| — IRT | Yes |
| — MRP | Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 |
| — PROFIenergy | Yes |
| — Prioritized startup | Yes; Max. 32 PROFINET devices |
| — Number of connectable IO Devices, max. | 128; In total, up to 256 distributed I/O devices can be connected via PROFIBUS or PROFINET |
| — Of which IO devices with IRT, max. | 64 |

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| | |
|---|---|
| — 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 |
| — 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 625 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 |
| — S7 routing | Yes |
| — Isochronous mode | No |
| — Open IE communication | Yes |
| — IRT | Yes |
| — MRP | Yes |
| — PROFIenergy | Yes |
| — Shared device | Yes |
| — Number of IO Controllers with shared device, max. | 4 |
| **SIMATIC communication** | |
| • 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. | 1 472 byte |
| • DHCP | No |
| • SNMP | Yes |
| • DCP | Yes |
| • LLDP | Yes |
| **Web server** | |
| • HTTP | Yes; Standard and user-defined pages |
| • HTTPS | Yes; Standard and user-defined pages |
| **Further protocols** | |
| • MODBUS | Yes; MODBUS TCP |
| **Media redundancy** | |
| • Switchover time on line break, typ. | 200 ms |
| • Number of stations in the ring, max. | 50 |

| Isochronous mode | |
|---|---|
| Isochronous operation (application synchronized up to terminal) | Yes |
| Equidistance | Yes |

| S7 message functions | |
|---|---|
| Number of login stations for message functions, max. | 32 |
| Block related messages | Yes |
| Number of configurable alarms, max. | 5 000 |
| Number of simultaneously active alarms in alarm pool | |
| • Number of reserved user alarms | 300 |
| • Number of reserved alarms for system diagnostics | 100 |
| • Number of reserved alarms for Motion Control technology objects | 80 |

| Test commissioning functions | |
|---|---|
| Joint commission (Team Engineering) | Yes; Parallel online access possible for up to 3 engineering systems |
| Status block | Yes; Up to 8 simultaneously (in total across all ES clients) |
| Single step | No |
| Status/control | |

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| | |
|---|---|
| • Status/control variable | Yes |
| • Variables | Inputs, outputs, memory bits, DB, times, counters |
| • Number of variables, max. | |
| — of which status variables, max. | 200; per job |
| — of which control variables, max. | 200; per job |
| **Forcing** | |
| • Forcing, variables | 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 |
| • Connection display LINK TX/RX | Yes |
| **Supported technology objects** | |
| Motion Control | Yes |
| • Speed-controlled axis | |
| — Number of speed-controlled axes, max. | 6; Max. number of speed-controlled axes (requirement: there must be no other motion technology objects created) |
| • Positioning axis | |
| — Number of positioning axes, max. | 6; Max. number of positioning axes (requirement: there must be no other motion technology objects created) |
| • Synchronized axes (relative gear synchronization) | |
| — Number of axes, max. | 3; Max. number of synchronous axes (requirement: there must be no other motion technology objects created) |
| • External encoders | |
| — Number of external encoders, max. | 6; Max. number of external encoders (requirement: there must be no other motion technology objects created) |
| Controller | |
| • PID_Compact | Yes; Universal PID controller with integrated optimization |
| • PID_3Step | Yes; PID controller with integrated optimization for valves |
| Counting and measuring | |
| • High-speed counter | Yes |
| **Standards, approvals, certificates** | |
| Highest safety class achievable in safety mode | |

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| 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 |

## Ambient conditions

### Ambient temperature during operation

| | |
|---|---|
| • horizontal installation, min. | 0 °C |
| • horizontal installation, max. | 60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off |
| • vertical installation, min. | 0 °C |
| • vertical installation, max. | 40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off |

## Configuration

### Programming

#### Programming language

| | |
|---|---|
| — LAD | Yes; incl. failsafe |
| — FBD | Yes; incl. failsafe |
| — STL | Yes |
| — SCL | Yes |
| — GRAPH | Yes |

### Know-how protection

| | |
|---|---|
| • User program protection | Yes |
| • Copy protection | Yes |
| • Block protection | Yes |

### Access protection

| | |
|---|---|
| • Password for display | Yes |
| • Protection level: Write protection | Yes |
| • Protection level: Read/write protection | Yes |
| • Protection level: Complete protection | Yes |

### 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. | 430 g |
| **last modified:** | 12/06/2016 |