



\*\*\* Spare part \*\*\* SIMATIC S7-1500, CPU 1515-2 PN, central processing unit with work memory 500 KB for program and 3 MB for data, 1st interface: PROFINET IRT with 2-port switch, 2nd interface: PROFINET RT, 30 ns bit performance, SIMATIC Memory Card required

| General information  |  |
|--|--|
| Product type designation   | CPU 1515-2 PN  |
| HW functional status   | FS03   |
| Firmware version   | V2.8   |
| Product function   |  |
| <ul style="list-style-type: none"> <li>I&amp;M data</li> </ul>   | Yes; I&M0 to I&M3  |
| <ul style="list-style-type: none"> <li>Isochronous mode</li> </ul>                                       | Yes; Distributed and central; with minimum OB 6x cycle of 500 $\mu$ s (distributed) and 1 ms (central) |
| Engineering with   |  |
| <ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated from version</li> </ul> | V16 (FW V2.8) / V13 (FW V1.5) or higher  |
| Configuration control  |  |
| via dataset  | Yes  |
| Display  |  |
| Screen diagonal [cm]   | 6.1 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  |  |
| <ul style="list-style-type: none"> <li>Mains/voltage failure stored energy time</li> </ul>               | 5 ms   |
| <ul style="list-style-type: none"> <li>Repeat rate, min.</li> </ul>                                      | 1/s  |
| Input current  |  |
| Current consumption (rated value)  | 0.8 A  |
| Inrush current, max.   | 2.4 A; nominal   |
| $I^2t$   | 0.02 A <sup>2</sup> ·s   |
| Power  |  |
| Infeed power to the backplane bus  | 12 W   |
| Power consumption from the backplane bus (balanced)  | 6.2 W  |
| Power loss   |  |
| Power loss, typ.   | 6.3 W  |
| Memory   |  |
| Number of slots for SIMATIC memory card  | 1  |

|   |   |
|---|---|
| SIMATIC memory card required                  | Yes   |
| <b>Work memory</b>                            |   |
| • integrated (for program)                    | 500 kbyte   |
| • integrated (for data)                       | 3 Mbyte   |
| <b>Load memory</b>                            |   |
| • Plug-in (SIMATIC Memory Card), max.         | 32 Gbyte  |
| <b>Backup</b>                                 |   |
| • maintenance-free                            | Yes   |
| <b>CPU processing times</b>                   |   |
| for bit operations, typ.                      | 30 ns   |
| for word operations, typ.                     | 36 ns   |
| for fixed point arithmetic, typ.              | 48 ns   |
| for floating point arithmetic, typ.           | 192 ns  |
| <b>CPU-blocks</b>                             |   |
| Number of elements (total)                    | 6 000; Blocks (OB, FB, FC, DB) and UDTs   |
| <b>DB</b>                                     |   |
| • 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.                                  | 3 Mbyte; For DBs with absolute addressing, the max. size is 64 KB   |
| <b>FB</b>                                     |   |
| • Number range                                | 0 ... 65 535  |
| • Size, max.                                  | 500 kbyte   |
| <b>FC</b>                                     |   |
| • Number range                                | 0 ... 65 535  |
| • Size, max.                                  | 500 kbyte   |
| <b>OB</b>                                     |   |
| • Size, max.                                  | 500 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 500 µs  |
| • Number of process alarm OBs                 | 50  |
| • Number of DPV1 alarm OBs                    | 3   |
| • Number of isochronous mode OBs              | 2   |
| • 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   |
| <b>Nesting depth</b>                          |   |
| • per priority class                          | 24  |
| <b>Counters, timers and their retentivity</b> |   |
| <b>S7 counter</b>                             |   |
| • Number                                      | 2 048   |
| <b>Retentivity</b>                            |   |
| — adjustable                                  | Yes   |
| <b>IEC counter</b>                            |   |
| • Number                                      | Any (only limited by the main memory)   |
| <b>Retentivity</b>                            |   |
| — adjustable                                  | Yes   |
| <b>S7 times</b>                               |   |
| • Number                                      | 2 048   |
| <b>Retentivity</b>                            |   |
| — adjustable                                  | Yes   |
| <b>IEC timer</b>                              |   |
| • Number                                      | Any (only limited by the main memory)   |
| <b>Retentivity</b>                            |   |


|  |   |
|--|---|
| — adjustable   | Yes   |
| <b>Data areas and their retentivity</b>                            |   |
| Retentive data area (incl. timers, counters, flags), max.          | 512 kbyte   |
| Extended retentive data area (incl. timers, counters, flags), max. | 3 Mbyte   |
| <b>Flag</b>  |   |
| • Number, max.   | 16 kbyte  |
| • Number of clock memories   | 8   |
| <b>Data blocks</b>   |   |
| • Retentivity adjustable   | Yes   |
| • Retentivity preset   | No  |
| <b>Local data</b>  |   |
| • per priority class, max.   | 64 kbyte  |
| <b>Address area</b>  |   |
| Number of IO modules   | 8 192; max. number of modules / submodules  |
| <b>I/O address area</b>  |   |
| • 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   |
| <b>Subprocess images</b>   |   |
| • Number of subprocess images, max.                                | 32  |
| <b>Hardware configuration</b>                                      |   |
| Number of distributed IO systems                                   | 64; 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) |
| <b>Number of DP masters</b>  |   |
| • Via CM   | 8; A maximum of 8 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total   |
| <b>Number of IO Controllers</b>                                    |   |
| • integrated   | 2   |
| • Via CM   | 8; A maximum of 8 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total   |
| <b>Rack</b>  |   |
| • Modules per rack, max.   | 32; CPU + 31 modules  |
| • Number of lines, max.  | 1   |
| <b>PtP CM</b>  |   |
| • Number of PtP CMs  | the number of connectable PtP CMs is only limited by the number of available slots  |
| <b>Time of day</b>   |   |
| <b>Clock</b>   |   |
| • Type   | Hardware clock  |
| • Backup time  | 6 wk; At 40 °C ambient temperature, typically   |
| • Deviation per day, max.  | 10 s  |
| <b>Operating hours counter</b>                                     |   |
| • Number   | 16  |
| <b>Clock synchronization</b>                                       |   |
| • supported  | Yes   |
| • in AS, master  | Yes   |
| • in AS, slave   | Yes   |
| • on Ethernet via NTP  | Yes   |
| <b>Interfaces</b>  |   |
| Number of PROFINET interfaces                                      | 2   |
| <b>1. Interface</b>  |   |

| Interface types   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• RJ 45 (Ethernet)</li> </ul>          | Yes; X1  |
| <ul style="list-style-type: none"> <li>• Number of ports</li> </ul>           | 2  |
| <ul style="list-style-type: none"> <li>• integrated switch</li> </ul>         | Yes  |
| Protocols   |  |
| <ul style="list-style-type: none"> <li>• IP protocol</li> </ul>               | Yes  |
| <ul style="list-style-type: none"> <li>• PROFINET IO Controller</li> </ul>    | Yes  |
| <ul style="list-style-type: none"> <li>• PROFINET IO Device</li> </ul>        | Yes  |
| <ul style="list-style-type: none"> <li>• SIMATIC communication</li> </ul>     | Yes  |
| <ul style="list-style-type: none"> <li>• Open IE communication</li> </ul>     | Yes; Optionally also encrypted   |
| <ul style="list-style-type: none"> <li>• Web server</li> </ul>                | Yes  |
| <ul style="list-style-type: none"> <li>• Media redundancy</li> </ul>          | Yes  |
| PROFINET IO Controller  |  |
| Services  |  |
| — PG/OP communication   | Yes  |
| — Isochronous mode  | Yes  |
| — Direct data exchange  | Yes  |
| — IRT   | Yes  |
| — PROFIenergy   | Yes; per user program  |
| — Prioritized startup   | Yes; Max. 32 PROFINET devices  |
| — Number of connectable IO Devices, max.                                      | 256; In total, up to 1 000 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.                               | 256  |
| — of which in line, max.  | 256  |
| — 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 $\mu$ s   | 250 $\mu$ s to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 500 $\mu$ s of the isochronous OB is decisive                          |
| — for send cycle of 500 $\mu$ s   | 500 $\mu$ s 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 $\mu$ s: 375 $\mu$ s, 625 $\mu$ s ... 3 875 $\mu$ s)   |
| Update time for RT  |  |
| — for send cycle of 250 $\mu$ s   | 250 $\mu$ s to 128 ms  |
| — for send cycle of 500 $\mu$ s   | 500 $\mu$ s 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  |
| — Asset management record   | Yes  |
| 2. Interface  |  |
| Interface types   |  |
| <ul style="list-style-type: none"> <li>• RJ 45 (Ethernet)</li> </ul>          | Yes; X2  |

|   |  |
|---|--|
| • Number of ports   | 1  |
| • integrated switch   | No   |
| <b>Protocols</b>  |  |
| • IP protocol   | Yes  |
| • PROFINET IO Controller  | Yes  |
| • PROFINET IO Device  | Yes  |
| • SIMATIC communication   | Yes  |
| • Open IE communication   | Yes; Optionally also encrypted   |
| • Web server  | Yes  |
| • Media redundancy  | No   |
| <b>PROFINET IO Controller</b>   |  |
| <b>Services</b>   |  |
| — PG/OP communication   | Yes  |
| — Isochronous mode  | No   |
| — Direct data exchange  | No   |
| — IRT   | No   |
| — PROFlenergy   | Yes; per user program  |
| — Prioritized startup   | No   |
| — Number of connectable IO Devices, max.                                      | 32; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET  |
| — Number of connectable IO Devices for RT, max.                               | 32   |
| — of which in line, max.  | 32   |
| — 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 |
| <b>Update time for RT</b>   |  |
| — for send cycle of 1 ms  | 1 ms to 512 ms   |
| <b>PROFINET IO Device</b>   |  |
| <b>Services</b>   |  |
| — PG/OP communication   | Yes  |
| — Isochronous mode  | No   |
| — IRT   | No   |
| — PROFlenergy   | Yes; per user program  |
| — Prioritized startup   | No   |
| — Shared device   | Yes  |
| — Number of IO Controllers with shared device, max.                           | 4  |
| — Asset management record   | Yes  |
| <b>Interface types</b>  |  |
| <b>RJ 45 (Ethernet)</b>   |  |
| • 100 Mbps  | Yes  |
| • Autonegotiation   | Yes  |
| • Autocrossing  | Yes  |
| <b>Protocols</b>  |  |
| <b>Number of connections</b>  |  |
| • Number of connections, max.   | 192; 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                             | 108  |
| • Number of S7 routing paths  | 16   |
| <b>Redundancy mode</b>  |  |
| • H-Sync forwarding   | Yes  |
| <b>Media redundancy</b>   |  |
| — MRP   | Yes; as MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50   |
| — MRPD  | Yes; Requirement: IRT  |
| — Switchover time on line break, typ.   | 200 ms; For MRP, bumpless for MRPD   |

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| — Number of stations in the ring, max.  | 50   |
| <b>SIMATIC communication</b>  |  |
| • S7 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)                           |
| <b>Open IE communication</b>  |  |
| • 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  |
| • DHCP  | No   |
| • SNMP  | Yes  |
| • DCP   | Yes  |
| • LLDP  | Yes  |
| <b>Web server</b>   |  |
| • HTTP  | Yes; Standard and user pages   |
| • HTTPS   | Yes; Standard and user pages   |
| <b>OPC UA</b>   |  |
| • Runtime license required  | Yes  |
| • OPC UA Client   | Yes  |
| — Application authentication  | Yes  |
| — Number of connections, max.   | 10   |
| — Number of nodes of the client interfaces, max.  | 2 000  |
| — Number of elements for one call of OPC-UA_NodeGetHandleList/OPC-UA_ReadList/C 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 per connection (except OPC-UA_ReadList, OPC-UA_WriteList, OPC-UA_M max. | 1  |
| — Number of simultaneous calls of the client instructions OPC-UA_ReadList, OPC-UA_WriteList and OPC-UA_MethodCall, max.           | 5  |
| — 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, custom address space |
| — Application authentication  | Yes  |
| — Number of sessions, max.  | 48   |
| — Number of accessible variables, max.  | 100 000  |
| — Number of registerable nodes, max.  | 20 000   |
| — Number of subscriptions per session, max.   | 20   |
| — Sampling interval, min.   | 100 ms   |
| — Publishing interval, min.   | 200 ms   |
| — Number of server methods, max.  | 50   |
| — Number of inputs/outputs per server method, max.  | 20   |
| — Number of monitored items, max.   | 2 000  |

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| — Number of server interfaces, max.  | 10   |
| — Number of nodes for user-defined server interfaces, max.                   | 5 000  |
| <b>Further protocols</b>   |  |
| • MODBUS   | Yes; MODBUS TCP  |
| <b>Isochronous mode</b>  |  |
| Equidistance   | Yes  |
| <b>S7 message functions</b>  |  |
| Number of login stations for message functions, max.                         | 64   |
| Program alarms   | Yes  |
| Number of configurable program messages, max.                                | 10 000; 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   | 800  |
| • Number of alarms for system diagnostics                                    | 200  |
| • Number of alarms for motion technology objects                             | 160  |
| <b>Test commissioning functions</b>  |  |
| Joint commission (Team Engineering)  | Yes; Parallel online access possible for up to 8 engineering systems   |
| Status block   | Yes; Up to 8 simultaneously (in total across all ES clients)   |
| Single step  | No   |
| Number of breakpoints  | 8  |
| <b>Status/control</b>  |  |
| • 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   |
| <b>Forcing</b>   |  |
| • Forcing, variables   | Peripheral inputs/outputs  |
| • Number of variables, max.  | 200  |
| <b>Diagnostic buffer</b>   |  |
| • present  | Yes  |
| • Number of entries, max.  | 3 200  |
| — of which powerfail-proof   | 500  |
| <b>Traces</b>  |  |
| • Number of configurable Traces  | 4; Up to 512 KB of data per trace are possible   |
| <b>Interrupts/diagnostics/status information</b>                             |  |
| <b>Diagnostics indication LED</b>  |  |
| • RUN/STOP LED   | Yes  |
| • ERROR LED  | Yes  |
| • MAINT LED  | Yes  |
| • Connection display LINK TX/RX  | Yes  |
| <b>Supported technology objects</b>  |  |
| Motion Control   | Yes; Note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool or SIZER |
| • Number of available Motion Control resources for technology objects        | 2 400  |
| • 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   |
| • Positioning axis   |  |
| — Number of positioning axes at motion control cycle of 4 ms (typical value) | 7  |

|  |  |
|--|--|
| — 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  |
| <b>Ambient conditions</b>  |  |
| 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 |
| 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                             |
| <b>Configuration</b>   |  |
| Programming  |  |
| 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  |  |
| • 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  |
| <b>Dimensions</b>  |  |
| Width  | 70 mm  |
| Height   | 147 mm   |
| Depth  | 129 mm   |
| <b>Weights</b>   |  |
| Weight, approx.  | 830 g  |
| <b>last modified:</b>  | 12/16/2020      |