

SIMATIC DP, CPU 1510SP-1 PN FOR ET 200SP, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 100 KB FOR PROGRAM AND 750 KB FOR DATA, 1. INTERFACE: PROFINET IRT WITH 3 PORT SWITCH, 72 NS BIT-PERFORMANCE, SIMATIC MEMORY CARD NECESSARY, BUSADAPTER NECESSARY FOR PORT 1 AND 2

| General information   |                        |
|---|------------------------|
| Product type designation  | CPU 1510SP-1 PN        |
| HW functional status  | FS01                   |
| Firmware version  | V1.8                   |
| Engineering with  |                        |
| <ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated as of version</li> </ul> | V13 SP1 Update 4       |
| Configuration control   |                        |
| via dataset   | Yes                    |
| Control elements  |                        |
| 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                   |
| Input current   |                        |
| Current consumption (rated value)   | 0.6 A                  |
| Inrush current, max.  | 4.7 A; Rated value     |
| $I^2t$  | 0.14 A <sup>2</sup> ·s |
| Power   |                        |
| Infeed power to the backplane bus   | 8.75 W                 |
| Power loss  |                        |
| Power loss, typ.  | 5.6 W                  |
| Memory  |                        |
| Number of slots for SIMATIC memory card   | 1                      |
| SIMATIC Memory Card required  | Yes                    |
| Work memory   |                        |

|  |   |
|--|---|
| • integrated (for program)                   | 100 kbyte   |
| • integrated (for data)                      | 750 kbyte   |
| <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.                     | 72 ns   |
| for word operations, typ.                    | 86 ns   |
| for fixed point arithmetic, typ.             | 115 ns  |
| for floating point arithmetic, typ.          | 461 ns  |
| <b>CPU-blocks</b>                            |   |
| Number of elements (total)                   | 2 000; In addition to blocks such as DBs, FBs and FCs, UDTs, global constants, etc. are also regarded as elements                                     |
| <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.                                 | 750 kbyte; For DBs with absolute addressing, the max. size is 64 KB   |
| <b>FB</b>                                    |   |
| • Number range                               | 0 ... 65 535  |
| • Size, max.                                 | 100 kbyte   |
| <b>FC</b>                                    |   |
| • Number range                               | 0 ... 65 535  |
| • Size, max.                                 | 100 kbyte   |
| <b>OB</b>                                    |   |
| • Size, max.                                 | 100 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   |
| <b>Nesting depth</b>                         |   |
| • per priority class                         | 24  |

## Counters, timers and their retentivity

|                    |                                       |
|--------------------|---------------------------------------|
| <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                                   |

## Data areas and their retentivity

|   |  |
|---|--|
| retentive data area in total (incl. times, counters, flags), max. | 128 kbyte; Available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 88 KB |
| <b>Flag</b>   |  |
| • Number, max.  | 16 kbyte   |
| • Number of clock memories  | 8; 8 clock memory bits, grouped into one clock memory byte   |
| <b>Data blocks</b>  |  |
| • Retentivity adjustable  | Yes  |
| • Retentivity preset  | No   |
| <b>Local data</b>   |  |
| • per priority class, max.  | 64 kbyte; max. 16 KB per block   |

## Address area

|                                     |  |
|-------------------------------------|--|
| Number of IO modules                | 1 024; 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 |
| <b>per integrated IO subsystem</b>  |  |
| — Inputs (volume)                   | 8 kbyte  |
| — Outputs (volume)                  | 8 kbyte  |
| <b>per CM/CP</b>                    |  |
| — Inputs (volume)                   | 8 kbyte  |
| — Outputs (volume)                  | 8 kbyte  |
| <b>Subprocess images</b>            |  |
| • Number of subprocess images, max. | 32   |

|                                   |  |
|-----------------------------------|--|
| <b>Address space per module</b>   |  |
| • Address space per module, max.  | 32 byte; For input and output data respectively                                    |
| <b>Address space per station</b>  |  |
| • Address space per station, max. | 1 280 byte; for central inputs and outputs; depending on configuration             |
| <b>Hardware configuration</b>     |  |
| Number of distributed IO systems  | 20   |
| <b>Number of DP masters</b>       |  |
| • Via CM                          | 1  |
| <b>Number of IO Controllers</b>   |  |
| • integrated                      | 1  |
| • Via CM                          | 0  |
| <b>Rack</b>                       |  |
| • Modules per rack, max.          | 64; CPU + 64 modules + server module (mounting width max. 1 m)                     |
| • Rack, number of rows, 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; Typ.: 2 s  |
| <b>Operating hours counter</b>    |  |
| • Number                          | 16   |
| <b>Clock synchronization</b>      |  |
| • supported                       | Yes  |
| • to DP, master                   | Yes; Via CM DP module  |
| • to DP, slave                    | Yes; Via CM DP module  |
| • in AS, master                   | Yes  |
| • in AS, slave                    | Yes  |
| • on Ethernet via NTP             | Yes  |
| <b>Interfaces</b>                 |  |
| Number of PROFINET interfaces     | 1  |
| Number of PROFIBUS interfaces     | 1; Via CM DP module  |
| With optical interface            | No   |
| <b>1. Interface</b>               |  |
| <b>Interface types</b>            |  |
| • Number of ports                 | 3; 1. integr. + 2. via BusAdapter  |
| • integrated switch               | Yes  |

|                          |   |
|--------------------------|---|
| • RJ 45 (Ethernet)       | Yes; X1   |
| • Bus adapter (PROFINET) | Yes; Applicable BusAdapters: BA 2x RJ45, BA 2x FC |
| <b>Functionality</b>     |   |
| • PROFINET IO Controller | Yes   |
| • PROFINET IO Device     | Yes   |
| • SIMATIC communication  | Yes   |
| • Open IE communication  | Yes   |
| • Web server             | Yes   |
| • Media redundancy       | Yes   |

## 2. Interface

|                         |                       |
|-------------------------|-----------------------|
| <b>Interface types</b>  |                       |
| • Number of ports       | 1                     |
| • RS 485                | Yes; Via CM DP module |
| <b>Functionality</b>    |                       |
| • PROFIBUS DP master    | Yes                   |
| • PROFIBUS DP slave     | Yes                   |
| • SIMATIC communication | Yes                   |

|                                  |           |
|----------------------------------|-----------|
| <b>Interface types</b>           |           |
| <b>RJ 45 (Ethernet)</b>          |           |
| • 100 Mbps                       | Yes       |
| • Autonegotiation                | Yes       |
| • Autocrossing                   | Yes       |
| • Industrial Ethernet status LED | Yes       |
| <b>RS 485</b>                    |           |
| • Transmission rate, max.        | 12 Mbit/s |

|   |     |
|---|-----|
| <b>Protocols</b>                                  |     |
| <b>Number of connections</b>                      |     |
| • Number of connections, max.                     | 64  |
| • Number of connections reserved for ES/HMI/web   | 10  |
| • Number of connections via integrated interfaces | 64  |
| • Number of S7 routing paths                      | 16  |
| <b>PROFINET IO Controller</b>                     |     |
| <b>Services</b>                                   |     |
| — 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   |
| — PROFINergy  | Yes  |
| — Prioritized startup   | Yes; Max. 32 PROFINET devices  |
| — Number of connectable IO Devices, max.                                      | 64; In total, up to 189 distributed I/O devices can be connected via PROFIBUS or PROFINET  |
| — Of which IO devices with IRT, max.  | 64   |
| — Number of connectable IO Devices for RT, max.                               | 64   |
| — of which in line, max.  | 64   |
| — 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 $\mu$ s                      | 250 $\mu$ s to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 $\mu$ s of the isochronous OB is decisive |
| — for send cycle of 500 $\mu$ s                      | 500 $\mu$ s to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 $\mu$ s 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 $\mu$ 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 |
| — S7 routing            | Yes |
| — Isochronous mode      | No  |
| — Open IE communication | Yes |
| — IRT                   | Yes |
| — MRP                   | Yes |
| — PROFINergy            | Yes |

|   |  |
|---|--|
| — Shared device   | Yes  |
| — Number of IO Controllers with shared device, max.             | 4  |
| <b>SIMATIC communication</b>                                    |  |
| • 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.   | 1 472 byte   |
| • DHCP  | No   |
| • SNMP  | Yes  |
| • DCP   | Yes  |
| • LLDP  | Yes  |
| <b>Web server</b>   |  |
| • HTTP  | Yes; Standard and user-defined pages                             |
| • HTTPS   | Yes; Standard and user-defined pages                             |
| <b>PROFIBUS DP master</b>                                       |  |
| • Number of connections, max.                                   | 48   |
| <b>Services</b>   |  |
| — PG/OP communication   | Yes  |
| — S7 routing  | Yes  |
| — Data record routing   | Yes  |
| — Isochronous mode  | No   |
| — Equidistance  | No   |
| — Number of DP slaves   | 125  |
| — Activation/deactivation of DP slaves                          | Yes  |
| <b>Further protocols</b>  |  |
| • MODBUS  | Yes; MODBUS TCP  |
| <b>Media redundancy</b>   |  |
| • Switchover time on line break, typ.                           | 200 ms   |
| • Number of stations in the ring, max.                          | 50   |
| <b>Isochronous mode</b>   |  |
| Isochronous operation (application synchronized up to terminal) | Yes; Only with PROFINET; with minimum OB 6x cycle of 625 $\mu$ s |

## 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  |       |
| <ul style="list-style-type: none"> <li>• Number of reserved user alarms</li> </ul>                                  | 300   |
| <ul style="list-style-type: none"> <li>• Number of reserved alarms for system diagnostics</li> </ul>                | 100   |
| <ul style="list-style-type: none"> <li>• Number of reserved alarms for Motion Control technology objects</li> </ul> | 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   |

|  |  |
|--|--|
| <b>Status/control</b>  |  |
| <ul style="list-style-type: none"> <li>• Status/control variable</li> </ul>          | Yes  |
| <ul style="list-style-type: none"> <li>• Variables</li> </ul>                        | Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters |
| <ul style="list-style-type: none"> <li>• Number of variables, max.</li> </ul>        |  |
| <ul style="list-style-type: none"> <li>— of which status variables, max.</li> </ul>  | 200; per job   |
| <ul style="list-style-type: none"> <li>— of which control variables, max.</li> </ul> | 200; per job   |

|   |                           |
|---|---------------------------|
| <b>Forcing</b>  |                           |
| <ul style="list-style-type: none"> <li>• Forcing</li> </ul>                   | Yes                       |
| <ul style="list-style-type: none"> <li>• Forcing, variables</li> </ul>        | Peripheral inputs/outputs |
| <ul style="list-style-type: none"> <li>• Number of variables, max.</li> </ul> | 200                       |

|  |       |
|--|-------|
| <b>Diagnostic buffer</b>   |       |
| <ul style="list-style-type: none"> <li>• present</li> </ul>                  | Yes   |
| <ul style="list-style-type: none"> <li>• Number of entries, max.</li> </ul>  | 1 000 |
| <ul style="list-style-type: none"> <li>— of which powerfail-proof</li> </ul> | 500   |

|   |  |
|---|--|
| <b>Traces</b>   |  |
| <ul style="list-style-type: none"> <li>• Number of configurable Traces</li> </ul> | 4; Up to 512 KB of data per trace are possible |

## Interrupts/diagnostics/status information

|  |     |
|--|-----|
| <b>Diagnostics indication LED</b>  |     |
| <ul style="list-style-type: none"> <li>• RUN/STOP LED</li> </ul>                               | Yes |
| <ul style="list-style-type: none"> <li>• ERROR LED</li> </ul>                                  | Yes |
| <ul style="list-style-type: none"> <li>• MAINT LED</li> </ul>                                  | Yes |
| <ul style="list-style-type: none"> <li>• Monitoring of the supply voltage (PWR-LED)</li> </ul> | Yes |
| <ul style="list-style-type: none"> <li>• Connection display LINK TX/RX</li> </ul>              | Yes |

## Supported technology objects

|                |     |
|----------------|-----|
| Motion Control | Yes |
|----------------|-----|



|   |   |
|---|---|
| <ul style="list-style-type: none"> <li>• Speed-controlled axis <ul style="list-style-type: none"> <li>— Number of speed-controlled axes, max.</li> </ul> </li> <li>• Positioning axis <ul style="list-style-type: none"> <li>— Number of positioning axes, max.</li> </ul> </li> <li>• Synchronized axes (relative gear synchronization) <ul style="list-style-type: none"> <li>— Number of axes, max.</li> </ul> </li> <li>• External encoders <ul style="list-style-type: none"> <li>— Number of external encoders, max.</li> </ul> </li> </ul> | <p>6; Requirement: There must be no other motion technology objects created; note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool</p> <p>6; Requirement: There must be no other motion technology objects created; note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool</p> <p>3; Requirement: There must be no other motion technology objects created; note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool</p> <p>6; Requirement: There must be no other motion technology objects created; note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool</p> |
| <b>Controller</b> <ul style="list-style-type: none"> <li>• PID_Compact</li> <li>• PID_3Step</li> <li>• PID-Temp</li> </ul>  | <p>Yes; Universal PID controller with integrated optimization</p> <p>Yes; PID controller with integrated optimization for valves</p> <p>Yes; PID controller with integrated optimization for temperature</p>  |
| <b>Counting and measuring</b> <ul style="list-style-type: none"> <li>• High-speed counter</li> </ul>  | <p>Yes</p>  |

### Ambient conditions

|  |        |
|--|--------|
| <b>Ambient temperature during operation</b>              |        |
| • horizontal installation, min.                          | 0 °C   |
| • horizontal installation, max.                          | 60 °C  |
| • vertical installation, min.                            | 0 °C   |
| • vertical installation, max.                            | 50 °C  |
| <b>Ambient temperature during storage/transportation</b> |        |
| • min.   | -40 °C |
| • max.   | 70 °C  |

### Configuration

|                             |     |
|-----------------------------|-----|
| <b>Programming</b>          |     |
| <b>Programming language</b> |     |
| — LAD                       | Yes |
| — FBD                       | Yes |
| — STL                       | Yes |
| — SCL                       | Yes |
| — GRAPH                     | Yes |
| <b>Know-how protection</b>  |     |
| • User program protection   | Yes |
| • Copy protection           | Yes |

|   |                               |
|---|-------------------------------|
| • Block protection                        | Yes                           |
| <b>Access protection</b>                  |                               |
| • Protection level: Write protection      | Yes                           |
| • Protection level: Read/write protection | Yes                           |
| • Protection level: Complete protection   | Yes                           |
| <b>Cycle time monitoring</b>              |                               |
| • lower limit                             | adjustable minimum cycle time |
| • upper limit                             | adjustable maximum cycle time |
| <b>Dimensions</b>                         |                               |
| Width                                     | 100 mm                        |
| Height                                    | 117 mm                        |
| Depth                                     | 75 mm                         |
| <b>Weights</b>                            |                               |
| Weight, approx.                           | 310 g                         |
| <b>last modified:</b>                     | 09.04.2016                    |