



SIMATIC DP, CPU 1510SP F-1 PN for ET 200SP, Central processing unit with Work memory 150 KB for program and 750 KB for data, 1st interface: PROFINET IRT with 3-port switch, 72 ns bit performance, SIMATIC Memory Card required, BusAdapter required for Port 1 and 2

General information	
Product type designation	CPU 1510SP F-1 PN
HW functional status	FS05
Firmware version	V2.9
Product function	
<ul style="list-style-type: none"> I&M data 	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> Module swapping during operation (hot swapping) 	Yes; Multi-hot swapping
<ul style="list-style-type: none"> Isochronous mode 	Yes; Only with PROFINET; with minimum OB 6x cycle of 625 µs
Engineering with	
<ul style="list-style-type: none"> STEP 7 TIA Portal configurable/integrated from version 	V17 (FW V2.9) / V13 SP1 Update 4 (FW V1.8) or higher
Configuration control	
via dataset	Yes
Control elements	
Mode selector switch	1
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
Input current	
Current consumption (rated value)	0.6 A
Current consumption, max.	0.9 A
Inrush current, max.	4.7 A; Rated value
I ² t	0.14 A ² ·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	
<ul style="list-style-type: none"> integrated (for program) 	150 kbyte
<ul style="list-style-type: none"> integrated (for data) 	750 kbyte
Load memory	
<ul style="list-style-type: none"> Plug-in (SIMATIC Memory Card), max. 	32 Gbyte

Backup	
• maintenance-free	Yes
CPU processing times	
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
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.	750 kbyte; For DBs with absolute addressing, the max. size is 64 KB
FB	
• Number range	0 ... 65 535
• Size, max.	100 kbyte
FC	
• Number range	0 ... 65 535
• Size, max.	100 kbyte
OB	
• Size, max.	150 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 Failsafe, two RTGs with one "Cyclic interrupt OB" or one "Free cycle OB" (F-OB) each are possible
• 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	
Retentive data area (incl. timers, counters, flags), max.	128 kbyte; Available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 88 KB
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	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
Address space per module	
• Address space per module, max.	288 byte; For input and output data respectively
Address space per station	
• Address space per station, max.	2 560 byte; for central inputs and outputs; depending on configuration; 2 048 bytes for ET 200SP modules + 512 bytes for ET 200AL modules
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	1
Number of IO Controllers	
• integrated	1
• Via CM	0
Rack	
• Modules per rack, max.	80; CPU + 64 modules + server module (mounting width max. 1 m) + 16 ET 200AL modules
• Quantity of operable ET 200SP modules, max.	64
• Quantity of operable ET 200AL modules, max.	16
• 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	16
Clock synchronization	
• 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
Interfaces	
Number of PROFINET interfaces	1
Number of PROFIBUS interfaces	1; Via CM DP module
Optical interface	No
1. Interface	

Interface types	
<ul style="list-style-type: none"> ● RJ 45 (Ethernet) ● Number of ports ● integrated switch ● BusAdapter (PROFINET) 	<p>Yes; X1 P3; opt. X1 P1 and X1 P2 via BusAdapter BA 2x RJ45</p> <p>3; 1. integr. + 2. via BusAdapter</p> <p>Yes</p> <p>Yes; compatible BusAdapters: BA 2x RJ45, BA 2x FC, BA 2x M12</p>
Protocols	
<ul style="list-style-type: none"> ● IP protocol ● PROFINET IO Controller ● PROFINET IO Device ● SIMATIC communication ● Open IE communication ● Web server ● Media redundancy 	<p>Yes; IPv4</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes; Optionally also encrypted</p> <p>Yes</p> <p>Yes; MRP Automanager according to IEC 62439-2 Edition 2.0</p>
PROFINET IO Controller	
Services	
<ul style="list-style-type: none"> — PG/OP communication — Isochronous mode — Direct data exchange — IRT — PROFIenergy — Prioritized startup — Number of connectable IO Devices, max. — Of which IO devices with IRT, max. — Number of connectable IO Devices for RT, max. — of which in line, max. — Number of IO Devices that can be simultaneously activated/deactivated, max. — Number of IO Devices per tool, max. — Updating times 	<p>Yes</p> <p>Yes</p> <p>Yes; Requirement: IRT and isochronous mode (MRPD optional)</p> <p>Yes</p> <p>Yes; per user program</p> <p>Yes; Max. 32 PROFINET devices</p> <p>64; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</p> <p>64</p> <p>64</p> <p>64</p> <p>8; in total across all interfaces</p> <p>8</p> <p>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</p>
Update time for IRT	
<ul style="list-style-type: none"> — for send cycle of 250 μs — for send cycle of 500 μs — for send cycle of 1 ms — for send cycle of 2 ms — for send cycle of 4 ms — With IRT and parameterization of "odd" send cycles 	<p>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</p> <p>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</p> <p>1 ms to 16 ms</p> <p>2 ms to 32 ms</p> <p>4 ms to 64 ms</p> <p>Update time = set "odd" send clock (any multiple of 125 μs: 375 μs, 625 μs ... 3 875 μs)</p>
Update time for RT	
<ul style="list-style-type: none"> — for send cycle of 250 μs — for send cycle of 500 μs — for send cycle of 1 ms — for send cycle of 2 ms — for send cycle of 4 ms 	<p>250 μs to 128 ms</p> <p>500 μs to 256 ms</p> <p>1 ms to 512 ms</p> <p>2 ms to 512 ms</p> <p>4 ms to 512 ms</p>
PROFINET IO Device	
Services	
<ul style="list-style-type: none"> — PG/OP communication — Isochronous mode — IRT — PROFIenergy — Shared device — Number of IO Controllers with shared device, max. — activation/deactivation of I-devices — Asset management record 	<p>Yes</p> <p>No</p> <p>Yes</p> <p>Yes; per user program</p> <p>Yes</p> <p>4</p> <p>Yes; per user program</p> <p>Yes; per user program</p>
2. Interface	
Interface types	

<ul style="list-style-type: none"> • RS 485 	Yes; Via CM DP module
<ul style="list-style-type: none"> • Number of ports 	1
Protocols	
<ul style="list-style-type: none"> • PROFIBUS DP master 	Yes
<ul style="list-style-type: none"> • PROFIBUS DP slave 	Yes
<ul style="list-style-type: none"> • SIMATIC communication 	Yes
PROFIBUS DP master	
<ul style="list-style-type: none"> • Number of connections, max. 	48; Of which 4 each reserved for ES and HMI
<ul style="list-style-type: none"> • Number of DP slaves, max. 	125; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
Services	
<ul style="list-style-type: none"> — PG/OP communication 	Yes
<ul style="list-style-type: none"> — Equidistance 	No
<ul style="list-style-type: none"> — Isochronous mode 	No
<ul style="list-style-type: none"> — Activation/deactivation of DP slaves 	Yes
Interface types	
RJ 45 (Ethernet)	
<ul style="list-style-type: none"> • 100 Mbps 	Yes
<ul style="list-style-type: none"> • Autonegotiation 	Yes
<ul style="list-style-type: none"> • Autocrossing 	Yes
<ul style="list-style-type: none"> • Industrial Ethernet status LED 	Yes
RS 485	
<ul style="list-style-type: none"> • Transmission rate, max. 	12 Mbit/s
Protocols	
PROFIsafe	Yes; V2.4 / V2.6
Number of connections	
<ul style="list-style-type: none"> • Number of connections, max. 	96; via integrated interfaces of the CPU and connected CPs / CMs
<ul style="list-style-type: none"> • Number of connections reserved for ES/HMI/web 	10
<ul style="list-style-type: none"> • Number of connections via integrated interfaces 	64
<ul style="list-style-type: none"> • Number of connections per CP/CM 	32
<ul style="list-style-type: none"> • Number of S7 routing paths 	16
Redundancy mode	
<ul style="list-style-type: none"> • H-Sync forwarding 	Yes
Media redundancy	
<ul style="list-style-type: none"> — Media redundancy 	Yes; only via BusAdapter
<ul style="list-style-type: none"> — MRP 	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0, MRP Manager; MRP Client
<ul style="list-style-type: none"> — MRP interconnection, supported 	Yes; as MRP ring node according to IEC 62439-2 Edition 3.0
<ul style="list-style-type: none"> — MRPD 	Yes; Requirement: IRT
<ul style="list-style-type: none"> — Switchover time on line break, typ. 	200 ms; For MRP, bumpless for MRPD
<ul style="list-style-type: none"> — Number of stations in the ring, max. 	50
SIMATIC communication	
<ul style="list-style-type: none"> • PG/OP communication 	Yes; encryption with TLS V1.3 pre-selected
<ul style="list-style-type: none"> • S7 routing 	Yes
<ul style="list-style-type: none"> • Data record routing 	Yes
<ul style="list-style-type: none"> • S7 communication, as server 	Yes
<ul style="list-style-type: none"> • S7 communication, as client 	Yes
<ul style="list-style-type: none"> • User data per job, max. 	See online help (S7 communication, user data size)
Open IE communication	
<ul style="list-style-type: none"> • TCP/IP 	Yes
<ul style="list-style-type: none"> — Data length, max. 	64 kbyte
<ul style="list-style-type: none"> — several passive connections per port, supported 	Yes
<ul style="list-style-type: none"> • ISO-on-TCP (RFC1006) 	Yes
<ul style="list-style-type: none"> — Data length, max. 	64 kbyte
<ul style="list-style-type: none"> • UDP 	Yes
<ul style="list-style-type: none"> — Data length, max. 	2 kbyte; 1 472 bytes for UDP broadcast
<ul style="list-style-type: none"> — UDP multicast 	Yes; Max. 5 multicast circuits
<ul style="list-style-type: none"> • DHCP 	Yes
<ul style="list-style-type: none"> • DNS 	Yes
<ul style="list-style-type: none"> • SNMP 	Yes

• DCP	Yes
• LLDP	Yes
• Encryption	Yes; Optional
Web server	
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
OPC UA	
• Runtime license required	Yes; "Small" license required
• OPC UA Client	Yes
— Application authentication	Yes
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	"anonymous" or by user name & password
— Number of connections, max.	4
— Number of nodes of the client interfaces, max.	1 000
— 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
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— 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.	20
— Sampling interval, min.	100 ms
— Publishing interval, min.	500 ms
— Number of server methods, max.	20
— Number of inputs/outputs per server method, max.	20
— Number of monitored items, max.	1 000; 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.	1 000
• 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	80
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; without fail-safe
• 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; without fail-safe
• 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
• Monitoring of the supply voltage (PWR-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	800
• 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)	5
— Number of positioning axes at motion control cycle of 8 ms (typical value)	10
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
Standards, approvals, certificates	
Highest safety class achievable in safety mode	

<ul style="list-style-type: none"> • Performance level according to ISO 13849-1 • SIL acc. to IEC 61508 	PLe 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
Ambient conditions	
Ambient temperature during operation	
<ul style="list-style-type: none"> • horizontal installation, min. • horizontal installation, max. • vertical installation, min. • vertical installation, max. 	-25 °C; No condensation 60 °C -25 °C; No condensation 50 °C
Altitude during operation relating to sea level	
<ul style="list-style-type: none"> • 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; incl. failsafe
— FBD	Yes; incl. failsafe
— STL	Yes
— SCL	Yes
— GRAPH	Yes
Know-how protection	
<ul style="list-style-type: none"> • User program protection/password protection • Copy protection • Block protection 	Yes Yes Yes
Access protection	
<ul style="list-style-type: none"> • protection of confidential configuration data • Protection level: Write protection • Protection level: Read/write protection • Protection level: Write protection for Failsafe • Protection level: Complete protection 	Yes Yes Yes Yes Yes
Dimensions	
Width	100 mm
Height	117 mm
Depth	75 mm
Weights	
Weight, approx.	310 g
last modified:	11/3/2021 