SIEMENS

Data sheet   **6ES7510-1SK03-0AB0**

SIMATIC DP, CPU 1510SP F-1 PN for ET 200SP, central processing unit with 300 KB work memory for program and 1 MB for data, 1st interface: PROFINET IRT with 3-port switch, 6 ns bit performance, SIMATIC Memory Card required, BusAdapter required for port 1 and 2

Figure similar

General information	
Product type designation	CPU 1510SP F-1 PN
HW functional status	FS04
Firmware version	V4.0
● FW update possible	Yes
Product function	
● I&M data	Yes; I&M0 to I&M3
● Module swapping during operation (hot swapping)	Yes; Multi-hot swapping
● Isochronous mode	Yes; only with PROFINET; with minimum OB 6x cycle of 500 µs
● SysLog	Yes
Engineering with	
● STEP 7 TIA Portal configurable/integrated from version	V20 (FW V4.0) / V18 (FW V3.0) or higher; configurable with older TIA Portal versions as 6ES7510-1SJ01-0AB0
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	
● Mains/voltage failure stored energy time	10 ms
Input current	
Current consumption (rated value)	0.48 A
Current consumption, max.	0.7 A
Inrush current, max.	1.34 A; Rated value
I²t	0.3 A²·s
Power	
Infeed power to the backplane bus	8.05 W
Power loss	
Power loss, typ.	3.5 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
● integrated (for program)	300 kbyte
● integrated (for data)	1 Mbyte

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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 Mbyte; For DBs with absolute addressing, the max. size is 64 KB
FB	
● Number range	0 ... 65 535
● Size, max.	300 kbyte
FC	
● Number range	0 ... 65 535
● Size, max.	300 kbyte
OB	
● Size, max.	300 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	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.	256 kbyte; in total; available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 216 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	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
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.	82; 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
● on DP, device	Yes; Via CM DP module
● in AS, master	Yes
● in AS, device	Yes
● on Ethernet via NTP	Yes
Interfaces	
Number of PROFINET interfaces	1
Number of PROFIBUS interfaces	1; Via CM DP module
Optical interface	Yes; Via SIMATIC BusAdapter
1. Interface	
Interface types	
● RJ 45 (Ethernet)	Yes; X1 P3; opt. X1 P1 and X1 P2 via BusAdapter BA 2x RJ45
● Number of ports	3; 1. integr. + 2. via BusAdapter

● integrated switch	Yes
● BusAdapter (PROFINET)	Yes; compatible BusAdapters: BA 2x RJ45, BA 2x M12, BA 2x FC, BA 2x LC, BA LC/RJ45, BA LC/FC, BA 2x SCRJ, BA SCRJ/RJ45, BA SCRJ/FC

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
— 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
— PROFINET Security Class	1

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
— PROFIenergy	Yes; per user program
— 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

2. Interface

Interface types

● RS 485	Yes; Via CM DP module
● Number of ports	1

Protocols

● PROFIBUS DP master	Yes
● PROFIBUS DP device	Yes
● SIMATIC communication	Yes

PROFIBUS DP master	
● Number of connections, max.	48; Of which 4 each reserved for ES and HMI
● max. number of DP devices	125; In total, up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
Services	
— Equidistance	No
— Isochronous mode	No
— activation/deactivation of DP devices	Yes
Interface types	
RJ 45 (Ethernet)	
● 100 Mbps	Yes
● Autonegotiation	Yes
● Autocrossing	Yes
● Industrial Ethernet status LED	Yes
RS 485	
● Transmission rate, max.	12 Mbit/s
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 connections per CP/CM	32
● Number of S7 routing paths	16
Redundancy mode	
● H-Sync forwarding	Yes
Media redundancy	
— Media redundancy	Yes; only via BusAdapter
— 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
— 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
— 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.	20; max. 20 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	Yes
Number of breakpoints	8
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
● 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	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
● 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
● 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	
Ecological footprint	
● environmental product declaration	Yes
Global warming potential	
— global warming potential, (total) [CO2 eq]	83.2 kg
— global warming potential, (during production) [CO2	22.3 kg

eq]	
— global warming potential, (during operation) [CO2 eq]	61.8 kg
— global warming potential, (after end of life cycle) [CO2 eq]	-0.949 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

product functions / security / header

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
● vertical installation, min.	-30 °C; No condensation
● vertical installation, max.	50 °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 / header

configuration / programming / header

Programming language	
— LAD	Yes; incl. failsafe
— FBD	Yes; incl. failsafe
— STL	Yes
— SCL	Yes
— CFC	No
— 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
● Protection level: Write protection	Yes
● Protection level: Read/write protection	Yes
● 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

programming / cycle time monitoring / header	
● lower limit	adjustable minimum cycle time
● upper limit	adjustable maximum cycle time

Dimensions

Width	100 mm
Height	117 mm
Depth	75 mm

Weights

Weight, approx.	265 g

Classifications

	Version	Classification
eClass	14	27-24-26-07

eClass	12	27-24-26-07
eClass	9.1	27-24-26-07
eClass	9	27-24-26-07
eClass	8	27-24-26-07
eClass	7.1	27-24-26-07
eClass	6	27-24-26-07
ETIM	9	EC001603
ETIM	8	EC001603
ETIM	7	EC001603
IDEA	4	3565
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval

Manufacturer Declaration

CE EG-Konf.

UKCA

UL

Miscellaneous

RCM

General Product Approval	For use in hazardous locations

KC

TÜV

UL

FM

CCC-Ex

Ex ATEX

For use in hazardous locations	Functional Saftey	Marine / Shipping

IECEx

Miscellaneous

CCC-Ex

TÜV

Type Examination Certificate

ABS

Marine / Shipping

BUREAU VERITAS

DNV

Lloyd's Register LRS

NK / Nippon Kaiji Kyokai

RINA

RMRS

Marine / Shipping	other	Environment

CCS (China Classification Society)

KR Korean Register

Profibus

PROFINET

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