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SIMATIC S7-1500, CPU 1511-1 PN, central processing unit with work memory 300 KB for program and 1.5 MB for data, 1st interface: PROFINET IRT with 2-port switch, 6 ns bit performance, SIMATIC Memory Card required



General information	
Product type designation	CPU 1511-1 PN
HW functional status	FS03
Firmware version	V4.0
<ul style="list-style-type: none"> FW update possible 	Yes
Product function	
<ul style="list-style-type: none"> I&M data 	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> Isochronous mode 	Yes; Distributed and central; with minimum OB 6x cycle of 500 µs (distributed) and 1 ms (central)
<ul style="list-style-type: none"> SysLog 	Yes
Engineering with	
<ul style="list-style-type: none"> 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 6ES7511-1AK02-0AB0
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	3.45 cm
Control elements	
Number of keys	8
Mode buttons	2
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
<ul style="list-style-type: none"> Repeat rate, min. 	1/s
Input current	
Current consumption (rated value)	0.56 A
Current consumption, max.	0.9 A
Inrush current, max.	1.15 A; Rated value
I ² t	0.5 A ² ·s
Power	
Infed power to the backplane bus	10 W
Power consumption from the backplane bus (balanced)	5.5 W
Power loss	

Power loss, typ.	3.4 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)	1.5 Mbyte
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.	1.5 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	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
Nesting depth	
• per priority class	24
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
Extended retentive data area (incl. timers, counters, flags), max.	1.5 Mbyte; When using PS 6 0W 24/48/60 V DC HF
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
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	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	16
Clock synchronization	
• supported	Yes
• to DP, master	Yes; via PROFIBUS CM / CP
• on DP, device	Yes; via PROFIBUS CM / CP
• in AS, master	Yes
• in AS, device	Yes
• on Ethernet via NTP	Yes
Interfaces	
Number of PROFINET interfaces	1
1. Interface	
Interface types	
• RJ 45 (Ethernet)	Yes; X1
• Number of ports	2

• integrated switch	Yes
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
— PROFINergy	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
— PROFINergy	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
Interface types	
RJ 45 (Ethernet)	
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes
• Industrial Ethernet status LED	Yes
Protocols	
PROFIsafe	No
Number of connections	

<ul style="list-style-type: none"> • Number of connections, max. 	128; 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 	88
<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	
— Media redundancy	only via 1st interface (X1)
— 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	
<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
— Data length, max.	64 kbyte
— several passive connections per port, supported	Yes
<ul style="list-style-type: none"> • ISO-on-TCP (RFC1006) 	Yes
— Data length, max.	64 kbyte
<ul style="list-style-type: none"> • UDP 	Yes
— Data length, max.	2 kbyte; 1 472 bytes for UDP broadcast
— UDP multicast	Yes; max. 78 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
<ul style="list-style-type: none"> • DCP 	Yes
<ul style="list-style-type: none"> • LLDP 	Yes
<ul style="list-style-type: none"> • Encryption 	Yes; Optional
Web server	
<ul style="list-style-type: none"> • HTTP 	Yes; Standard and user pages
<ul style="list-style-type: none"> • HTTPS 	Yes; Standard and user pages
<ul style="list-style-type: none"> • web API 	
— Number of sessions, max.	50
— number of simultaneous HTTP calls, max.	4
— HTTP request body, max.	131 072 byte
OPC UA	
<ul style="list-style-type: none"> • Runtime license required 	Yes; "Small" license required
<ul style="list-style-type: none"> • 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-UA_WriteList, 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	No
Number of breakpoints	8
Profiling	Yes
Status/control	
● 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
Forcing	
● Forcing	Yes
● Forcing, variables	Peripheral inputs/outputs
● Number of variables, max.	200
Diagnostic buffer	
● present	Yes

<ul style="list-style-type: none"> Number of entries, max. <ul style="list-style-type: none"> — of which powerfail-proof 	<p>1 000</p> <p>500</p>
Traces	
<ul style="list-style-type: none"> Number of configurable Traces Memory size per trace, max. 	<p>4</p> <p>512 kbyte</p>
Interrupts/diagnostics/status information	
Diagnostics indication LED	
<ul style="list-style-type: none"> RUN/STOP LED ERROR LED MAINT LED STOP ACTIVE LED Connection display LINK TX/RX 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Supported technology objects	
<p>Motion Control</p> <ul style="list-style-type: none"> Number of available Motion Control resources for technology objects Required Motion Control resources <ul style="list-style-type: none"> — per speed-controlled axis — per positioning axis — per synchronous axis — per external encoder — per output cam — per cam track — per probe Positioning axis <ul style="list-style-type: none"> — Number of positioning axes at motion control cycle of 4 ms (typical value) — Number of positioning axes at motion control cycle of 8 ms (typical value) 	<p>Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool</p> <p>1 120</p> <p>40</p> <p>80</p> <p>160</p> <p>80</p> <p>20</p> <p>160</p> <p>40</p> <p>11</p> <p>14</p>
<p>Controller</p> <ul style="list-style-type: none"> PID_Compact PID_3Step PID-Temp 	<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>
<p>Counting and measuring</p> <ul style="list-style-type: none"> High-speed counter 	<p>Yes</p>
Standards, approvals, certificates	
Siemens Eco Profile (SEP)	Siemens EcoTech
Recycler Guide available	Yes
Ecological footprint	
<ul style="list-style-type: none"> environmental product declaration 	<p>Yes</p>
Global warming potential	
<ul style="list-style-type: none"> — global warming potential, (total) [CO2 eq] — global warming potential, (during production) [CO2 eq] — global warming potential, (during operation) [CO2 eq] — global warming potential, (after end of life cycle) [CO2 eq] 	<p>80.1 kg</p> <p>23.8 kg</p> <p>57.4 kg</p> <p>-1.29 kg</p>
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	
<ul style="list-style-type: none"> horizontal installation, min. horizontal installation, max. vertical installation, min. vertical installation, max. 	<p>-30 °C; No condensation</p> <p>60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off</p> <p>-30 °C; No condensation</p> <p>40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off</p>
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	
configuration / header		
configuration / programming / header		
Programming language		
— LAD	Yes	
— FBD	Yes	
— STL	Yes	
— SCL	Yes	
— CFC	Yes	
— 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	
• Password for display	Yes	
• Protection level: Write protection	Yes	
• Protection level: Read/write protection	Yes	
• Protection level: Write protection for Failsafe	No	
• 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	35 mm	
Height	147 mm	
Depth	129 mm	
Weights		
Weight, approx.	336 g	
Classifications		
	Version	Classification
eClass	14	27-24-22-07
eClass	12	27-24-22-07
eClass	9.1	27-24-22-07
eClass	9	27-24-22-07
eClass	8	27-24-22-07
eClass	7.1	27-24-22-07
eClass	6	27-24-22-07
ETIM	10	EC000236
ETIM	9	EC000236
ETIM	8	EC000236
ETIM	7	EC000236
IDEA	4	3565
UNSPSC	15	32-15-17-05
Approvals / Certificates		
General Product Approval		



[Miscellaneous](#)

[Manufacturer Declaration](#)



[Miscellaneous](#)

General Product Approval

For use in hazardous locations



[KC](#)

[TUEV](#)

[EM](#)



[EM](#)

For use in hazardous locations

Maritime application

[CCC-Ex](#)



[Type Examination Certificate](#)

[Miscellaneous](#)



IECEX



ABS

Maritime application



[NK / Nippon Kaiji Kyokai](#)



[CCS \(China Classification Society\)](#)

Maritime application

other

Environment



[PROFINET](#)



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