



Figure similar

SIPLUS S7-1500 CPU 1511-1 PN based on 6ES7511-1AL03-0AB0 with conformal coating -40...+60 °C . central processing unit with work memory 300 KB for program and 1.5 MB for data, 1st interface: PROFINET IRT with 2-port switch, 25 ns bit performance, SIMATIC Memory Card required

General information	
Product type designation	CPU 1511-1 PN
Firmware version	
• FW update possible	Yes
based on	6ES7511-1AL03-0AB0
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	Yes; Distributed and central; with minimum OB 6x cycle of 500 µs (distributed) and 1 ms (central)
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	see entry ID: 109746275
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	
• Mains/voltage failure stored energy time	5 ms
• Repeat rate, min.	1/s
Input current	
Current consumption (rated value)	0.73 A
Current consumption, max.	0.9 A
Inrush current, max.	1.15 A; Rated value
I ² t	0.5 A ² ·s
Power	
Infeed power to the backplane bus	10 W
Power consumption from the backplane bus (balanced)	5.5 W
Power loss	
Power loss, typ.	7.5 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)	1.5 Mbyte
Load memory	
• Plug-in (SIMATIC Memory Card), max.	32 Gbyte
Backup	
• maintenance-free	Yes
CPU processing times	
for bit operations, typ.	25 ns
for word operations, typ.	32 ns
for fixed point arithmetic, typ.	42 ns
for floating point arithmetic, typ.	170 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	
<ul style="list-style-type: none"> • Size, max. • Number of clock memories 	<p>16 kbyte 8; 8 clock memory bit, grouped into one clock memory byte</p>
Data blocks	
<ul style="list-style-type: none"> • Retentivity adjustable • Retentivity preset 	<p>Yes No</p>
Local data	
<ul style="list-style-type: none"> • 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	
<ul style="list-style-type: none"> • Inputs • Outputs 	<p>32 kbyte; All inputs are in the process image 32 kbyte; All outputs are in the process image</p>
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	
<ul style="list-style-type: none"> • 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	
<ul style="list-style-type: none"> • Via CM 	4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
Number of IO Controllers	
<ul style="list-style-type: none"> • integrated • Via CM 	<p>1 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total</p>
Rack	
<ul style="list-style-type: none"> • Modules per rack, max. • Number of lines, max. 	<p>32; CPU + 31 modules 1</p>
PtP CM	
<ul style="list-style-type: none"> • Number of PtP CMs 	the number of connectable PtP CMs is only limited by the number of available slots
Time of day	
Clock	
<ul style="list-style-type: none"> • Type • Backup time • Deviation per day, max. 	<p>Hardware clock 6 wk; At 40 °C ambient temperature, typically 10 s; Typ.: 2 s</p>
Operating hours counter	
<ul style="list-style-type: none"> • Number 	16
Clock synchronization	
<ul style="list-style-type: none"> • supported • in AS, master • in AS, device • on Ethernet via NTP 	<p>Yes Yes Yes Yes</p>
Interfaces	
Number of PROFINET interfaces	1
1. Interface	
Interface types	
<ul style="list-style-type: none"> • RJ 45 (Ethernet) • Number of ports • integrated switch 	<p>Yes; X1 2 Yes</p>
Protocols	
<ul style="list-style-type: none"> • IP protocol • PROFINET IO Controller • PROFINET IO Device • SIMATIC communication 	<p>Yes; IPv4 Yes Yes Yes</p>

<ul style="list-style-type: none"> • Open IE communication • Web server • Media redundancy 	<p>Yes; Optionally also encrypted</p> <p>Yes</p> <p>Yes</p>
PROFINET IO Controller	
Services	
<ul style="list-style-type: none"> — PG/OP communication — Isochronous mode — Direct data exchange — IRT — PROFINergy — 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>128; In total, up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</p> <p>64</p> <p>128</p> <p>128</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 500 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 — PROFINergy — 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>
Interface types	
RJ 45 (Ethernet)	
<ul style="list-style-type: none"> • 100 Mbps • Autonegotiation • Autocrossing • Industrial Ethernet status LED 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Protocols	
PROFIsafe	No
Number of connections	
<ul style="list-style-type: none"> • Number of connections, max. • Number of connections reserved for ES/HMI/web • Number of connections via integrated interfaces • Number of S7 routing paths 	<p>128; via integrated interfaces of the CPU and connected CPs / CMs</p> <p>10</p> <p>88</p> <p>16</p>
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	
• 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
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-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
— 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
— 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
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	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

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
- 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
- STOP ACTIVE 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	1 120

technology objects	
<ul style="list-style-type: none"> ● 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>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>
Controller	
<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>
Counting and measuring	
<ul style="list-style-type: none"> ● High-speed counter 	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>-40 °C; = Tmin (incl. condensation/frost)</p> <p>60 °C; = Tmax; display: 50 °C, the display is switched off at an operating temperature of typically 50 °C</p> <p>-40 °C; = Tmin</p> <p>40 °C; = Tmax; display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off</p>
Ambient temperature during storage/transportation	
<ul style="list-style-type: none"> ● min. ● max. 	<p>-40 °C</p> <p>70 °C</p>
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
Relative humidity	
<ul style="list-style-type: none"> ● With condensation, tested in accordance with IEC 60068-2-38, max. 	100 %; RH incl. condensation / frost (no commissioning in bedewed state), horizontal installation
Resistance	
Coolants and lubricants	
<ul style="list-style-type: none"> — Resistant to commercially available coolants and lubricants 	Yes; Incl. diesel and oil droplets in the air
Use in stationary industrial systems	
<ul style="list-style-type: none"> — to biologically active substances according to EN 60721-3-3 — to chemically active substances according to EN 60721-3-3 — to mechanically active substances according to EN 60721-3-3 	<p>Yes; Class 3B2 mold, fungus and dry rot spores (with the exception of fauna); Class 3B3 on request</p> <p>Yes; Class 3C4 (RH < 75 %) incl. salt spray acc. to EN 60068-2-52 (severity degree 3); *</p> <p>Yes; Class 3S4 incl. sand, dust, *</p>
Use on ships/at sea	
<ul style="list-style-type: none"> — to biologically active substances according to EN 60721-3-6 — to chemically active substances according to EN 60721-3-6 — to mechanically active substances according to EN 60721-3-6 	<p>Yes; Class 6B2 mold, fungal and dry rot spores (excluding fauna)</p> <p>Yes; Class 6C3 (RH < 75 %) incl. salt spray acc. to EN 60068-2-52 (severity degree 3); *</p> <p>Yes; Class 6S3 incl. sand, dust; *</p>
Usage in industrial process technology	
<ul style="list-style-type: none"> — Against chemically active substances acc. to EN 60654-4 — Environmental conditions for process, measuring and control systems acc. to ANSI/ISA-71.04 	<p>Yes; Class 3 (excluding trichlorethylene)</p> <p>Yes; Level GX group A/B (excluding trichlorethylene; harmful gas concentrations up to the limits of EN 60721-3-3 class 3C4 permissible); level LC3 (salt spray) and level LB3 (oil)</p>
Remark	
<ul style="list-style-type: none"> — Note regarding classification of environmental conditions acc. to EN 60721, EN 60654-4 and ANSI/ISA-71.04 	* The supplied plug covers must remain in place over the unused interfaces during operation!
Conformal coating	
<ul style="list-style-type: none"> ● Coatings for printed circuit board assemblies acc. to EN 	Yes; Class 2 for high reliability

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- Protection against fouling acc. to EN 60664-3
- Military testing according to MIL-I-46058C, Amendment 7
- Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies according to IPC-CC-830A

Yes; Type 1 protection
Yes; Discoloration of coating possible during service life
Yes; Conformal coating, Class A

configuration / header

configuration / programming / header

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

• protection of confidential configuration data	Yes
• Password for display	Yes
• Protection level: Write protection	Yes
• Protection level: Read/write protection	Yes
• Protection level: Complete protection	Yes

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
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last modified:

