SIEMENS

Data sheet

6ES7511-1AK02-0AB0



SIMATIC S7-1500, CPU 1511-1 PN, Central processing unit with working memory 150 KB for program and 1 MB for data, 1. interface: PROFINET IRT with 2 port switch, 60 NS bit-performance, SIMATIC memory card necessary

General information	
Product type designation	CPU 1511-1 PN
HW functional status	FS03
Firmware version	V2.9
Product function	
• I&M data	Yes; I&M0 to I&M3
Isochronous mode	Yes; Distributed and central; with minimum OB 6x cycle of 625 μs (distributed) and 1 ms (central)
Engineering with	
 STEP 7 TIA Portal configurable/integrated from version 	V17 (FW V2.9) / V15 (FW V2.5) or higher; with older TIA Portal versions configurable as 6ES7511-1AK01-0AB0
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	
 Mains/voltage failure stored energy time 	5 ms
Repeat rate, min.	1/s
Input current	
Current consumption (rated value)	0.7 A
Current consumption, max.	0.95 A
Inrush current, max.	1.9 A; Rated value
l²t	0.02 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.	5.7 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes

Work memory	
 integrated (for program) 	150 kbyte
integrated (for data)	1 Mbyte
Load memory	
Plug-in (SIMATIC Memory Card), max.	32 Gbyte
Backup	
maintenance-free	Yes
CPU processing times	
for bit operations, typ.	60 ns
for word operations, typ.	72 ns
for fixed point arithmetic, typ.	96 ns
for floating point arithmetic, typ.	384 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.	150 kbyte
FC	
Number range	0 65 535
• Size, max.	150 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 minimum OB 3x cycle of 500 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.	128 kbyte; In total; available retentive memory for bit memories, timers,

	counters DPa and toohnology data (avea), 00 KD
Extended retentive data area (incl. timers, counters, flags),	counters, DBs, and technology data (axes): 88 KB 1 Mbyte; When using PS 6 0W 24/48/60 V DC HF
max.	
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
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	
• Туре	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
• in AS, master	Yes
• in AS, slave	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	
— PG/OP communication	Yes
 — Isochronous mode 	Yes
 — Direct data exchange 	Yes; Requirement: IRT and isochronous mode (MRPD optional)
— IRT	Yes
— PROFlenergy	Yes; per user program
— Prioritized startup	Yes; Max. 32 PROFINET devices
 Number of connectable IO Devices, max. 	128; In total, up to 256 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
 — Of which if fine, max. — Number of IO Devices that can be 	8; in total across all interfaces
simultaneously activated/deactivated, max.	
— 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
Update time for IRT	quantity of configured user data
— 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 $625 \mu s$ of the isochronous OB is decisive
— for send cycle of 500 μs	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
— 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 μ s: 375 μ s, 625 μ s 3 875 μ s)
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	Y.
— PG/OP communication	Yes
— Isochronous mode	No
- IRT	Yes
 — PROFlenergy — Shared device 	Yes; per user program Yes
 — Shared device — Number of IO Controllers with shared device, 	4
max.	-
- activation/deactivation of I-devices	Yes; per user program
— Asset management record	Yes; per user program
Interface types	
RJ 45 (Ethernet)	
• 100 Mbps	Yes
Autonegotiation	Yes
Autocrossing	Yes
Industrial Ethernet status LED	Yes
Protocols	

Notice Notice Number of connections, max. 96, via integrated interfaces of the CPU and connected CPs / CMs Number of connections revered for ESHMLiveb 10 Number of connections via integrated interfaces 64 Number of connections via integrated interfaces 64 H-Marker of Knowling Yes Media redundancy only via 1st interface (X1) MRP Yes, MRP Automanaper according to IEC 62439-2 Edition 2.0, MRP MRP Interconnection, supported Yes, early NRP Chilem MRP Interconnection, supported Yes, encryption with TLS V1 3 pre-selected Switchover fine on line break, typ. 200 ms, Fer MRP, bumpless for MRPD Number of stations in the ring, max. See online help (S7 communication, as client + S7 communication, as client Yes + S7 communication, as client Yes + S80 Communication Yes - Dota length, max. See online help (S7 communication, user data size) DPanel Ecommunication Yes - Dota length, max. See online help (S7 communication, user data size) DPanel Ecommunication Yes - DOT multicast Yes <	PROFIsafe	No
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• Number of \$7 routing paths 16 Redundancy • H-Sync forwarding Yes • Media redundancy only via 1st interface (X1) • MRP • MRP Yes, IMP Automanager according to EC 62439-2 Edition 2.0, MRP • MRP Interconnection, supported Yes, IMP Automanager according to EC 62439-2 Edition 3.0 • MRP Interconnection, supported Yes, IMP Automanager according to EC 62439-2 Edition 3.0 • MRP Interconnection, supported Yes, IMP Automanager according to EC 62439-2 Edition 3.0 • MRP Interconnection, supported Yes, IMP Automanager according to EC 62439-2 Edition 3.0 • MRP Interconnection, supported Yes, IMP Automanager according to EC 62439-2 Edition 3.0 • MRP Domunication Yes, encryption with TLS VI 3 pre-selected • S7 communication Yes, encryption with TLS VI 3 pre-selected • FO/OP Communication Yes, encryption with TLS VI 3 pre-selected • S7 communication, as client Yes • Edit degith, max. See online help (S7 communication, user data size) • DOP In Edits Yes • Boo n-TCP (RFC1006) Yes • DDP maticast Yes, Yes • DDP Yes • DMR Y		
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- Switchover time on line break, typ. - Number of stations in the ring, max. 50 SIMATIC communication Ser routing SF rout		
Number of stations in the ring, max. 50 SIMATIC communication Yes, encryption with TLS V1.3 pre-selected • PRO/OP communication, as server Yes • S7 communication, as server 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 II: communication Yes - Data length, max. See online help (S7 communication, user data size) Open II: communication Yes - Data length, max. See online help (S7 communication user data size) Open II: communication Yes - Data length, max. See online help (S7 communication user data size) OPC W Yes - Data length, max. Skyle; 1472 byles for UDP broadcast - UDP muticast Yes, Max, 5 muticast circuits - Data length, max. Skyle; 1472 byles for UDP broadcast - UDP muticast Yes, Max, 5 muticast circuits - DATA Yes - DNS Yes - DROPC Yes - Encryption Yes; Standard and u		
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Open IE communication Yes - Data length, max. several passive connections per port, supported Yes - ISO-on-TCP (RFC1006) Yes - Data length, max. 64 kbyte - Data length, max. 64 kbyte - Data length, max. 2 kbyte; 1472 bytes for UDP broadcast - UDP multicast Yes DHCP Yes DNS Yes DNS Yes DCP Yes DDCP Yes DLDP Yes DCP Yes DCP Yes DCP Yes DCP Yes DCP Yes DCP Yes DCP Yes DCP Yes DCP Yes Standard and user pages OPC UA <		
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• 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 elements for one call of OPC_UA_NodeGetHandleList/OPC_UA_ReadList/C max. 300 - Number of elements for one call of OPC_UA_MetodGetHandleList, max. 100 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_ReadList, OPC_UA_MetodGetHandleList, max. 100 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_ReadList, OPC_UA_MetodGetHandleList, max. 1 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_ReadList, OPC_UA_ReadList, OPC_UA_NetodetHandleList, max. 1 - Number of simultaneous calls of the client 1 - Number of simultaneous calls of the client 1 - Number of simultaneous calls of the		
Web server • HTTP Yes; Standard and user pages • HTTPS Yes; Standard and user pages OPC UA Yes; Standard and user pages • 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 elements for one call of 300 OPC_UA_NodeGetHandleList/OPC_UA_ReadList/C 300 - Number of elements for one call of 20 OPC_UA_MameSpaceGetIndexList, max. 100 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_MeadList, OPC_UA_MeadList, OPC_UA_MeadList, OPC_UA_MiteList, OPC_UA_Mit		
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• 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. 1000 - Number of elements for one call of OPC_UA_NodeGetHandleList/OPC_UA_ReadList/ORA_MARSpaceGetIndexList, max. 20 - Number of elements for one call of OPC_UA_NethodGetHandleList, max. 100 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_ReadList, OPC_UA_MethodGetHandleList, OPC_UA_M 11 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_MethodGetHandleList, OPC_UA_M 1 - Number of simultaneous calls of the client instructions per connection (except OPC_UA_ReadList, OPC_UA_MethodGetHandleList, OPC_UA_M 1		Vac Chandard and user no
OPC UA • Runtime license required • OPC UA Client - Application authentication - Security policies - User authentication - Number of connections, max. - Number of nodes of the client interfaces, max. - Number of elements for one call of OPC_UA_NameSpaceGetIndexList, max. - Number of elements for one call of OPC_UA_MethodGetHandleList, max. - Number of simultaneous calls of the client instructions per connection (except OPC_UA_MethodGetHandleList, OPC_UA_M - Number of simultaneous calls of the client 0PC_UA_ReadList, OPC_UA_WriteList, OPC_UA_M max. - Number of simultaneous calls of the client 1 instructions per connection (except OPC_UA_ReadList, OPC_UA_WriteList, OPC_UA_M Max. - Number of simultaneous calls of the client 1		
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OPC_UA_NameSpaceGetIndexList, max. 100 - Number of elements for one call of 100 OPC_UA_MethodGetHandleList, max. 1 - Number of simultaneous calls of the client 1 instructions per connection (except 1 OPC_UA_ReadList,OPC_UA_WriteList,OPC_UA_M 1 max. 5	OPC_UA_NodeGetHandleList/OPC_UA_ReadList/C	300
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instructions per connection (except OPC_UA_ReadList,OPC_UA_WriteList,OPC_UA_M max. — Number of simultaneous calls of the client 5		100
	instructions per connection (except OPC_UA_ReadList,OPC_UA_WriteList,OPC_UA_M	1
		5

OPC_UA_ReadList,OPC_UA_WriteList and	
OPC_UA_MethodCall, max.	
 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
Isochronous mode	
Equidistance	Yes
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
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
ForcingForcing, variables	Yes Peripheral inputs/outputs
0	
• Forcing, variables	Peripheral inputs/outputs

Number of entries, max.	1 000
- of which powerfail-proof	500
Traces	500
Number of configurable Traces	4: Up to 512 KB of data per trace are possible
	+, op to 312 hb of data per trace are possible
Interrupts/diagnostics/status information	
Diagnostics indication LED	Ver
RUN/STOP LED	Yes
• ERROR LED	Yes
	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 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
Ambient conditions	
Ambient temperature during operation	
 horizontal installation, min. 	-25 °C; No condensation
 horizontal installation, max. 	60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off
 vertical installation, min. 	-25 °C; No condensation
 vertical installation, max. 	40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off
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
— 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.	405 g
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