

*** Spare part *** SIMATIC S7-1500, CPU 1513-1 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, 40 ns bit performance, SIMATIC Memory Card required



General information	
Product type designation	CPU 1513-1 PN
HW functional status	FS03
Firmware version	V2.6
Product function	
• I&M data	Yes; I&M0 to I&M3
Engineering with	
• STEP 7 TIA Portal configurable/integrated as of version	V15.1 (FW V2.6)/V13 SP1 Update 4 (FW V1.8) or higher
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	3.45 cm
Control elements	
Number of keys	6
Mode selector switch	1
Supply voltage	

Type of supply voltage	24 V DC
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)	0.7 A
Inrush current, max.	1.9 A; Rated value
I^2t	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	
<ul style="list-style-type: none"> • integrated (for program) 	300 kbyte
<ul style="list-style-type: none"> • integrated (for data) 	1.5 Mbyte
Load memory	
<ul style="list-style-type: none"> • Plug-in (SIMATIC Memory Card), max. 	32 Gbyte
Backup	
<ul style="list-style-type: none"> • maintenance-free 	Yes
CPU processing times	
for bit operations, typ.	40 ns
for word operations, typ.	48 ns
for fixed point arithmetic, typ.	64 ns
for floating point arithmetic, typ.	256 ns
CPU-blocks	
Number of elements (total)	2 000; Blocks (OB, FB, FC, DB) and UDTs
DB	
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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 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, DBs, and technology data (axes): 88 KB
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Extended retentive data area (incl. timers, counters, flags), max.	1.5 Mbyte; When using PS 6 0W 24/48/60 V DC HF
Flag	
• Number, 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
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	6; A maximum of 6 CMs (PROFINET + PROFIBUS) can be inserted in total
Number of IO Controllers	
• integrated	1
• Via CM	6; A maximum of 6 CMs (PROFINET + PROFIBUS) 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
• in AS, master	Yes
• in AS, slave	Yes
Interfaces	
Number of PROFINET interfaces	1
1. Interface	
Interface types	
• Number of ports	2
• integrated switch	Yes
• RJ 45 (Ethernet)	Yes; X1
Protocols	
• IP protocol	Yes; IPv4
• PROFINET IO Controller	Yes
• PROFINET IO Device	Yes
• SIMATIC communication	Yes
• Open IE communication	Yes
• Web server	Yes
• Media redundancy	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0
PROFINET IO Controller	
Services	
— PG/OP communication	Yes
— S7 routing	Yes
— Isochronous mode	Yes
— Open IE communication	Yes
— IRT	Yes
— MRP	Yes; as MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50
— MRPD	Yes; Requirement: IRT
— PROFlenergy	Yes
— 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.
- Number of IO Devices per tool, max.
- Updating times

8; in total across all interfaces

8

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

Update time for IRT

- for send cycle of 250 μ s
- for send cycle of 500 μ s
- 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

250 μ s to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 500 μ s of the isochronous OB is decisive

500 μ s to 8 ms

1 ms to 16 ms

2 ms to 32 ms

4 ms to 64 ms

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 μ s
- for send cycle of 500 μ s
- for send cycle of 1 ms
- for send cycle of 2 ms
- for send cycle of 4 ms

250 μ s to 128 ms

500 μ s to 256 ms

1 ms to 512 ms

2 ms to 512 ms

4 ms to 512 ms

PROFINET IO Device

Services

- PG/OP communication
- S7 routing
- Isochronous mode
- Open IE communication
- IRT
- MRP
- MRPD
- PROFINergy
- Shared device
- Number of IO Controllers with shared device, max.
- Asset management record

Yes

Yes

No

Yes

Yes

Yes; as MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50

Yes; Requirement: IRT

Yes; per user program

Yes

4

Yes; per user program

Interface types

RJ 45 (Ethernet)

- 100 Mbps
- Autonegotiation
- Autocrossing

Yes

Yes

Yes

- Industrial Ethernet status LED

Yes

Protocols

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 S7 routing paths 16

Redundancy mode

- H-Sync forwarding Yes

SIMATIC communication

- 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
 - 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. 5 multicast circuits
- DHCP No
- SNMP Yes
- DCP Yes
- LLDP Yes

Web server

- HTTP Yes; Standard and user pages
- HTTPS Yes; Standard and user pages

OPC UA

- Runtime license required Yes
- 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/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 per connection (except OPC-UA_ReadList, OPC-UA_WriteList, OPC-UA_MethodCall), 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
— 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
— Number of nodes for user-defined server interfaces, max.	1 000

Further protocols

• MODBUS	Yes; MODBUS TCP
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Media redundancy

- Switchover time on line break, typ. 200 ms; For MRP, bumpless for MRPD
- Number of stations in the ring, max. 50

Isochronous mode

Isochronous operation (application synchronized up to terminal)	Yes; Distributed and central; with minimum OB 6x cycle of 500 μ s (distributed) and 1 ms (central)
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	300
• 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, 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
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Interrupts/diagnostics/status information

Diagnostics indication LED	
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• RUN/STOP LED	Yes
• ERROR LED	Yes
• MAINT LED	Yes
• Connection display LINK TX/RX	Yes

Supported technology objects

Motion Control	Yes; Note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool or SIZER
• Number of available Motion Control resources for technology objects (except cam disks)	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.	0 °C
• horizontal installation, max.	60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off
• vertical installation, min.	0 °C
• 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	
Programming	
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	
• Password for display	Yes
• Protection level: Write protection	Yes
• Protection level: Read/write protection	Yes
• Protection level: Complete protection	Yes
Cycle time monitoring	
• 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.	430 g
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