2.4 Properties

Article number

6ES7513-1AL01-0AB0

View of the module

The following figure shows the CPU 1513-1 PN.



Figure 2-1 CPU 1513-1 PN

Note

Protective film

Note that a protective film is attached to the display of the CPU when shipped from the factory. Remove the protective film if necessary.

Properties

The CPU 1513-1 PN has the following technical properties:

- Communication:
  - Interfaces

    CPU 1513-1 PN has an interface.

    The **1st PROFINET interface** (X1 P1, X1 P2) has two ports. In addition to PROFINET basic functionality, it also supports PROFINET IO RT (real-time) and IRT (isochronous real-time). PROFINET IO communication or real-time settings can be configured.

    Port 1 and port 2 can also be used as ring ports for the configuration of redundant ring structures in Ethernet.

    The basic functionality of PROFINET supports HMI communication, communication with the configuration system, communication with a higher-level network (backbone, router, Internet) and communication with another machine or automation cell.
  - OPC UA
    With OPC UA, data is exchanged via an open and vendor-neutral communication protocol. The CPU, as OPC UA server, can communicate with OPC UA clients such as HMI panels, SCADA systems, etc.
- Integrated Web server:

  A Web server is integrated in the CPU. You can read out the following information with the Web server:
  - Start page with general CPU information
  - Identification information
  - Contents of the diagnostics buffer
  - Query of module states
  - Firmware update
  - Alarms (without acknowledgment option)
  - Information about communication
  - PROFINET topology
  - Tag status, writing tags
  - Watch tables
  - Memory usage
  - User pages
  - Data logs (if used)
  - Online backup and restoration of the configuration.
  - Diagnostic information for the motion control technology objects
  - Display of trace recording stored on the SIMATIC memory card
  - Readout service data
  - Basic Web pages
  - Display of the Web server in 3 project languages, for example, comments and message texts
  - Recipes
  - User-defined Web pages

- Integrated technology:
  - Motion Control

    The Motion Control functionality uses technology objects to support speed-controlled axes, positioning axes, synchronous axes, external encoders, cams, cam tracks and measuring inputs, as well as PLCopen blocks for programming the motion control functionality.
    You can find a detailed description of the use of Motion Control and its configuration in the S7-1500 Motion Control (http://support.automation.siemens.com/WW/view/en/109739589) function manual.
    You can also use the TIA Selection Tool (http://w3.siemens.com/mcms/topics/en/simatic/tia-selection-tool) or the SIZER (http://w3.siemens.com/mcms/mc-solutions/en/engineering-software/drive-design-tool-sizer/Pages/drive-design-tool-sizer.aspx) to create or configure axes.
  - Integrated closed-loop control functionality

    - PID Compact (continuous PID controller)

    - PID 3Step (step controller for integrating actuators)

    - PID Temp (temperature controller for heating and cooling with two separate actuators)
- Trace functionality:
  - The trace functionality supports troubleshooting and optimization of the user program. You can find additional information on the trace functionality in the Using the Trace and Logic Analyzer (http://support.automation.siemens.com/WW/view/en/64897128) function manual.
- Integrated system diagnostics:
  - The alarms for the system diagnostics are automatically created by the system and displayed on a PG/PC, HMI device, Web server or the integrated display. System diagnostics information is also available when the CPU is in STOP mode.

- Integrated security:
  - Know-how protection

    The know-how protection protects user blocks against unauthorized access and modifications.
  - Copy protection

    Copy protection links user blocks to the serial number of the SIMATIC memory card or to the serial number of the CPU. User programs cannot run without the corresponding SIMATIC memory card or CPU.
  - Access protection

    Extended access protection provides high-quality protection against unauthorized configuration changes. You can use authorization levels to assign separate rights to different user groups.
  - Integrity protection

    The system protects the data transferred to the CPU against manipulation. The CPU detects erroneous or manipulated engineering data.
- Additional functions:
  - PROFIenergy
    You can find information on the topic of "PROFIenergy" in the PROFINET function manual (https://support.industry.siemens.com/cs/ww/en/view/49948856) and in the PROFINET specification on the Internet (http://www.profibus.com).
  - Shared device
    You can find information on the topic of "Shared device" in the PROFINET function manual (https://support.industry.siemens.com/cs/ww/en/view/49948856).
  - Configuration control
    You can find information on the topic of "Configuration control" in the S7-1500, ET 200MP (http://support.automation.siemens.com/WW/view/en/59191792) system manual.
  - Isochronous mode
    You can find information about the "Isochronous mode" topic in the PROFINET (https://support.industry.siemens.com/cs/ww/en/view/49948856) function manual.

Reference

You will find additional information on the topic of "Integrated security/Access protection" in the S7-1500, ET 200MP (http://support.automation.siemens.com/WW/view/en/59191792) system manual.

Technical specifications

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General information	
Product type designation	CPU 1513-1 PN
Hardware function version	FS03
Firmware version	V2.0
Engineering with	
STEP 7 TIA Portal can be configured/integrated as of version	V14
Configuration control	
Via data record	Yes
Display	
Screen diagonal (cm)	3.45 cm
Operator controls	
Number of buttons	6
Mode selector	1
Supply voltage	
Type of supply voltage	24 V DC
Low limit of permitted range (DC)	19.2 V
High limit of permitted range (DC)	28.8 V
Reverse polarity protection	Yes
Power and voltage failure buffering	
Power/voltage failure buffer time	5 ms
Input current	
Current consumption (rated value)	0.7 A
Inrush current, max.	1.9 A; rated value
I^2t	0.02 A^2s
Power	
Power consumption from the backplane bus (balanced)	5.5 W
Incoming power to the backplane bus	10 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)	300 KB
Integrated (for data)	1.5 MB

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Load memory	
Plug-in (SIMATIC memory card), max.	32 GB
Buffering	
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)	2000; blocks (OB/FB/FC/DB) and UDTs
DB	
Number range	1 ... 60 999; divided into: Number range available for the user: 1 ... 59 999 and number range for DBs generated by SFC 86: 60 000 ... 60 999
Size, max.	1.5 MB; the maximum size of the DB is 64 KB with non-optimized block access
FB	
Number range	0 ... 65 535
Size, max.	300 KB
FC	
Number range	0 ... 65 535
Size, max.	300 KB
OB	
Size, max.	300 KB
Number of free-cycle OBs	100
Number of time-of-day interrupt OBs	20
Number of time-delay interrupt OBs	20
Number of cyclic interrupt OBs	20; with minimum OB 3x cycle of 500 µs
Number of hardware interrupt OBs	50
Number of DPV1 interrupt OBs	3
Number of isochronous mode OBs	1
Number of technology synchronous interrupt OBs	2
Number of restart OBs	100
Number of asynchronous error OBs	4
Number of synchronous error OBs	2
Number of diagnostic interrupt OBs	1
Nesting depth	
Per priority class	24
Counters, timers and their retentivity	
S7 counters	
Quantity	2048
Retentivity	
• Adjustable	Yes

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IEC counters	
Quantity	Unlimited (limited only by work memory)
Retentivity	
• Adjustable	Yes
S7 timers	
Quantity	2048
Retentivity	
• Adjustable	Yes
IEC timers	
Quantity	Unlimited (limited only by work memory)
Retentivity	
• Adjustable	Yes
Data areas and their retentivity	
Total retentive data area (including timers, counters, bit memories), max.	128 KB; in total; for bit memories, timers, counters, DBs and technological data (axes), usable retentive memory: 88 KB
Bit memory	
Number, max.	16 KB
Number of clock memory bits	8; 8 clock memory bits, grouped in one clock memory byte
Data blocks	
Retentivity adjustable	Yes
Retentivity preset	No
Local data	
Per priority class, max.	64 KB; max. 16 KB per block
Address area	
Number of I/O modules	2048; max. number of modules/submodules
I/O address area	
Inputs	32 KB; all inputs are in the process image
Outputs	32 KB; all outputs are in the process image
Of which per integrated IO subsystem	
• Inputs (volume)	8 KB
• Outputs (volume)	8 KB
Of which per CM/CP	
• Inputs (volume)	8 KB
• Outputs (volume)	8 KB
Process image partitions	
Number of process image partitions, max.	32

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Hardware configuration	
Number of distributed IO systems	32; a distributed IO system is understood to mean the integration of distributed I/O via PROFINET or PROFIBUS communication modules as well as 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 rows, max.	1
PtP CM	
Number of PtP CMs	The number of PtP CMs that can be connected is only limited by the available slots
Time	
Clock	
Type	Hardware clock
Backup duration	6 wk; at 40 °C ambient temperature, typ.
Deviation per day, max.	10 s; typ.: 2 s
Operating hours counter	
Quantity	16
Time-of-day synchronization	
Supported	Yes
in AS, Master	Yes
in AS, Slave	Yes
On Ethernet via NTP	Yes
Interfaces	
Number of PROFINET interfaces	1
1st interface	
Interface hardware	
Number of ports	2
Integrated switch	Yes
RJ45 (Ethernet)	Yes; X1
Protocols	
PROFINET IO controller	Yes
PROFINET IO device	Yes
SIMATIC communication	Yes
Open IE communication	Yes
Web server	Yes
Media redundancy	Yes

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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
• Prioritized startup	Yes; max. 32 PROFINET devices
• Number of connectable IO devices, max.	128
• of these, IO devices with IRT, max.	64
• Number of connectable IO devices for RT, max.	128
• of these, in a line topology, max.	128
• Number of IO devices that can be activated/deactivated simultaneously, max.	8; in total over all interfaces
• Number of IO devices per tool, max.	8
• Update times	The minimum value of the update time also depends on the communication component set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data.
Update time with IRT	
• for send clock of 250 µs	250 µs to 4 ms; note: with IRT with isochronous mode, the minimum update time of 500 µs of the isochronous OB is crucial
• With send clock of 500 µs	500 µs to 8 ms
• With send clock of 1 ms	1 ms to 16 ms
• with send clock of 2 ms	2 ms to 32 ms
• with send clock of 4 ms	4 ms to 64 ms
• with IRT and "odd" send clock parameter assignment	Update time = set "odd" send clock (any multiple of 125 µs: 375 µs, 625 µs to 3 875 µs)

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Update time with RT	
• for send clock of 250 µs	250 µs to 128 ms
• With send clock of 500 µs	500 µs to 256 ms
• With send clock of 1 ms	1 ms to 512 ms
• with send clock of 2 ms	2 ms to 512 ms
• with send clock of 4 ms	4 ms to 512 ms
PROFINET IO device	
Services	
• PG/OP communication	Yes
• S7 routing	Yes
• Isochronous mode	No
• Open IE communication	Yes
• IRT	Yes
• MRP	Yes
• MRPD	Yes; requirement: IRT
• PROFIenergy	Yes
• Shared device	Yes
• Number of IO controllers with shared device, max.	4
Interface hardware	
RJ 45 (Ethernet)	
100 Mbps	Yes
Autonegotiation	Yes
Autocrossing	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 connections	16

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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
• PROFIenergy	Yes
• Prioritized startup	Yes; max. 32 PROFINET devices
• Number of connectable IO devices, max.	128; a total of up to 512 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
• of these, IO devices with IRT, max.	64
• Number of connectable IO devices for RT, max.	128
• of these in a line, max.	128
• Number of IO devices that can be enabled/disabled simultaneously, max.	8; in total over all interfaces
• Number of IO devices per tool, max.	8
• Update times	Minimum value of update time also depends on the communication allocation setting for PROFINET IO, the number of IO devices and the amount of configured user data
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	Yes
• Data length, max.	64 KB
• Multiple passive connections per port, supported	Yes
ISO-on-TCP (RFC1006)	Yes
• Data length, max.	64 KB
UDP	Yes
• Data length, max.	1472 bytes
DHCP	No

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SNMP	Yes
DCP	Yes
LLDP	Yes
Web server	
HTTP	Yes; standard and user-defined sites
HTTPS	Yes; standard and user-defined sites
OPC UA	
OPC UA server	Yes; Data Access (Read, Write, Subscribe), Runtime license required
• Application authentication	Yes
• Security Policies	Available Security Policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
• User authentication	"Anonymous" or with user name and password
Additional protocols	
MODBUS	Yes; MODBUS TCP
Media redundancy	
Switchover time in the case of cable break, typ.	200 ms; with MRP; bumpless with MRPD
Number of devices in the ring, max.	50
Isochronous mode	
Isochronous mode (application synchronized up to terminal)	Yes; with minimum OB 6x cycle of 500 µs
Constant bus cycle time	Yes
S7 signaling functions	
Number of stations that can be logged in for signaling functions, max.	32
Block-related alarms	Yes
Number of configurable interrupts, max.	5000
Number of simultaneously active interrupts in interrupt pool	
• Number of reserved user interrupts	300
• Number of reserved interrupts for system diagnostics	100
• Number of reserved interrupts for motion control technology objects	80
Test/commissioning functions	
Joint commissioning (Team Engineering)	Yes; parallel online access possible for up to 5 engineering systems
Status block	Yes; up to 8 simultaneously (in total over all ES clients)
Single-step	No

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Status/modify	
Status/modify tag	Yes
Tags	Inputs/outputs, bit memory, DB, peripheral inputs/outputs, timers, counters
Number of tags, max.	
• Of which are status tags, max.	200; per job
• Of which are modify tags, max.	200; per job
Force	
Forcing, tags	Peripheral inputs/outputs
Number of tags, max.	200
Diagnostics buffer	
Available	Yes
Number of entries, max.	1000
• Of which are power failure-proof	500
Traces	
Number of configurable traces	4; up to 512 KB data possible per trace
Interrupts/diagnostics/status information	
Diagnostics display LED	
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 cams)	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 measuring input	40
• Positioning axis	
– Number of positioning axes with motion control cycle of 4 ms (typical value)	3; with 40 % CPU utilization by Motion Control
– Number of positioning axes with motion control cycle of 8 ms (typical value)	8; with 40 % CPU utilization by Motion Control

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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 mounting position, min.	0 °C
Horizontal mounting position, max.	60 °C; display: 50 °C, the display is switched off at an operating temperature of typically 50 °C
Vertical mounting position, min.	0 °C
Vertical mounting position, max.	40 °C; display: 40 °C, the display is switched off at an operating temperature of typically 40 °C
Ambient temperature during storage/transport	
Min.	-40 °C
Max.	70 °C
Configuring	
Programming	
Programming language	
• LAD	Yes
• FBD	Yes
• STL	Yes
• SCL	Yes
• GRAPH	Yes
Know-how protection	
User program 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	
Low limit	Adjustable minimum cycle time
High limit	Adjustable maximum cycle time

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Dimensions	
Width	35 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	430 g

General technical specifications

You can find information on the general technical specifications, such as standards and approvals, electromagnetic compatibility, protection class, etc., in the S7-1500, ET 200MP (http://support.automation.siemens.com/WW/view/en/59191792) system manual.

Dimensional drawing

A

This section includes a dimensional drawing of the module on a mounting rail and a dimensional drawing with the front panel open. Always observe the specified dimensions for installation in cabinets, control rooms, etc.

Dimensional drawings for CPU 1513-1 PN

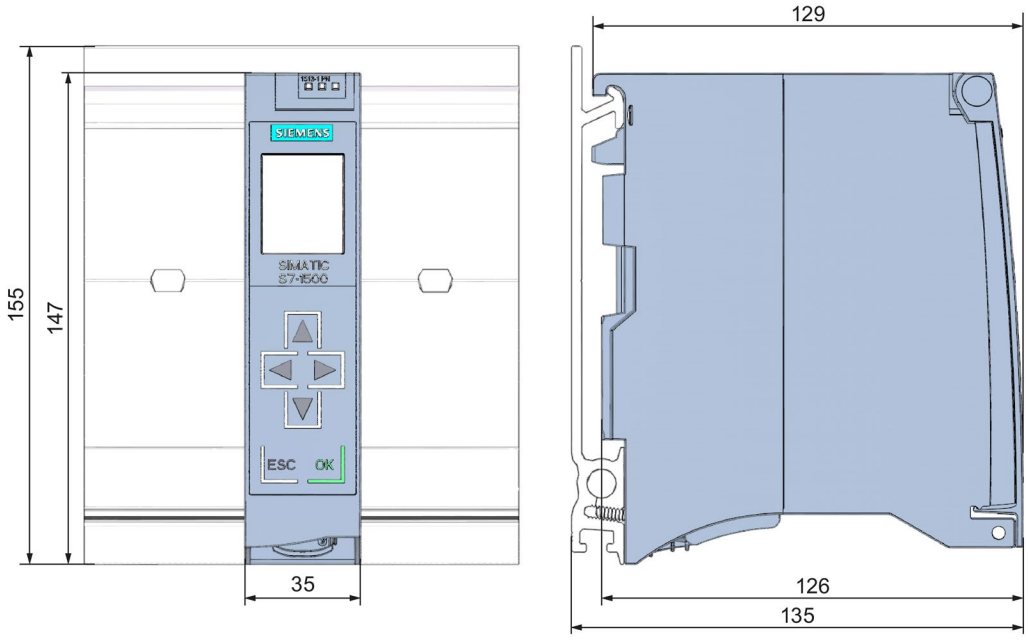


Figure A-1 Dimensional drawing of CPU 1513-1 PN, front and side views