



SIMATIC ET 200SP Open Controller, CPU 1515SP PC2 F, 8 GB RAM (basic device 6ES7677-2DB40-0AA0), 128 GB CFast with Windows 10 IoT Enterprise LTSC 2019 64-bit and S7-1500 Failsafe Software Controller CPU 1505SP F V2x preinstalled; interfaces: 1x slot CFast, 1x slot SD/MMC, 1x connection for ET 200SP BusAdapter PROFINET, 1x 10/100/1000 Mbps Ethernet, 2x USB 3.0, 2x USB 2.0, 1x DisplayPort; documentation on CFast, restore image on CFast

### General information

Product type designation	CPU 1515SP PC2 F
HW functional status	from FS04
Firmware version	V21.9
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V17
Installed software	
• Visualization	No
• Control	S7-1500 Software Controller CPU 1505SP F

### Configuration control

via dataset	Yes
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### Control elements

Mode selector switch	1
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### 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

### Input current

Current consumption (rated value)	1.8 A; Full processor load, incl. ET 200SP modules and using USB
Current consumption (in no-load operation), typ.	0.5 A
Current consumption, max.	2.9 A
$I^2t$	0.426 A <sup>2</sup> ·s; with starting current inrush

### Power

Active power input, max.	55 W; incl. ET 200SP modules and using USB
Infeed power to the backplane bus	8.75 W

### Power loss

Power loss, typ.	15 W; without ET 200SP modules and without using USB
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### Processor

Processor type	Intel Atom E3940, 1.6 GHz, 4 cores
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### Memory

Type of memory	DDR3L
Main memory	8 GB RAM
CFast memory card	Yes; 128 GB flash memory
SIMATIC memory card required	No
Work memory	
• integrated (for program)	1.5 Mbyte
• integrated (for data)	5 Mbyte

• integrated (for CPU function library of CPU Runtime)	20 Mbyte
Load memory	
• integrated (on PC mass storage)	320 Mbyte
Backup	
• with UPS	Yes; all memory areas declared retentive
• with non-volatile memory	Yes
<b>CPU-blocks</b>	
Number of elements (total)	6 000; In addition to blocks such as DBs, FBs and FCs, UDTs, global constants, etc. are also regarded as elements
DB	
• Number, max.	5 999; Number range: 1 to 65535
• Size, max.	5 Mbyte
FB	
• Number, max.	5 998; Number range: 1 to 65535
• Size, max.	1 024 kbyte
FC	
• Number, max.	5 999; Number range: 1 to 65535
• Size, max.	1 024 kbyte
OB	
• Size, max.	1 024 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
• Number of process alarm OBs	50
• Number of DPV1 alarm OBs	3
• Number of isochronous mode OBs	1
• 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; Up to 8 possible for F-blocks
<b>Counters, timers and their retentivity</b>	
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
<b>Data areas and their retentivity</b>	
Retentive data area (incl. timers, counters, flags), max.	410 kbyte; For storage in NVRAM; for storage in mass storage 5 242 020 bytes
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

<b>Address area</b>	
Number of IO modules	8 192
<b>I/O address area</b>	
• Inputs	32 kbyte; All inputs are in the process image
• Outputs	32 kbyte; All outputs are in the process image
<b>Subprocess images</b>	
• Number of subprocess images, max.	32
<b>Hardware configuration</b>	
Integrated power supply	Yes
Number of distributed IO systems	20
<b>Number of DP masters</b>	
• Via CM	1
<b>Number of IO Controllers</b>	
• via PC interfaces	1
<b>Rack</b>	
• Modules per rack, max.	64; CPU 1515SP PC + 64 modules + server module
• Quantity of operable ET 200SP modules, max.	64
• Quantity of operable ET 200AL modules, max.	16
• Number of lines, max.	1
<b>PtP CM</b>	
• Number of PtP CMs	the number of connectable PtP CMs is only limited by the number of available slots
<b>Time of day</b>	
<b>Clock</b>	
• Type	Hardware clock
• Hardware clock (real-time)	Yes; Resolution: 1 s
• Backup time	6 wk; At 40 °C ambient temperature, typically
• Deviation per day, max.	10 s; Typ.: 2 s
<b>Clock synchronization</b>	
• supported	Yes
• to DP, master	Yes
• on Ethernet via NTP	Yes
• on Windows clock, device	Yes
<b>Interfaces</b>	
Number of industrial Ethernet interfaces	2
Number of PROFINET interfaces	1
Number of PROFIBUS interfaces	1
Number of RS 485 interfaces	1; Via CM DP module
Number of USB interfaces	4; 2x USB 2.0, 2x USB 3.0 on front side
Number of SD card slots	1
<b>Video interfaces</b>	
• Graphics interface	1x DisplayPort
<b>1. Interface</b>	
Interface type	PROFINET
automatic detection of transmission rate	Yes
Autonegotiation	Yes
Autocrossing	Yes
Number of connections	88
<b>Interface types</b>	
• RJ 45 (Ethernet)	Yes; Via BusAdapter BA 2x RJ45
— Transmission rate, max.	100 Mbit/s
— Industrial Ethernet status LED	Yes
• Number of ports	2
• integrated switch	Yes
• BusAdapter (PROFINET)	Yes; compatible BusAdapters: BA 2x RJ45, BA 2x M12, BA 2x FC, BA 2x LC, BA LC/RJ45, BA LC/FC, BA 2x SCRJ, BA SCRJ/RJ45, BA SCRJ/FC,
<b>Protocols</b>	
• 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
<b>PROFINET IO Controller</b>	
<b>Services</b>	
— Isochronous mode	Yes
— shortest clock pulse	500 µs
— IRT	Yes
— PROFINergy	Yes
— Prioritized startup	Yes; Max. 32 PROFINET devices
— Number of connectable IO Devices, max.	128
— Of which IO devices with IRT, max.	64
— of which in line, 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
— IO Devices changing during operation (partner ports), supported	Yes
— 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
<b>Update time for IRT</b>	
— 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: 625 µs ... 3 875 µs) minimum cycle time start from 500 µs
<b>Update time for RT</b>	
— 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
<b>Address area</b>	
— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
<b>PROFINET IO Device</b>	
<b>Services</b>	
— Isochronous mode	No
— shortest clock pulse	500 µs
— IRT	Yes
— PROFINergy	Yes
— Prioritized startup	Yes
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— Asset management record	Yes
<b>2. Interface</b>	
Interface type	Integrated Ethernet interface
automatic detection of transmission rate	Yes
Autonegotiation	Yes
Autocrossing	Yes
<b>Interface types</b>	
• RJ 45 (Ethernet)	Yes; Integrated
— Transmission rate, max.	1 000 Mbit/s
— Industrial Ethernet status LED	No
• Number of ports	1
<b>3. Interface</b>	
Interface type	PROFIBUS with CM DP
Number of connections	44
<b>Interface types</b>	
• RS 485	Yes

<b>Protocols</b>	
• PROFIBUS DP master	Yes
• PROFIBUS DP device	Yes
• SIMATIC communication	Yes
<b>PROFIBUS DP master</b>	
• max. number of DP devices	125
<b>Services</b>	
— Equidistance	No
— Isochronous mode	No
<b>Address area</b>	
— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
<b>Interface types</b>	
<b>RS 485</b>	
• Transmission rate, max.	12 Mbit/s
<b>Protocols</b>	
PROFIsafe	Yes
<b>Number of connections</b>	
• Number of connections, max.	88
• Number of connections reserved for ES/HMI/web	10
• Number of S7 routing paths	16
<b>Redundancy mode</b>	
<b>Media redundancy</b>	
— MRP	Yes
— MRPD	Yes
— Switchover time on line break, typ.	200 ms
— Number of stations in the ring, max.	50
<b>SIMATIC communication</b>	
• PG/OP communication	Yes
• S7 routing	Yes
• S7 communication, as server	Yes
• S7 communication, as client	Yes
• User data per job, max.	64 kbyte; BSEND/BRCV: 64 KB; PUT/GET: 960 bytes
<b>Open IE communication</b>	
• TCP/IP	Yes
— Data length, max.	64 kbyte
• ISO-on-TCP (RFC1006)	Yes
— Data length, max.	64 kbyte
• UDP	Yes
— Data length, max.	2 048 byte
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
<b>Web server</b>	
• HTTP	Yes; Via Windows and PROFINET interface
• HTTPS	Yes; Via Windows and PROFINET interface
<b>OPC UA</b>	
• Runtime license required	Yes; "Small" license required
• OPC UA Client	Yes; From SW CPU 1505SP V2.6
• OPC UA Server	Yes; Data access (read, write, subscribe), runtime license required
— Application authentication	Yes; Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— Security policies	Yes; Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	Yes; "anonymous" or by user name & password
<b>Further protocols</b>	
• MODBUS	Yes; MODBUS TCP
<b>S7 message functions</b>	
Number of login stations for message functions, max.	32
Program alarms	Yes
Number of configurable program messages, max.	10 000

Number of simultaneously active program alarms	1 000
• Number of program alarms	1 000
• Number of alarms for system diagnostics	200
• Number of alarms for motion technology objects	160
<b>Test commissioning functions</b>	
Joint commission (Team Engineering)	Yes; Parallel online access possible for up to 8 engineering systems
Status block	Yes; up to 8 simultaneously
Single step	No
Number of breakpoints	8
<b>Status/control</b>	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	
— of which status variables, max.	200
— of which control variables, max.	200
<b>Forcing</b>	
• Forcing	Yes
• Forcing, variables	Inputs, outputs
• Number of variables, max.	200
<b>Diagnostic buffer</b>	
• present	Yes
• Number of entries, max.	1 000
— of which powerfail-proof	300
<b>Traces</b>	
• Number of configurable Traces	4
• Memory size per trace, max.	512 kbyte
<b>Interrupts/diagnostics/status information</b>	
<b>Diagnostics indication LED</b>	
• RUN/STOP LED	Yes
• ERROR LED	Yes
• MAINT LED	Yes
<b>Supported technology objects</b>	
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	2 400
• Required Motion Control resources	
— per speed-controlled axis	40; per axis
— per positioning axis	80; per axis
— per synchronous axis	160; per axis
— per external encoder	80; per external encoder
— per output cam	20; per cam
— per cam track	160; per cam track
— per probe	40; per probe
• Positioning axis	
— Number of positioning axes at motion control cycle of 4 ms (typical value)	15
— Number of positioning axes at motion control cycle of 8 ms (typical value)	30
<b>Controller</b>	
• 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
<b>Counting and measuring</b>	
• High-speed counter	Yes
<b>Standards, approvals, certificates</b>	
CE mark	Yes
CSA approval	Yes
cULus	Yes
FM approval	Yes
RCM (formerly C-TICK)	Yes
Highest safety class achievable in safety mode	

<ul style="list-style-type: none"> <li>• Performance level according to ISO 13849-1</li> <li>• SIL acc. to IEC 61508</li> </ul>	PLe SIL 3
Probability of failure (for service life of 20 years and repair time of 100 hours)	
— Low demand mode: PFDavg in accordance with SIL3	< 2.00E-05
— High demand/continuous mode: PFH in accordance with SIL3	< 1.00E-09 1/h
<b>Ambient conditions</b>	
Ambient temperature during operation	
<ul style="list-style-type: none"> <li>• min.</li> <li>• horizontal installation, min.</li> <li>• horizontal installation, max.</li> <li>• vertical installation, min.</li> <li>• vertical installation, max.</li> </ul>	-20 °C -20 °C 60 °C; from 55°C: with max. 32 ET 200SP modules; 4x 0.3 A USB load; CFast memory card max. 10% load; SD card not used -20 °C 50 °C; from 45°C: with max. 32 ET 200SP modules; 4x 0.3 A USB load; CFast memory card and SD card; max. 10% load
Ambient temperature during storage/transportation	
<ul style="list-style-type: none"> <li>• min.</li> <li>• max.</li> </ul>	-40 °C 70 °C
Vibrations	
<ul style="list-style-type: none"> <li>• Operation, tested according to IEC 60068-2-6</li> <li>• Transport, tested acc. to IEC 60068-2-6</li> </ul>	Yes Yes
Shock testing	
<ul style="list-style-type: none"> <li>• tested according to IEC 60068-2-6</li> <li>• tested according to IEC 60068-2-27</li> <li>• tested according to IEC 60068-2-29</li> <li>• Storage/transport, tested acc. to IEC 60068-2-27</li> </ul>	Yes Yes Yes Yes
<b>Operating systems</b>	
pre-installed operating system	Windows 10 IoT Enterprise 2019 LTSC, 64 bit, MUI
<b>configuration / header</b>	
configuration / programming / header	
Programming language	
— LAD	Yes; incl. failsafe
— FBD	Yes; incl. failsafe
— STL	Yes
— SCL	Yes
— CFC	No
— GRAPH	Yes
Know-how protection	
<ul style="list-style-type: none"> <li>• User program protection/password protection</li> <li>• Copy protection</li> <li>• Block protection</li> </ul>	Yes Yes Yes
Access protection	
<ul style="list-style-type: none"> <li>• protection of confidential configuration data</li> <li>• Protection level: Write protection</li> <li>• Protection level: Read/write protection</li> <li>• Protection level: Write protection for Failsafe</li> <li>• Protection level: Complete protection</li> </ul>	Yes Yes Yes Yes Yes
programming / cycle time monitoring / header	
<ul style="list-style-type: none"> <li>• lower limit</li> <li>• upper limit</li> </ul>	adjustable minimum cycle time adjustable maximum cycle time
Open Development interfaces	
<ul style="list-style-type: none"> <li>• Size of ODK SO file, max.</li> </ul>	5.8 Mbyte
<b>Peripherals/Options</b>	
SD card	Optionally for additional mass storage
<b>Dimensions</b>	
Width	160 mm
Height	117 mm
Depth	75 mm
<b>Weights</b>	
Weight, approx.	0.83 kg
<b>last modified:</b>	7/13/2024 

