

SIMATIC ET 200SP Open Controller, CPU 1515SP PC2 F + HMI 512PT, 8 GB RAM, 128 GB CFast with Windows 10 IoT Enterprise 64-bit, S7-1500 Failsafe Software Controller CPU 1505SP F and WinCC Runtime Advanced pre-installed, with 512 PowerTags license; Interfaces: 1x Slot CFast, 1x slot SD/MMC, 1x connection for ET 200SP bus Adapter PROFINET, 1x 10/100/1000 Mbit/s Ethernet, 2x USB 3.0, 2x USB 2.0, 1x display port, Documentation on CFast Restore image on CFast



Figure similar

General information	
Product type designation	CPU 1515SP PC2 F + HMI 512
HW functional status	from FS04
Firmware version	V20.8
Engineering with	
<ul style="list-style-type: none"> <li>STEP 7 TIA Portal configurable/integrated from version</li> </ul>	V16
Installed software	
<ul style="list-style-type: none"> <li>Visualization</li> <li>Control</li> </ul>	WinCC Runtime Advanced V16 S7-1500 Software Controller CPU 1505SP F
Configuration control	
via dataset	Yes
Control elements	
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

- 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.	16 W
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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

#### CPU processing times

for bit operations, typ.	10 ns
for word operations, typ.	12 ns
for fixed point arithmetic, typ.	16 ns
for floating point arithmetic, typ.	64 ns

#### CPU-blocks

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
<b>DB</b>	
• Number, max.	5 999; Number range: 1 to 65535
• Size, max.	5 Mbyte
<b>FB</b>	
• Number, max.	5 998; Number range: 1 to 65535
• Size, max.	1 024 kbyte
<b>FC</b>	
• Number, max.	5 999; Number range: 1 to 65535
• Size, max.	1 024 kbyte
<b>OB</b>	
• 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
<b>Nesting depth</b>	
• per priority class	24; Up to 8 possible for F-blocks
<b>Counters, timers and their retentivity</b>	
<b>S7 counter</b>	
• Number	2 048
<b>Retentivity</b>	
— adjustable	Yes
<b>IEC counter</b>	
• Number	Any (only limited by the main memory)
<b>Retentivity</b>	
— adjustable	Yes
<b>S7 times</b>	
• Number	2 048
<b>Retentivity</b>	
— adjustable	Yes
<b>IEC timer</b>	

• Number	Any (only limited by the main memory)
<b>Retentivity</b>	
— 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
<b>Flag</b>	
• Number, max.	16 kbyte
• Number of clock memories	8; 8 clock memory bit, grouped into one clock memory byte
<b>Data blocks</b>	
• Retentivity adjustable	Yes
• Retentivity preset	No
<b>Local data</b>	
• 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
• 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, slave Yes

## Interfaces

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

## Video interfaces

- Graphics interface 1x DisplayPort

## 1. Interface

Interface type	PROFINET
automatic detection of transmission rate	Yes
Autonegotiation	Yes
Autocrossing	Yes
Number of connections	88

## Interface types

- Number of ports 2
- integrated switch Yes
- RJ 45 (Ethernet) Yes; Via BusAdapter BA 2x RJ45
  - Transmission rate, max. 100 Mbit/s
  - Industrial Ethernet status LED Yes
- BusAdapter (PROFINET) Yes; Compatible BusAdapter: BA 2x RJ45, BA 2x FC, BA 2x SCRJ (from FS03, V2.2), BA SCRJ / RJ45 (from FS03, V3.1), BA SCRJ / FC (from FS03, V3.1), BA 2x LC (from FS03, V3.3), BA LC / RJ45 (from FS03, V3.3), BA LC / FC (from FS03, V3.3)

## Protocols

- PROFINET IO Controller Yes
- PROFINET IO Device Yes
- SIMATIC communication Yes
- Open IE communication Yes
- Web server Yes

## PROFINET IO Controller

### Services

- Isochronous mode Yes
- shortest clock pulse 500  $\mu$ s
- IRT Yes
- MRP Yes
- MRPD Yes

— PROFINergy	Yes
— Prioritized startup	Yes; Max. 32 PROFINET devices; if you want to use the "Prioritized startup" functionality in STEP 7 for the PROFINET interface of the CPU, the CPU and the device must be separated by means of a switch (e.g. SCALANCE X205)
— 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

#### Update time for IRT

— for send cycle of 500 $\mu$ s	500 $\mu$ s 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 $\mu$ s: 375 $\mu$ s, 625 $\mu$ s ... 3 875 $\mu$ s)

#### Update time for RT

— for send cycle of 500 $\mu$ s	500 $\mu$ s 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

#### Address area

— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte

#### PROFINET IO Device

##### Services

— Isochronous mode	No
— shortest clock pulse	500 $\mu$ s
— IRT	Yes
— MRP	Yes
— MRPD	Yes
— PROFINergy	Yes
— Prioritized startup	Yes

— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— Asset management record	Yes

## 2. Interface

Interface type	Integrated Ethernet interface
automatic detection of transmission rate	Yes
Autonegotiation	Yes
Autocrossing	Yes

### Interface types

• Number of ports	1
• RJ 45 (Ethernet)	Yes; Integrated
— Transmission rate, max.	1 000 Mbit/s
— Industrial Ethernet status LED	No

## 3. Interface

Interface type	PROFIBUS with CM DP
Number of connections via this interface	44

### Interface types

• RS 485	Yes
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### Protocols

• PROFIBUS DP master	Yes
• PROFIBUS DP slave	Yes
• SIMATIC communication	Yes

### PROFIBUS DP master

• Number of DP slaves, max.	125
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### Services

— Equidistance	No
— Isochronous mode	No

### Address area

— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte

### Interface types

RS 485	
• Transmission rate, max.	12 Mbit/s

### Protocols

Number of connections	
• Number of connections, max.	88
• Number of connections reserved for ES/HMI/web	10
• Number of S7 routing paths	16

### Redundancy mode

<b>Media redundancy</b>	
— 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
• 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
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

### Standards, approvals, certificates

CE mark	Yes
CSA approval	Yes
cULus	Yes
FM approval	Yes
RCM (formerly C-TICK)	Yes

Highest safety class achievable in safety mode	
• Performance level according to ISO 13849-1	PLe
• SIL acc. to IEC 61508	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

### Ambient conditions

Ambient temperature during operation	
• min.	-20 °C
• max.	Up to 60 °C with max. 32 ET 200SP modules; up to 55 °C with max. 64 ET 200SP modules
• horizontal installation, min.	-20 °C
• horizontal installation, max.	60 °C
• vertical installation, min.	-20 °C
• vertical installation, max.	50 °C; With max. 32 ET 200SP modules
Ambient temperature during storage/transportation	
• min.	-40 °C
• max.	70 °C
Vibrations	
• Operation, tested according to IEC 60068-2-6	Yes
• Transport, tested acc. to IEC 60068-2-6	Yes
Shock testing	

- tested according to IEC 60068-2-6
- tested according to IEC 60068-2-27
- tested according to IEC 60068-2-29
- Storage/transport, tested acc. to IEC 60068-2-27

Yes  
Yes  
Yes  
Yes

## Operating systems

pre-installed operating system

Windows 10 IoT Enterprise 2016 LTSC, 64bit, MUI

## Configuration

### Programming

#### Programming language

— LAD	Yes; incl. failsafe
— FBD	Yes; incl. failsafe
— STL	Yes
— SCL	Yes
— CFC	No
— GRAPH	Yes

### Know-how protection

• User program protection/password protection	Yes
• Copy protection	Yes
• Block protection	Yes

### Access protection

• 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

### Open Development interfaces

• Size of ODK SO file, max.	5.8 Mbyte
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## Peripherals/Options

SD card

Optionally for additional mass storage

## Dimensions

Width	160 mm
Height	117 mm
Depth	75 mm

## Weights

Weight, approx.	0.83 kg
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**last modified:** 06/22/2020