

SIMATIC S7-400H, CPU 412-5H, central processing unit for S7-400H and S7-400F/FH, 5 interfaces: 1x MPI/DP, 1x DP, 1x PN and 2 for sync modules, 1 MB memory (512 KB data/512 KB program)



General information	
Product type designation	CPU 412-5H PN/DP
HW functional status	1
Firmware version	V6.0
Engineering with	
<ul style="list-style-type: none"> <li>Programming package</li> </ul>	As of STEP 7 V5.5 SP2 with HF1
CiR – Configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	0 µs
Supply voltage	
Rated value (DC) <ul style="list-style-type: none"> <li>24 V DC</li> </ul>	No; Power supply via system power supply
Input current	
from backplane bus 5 V DC, typ.	1.6 A
from backplane bus 5 V DC, max.	1.9 A
from backplane bus 24 V DC, max.	150 mA; 150 mA per DP interface
from interface 5 V DC, max.	90 mA; At each DP interface

## Power loss

Power loss, typ.	7.5 W
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## Memory

Type of memory	other
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### Work memory

• integrated	1 Mbyte
• integrated (for program)	512 kbyte
• integrated (for data)	512 kbyte
• expandable	No

### Load memory

• expandable FEPRM	Yes; with Memory Card (FLASH)
• expandable FEPRM, max.	64 Mbyte
• integrated RAM, max.	512 kbyte
• expandable RAM	Yes
• expandable RAM, max.	64 Mbyte

### Backup

• present	Yes
• with battery	Yes; all data
• without battery	No

## Battery

### Backup battery

• Backup current, typ.	180 $\mu$ A; Valid up to 40°C
• Backup current, max.	1 000 $\mu$ A
• Backup time, max.	Dealt with in the module data manual with the secondary conditions and the factors of influence
• Feeding of external backup voltage to CPU	5 V DC to 15 V DC

## CPU processing times

for bit operations, typ.	31.25 ns
for word operations, typ.	31.25 ns
for fixed point arithmetic, typ.	31.25 ns
for floating point arithmetic, typ.	62.5 ns

## CPU-blocks

### DB

• Number, max.	6 000; Number range: 1 to 16000
• Size, max.	64 kbyte

### FB

• Number, max.	3 000; Number range: 0 to 7999
• Size, max.	64 kbyte

### FC

• Number, max.	3 000; Number range: 0 to 7999
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• Size, max.	64 kbyte
<b>OB</b>	
• Number, max.	see instruction list
• Size, max.	64 kbyte
• Number of free cycle OBs	1; OB 1
• Number of time alarm OBs	4; OB 10-13
• Number of delay alarm OBs	4; OB 20-23
• Number of cyclic interrupt OBs	4; OB 32-35
• Number of process alarm OBs	4; OB 40-43
• Number of DPV1 alarm OBs	3; OB 55-57
• Number of startup OBs	2; OB 100, 102
• Number of asynchronous error OBs	9; OB 80-88
• Number of synchronous error OBs	2; OB 121, 122
<b>Nesting depth</b>	
• per priority class	24
• additional within an error OB	1
<b>Counters, timers and their retentivity</b>	
<b>S7 counter</b>	
• Number	2 048
<b>Retentivity</b>	
— adjustable	Yes
— lower limit	0
— upper limit	2 047
— preset	Z 0 to Z 7
<b>Counting range</b>	
— lower limit	0
— upper limit	999
<b>IEC counter</b>	
• present	Yes
• Type	SFB
• Number	Unlimited (limited only by RAM capacity)
<b>S7 times</b>	
• Number	2 048
<b>Retentivity</b>	
— adjustable	Yes
— lower limit	0
— upper limit	2 047
— preset	No times retentive
<b>Time range</b>	
— lower limit	10 ms
— upper limit	9 990 s

<b>IEC timer</b>	
• present	Yes
• Type	SFB
• Number	Unlimited (limited only by RAM capacity)
<b>Data areas and their retentivity</b>	
retentive data area in total	Total working and load memory (with backup battery)
<b>Flag</b>	
• Number, max.	8 192 byte
• Retentivity available	Yes
• Retentivity preset	MB 0 to MB 15
• Number of clock memories	8; in 1 memory byte
<b>Local data</b>	
• adjustable, max.	16 kbyte
• preset	8 kbyte
<b>Address area</b>	
<b>I/O address area</b>	
• Inputs	8 kbyte
• Outputs	8 kbyte
<b>Process image</b>	
• Inputs, adjustable	8 kbyte
• Outputs, adjustable	8 kbyte
• Inputs, default	256 byte
• Outputs, default	256 byte
• consistent data, max.	244 byte
• Access to consistent data in process image	Yes
<b>Subprocess images</b>	
• Number of subprocess images, max.	15
<b>Digital channels</b>	
• Inputs	65 536
— of which central	65 536
• Outputs	65 536
— of which central	65 536
<b>Analog channels</b>	
• Inputs	4 096
— of which central	4 096
• Outputs	4 096
— of which central	4 096
<b>Hardware configuration</b>	
Number of expansion units, max.	21
connectable OPs	47
Multicomputing	No

Interface modules	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; Single mode only
Number of DP masters	
• integrated	2
• via CP	10; CP 443-5 Extended
• Mixed mode IM + CP permitted	No
• via interface module	0
Number of IO Controllers	
• integrated	1
• via CP	0
Number of operable FMs and CPs (recommended)	
• FM	See manual Automation System S7-400H fault-tolerant systems. Limited by number of slots and number of connections
• CP, PtP	See manual Automation System S7-400H fault-tolerant systems. Limited by number of slots and number of connections
• PROFIBUS and Ethernet CPs	14; Of which max. 10 CP as DP master
Slots	
• required slots	2
Time of day	
Clock	
• Hardware clock (real-time)	Yes
• retentive and synchronizable	Yes
• Resolution	1 ms
• Deviation per day (buffered), max.	1.7 s; Power off
• Deviation per day (unbuffered), max.	8.6 s; Power on
Operating hours counter	
• Number	16
• Number/Number range	0 to 15
• Range of values	SFCs 2, 3 and 4: 0 to 32767 hours SFC 101: 0 to 2 <sup>31</sup> - 1 hours
• Granularity	1 h
• retentive	Yes
Clock synchronization	
• supported	Yes
• to MPI, master	Yes
• to MPI, slave	Yes
• to DP, master	Yes
• to DP, slave	Yes
• in AS, master	Yes
• in AS, slave	Yes
• on Ethernet via NTP	Yes; As client

Time difference in system when synchronizing via	
• Ethernet, max.	10 ms; Via NTP
• MPI, max.	200 ms

Interfaces	
Number of RS 485 interfaces	2
Number of other interfaces	2; Fiber-optic interface

### 1. Interface

Interface type	Integrated
Physics	RS 485 / PROFIBUS + MPI
Isolated	Yes
Power supply to interface (15 to 30 V DC), max.	150 mA
Number of connection resources	MPI: 32, DP: 16

Protocols	
• MPI	Yes
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	No

MPI	
• Number of connections	32; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1
• Transmission rate, max.	12 Mbit/s

Services	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	No
— S7 basic communication	No
— S7 communication	Yes
— S7 communication, as client	Yes
— S7 communication, as server	Yes

PROFIBUS DP master	
• Number of connections, max.	16; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	32

Services	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	No
— S7 basic communication	No
— S7 communication	Yes
— S7 communication, as client	Yes
— S7 communication, as server	Yes

— Equidistance	No
— Isochronous mode	No
— SYNC/FREEZE	No
— Activation/deactivation of DP slaves	No
— Direct data exchange (slave-to-slave communication)	No
— DPV1	Yes
<b>Address area</b>	
— Inputs, max.	2 kbyte
— Outputs, max.	2 kbyte
<b>User data per DP slave</b>	
— User data per DP slave, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
<b>PROFIBUS DP slave</b>	
• Number of connections	No configuration of CPU as DP slave
<b>2. Interface</b>	
Interface type	PROFINET
Physics	Ethernet RJ45
Isolated	Yes
automatic detection of transmission rate	Yes; Autosensing
Autonegotiation	Yes
Autocrossing	Yes
Change of IP address at runtime, supported	No
Number of connection resources	48
<b>Interface types</b>	
• Number of ports	2
• integrated switch	Yes
<b>Media redundancy</b>	
• supported	Yes
• Switchover time on line break, typ.	200 ms
• Number of stations in the ring, max.	50
<b>Protocols</b>	
• PROFINET IO Controller	Yes
• PROFINET IO Device	No
• PROFINET CBA	No
• PROFIBUS DP master	No
• PROFIBUS DP slave	No
• Open IE communication	Yes
• Web server	No

• Point-to-point connection	No
<b>PROFINET IO Controller</b>	
• Transmission rate, max.	100 Mbit/s
<b>Services</b>	
— PG/OP communication	Yes
— S7 routing	Yes
— S7 communication	Yes
— Isochronous mode	No
— Open IE communication	Yes
— Shared device	Yes; Single mode only
— Prioritized startup	No
— Number of connectable IO Devices, max.	256; In redundant mode via both interfaces
— Number of connectable IO Devices for RT, max.	256
— of which in line, max.	256
— Activation/deactivation of IO Devices	No
— IO Devices changing during operation (partner ports), supported	No
— Device replacement without swap medium	Yes
— Send cycles	250 µs, 500 µs, 1 ms, 2 ms, 4 ms
— Updating time	250 µs to 512 ms, minimum value depends on the number of configured user data and the configured single or redundant mode
<b>Address area</b>	
— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
— User data consistency, max.	1 024 byte
<b>Open IE communication</b>	
• Number of connections, max.	46
• Local port numbers used at the system end	0, 20, 21, 25, 102, 135, 161, 34962, 34963, 34964, 65532, 65533, 65534, 65535
• Keep-alive function, supported	Yes
<b>3. Interface</b>	
Interface type	Integrated
Physics	RS 485 / PROFIBUS
Power supply to interface (15 to 30 V DC), max.	150 mA
Number of connection resources	16
<b>Protocols</b>	
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	No
<b>PROFIBUS DP master</b>	
• Number of connections, max.	16
• Transmission rate, max.	12 Mbit/s



• Number of DP slaves, max.	64
<b>Services</b>	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	No
— S7 basic communication	No
— S7 communication	Yes
— S7 communication, as client	Yes
— S7 communication, as server	Yes
— Equidistance	No
— Isochronous mode	No
— SYNC/FREEZE	No
— Activation/deactivation of DP slaves	No
— Direct data exchange (slave-to-slave communication)	No
— DPV0	Yes
— DPV1	Yes
<b>Address area</b>	
— Inputs, max.	4 kbyte
— Outputs, max.	4 kbyte
<b>User data per DP slave</b>	
— User data per DP slave, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
<b>4. Interface</b>	
Interface type	Pluggable synchronization submodule (FO)
Plug-in interface modules	Synchronization modules 6ES7960-1AA06-0XA0 or 6ES7960-1AB06-0XA0
<b>5. Interface</b>	
Interface type	Pluggable synchronization submodule (FO)
Plug-in interface modules	Synchronization modules 6ES7960-1AA06-0XA0 or 6ES7960-1AB06-0XA0
<b>Protocols</b>	
<b>SIMATIC communication</b>	
• S7 routing	Yes
<b>Open IE communication</b>	
• TCP/IP	Yes; via integrated PROFINET interface and loadable FBs
— Number of connections, max.	46
— Data length, max.	32 kbyte

— several passive connections per port, supported	Yes
• ISO-on-TCP (RFC1006)	Yes; Via integrated PROFINET interface or CP 443-1 and loadable FBs
— Number of connections, max.	46
— Data length, max.	32 kbyte; 1452 bytes via CP 443-1 Adv.
• UDP	Yes; via integrated PROFINET interface and loadable FBs
— Number of connections, max.	46
— Data length, max.	1 472 byte
<b>Web server</b>	
• supported	No
<b>Isochronous mode</b>	
Isochronous operation (application synchronized up to terminal)	No
Equidistance	No
<b>Communication functions</b>	
PG/OP communication	Yes
• Number of connectable OPs without message processing	47
• Number of connectable OPs with message processing	47; When using Alarm_S/SQ and Alarm_D/DQ
Data record routing	Yes
<b>Global data communication</b>	
• supported	No
<b>S7 basic communication</b>	
• supported	No
<b>S7 communication</b>	
• supported	Yes
• as server	Yes
• as client	Yes
• User data per job, max.	64 kbyte
• User data per job (of which consistent), max.	462 byte; 1 variable
<b>S5 compatible communication</b>	
• supported	Yes; (via CP max. 10 and FC AG_SEND and FC AG_RECV)
• User data per job, max.	8 kbyte
• User data per job (of which consistent), max.	240 byte
• Number of simultaneous AG-SEND/AG-RECV orders per CPU, max.	64/64
<b>Standard communication (FMS)</b>	
• supported	Yes; Via CP and loadable FB
<b>Number of connections</b>	
• overall	48

- usable for PG communication
  - reserved for PG communication 1
  - adjustable for PG communication, max. 0
- usable for OP communication
  - reserved for OP communication 1
  - adjustable for OP communication, max. 0
- usable for S7 basic communication
  - reserved for S7 basic communication 0
  - adjustable for S7 basic communication, max. 0
- usable for S7 communication
  - reserved for S7 communication 0
  - adjustable for S7 communication, max. 0
- usable for routing
  - reserved for routing 0
  - adjustable for routing, max. 0

1
0
1
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0

### S7 message functions

Number of login stations for message functions, max.	47; Max. 47 with Alarm_S/SQ and Alarm_D/DQ (OPs); max. 8 with Alarm, Alarm_8, Alarm_8P, Notify and Notify_8 (e.g. WinCC)
Symbol-related messages	No
SCAN procedure	No
Program alarms	Yes
Process diagnostic messages	Yes
simultaneously active Alarm-S blocks, max.	250; Simultaneously active alarm_S/SQ blocks or alarm_D/DQ blocks
Alarm 8-blocks	Yes
<ul style="list-style-type: none"> <li>• Number of instances for alarm 8 and S7 communication blocks, max.</li> </ul>	600
<ul style="list-style-type: none"> <li>• preset, max.</li> </ul>	300
Process control messages	Yes
Number of archives that can log on simultaneously (SFB 37 AR_SEND)	16

### Test commissioning functions

Status block	Yes
Single step	Yes
Number of breakpoints	16
<b>Status/control</b>	
<ul style="list-style-type: none"> <li>• Status/control variable</li> </ul>	Yes; Up to 16 variable tables
<ul style="list-style-type: none"> <li>• Variables</li> </ul>	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
<ul style="list-style-type: none"> <li>• Number of variables, max.</li> </ul>	70
<b>Forcing</b>	

• Forcing	Yes
• Forcing, variables	Inputs/outputs, bit memories, distributed I/Os
• Number of variables, max.	256
<b>Diagnostic buffer</b>	
• present	Yes
• Number of entries, max.	3 200
— adjustable	Yes
— preset	120
<b>Service data</b>	
• can be read out	Yes
<b>EMC</b>	
<b>Emission of radio interference acc. to EN 55 011</b>	
• Limit class A, for use in industrial areas	Yes
• Limit class B, for use in residential areas	No
<b>Configuration</b>	
<b>Configuration software</b>	
• STEP 7	Yes
<b>Programming</b>	
• Command set	see instruction list
• Nesting levels	7
• Access to consistent data in process image	Yes
• System functions (SFC)	see instruction list
• System function blocks (SFB)	see instruction list
<b>Programming language</b>	
— LAD	Yes
— FBD	Yes
— STL	Yes
— SCL	Yes
— CFC	Yes
— GRAPH	Yes
— HiGraph®	Yes
<b>Number of simultaneously active SFCs</b>	
— RD_REC	8
— WR_REC	8
— WR_PARM	8
— PARM_MOD	1
— WR_DPARM	2
— DPNRM_DG	8
— RDSYSST	8
— DP_TOPOL	1
<b>Number of simultaneously active SFBs</b>	

— RDREC 8  
— WRREC 8

#### Know-how protection

- User program protection/password protection Yes
- Block encryption Yes; With S7 block Privacy

#### Dimensions

Width 50 mm  
Height 290 mm  
Depth 219 mm

#### Weights

Weight, approx. 995 g

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