

SIMATIC S7-400H, CPU 412-3H central processing unit for S7-400H and S7-400F/FH, 3 interfaces: 1 MPI/DP and 2 for sync modules, 768 KB memory (256 KB data/512 KB program)



General information	
Product type designation	CPU 412-3H PN/DP
HW functional status	1
Firmware version	V4.5
Engineering with	
<ul style="list-style-type: none"> <li>Programming package</li> </ul>	STEP 7 V5.3 SP2 or higher with HW update
CiR – Configuration in RUN	
CiR synchronization time, basic load	150 ms
CiR synchronization time, time per I/O byte	40 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.	1.2 A
from backplane bus 5 V DC, max.	1.5 A
from backplane bus 24 V DC, max.	150 mA; Per DP interface
from interface 5 V DC, max.	90 mA; At each DP interface

Power loss	
Power loss, typ.	5.5 W
Memory	
Type of memory	other
Work memory	
<ul style="list-style-type: none"> <li>integrated</li> </ul>	768 kbyte
<ul style="list-style-type: none"> <li>integrated (for program)</li> </ul>	512 kbyte
<ul style="list-style-type: none"> <li>integrated (for data)</li> </ul>	256 kbyte
<ul style="list-style-type: none"> <li>expandable</li> </ul>	No
Load memory	
<ul style="list-style-type: none"> <li>expandable FEPRM</li> </ul>	Yes
<ul style="list-style-type: none"> <li>expandable FEPRM, max.</li> </ul>	64 Mbyte
<ul style="list-style-type: none"> <li>integrated RAM, max.</li> </ul>	256 kbyte
<ul style="list-style-type: none"> <li>expandable RAM</li> </ul>	Yes
<ul style="list-style-type: none"> <li>expandable RAM, max.</li> </ul>	64 Mbyte
Backup	
<ul style="list-style-type: none"> <li>present</li> </ul>	Yes
<ul style="list-style-type: none"> <li>with battery</li> </ul>	Yes; all data
<ul style="list-style-type: none"> <li>without battery</li> </ul>	No
Battery	
Backup battery	
<ul style="list-style-type: none"> <li>Backup current, typ.</li> </ul>	190 $\mu$ A; Valid up to 40°C
<ul style="list-style-type: none"> <li>Backup current, max.</li> </ul>	660 $\mu$ A
<ul style="list-style-type: none"> <li>Backup time, max.</li> </ul>	Dealt with in the module data manual with the secondary conditions and the factors of influence
<ul style="list-style-type: none"> <li>Feeding of external backup voltage to CPU</li> </ul>	5 V DC to 15 V DC
CPU processing times	
for bit operations, typ.	0.075 $\mu$ s
for word operations, typ.	0.075 $\mu$ s
for fixed point arithmetic, typ.	0.075 $\mu$ s
for floating point arithmetic, typ.	0.225 $\mu$ s
CPU-blocks	
DB	
<ul style="list-style-type: none"> <li>Number, max.</li> </ul>	4 095; Number range: 1 to 4095
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	64 kbyte
FB	
<ul style="list-style-type: none"> <li>Number, max.</li> </ul>	2 048; Number range: 0 to 2047
<ul style="list-style-type: none"> <li>Size, max.</li> </ul>	64 kbyte
FC	
<ul style="list-style-type: none"> <li>Number, max.</li> </ul>	2 048; Number range: 0 to 2047

• Size, max.	64 kbyte
<b>OB</b>	
• Size, max.	64 kbyte
• Number of time alarm OBs	4
• Number of delay alarm OBs	4
• Number of cyclic interrupt OBs	4
• Number of process alarm OBs	4
<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
<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
<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 kbyte

• 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	15 without message processing, 8 with message processing
Multicomputing	No
<b>Interface modules</b>	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; Single mode only
<b>Number of DP masters</b>	
• integrated	1
• via CP	10
• Mixed mode IM + CP permitted	No

• via interface module	0
<b>Number of operable FMs and CPs (recommended)</b>	
• 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
<b>Slots</b>	
• required slots	2
<b>Time of day</b>	
<b>Clock</b>	
• 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
<b>Operating hours counter</b>	
• Number	8
• Number/Number range	0 to 7
• Range of values	0 to 32767 hours
• Granularity	1 h
• retentive	Yes
<b>Clock synchronization</b>	
• 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
<b>Time difference in system when synchronizing via</b>	
• MPI, max.	200 ms
<b>Interfaces</b>	
Number of RS 485 interfaces	2
Number of other interfaces	0
<b>1. Interface</b>	
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: 16, DP: 16

Protocols	
• MPI	Yes
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	No
MPI	
• Number of connections	16
• Transmission rate, max.	12 Mbit/s
Services	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	No
— S7 basic communication	No
— S7 communication	Yes
PROFIBUS DP master	
• Number of connections, max.	16
• 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
— Equidistance	No
— SYNC/FREEZE	No
— Activation/deactivation of DP slaves	No
— Direct data exchange (slave-to-slave communication)	No
Address area	
— Inputs, max.	2 kbyte
— Outputs, max.	2 kbyte
User data per DP slave	
— User data per DP slave, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
PROFIBUS DP slave	
• Number of connections	No configuration of CPU as DP slave
3. Interface	
Interface type	Pluggable synchronization submodule (FO)

Plug-in interface modules	Synchronization submodule IF 960 6ES7960-1AA04-0XA0
<b>4. Interface</b>	
Interface type	Pluggable synchronization submodule (FO)
Plug-in interface modules	Synchronization submodule IF 960 6ES7960-1AA04-0XA0
<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	15
• Number of connectable OPs with message processing	8
<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.	24/24
<b>Standard communication (FMS)</b>	
• supported	Yes; Via CP and loadable FB
<b>Number of connections</b>	
• overall	16
• 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

0
0
0
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0

### S7 message functions

Number of login stations for message functions, max.	8
Symbol-related messages	No
Program alarms	Yes
simultaneously active Alarm-S blocks, max.	100
Alarm 8-blocks <ul style="list-style-type: none"> <li>• Number of instances for alarm 8 and S7 communication blocks, max. 600</li> <li>• preset, max. 300</li> </ul>	
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	4
<b>Status/control</b>	
<ul style="list-style-type: none"> <li>• Status/control variable Yes</li> <li>• Variables Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters</li> <li>• Number of variables, max. 70</li> </ul>	
<b>Forcing</b>	
<ul style="list-style-type: none"> <li>• Forcing Yes</li> <li>• Forcing, variables Inputs/outputs, bit memories, distributed I/Os</li> <li>• Number of variables, max. 256</li> </ul>	
<b>Diagnostic buffer</b>	
<ul style="list-style-type: none"> <li>• present Yes</li> <li>• Number of entries, max. 3 200           <ul style="list-style-type: none"> <li>— adjustable Yes</li> <li>— preset 120</li> </ul> </li> </ul>	

### Configuration

<b>Configuration software</b>	
• STEP 7	Yes



Programming	
• Command set	see instruction list
• Nesting levels	8
• Access to consistent data in process image	Yes
• System functions (SFC)	see instruction list
• System function blocks (SFB)	see instruction list
Programming language	
— LAD	Yes
— FBD	Yes
— STL	Yes
— SCL	Yes
— CFC	Yes
— GRAPH	Yes
— HiGraph®	Yes
Number of simultaneously active SFCs	
— RD_REC	8
— WR_REC	8
— WR_PARM	8
— PARM_MOD	1
— WR_DPARM	2
— DPNRM_DG	8
— RDSYSST	8
— DP_TOPOL	1
Number of simultaneously active SFBs	
— RDREC	8
— WRREC	8
Know-how protection	
• User program protection/password protection	Yes
Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm
Weights	
Weight, approx.	990 g
<b>last modified:</b>	08/15/2019