

SIPLUS S7-400 CPU 412-5H -25...+70°C with conformal coating based on 6ES7412-5HK06-0AB0 . 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)



Figure similar

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
<b>Power loss</b>	
Power loss, typ.	7.5 W
<b>Memory</b>	
Type of memory	RAM
<b>Work memory</b>	
<ul style="list-style-type: none"> <li>• integrated</li> <li>• integrated (for program)</li> <li>• integrated (for data)</li> <li>• expandable</li> </ul>	<ul style="list-style-type: none"> <li>1 Mbyte</li> <li>512 kbyte</li> <li>512 kbyte</li> <li>No</li> </ul>
<b>Load memory</b>	
<ul style="list-style-type: none"> <li>• expandable FEPRM</li> <li>• expandable FEPRM, max.</li> <li>• integrated RAM, max.</li> <li>• expandable RAM</li> <li>• expandable RAM, max.</li> </ul>	<ul style="list-style-type: none"> <li>Yes; with Memory Card (FLASH)</li> <li>64 Mbyte</li> <li>512 kbyte</li> <li>Yes</li> <li>64 Mbyte</li> </ul>
<b>Backup</b>	
<ul style="list-style-type: none"> <li>• present</li> <li>• with battery</li> <li>• without battery</li> </ul>	<ul style="list-style-type: none"> <li>Yes</li> <li>Yes; all data</li> <li>No</li> </ul>
<b>Battery</b>	
<b>Backup battery</b>	
<ul style="list-style-type: none"> <li>• Backup current, typ.</li> <li>• Backup current, max.</li> <li>• Backup time, max.</li> <li>• Feeding of external backup voltage to CPU</li> </ul>	<ul style="list-style-type: none"> <li>180 <math>\mu</math>A; Valid up to 40°C</li> <li>1 000 <math>\mu</math>A</li> <li>Dealt with in the module data manual with the secondary conditions and the factors of influence</li> <li>5 V DC to 15 V DC</li> </ul>
<b>CPU processing times</b>	
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
<b>CPU-blocks</b>	
<b>DB</b>	
<ul style="list-style-type: none"> <li>• Number, max.</li> <li>• Size, max.</li> </ul>	<ul style="list-style-type: none"> <li>6 000; Number range: 1 to 16000</li> <li>64 kbyte</li> </ul>
<b>FB</b>	
<ul style="list-style-type: none"> <li>• Number, max.</li> <li>• Size, max.</li> </ul>	<ul style="list-style-type: none"> <li>3 000; Number range: 0 to 7999</li> <li>64 kbyte</li> </ul>
<b>FC</b>	

• Number, max.	3 000; Number range: 0 to 7999
• 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
<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	2
• via CP	10; CP 443-5 Extended
• Mixed mode IM + CP permitted	No
• via interface module	0
<b>Number of IO Controllers</b>	
• integrated	1
• via CP	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
• 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	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
<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
• on Ethernet via NTP	Yes; As client
<b>Time difference in system when synchronizing via</b>	
• Ethernet, max.	10 ms; Via NTP
• MPI, max.	200 ms

<b>Interfaces</b>	
Number of RS 485 interfaces	2
Number of other interfaces	2; Fiber-optic interface

<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: 32, DP: 16

<b>Protocols</b>	
• MPI	Yes
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	No

<b>MPI</b>	
• 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

<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

<b>PROFIBUS DP master</b>	
• 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

<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
— 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



PROFIBUS DP master	
• Number of connections, max.	16
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	64
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
— DPV0	Yes
— DPV1	Yes
Address area	
— Inputs, max.	4 kbyte
— Outputs, max.	4 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
4. Interface	
Interface type	Pluggable synchronization submodule (FO)
Plug-in interface modules	Synchronization modules 6ES7960-1AA06-0XA0 or 6ES7960-1AB06-0XA0
5. Interface	
Interface type	Pluggable synchronization submodule (FO)
Plug-in interface modules	Synchronization modules 6ES7960-1AA06-0XA0 or 6ES7960-1AB06-0XA0
Protocols	
SIMATIC communication	
• S7 routing	Yes
Open IE communication	

<ul style="list-style-type: none"> <li>• TCP/IP <ul style="list-style-type: none"> <li>— Number of connections, max.</li> <li>— Data length, max.</li> <li>— several passive connections per port, supported</li> </ul> </li> <li>• ISO-on-TCP (RFC1006) <ul style="list-style-type: none"> <li>— Number of connections, max.</li> <li>— Data length, max.</li> </ul> </li> <li>• UDP <ul style="list-style-type: none"> <li>— Number of connections, max.</li> <li>— Data length, max.</li> </ul> </li> </ul>	<p>Yes; via integrated PROFINET interface and loadable FBs</p> <p>46</p> <p>32 kbyte</p> <p>Yes</p> <p>Yes; Via integrated PROFINET interface or CP 443-1 and loadable FBs</p> <p>46</p> <p>32 kbyte; 1452 bytes via CP 443-1 Adv.</p> <p>Yes; via integrated PROFINET interface and loadable FBs</p> <p>46</p> <p>1 472 byte</p>
<b>Web server</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	No
<b>Isochronous mode</b>	
Isochronous operation (application synchronized up to terminal)	No
Equidistance	No
<b>Communication functions</b>	
PG/OP communication	Yes
<ul style="list-style-type: none"> <li>• Number of connectable OPs without message processing</li> <li>• Number of connectable OPs with message processing</li> </ul>	<p>47</p> <p>47; When using Alarm_S/SQ and Alarm_D/DQ</p>
Data record routing	Yes
<b>Global data communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	No
<b>S7 basic communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	No
<b>S7 communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> <li>• as server</li> <li>• as client</li> <li>• User data per job, max.</li> <li>• User data per job (of which consistent), max.</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>64 kbyte</p> <p>462 byte; 1 variable</p>
<b>S5 compatible communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> <li>• User data per job, max.</li> <li>• User data per job (of which consistent), max.</li> <li>• Number of simultaneous AG-SEND/AG-RECV orders per CPU, max.</li> </ul>	<p>Yes; (via CP max. 10 and FC AG_SEND and FC AG_RECV)</p> <p>8 kbyte</p> <p>240 byte</p> <p>64/64</p>
<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

<b>S7 message functions</b>	
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
• Number of instances for alarm 8 and S7 communication blocks, max.	600
• preset, max.	300
Process control messages	Yes
Number of archives that can log on simultaneously (SFB 37 AR_SEND)	16

<b>Test commissioning functions</b>	
Status block	Yes
Single step	Yes
Number of breakpoints	16
<b>Status/control</b>	
• Status/control variable	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>	
<ul style="list-style-type: none"> <li>• Forcing</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Forcing, variables</li> </ul>	Inputs/outputs, bit memories, distributed I/Os
<ul style="list-style-type: none"> <li>• Number of variables, max.</li> </ul>	256
<b>Diagnostic buffer</b>	
<ul style="list-style-type: none"> <li>• present</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Number of entries, max.</li> </ul>	3 200
<ul style="list-style-type: none"> <li>— adjustable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— preset</li> </ul>	120
<b>Service data</b>	
<ul style="list-style-type: none"> <li>• can be read out</li> </ul>	Yes
<b>EMC</b>	
Emission of radio interference acc. to EN 55 011	
<ul style="list-style-type: none"> <li>• Limit class A, for use in industrial areas</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Limit class B, for use in residential areas</li> </ul>	No
<b>Standards, approvals, certificates</b>	
CE mark	Yes
<b>Ambient conditions</b>	
Ambient temperature during operation	
<ul style="list-style-type: none"> <li>• min.</li> </ul>	-25 °C; = Tmin
<ul style="list-style-type: none"> <li>• max.</li> </ul>	70 °C; = Tmax; @ 60°C for UL/ATEX/FM and safety-related application
Ambient temperature during storage/transportation	
<ul style="list-style-type: none"> <li>• min.</li> </ul>	-40 °C
<ul style="list-style-type: none"> <li>• max.</li> </ul>	70 °C
Altitude during operation relating to sea level	
<ul style="list-style-type: none"> <li>• Installation altitude above sea level, max.</li> </ul>	5 000 m
<ul style="list-style-type: none"> <li>• Ambient air temperature-barometric pressure-altitude</li> </ul>	Tmin ... Tmax at 1 140 hPa ... 795 hPa (-1 000 m ... +2 000 m) // Tmin ... (Tmax - 10 K) at 795 hPa ... 658 hPa (+2 000 m ... +3 500 m) // Tmin ... (Tmax - 20 K) at 658 hPa ... 540 hPa (+3 500 m ... +5 000 m); with "F-System" applications max. +2 000 m above sea level permissible
Relative humidity	
<ul style="list-style-type: none"> <li>• With condensation, tested in accordance with IEC 60068-2-38, max.</li> </ul>	100 %; RH incl. condensation/frost (no commissioning under condensation conditions)
<b>Resistance</b>	
Use in stationary industrial systems	
<ul style="list-style-type: none"> <li>— to biologically active substances according to EN 60721-3-3</li> </ul>	Yes; Class 3B2 mold, fungus and dry rot spores (with the exception of fauna); Class 3B3 on request

— to chemically active substances according to EN 60721-3-3	Yes; Class 3C4 (RH < 75 %) incl. salt spray acc. to EN 60068-2-52 (severity degree 3); *
— to mechanically active substances according to EN 60721-3-3	Yes; Class 3S4 incl. sand, dust, *
<b>Use on ships/at sea</b>	
— to biologically active substances according to EN 60721-3-6	Yes; Class 6B2 mold and fungal spores (excluding fauna); Class 6B3 on request
— to chemically active substances according to EN 60721-3-6	Yes; Class 6C3 (RH < 75 %) incl. salt spray acc. to EN 60068-2-52 (severity degree 3); *
— to mechanically active substances according to EN 60721-3-6	Yes; Class 6S3 incl. sand, dust; *
<b>Remark</b>	
— Note regarding classification of environmental conditions acc. to EN 60721	* The supplied plug covers must remain in place over the unused interfaces during operation!
<b>Conformal coating</b>	
• Coatings for printed circuit board assemblies acc. to EN 61086	Yes; Class 2 for high availability
• Military testing according to MIL-I-46058C, Amendment 7	Yes; Discoloration of coating possible during service life
• Qualification and Performance of Electrical Insulating Compound for Printed Board Assemblies according to IPC-CC-830A	Yes; Conformal coating, Class A
<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

#### Number of simultaneously active SFBs

— 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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**last modified:** 12/27/2018