



\*\*\*\*\* Replacement part \*\*\*\*\* SIMATIC S7-400, CPU 412-2 PN Central processing unit with: work memory 1 MB, (0.5 MB code, 0.5 MB data), interfaces 1st interface MPI/DP 12 Mbit/s, (X1), 2nd interface Ethernet/PROFINET (X5)

General information	
Product type designation	CPU 412-2 PN
HW functional status	01
Firmware version	V6.0
Product function	
<ul style="list-style-type: none"> <li>• Isochronous mode</li> </ul>	Yes; Via PROFIBUS DP or PROFINET interface
Engineering with	
<ul style="list-style-type: none"> <li>• Programming package</li> </ul>	STEP 7 V5.5 or higher/iMap V3.0 + iMap STEP 7 Add-on V3.0 SP5 or higher
CiR - Configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	30 µs; Time per I/O byte
Supply voltage	
Rated value (DC)	Power supply via system power supply
Input current	
from backplane bus 5 V DC, typ.	1.1 A
from backplane bus 5 V DC, max.	1.3 A
from backplane bus 24 V DC, max.	150 mA; 150 mA per DP interface
from interface 5 V DC, max.	90 mA; At the DP interface
Power loss	
Power loss, typ.	5.5 W
Storage	
Type of memory	RAM
Work memory	
<ul style="list-style-type: none"> <li>• integrated</li> <li>• integrated (for program)</li> <li>• integrated (for data)</li> <li>• expandable</li> </ul>	1 Mbyte 0.5 Mbyte 0.5 Mbyte No
Load memory	
<ul style="list-style-type: none"> <li>• expandable FEPR0M</li> <li>• expandable FEPR0M, max.</li> <li>• integrated RAM, max.</li> <li>• expandable RAM</li> <li>• expandable RAM, max.</li> </ul>	Yes; with Memory Card (FLASH) 64 Mbyte 512 kbyte Yes; with Memory Card (RAM) 64 Mbyte
Backup	
<ul style="list-style-type: none"> <li>• present</li> <li>• with battery</li> <li>• without battery</li> </ul>	Yes Yes; all data No
Battery	
Backup battery	

• Backup current, typ.	125 µA; up to 40 °C
• Backup current, max.	450 µA
• 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.	75 ns
for word operations, typ.	75 ns
for fixed point arithmetic, typ.	75 ns
for floating point arithmetic, typ.	225 ns

#### CPU-blocks

##### DB

• Number, max.	3 000; Number range: 1 to 16000
• Size, max.	64 kbyte

##### FB

• Number, max.	1 500; Number range: 0 to 7999
• Size, max.	64 kbyte

##### FC

• Number, max.	1 500; Number range: 0 to 7999
• Size, max.	64 kbyte

##### OB

• Number, max.	see instruction list
• Size, max.	64 kbyte
• Number of free cycle OBs	1; OB 1
• Number of time alarm OBs	2; OB 10, 11
• Number of delay alarm OBs	2; OB 20, 21
• Number of cyclic interrupt OBs	2; OB 32, 35 (shortest cycle that can be set = 500 µs)
• Number of process alarm OBs	2; OB 40, 41
• Number of DPV1 alarm OBs	3; OB 55-57
• Number of isochronous mode OBs	2; OB 61-62
• Number of multicomputing OBs	1; OB 60
• Number of background OBs	1; OB 90
• Number of startup OBs	3; OB 100-102
• Number of asynchronous error OBs	9; OB 80-88
• Number of synchronous error OBs	2; OB 121, 122

##### Nesting depth

• per priority class	24
• additional within an error OB	1

#### Counters, timers and their retentivity

##### S7 counter

• Number	2 048
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##### Retentivity

— can be set	Yes
— preset	Z 0 to Z 7

##### Counting range

— lower limit	0
— upper limit	999

##### IEC counter

• present	Yes
• Type	SFB
• Number	Unlimited (limited only by RAM capacity)

##### S7 timer

• Number	2 048
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##### Retentivity

— adjustable	Yes
— preset	No times retentive

##### Time range

— 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 (incl. timers, counters, flags), max.	Total working and load memory (with backup battery)
<b>Flag</b>	
• Size, max.	4 kbyte; Size of bit memory address area
• 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.	8 kbyte
• preset	4 kbyte
<b>Address area</b>	
<b>I/O address area</b>	
• Inputs	4 kbyte
• Outputs	4 kbyte
<b>Process image</b>	
• Inputs, adjustable	4 kbyte
• Outputs, adjustable	4 kbyte
• Inputs, default	128 kbyte
• Outputs, default	128 kbyte
• 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	32 768
— of which central	32 768
• Outputs	32 768
— of which central	32 768
<b>Analog channels</b>	
• Inputs	2 048
— of which central	2 048
• Outputs	2 048
— of which central	2 048
<b>Hardware configuration</b>	
Integrated power supply	No
Number of expansion units, max.	21
connectable OPs	47
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)
<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; IM 463-2
<b>Number of DP masters</b>	
• integrated	1
• via CP	10; CP 443-5 Extended
• via IM 467	4
• Mixed mode IM + CP permitted	No; IM 467 not suitable for use with CP 443-5 Ext. and CP 443-1 EX4x, EX20, GX20 (in PROFINET IO mode)
• via interface module	0
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
<b>Number of IO Controllers</b>	
• Integrated	1
• Via CP	4; No mixed operation of CP443-1 EX40 and CP443-1 EX 41/EX20/GX20, max. 4 in central controller
<b>Number of operable FMs and CPs (recommended)</b>	

- FM
- CP, PtP
- PROFIBUS and Ethernet CPs

Limited by number of slots and number of connections  
 CP 440: Limited by number of slots; CP 441: Limited by number of slots and number of connections  
 14; In total max. 10 CPs as DP master and PROFINET controller, of which up to 10 IMs or CPs as DP master and up to 4 CPs as PROFINET controller

<b>Slots</b>	
• required slots	1
<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; For 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
• on MPI, device	Yes
• to DP, master	Yes
• on DP, device	Yes
• in AS, master	Yes
• in AS, device	Yes
• on Ethernet via NTP	Yes; As client
<b>Time difference in system when synchronizing via</b>	
• Ethernet, max.	10 ms
• MPI, max.	200 ms
<b>Interfaces</b>	
Interfaces/bus type	1 x MPI/PROFIBUS DP, 1 x PROFINET (2 ports)
Number of RS 485 interfaces	1
Number of other interfaces	0
Optical interface	No
<b>1. Interface</b>	
Interface type	MPI/PROFIBUS DP
Isolated	Yes
<b>Interface types</b>	
• RS 485	Yes
• Output current of the interface, max.	150 mA
<b>Protocols</b>	
• MPI	Yes
• PROFIBUS DP master	Yes
• PROFIBUS DP device	Yes
<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	Yes
— S7 basic communication	Yes
— 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
• max. number of DP devices	32
<b>Services</b>	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	No
— S7 basic communication	Yes
— S7 communication	Yes
— S7 communication, as client	Yes
— S7 communication, as server	Yes
— Equidistance	Yes
— Isochronous mode	Yes
— SYNC/FREEZE	Yes
— activation/deactivation of DP devices	Yes
— Direct data exchange (slave-to-slave communication)	Yes
— DPV1	Yes
<b>Address area</b>	
— Inputs, max.	2 kbyte
— Outputs, max.	2 kbyte
<b>User data per DP device</b>	
— user data per DP device, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
<b>PROFIBUS DP device</b>	
• Number of connections	16
• GSD file	<a href="http://support.automation.siemens.com/WW/view/en/113652">http://support.automation.siemens.com/WW/view/en/113652</a>
• Transmission rate, max.	12 Mbit/s
• automatic baud rate search	No
• Address area, max.	32; Virtual slots
• User data per address area, max.	32 byte
— of which consistent, max.	32 byte
<b>Services</b>	
— PG/OP communication	Yes; with interface active
— Routing	Yes; with interface active
— Global data communication	No
— S7 basic communication	No
— S7 communication	Yes
— S7 communication, as client	Yes
— S7 communication, as server	Yes
— Direct data exchange (slave-to-slave communication)	No
— DPV1	No
<b>Transfer memory</b>	
— Inputs	244 byte
— Outputs	244 byte
<b>2. Interface</b>	
Interface type	PROFINET
Isolated	Yes
automatic detection of transmission rate	Yes; Autosensing
Autonegotiation	Yes
Autocrossing	Yes
Change of IP address at runtime, supported	Yes; Assignment by higher-level IO-Controller or by the user program with SFB104 "IP_CONF"
<b>Interface types</b>	
• RJ 45 (Ethernet)	Yes

• Number of ports	2
• integrated switch	Yes
<b>Protocols</b>	
• PROFINET IO Controller	Yes
• PROFINET IO device	Yes
• PROFINET CBA	Yes
• PROFIBUS DP master	No
• PROFIBUS DP device	No
• Open IE communication	Yes
• Web server	Yes
• Point-to-point connection	No
• Media redundancy	Yes
<b>PROFINET IO Controller</b>	
• Transmission rate, max.	100 Mbit/s
<b>Services</b>	
— PG/OP communication	Yes
— S7 communication	Yes
— Isochronous mode	Yes; Only with IRT and the High Performance option
— Shared device	Yes
— Prioritized startup	Yes
— Number of IO devices with prioritized startup, max.	32
— Number of connectable IO Devices, max.	256
— Of which IO devices with IRT, max.	64
— of which in line, max.	64
— Number of IO Devices with IRT and the option "high flexibility"	256
— of which in line, max.	61
— Number of connectable IO Devices for RT, max.	256
— of which in line, max.	256
— Activation/deactivation of IO Devices	Yes
— 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; 8 parallel calls of the SFC 12 "D_ACT_DP" possible per line. Max. 32 IO Devices changing during operation (partner ports) are supported
— Device replacement without swap medium	Yes
— Send cycles	250 µs, 500 µs, 1 ms, 2 ms, 4 ms additionally with IRT with high performance: 250 µs to 4 ms in 125 µs frame
— Updating time	250 µs to 512 ms; minimum value depends on preset communication share for PROFINET IO, on the number of IO Devices and on the amount of configured user data, see PROFINET system description
<b>Address area</b>	
— Inputs, max.	4 kbyte
— Outputs, max.	4 kbyte
— User data consistency, max.	1 024 byte
<b>PROFINET IO Device</b>	
<b>Services</b>	
— PG/OP communication	Yes
— S7 communication	Yes
— Isochronous mode	No
— IRT	Yes
— Prioritized startup	Yes
— Shared device	Yes
— Number of IO Controllers with shared device, max.	2
<b>Transfer memory</b>	
— Inputs, max.	1 440 byte; Per IO Controller with shared device
— Outputs, max.	1 440 byte; Per IO Controller with shared device
<b>Submodules</b>	
— Number, max.	64
— User data per submodule, max.	1 024 byte

<b>PROFINET CBA</b>	
• acyclic transmission	Yes
• cyclic transmission	Yes
<b>Open IE communication</b>	
• Number of connections, max.	46
• Local port numbers used at the system end	0, 20, 21, 25, 80, 102, 135, 161, 34962, 34963, 34964, 65532, 65533, 65534, 65535
• Keep-alive function, supported	Yes
<b>Protocols</b>	
<b>Redundancy mode</b>	
<b>Media redundancy</b>	
— Switchover time on line break, typ.	200 ms
— Number of stations in the ring, max.	50
<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 Adv. and loadable FBs
— Number of connections, max.	46
— Data length, max.	32 kbyte; 1 452 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	Yes
• User-defined websites	Yes
• Number of HTTP clients	5
<b>Isochronous mode</b>	
Equidistance	Yes
Number of DP masters with isochronous mode	1
User data per isochronous slave, max.	244 byte
shortest clock pulse	1.5 ms; 0.5 ms without use of SFC 126, 127
max. cycle	32 ms
<b>Communication functions</b>	
<b>PG/OP communication</b>	
• Number of connectable OPs with message processing	47; When using Alarm_S/SQ and Alarm_D/DQ
• Number of connectable OPs without message processing	47
Data record routing	Yes
<b>Global data communication</b>	
• supported	Yes
• Number of GD loops, max.	8
• Number of GD packets, transmitter, max.	8
• Number of GD packets, receiver, max.	16
• Size of GD packets, max.	54 byte
• Size of GD packet (of which consistent), max.	1 variable
<b>S7 basic communication</b>	
• supported	Yes
• User data per job, max.	76 byte
• User data per job (of which consistent), max.	1 variable
<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>	

<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>	Yes; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5 8 kbyte 240 byte 24/24
<b>Standard communication (FMS)</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes; Via CP and loadable FB
<b>PROFINET CBA (at set setpoint communication load)</b>	
<ul style="list-style-type: none"> <li>• Setpoint for the CPU communication load</li> <li>• Number of remote interconnection partners</li> <li>• number of master/device functions</li> <li>• total of all master/device connections</li> <li>• data length of all incoming master/device connections, max.</li> <li>• data length of all outgoing master/device connections, max.</li> <li>• Number of device-internal and PROFIBUS interconnections</li> <li>• Data length of device-internal und PROFIBUS interconnections, max.</li> <li>• Data length per connection, max.</li> </ul>	20 % 32 150 4 500 45 000 byte 45 000 byte 1 000 16 000 byte 2 000 byte
<b>Remote interconnections with cyclic transmission</b>	
<ul style="list-style-type: none"> <li>— Transmission frequency: Transmission interval, min.</li> <li>— Number of incoming interconnections</li> <li>— Number of outgoing interconnections</li> <li>— Data length of all incoming interconnections, max.</li> <li>— Data length of all outgoing interconnections, max.</li> <li>— Data length per connection, max.</li> </ul>	1 ms; Depending on preset communication load, number of interconnections and data length used 300 300 4 800 byte 4 800 byte 450 byte
<b>HMI variables via PROFINET (acyclic)</b>	
<ul style="list-style-type: none"> <li>— Number of stations that can log on for HMI variables (PN OPC/iMap)</li> <li>— HMI variable updating</li> <li>— Number of HMI variables</li> <li>— Data length of all HMI variables, max.</li> </ul>	2x PN OPC/1x iMap 500 ms 1 000 32 000 byte
<b>PROFIBUS proxy functionality</b>	
<ul style="list-style-type: none"> <li>— supported</li> <li>— Data length per connection, max.</li> </ul>	Yes; 32 PROFIBUS slaves max. connectable 240 byte; Slave-dependent
<b>Number of connections</b>	
<ul style="list-style-type: none"> <li>• overall</li> <li>• usable for PG communication               <ul style="list-style-type: none"> <li>— reserved for PG communication</li> <li>— adjustable for PG communication, max.</li> </ul> </li> <li>• usable for OP communication               <ul style="list-style-type: none"> <li>— reserved for OP communication</li> <li>— adjustable for OP communication, max.</li> </ul> </li> <li>• usable for S7 basic communication               <ul style="list-style-type: none"> <li>— reserved for S7 basic communication</li> <li>— adjustable for S7 basic communication, max.</li> </ul> </li> <li>• usable for S7 communication               <ul style="list-style-type: none"> <li>— reserved for S7 communication</li> <li>— adjustable for S7 communication, max.</li> </ul> </li> <li>• usable for routing               <ul style="list-style-type: none"> <li>— reserved for routing</li> <li>— adjustable for routing, max.</li> </ul> </li> </ul>	48 1 0 1 0 0 0 0 0 0 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	Yes
SCAN procedure	Yes
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.	300
• preset, max.	150
Process control messages	Yes
Number of archives that can log on simultaneously (SFB 37 AR_SEND)	4
<b>Number of messages</b>	
• overall, max.	256
• in 100 ms grid, max.	0
• in 500 ms grid, max.	256
• in 1000 ms grid, max.	256
<b>Number of additional values</b>	
• with 100 ms grid, max.	0
• with 500, 1000 ms grid, max.	1
<b>Test commissioning functions</b>	
Status block	Yes; Up to 16 simultaneously
Single step	Yes
Number of breakpoints	16
<b>Status/control</b>	
• Status/control variable	Yes; Up to 16 variable tables
• Variables	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
• Number of variables, max.	70; Status/control
<b>Forcing</b>	
• Forcing	Yes
• Forcing, variables	Inputs/outputs, bit memories, distributed I/Os
• Number of variables, max.	64
<b>Diagnostic buffer</b>	
• present	Yes
• Number of entries, max.	400
— can be set	Yes
— preset	120
<b>Service data</b>	
• Can be read out	Yes
<b>EMC</b>	
Emission of radio interference acc. to EN 55 011	
• 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>	
— DPSYC_FR	2

— D_ACT_DP	8
— 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	25 mm
Height	290 mm
Depth	219 mm

Weights

Weight, approx.	750 g
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Classifications

	Version	Classification
eClass	14	27-24-22-07
eClass	12	27-24-22-07
eClass	9.1	27-24-22-07
eClass	9	27-24-22-07
eClass	8	27-24-22-07
eClass	7.1	27-24-22-07
eClass	6	27-24-22-07
ETIM	10	EC000236
ETIM	9	EC000236
ETIM	8	EC000236
ETIM	7	EC000236
IDEA	4	3565
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval



[Miscellaneous](#)



[China RoHS](#)

EMV

For use in hazardous locations



[EM](#)



For use in hazardous locations

Maritime application

[Type Examination Certificate](#)



Maritime application

[CCS \(China Classification Society\)](#)

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