

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	V7.0
Engineering with	
<ul style="list-style-type: none"> Programming package 	STEP 7 V5.5 or higher with HSP 262
CiR – Configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	30 µs
Supply voltage	
Rated value (DC)	
<ul style="list-style-type: none"> 24 V DC 	No; 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.	1.4 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
Power loss, max.	7 W

Memory

Type of memory	RAM
Work memory	
<ul style="list-style-type: none"> integrated 	1 Mbyte
<ul style="list-style-type: none"> integrated (for program) 	512 kbyte
<ul style="list-style-type: none"> integrated (for data) 	512 kbyte
<ul style="list-style-type: none"> expandable 	No
Load memory	
<ul style="list-style-type: none"> expandable FEPRM 	Yes; with Memory Card (FLASH)
<ul style="list-style-type: none"> expandable FEPRM, max. 	64 Mbyte
<ul style="list-style-type: none"> integrated RAM, max. 	512 kbyte
<ul style="list-style-type: none"> expandable RAM 	Yes; with Memory Card (RAM)
<ul style="list-style-type: none"> expandable RAM, max. 	64 Mbyte
Backup	
<ul style="list-style-type: none"> present 	Yes
<ul style="list-style-type: none"> with battery 	Yes; all data
<ul style="list-style-type: none"> without battery 	No

Battery

Backup battery	
<ul style="list-style-type: none"> Backup current, typ. 	180 μ A; up to 40 °C
<ul style="list-style-type: none"> Backup current, max. 	850 μ A
<ul style="list-style-type: none"> Backup time, max. 	Dealt with in the module data manual with the secondary conditions and the factors of influence
<ul style="list-style-type: none"> 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	
<ul style="list-style-type: none"> Number, max. 	3 000; Number range: 1 to 16000
<ul style="list-style-type: none"> Size, max. 	64 kbyte
FB	
<ul style="list-style-type: none"> Number, max. 	1 500; Number range: 0 to 7999
<ul style="list-style-type: none"> Size, max. 	64 kbyte
FC	
<ul style="list-style-type: none"> 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
Retentivity	
— adjustable	Yes
— lower limit	0
— upper limit	2 047
— 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 times	
• Number	2 048
Retentivity	
— adjustable	Yes
— lower limit	0
— upper limit	2 047
— preset	No times retentive

Time range	
— lower limit	10 ms
— upper limit	9 990 s
IEC timer	
• present	Yes
• Type	SFB
• Number	Unlimited (limited only by RAM capacity)
Data areas and their retentivity	
retentive data area in total	Total working and load memory (with backup battery)
Flag	
• Number, 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
Local data	
• adjustable, max.	8 kbyte
• preset	4 kbyte
Address area	
I/O address area	
• Inputs	4 kbyte
• Outputs	4 kbyte
Process image	
• Inputs, adjustable	4 kbyte
• Outputs, adjustable	4 kbyte
• Inputs, default	128 byte
• Outputs, default	128 byte
• consistent data, max.	244 byte
• Access to consistent data in process image	Yes
Subprocess images	
• Number of subprocess images, max.	15
Digital channels	
• Inputs	32 768
— of which central	32 768
• Outputs	32 768
— of which central	32 768
Analog channels	
• Inputs	2 048
— of which central	2 048
• Outputs	2 048
— of which central	2 048

Hardware configuration

Number of expansion units, max.	21
connectable OPs	47
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)
Interface modules	
<ul style="list-style-type: none"> Number of connectable IMs (total), max. 	6
<ul style="list-style-type: none"> Number of connectable IM 460s, max. 	6
<ul style="list-style-type: none"> Number of connectable IM 463s, max. 	4; IM 463-2
Number of DP masters	
<ul style="list-style-type: none"> integrated 	1
<ul style="list-style-type: none"> via CP 	10; CP 443-5 Extended
<ul style="list-style-type: none"> via IM 467 	4
<ul style="list-style-type: none"> Mixed mode IM + CP permitted 	No; IM 467 cannot be used jointly with CP 443-5 Ext. or CP 443-1 in PROFINET IO mode
<ul style="list-style-type: none"> via interface module 	0
<ul style="list-style-type: none"> Number of pluggable S5 modules (via adapter capsule in central device), max. 	6
Number of IO Controllers	
<ul style="list-style-type: none"> integrated 	1
<ul style="list-style-type: none"> via CP 	4; Max. 4 in the central controller; no mixed operation of different CP 443-1 types in PROFINET IO mode
Number of operable FMs and CPs (recommended)	
<ul style="list-style-type: none"> FM 	Limited by number of slots and number of connections
<ul style="list-style-type: none"> CP, PtP 	CP 440: Limited by number of slots; CP 441: Limited by number of slots and number of connections
<ul style="list-style-type: none"> PROFIBUS and Ethernet CPs 	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
Slots	
<ul style="list-style-type: none"> required slots 	1
Time of day	
Clock	
<ul style="list-style-type: none"> Hardware clock (real-time) 	Yes
<ul style="list-style-type: none"> retentive and synchronizable 	Yes
<ul style="list-style-type: none"> Resolution 	1 ms
<ul style="list-style-type: none"> Deviation per day (buffered), max. 	1.7 s; Power off
<ul style="list-style-type: none"> Deviation per day (unbuffered), max. 	8.6 s; For power On
Operating hours counter	
<ul style="list-style-type: none"> Number 	16
<ul style="list-style-type: none"> Number/Number range 	0 to 15
<ul style="list-style-type: none"> Range of values 	SFCs 2, 3 and 4: 0 to 32767 hours SFC 101: 0 to 2 ³¹ - 1 hours
<ul style="list-style-type: none"> Granularity 	1 h
<ul style="list-style-type: none"> 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
• to IF 964 DP	No
Time difference in system when synchronizing via	
• Ethernet, max.	10 ms
• MPI, max.	200 ms
Interfaces	
Interfaces/bus type	1 x MPI/PROFIBUS DP, 1 x PROFINET (2 ports)
Number of RS 485 interfaces	1; Combined MPI / PROFIBUS DP
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	Yes
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	Yes
— S7 basic communication	Yes
— 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; S7 routing
— 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 slaves	Yes
— Direct data exchange (slave-to-slave communication)	Yes
— DPV1	Yes
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	16
• GSD file	http://support.automation.siemens.com/WW/view/en/113652
• 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
Services	
— PG/OP communication	Yes; with interface active
— S7 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
Transfer memory	
— Inputs	244 byte
— Outputs	244 byte

2. Interface

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	Yes; Assignment by higher-level IO-Controller or by the user program with SFB104 "IP_CONF"
Number of connection resources	48

Interface types	
• Number of ports	2
• integrated switch	Yes

Media redundancy	
• supported	Yes
• Switchover time on line break, typ.	200 ms
• Number of stations in the ring, max.	50

Protocols	
• PROFINET IO Controller	Yes
• PROFINET IO Device	Yes
• PROFINET CBA	Yes
• PROFIBUS DP master	No
• PROFIBUS DP slave	No
• Open IE communication	Yes
• Web server	Yes
• Point-to-point connection	No

PROFINET IO Controller	
• Transmission rate, max.	100 Mbit/s

Services	
— PG/OP communication	Yes
— S7 routing	Yes
— S7 communication	Yes
— Isochronous mode	Yes; Only with IRT and the High Performance option
— Open IE communication	Yes
— 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

Address area

— Inputs, max.	4 kbyte
— Outputs, max.	4 kbyte
— User data consistency, max.	1 024 byte

PROFINET IO Device

Services

— PG/OP communication	Yes
— S7 routing	Yes
— S7 communication	Yes
— Isochronous mode	No
— Open IE communication	Yes
— IRT	Yes
— Prioritized startup	Yes
— Shared device	Yes
— Number of IO Controllers with shared device, max.	2

Transfer memory	
— Inputs, max.	1 440 byte; Per IO Controller with shared device
— Outputs, max.	1 440 byte; Per IO Controller with shared device
Submodules	
— Number, max.	64
— User data per submodule, max.	1 024 byte
PROFINET CBA	
• acyclic transmission	Yes
• cyclic transmission	Yes
Open IE communication	
• 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
Protocols	
Open IE communication	
• 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; 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
Web server	
• supported	Yes
• User-defined websites	Yes
• Number of HTTP clients	5
Isochronous mode	
Isochronous operation (application synchronized up to terminal)	Yes; Via PROFIBUS DP or PROFINET interface
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
Communication functions	

PG/OP communication	Yes
<ul style="list-style-type: none"> • Number of connectable OPs without message processing • Number of connectable OPs with message processing 	47 47; When using Alarm_S/SQ and Alarm_D/DQ
Data record routing	Yes
Global data communication	
<ul style="list-style-type: none"> • supported • Number of GD loops, max. • Number of GD packets, transmitter, max. • Number of GD packets, receiver, max. • Size of GD packets, max. • Size of GD packet (of which consistent), max. 	Yes 8 8 16 54 byte 1 variable
S7 basic communication	
<ul style="list-style-type: none"> • supported • User data per job, max. • User data per job (of which consistent), max. 	Yes 76 byte 1 variable
S7 communication	
<ul style="list-style-type: none"> • supported • as server • as client • User data per job, max. • User data per job (of which consistent), max. 	Yes Yes Yes 64 kbyte 462 byte; 1 variable
S5 compatible communication	
<ul style="list-style-type: none"> • supported • User data per job, max. • User data per job (of which consistent), max. • Number of simultaneous AG-SEND/AG-RECV orders per CPU, max. 	Yes; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5 8 kbyte 240 byte 24/24
Standard communication (FMS)	
<ul style="list-style-type: none"> • supported 	Yes; Via CP and loadable FB
PROFINET CBA (at set setpoint communication load)	
<ul style="list-style-type: none"> • Setpoint for the CPU communication load • Number of remote interconnection partners • Number of functions, master/slave • Total of all master/slave connections • Data length of all incoming connections master/slave, max. • Data length of all outgoing connections master/slave, max. • Number of device-internal and PROFIBUS interconnections 	20 % 32 150 4 500 45 000 byte 45 000 byte 1 000

• Data length of device-internal und PROFIBUS interconnections, max.	16 000 byte
• Data length per connection, max.	2 000 byte
Remote interconnections with acyclic transmission	
— Sampling frequency: Sampling time, min.	200 ms; Depending on preset communication load, number of interconnections and data length used
— Number of incoming interconnections	250
— Number of outgoing interconnections	250
— Data length of all incoming interconnections, max.	8 000 byte
— Data length of all outgoing interconnections, max.	8 000 byte
— Data length per connection, max.	2 000 byte
Remote interconnections with cyclic transmission	
— Transmission frequency: Transmission interval, min.	1 ms; Depending on preset communication load, number of interconnections and data length used
— Number of incoming interconnections	300
— Number of outgoing interconnections	300
— Data length of all incoming interconnections, max.	4 800 byte
— Data length of all outgoing interconnections, max.	4 800 byte
— Data length per connection, max.	450 byte
HMI variables via PROFINET (acyclic)	
— Number of stations that can log on for HMI variables (PN OPC/iMap)	2x PN OPC/1x iMap
— HMI variable updating	500 ms
— Number of HMI variables	1 000
— Data length of all HMI variables, max.	32 000 byte
PROFIBUS proxy functionality	
— supported	Yes; 32 PROFIBUS slaves max. connectable
— Data length per connection, max.	240 byte; Slave-dependent
Number of connections	
• overall	48
• usable for PG communication	47
— reserved for PG communication	1
— adjustable for PG communication, max.	0
• usable for OP communication	47
— reserved for OP communication	1
— adjustable for OP communication, max.	0
• usable for S7 basic communication	46
— reserved for S7 basic communication	0

- adjustable for S7 basic communication, max. 0
- usable for S7 communication 46
 - reserved for S7 communication 0
 - adjustable for S7 communication, max. 0
- usable for routing 23
 - reserved for routing 0
 - adjustable for routing, max. 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	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
Number of messages	
• overall, max.	256
• in 100 ms grid, max.	0
• in 500 ms grid, max.	256
• in 1000 ms grid, max.	256
Number of additional values	
• with 100 ms grid, max.	0
• with 500, 1000 ms grid, max.	1

Test commissioning functions

Status block	Yes; Up to 16 simultaneously
Single step	Yes
Number of breakpoints	16
Status/control	
• 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
Forcing	

• Forcing	Yes
• Forcing, variables	Inputs/outputs, bit memories, distributed I/Os
• Number of variables, max.	64
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3 200
— adjustable	Yes
— preset	120
Service data	
• can be read out	Yes
Standards, approvals, certificates	
CE mark	Yes
CSA approval	Yes
UL approval	Yes
cULus	Yes
FM approval	Yes
RCM (formerly C-TICK)	Yes
KC approval	Yes
EAC (formerly Gost-R)	Yes
Use in hazardous areas	
• ATEX	ATEX II 3G Ex nA IIC T4 Gc
Ambient conditions	
Ambient temperature during operation	
• min.	0 °C
• max.	60 °C
Configuration	
Configuration software	
• STEP 7	Yes
Programming	
• 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
Programming language	
— LAD	Yes
— FBD	Yes
— STL	Yes
— SCL	Yes
— CFC	Yes
— GRAPH	Yes

— HiGraph®	Yes
Number of simultaneously active SFCs	
— DPSYC_FR	2; SFC 11; per interface
— D_ACT_DP	8; SFC 12; per interface
— RD_REC	8; SFC 59; per interface
— WR_REC	8; SFC 58; per interface
— WR_PARM	8; SFC 55; per interface
— PARM_MOD	1; SFC 57; per interface
— WR_DPARM	2; SFC 56; per interface
— DPNRM_DG	8; SFC 13; per interface
— RDSYSST	8; SFC 51
— DP_TOPOL	1; SFC 103; per interface
Number of simultaneously active SFBs	
— RDREC	8; SFB 52; per interface, but not more than 32 across all external interfaces
— WRREC	8; SFB 53; per interface, but not more than 32 across all external interfaces
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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