



SIMATIC S7-400, CPU 412-1 Central processing unit with: Work memory 512 KB, (256 KB code, 256 KB data), interface MPI/DP 12 Mbit/s,

General information	
Product type designation	CPU 412-1
Firmware version	V7.0
Product function	
<ul style="list-style-type: none"> • Isochronous mode 	Yes; For PROFIBUS only
Engineering with	
<ul style="list-style-type: none"> • Programming package 	STEP 7 V5.4 or higher with HSP 261
CiR - Configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	30 μ s
Supply voltage	
Rated value (DC)	Power supply via system power supply
Input current	
from backplane bus 5 V DC, typ.	0.7 A
from backplane bus 5 V DC, max.	0.8 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.	3.5 W
Power loss, max.	4 W
Memory	
Type of memory	RAM
Work memory	
<ul style="list-style-type: none"> • integrated 	512 kbyte
<ul style="list-style-type: none"> • integrated (for program) 	256 kbyte
<ul style="list-style-type: none"> • integrated (for data) 	256 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. • Backup current, max. • Backup time, max. 	180 μ A; up to 40 °C 850 μ A 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. • Size, max. 	3 000; Number range: 1 to 16000 64 kbyte
FB	
<ul style="list-style-type: none"> • Number, max. • Size, max. 	1 500; Number range: 0 to 7999 64 kbyte
FC	
<ul style="list-style-type: none"> • Number, max. • Size, max. 	1 500; Number range: 0 to 7999 64 kbyte
OB	
<ul style="list-style-type: none"> • Number, max. • Size, max. • Number of free cycle OBs • Number of time alarm OBs • Number of delay alarm OBs • Number of cyclic interrupt OBs • Number of process alarm OBs • Number of DPV1 alarm OBs • Number of isochronous mode OBs • Number of multicomputing OBs • Number of background OBs • Number of startup OBs • Number of asynchronous error OBs • Number of synchronous error OBs 	see instruction list 64 kbyte 1; OB 1 2; OB 10, 11 2; OB 20, 21 2; OB 32, 35 (shortest cycle that can be set = 500 μ s) 2; OB 40, 41 3; OB 55-57 2; OB 61-62 1; OB 60 1; OB 90 3; OB 100-102 9; OB 80-88 2; OB 121, 122
Nesting depth	
<ul style="list-style-type: none"> • per priority class • additional within an error OB 	24 1
Counters, timers and their retentivity	
S7 counter	
<ul style="list-style-type: none"> • Number 	2 048
Retentivity	
<ul style="list-style-type: none"> — adjustable — lower limit — upper limit — preset 	Yes 0 2 047 Z 0 to Z 7
Counting range	
<ul style="list-style-type: none"> — lower limit — upper limit 	0 999
IEC counter	
<ul style="list-style-type: none"> • present • Type • Number 	Yes SFB Unlimited (limited only by RAM capacity)
S7 times	
<ul style="list-style-type: none"> • 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 (incl. timers, counters, flags), max.	Total working and load memory (with backup battery)
Flag	
• 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
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	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; IM 463-2
Number of DP masters	
• integrated	1
• via CP	10; CP 443-5 Extended
• via IM 467	4
• 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 	0
<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	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • to MPI, master 	Yes
<ul style="list-style-type: none"> • to MPI, slave 	Yes
<ul style="list-style-type: none"> • to DP, master 	Yes
<ul style="list-style-type: none"> • to DP, slave 	Yes
<ul style="list-style-type: none"> • in AS, master 	Yes
<ul style="list-style-type: none"> • in AS, slave 	Yes
<ul style="list-style-type: none"> • on Ethernet via NTP 	No; Via CP
<ul style="list-style-type: none"> • to IF 964 DP 	No
Time difference in system when synchronizing via	
<ul style="list-style-type: none"> • MPI, max. 	200 ms
Interfaces	
Interfaces/bus type	1 x MPI/PROFIBUS DP
Number of RS 485 interfaces	1; Combined MPI / PROFIBUS DP
1. Interface	
Interface type	MPI/PROFIBUS DP
Isolated	Yes
Interface types	
<ul style="list-style-type: none"> • RS 485 	Yes
<ul style="list-style-type: none"> • Output current of the interface, max. 	150 mA
Protocols	
<ul style="list-style-type: none"> • MPI 	Yes
<ul style="list-style-type: none"> • PROFIBUS DP master 	Yes
<ul style="list-style-type: none"> • PROFIBUS DP slave 	Yes
MPI	
<ul style="list-style-type: none"> • 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
<ul style="list-style-type: none"> • 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
— 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
Protocols	

Open IE communication	
<ul style="list-style-type: none"> • ISO-on-TCP (RFC1006) <ul style="list-style-type: none"> — Data length, max. 	Via CP 443-1 Adv. and loadable FB 1 452 bytes via CP 443-1 Adv.
Web server	
<ul style="list-style-type: none"> • supported 	No
Isochronous mode	
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 	47
<ul style="list-style-type: none"> • Number of connectable OPs with message processing 	47; When using Alarm_S/SQ and Alarm_D/DQ
Data record routing	Yes
Global data communication	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • Number of GD loops, max. 	8
<ul style="list-style-type: none"> • Number of GD packets, transmitter, max. 	8
<ul style="list-style-type: none"> • Number of GD packets, receiver, max. 	16
<ul style="list-style-type: none"> • Size of GD packets, max. 	54 byte
<ul style="list-style-type: none"> • Size of GD packet (of which consistent), max. 	1 variable
S7 basic communication	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • User data per job, max. 	76 byte
<ul style="list-style-type: none"> • User data per job (of which consistent), max. 	1 variable
S7 communication	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • as server 	Yes
<ul style="list-style-type: none"> • as client 	Yes
<ul style="list-style-type: none"> • User data per job, max. 	64 kbyte
<ul style="list-style-type: none"> • User data per job (of which consistent), max. 	462 byte
S5 compatible communication	
<ul style="list-style-type: none"> • supported 	Yes; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5
<ul style="list-style-type: none"> • User data per job, max. 	8 kbyte
<ul style="list-style-type: none"> • User data per job (of which consistent), max. 	240 byte
<ul style="list-style-type: none"> • Number of simultaneous AG-SEND/AG-RECV orders per CPU, max. 	24/24
Standard communication (FMS)	
<ul style="list-style-type: none"> • supported 	Yes; Via CP and loadable FB
Number of connections	
<ul style="list-style-type: none"> • overall 	48
<ul style="list-style-type: none"> • usable for PG communication <ul style="list-style-type: none"> — reserved for PG communication — adjustable for PG communication, max. 	47 1 0
<ul style="list-style-type: none"> • usable for OP communication <ul style="list-style-type: none"> — reserved for OP communication — adjustable for OP communication, max. 	47 1 0
<ul style="list-style-type: none"> • usable for S7 basic communication <ul style="list-style-type: none"> — reserved for S7 basic communication — adjustable for S7 basic communication, max. 	46 0 0
<ul style="list-style-type: none"> • usable for S7 communication <ul style="list-style-type: none"> — reserved for S7 communication — adjustable for S7 communication, max. 	46 0 0
<ul style="list-style-type: none"> • usable for routing <ul style="list-style-type: none"> — reserved for routing 	23 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.	700 g
last modified:	3/25/2021 