SIEMENS

Data sheet   **6ES7412-2EK06-0AB0**

********** 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	
● Isochronous mode	Yes; Via PROFIBUS DP or PROFINET interface
Engineering with	
● Programming package	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
Power loss, max.	6.5 W
Memory	
Type of memory	RAM
Work memory	
● integrated	1 Mbyte
● integrated (for program)	0.5 Mbyte
● integrated (for data)	0.5 Mbyte
● expandable	No
Load memory	
● expandable FEPROM	Yes; with Memory Card (FLASH)
● expandable FEPROM, max.	64 Mbyte
● integrated RAM, max.	512 kbyte
● expandable RAM	Yes; with Memory Card (RAM)
● expandable RAM, max.	64 Mbyte
Backup	
● present	Yes
● with battery	Yes; all data
● without battery	No
Battery	
Backup battery	

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● 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
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 (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 kbyte
● Outputs, default	128 kbyte
● 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	
Integrated power supply	No
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 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
Number of IO Controllers	
● integrated	1
● via CP	4; No mixed operation of CP443-1 EX40 and CP443-1 EX 41/EX20/GX20, max. 4 in central controller

Number of operable FMs and CPs (recommended)	
● FM	Limited by number of slots and number of connections
● CP, PtP	CP 440: Limited by number of slots; CP 441: Limited by number of slots and number of connections
● 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	
● required slots	1
Time of day	
Clock	
● 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
Operating hours counter	
● Number	16
● Number/Number range	0 to 15
● Range of values	SFCs 2, 3 and 4: 0 to 32767 hours SFC 101: 0 to 2^31 - 1 hours
● Granularity	1 h
● 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
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
Number of other interfaces	0
Optical interface	No
1. Interface	
Interface type	MPI/PROFIBUS DP
Isolated	Yes
Interface types	
● RS 485	Yes
● Output current of the interface, max.	150 mA
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
— 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
2. Interface	
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"
Number of connection resources	48
Interface types	
● RJ 45 (Ethernet)	Yes
● Number of ports	2

● integrated switch	Yes
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
● Media redundancy	Yes
PROFINET IO Controller	
● Transmission rate, max.	100 Mbit/s
Services	
— 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
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 communication	Yes
— Isochronous mode	No
— 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		
Redundancy mode		
Media redundancy		
— Switchover time on line break, typ.	200 ms	
— Number of stations in the ring, max.	50	
SIMATIC communication		
● S7 routing	Yes	
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; 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	
Web server		
● supported	Yes	
● User-defined websites	Yes	
● Number of HTTP clients	5	
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 / header		
PG/OP communication	Yes	
● Number of connectable OPs without message processing	47	
● Number of connectable OPs with message processing	47; When using Alarm_S/SQ and Alarm_D/DQ	
Data record routing	Yes	
Global data communication		
● 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	
S7 basic communication		
● supported	Yes	
● User data per job, max.	76 byte	
● User data per job (of which consistent), max.	1 variable	
S7 communication		
● 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	
S5 compatible communication		
● supported	Yes; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5	
● 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	

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Standard communication (FMS)	
● supported	Yes; Via CP and loadable FB
communication functions / PROFINET CBA (with set target communication load) / header	
● Setpoint for the CPU communication load	20 %
● number of remote connection partners / with PROFINET CBA	32
● number of technological functions / with PROFINET CBA / for master or slave	150
● number of connections / with PROFINET CBA / for master or slave / total	4 500
● data volume / of the input variables / with PROFINET CBA / for master or slave	45 000 byte
● data volume / of the output variables / with PROFINET CBA / for master or slave	45 000 byte
● number of internal and PROFIBUS interconnections / with PROFINET CBA / maximum	1 000
● data volume / of internal and PROFIBUS interconnections / with PROFINET CBA / for master or slave	16 000 byte
● data volume / with PROFINET CBA / per connection / maximum	2 000 byte
performance data / PROFINET CBA / remote interconnection / with acyclic transfer / header	
— update time / of the remote interconnections / in the case of acyclic transmission / with PROFINET CBA	200 ms; Depending on preset communication load, number of interconnections and data length used
— number of remote connections to input variables / in the case of acyclic transmission / with PROFINET CBA / maximum	250
— number of remote connections to output variables / in the case of acyclic transmission / with PROFINET CBA / maximum	250
— data volume / as user data for remote interconnections with input variables / in the case of acyclic transmission / with PROFINET CBA	8 000 byte
— data volume / as user data for remote interconnections with output variables / in the case of acyclic transmission / with PROFINET CBA	8 000 byte
— data volume / as user data for remote interconnections / in the case of acyclic transmission / with PROFINET CBA / per connection / maximum	2 000 byte
performance data / PROFINET CBA / remote interconnection / with cyclic transfer / header	
— update time / of the remote interconnections / with cyclical transfer / with PROFINET CBA	1 ms; Depending on preset communication load, number of interconnections and data length used
— number of remote connections to input variables / with PROFINET CBA / with cyclic transfer / maximum	300
— number of remote connections to output variables / with cyclical transfer / with PROFINET CBA / maximum	300
— data volume / as user data for remote interconnections with input variables / with cyclical transfer / with PROFINET CBA / maximum	4 800 byte
— data volume / as user data for remote interconnections with output variables / with cyclical transfer / with PROFINET CBA / maximum	4 800 byte
— data volume / as user data for remote interconnections / with cyclical transfer / with PROFINET CBA / per connection / maximum	450 byte
performance data / PROFINET CBA / HMI variables via PROFINET / acyclic / header	
— number of connectable HMI stations / for HMI variables / in the case of acyclic transmission / with PROFINET CBA	2x PN OPC/1x iMap
— update time / of the HMI variables / in the case of acyclic transmission / with PROFINET CBA	500 ms
— number of HMI variables / in the case of acyclic transmission / with PROFINET CBA / maximum	1 000
— data volume / as user data for HMI variables / in the case of acyclic transmission / with PROFINET CBA / maximum	32 000 byte
performance data / PROFINET CBA / PROFIBUS proxy functionality / header	
— product function / with PROFINET CBA / PROFIBUS proxy functionality	Yes; 32 PROFIBUS slaves max. connectable
— data volume / with PROFIBUS proxy functionality / with PROFINET CBA / per connection / maximum	240 byte; Slave-dependent
Number of connections	
● 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

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.	400
— adjustable	Yes
— preset	120
Service data	
● can be read out	Yes

EMC	
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

configuration / header	
Configuration software	
● STEP 7	Yes
configuration / programming / header	
● 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
configuration / programming / number of simultaneously active SFC / header	
— number of simultaneously active system functions (SFC) / with DPSYC_FR	2
— number of simultaneously active system functions (SFC) / with 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
configuration / programming / number of simultaneously active SFB / header	
— 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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