SIEMENS

Data sheet   **6ES7412-2XJ05-0AB0**

********** Replacement part ********* SIMATIC S7-400, CPU 412-2 Central processing unit with: work memory 512 KB, (256 KB code, 256 KB of data), 1st interface MPI/DP 12 Mbit/s, 2nd interface PROFIBUS DP

General information	
Product type designation	CPU 412-2
HW functional status	03
Firmware version	V5.3
Product function	
● Isochronous mode	Yes; For PROFIBUS only
Engineering with	
● Programming package	STEP 7 V5.3 SP2 or higher with HW update
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)	Power supply via system power supply
Input current	
from backplane bus 5 V DC, typ.	0.9 A
from backplane bus 5 V DC, max.	1.1 A
from backplane bus 24 V DC, max.	300 mA; 150 mA per DP interface
from interface 5 V DC, max.	90 mA; At each DP interface
Power loss	
Power loss, typ.	4.5 W
Power loss, max.	5 W
Memory	
Type of memory	RAM
Work memory	
● integrated	512 kbyte
● integrated (for program)	256 kbyte
● integrated (for data)	256 kbyte
● 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	

8/5/2023

● Backup current, typ.	125 µA; up to 40 °C
● Backup current, max.	550 µA
● Backup time, max.	See reference manual, module data, Chapter 3.3
● 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 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	
Integrated power supply	No
Number of expansion units, max.	21
connectable OPs	31
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	2
● 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	0
● via CP	4; No mixed operation of CP443-1 EX40 and CP443-1 EX 41/EX20/GX20, max. 4 in central controller

8/5/2023

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; Of which 10 CPs max. or IMs as DP master, 4 PROFINET controller maximum
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	No; Via CP
Time difference in system when synchronizing via	
● MPI, max.	200 ms

Interfaces

Interfaces/bus type	1 x MPI/PROFIBUS DP, 1 x PROFIBUS DP
Number of RS 485 interfaces	2; Combined MPI / PROFIBUS DP and PROFIBUS DP
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; 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
2. Interface	
Interface type	PROFIBUS DP
Isolated	Yes
Number of connection resources	16
Interface types	
● RS 485	Yes
● Output current of the interface, max.	150 mA
Protocols	
● PROFIBUS DP master	Yes
● PROFIBUS DP slave	Yes
PROFIBUS DP master	
● Number of connections, max.	16
● Transmission rate, max.	12 Mbit/s
● Number of DP slaves, max.	64

8/5/2023

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.	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	
PROFIBUS DP slave		
● Number of connections	16	
● GSD file	http://support.automation.siemens.com/WW/view/en/113652	
● Transmission rate, max.	12 Mbit/s	
● Address area, max.	32	
● User data per address area, max.	32 byte	
— of which consistent, max.	32 byte	
Services		
— Routing	Yes	
Transfer memory		
— Inputs	244 byte	
— Outputs	244 byte	

Protocols

SIMATIC communication		
● S7 routing	Yes	
Open IE communication		
● ISO-on-TCP (RFC1006)	Via CP 443-1 and loadable FB	
— Data length, max.	1 452 bytes via CP 443-1 Adv.	
Web server		
● supported	No	

Isochronous mode

Equidistance	Yes	
Number of DP masters with isochronous mode	2	
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	31	
● Number of connectable OPs with message processing	31; 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
Standard communication (FMS)	
● supported	Yes; Via CP and loadable FB
Number of connections	
● overall	32
● usable for PG communication	31
— reserved for PG communication	1
— adjustable for PG communication, max.	0
● usable for OP communication	31
— reserved for OP communication	1
— adjustable for OP communication, max.	0
● usable for S7 basic communication	30
— reserved for S7 basic communication	0
— adjustable for S7 basic communication, max.	0
● usable for S7 communication	30
— reserved for S7 communication	0
— adjustable for S7 communication, max.	0
● usable for routing	15
— reserved for routing	0
— adjustable for routing, max.	0
S7 message functions	
Number of login stations for message functions, max.	31; Max. 31 with Alarm_S/SQ and Alarm_D/DQ (OPs); max. 8 with Alarm_8 and Alarm_P (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 2 simultaneously
Single step	Yes

Number of breakpoints	4
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, peripheral inputs, peripheral outputs
● 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

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 / 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; SFC 11; per interface
— number of simultaneously active system functions (SFC) / with 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
— DP_TOPOL	1; SFC 103; per interface

configuration / programming / number of simultaneously active SFB / header	
— 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
Dimensions	
Width	25 mm
Height	290 mm
Depth	219 mm
Weights	
Weight, approx.	700 g

last modified: 4/1/2022 ↗