MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Selected official pages for procurement and maintenance review

PRODUCT BRAND

Siemens

PRODUCT MODEL

6ES7412-2XK07-0AB0

S7-400 CPU 412-2 Processor. Source PDF pages: CPU23 pp. 2,12,240-251. Adjacent model text on shared pages is outside this product reference.

OFFICIAL SOURCE

S7-400 Automation System, CPU Specifications; 03/2023

Siemens original documentation and product reference

Original 03/2023 CPU 412-2 technical section for 6ES7412-2XK07-0AB0, not a complete installation manual. Reference firmware V7.0 does not identify the offered unit. ATEX markings differ across source editions; verify the actual unit certificate.

AMIKON PRODUCT SUPPORT

+86-18020776786 INFO@AMIKON.CN

AMIKONG.COM

Amikon Limited prepared this independent reference package. Selected manufacturer pages follow with their original content and pagination visible.

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠ DANGER

indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠ WARNING

indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠ CAUTION

indicates that minor personal injury can result if proper precautions are not taken.

NOTICE

indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠ WARNING

Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

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Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

Siemens AG
Digital Industries
Postfach 48 48
90026 NÜRNBERG
GERMANY

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Without PN:

- CPU 412-1, V7.0; 6ES7 412-1XJ07-0AB0
- CPU 412-2, V7.0; 6ES7 412-2XK07-0AB0
- CPU 414-2, V7.0; 6ES7 414-2XL07-0AB0
- CPU 414-3, V7.0; 6ES7 414-3XM07-0AB0
- CPU 416-2, V7.0; 6ES7 416-2XP07-0AB0
- CPU 416F-2, V7.0; 6ES7 416-2FP07-0AB0
- CPU 416-3, V7.0; 6ES7 416-3XS07-0AB0
- CPU 417-4, V7.0; 6ES7 417-4XT07-0AB0

General technical specifications

Information pertaining to approvals and standards is available in the *S7-400 Automation System; Module Data* manual.

Scope of information

This manual is part of the S7-400 documentation package.

System	Documentation package
S7-400	• S7-400 Automation System; Hardware and Installation • S7-400 Automation Systems; Module Data • S7-400 Instruction List • S7-400 Automation System; CPU Specifications

Additional information

The following manuals provide more information relating to the topics in this manual:

Programming with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/109751825)

Configuring Hardware and Communication Connections with STEP 7 (https://support.industry.siemens.com/cs/ww/en/view/109751824)

System and Standard Functions (https://support.industry.siemens.com/cs/ww/en/view/44240604)

Recycling and disposal

The S7-400 system can be recycled due to its low-üollutant equipment. For ecologically compatible recycling and disposal of your old device, contact a certified disposal service for electronic scrap.

10.2 Technical data of the CPU 412-2 (6ES7412-2XK07-0AB0)

Data

	6ES7412-2XK07-0AB0
General information	
Product type designation	CPU 412-2
Hardware version	01
Firmware version	V7.0
Engineering with	
Programming package	As of STEP 7 V5.4 with HSP 261
CiR Configuration in RUN	
CiR synchronization time, base load	100 ms
CiR synchronization time, time per I/O byte	30 µs
Power supply	
Rated value (DC)	
24 V DC	No; voltage supplied via the system voltage supply
Input current	
From backplane bus 5 V DC, typ.	0.9 A
From backplane bus 5 V DC, max.	1.1 A
From the backplane bus 24 V DC, max.	300 mA; 150 mA per DP interface
From interface 5 V DC, max.	90 mA; for each DP interface
Power loss	
Typical power loss	4.5 W
Power loss, max.	5.5 W
Memory	
Type of memory	RAM
Work memory	
Integrated	1 MB
integrated (for program)	512 KB
integrated (for data)	512 KB
Expandable	No
Load memory	
Expandable FEPROM	Yes; with memory card (FLASH)
Expandable FEPROM, max.	64 MB
integrated RAM, max.	512 KB
Expandable RAM	Yes; with memory card (RAM)
Expandable RAM, max.	64 MB
Battery backup	
Available	Yes
With battery	Yes; all data
Without battery	No

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Battery	
Backup battery	
Backup battery current, typ.	180 µA; to 40 °C
Backup battery current, max.	850 µA
Backup battery time, max.	Covered by the conditions and effects described in the Module data manual
Feed of external backup voltage to the CPU	5 to 15 V DC
CPU processing times	
For bit operations, typ.	31.25 ns
For word operations, typ.	31.25 ns
For integer arithmetic, typ.	31.25 ns
For floating-point arithmetic, typ.	62.5 ns
CPU blocks	
DB	
Number, max.	3000; number range: 1 to 16000
Size, max.	64 KB
FB	
Number, max.	1500; number range: 0 to 7999
Size, max.	64 KB
FC	
Number, max.	1500; number range: 0 to 7999
Size, max.	64 KB
OB	
Size, max.	64 KB
Number of free-cycle OBs	1; OB 1
Number of time-of-day interrupt OBs	2; OB 10. 11
Number of time-delay interrupt OBs	2; OB 20, 21
Number of cyclic interrupt OBs	2; OB 32, 35 (smallest configurable cycle = 500 µs)
Number of hardware interrupt OBs	2; OB 40, 41
Number of DPV1 interrupt OBs	3; OB 55-57
Number of isochronous OBs	2; OB 61-62
Number of multi-computing 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 levels within an error OB	1
Counters, timers and their retentivity	
S7 counters	

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Number	2048
Retentivity	
Adjustable	Yes
Low limit	0
High limit	2047
Default	C 0 to C 7
Counting range	
Low limit	0
High limit	999
IEC counters	
Available	Yes
Type	SFB
Number	Unlimited (limited only by the work memory)
S7 timers	
Number	2048
Retentivity	
Adjustable	Yes
Low limit	0
High limit	2047
Default	No retentive timers
Time range	
Low limit	10 ms
High limit	9990 s
IEC timers	
Available	Yes
Type	SFB
Number	Unlimited (limited only by the work memory)
Data areas and their retentivity	
Retentive data area, total	Total work and load memory (with backup battery)
Bit memories	
Number, max.	4 KB; size of bit memory address area
Retentivity available	Yes
Default retentivity	MB 0 to MB 15
Number of clock memories	8; in 1 memory byte
Local data	
Adjustable, max.	8 KB
Default	4 KB
Address area	
I/O address area	
Inputs	4 KB
Outputs	4 KB

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of which are distributed	
MPI/DP interface, inputs	2 KB
MPI/DP interface, outputs	2 KB
DP interface, inputs	4 KB
DP interface, outputs	4 KB
Process image	
Inputs, adjustable	4 KB
Outputs, adjustable	4 KB
Inputs, preset	128 bytes
Outputs, preset	128 bytes
Consistent data, max.	244 bytes
Access to consistent data in the process image	Yes
Process image partitions	
Number of process image partitions, max.	15
Digital channels	
Inputs	32768
of which are central	32768
Outputs	32768
of which are central	32768
Analog channels	
Inputs	2048
of which are central	2048
Outputs	2048
of which are central	2048
Hardware configuration	
Number of expansion units, max.	21
Connectable OP	47
Multicomputing	Yes; max. 4 CPU (with UR1 or UR2)
Interface modules	
Number of plug-in IMs (total), max.	6
Number of plug-in IM 460s, max.	6
Number of plug-in IM 463s, max.	4; IM 463-2
Number of DP masters	
Integrated	2
Via IM 467	4
Via CP	10; CP 443-5 Extended
Mixed IM + CP operation allowed	No; IM 467 cannot be used in combination with CP 443-5 Ext. or CP 443-1 n PROFINET IO mode
Via interface module	0
Number of plug-in S5 modules (via adapter bay, in the central controller), max.	6
Number of IO controllers	

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Integrated	0
Via CP	4; max. 4 in central controller; no mixed operation of different CP 443-1 types in PROFINET IO mode
Number of usable FMs and CPs (recommendation)	
FM	Limited by the number of slots and connections
CP, point-to-point	CP 440: limited by the number of slots; CP 441: limited by the number of slots or connections
PROFIBUS and Ethernet CPs	14; in total max. 10 CP as DP master and PROFINET controller, of which up to 10 IM or CP as DP master and up to 4 CP as PROFINET controller
Slots	
Slots required	1
Time of day	
Clock	
Hardware clock (real-time clock)	Yes
With battery backup, can be synchronized	Yes
Resolution	1 ms
Deviation per day (with battery backup), max.	1.7 s; Power off
Deviation per day (without battery backup), max.	8.6 s; with 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 hour
Resolution	1 hour
Retentive	Yes
Time synchronization	
Supported	Yes
on MPI, master	Yes
on MPI, slave	Yes
on DP, master	Yes
on DP, slave	Yes
in the AS, master	Yes
in the AS, slave	Yes
On Ethernet via NTP	No; via CP
On IF 964 DP	No
Time difference in the system with synchronization via	
MPI, max.	200 ms
Interfaces	
Interfaces/bus type	1x MPI/PROFIBUS DP, 1x PROFIBUS DP
Number of RS 485 interfaces	2; combination MPI / PROFIBUS DP and PROFIBUS DP
1st interface	
Interface type	Integrated

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Hardware	RS 485 / PROFIBUS + MPI
Electrically isolated	Yes
Power supply at interface (15 to 30 V DC), max.	150 mA
Number of connection resources	MPI: 32, DP: 16
Protocols	
MPI	Yes
DP master	Yes
DP slave	Yes
MPI	
Number of connections	32; a diagnostics repeater in the segment reduces the number of connection resources on the segment by 1
Transmission rate, max.	12 Mbps
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; a diagnostics repeater in the segment reduces the number of connection resources on the segment by 1
Transmission rate, max.	12 Mbps
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
Support for constant bus cycle time	Yes
Isochronous mode	Yes
SYNC/FREEZE	Yes
Enabling/disabling of DP slaves	Yes
Direct data exchange (peer-to-peer)	Yes
DPV1	Yes
Address area	
Inputs, max.	2 KB
Outputs, max.	2 KB

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User data per DP slave	
User data per DP slave, max.	244 bytes
Inputs, max.	244 bytes
Outputs, max.	244 bytes
Slots, max.	244
Per slot, max.	128 bytes
PROFIBUS DP slave	
Number of connections	16
GSD file	https://support.industry.siemens.com/cs/ww/en/view/113652
Transmission rate, max.	12 Mbps
Automatic baud rate detection	No
Address area, max.	32; virtual slots
User data per address area, max.	32 bytes
of which consistent, max.	32 bytes
Services	
PG/OP communication	Yes; with active interface
S7 routing	Yes; with active interface
Global data communication	No
S7 basic communication	No
S7 communication	Yes
S7 communication, as client	Yes
S7 communication, as server	Yes
Direct data exchange (peer-to-peer)	No
DPV1	No
Transfer memory	
Inputs	244 bytes
Outputs	244 bytes
2nd interface	
Interface type	Integrated
Hardware	RS 485 / PROFIBUS
Electrically isolated	Yes
Power supply at interface (15 to 30 V DC), max.	150 mA
Number of connection resources	16
Protocols	
DP master	Yes
DP slave	Yes
PROFIBUS DP master	
Number of connections, max.	16
Transmission rate, max.	12 Mbps
Number of DP slaves, max.	64
Services	

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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
Support for constant bus cycle time	Yes
Isochronous mode	Yes
SYNC/FREEZE	Yes
Enabling/disabling of DP slaves	Yes
Direct data exchange (peer-to-peer)	Yes
DPV1	Yes
Address area	
Inputs, max.	4 KB
Outputs, max.	4 KB
User data per DP slave	
User data per DP slave, max.	244 bytes
Inputs, max.	244 bytes
Outputs, max.	244 bytes
Slots, max.	244
Per slot, max.	128 bytes
PROFIBUS DP slave	
Number of connections	16
GSD file	https://support.industry.siemens.com/cs/ww/en/view/113652
Transmission rate, max.	12 Mbps
Address area, max.	32
User data per address area, max.	32 bytes
of which consistent, max.	32 bytes
Services	
Routing	Yes; with active interface
Transfer memory	
Inputs	244 bytes
Outputs	244 bytes
Isochronous mode	
Isochronous mode (application synchronized up to terminal)	Yes; only with PROFIBUS
Number of DP masters with isochronous mode	2
User data per isochronous slave, max.	244 bytes
Constant bus cycle time	Yes
Minimum clock cycle	1.5 ms; 0.5 ms without use of SFC 126, 127
Maximum clock cycle	32 ms

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Communication functions	
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 circles, max.	8
Number of GD packets, sender, max.	8
Number of GD packets, receiver, max.	16
Size of GD packets, max.	54 bytes
Size of GD packets (of which are consistent), max.	1 variable
S7 basic communication	
Supported	Yes
User data per job, max.	76 bytes
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 KB
User data per job (of which consistent), max.	462 bytes; 1 variable
S5-compatible communication	
Supported	Yes; via FC AG_SEND and AG_RECV, maximum via 10 CP 443-1 or 443-5
User data per job, max.	8 KB
User data per job (of which consistent), max.	240 bytes
Number of simultaneous AG-SEND/AG-RECV jobs per CPU, max.	24/24
Standard communication (FMS)	
Supported	Yes; via CP and loadable FBs
Open IE communication	
ISO-on-TCP (RFC1006)	via CP 443-1 and loadable FB
Data length, max.	1452 bytes via CP 443-1 Adv.
Web server	
Supported	No
Number of connections	
Total	48
Suitable for PG communication	47
Reserved for PG communication	1
Assignable for PG communication, max.	0
Suitable for OP communication	47

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Reserved for OP communication	1
Assignable for OP communication, max.	0
Suitable for S7 basic communication	46
Reserved for S7 basic communication	0
Assignable for S7 basic communication, max.	0
Suitable for S7 communication	46
Reserved for S7 communication	0
Assignable for S7 communication, max.	0
Suitable for routing	23
Reserved for routing	0
Assignable for routing, max.	0
S7 message functions	
Number of stations that can be logged on for signaling 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
Block-related messages	Yes
Process diagnostics messages	Yes
Simultaneously active Alarm_S blocks, max.	250; simultaneously active Alarm_S/SQ blocks and 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 be logged on simultaneously (SFB 37 AR_SEND)	4
Number of messages	
Total, max.	256
In 100 ms interval, max.	0
in 500 ms interval, max.	256
in 1000 ms interval, max.	256
Number of additional values	
In 100 ms interval, max.	0
In 500, 1000 ms interval, max.	1
Test and commissioning functions	
Block status	Yes; up to 16 simultaneously
Single-step	Yes
Number of breakpoints	16
Status/modify	
Status/modify variable	Yes; up to 16 variable tables

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Variables	Inputs/outputs, bit memory, DB, I/O inputs/outputs, timers, counters
Number of variables, max.	70; Status / Modify
Forcing	
Forcing	Yes
Force, variables	Inputs, outputs, bit memories, distributed I/O
Number of variables, max.	64
Diagnostics buffer	
Available	Yes
Number of entries, max.	3200
Adjustable	Yes
Default	120
Service data	
Readable	Yes
Standards, approvals, certificates	
UKCA	Yes
CE mark	Yes
CSA approval	Yes
UL approval	Yes
cULus	Yes
FM approval	Yes
RCM (formerly C-TICK)	Yes
CCC	Yes
KC approval	Yes
EAC (formerly Gost-R)	Yes
Use in hazardous areas	
ATEX	ATEX II 3 G Ex ec IIC T4 Gc
Ambient conditions	
Ambient temperature during operation	
Min.	0 °C
Max.	60 °C
Configuration	
Programming	
Instruction set	See instruction list
Nesting levels	7
Access to consistent data in the process image	Yes
System functions (SFC)	See instruction list
System function blocks (SFB)	See instruction list
Programming language	
LAD	Yes
FBD	Yes

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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/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