

# Siemens 6ES7416-2XP07-0AB0 Manual

|                |                       |
|----------------|-----------------------|
| Brand          | Siemens               |
| Product Series | Siemens               |
| Product Type   | designation CPU 416-2 |

## Description

6ES7416-2XP07-0AB0

SIMATIC S7-400, CPU 416-2, Central processing unit with: Work memory 8 MB, (4 MB code, 4 MB data), 1st interface MPI/DP 12 Mbit/s, 2nd interface PROFIBUS DP,

### General information

Product type designation CPU 416-2

HW functional status 01

Firmware version V7.0

### Product function

- Isochronous mode Yes; For PROFIBUS only

### Engineering with

- 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 10 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. 5.5 W

### Memory

Type of memory RAM

### Work memory

- integrated 8 Mbyte
- integrated (for program) 4 Mbyte
- integrated (for data) 4 Mbyte
- expandable No

### Load memory

- expandable FEPR0M Yes; with Memory Card (FLASH)
- expandable FEPR0M, max. 64 Mbyte
- integrated RAM, max. 1 Mbyte
- 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

Backup current, typ. 180  $\mu$ A; up to 40 °C

- Backup current, max. 850  $\mu$ A
- 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. 12.5 ns

for word operations, typ. 12.5 ns

for fixed point arithmetic, typ. 12.5 ns

for floating point arithmetic, typ. 25 ns

## CPU-blocks

## DB

- Number, max. 10 000; Number range: 1 to 16000
- Size, max. 64 kbyte

## FB

- Number, max. 5 000; Number range: 0 to 7999
- Size, max. 64 kbyte

## FC

- Number, max. 5 000; 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 8; OB 10-17
- Number of delay alarm OBs 4; OB 20-23
- Number of cyclic interrupt OBs 9; OB 30-38 (shortest cycle that can be set = 500  $\mu$ s)
- Number of process alarm OBs 8; OB 40-47
- Number of DPV1 alarm OBs 3; OB 55-57
- Number of isochronous mode OBs 4; OB 61-64
- 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 2

## Counters, timers and their retentivity

## S7 counter

- Number 2 048

## Retentivity

— adjustable Yes

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— 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

— 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. 16 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. 32 kbyte
- preset 16 kbyte

Address area

I/O address area

- Inputs 16 kbyte
- Outputs 16 kbyte

Process image

- Inputs, adjustable 16 kbyte
- Outputs, adjustable 16 kbyte
- Inputs, default 512 byte
- Outputs, default 512 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 131 072
- of which central 131 072
- Outputs 131 072
- of which central 131 072

Analog channels

- Inputs 8 192

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— of which central 8 192

- Outputs 8 192

— of which central 8 192

Hardware configuration

Number of expansion units, max. 21

connectable OPs 95

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 cannot be used jointly with CP 443-5 Ext. or CP 443-1 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; Max. 4 in the central controller; no mixed operation of different CP 443-1

types in PROFINET IO mode [www.AutoDCSTech.com](http://www.AutoDCSTech.com)

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 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 No; Via CP
- to IF 964 DP No

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

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 44; 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. 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
- 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

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— 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 32

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

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. 32

• Transmission rate, max. 12 Mbit/s

• Number of DP slaves, max. 125

Services

— PG/OP communication Yes

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- 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. 8 kbyte
- Outputs, max. 8 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 32

#### 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; with interface active

#### 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 ms; 0.5 ms without use of SFC 126, 127

##### max. cycle 32 ms

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communication functions / header

PG/OP communication Yes

- Number of connectable OPs without message processing 95
- Number of connectable OPs with message processing 95; When using Alarm\_S/SQ and Alarm\_D/DQ

Data record routing Yes

Global data communication

- supported Yes
- Number of GD loops, max. 16
- Number of GD packets, transmitter, max. 16
- Number of GD packets, receiver, max. 32
- Size of GD packets, max. 54 byte
- Size of GD packet (of which consistent), max. 1 variable

S7 basic communication

- communication function / S7 basic communication 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 [www.AutoDCSTech.com](http://www.AutoDCSTech.com)

- 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.

64/64

Standard communication (FMS)

- supported Yes; Via CP and loadable FB

Number of connections

- overall 96
- usable for PG communication 95
  - reserved for PG communication 1
  - adjustable for PG communication, max. 0
- usable for OP communication 95
  - reserved for OP communication 1
  - adjustable for OP communication, max. 0
- usable for S7 basic communication 94
  - reserved for S7 basic communication 0
  - adjustable for S7 basic communication, max. 0
- usable for S7 communication 94
  - reserved for S7 communication 0
  - adjustable for S7 communication, max. 0
- usable for routing 47
  - reserved for routing 0
  - adjustable for routing, max. 0

S7 message functions

Number of login stations for message functions, max. 95; Max. 95 with Alarm\_S/SQ and Alarm\_D/DQ (OPs); max. 16 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. 1 000; 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.

4 000

- preset, max. 600

Process control messages Yes

Number of archives that can log on simultaneously (SFB 37 AR\_SEND)

32

Number of messages

- overall, max. 1 024
- in 100 ms grid, max. 128
- in 500 ms grid, max. 512
- in 1000 ms grid, max. 1 024

Number of additional values

- with 100 ms grid, max. 1
- with 500, 1000 ms grid, max. 10

Test commissioning functions [www.AutoDCSTech.com](http://www.AutoDCSTech.com)

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, peripheral inputs, peripheral outputs

- Number of variables, max. 512

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 / 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

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configuration / programming / number of simultaneously active SFC / header

— 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

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
- Block encryption Yes; With S7 block Privacy

Dimensions

Width 25 mm

Height 290 mm

Depth 219 mm

Weights

Weight, approx. 700 g