SIEMENS

Data sheet 6ES7416-2XN05-0AB0

SIMATIC S7-400, CPU 416-2 CENTRAL PROCESSING UNIT WITH: 5.6 MB WORKING MEMORY, (2.8 MB CODE, 2.8 MB DATA), 1. INTERFACE MPI/DP 12 MBIT/S, 2. INTERFACE PROFIBUS DP

General information	
Product type designation	CPU 416-2
Hardware product version	04
Firmware version	V5.3
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	10 µs
Supply voltage	
Rated value (DC)	
• 24 V DC	No; 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	5.6 Mbyte
• integrated (for program)	2.8 Mbyte
• integrated (for data)	2.8 Mbyte
• expandable	No
Load memory	
• expandable FEPROM	Yes; with Memory Card (FLASH)
• expandable FEPROM, 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.	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.	30 ns
for word operations, typ.	30 ns
for fixed point arithmetic, typ.	30 ns
for floating point arithmetic, typ.	90 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 µs)
• 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
— 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 in total	Total working and load memory (with backup battery)
Flag	
• Number, 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
Data blocks	
• Number, max.	10 000; Number range: 1 to 16000
• Size, max.	64 kbyte
Local data	
• adjustable, max.	32 kbyte
• preset	16 kbyte
Address area	
I/O address area	
• Inputs	16 kbyte
• Outputs	16 kbyte
of which distributed	
— MPI/DP interface, inputs	2 kbyte
— MPI/DP interface, outputs	2 kbyte
— DP interface, inputs	8 kbyte
— DP interface, outputs	8 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
— of which central	8 192
• Outputs	8 192
— of which central	8 192

Hardware configuration	
Number of expansion units, max.	21
connectable OPs	63
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
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; 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 hour
• 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	Integrated
Physics	RS 485 / PROFIBUS + MPI
Isolated	Yes
Power supply to interface (15 to 30 V DC), max.	150 mA
Number of connection resources	MPI: 44, DP: 32
Functionality	
• 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
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
— 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
DP slave	
• Number of connections	32
• 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

— S7 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	Integrated
Physics	RS 485 / PROFIBUS
Isolated	Yes
Power supply to interface (15 to 30 V DC), max.	150 mA
Number of connection resources	32
Functionality	
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	Yes
DP master	
• Number of connections, max.	32
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	125
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.	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
DP slave	
• Number of connections	32
• 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; with interface active
Transfer memory	
— Inputs	244 byte
— Outputs	244 byte

Isochronous mode	
Isochronous operation (application synchronized up to terminal)	Yes; For PROFIBUS only
Number of DP masters with isochronous mode	2
User data per isochronous slave, max.	244 byte
Equidistance	Yes
shortest clock pulse	1 ms; 0.5 ms without use of SFC 126, 127
max. cycle	32 ms

Communication functions	
PG/OP communication	Yes
• Number of connectable OPs without message processing	63
• Number of connectable OPs with message processing	63; 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	
• 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.	64/64
Standard communication (FMS)	
• supported	Yes; Via CP and loadable FB
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	
• overall	64
• usable for PG communication	63
— reserved for PG communication	1
— adjustable for PG communication, max.	0
• usable for OP communication	63
— reserved for OP communication	1
— adjustable for OP communication, max.	0
• usable for S7 basic communication	62
— reserved for S7 basic communication	0
— adjustable for S7 basic communication, max.	0
• usable for S7 communication	62
— reserved for S7 communication	0
— adjustable for S7 communication, max.	0
• usable for routing	31
— reserved for routing	0

— adjustable for routing, max.	0
S7 message functions	
Number of login stations for message functions, max.	63; Max. 63 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 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	
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.	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	
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
— 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

Dimensions	
Width	25 mm
Height	290 mm
Depth	219 mm

Weights	
Weight, approx.	720 g

last modified: 03/24/2017