SIEMENS

Data sheet   **6ES7416-3XS07-0AB0**

SIMATIC S7-400, CPU 416-3, Central processing unit with: Work memory 16 MB, (8 MB code, 8 MB data), 1st interface MPI/DP 12 Mbit/s, 2nd interface PROFIBUS DP, 3rd interface plug-in IFM module

General information	
Product type designation	CPU 416-3
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)	
• 24 V DC	No; 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.	450 mA; 150 mA per DP interface

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from interface 5 V DC, max.	90 mA; At each DP interface

Power loss

Power loss, typ.	5.5 W
Power loss, max.	6.5 W

Memory

Type of memory	RAM

Work memory

• integrated	16 Mbyte
• integrated (for program)	8 Mbyte
• integrated (for data)	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.	180 µA; up to 40 °C
• Backup current, max.	850 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.	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

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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

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— 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
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
— of which central	8 192
● Outputs	8 192

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— 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	1
• 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; 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	2

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

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• 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	Yes
Time difference in system when synchronizing via	
• MPI, max.	200 ms

Interfaces	
Interfaces/bus type	1 x MPI/PROFIBUS DP, 1 x PROFIBUS DP, 1 x PROFIBUS DP (optionally pluggable)
Number of RS 485 interfaces	2; Combined MPI / PROFIBUS DP and PROFIBUS DP
Number of other interfaces	1; PROFIBUS DP with IF 964-DP (plug-in option; MLFB: 6ES7964-2AA04-0AB0)

1. Interface	
Interface type	Integrated
Physics	RS 485 / PROFIBUS + MPI
Isolated	Yes
Power supply to interface (15 to 30 V DC), 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	

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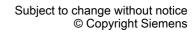|	
• Number of connections, max.	32; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	32
Services	
— PG/OP communication	Yes
— Routing	Yes; S7 routing
— Global data communication	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
PROFIBUS 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
— Routing	Yes; with interface active
— Global data communication	No
— S7 basic communication	No

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— 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
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
— 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	

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— 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
● 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

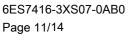| Transfer memory	
— Inputs	244 byte
— Outputs	244 byte

3. Interface	
Interface type	pluggable interface module (IF), technical data as for 2nd interface
Plug-in interface modules	IF 964-DP (MLFB: 6ES7964-2AA04-0AB0)
Physics	RS 485 / PROFIBUS
Isolated	Yes
Power supply to interface (15 to 30 V DC), max.	150 mA
automatic detection of transmission rate	No
Number of connection resources	32

Protocols	
● MPI	No
● 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
— Routing	Yes; S7 routing
— Global data communication	No
— S7 basic communication	Yes
— S7 communication	Yes
— S7 communication, as client	Yes

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— 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
— DPV0	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
• 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
• User data per address area, max.	32 byte
— of which consistent, max.	32 byte
Services	
— PG/OP communication	Yes
— 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
Protocols	

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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	3
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

Communication functions	
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	
• 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

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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	

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

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, 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	

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• 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; 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 protection/password protection	Yes
• Block encryption	Yes; With S7 block Privacy

Dimensions	
Width	50 mm
Height	290 mm
Depth	219 mm

Weights	
Weight, approx.	900 g

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