



Figure similar

SIMATIC S7-400, CPU 416-3 PN/DP CENTRAL PROCESSING UNIT WITH: 16 MB WORKING MEMORY, (8 MB KB CODE, 8 MB DATA), INTERFACES: 1. IF MPI/DP 12 MBIT/S (X1), 2. IF ETHERNET/PROFINET (X5), 3. IF IF964-DP PLUGABLE (IF1)

Product type designation	
General information	
Hardware product version	01
Firmware version	V6.0
Engineering with	
<ul style="list-style-type: none"> Programming package 	STEP7 V5.5 or higher/iMap V3.0 + iMap STEP7 Add-on V3.0 SP5 or higher
CiR - Configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	10 µs; Time per I/O byte
Supply voltage	
Rated value (DC)	
<ul style="list-style-type: none"> 24 V DC 	No; Power supply via system power supply
Input current	
from backplane bus 5 V DC, typ.	1.3 A
from backplane bus 5 V DC, max.	1.5 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 losses	
Power loss, typ.	6.5 W
Power loss, max.	7.5 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 FEPRM	Yes; with Memory Card (FLASH)
• expandable FEPRM, 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 μ A; up to 40 °C
• Backup current, max.	450 μ 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 to 15 VDC
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 time 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 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
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Retentivity

— can be set	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
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Retentivity

— can be set	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
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• Type	SFB
• Number	Unlimited (limited only by RAM capacity)

Data areas and their retentivity

Total retentive data area	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
— PN interface, inputs	8 kbyte
— PN 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
— Inputs, of which central	131 072
• Outputs	131 072
— Outputs, of which central	131 072
Analog channels	

• Inputs	8 192
— Inputs, of which central	8 192
• Outputs	8 192
— Outputs, of which central	8 192
Hardware configuration	
Expansion devices, 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	1
• via IM 467	4
• Via CP	10; CP 443-5 Extended
• 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	1; IF 964-DP
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
Number of IO Controllers	
• Integrated	1
• 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 or number of connections
• CP, point-to-point	CP 440: Limited by number of slots; CP 441: Limited by number of slots and 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 clock)	Yes
• battery-backed 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	Yes; As client
• to IF 964 DP	Yes
Time difference in system when synchronizing via	
• Ethernet, max.	10 ms
• MPI, max.	200 ms
Interfaces	
Interface/bus type	1 x MPI/PROFIBUS DP, 1 x PROFINET (2 ports), 1 x PROFIBUS DP (optionally pluggable)
Number of RS 485 interfaces	1
Number of other interfaces	0
1st 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
• DP master	Yes
• 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
— Global data communication	No
— S7 basic communication	Yes
— S7 communication	Yes
— S7 communication, as client	Yes
— S7 communication, as server	Yes
— Equidistance mode support	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
• User data per address area, 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
2nd interface	
Interface type	PROFINET
Physics	Ethernet RJ45
Isolated	Yes
Integrated switch	Yes
Number of ports	2
Automatic detection of transmission speed	Yes; Autosensing
Autonegotiation	Yes
Autocrossing	Yes
Change of IP address at runtime, supported	Yes; Assignment by higher-level IO-Controller or by the user program with SFB104 "IP_CONF"
Number of connection resources	96
Media redundancy	
• supported	Yes
• Switchover time on line break, typically	200 ms
• Number of stations in the ring, max.	50
Functionality	
• DP master	No
• DP slave	No
• PROFINET IO Controller	Yes
• PROFINET IO Device	Yes
• PROFINET CBA	Yes
• Open IE communication	Yes
• Web server	Yes
— Number of HTTP clients	5
• Point-to-point connection	No
PROFINET IO Controller	
• Transmission rate, max.	100 Mbit/s

• Number of connectable IO devices, max.	256
• Max. number of connectable IO devices for RT — of which in line, max.	256 256
• Number of IO devices with IRT and the option "high flexibility" — of which in line, max.	256 61
• Number of IO Devices with IRT and the option "high performance", max. — of which in line, max.	64 64
• Shared device	Yes
• Prioritized startup — Number of IO Devices, max.	Yes 32
• Activation/deactivation of IO Devices — Maximum number of IO devices that can be activated/deactivated at the same time.	Yes 8
• IO Devices changing during operation (partner ports), supported — Max. number of IO devices per tool	Yes 8; 8 parallel calls of the SFC 12 "D_ACT_DP" possible per line. Max. 32 IO Devices changing during operation (partner ports) are supported
• Device replacement without swap medium	Yes
• Send cycles	250 µs, 500 µs, 1 ms, 2 ms, 4 ms additionally with IRT with high performance: 250 µs to 4 ms in 125 µs frame
• Updating time	250 µs to 512 ms; minimum value depends on preset communication share for PROFINET IO, on the number of IO Devices and on the amount of configured user data, see PROFINET system description

Services

— PG/OP communication	Yes
— S7 routing	Yes
— S7 communication	Yes
— Isochronous mode	Yes; Only with IRT and the High Performance option
— Open IE communication	Yes

Address area

— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
— User data consistency, max.	1 024 byte

PROFINET IO Device

Services

— PG/OP communication	Yes
— S7 routing	Yes
— S7 communication	Yes
— Isochronous mode	No

— Open IE communication	Yes
— IRT	Yes
— Prioritized startup	Yes
— Shared device	Yes
— Number of IO controllers with shared device, max.	2
Transfer memory	
— Inputs, max.	1 440 byte; Per IO Controller with shared device
— Outputs, max.	1 440 byte; Per IO Controller with shared device
Submodules	
— Number, max.	64
— User data per submodule, max.	1 024 byte
PROFINET CBA	
• acyclic transmission	Yes
• Cyclic transmission	Yes
Open IE communication	
• Number of connections, max.	94
• Local port numbers used at the system end	0, 20, 21, 25, 80, 102, 135, 161, 34962, 34963, 34964, 65532, 65533, 65534, 65535
• Keep-alive function, supported	Yes
3rd interface	
Interface type	Pluggable interface module (IF)
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 speed	No
Number of connection resources	32
Functionality	
• MPI	No
• DP master	Yes
• DP slave	Yes
DP master	
• Number of connections, max.	32
• Transmission rate, min.	9.6 kbit/s
• 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 mode support	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
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
• User data per address area, of which consistent, max.	32 byte
Services	
— PG/OP communication	Yes
— 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

Isochronous mode

Isochronous operation (application synchronized up to terminal)	Yes; Via PROFIBUS DP or PROFINET interface
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
<ul style="list-style-type: none"> • Number of connectable OPs without message processing 	95
<ul style="list-style-type: none"> • Number of connectable OPs with message processing 	95; When using Alarm_S/SQ and Alarm_D/DQ
Data record routing	Yes
Global data communication	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • Number of GD loops, max. 	16
<ul style="list-style-type: none"> • Number of GD packets, transmitter, max. 	16
<ul style="list-style-type: none"> • Number of GD packets, receiver, max. 	32
<ul style="list-style-type: none"> • Size of GD packets, max. 	54 byte
<ul style="list-style-type: none"> • Size of GD packet (of which consistent), max. 	1 variable
S7 basic communication	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • User data per job, max. 	76 byte
<ul style="list-style-type: none"> • User data per job (of which consistent), max. 	1 variable
S7 communication	
<ul style="list-style-type: none"> • supported 	Yes
<ul style="list-style-type: none"> • as server 	Yes
<ul style="list-style-type: none"> • As client 	Yes
<ul style="list-style-type: none"> • User data per job, max. 	64 kbyte
<ul style="list-style-type: none"> • User data per job (of which consistent), max. 	462 byte; 1 variable
S5-compatible communication	
<ul style="list-style-type: none"> • supported 	Yes; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5
<ul style="list-style-type: none"> • User data per job, max. 	8 kbyte
<ul style="list-style-type: none"> • User data per job (of which consistent), max. 	240 byte
<ul style="list-style-type: none"> • Number of simultaneous AG-SEND/AG-RECV orders per CPU, max. 	64/64
Standard communication (FMS)	
<ul style="list-style-type: none"> • supported 	Yes; Via CP and loadable FB

Open IE communication	
<ul style="list-style-type: none"> • TCP/IP <ul style="list-style-type: none"> — Number of connections, max. — Data length, max. — Several passive connections per port, supported • ISO-on-TCP (RFC1006) <ul style="list-style-type: none"> — Number of connections, max. — Data length, max. • UDP <ul style="list-style-type: none"> — Number of connections, max. — Data length, max. 	<p>Yes; via integrated PROFINET interface and loadable FBs</p> <p>94</p> <p>32 kbyte</p> <p>Yes</p> <p>Yes; Via integrated PROFINET interface or CP 443-1 and loadable FBs</p> <p>94</p> <p>32 kbyte; 1452 bytes via CP 443-1 Adv.</p> <p>Yes; via integrated PROFINET interface and loadable FBs</p> <p>94</p> <p>1 472 byte</p>
Web server	
<ul style="list-style-type: none"> • supported • Number of HTTP clients • User-defined websites 	<p>Yes</p> <p>5</p> <p>Yes</p>
PROFINET CBA (at set setpoint communication load)	
<ul style="list-style-type: none"> • Setpoint for the CPU communication load • Number of remote interconnection partners • Number of functions, master/slave • Total of all Master/Slave connections • Data length of all incoming connections master/slave, max. • Data length of all outgoing connections master/slave, max. • Number of device-internal and PROFIBUS interconnections • Data length of device-internal und PROFIBUS interconnections, max. • Data length per connection, max. 	<p>20 %</p> <p>32</p> <p>150</p> <p>6 000</p> <p>65 000 byte</p> <p>65 000 byte</p> <p>1 000</p> <p>16 000 byte</p> <p>2 000 byte</p>
Remote interconnections with acyclic transmission	
<ul style="list-style-type: none"> — Sampling frequency: Sampling time, min. — Number of incoming interconnections — Number of outgoing interconnections — Data length of all incoming interconnections, max. — Data length of all outgoing interconnections, max. — Data length per connection, max. 	<p>200 ms; Depending on preset communication load, number of interconnections and data length used</p> <p>500</p> <p>500</p> <p>16 000 byte</p> <p>16 000 byte</p> <p>2 000 byte</p>
Remote interconnections with cyclic transmission	

— Transmission frequency: Transmission interval, min.	1 ms; Depending on preset communication load, number of interconnections and data length used
— Number of incoming interconnections	300
— Number of outgoing interconnections	300
— Data length of all incoming interconnections, max.	4 800 byte
— Data length of all outgoing interconnections, max.	4 800 byte
— Data length per connection, max.	450 byte
HMI variables via PROFINET (acyclic)	
— Number of stations that can log on for HMI variables (PN OPC/iMap)	2x PN OPC/1x iMap
— HMI variable updating	500 ms
— Number of HMI variables	1 500
— Data length of all HMI variables, max.	48 000 byte
PROFIBUS proxy functionality	
— supported	Yes; 32 PROFIBUS slaves max. connectable
— Data length per connection, max.	240 byte; Slave-dependent
Number of connections	
• overall	96
• usable for PG communication	
— reserved for PG communication	1
— Adjustable for PG communication, max.	0
• usable for OP communication	
— reserved for OP communication	1
— adjustable for OP communication, max.	0
• usable for S7 basic communication	
— Reserved for S7 basic communication	0
— adjustable for S7 basic communication, max.	0
• usable for S7 communication	
— reserved for S7 communication	0
— Adjustable for S7 communication, max.	0
• usable for routing	
— 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. 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 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
• Force, variables	Inputs/outputs, bit memories, distributed I/Os
• Number of variables, max.	512
Diagnostic buffer	
• present	Yes
• Number of entries, max.	3 200
— can be set	Yes
— preset	120
Service data	
• Can be read out	Yes
EMC	
Emission of radio interference acc. to EN 55 011	
• Limit class A, for use in industrial areas	Yes
• Limit class B, for use in residential areas	No

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
— D_ACT_DP	8
— RD_REC	8
— WR_REC	8
— WR_PARM	8
— PARM_MOD	1
— WR_DPARM	2
— DPNRM_DG	8
— RDSYSST	8
— DP_TOPOL	1
Number of simultaneously active SFBs	
— RDREC	8
— WRREC	8
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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