

SIMATIC

S7-400 S7-400 Automation System, CPU Specifications

Manual

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10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Data

Technical specifications	
CPU and firmware version	
Order number	6ES7414-3EM06-0AB0 6ES7414-3FM06-0AB0
• Firmware version	V6.0
Associated programming package	As of STEP 7 V 5.5/iMap V3.0 or higher + iMap-STEP 7 Add On V3.0 + SP 5 See also Preface (Page 11)
Memory	
Work memory	
• Integrated	2.0 MB for code 2.0 MB for data
Load memory	
• Integrated	512 KB RAM
• Expandable FEPR0M	With memory card (FLASH) up to 64 MB
• Expandable RAM	With memory card (RAM) up to 64 MB
Backup with battery	Yes, all data
Typical execution times	
Execution times for	
• Bit operations	45 ns
• Word operations	45 ns
• Fixed-point arithmetic	45 ns
• Floating-point arithmetic	135 ns
Timers/counters and their retentivity	
S7 counters	2048
• Retentivity programmable	From C 0 to C 2047
• Default	From C 0 to C 7
• Counting range	0 to 999
IEC counters	Yes
• Type	SFB
S7 timers	2048
• Retentivity programmable	From T 0 to T 2047
• Default	No retentive timers
• Time range	10 ms to 9990 s

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
IEC timers	Yes
• Type	SFB
Data areas and their retentivity	
Total retentive data area (including bit memories, timers, and counters)	Total work and load memory (with backup battery)
Bit memories	8 KB
• Retentivity programmable	From MB 0 to MB 8191
• Default retentivity	From MB 0 to MB 15
Clock memories	8 (1 memory byte)
Data blocks	Maximum 6000 (DB 0 reserved) Range of numbers 1 - 16 000
• Size	Maximum 64 KB
Local data (programmable)	Maximum 16 KB
• Default	8 KB
Blocks	
OBs	See <i>Instruction List</i>
• Size	Maximum 64 KB
Number of free-cycle OBs	OB 1
Number of time-of-day interrupt OBs	OB 10, 11, 12, 13
Number of time-delay interrupt OBs	OB 20, 21, 22, 23
Number of cyclic interrupts	OB 32, 33, 34, 35
Number of hardware interrupt OBs	OB 40, 41, 42, 43
Number of DPV1 interrupt OBs	OB 55, 56, 57
Number of multi-computing OBs	OB 60
Number of isochronous OBs	OB 61, 62, 63
Number of asynchronous error OBs	OB 80, 81, 82, 83, 84, 85, 86, 87, 88
Number of background OBs	OB 90
Number of restart OBs	OB 100, 101, 102 OB 101 not for CPU 414F-3 PN/DP
Number of synchronous error OBs	OB 121, 122
Nesting depth	
• Per priority class	24
• Additionally within an error OB	1
FBs	Maximum 3000 Range of numbers 0 - 7999
• Size	Maximum 64 KB
FCs	Maximum 3000 Range of numbers 0 - 7999
• Size	Maximum 64 KB
SDBs	Maximum 2048

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
Address areas (I/O)	
Total I/O address area	8 KB/8 KB including diagnostics addresses, addresses for I/O interface modules, etc
Of those distributed	
• MPI/DP interface	2 KB/2 KB
• DP interface	6 KB/6 KB
• PN interface	8 KB/8 KB
Process image	8 KB/8 KB (programmable)
• Default	256 bytes/256 bytes
• Number of process image partitions	Maximum 15
Consistent data via PROFIBUS	Maximum 244 bytes
Via integrated PROFINET interface	Maximum 1024 bytes
Digital channels	Maximum 65536/maximum 65536
• Of those are central	Maximum 65536/maximum 65536
Analog channels	Maximum 4096/maximum 4096
• Of those are central	Maximum 4096/maximum 4096
Configuration	
Central / expansion devices	Maximum 1/21
Multicomputing	Maximum 4 CPUs with UR1 or UR2 maximum 2 CPUs with CR3
Number of insertable IMs (total)	Maximum 6
• IM 460	Maximum 6
• IM 463-2	Maximum 4
Number of DP masters	
• Integrated	1
• Via IF 964-DP	1
• Via IM 467	Maximum 4
• Via CP 443-5 Extended	Maximum 10
IM 467 cannot be used in combination with CP 443-5 Extended IM 467 cannot be operated in PN IO mode in combination with CP 443-1 EX4x/EX20/GX40	
Number of PN IO controllers	
• Integrated	1
• Via CP 443-1 in PN IO mode	Maximum 4 in central rack, see the CP 443-1 Manual, no combined operation of CP 443-1 EX40 and CP 443-1 EX41/EX20/GX20
Number of S5 modules that can be inserted by means of adapter bay (in the central rack)	Maximum 6
Supported FMs and CPs	
• FM	Limited by the number of slots and connections

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
• CP 440	Limited by the number of slots
• CP 441	Limited by the number of connections
• PROFIBUS and Ethernet CPs, including CP 443-5 Extended and IM 467	Maximum 14, sum total is maximum 10 CPs as DP master and PN controller, of those up to 10 IMs or CPs as DP master, and up to 4 CPs as PN controller
Time	
Clock	Yes
• Buffered	Yes
• Resolution	1 ms
• Accuracy in POWER OFF state	Maximum deviation of 1.7 s/day
• Accuracy in POWER ON state	Maximum deviation of 8.6 s/day
Operating hours counter	16
• Number	0 to 15
• Range of values	0 to 32767 hours 0 to $2^{31}-1$ hours when SFC 101 is used
• Resolution	1 hour
• Retentive	Yes
Time synchronization	Yes
• In AS, on MPI, DP and IF 964 DP	As master or slave
• On Ethernet via NTP	Yes (as client)
System time difference with synchronization via MPI	Maximum 200 ms
System time difference with synchronization via Ethernet	Maximum 10 ms
S7 alarm functions	
Number of stations that can be logged on	
For block-related alarms (Alarm_S/SQ or Alarm_D/DQ)	63
For process control alarms (ALARM_8 blocks, archive)	8
Symbol-related alarms	Yes
• Number of alarms Total 100 ms interval 500 ms interval 1000 ms interval	Maximum 512 Maximum 128 Maximum 256 Maximum 512
• Number of auxiliary values per alarm With 100 ms interval With 500, 1000 ms interval	Maximum 1 Maximum 10
Block-related alarms	Yes
• Simultaneously active ALARM_S/SQ blocks and ALARM_D/DQ blocks	Maximum 400

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
ALARM_8 blocks	Yes
Number of communication jobs for ALARM_8 blocks and blocks for S7 communication (programmable)	Maximum 1200
Default	300
Process control alarms	Yes
Number of archives that can be logged on simultaneously (SFB 37 AR_SEND)	16
Test and commissioning functions	
Status/modify variable	Yes, maximum 16 variable tables
Variable	Inputs/outputs, bit memories, DB, distributed I/O, timers, counters
Number of variables	Maximum 70
Force	Yes
Variable	Inputs/outputs, bit memories, distributed I/O
Number of variables	Maximum 256
Monitoring blocks	Yes, maximum 16 blocks at the same time
Single-step	Yes
Number of breakpoints	Maximum 16
Diagnostics buffer	Yes
Number of entries	Maximum 3200 (programmable)
Default	120
Cyclic interrupts	
Range of values	500 µs to 60000 ms
Communication	
PG/OP communication	Yes
Number of connectable OPs	63
Number of connection resources for S7 connections via all interfaces and CPs	64, with one each of those reserved for programming device and OP
Global data communication	Yes
Number of GD circuits	Maximum 8
Number of GD packets Transmitter Receiver	Maximum 8 Maximum 16
Size of GD packets Of those are consistent	Maximum 54 bytes 1 variable
S7 basic communication	Yes
In MPI Mode	Via SFC X_SEND, X_RCV, X_GET and X_PUT
In DP master mode	Via SFC I_GET and I_PUT
User data per job Of those are consistent	Maximum 76 bytes 1 variable

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
S7 communication	Yes
- User data per job - Of those are consistent	Maximum 64 KB 1 variable (462 bytes)
S5-compatible communication	Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5)
- User data per job - Of those are consistent	Maximum 8 KB 240 bytes
Number of simultaneous AG-SEND/AG-RECV jobs per CPU, maximum	24/24
Standard communication (FMS)	Yes (via CP and loadable FBs)
Web Server	Yes
Number of http clients	5
Variable tables	Maximum 50, each with maximum 200 variables
Variable status	Of max. 50 variables
Messages	Per language max. 8000 message texts with a total size of 900 kByte
Number of simultaneously active applications	Maximum 4
Size of an application	Maximum 1 MB
Open IE communication over TCP/IP	
Number of connections / access points, total	Maximum 62
Possible port numbers	1 to 49151
Where parameters are assigned without specification of a port number, the system assigns a port from the dynamic port number range between 49152 and 65534	
Reserved port numbers	0 reserved TCP 20, 21 FTP TCP 25 SMTP TCP 80 HTTP TCP 102 RFC1006 UDP 135 RPC-DCOM UDP 161 SNMP_REQUEST UDP 34962 PN IO UDP 34963 PN IO UDP 34964 PN IO UDP 65532 NTP UDP 65533 NTP UDP 65534 NTP UDP 65535 NTP
TCP/IP	Yes, via integrated PROFINET interface and loadable FBs
Maximum number of connections	62
Data length, max.	32767 bytes
ISO on TCP	Yes (via integrated PROFINET interface or CP 443-1 EX40/EX41/ EX20/GX 20 and loadable FBs)
Maximum number of connections	62

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
• Maximum data length via integrated PROFINET interface	32767 bytes
• Maximum data length via CP 443-1	1452 bytes
UDP	Yes, via integrated PROFINET interface and loadable blocks
• Maximum number of connections	62
• Data length, max.	1472 bytes
PROFINET CBA	
Reference setting for CPU communication load	20%
Number of remote interconnection partners	32
Number of master/slave functions	150
Total of all master/slave connections	4500
Data length of all incoming master/slave connections, max.	45000 bytes
Data length of all outgoing master/slave connections, max.	45000 bytes
Number of device-internal and PROFIBUS interconnections	1000
Data length of the device-internal and PROFIBUS interconnections, max.	16000 bytes
Data length per connection, max.	2000 bytes
Remote interconnections with non-cyclic transmission	
• Sampling rate:Sampling time, min.	200 ms
• Number of incoming interconnections	250
• Number of outgoing interconnections	250
• Data length of all incoming interconnections, max.	8000 bytes
• Data length of all outgoing interconnections, max.	8000 bytes
• Data length per connection, (acyclic interconnections), max.	2000 bytes
Remote interconnections with cyclic transmission	
• Transmission rate:Minimum transmission time	1 ms
• Number of incoming interconnections	300
• Number of outgoing interconnections	300
• Data length of all incoming interconnections, max.	4800 bytes
• Data length of all outgoing interconnections	4800 bytes
• Data length per connection, (cyclic interconnections), max.	450 bytes
HMI variables via PROFINET (non-cyclic)	
• Update of HMI variables	500 ms
• Number of stations that can be logged on for HMI variables (PN OPC/iMAP)	2*PN OPC / 1* iMAP

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
• Number of HMI variables	1000
• Data length of all HMI variables, max.	32000 bytes
PROFIBUS proxy functionality	
• Supported	Yes
• Number of coupled PROFIBUS devices	32
• Data length per connection, max.	240 bytes (slave dependent)
Interfaces	
Interface 1	
Interface designation	X1
Type of interface	MPI/DP
Features	RS 485 / PROFIBUS
Electrically isolated	Yes
Power supply to interface with 24 V rated voltage (15 to 30 VDC)	Maximum 150 mA
Number of connection resources	MPI: 32 DP: 16, a diagnostics repeater in the segment reduces the number of connection resources on the segment by 1
Functionality	
MPI	Yes
PROFIBUS DP	DP master/DP slave
Interface 1 in MPI mode	
Services	
PG/OP communication	Yes
S7 Routing	Yes
Global data communication	Yes
S7 basic communication	Yes
S7 communication	Yes
Time synchronization	Yes
Transmission rates	Up to 12 Mbps
Interface 1 in DP master mode	
Services	
PG/OP communication	Yes
S7 Routing	Yes
S7 basic communication	Yes
S7 communication	Yes
Constant cycle	Yes
SYNC/FREEZE	Yes
Activate/deactivate DP slaves	Yes
Time synchronization	Yes
Direct data communication (cross-traffic)	Yes
Transmission rates	Up to 12 Mbps
Number of DP slaves	Maximum 32
Number of slots per interface	Maximum 544
Address area	Maximum 2 KB inputs / 2 KB outputs

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
User data per DP slave	Max. 244 bytes inputs and max. 244 bytes outputs, max. 244 slots, max. 128 bytes per slot
Note: - The total sum of the input bytes across all slots must not exceed 244. - The total sum of the output bytes across all slots must not exceed 244. - The address range of the interface (maximum 2 KB inputs / 2 KB outputs) must not be exceeded in total across all 32 slaves.	
Interface 1 in DP slave mode	
In DP slave mode, the interface can be operated only in active mode. You can only configure the CPU once as a DP slave even if the CPU has several interfaces.	
Services	
Status/modify	Yes
Programming	Yes
S7 Routing	Yes
Time synchronization	Yes
Transmission rate	Up to 12 Mbps
Transfer memory	244 bytes inputs / 244 bytes outputs
Virtual slots	Maximum 32
User data per address area	Maximum 32 bytes
Consistent	32 bytes
Interface 2	
Interface designation	X5
Type of interface	PROFINET
Features	Ethernet RJ45 2 ports (switch)
Electrically isolated	Yes
Autosensing (10/100 Mbps)	Yes
Autonegotiation	Yes
Autocrossover	Yes
Media redundancy	Yes
Switching time in case of interrupted connection, typical	200 ms (PROFINET MRP)
Number of nodes on the ring, max.	50
Change of the IP address at runtime, supported	Yes
KeepAlive function supported	Yes
Functionality	
PROFINET	Yes
Services	
PG communication	Yes
OP communication	Yes
S7 communication	Yes
Maximum number of configurable connections	64, one of each reserved for
Maximum number of instances	programming device and OP 1200

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
• S7 routing	Yes
• PROFINET IO controller	Yes
• PROFINET I-Device	Yes
• PROFINET CBA	Yes
Open IE communication	
• over TCP/IP	Yes
• ISO on TCP	Yes
• UDP	Yes
• Time synchronization	Yes
PROFINET IO	
PNO ID (hexadecimal)	Vendor ID: 0x002A Device ID: 0x0102
Number of integrated PROFINET IO controllers	1
Number of PROFINET IO devices that can be connected	256
Address area	Maximum 8 KB inputs/outputs
Number of submodules	Maximum 8192 Mixed modules count twice
Maximum user data length, including user data qualifiers	1440 bytes
Maximum user data consistency, including user data qualifiers	1024 bytes
Update time	250 μ s, 0.5 ms, 1 ms, 2 ms, 4 ms, 8 ms, 16 ms, 32 ms, 64 ms, 128 ms, 256 ms, and 512 ms The minimum value depends on the set communication portion for PROFINET IO, the number of IO devices, and the amount of configured user data.
PROFINET I-Device	
Number of submodules	Maximum 64
Maximum user data length	1024 bytes per address area
Maximum consistency of user data	1024 bytes per address area
S7 protocol functions	
• Programming device functions	Yes
• OP functions	Yes
IRT (Isochronous Real Time)	Yes, RT Class 2, RT Class 3
• "High flexibility" option	Yes
• "High performance" option	Yes
• Send clocks	250 μ s, 500 μ s, 1 ms, 2 ms, 4 ms Additional for IRT with high performance: 250 μ s to 4 ms at a resolution of 125 μ s

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
Prioritized startup Accelerated (ASU) and Fast Startup Mode (FSU)	Yes, total of maximum 32 ASU and FSU IO devices per PN IO system
Note: The Fast Startup function is available only after the relevant IO device was disconnected from the IO controller at least for the duration of six seconds.	
Tool change	Yes, 8 parallel calls of SFC 12 "D_ACT_DP" are possible.
Changing an IO device without Micro Memory Card or PG	Yes
Interface 3	
Interface designation	IF1
Type of interface	Insertable interface module
Supported interface module	IF 964-DP
Features	RS 485 / PROFIBUS
Electrically isolated	Yes
Power supply to interface with 24V rated voltage (15 to 30 VDC)	Maximum 150 mA
Number of connection resources	16, a diagnostics repeater in the segment reduces the number of connection resources on the segment by 1
Functionality	
PROFIBUS DP	DP master/DP slave
Interface 3 in DP master mode	
Services	
PG/OP communication	Yes
S7 Routing	Yes
S7 basic communication	Yes
S7 communication	Yes
Constant cycle	Yes
SYNC/FREEZE	Yes
Activate/deactivate DP slaves	Yes
Time synchronization	Yes
Direct data communication (cross-traffic)	Yes
Transmission rates	Up to 12 Mbps
Number of DP slaves	Maximum 96
Number of slots per interface	Maximum 1632
Address area	Maximum 6 KB inputs / 6 KB outputs
User data per DP slave	Max. 244 bytes inputs and max. 244 bytes outputs, max. 244 slots, max. 128 bytes per slot

Technical specifications	
Note: - The total sum of the input bytes across all slots must not exceed 244. - The total sum of the output bytes across all slots must not exceed 244. - The address area of the interface (max. 6 KB inputs / 6 KB outputs) may not be exceeded in sum across all 96 slaves.	
Interface 3 in DP slave mode	
In DP slave mode, the interface can be operated in active and passive mode. Technical specifications as for interface 1	
Programming	
Programming language	LAD, FBD, STL, SCL, S7 GRAPH, S7 HiGraph
Instruction set	See <i>Instruction List</i>
Nesting levels	7
System functions (SFC)	See <i>Instruction List</i>
Number of simultaneously active SFCs per segment	
• SFC 11 "DPSYC_FR"	2
• SFC 12 "D_ACT_DP"	8
• SFC 59 "RD_REC"	8
• SFC 58 "WR_REC"	8
• SFC 55 "WR_PARM"	8
• SFC 57 "PARM_MOD"	1
• SFC 56 "WR_DPARM"	2
• SFC 13 "DPNRM_DG"	8
• SFC 51 "RDSYSST"	1... 8
• SFC 103 "DP_TOPOL"	1
System function blocks (SFB)	See <i>Instruction List</i>
Number of simultaneously active SFBs	
• SFB 52 "RDREC"	8
• SFB 53 "WRREC"	8
User program protection	Yes
Block encryption	Yes, with S7 Block Privacy
Access to consistent data in the process image	Yes
CiR synchronization time	
Basic load	100 ms
Time slice per I/O byte	15 µs
Isochronous mode	
Number of isochronous segments	maximal 3, OB 61 ... OB 63 The isochronous segments can be distributed to isochronous DP and PN

10.6 Technical specifications of CPU 414-3 PN/DP (6ES7414-3EM06-0AB0), CPU 414F-3 PN/DP (6ES7414-3FM06-0AB0)

Technical specifications	
Isochronous mode on PROFIBUS	
Maximum number of bytes and slaves in a process image partition with PROFIBUS DP	Rule: number of bytes / 100 + number of slaves < 26
User data per isochronous slave	Maximum 244 bytes
Constant bus cycle time	Yes
shortest clock	1.0 ms,
longest clock	0.5 ms without use of SFC 126, 127 32 ms
See the <i>Isochronous Mode</i> manual	
Isochronous mode on PROFINET	
Maximum number of bytes in a process image partition for PROFINET IO	1600
shortest clock	0.5 ms,
longest clock	4.0 ms
Refer to chapter Isochronous mode (Page 188)	
Dimensions	
Mounting dimensions WxHxD (mm)	50x290x219
Slots required	2
Weight	Approx. 0.9 kg
Voltages, currents	
Current sinking from the S7-400 bus (5 VDC)	Typically 1.3 A Maximum 1.5 A
Current sinking from S7-400 bus (24 VDC) The CPU does not consume any current at 24 V, it merely provides this voltage at the MPI/DP interface.	Total current consumption of the components connected to the MPI/DP interfaces, however, with a maximum of 150 mA per interface
Backup current	Typically 125 µA (up to 40° C) Maximum 450 µA
Maximum backup time	See <i>Module Specifications</i> reference manual, Section 3.3.
Supply of external backup voltage to the CPU	5 VDC to 15 VDC
Power loss	Typically 6.5 W