10.2 Specifications of the CPU 412-2 (6ES7412-2XJ05-0AB0)

Data

CPU and firmware version	
MLFB	6ES7412-2XJ05-0AB0
• Firmware version	V 5.3
Associated programming package	as of STEP 7 V 5.3 SP2 + hardware update see also Introduction (Page 11)
Memory	
Work memory	
• Integrated	256 KB for code 256 KB for data
Load memory	
• Integrated	512 KB RAM
• Expandable FEPROM	With memory card (FLASH) up to 64 MB
• Expandable RAM	With memory card (RAM) up to 64 MB
Buffering	Yes
• With battery	All data
• Without battery	None
Typical processing times	
Processing times of	
• Bit operations	75 ns
• Word operations	75 ns
• Fixed-point arithmetic	75 ns
• Floating-point arithmetic	225 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
IEC timers	Yes
• Type	SFB

Data areas and their retentivity	
Total retentive data area (including bit memories, timers, counters)	Total work and load memory (with backup battery)
Bit memory	4 KB
• Retentivity programmable	From MB 0 to MB 4095
• Default retentive address areas	From MB 0 to MB 15
Clock flag bits	8 (1 flag byte)
Data blocks	Maximum 3000 (DB 0 reserved) Band of numbers 1 - 16000
• Size	Maximum 64 KB
Local data (programmable)	Maximum 8 KB
• Default	4 KB
Blocks	
OBs	See *Instruction List*
• Size	Maximum 64 KB
Nesting depth	
• Per priority class	24
• Additionally within an error OB	1
FBs	Maximum 1500 Band of numbers 0 - 7999
• Size	Maximum 64 KB
FCs	Maximum 1500 Band of numbers 0 - 7999
• Size	Maximum 64 KB
SDBs	Maximum 2048
Address areas (I/O)	
Total I/O address area	4 KB / 4 KB including diagnostics addresses, addresses for I/O interface modules, etc
Distributed of this	
• MPI/DP interface	2 KB / 2 KB
• DP interface	4 KB / 4 KB
Process image	4 KB/4 KB (programmable)
• Default	128 bytes / 128 bytes
• Number of process image partitions	Maximum 15
Consistent data	Maximum 244 bytes
Digital channels	Maximum 32768 / maximum 32768
• Of those are central	Maximum 32768 / maximum 32768
Analog channels	Maximum 2048 / maximum 2048
• Of those are central	Maximum 2048 / maximum 2048

Configuration	
Central racks/expansion units	Maximum 1/21
Multicomputing	Maximum 4 CPUs with UR1 or UR2 Maximum 2 CPUs with CR3
Number of plug-in IMs (total)	Maximum 6
• IM 460	Maximum 6
• IM 463-2	Maximum 4
Number of DP masters	
• Integrated	2
• Via IM 467	Maximum 4
• Via CP 443-5 Extended	Maximum 10
IM 467 cannot be used with the CP 443-5 Extended IM 467 cannot be used with the CP 443-1 EX4x in PN IO mode	
Number of PN IO controllers	
• Via CP 443-1 in PN IO mode	Maximum 4 in central rack, see manual for CP 443-1, no combined operation of CP 443-1 EX40 and CP 443-1 EX41/EX20/GX20
Number of plug-in S5 modules via adapter casing (in the central rack)	Maximum 6
Operable function modules and communication processors	
• FM	Limited by the number of slots and the number of connections
• 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, of which no more than 10 may be CPs or IMs as DP master, up to 4 PN IO controllers
Time	
Clock	Yes
• Buffered	Yes
• Resolution	1 ms
• Accuracy after POWER OFF	Maximum deviation per day 1.7 s
• Accuracy after POWER ON	Maximum deviation per day 8.6 s
Operating hours counter	16
• Number	0 to 15
• Value range	0 to 32767 hours 0 to 2^{31} -1 hours when SFC 101 is used
• Granularity	1 hour
• Retentive	Yes
Time synchronization	Yes
• In PLC, on MPI and DP	As master or slave

Time difference in the system with synchronization via MPI	Maximum 200 ms
S7 message functions	
Number of stations that can log on for message functions (e.g. WIN CC or SIMATIC OP)	Maximum 8 with ALARM_8 or ALARM_P (WinCC); up to 31 with ALARM_S or ALARM_D (OPs)
Symbol-related messages	Yes
• Number of messages Total 100 ms interval 500 ms interval 1000 ms interval	 Maximum 512 None Maximum 256 Maximum 256
• Number of auxiliary values per message With 100 ms interval With 500, 1000 ms interval	 None 1
Block-related messages	Yes
• Simultaneously active ALARM_S/SQ blocks and ALARM_D/DQ blocks	Maximum 250
ALARM_8 blocks	Yes
• Number of communication jobs for ALARM_8 blocks and blocks for S7 communication (programmable)	Maximum 300
• Default	150
Process control messages	Yes
Number of archives that can log on simultaneously (SFB 37 AR_SEND)	4
Test and startup functions	
Status/modify variable	Yes, maximum 16 variable tables
• Variable	Inputs/outputs, bit memories, DB, distributed inputs/outputs, timers, counters
• Number of variables	Maximum 70
Force	Yes
• Variable	Inputs/outputs, bit memories, distributed inputs/outputs
• Number	Maximum 64
Status block	Yes, maximum 2 blocks at the same time
Single-step	Yes
Number of breakpoints	4
Diagnostic buffer	Yes
• Number of entries	Maximum 400 (programmable)
• Default	120
Cyclic interrupts	
Value range	500 µs to 60000 ms

Communication	
PG/OP communication	Yes
Number of connectable OPs	31
Number of connection resources for S7 connections via all interfaces and CPs	32, 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 Sender Receiver	 Maximum 8 Maximum 16
• Size of GD packets Consistent of this	Maximum 54 bytes 1 variable
S7 basic communication	Yes
• MPI Mode	Via SFC X_SEND, X_RCV, X_GET and X_PUT
• DP Master Mode	Via SFC I_GET and I_PUT
• User data per job Consistent of this	Maximum 76 bytes 1 variable
S7 communication	Yes
• User data per job Consistent of this	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 Consistent of this	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 FB)
Open IE communication	ISO on TCP via CP 443-1 and downloadable FBs
• Maximum data length	1452 bytes
Interfaces	
1st interface	
Type of interface	Integrated
Features	RS 485 / PROFIBUS
Electrically isolated	Yes
Power supply to interface 24 V rated voltage (15 to 30 VDC)	Maximum 150 mA
Number of connection resources	MPI: 32 DP: 16
Functionality	
• MPI	Yes
• PROFIBUS DP	DP master/DP slave

2nd interface	
Type of interface	Integrated
Features	RS 485 / PROFIBUS
Electrically isolated	Yes
Power supply to interface (15 VDC to 30 VDC)	Maximum 150 mA
Number of connection resources	16
Functionality	
• PROFIBUS DP	DP master/DP slave
2nd interface DP master mode	
Services PG/OP communication Routing S7 basic communication S7 communication Constant cycle SYNC/FREEZE Activate/deactivate DP slaves Time synchronization Direct data communication (internetwork traffic)	 Yes Yes Yes Yes Yes Yes Yes Yes Yes
Transmission rates	Up to 12 Mbps
Number of DP slaves	Maximum 64
Number of slots per interface	Maximum 1088
Address area	Maximum 4 KB inputs / 4 KB outputs
User data per DP slave	Maximum 244 bytes maximum 244 bytes I and maximum 244 bytes O, maximum 244 slots maximum 128 bytes per slot
Note: • The total sum of the input bytes across all slots may not exceed 244. • The total sum of the output bytes across all slots may not exceed 244. • The address area of the interface (max. 4 KB inputs / 4 KB outputs) may not be exceeded in sum across all 64 slaves.	
2nd interface DP slave mode	
Specifications as for 1st interface	
Programming	
Programming language	LAD, FBD, STL, SCL, S7 GRAPH, S7 HiGraph
Instruction set	See *Instruction List*
Nesting levels	7
System functions (SFC)	See *Instruction List*
Number of simultaneously active SFCs per segment	
• SFC 11 "DP_SYC_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 *Instruction List*
Number of simultaneously active SFBs	
• SFB 52 "RDREC"	8
• SFB 53 "WRREC"	8
User program protection	Password protection
Access to consistent data in the process image	Yes
CiR synchronization time	
Base load	100 ms
Time per I/O byte	30 µs
Isochronous mode	
User data per isochronous slave	Maximum 244 bytes
Maximum number of bytes and slaves in a process image partition	The following must apply: Number of bytes/100 + number of slaves < 16
Constant bus cycle time	Yes
Shortest clock pulse Longest clock pulse	1.5 ms 0.5 ms without use of SFC 126, 127 32 ms
See *Isochronous Mode* manual	
Dimensions	
Mounting dimensions WxHxD (mm)	25x290x219
Slots required	1
Weight	Approx. 0.72 kg
Voltages, currents	
Current consumption from the S7-400 bus (5 VDC)	Typically 0.9 A Maximum 1.1 A
Current consumption from S7-400 bus (24 VDC) The CPU does not consume any current at 24 V, it only makes this voltage available at the MPI/DP interface.	Total current consumption of the components connected to the MPI/DP interfaces, with a maximum of 150 mA per interface
Backup current	Typically 125 µA (up to 40° C) Maximum 550 µA
Maximum backup time	See Module Specifications reference manual, Section 3.3.
Supply of external backup voltage to CPU	5 to 15 VDC
Power loss	Typically 4.5 W