



***** Replacement part ***** SIMATIC S7-400, CPU 412-1 Central processing unit with: work memory 288 KB, (144 KB code, 144 KB of data), Interface MPI/DP 12 Mbit/s,

| General information | |
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| Product type designation | CPU 412-1 |
| HW functional status | 03 |
| Firmware version | V5.3 |
| Product function | |
| <ul style="list-style-type: none"> • Isochronous mode | Yes; For PROFIBUS only |
| Engineering with | |
| <ul style="list-style-type: none"> • 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 | 30 µs |
| Supply voltage | |
| Rated value (DC) | Power supply via system power supply |
| Input current | |
| from backplane bus 5 V DC, typ. | 0.5 A |
| from backplane bus 5 V DC, max. | 0.6 A |
| from backplane bus 24 V DC, max. | 150 mA; 150 mA per DP interface |
| from interface 5 V DC, max. | 90 mA |
| Power loss | |
| Power loss, typ. | 2.5 W |
| Power loss, max. | 3 W |
| Memory | |
| Type of memory | RAM |
| Work memory | |
| <ul style="list-style-type: none"> • integrated • integrated (for program) • integrated (for data) • expandable | 288 kbyte 144 kbyte 144 kbyte No |
| Load memory | |
| <ul style="list-style-type: none"> • expandable FEPRM • expandable FEPRM, max. • integrated RAM, max. • expandable RAM • expandable RAM, max. | Yes; with Memory Card (FLASH) 64 Mbyte 512 kbyte Yes; with Memory Card (RAM) 64 Mbyte |
| Backup | |
| <ul style="list-style-type: none"> • present • with battery • without battery | Yes Yes; all data No |
| Battery | |

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| Backup battery | |
| <ul style="list-style-type: none"> • Backup current, typ. • Backup current, max. • Backup time, max. • Feeding of external backup voltage to CPU | <p>125 μA; up to 40 °C</p> <p>300 μA</p> <p>See reference manual, module data, Chapter 3.3</p> <p>5 V DC to 15 V DC</p> |
| CPU processing times | |
| for bit operations, typ. | 75 ns |
| for word operations, typ. | 75 ns |
| for fixed point arithmetic, typ. | 75 ns |
| for floating point arithmetic, typ. | 225 ns |
| CPU-blocks | |
| DB | |
| <ul style="list-style-type: none"> • Number, max. • Size, max. | <p>1 500; Number range: 1 to 16000</p> <p>64 kbyte</p> |
| FB | |
| <ul style="list-style-type: none"> • Number, max. • Size, max. | <p>750; Number range: 0 to 7999</p> <p>64 kbyte</p> |
| FC | |
| <ul style="list-style-type: none"> • Number, max. • Size, max. | <p>750; Number range: 0 to 7999</p> <p>64 kbyte</p> |
| OB | |
| <ul style="list-style-type: none"> • Number, max. • Size, max. • Number of free cycle OBs • Number of time alarm OBs • Number of delay alarm OBs • Number of cyclic interrupt OBs • Number of process alarm OBs • Number of DPV1 alarm OBs • Number of isochronous mode OBs • Number of multicomputing OBs • Number of background OBs • Number of startup OBs • Number of asynchronous error OBs • Number of synchronous error OBs | <p>see instruction list</p> <p>64 kbyte</p> <p>1; OB 1</p> <p>2; OB 10, 11</p> <p>2; OB 20, 21</p> <p>2; OB 32, 35 (shortest cycle that can be set = 500 μs)</p> <p>2; OB 40, 41</p> <p>3; OB 55-57</p> <p>2; OB 61-62</p> <p>1; OB 60</p> <p>1; OB 90</p> <p>3; OB 100-102</p> <p>9; OB 80-88</p> <p>2; OB 121, 122</p> |
| Nesting depth | |
| <ul style="list-style-type: none"> • per priority class • additional within an error OB | <p>24</p> <p>1</p> |
| Counters, timers and their retentivity | |
| S7 counter | |
| <ul style="list-style-type: none"> • 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 | |
| <ul style="list-style-type: none"> • present • Type • Number | <p>Yes</p> <p>SFB</p> <p>Unlimited (limited only by RAM capacity)</p> |
| S7 times | |
| <ul style="list-style-type: none"> • Number | 2 048 |
| Retentivity | |
| — adjustable | Yes |
| — lower limit | 0 |
| — upper limit | 2 047 |
| — preset | No times retentive |


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| 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 (incl. timers, counters, flags), max. | Total working and load memory (with backup battery) |
| Flag | |
| • Size, max. | 4 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. | 8 kbyte |
| • preset | 4 kbyte |
| Address area | |
| I/O address area | |
| • Inputs | 4 kbyte |
| • Outputs | 4 kbyte |
| Process image | |
| • Inputs, adjustable | 4 kbyte |
| • Outputs, adjustable | 4 kbyte |
| • Inputs, default | 128 byte |
| • Outputs, default | 128 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 | 32 768 |
| — of which central | 32 768 |
| • Outputs | 32 768 |
| — of which central | 32 768 |
| Analog channels | |
| • Inputs | 2 048 |
| — of which central | 2 048 |
| • Outputs | 2 048 |
| — of which central | 2 048 |
| Hardware configuration | |
| Integrated power supply | No |
| Number of expansion units, max. | 21 |
| connectable OPs | 31 |
| 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 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 |

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| <ul style="list-style-type: none"> • 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) | |
| <ul style="list-style-type: none"> • FM • CP, PtP • PROFIBUS and Ethernet CPs | Limited by number of slots and number of connections CP 440: Limited by number of slots; CP 441: Limited by number of slots and number of connections 14; Of which 10 CPs max. or IMs as DP master, 4 PROFINET controller maximum |
| Slots | |
| <ul style="list-style-type: none"> • required slots | 1 |
| Time of day | |
| Clock | |
| <ul style="list-style-type: none"> • Hardware clock (real-time) • retentive and synchronizable • Resolution • Deviation per day (buffered), max. • Deviation per day (unbuffered), max. | Yes Yes 1 ms 1.7 s; Power off 8.6 s; For power On |
| Operating hours counter | |
| <ul style="list-style-type: none"> • Number • Number/Number range • Range of values • Granularity • retentive | 16 0 to 15 SFCs 2, 3 and 4: 0 to 32767 hours SFC 101: 0 to 2 ³¹ - 1 hours 1 h Yes |
| Clock synchronization | |
| <ul style="list-style-type: none"> • supported • to MPI, master • to MPI, slave • to DP, master • to DP, slave • in AS, master • in AS, slave • on Ethernet via NTP • to IF 964 DP | Yes Yes Yes Yes Yes Yes Yes No; Via CP No |
| Time difference in system when synchronizing via | |
| <ul style="list-style-type: none"> • MPI, max. | 200 ms |
| Interfaces | |
| Interfaces/bus type | 1 x MPI/PROFIBUS DP |
| Number of RS 485 interfaces | 1; Combined MPI / PROFIBUS DP |
| Optical interface | No |
| 1. Interface | |
| Interface type | MPI/PROFIBUS DP |
| Isolated | Yes |
| Interface types | |
| <ul style="list-style-type: none"> • RS 485 • Output current of the interface, max. | Yes 150 mA |
| Protocols | |
| <ul style="list-style-type: none"> • MPI • PROFIBUS DP master • PROFIBUS DP slave | Yes Yes Yes |
| MPI | |
| <ul style="list-style-type: none"> • Number of connections • Transmission rate, max. | 32; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1 12 Mbit/s |
| Services | |
| <ul style="list-style-type: none"> — PG/OP communication — Routing — Global data communication — S7 basic communication — S7 communication — S7 communication, as client — S7 communication, as server | Yes Yes Yes Yes Yes Yes Yes |

| PROFIBUS DP master | |
|--|---|
| <ul style="list-style-type: none"> • Number of connections, max. | 16; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1 |
| <ul style="list-style-type: none"> • Transmission rate, max. | 12 Mbit/s |
| <ul style="list-style-type: none"> • 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 | |
| <ul style="list-style-type: none"> • Number of connections | 16 |
| <ul style="list-style-type: none"> • GSD file | http://support.automation.siemens.com/WWW/view/en/113652 |
| <ul style="list-style-type: none"> • Transmission rate, max. | 12 Mbit/s |
| <ul style="list-style-type: none"> • automatic baud rate search | No |
| <ul style="list-style-type: none"> • Address area, max. | 32; Virtual slots |
| <ul style="list-style-type: none"> • User data per address area, max. | 32 byte |
| <ul style="list-style-type: none"> — 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 |
| — 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 | |
| Open IE communication | |
| <ul style="list-style-type: none"> • ISO-on-TCP (RFC1006) | Via CP 443-1 Adv. and loadable FB |
| <ul style="list-style-type: none"> — Data length, max. | 1 452 bytes via CP 443-1 Adv. |
| Web server | |
| <ul style="list-style-type: none"> • supported | No |
| Isochronous mode | |
| Equidistance | Yes |
| Number of DP masters with isochronous mode | 1 |
| User data per isochronous slave, max. | 244 byte |

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| shortest clock pulse | 1.5 ms; 0.5 ms without use of SFC 126, 127 |
| max. cycle | 32 ms |
| communication functions / header | |
| PG/OP communication | Yes |
| • Number of connectable OPs without message processing | 31 |
| • Number of connectable OPs with message processing | 31; When using Alarm_S/SQ and Alarm_D/DQ |
| Data record routing | Yes |
| Global data communication | |
| • supported | Yes |
| • Number of GD loops, max. | 8 |
| • Number of GD packets, transmitter, max. | 8 |
| • Number of GD packets, receiver, max. | 16 |
| • 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 |
| 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. | 24/24 |
| Standard communication (FMS) | |
| • supported | Yes; Via CP and loadable FB |
| Number of connections | |
| • overall | 32 |
| • usable for PG communication | 31 |
| — reserved for PG communication | 1 |
| — adjustable for PG communication, max. | 0 |
| • usable for OP communication | 31 |
| — reserved for OP communication | 1 |
| — adjustable for OP communication, max. | 0 |
| • usable for S7 basic communication | 30 |
| — reserved for S7 basic communication | 0 |
| — adjustable for S7 basic communication, max. | 0 |
| • usable for S7 communication | 30 |
| — reserved for S7 communication | 0 |
| — adjustable for S7 communication, max. | 0 |
| • usable for routing | 15 |
| — reserved for routing | 0 |
| — adjustable for routing, max. | 0 |
| S7 message functions | |
| Number of login stations for message functions, max. | 31; Max. 31 with Alarm_S/SQ and Alarm_D/DQ (OPs); max. 8 with Alarm_8 and Alarm_P (e.g. WinCC) |
| Symbol-related messages | Yes |
| SCAN procedure | Yes |
| Program alarms | Yes |
| Process diagnostic messages | Yes |
| simultaneously active Alarm-S blocks, max. | 250; Simultaneously active alarm_S/SQ blocks or alarm_D/DQ blocks |
| Alarm 8-blocks | Yes |
| • Number of instances for alarm 8 and S7 | 300 |

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| communication blocks, max. | |
| • preset, max. | 150 |
| Process control messages | Yes |
| Number of archives that can log on simultaneously (SFB 37 AR_SEND) | 4 |
| Number of messages | |
| • overall, max. | 256 |
| • in 100 ms grid, max. | 0 |
| • in 500 ms grid, max. | 256 |
| • in 1000 ms grid, max. | 256 |
| Number of additional values | |
| • with 100 ms grid, max. | 0 |
| • with 500, 1000 ms grid, max. | 1 |
| 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, distributed I/Os |
| • Number of variables, max. | 64 |
| Diagnostic buffer | |
| • present | Yes |
| • Number of entries, max. | 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 / header | |
| Configuration software | |
| • STEP 7 | Yes |
| configuration / programming / header | |
| • 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 |

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| — SCL | Yes |
| — CFC | Yes |
| — GRAPH | Yes |
| — HiGraph® | Yes |
| configuration / programming / number of simultaneously active SFC / header | |
| — number of simultaneously active system functions (SFC) / with DPSYC_FR | 2; SFC 11; per interface |
| — number of simultaneously active system functions (SFC) / with 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 |
| configuration / programming / number of simultaneously active SFB / header | |
| — 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. | 700 g |
| last modified: | 4/1/2022  |