SIEMENS

## Data sheet 6ES7412-2EK06-0AB0

SIMATIC S7-400, CPU 412-2 PN Central processing unit with: Work memory 1 MB, (0.5 MB code, 0.5 MB data), interfaces 1st interface MPI/DP 12 Mbit/s, (X1), 2nd interface Ethernet/PROFINET (X5)

| General information | |
|---|---|
| Product type designation | CPU 412-2 PN |
| HW functional status | 01 |
| Firmware version | V6.0 |
| Engineering with | |
| • Programming package | STEP 7 V5.5 or higher/iMap V3.0 + iMap STEP 7 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 | 30 µs; Time per I/O byte |

| 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. | 150 mA; 150 mA per DP interface |
| from interface 5 V DC, max. | 90 mA; At the DP interface |

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

| Memory | |
|---|---|
| Type of memory | RAM |
| Work memory | |
| • integrated | 1 Mbyte |
| • integrated (for program) | 0.5 Mbyte |
| • integrated (for data) | 0.5 Mbyte |
| • expandable | No |
| Load memory | |
| • expandable FEPROM | Yes; with Memory Card (FLASH) |
| • expandable FEPROM, max. | 64 Mbyte |
| • integrated RAM, max. | 512 kbyte |
| • 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 µA; up to 40 °C |
| • Backup current, max. | 450 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. | 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 | |
| • Number, max. | 3 000; Number range: 1 to 16000 |
| • Size, max. | 64 kbyte |
| FB | |
| • Number, max. | 1 500; Number range: 0 to 7999 |
| • Size, max. | 64 kbyte |
| FC | |
| • Number, max. | 1 500; 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 | 2; OB 10, 11 |
| • Number of delay alarm OBs | 2; OB 20, 21 |
| • Number of cyclic interrupt OBs | 2; OB 32, 35 (shortest cycle that can be set = 500 µs) |
| • Number of process alarm OBs | 2; OB 40, 41 |
| • Number of DPV1 alarm OBs | 3; OB 55-57 |
| • Number of isochronous mode OBs | 2; OB 61-62 |
| • 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 | 1 |

| 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 | |
| • Number | Unlimited (limited only by RAM capacity) |
| S7 times | |
| • Number | 2 048 |
| Retentivity | |
| — adjustable | 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 |
| • 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. | 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 |
| of which distributed | |
| — MPI/DP interface, inputs | 2 kbyte |
| — MPI/DP interface, outputs | 2 kbyte |
| — PROFINET interface, inputs | 4 kbyte |
| — PROFINET interface, outputs | 4 kbyte |
| Process image | |
| • Inputs, adjustable | 4 kbyte |
| • Outputs, adjustable | 4 kbyte |
| • Inputs, default | 128 kbyte |
| • Outputs, default | 128 kbyte |
| • 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 | |
|---|---|
| Number of expansion units, max. | 21 |
| connectable OPs | 47 |
| 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 | 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 and number of connections |
| • CP, PtP | 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 | 1 |

| 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 |
| • 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 |
| Time difference in system when synchronizing via | |
| • Ethernet, max. | 10 ms |
| • MPI, max. | 200 ms |

| Interfaces | |
|---|---|
| Interfaces/bus type | 1 x MPI/PROFIBUS DP, 1 x PROFINET (2 ports) |
| Number of RS 485 interfaces | 1 |
| Number of other interfaces | 0 |

| 1. 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: 32, DP: 16 |
| Functionality | |
| • MPI | Yes |
| • PROFIBUS DP master | Yes |
| • PROFIBUS DP slave | Yes |
| MPI | |
| • Number of connections | 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 |
| 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. | 16; 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 | 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 | 16 |
| • 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 |
| — 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 |

| 2. Interface | |
|---|---|
| Interface type | PROFINET |
| Physics | Ethernet RJ45 |
| Isolated | Yes |
| automatic detection of transmission rate | 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 | 48 |
| Interface types | |
| • Number of ports | 2 |
| • integrated switch | Yes |
| Media redundancy | |
| • supported | Yes |
| • Switchover time on line break, typ. | 200 ms |
| • Number of stations in the ring, max. | 50 |
| Functionality | |
| • PROFINET IO Controller | Yes |
| • PROFINET IO Device | Yes |
| • PROFINET CBA | Yes |
| • PROFIBUS DP master | No |
| • PROFIBUS DP slave | No |
| • Open IE communication | Yes |
| • Web server | Yes |
| • Point-to-point connection | No |
| PROFINET IO Controller | |
| • Transmission rate, max. | 100 Mbit/s |
| 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 |
| — Shared device | Yes |
| — Prioritized startup | Yes |
| — Number of IO devices with prioritized startup, max. | 32 |
| — Number of connectable IO Devices, max. | 256 |
| — Of which IO devices with IRT, max. | 64 |
| — of which in line, max. | 64 |
| — Number of IO Devices with IRT and the option "high flexibility" | 256 |
| — of which in line, max. | 61 |
| — Number of connectable IO Devices for RT, max. | 256 |
| — of which in line, max. | 256 |
| — Activation/deactivation of IO Devices | Yes |
| — Number of IO Devices that can be simultaneously activated/deactivated, max. | 8 |
| — IO Devices changing during operation (partner ports), supported | Yes |
| — Number of IO Devices per tool, max. | 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 |
| Address area | |
| — Inputs, max. | 4 kbyte |
| — Outputs, max. | 4 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. | 46 |
| • 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 |

| Protocols | |
|---|---|
| Open IE communication | |
| • TCP/IP | Yes; via integrated PROFINET interface and loadable FBs |
| — Data length, max. | 32 kbyte |
| — several passive connections per port, supported | Yes |
| • ISO-on-TCP (RFC1006) | Yes; Via integrated PROFINET interface or CP 443-1 Adv. and loadable FBs |
| — Data length, max. | 32 kbyte; 1452 bytes via CP 443-1 Adv. |
| • UDP | Yes; via integrated PROFINET interface and loadable FBs |
| — Number of connections, max. | 46 |
| — Data length, max. | 1 472 byte |
| Web server | |
| • User-defined websites | Yes |
| • Number of HTTP clients | 5 |

| Isochronous mode | |
|---|---|
| Isochronous operation (application synchronized up to terminal) | Yes; Via PROFIBUS DP or PROFINET interface |
| Equidistance | Yes |
| Number of DP masters with isochronous mode | 1 |
| User data per isochronous slave, max. | 244 byte |
| shortest clock pulse | 1.5 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 | 47 |
| • Number of connectable OPs with message processing | 47; 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; 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. | 24/24 |
| Standard communication (FMS) | |
| • supported | Yes; Via CP and loadable FB |
| Web server | |
| • supported | Yes |
| PROFINET CBA (at set setpoint communication load) | |
| • Setpoint for the CPU communication load | 20 % |
| • Number of remote interconnection partners | 32 |
| • Number of functions, master/slave | 150 |
| • Total of all master/slave connections | 4 500 |
| • Data length of all incoming connections master/slave, max. | 45 000 byte |
| • Data length of all outgoing connections master/slave, max. | 45 000 byte |

| | |
|---|---|
| • Number of device-internal and PROFIBUS interconnections | 1 000 |
| • Data length of device-internal und PROFIBUS interconnections, max. | 16 000 byte |
| • Data length per connection, max. | 2 000 byte |
| Remote interconnections with acyclic transmission | |
| — Sampling frequency: Sampling time, min. | 200 ms; Depending on preset communication load, number of interconnections and data length used |
| — Number of incoming interconnections | 250 |
| — Number of outgoing interconnections | 250 |
| — Data length of all incoming interconnections, max. | 8 000 byte |
| — Data length of all outgoing interconnections, max. | 8 000 byte |
| — Data length per connection, max. | 2 000 byte |
| 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 | 1 000 |
| — Data length of all HMI variables, max. | 32 000 byte |
| PROFIBUS proxy functionality | |
| — supported | Yes; 32 PROFIBUS slaves max. connectable |
| — Data length per connection, max. | 240 byte; Slave-dependent |
| Number of connections | |
| • overall | 48 |
| • 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. | 47; Max. 47 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 |
| 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 communication blocks, max. | 300 |
| • 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 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, distributed I/Os |
| • Number of variables, max. | 64 |
| **Diagnostic buffer** | |
| • present | Yes |
| • Number of entries, max. | 400 |
| — adjustable | 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 | 25 mm |
| Height | 290 mm |
| Depth | 219 mm |

| Weights | |
|---|---|
| Weight, approx. | 750 g |

**last modified:** 04/25/2018