SIEMENS

## Data sheet 6ES7412-2XJ05-0AB0

SIMATIC S7-400, CPU 412-2 CENTRAL PROCESSING UNIT WITH: 512 KB WORKING MEMORY, (256 KB CODE, 256 KB DATA), 1. INTERFACE MPI/DP 12 MBIT/S, 2. INTERFACE PROFIBUS DP

Figure similar

| General information | |
|---|---|
| Product type designation | CPU 412-2 |
| Hardware product version | 03 |
| Firmware version | V5.3 |
| Engineering with | |
| • 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) | |
| • 24 V DC | No; Power supply via system power supply |

| Input current | |
|---|---|
| from backplane bus 5 V DC, typ. | 0.9 A |
| from backplane bus 5 V DC, max. | 1.1 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 loss** | |
| Power loss, typ. | 4.5 W |
| Power loss, max. | 5 W |
| **Memory** | |
| Type of memory | RAM |
| Work memory | |
| • integrated | 512 kbyte |
| • integrated (for program) | 256 kbyte |
| • integrated (for data) | 256 kbyte |
| • 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. | 550 µA |
| • Backup time, max. | See reference manual, module data, Chapter 3.3 |
| • 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 | |
| • present | Yes |
| • Type | SFB |
| • 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 |
| Data blocks | |
| • Number, max. | 3 000; Number range: 1 to 16000 |
| • Size, max. | 64 kbyte |
| 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 |
| — DP interface, inputs | 4 kbyte |
| — DP interface, 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 | |
|---|---|
| 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 | 2 |
| • 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 |
| • 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; Of which 10 CPs max. or IMs as DP master, 4 PROFINET controller maximum |
| 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 |
| • 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 | No; Via CP |
| Time difference in system when synchronizing via | |
| • MPI, max. | 200 ms |

| Interfaces | |
|---|---|
| Interfaces/bus type | 1 x MPI/PROFIBUS DP, 1 x PROFIBUS DP |
| Number of RS 485 interfaces | 2; Combined MPI / PROFIBUS DP and PROFIBUS DP |

| 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; 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 |
| 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 | Integrated |
| Physics | RS 485 / PROFIBUS |
| Isolated | Yes |
| Power supply to interface (15 to 30 V DC), max. | 150 mA |
| Number of connection resources | 16 |
| Functionality | |
| • PROFIBUS DP master | Yes |
| • PROFIBUS DP slave | Yes |
| DP master | |
| • Number of connections, max. | 16 |
| • Transmission rate, max. | 12 Mbit/s |
| • Number of DP slaves, max. | 64 |
| 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. | 4 kbyte |
| — Outputs, max. | 4 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 |
| • Address area, max. | 32 |
| • User data per address area, max. | 32 byte |
| — of which consistent, max. | 32 byte |
| Services | |
| — Routing | Yes |
| Transfer memory | |
| — Inputs | 244 byte |
| — Outputs | 244 byte |

| Isochronous mode | |
|---|---|
| Isochronous operation (application synchronized up to terminal) | Yes; For PROFIBUS only |
| Number of DP masters with isochronous mode | 2 |
| User data per isochronous slave, max. | 244 byte |
| Equidistance | Yes |
| 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 | 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; 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 |
| Open IE communication | |
| • ISO-on-TCP (RFC1006) | Via CP 443-1 and loadable FB |
| — Data length, max. | 1452 bytes via CP 443-1 Adv. |
| Web server | |
| • supported | No |
| 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 |
| Block related messages | 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 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, peripheral inputs, peripheral outputs |
| • 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 |

| 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 | |
|---|---|
| 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; SFC 11; per interface |
| — 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 |
| — DP_TOPOL | 1; SFC 103; per interface |
| Number of simultaneously active SFBs | |
| — 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:** 03/24/2017