# SIEMENS

**Data sheet**

SIMATIC S7-400H, CPU 412-5H, central processing unit for S7-400H and S7-400F/FH, 5 interfaces: 1x MPI/DP, 1x DP, 1x PN and 2 for sync modules, 1 MB memory (512 KB data/512 KB program)

| General information | |
|---|---|
| Product type designation | CPU 412-5H PN/DP |
| HW functional status | 1 |
| Firmware version | V6.0 |
| Product function | |
| • Isochronous mode | No |
| Engineering with | |
| • Programming package | As of STEP 7 V5.5 SP2 with HF1 |

| CiR - Configuration in RUN | |
|---|---|
| CiR synchronization time, basic load | 100 ms |
| CiR synchronization time, time per I/O byte | 0 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. | 1.6 A |
| from backplane bus 5 V DC, max. | 1.9 A |
| from backplane bus 24 V DC, max. | 150 mA; 150 mA per DP interface |

10/16/2020

🌀 PNAP

| | |
|---|---|
| from interface 5 V DC, max. | 90 mA; At each DP interface |

## Power loss
| | |
|---|---|
| Power loss, typ. | 7.5 W |

## Memory
| | |
|---|---|
| Type of memory | other |

### Work memory
| | |
|---|---|
| ● integrated | 1 Mbyte |
| ● integrated (for program) | 512 kbyte |
| ● integrated (for data) | 512 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 |
| ● expandable RAM, max. | 64 Mbyte |

### Backup
| | |
|---|---|
| ● present | Yes |
| ● with battery | Yes; all data |
| ● without battery | No |

## Battery

### Backup battery
| | |
|---|---|
| ● Backup current, typ. | 180 µA; Valid up to 40°C |
| ● Backup current, max. | 1 000 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. | 31.25 ns |
| for word operations, typ. | 31.25 ns |
| for fixed point arithmetic, typ. | 31.25 ns |
| for floating point arithmetic, typ. | 62.5 ns |

## CPU-blocks

### DB
| | |
|---|---|
| ● Number, max. | 6 000; Number range: 1 to 16000 |
| ● Size, max. | 64 kbyte |

### FB
| | |
|---|---|
| ● Number, max. | 3 000; Number range: 0 to 7999 |
| ● Size, max. | 64 kbyte |

### FC

PNAP

| | |
|---|---|
| • Number, max. | 3 000; 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 | 4; OB 10-13 |
| • Number of delay alarm OBs | 4; OB 20-23 |
| • Number of cyclic interrupt OBs | 4; OB 32-35 |
| • Number of process alarm OBs | 4; OB 40-43 |
| • Number of DPV1 alarm OBs | 3; OB 55-57 |
| • Number of startup OBs | 2; 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 |

PNAP

| | |
|---|---|
| — 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. | 8 192 byte |
| • Retentivity available | Yes |
| • Retentivity preset | MB 0 to MB 15 |
| • Number of clock memories | 8; in 1 memory byte |

#### Local data

| | |
|---|---|
| • adjustable, max. | 16 kbyte |
| • preset | 8 kbyte |

### Address area

#### I/O address area

| | |
|---|---|
| • Inputs | 8 kbyte |
| • Outputs | 8 kbyte |

#### Process image

| | |
|---|---|
| • Inputs, adjustable | 8 kbyte |
| • Outputs, adjustable | 8 kbyte |
| • Inputs, default | 256 byte |
| • Outputs, default | 256 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 | 65 536 |
| — of which central | 65 536 |
| • Outputs | 65 536 |
| — of which central | 65 536 |

#### Analog channels

| | |
|---|---|
| • Inputs | 4 096 |
| — of which central | 4 096 |
| • Outputs | 4 096 |
| — of which central | 4 096 |

### Hardware configuration

| | |
|---|---|
| Number of expansion units, max. | 21 |
| connectable OPs | 47 |

PNAP

| | |
|---|---|
| Multicomputing | No |
| **Interface modules** | |
| • Number of connectable IMs (total), max. | 6 |
| • Number of connectable IM 460s, max. | 6 |
| • Number of connectable IM 463s, max. | 4; Single mode only |
| **Number of DP masters** | |
| • integrated | 2 |
| • via CP | 10; CP 443-5 Extended |
| • Mixed mode IM + CP permitted | No |
| • via interface module | 0 |
| **Number of IO Controllers** | |
| • integrated | 1 |
| • via CP | 0 |
| **Number of operable FMs and CPs (recommended)** | |
| • FM | See manual Automation System S7-400H fault-tolerant systems. Limited by number of slots and number of connections |
| • CP, PtP | See manual Automation System S7-400H fault-tolerant systems. Limited by number of slots and number of connections |
| • PROFIBUS and Ethernet CPs | 14; Of which max. 10 CP as DP master |
| **Slots** | |
| • required slots | 2 |

| | |
|---|---|
| **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; 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 h |
| • 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 |

10/16/2020

PNAP

| | |
|---|---|
| ● on Ethernet via NTP | Yes; As client |

| Time difference in system when synchronizing via | |
|---|---|
| ● Ethernet, max. | 10 ms; Via NTP |
| ● MPI, max. | 200 ms |

## Interfaces

| | |
|---|---|
| Number of RS 485 interfaces | 2 |
| Number of other interfaces | 2; Fiber-optic interface |
| Optical interface | No |

## 1. Interface

| | |
|---|---|
| Interface type | Integrated |
| Physics | RS 485 / PROFIBUS + MPI |
| Isolated | Yes |
| Power supply to interface (15 to 30 V DC), max. | 150 mA |

### Protocols

| | |
|---|---|
| ● MPI | Yes |
| ● PROFIBUS DP master | Yes |
| ● PROFIBUS DP slave | No |

### 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 | No |
| — S7 basic communication | No |
| — S7 communication | Yes |
| — S7 communication, as client | Yes |
| — S7 communication, as server | Yes |

### PROFIBUS 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 | No |
| — S7 communication | Yes |
| — S7 communication, as client | Yes |

PNAP

| | |
|---|---|
| — S7 communication, as server | Yes |
| — Equidistance | No |
| — Isochronous mode | No |
| — SYNC/FREEZE | No |
| — Activation/deactivation of DP slaves | No |
| — Direct data exchange (slave-to-slave communication) | No |
| — 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** | |
| • Number of connections | No configuration of CPU as DP slave |

| **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 | No |
| Number of connection resources | 48 |
| **Interface types** | |
| • Number of ports | 2 |
| • integrated switch | Yes |
| **Protocols** | |
| • PROFINET IO Controller | Yes |
| • PROFINET IO Device | No |
| • PROFINET CBA | No |
| • PROFIBUS DP master | No |
| • PROFIBUS DP slave | No |
| • Open IE communication | Yes |
| • Web server | No |
| • Point-to-point connection | No |
| • Media redundancy | Yes |
| **PROFINET IO Controller** | |

PNAP

| | |
|---|---|
| • Transmission rate, max. | 100 Mbit/s |
| **Services** | |
| — PG/OP communication | Yes |
| — S7 routing | Yes |
| — S7 communication | Yes |
| — Isochronous mode | No |
| — Shared device | Yes; Single mode only |
| — Prioritized startup | No |
| — Number of connectable IO Devices, max. | 256; In redundant mode via both interfaces |
| — Number of connectable IO Devices for RT, max. | 256 |
| — of which in line, max. | 256 |
| — Activation/deactivation of IO Devices | No |
| — IO Devices changing during operation (partner ports), supported | No |
| — Device replacement without swap medium | Yes |
| — Send cycles | 250 µs, 500 µs, 1 ms, 2 ms, 4 ms |
| — Updating time | 250 µs to 512 ms, minimum value depends on the number of configured user data and the configured single or redundant mode |
| **Address area** | |
| — Inputs, max. | 8 kbyte |
| — Outputs, max. | 8 kbyte |
| — User data consistency, max. | 1 024 byte |
| **Open IE communication** | |
| • Number of connections, max. | 46 |
| • Local port numbers used at the system end | 0, 20, 21, 25, 102, 135, 161, 34962, 34963, 34964, 65532, 65533, 65534, 65535 |
| • Keep-alive function, supported | Yes |
| **3. Interface** | |
| Interface type | Integrated |
| Physics | RS 485 / PROFIBUS |
| Power supply to interface (15 to 30 V DC), max. | 150 mA |
| Number of connection resources | 16 |
| **Protocols** | |
| • PROFIBUS DP master | Yes |
| • PROFIBUS DP slave | No |
| **PROFIBUS DP master** | |
| • Number of connections, max. | 16 |
| • Transmission rate, max. | 12 Mbit/s |
| • Number of DP slaves, max. | 64 |
| **Services** | |
| — PG/OP communication | Yes |

PNAP

| | |
|---|---|
| — Routing | Yes |
| — Global data communication | No |
| — S7 basic communication | No |
| — S7 communication | Yes |
| — S7 communication, as client | Yes |
| — S7 communication, as server | Yes |
| — Equidistance | No |
| — Isochronous mode | No |
| — SYNC/FREEZE | No |
| — Activation/deactivation of DP slaves | No |
| — Direct data exchange (slave-to-slave communication) | No |
| — DPV0 | 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 |

## 4. Interface

| | |
|---|---|
| Interface type | Pluggable synchronization submodule (FO) |
| Plug-in interface modules | Synchronization modules 6ES7960-1AA06-0XA0 or 6ES7960-1AB06-0XA0 |

## 5. Interface

| | |
|---|---|
| Interface type | Pluggable synchronization submodule (FO) |
| Plug-in interface modules | Synchronization modules 6ES7960-1AA06-0XA0 or 6ES7960-1AB06-0XA0 |

## Protocols

| | |
|---|---|
| **Redundancy mode** | |
| Media redundancy | |
| — Switchover time on line break, typ. | 200 ms |
| — Number of stations in the ring, max. | 50 |
| **SIMATIC communication** | |
| • S7 routing | Yes |
| **Open IE communication** | |
| • TCP/IP | Yes; via integrated PROFINET interface and loadable FBs |
| — Number of connections, max. | 46 |

PNAP

| | |
|---|---|
| — 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 and loadable FBs |
| — Number of connections, max. | 46 |
| — Data length, max. | 32 kbyte; 1 452 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 | |
|---|---|
| • supported | No |

| Isochronous mode | |
|---|---|
| Equidistance | No |

| 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 | No |

| S7 basic communication | |
|---|---|
| • supported | No |

| 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 CP max. 10 and FC AG_SEND and FC AG_RECV) |
| • 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. | 64/64 |

| Standard communication (FMS) | |
|---|---|
| • supported | Yes; Via CP and loadable FB |

| Number of connections | |
|---|---|
| • overall | 48 |
| • usable for PG communication | |

10/16/2020

PNAP

| | |
|---|---|
| — 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 | No |
| SCAN procedure | No |
| 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. | 600 |
| • preset, max. | 300 |
| Process control messages | Yes |
| Number of archives that can log on simultaneously (SFB 37 AR_SEND) | 16 |

## Test commissioning functions

| | |
|---|---|
| Status block | Yes |
| 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 |
| Forcing | |
| • Forcing | Yes |

PNAP

| | |
|---|---|
| • Forcing, variables | Inputs/outputs, bit memories, distributed I/Os |
| • Number of variables, max. | 256 |

| Diagnostic buffer | |
|---|---|
| • present | Yes |
| • Number of entries, max. | 3 200 |
| — 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 | |
|---|---|
| — 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 |

PNAP

| | |
|---|---|
| — WRREC | 8 |
| **Know-how protection** | |
| • User program protection/password protection | Yes |
| • Block encryption | Yes; With S7 block Privacy |

| **Dimensions** | |
|---|---|
| Width | 50 mm |
| Height | 290 mm |
| Depth | 219 mm |

| **Weights** | |
|---|---|
| Weight, approx. | 995 g |

| | |
|---|---|
| **last modified:** | 10/09/2020 |

PNAP