

SIMATIC S7-400, CPU 416-2 CENTRAL PROCESSING UNIT WITH:  
2.8 MB WORKING MEMORY, (1.4 MB CODE, 1.4 MB DATA), 1.  
INTERFACE MPI/DP 12 MBIT/S, 2. INTERFACE PROFIBUS DP

### General information

Firmware version	V4.0
Engineering with	
<ul style="list-style-type: none"> <li>Programming package</li> </ul>	STEP 7 V5.2 SP1 HF3 or higher with HW update

### CiR – Configuration in RUN

CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	40 µs

### Supply voltage

Rated value (DC)	
<ul style="list-style-type: none"> <li>24 V DC</li> </ul>	Yes

### Input current

from backplane bus 5 V DC, typ.	1 A
from backplane bus 5 V DC, max.	1.2 A
from backplane bus 24 V DC, max.	Total current consumption of the components connected to the MPI/DP interfaces, but no more than 150 mA per interface

### Power loss

Power loss, typ.	4.5 W
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### Memory

Work memory	
<ul style="list-style-type: none"> <li>integrated (for program)</li> </ul>	1 400 kbyte
<ul style="list-style-type: none"> <li>integrated (for data)</li> </ul>	1 400 kbyte
<ul style="list-style-type: none"> <li>expandable</li> </ul>	No
Load memory	
<ul style="list-style-type: none"> <li>expandable FEPR0M</li> </ul>	Yes; with Memory Card (FLASH)
<ul style="list-style-type: none"> <li>expandable FEPR0M, max.</li> </ul>	64 Mbyte
<ul style="list-style-type: none"> <li>integrated RAM, max.</li> </ul>	256 kbyte
<ul style="list-style-type: none"> <li>expandable RAM</li> </ul>	Yes; with Memory Card (RAM)
<ul style="list-style-type: none"> <li>expandable RAM, max.</li> </ul>	16 Mbyte
Backup	
<ul style="list-style-type: none"> <li>present</li> </ul>	Yes
<ul style="list-style-type: none"> <li>with battery</li> </ul>	Yes; all data
<ul style="list-style-type: none"> <li>without battery</li> </ul>	No

## Battery

### Backup battery

- |   |                   |
|---|-------------------|
| • Backup current, typ.                      | 550 $\mu$ A       |
| • Backup current, max.                      | 1 539 $\mu$ A     |
| • Backup time, max.                         | 144 d             |
| • Feeding of external backup voltage to CPU | 5 V DC to 15 V DC |

## CPU processing times

- |                                     |              |
|-------------------------------------|--------------|
| for bit operations, typ.            | 0.04 $\mu$ s |
| for word operations, typ.           | 0.04 $\mu$ s |
| for fixed point arithmetic, typ.    | 0.04 $\mu$ s |
| for floating point arithmetic, typ. | 0.12 $\mu$ s |

## CPU-blocks

### DB

- |                |                      |
|----------------|----------------------|
| • Number, max. | 4 095; DB 0 reserved |
| • Size, max.   | 64 kbyte             |

### FB

- |                |          |
|----------------|----------|
| • Number, max. | 2 048    |
| • Size, max.   | 64 kbyte |

### FC

- |                |          |
|----------------|----------|
| • Number, max. | 2 048    |
| • Size, max.   | 64 kbyte |

### OB

- |                                  |                      |
|----------------------------------|----------------------|
| • Number, max.                   | see instruction list |
| • Size, max.                     | 64 kbyte             |
| • Number of time alarm OBs       | 8                    |
| • Number of delay alarm OBs      | 4                    |
| • Number of cyclic interrupt OBs | 9                    |
| • Number of process alarm OBs    | 8                    |
| • Number of multicomputing OBs   | 1                    |

### Nesting depth

- |                                 |    |
|---------------------------------|----|
| • per priority class            | 24 |
| • additional within an error OB | 2  |

## 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 |

<b>Counting range</b>	
— lower limit	0
— upper limit	999
<b>IEC counter</b>	
• present	Yes
• Type	SFB
<b>S7 times</b>	
• Number	2 048
<b>Retentivity</b>	
— adjustable	Yes
— lower limit	0
— upper limit	2 047
— preset	No times retentive
<b>Time range</b>	
— lower limit	10 ms
— upper limit	9 990 s
<b>IEC timer</b>	
• present	Yes
• Type	SFB
<b>Data areas and their retentivity</b>	
retentive data area in total	Total working and load memory (with backup battery)
<b>Flag</b>	
• Number, max.	16 kbyte
• Retentivity available	Yes; MB 0 to MB 16383
• Retentivity preset	MB 0 to MB 15
• Number of clock memories	8; 1 memory byte
<b>Data blocks</b>	
• Number, max.	4 095; DB 0 reserved
• Size, max.	64 kbyte
<b>Local data</b>	
• adjustable, max.	32 kbyte
• preset	16 kbyte
<b>Address area</b>	
<b>I/O address area</b>	
• Inputs	16 kbyte
• Outputs	16 kbyte
<b>of which distributed</b>	
— MPI/DP interface, inputs	2 kbyte
— MPI/DP interface, outputs	2 kbyte

— DP interface, inputs	8 kbyte; for each line that is operated in isochronous mode, i.e. to which an OB61 to 62 has been assigned, the distributed IO address areas are halved
— DP interface, outputs	8 kbyte; for each line that is operated in isochronous mode, i.e. to which an OB61 to 62 has been assigned, the distributed IO address areas are halved
<b>Process image</b>	
• Inputs, adjustable	16 kbyte
• Outputs, adjustable	16 kbyte
• Inputs, default	512 byte
• Outputs, default	512 byte
• consistent data, max.	244 byte
• Access to consistent data in process image	Yes
<b>Subprocess images</b>	
• Number of subprocess images, max.	15
<b>Digital channels</b>	
• Inputs	131 072
— of which central	131 072
• Outputs	131 072
— of which central	131 072
<b>Analog channels</b>	
• Inputs	8 192
— of which central	8 192
• Outputs	8 192
— of which central	8 192
<b>Hardware configuration</b>	
Number of expansion units, max.	21; of which 6 ER with K-bus
connectable OPs	63 without message processing, 12 with message processing
Multicomputing	Yes; 4 CPUs max. (with UR1 or UR2)
<b>Interface modules</b>	
• Number of connectable IMs (total), max.	6
• Number of connectable IM 460s, max.	6
• Number of connectable IM 463s, max.	4; IM 463-2
<b>Number of DP masters</b>	
• integrated	2
• via CP	10; CP 443-5 Extended
• via IM 467	4
• Mixed mode IM + CP permitted	No; IM 467 cannot be used jointly with CP 443-5 Ext.
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
<b>Number of operable FMs and CPs (recommended)</b>	
• FM	Limited by number of slots and number of connections

- CP, PtP
- CP, LAN
- PROFIBUS and Ethernet CPs

CP 440: Limited by number of slots; CP 441: limited by number of connections

Limited by number of slots and number of connections

14; incl. CP 443-5 Ext. and IM 467

#### 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 on
- Deviation per day (unbuffered), max. 8.6 s; Power off

##### Operating hours counter

- Number 8
- Number/Number range 0 to 7
- Range of values 0 to 32767 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

#### 1. 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 MPI: 44, DP: 32

##### Functionality

- MPI Yes
- PROFIBUS DP master Yes
- PROFIBUS DP slave Yes

##### MPI

- Number of connections 44
- Transmission rate, max. 12 Mbit/s

##### Services

— PG/OP communication	Yes
— Routing	Yes
— Global data communication	Yes
— S7 basic communication	Yes
— S7 communication	Yes
<b>DP master</b>	
• Number of connections, max.	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
• Number of DP slaves, max.	32
<b>Services</b>	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	Yes
— S7 basic communication	Yes
— S7 communication	Yes
— Equidistance	Yes
— SYNC/FREEZE	Yes
— Activation/deactivation of DP slaves	Yes
— Direct data exchange (slave-to-slave communication)	Yes
<b>Address area</b>	
— Inputs, max.	2 kbyte
— Outputs, max.	2 kbyte
<b>User data per DP slave</b>	
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
<b>DP slave</b>	
• GSD file	<a href="http://www.ad.siemens.de/csi_e/gsd">http://www.ad.siemens.de/csi_e/gsd</a>
• Transmission rate, max.	12 Mbit/s
• Address area, max.	32
• User data per address area, max.	32 byte
— of which consistent, max.	32 byte
<b>Services</b>	
— PG/OP communication	Yes
— Routing	Yes
<b>Transfer memory</b>	
— 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	32
<b>Functionality</b>	
• PROFIBUS DP master	Yes
• PROFIBUS DP slave	Yes
<b>DP master</b>	
• Number of connections, max.	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
• Number of DP slaves, max.	125
<b>Services</b>	
— PG/OP communication	Yes
— Routing	Yes
— Global data communication	Yes
— S7 basic communication	Yes
— S7 communication	Yes
— Equidistance	Yes
— SYNC/FREEZE	Yes
— Activation/deactivation of DP slaves	Yes
— Direct data exchange (slave-to-slave communication)	Yes
<b>Address area</b>	
— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
<b>User data per DP slave</b>	
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
<b>DP slave</b>	
• GSD file	<a href="http://www.ad.siemens.de/csi_e/gsd">http://www.ad.siemens.de/csi_e/gsd</a>
• Transmission rate, max.	12 Mbit/s
• Address area, max.	32
• User data per address area, max.	32 byte
— of which consistent, max.	32 byte
<b>Services</b>	
— Routing	Yes
<b>Transfer memory</b>	

— Inputs	244 byte
— Outputs	244 byte

### Isochronous mode

Isochronous operation (application synchronized up to terminal)	Yes
User data per isochronous slave, max.	244 byte
Equidistance	Yes
shortest clock pulse	1 ms
max. cycle	32 ms

### Communication functions

PG/OP communication	Yes
<ul style="list-style-type: none"> <li>• Number of connectable OPs without message processing</li> </ul>	63
<ul style="list-style-type: none"> <li>• Number of connectable OPs with message processing</li> </ul>	12
<b>Global data communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Number of GD loops, max.</li> </ul>	16
<ul style="list-style-type: none"> <li>• Number of GD packets, transmitter, max.</li> </ul>	16
<ul style="list-style-type: none"> <li>• Number of GD packets, receiver, max.</li> </ul>	32
<ul style="list-style-type: none"> <li>• Size of GD packets, max.</li> </ul>	64 byte
<ul style="list-style-type: none"> <li>• Size of GD packet (of which consistent), max.</li> </ul>	1 variable
<b>S7 basic communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes; in MPI mode via: SFC X_SEND, X_RCV, X_GET and X_PUT; in DP master mode via: SFC I_GET and I_PUT
<ul style="list-style-type: none"> <li>• User data per job, max.</li> </ul>	76 byte
<ul style="list-style-type: none"> <li>• User data per job (of which consistent), max.</li> </ul>	1 variable
<b>S7 communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• as server</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• as client</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• User data per job, max.</li> </ul>	64 kbyte
<ul style="list-style-type: none"> <li>• User data per job (of which consistent), max.</li> </ul>	462 byte; 1 variable
<b>S5 compatible communication</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes; Via FC AG_SEND and AG_RECV, max. via 10 CP 443-1 or 443-5
<ul style="list-style-type: none"> <li>• User data per job, max.</li> </ul>	8 kbyte
<ul style="list-style-type: none"> <li>• User data per job (of which consistent), max.</li> </ul>	240 byte
<b>Standard communication (FMS)</b>	
<ul style="list-style-type: none"> <li>• supported</li> </ul>	Yes; Via CP and loadable FB
<b>Number of connections</b>	
<ul style="list-style-type: none"> <li>• overall</li> </ul>	64



- usable for PG communication
  - reserved for PG communication
- usable for OP communication
  - reserved for OP communication

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### S7 message functions

Number of login stations for message functions, max.	12
Symbol-related messages	Yes
Block related messages	Yes
simultaneously active Alarm-S blocks, max.	200; ALARM_S/SQ blocks or ALARM_D/DQ blocks
Alarm 8-blocks	Yes
<ul style="list-style-type: none"> <li>• Number of instances for alarm 8 and S7 communication blocks, max.</li> </ul>	1 800
<ul style="list-style-type: none"> <li>• preset, max.</li> </ul>	600
Process control messages	Yes
Number of archives that can log on simultaneously (SFB 37 AR_SEND)	32
<b>Number of messages</b>	
<ul style="list-style-type: none"> <li>• overall, max.</li> </ul>	1 024
<ul style="list-style-type: none"> <li>• in 100 ms grid, max.</li> </ul>	128
<ul style="list-style-type: none"> <li>• in 500 ms grid, max.</li> </ul>	512
<ul style="list-style-type: none"> <li>• in 1000 ms grid, max.</li> </ul>	1 024
<b>Number of additional values</b>	
<ul style="list-style-type: none"> <li>• with 100 ms grid, max.</li> </ul>	1
<ul style="list-style-type: none"> <li>• with 500, 1000 ms grid, max.</li> </ul>	10

### Test commissioning functions

Status block	Yes
Single step	Yes
Number of breakpoints	4
<b>Status/control</b>	
<ul style="list-style-type: none"> <li>• Status/control variable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Variables</li> </ul>	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
<ul style="list-style-type: none"> <li>• Number of variables, max.</li> </ul>	70
<b>Forcing</b>	
<ul style="list-style-type: none"> <li>• Forcing</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Forcing, variables</li> </ul>	Inputs/outputs, bit memories, distributed I/Os
<ul style="list-style-type: none"> <li>• Number of variables, max.</li> </ul>	512
<b>Diagnostic buffer</b>	
<ul style="list-style-type: none"> <li>• present</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Number of entries, max.</li> </ul>	3 200
<ul style="list-style-type: none"> <li>— adjustable</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— preset</li> </ul>	120

Configuration	
Configuration software	
• STEP 7	Yes
Programming	
• Command set	see instruction list
• Nesting levels	8
• 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	4
— RD_REC	8
— WR_REC	8
— WR_PARM	8
— PARM_MOD	1
— WR_DPARM	2
— DPNRM_DG	8
— RDSYSST	8; 1 to 8
— DP_TOPOL	1
Number of simultaneously active SFBs	
— RDREC	8
— WRREC	8
Know-how protection	
• User program protection/password protection	Yes
Dimensions	
Width	25 mm
Height	290 mm
Depth	219 mm
Weights	
Weight, approx.	720 g

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