



SIMATIC S7-400, CPU 416F-2, Central processing unit with: Work memory 8 MB, (4 MB code, 4 MB data), 1st interface MPI/DP 12 Mbit/s, 2nd interface PROFIBUS DP,

General information	
Product type designation	CPU 416F-2
HW functional status	01
Firmware version	V7.0
Product function	
<ul style="list-style-type: none"> <li>• Isochronous mode</li> </ul>	Yes; For PROFIBUS only
Engineering with	
<ul style="list-style-type: none"> <li>• Programming package</li> </ul>	STEP 7 V5.4 or higher with HSP 261
CiR - Configuration in RUN	
CiR synchronization time, basic load	100 ms
CiR synchronization time, time per I/O byte	10 µs
Supply voltage	
Rated value (DC)	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.	5.5 W
Memory	
Type of memory	RAM
Work memory	
<ul style="list-style-type: none"> <li>• integrated</li> <li>• integrated (for program)</li> <li>• integrated (for data)</li> <li>• expandable</li> </ul>	8 Mbyte 4 Mbyte 4 Mbyte No
Load memory	
<ul style="list-style-type: none"> <li>• expandable FEPRM</li> <li>• expandable FEPRM, max.</li> <li>• integrated RAM, max.</li> <li>• expandable RAM</li> <li>• expandable RAM, max.</li> </ul>	Yes; with Memory Card (FLASH) 64 Mbyte 1 Mbyte Yes; with Memory Card (RAM) 64 Mbyte
Backup	
<ul style="list-style-type: none"> <li>• present</li> <li>• with battery</li> <li>• without battery</li> </ul>	Yes Yes; all data No
Battery	

<b>Backup battery</b>	
<ul style="list-style-type: none"> <li>• Backup current, typ.</li> <li>• Backup current, max.</li> <li>• Backup time, max.</li> </ul>	180 µA; up to 40 °C 850 µA Dealt with in the module data manual with the secondary conditions and the factors of influence
<ul style="list-style-type: none"> <li>• Feeding of external backup voltage to CPU</li> </ul>	5 V DC to 15 V DC
<b>CPU processing times</b>	
for bit operations, typ.	12.5 ns
for word operations, typ.	12.5 ns
for fixed point arithmetic, typ.	12.5 ns
for floating point arithmetic, typ.	25 ns
<b>CPU-blocks</b>	
<b>DB</b>	
<ul style="list-style-type: none"> <li>• Number, max.</li> <li>• Size, max.</li> </ul>	10 000; Number range: 1 to 16000 64 kbyte
<b>FB</b>	
<ul style="list-style-type: none"> <li>• Number, max.</li> <li>• Size, max.</li> </ul>	5 000; Number range: 0 to 7999 64 kbyte
<b>FC</b>	
<ul style="list-style-type: none"> <li>• Number, max.</li> <li>• Size, max.</li> </ul>	5 000; Number range: 0 to 7999 64 kbyte
<b>OB</b>	
<ul style="list-style-type: none"> <li>• Number, max.</li> <li>• Size, max.</li> <li>• Number of free cycle OBs</li> <li>• Number of time alarm OBs</li> <li>• Number of delay alarm OBs</li> <li>• Number of cyclic interrupt OBs</li> <li>• Number of process alarm OBs</li> <li>• Number of DPV1 alarm OBs</li> <li>• Number of isochronous mode OBs</li> <li>• Number of multicomputing OBs</li> <li>• Number of background OBs</li> <li>• Number of startup OBs</li> <li>• Number of asynchronous error OBs</li> <li>• Number of synchronous error OBs</li> </ul>	see instruction list 64 kbyte 1; OB 1 8; OB 10-17 4; OB 20-23 9; OB 30-38 (shortest cycle that can be set = 500 µs) 8; OB 40-47 3; OB 55-57 4; OB 61-64 1; OB 60 1; OB 90 2; OB 100, 102 9; OB 80-88 2; OB 121, 122
<b>Nesting depth</b>	
<ul style="list-style-type: none"> <li>• per priority class</li> <li>• additional within an error OB</li> </ul>	24 2
<b>Counters, timers and their retentivity</b>	
<b>S7 counter</b>	
<ul style="list-style-type: none"> <li>• Number</li> </ul>	2 048
<b>Retentivity</b>	
<ul style="list-style-type: none"> <li>— adjustable</li> <li>— lower limit</li> <li>— upper limit</li> <li>— preset</li> </ul>	Yes 0 2 047 Z 0 to Z 7
<b>Counting range</b>	
<ul style="list-style-type: none"> <li>— lower limit</li> <li>— upper limit</li> </ul>	0 999
<b>IEC counter</b>	
<ul style="list-style-type: none"> <li>• present</li> <li>• Type</li> <li>• Number</li> </ul>	Yes SFB Unlimited (limited only by RAM capacity)
<b>S7 times</b>	
<ul style="list-style-type: none"> <li>• Number</li> </ul>	2 048
<b>Retentivity</b>	
<ul style="list-style-type: none"> <li>— adjustable</li> <li>— lower limit</li> <li>— upper limit</li> </ul>	Yes 0 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
• Number	Unlimited (limited only by RAM capacity)
<b>Data areas and their retentivity</b>	
Retentive data area (incl. timers, counters, flags), max.	Total working and load memory (with backup battery)
<b>Flag</b>	
• Size, max.	16 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
<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>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
connectable OPs	95
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. or CP 443-1 in PROFINET IO mode
• via interface module	0
• Number of pluggable S5 modules (via adapter capsule in central device), max.	6
<b>Number of IO Controllers</b>	
• integrated	0

<ul style="list-style-type: none"> <li>• via CP</li> </ul>	4; Max. 4 in the central controller; no mixed operation of different CP 443-1 types in PROFINET IO mode
<b>Number of operable FMs and CPs (recommended)</b>	
<ul style="list-style-type: none"> <li>• FM</li> <li>• CP, PtP</li> <li>• PROFIBUS and Ethernet CPs</li> </ul>	<p>Limited by number of slots and number of connections</p> <p>CP 440: Limited by number of slots; CP 441: limited by number of connections</p> <p>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</p>
<b>Slots</b>	
<ul style="list-style-type: none"> <li>• required slots</li> </ul>	1
<b>Time of day</b>	
<b>Clock</b>	
<ul style="list-style-type: none"> <li>• Hardware clock (real-time)</li> <li>• retentive and synchronizable</li> <li>• Resolution</li> <li>• Deviation per day (buffered), max.</li> <li>• Deviation per day (unbuffered), max.</li> </ul>	<p>Yes</p> <p>Yes</p> <p>1 ms</p> <p>1.7 s; Power off</p> <p>8.6 s; For power On</p>
<b>Operating hours counter</b>	
<ul style="list-style-type: none"> <li>• Number</li> <li>• Number/Number range</li> <li>• Range of values</li> <li>• Granularity</li> <li>• retentive</li> </ul>	<p>16</p> <p>0 to 15</p> <p>SFCs 2, 3 and 4: 0 to 32767 hours SFC 101: 0 to 2<sup>31</sup> - 1 hours</p> <p>1 h</p> <p>Yes</p>
<b>Clock synchronization</b>	
<ul style="list-style-type: none"> <li>• supported</li> <li>• to MPI, master</li> <li>• to MPI, slave</li> <li>• to DP, master</li> <li>• to DP, slave</li> <li>• in AS, master</li> <li>• in AS, slave</li> <li>• on Ethernet via NTP</li> <li>• to IF 964 DP</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>No; Via CP</p> <p>No</p>
<b>Time difference in system when synchronizing via</b>	
<ul style="list-style-type: none"> <li>• MPI, max.</li> </ul>	200 ms
<b>Interfaces</b>	
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
<b>1. Interface</b>	
Interface type	MPI/PROFIBUS DP
Isolated	Yes
<b>Interface types</b>	
<ul style="list-style-type: none"> <li>• RS 485</li> <li>• Output current of the interface, max.</li> </ul>	<p>Yes</p> <p>150 mA</p>
<b>Protocols</b>	
<ul style="list-style-type: none"> <li>• MPI</li> <li>• PROFIBUS DP master</li> <li>• PROFIBUS DP slave</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p>
<b>MPI</b>	
<ul style="list-style-type: none"> <li>• Number of connections</li> <li>• Transmission rate, max.</li> </ul>	<p>44; If a diagnostics repeater is used on the line, the number of connection resources on the line is reduced by 1</p> <p>12 Mbit/s</p>
<b>Services</b>	
<ul style="list-style-type: none"> <li>— PG/OP communication</li> <li>— Routing</li> <li>— Global data communication</li> <li>— S7 basic communication</li> <li>— S7 communication</li> <li>— S7 communication, as client</li> <li>— S7 communication, as server</li> </ul>	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>

PROFIBUS DP master	
<ul style="list-style-type: none"> <li>• Number of connections, max.</li> </ul>	32; 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"> <li>• Transmission rate, max.</li> </ul>	12 Mbit/s
<ul style="list-style-type: none"> <li>• Number of DP slaves, max.</li> </ul>	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"> <li>• Number of connections</li> </ul>	32
<ul style="list-style-type: none"> <li>• GSD file</li> </ul>	<a href="http://support.automation.siemens.com/WWW/view/en/113652">http://support.automation.siemens.com/WWW/view/en/113652</a>
<ul style="list-style-type: none"> <li>• Transmission rate, max.</li> </ul>	12 Mbit/s
<ul style="list-style-type: none"> <li>• automatic baud rate search</li> </ul>	No
<ul style="list-style-type: none"> <li>• Address area, max.</li> </ul>	32; Virtual slots
<ul style="list-style-type: none"> <li>• User data per address area, max.</li> </ul>	32 byte
<ul style="list-style-type: none"> <li>— of which consistent, max.</li> </ul>	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
2. Interface	
Interface type	PROFIBUS DP
Isolated	Yes
Number of connection resources	32
Interface types	
<ul style="list-style-type: none"> <li>• RS 485</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• Output current of the interface, max.</li> </ul>	150 mA
Protocols	
<ul style="list-style-type: none"> <li>• PROFIBUS DP master</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• PROFIBUS DP slave</li> </ul>	Yes

<b>PROFIBUS DP master</b>	
• Number of connections, max.	32
• Transmission rate, max.	12 Mbit/s
• Number of DP slaves, max.	125
<b>Services</b>	
— 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
<b>Address area</b>	
— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
<b>User data per DP slave</b>	
— User data per DP slave, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
<b>PROFIBUS DP slave</b>	
• Number of connections	32
• GSD file	<a href="http://support.automation.siemens.com/WW/view/en/113652">http://support.automation.siemens.com/WW/view/en/113652</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; with interface active
<b>Transfer memory</b>	
— Inputs	244 byte
— Outputs	244 byte
<b>Protocols</b>	
<b>SIMATIC communication</b>	
• S7 routing	Yes
<b>Open IE communication</b>	
• ISO-on-TCP (RFC1006)	Via CP 443-1 and loadable FB
— Data length, max.	1 452 bytes via CP 443-1 Adv.
<b>Web server</b>	
• supported	No
<b>Isochronous mode</b>	
Equidistance	Yes
Number of DP masters with isochronous mode	2
User data per isochronous slave, max.	244 byte
shortest clock pulse	1 ms; 0.5 ms without use of SFC 126, 127
max. cycle	32 ms
<b>communication functions / header</b>	
PG/OP communication	Yes
• Number of connectable OPs without message processing	95
• Number of connectable OPs with message processing	95; When using Alarm_S/SQ and Alarm_D/DQ

Data record routing	Yes
<b>Global data communication</b>	
• supported	Yes
• Number of GD loops, max.	16
• Number of GD packets, transmitter, max.	16
• Number of GD packets, receiver, max.	32
• Size of GD packets, max.	54 byte
• Size of GD packet (of which consistent), max.	1 variable
<b>S7 basic communication</b>	
• supported	Yes
• User data per job, max.	76 byte
• User data per job (of which consistent), max.	1 variable
<b>S7 communication</b>	
• 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
<b>S5 compatible communication</b>	
• 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.	64/64
<b>Standard communication (FMS)</b>	
• supported	Yes; Via CP and loadable FB
<b>Number of connections</b>	
• overall	96
• usable for PG communication	95
— reserved for PG communication	1
— adjustable for PG communication, max.	0
• usable for OP communication	95
— reserved for OP communication	1
— adjustable for OP communication, max.	0
• usable for S7 basic communication	94
— reserved for S7 basic communication	0
— adjustable for S7 basic communication, max.	0
• usable for S7 communication	94
— reserved for S7 communication	0
— adjustable for S7 communication, max.	0
• usable for routing	47
— reserved for routing	0
— adjustable for routing, max.	0
<b>S7 message functions</b>	
Number of login stations for message functions, max.	95; Max. 95 with Alarm_S/SQ and Alarm_D/DQ (OPs); max. 16 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.	1 000; 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.	4 000
• preset, max.	600
Process control messages	Yes
Number of archives that can log on simultaneously (SFB 37 AR_SEND)	32
<b>Number of messages</b>	
• overall, max.	1 024
• in 100 ms grid, max.	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
<b>Test commissioning functions</b>	
Status block	Yes; Up to 16 simultaneously
Single step	Yes
Number of breakpoints	16
<b>Status/control</b>	
<ul style="list-style-type: none"> <li>• Status/control variable</li> </ul>	Yes; Up to 16 variable tables
<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; Status/control
<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, peripheral inputs, peripheral outputs
<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
<b>Service data</b>	
<ul style="list-style-type: none"> <li>• can be read out</li> </ul>	Yes
<b>Standards, approvals, certificates</b>	
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
<b>Use in hazardous areas</b>	
<ul style="list-style-type: none"> <li>• ATEX</li> </ul>	ATEX II 3G Ex nA IIC T4 Gc
<b>Ambient conditions</b>	
<b>Ambient temperature during operation</b>	
<ul style="list-style-type: none"> <li>• min.</li> </ul>	0 °C
<ul style="list-style-type: none"> <li>• max.</li> </ul>	60 °C
<b>configuration / header</b>	
<b>Configuration software</b>	
<ul style="list-style-type: none"> <li>• STEP 7</li> </ul>	Yes
<b>configuration / programming / header</b>	
<ul style="list-style-type: none"> <li>• Command set</li> </ul>	see instruction list
<ul style="list-style-type: none"> <li>• Nesting levels</li> </ul>	7
<ul style="list-style-type: none"> <li>• Access to consistent data in process image</li> </ul>	Yes
<ul style="list-style-type: none"> <li>• System functions (SFC)</li> </ul>	see instruction list
<ul style="list-style-type: none"> <li>• System function blocks (SFB)</li> </ul>	see instruction list
<b>Programming language</b>	
<ul style="list-style-type: none"> <li>— LAD</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— FBD</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— STL</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— SCL</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— CFC</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— GRAPH</li> </ul>	Yes
<ul style="list-style-type: none"> <li>— HiGraph®</li> </ul>	Yes
<b>configuration / programming / number of simultaneously active SFC / header</b>	
<ul style="list-style-type: none"> <li>— number of simultaneously active system functions (SFC) / with DPSYC_FR</li> </ul>	2; SFC 11; per interface
<ul style="list-style-type: none"> <li>— number of simultaneously active system</li> </ul>	8; SFC 12; per interface



functions (SFC) / with D_ACT_DP	
— 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
• Block encryption	Yes; With S7 block Privacy
<b>Dimensions</b>	
Width	25 mm
Height	290 mm
Depth	219 mm
<b>Weights</b>	
Weight, approx.	700 g
<b>last modified:</b>	4/1/2022 