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Data sheet 6ES7416-2FN05-0AB0



Figure similar

********** Replacement part ********* SIMATIC S7-400, CPU 416F-2, Central processing unit with: work memory 5.6 MB, (2.8 MB code, 2.8 MB data), 1st interface MPI/DP 12 Mbit/s, 2nd interface PROFIBUS DP Can be used with software package Distributed Safety as of V5.2+SP2

General information	
Product type designation	CPU 416F-2
HW functional status	03
Firmware version	V5.3
Product function	
● Isochronous mode	Yes; For PROFIBUS only
Engineering with	
● Programming package	STEP 7 V5.3 SP2 or higher with hardware update, Distributed Safety V5.2 SP2 or higher
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
Storage	
Type of memory	other
Work memory	
● integrated	5.6 Mbyte
● integrated (for program)	2.8 Mbyte
● integrated (for data)	2.8 Mbyte
● expandable	No
Load memory	
● expandable FEPROM	Yes; with Memory Card (FLASH)
● expandable FEPROM, max.	64 Mbyte
● integrated RAM, max.	1 Mbyte
● expandable RAM	Yes; with Memory Card (RAM)
● expandable RAM, max.	64 Mbyte
Backup	
● present	Yes
● with battery	Yes; all data
● without battery	No

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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.	30 ns
for word operations, typ.	30 ns
for fixed point arithmetic, typ.	30 ns
for floating point arithmetic, typ.	90 ns
CPU-blocks	
DB	
● Number, max.	10 000; Number range: 1 to 16000
● Size, max.	64 kbyte
FB	
● Number, max.	5 000; Number range: 0 to 7999
● Size, max.	64 kbyte
FC	
● Number, max.	5 000; 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	8; OB 10-17
● Number of delay alarm OBs	4; OB 20-23
● Number of cyclic interrupt OBs	9; OB 30-38 (shortest cycle that can be set = 500 µs)
● Number of process alarm OBs	8; OB 40-47
● Number of DPV1 alarm OBs	3; OB 55-57
● Number of isochronous mode OBs	4; OB 61-64
● Number of multicomputing OBs	1; OB 60
● Number of background OBs	1; OB 90
● 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	2
Counters, timers and their retentivity	
S7 counter	
● Number	2 048
Retentivity	
— adjustable	Yes
— 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 timer	
● Number	2 048
Retentivity	
— adjustable	Yes
— preset	No times retentive
Time range	
— lower limit	10 ms

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— 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 (incl. timers, counters, flags), max.	Total working and load memory (with backup battery)
Flag	
● 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
Local data	
● adjustable, max.	32 kbyte
● preset	16 kbyte
Address area	
I/O address area	
● Inputs	16 kbyte
● Outputs	16 kbyte
Process image	
● 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
Subprocess images	
● Number of subprocess images, max.	15
Digital channels	
● Inputs	131 072
— of which central	131 072
● Outputs	131 072
— of which central	131 072
Analog channels	
● Inputs	8 192
— of which central	8 192
● Outputs	8 192
— of which central	8 192
Hardware configuration	
Number of expansion units, max.	21
connectable OPs	63
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)	

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● 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 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 h
● retentive	Yes
Clock synchronization	
● supported	Yes
● to MPI, master	Yes
● on MPI, device	Yes
● to DP, master	Yes
● on DP, device	Yes
● in AS, master	Yes
● in AS, device	Yes
● on Ethernet via NTP	No; Via CP
● to IF 964 DP	No
Time difference in system when synchronizing via	
● MPI, max.	200 ms
Interfaces	
Number of RS 485 interfaces	2; Combined MPI / PROFIBUS DP and PROFIBUS DP
Optical interface	No
1. Interface	
Interface type	MPI/PROFIBUS DP
Isolated	Yes
Interface types	
● RS 485	Yes
● Output current of the interface, max.	150 mA
Protocols	
● MPI	Yes
● PROFIBUS DP master	Yes
● PROFIBUS DP device	Yes
MPI	
● Number of connections	44; 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
PROFIBUS DP master	
● 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

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● max. number of DP devices	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 devices	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 device	
— user data per DP device, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
PROFIBUS DP device	
● Number of connections	32
● 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
— 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
Interface types	
● RS 485	Yes
● Output current of the interface, max.	150 mA
Protocols	
● PROFIBUS DP master	Yes
● PROFIBUS DP device	Yes
PROFIBUS DP master	
● Number of connections, max.	32
● Transmission rate, max.	12 Mbit/s

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● max. number of DP devices	125
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 devices	Yes
— Direct data exchange (slave-to-slave communication)	Yes
— DPV1	Yes
Address area	
— Inputs, max.	8 kbyte
— Outputs, max.	8 kbyte
User data per DP device	
— user data per DP device, max.	244 byte
— Inputs, max.	244 byte
— Outputs, max.	244 byte
— Slots, max.	244
— per slot, max.	128 byte
PROFIBUS DP device	
● Number of connections	32
● 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; with interface active
Transfer memory	
— Inputs	244 byte
— Outputs	244 byte
Protocols	
SIMATIC communication	
● S7 routing	Yes
Open IE communication	
● ISO-on-TCP (RFC1006)	Via CP 443-1 and loadable FB
— Data length, max.	1 452 bytes via CP 443-1 Adv.
Web server	
● supported	No
Isochronous mode	
Equidistance	Yes
Number of DP masters with isochronous mode	2
payload per isochronous device, max.	244 byte
shortest clock pulse	1 ms; 0.5 ms without use of SFC 126, 127
max. cycle	32 ms
Communication functions	
PG/OP communication	Yes
● Number of connectable OPs with message processing	63; When using Alarm_S/SQ and Alarm_D/DQ
● Number of connectable OPs without message processing	63
Data record routing	Yes
Global data communication	
● supported	Yes
● Number of GD loops, max.	16

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● 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
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.	64/64
Standard communication (FMS)	
● supported	Yes; Via CP and loadable FB
Number of connections	
● overall	64
● usable for PG communication	63
— reserved for PG communication	1
— adjustable for PG communication, max.	0
● usable for OP communication	63
— reserved for OP communication	1
— adjustable for OP communication, max.	0
● usable for S7 basic communication	62
— reserved for S7 basic communication	0
— adjustable for S7 basic communication, max.	0
● usable for S7 communication	62
— reserved for S7 communication	0
— adjustable for S7 communication, max.	0
● usable for routing	31
— reserved for routing	0
— adjustable for routing, max.	0
S7 message functions	
Number of login stations for message functions, max.	63; Max. 63 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.	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
Number of messages	
● overall, max.	1 024
● in 100 ms grid, max.	128
● in 500 ms grid, max.	512
● in 1000 ms grid, max.	1 024
Number of additional values	

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● with 100 ms grid, max.	1
● with 500, 1000 ms grid, max.	10
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.	512
Diagnostic buffer	
● present	Yes
● Number of entries, max.	3 200
— can be set	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 marking	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

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— 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

Classifications

	Version	Classification
eClass	16	27-24-22-07
eClass	14	27-24-22-07
eClass	12	27-24-22-07
eClass	9.1	27-24-22-07
eClass	9	27-24-22-07
eClass	8	27-24-22-07
eClass	7.1	27-24-22-07
eClass	6	27-24-22-07
ETIM	10	EC000236
ETIM	9	EC000236
ETIM	8	EC000236
ETIM	7	EC000236
IDEA	4	3565
UNSPSC	15	32-15-17-05

Approvals / Certificates

General Product Approval

Miscellaneous

General Product Approval | **EMV** | **For use in hazardous locations**

China RoHS | Miscellaneous | Manufacturer Declaration

For use in hazardous locations | **Functional Saftey**

FM | Type Examination Certificate | TUEV

Functional Saftey | **Maritime application**

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Type Examination Certificate					

Maritime application

CCS (China Classification Society)	

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