

SIMATIC S7-1500F, CPU 1516F-3 PN/DP, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 1,5 MB FOR PROGRAM AND 5 MB FOR DATA, 1. INTERFACE: PROFINET IRT WITH 2 PORT SWITCH, 2. INTERFACE: PROFINET RT, 3. INTERFACE: PROFIBUS, 10 NS BIT-PERFORMANCE, SIMATIC MEMORY CARD NECESSARY



Figure similar

General information	
Product type designation	CPU 1516F-3 PN/DP
HW functional status	FS01
Firmware version	V1.8
Engineering with	
<ul style="list-style-type: none"> STEP 7 TIA Portal configurable/integrated as of version 	V13 SP1 Update 4
Display	
Screen diagonal (cm)	6.1 cm
Control elements	
Number of keys	6
Mode selector switch	1
Supply voltage	
Type of supply voltage	24 V DC
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V

Reverse polarity protection	Yes
Mains buffering	
• Mains/voltage failure stored energy time	5 ms
Input current	
Current consumption (rated value)	0.85 A
Inrush current, max.	2.4 A; Rated value
I^2t	0.02 A ² ·s
Power	
Power consumption from the backplane bus (balanced)	6.7 W
Infeed power to the backplane bus	12 W
Power loss	
Power loss, typ.	7 W
Memory	
SIMATIC memory card required	Yes
Work memory	
• integrated (for program)	1.5 Mbyte
• integrated (for data)	5 Mbyte
Load memory	
• Plug-in (SIMATIC Memory Card), max.	32 Gbyte
Backup	
• maintenance-free	Yes
CPU processing times	
for bit operations, typ.	10 ns
for word operations, typ.	12 ns
for fixed point arithmetic, typ.	16 ns
for floating point arithmetic, typ.	64 ns
CPU-blocks	
Number of elements (total)	6 000; Blocks (OB, FB, FC, DB) and UDTs
DB	
• Number range	1 ... 60 999; subdivided into: number range that can be used by the user: 1 ... 59 999, and number range of DBs created via SFC 86: 60 000 ... 60 999
• Size, max.	5 Mbyte; For non-optimized block accesses, the max. size of the DB is 64 KB
FB	
• Number range	0 ... 65 535
• Size, max.	512 kbyte
FC	
• Number range	0 ... 65 535
• Size, max.	512 kbyte

OB	
• Size, max.	512 kbyte
• Number of free cycle OBs	100
• Number of time alarm OBs	20
• Number of delay alarm OBs	20
• Number of cyclic interrupt OBs	20
• Number of process alarm OBs	50
• Number of DPV1 alarm OBs	3
• Number of isochronous mode OBs	2
• Number of technology synchronous alarm OBs	2
• Number of startup OBs	100
• Number of asynchronous error OBs	4
• Number of synchronous error OBs	2
• Number of diagnostic alarm OBs	1
Nesting depth	
• per priority class	24; Up to 8 possible for F-blocks
Counters, timers and their retentivity	
S7 counter	
• Number	2 048
Retentivity	
— adjustable	Yes
IEC counter	
• Number	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
S7 times	
• Number	2 048
Retentivity	
— adjustable	Yes
IEC timer	
• Number	Any (only limited by the main memory)
Retentivity	
— adjustable	Yes
Data areas and their retentivity	
Flag	
• Number, max.	16 kbyte
• Number of clock memories	8; 8 clock memory bits, grouped into one clock memory byte
Data blocks	
• Retentivity adjustable	Yes
• Retentivity preset	No
Local data	

- per priority class, max.

64 kbyte; max. 16 KB per block

Address area

Number of IO modules 8 192; max. number of modules / submodules

I/O address area

- Inputs 32 kbyte; All inputs are in the process image
- Outputs 32 kbyte; All outputs are in the process image

per integrated IO subsystem

- Inputs (volume) 8 kbyte
- Outputs (volume) 8 kbyte

per CM/CP

- Inputs (volume) 8 kbyte
- Outputs (volume) 8 kbyte

Subprocess images

- Number of subprocess images, max. 32

Hardware configuration

Number of distributed IO systems 20

Number of DP masters

- integrated 1
- Via CM 8; A maximum of 8 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total

Number of IO Controllers

- integrated 1
- Via CM 8; A maximum of 8 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total

Rack

- Modules per rack, max. 32; CPU + 31 modules
- Number of lines, max. 1

PtP CM

- Number of PtP CMs the number of connectable PtP CMs is only limited by the number of available slots

Time of day

Clock

- Type Hardware clock
- Backup time 6 wk; At 40 °C ambient temperature, typically
- Deviation per day, max. 10 s; Typ.: 2 s

Operating hours counter

- Number 16

Clock synchronization

- supported Yes
- to DP, master Yes
- in AS, master Yes

- in AS, slave
- on Ethernet via NTP

Yes

Yes

Interfaces

Number of PROFINET interfaces

2

Number of PROFIBUS interfaces

1

1. Interface

Interface types

- Number of ports 2
- integrated switch Yes
- RJ 45 (Ethernet) Yes; X1

Functionality

- PROFINET IO Controller Yes
- PROFINET IO Device Yes
- SIMATIC communication Yes
- Open IE communication Yes
- Web server Yes
- Media redundancy Yes

2. Interface

Interface types

- Number of ports 1
- integrated switch No
- RJ 45 (Ethernet) Yes; X2

Functionality

- PROFINET IO Controller No
- PROFINET IO Device No
- SIMATIC communication Yes
- Open IE communication Yes
- Web server Yes

3. Interface

Interface types

- Number of ports 1
- RS 485 Yes

Functionality

- PROFIBUS DP master Yes
- PROFIBUS DP slave No
- SIMATIC communication Yes

Interface types

RJ 45 (Ethernet)

- 100 Mbps Yes
- Autonegotiation Yes

• Autocrossing	Yes
• Industrial Ethernet status LED	Yes
RS 485	
• Transmission rate, max.	12 Mbit/s
Protocols	
Number of connections	
• Number of connections, max.	256; via integrated interfaces of the CPU and connected CPs / CMs
• Number of connections reserved for ES/HMI/web	10
• Number of connections via integrated interfaces	128
• Number of S7 routing paths	16
PROFINET IO Controller	
Services	
— PG/OP communication	Yes
— S7 routing	Yes
— Isochronous mode	Yes
— Open IE communication	Yes
— IRT	Yes
— MRP	Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50
— PROFINergy	Yes
— Prioritized startup	Yes; Max. 32 PROFINET devices
— Number of connectable IO Devices, max.	256; In total, up to 768 distributed I/O devices can be connected via PROFIBUS or PROFINET
— Of which IO devices with IRT, max.	64
— Number of connectable IO Devices for RT, max.	256
— of which in line, max.	256
— Number of IO Devices that can be simultaneously activated/deactivated, max.	8
— Number of IO Devices per tool, max.	8
— Updating times	The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data
Update time for IRT	
— for send cycle of 250 μ s	250 μ s to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 500 μ s of the isochronous OB is decisive
— for send cycle of 500 μ s	500 μ s to 8 ms
— for send cycle of 1 ms	1 ms to 16 ms
— for send cycle of 2 ms	2 ms to 32 ms

— for send cycle of 4 ms	4 ms to 64 ms
— With IRT and parameterization of "odd" send cycles	Update time = set "odd" send clock (any multiple of 125 µs: 375 µs, 625 µs ... 3 875 µs)
Update time for RT	
— for send cycle of 250 µs	250 µs to 128 ms
— for send cycle of 500 µs	500 µs to 256 ms
— for send cycle of 1 ms	1 ms to 512 ms
— for send cycle of 2 ms	2 ms to 512 ms
— for send cycle of 4 ms	4 ms to 512 ms
PROFINET IO Device	
Services	
— PG/OP communication	Yes
— S7 routing	Yes
— Isochronous mode	No
— Open IE communication	Yes
— IRT	Yes
— MRP	Yes
— PROFinergy	Yes
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
SIMATIC communication	
• S7 communication, as server	Yes
• S7 communication, as client	Yes
• User data per job, max.	See online help (S7 communication, user data size)
Open IE communication	
• TCP/IP	Yes
— Data length, max.	64 kbyte
— several passive connections per port, supported	Yes
• ISO-on-TCP (RFC1006)	Yes
— Data length, max.	64 kbyte
• UDP	Yes
— Data length, max.	1 472 byte
• DHCP	No
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
Web server	
• HTTP	Yes; Standard and user-defined pages
• HTTPS	Yes; Standard and user-defined pages
PROFIBUS DP master	

• Number of connections, max.	48; for the integrated PROFIBUS DP interface
Services	
— PG/OP communication	Yes
— S7 routing	Yes
— Data record routing	Yes
— Isochronous mode	Yes
— Equidistance	Yes
— Number of DP slaves	125; In total, up to 768 distributed I/O devices can be connected via PROFIBUS or PROFINET
— Activation/deactivation of DP slaves	Yes
Further protocols	
• MODBUS	Yes; MODBUS TCP
Media redundancy	
• Switchover time on line break, typ.	200 ms
• Number of stations in the ring, max.	50
Isochronous mode	
Isochronous operation (application synchronized up to terminal)	Yes; With minimum OB 6x cycle of 375 µs
Equidistance	Yes
S7 message functions	
Number of login stations for message functions, max.	32
Block related messages	Yes
Number of configurable alarms, max.	10 000
Number of simultaneously active alarms in alarm pool	
• Number of reserved user alarms	600
• Number of reserved alarms for system diagnostics	200
• Number of reserved alarms for Motion Control technology objects	160
Test commissioning functions	
Joint commission (Team Engineering)	Yes; Parallel online access possible for up to 8 engineering systems
Status block	Yes; Up to 8 simultaneously (in total across all ES clients)
Single step	No
Status/control	
• Status/control variable	Yes
• Variables	Inputs, outputs, memory bits, DB, times, counters
• Number of variables, max.	
— of which status variables, max.	200; per job
— of which control variables, max.	200; per job
Forcing	

<ul style="list-style-type: none"> • Forcing, variables • Number of variables, max. 	Peripheral inputs/outputs 200
Diagnostic buffer	
<ul style="list-style-type: none"> • present • Number of entries, max. <ul style="list-style-type: none"> — of which powerfail-proof 	Yes 3 200 500
Traces	
<ul style="list-style-type: none"> • Number of configurable Traces 	4; Up to 512 KB of data per trace are possible

Interrupts/diagnostics/status information	
Diagnostics indication LED	
<ul style="list-style-type: none"> • RUN/STOP LED • ERROR LED • MAINT LED • Connection display LINK TX/RX 	Yes Yes Yes Yes

Supported technology objects	
Motion Control	Yes
<ul style="list-style-type: none"> • Speed-controlled axis <ul style="list-style-type: none"> — Number of speed-controlled axes, max. • Positioning axis <ul style="list-style-type: none"> — Number of positioning axes, max. • Synchronized axes (relative gear synchronization) <ul style="list-style-type: none"> — Number of axes, max. • External encoders <ul style="list-style-type: none"> — Number of external encoders, max. 	30; Requirement: There must be no other motion technology objects created 30; Requirement: There must be no other motion technology objects created 15; Requirement: There must be no other motion technology objects created 30; Requirement: There must be no other motion technology objects created
Controller	
<ul style="list-style-type: none"> • PID_Compact • PID_3Step • PID-Temp 	Yes; Universal PID controller with integrated optimization Yes; PID controller with integrated optimization for valves Yes; PID controller with integrated optimization for temperature
Counting and measuring	
<ul style="list-style-type: none"> • High-speed counter 	Yes

Standards, approvals, certificates	
Highest safety class achievable in safety mode	
Probability of failure (for service life of 20 years and repair time of 100 hours)	
<ul style="list-style-type: none"> — Low demand mode: PFDavg in accordance with SIL3 — High demand/continuous mode: PFH in accordance with SIL3 	< 2.00E-05 < 1.00E-09

Ambient conditions

Ambient temperature during operation

- | | |
|---------------------------------|--|
| • horizontal installation, min. | 0 °C |
| • horizontal installation, max. | 60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off |
| • vertical installation, min. | 0 °C |
| • vertical installation, max. | 40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off |

Configuration

Programming

Programming language

- | | |
|---------|---------------------|
| — LAD | Yes; incl. failsafe |
| — FBD | Yes; incl. failsafe |
| — STL | Yes |
| — SCL | Yes |
| — GRAPH | Yes |

Know-how protection

- | | |
|---------------------------|-----|
| • User program protection | Yes |
| • Copy protection | Yes |
| • Block protection | Yes |

Access protection

- | | |
|---|-----|
| • Password for display | Yes |
| • Protection level: Write protection | Yes |
| • Protection level: Read/write protection | Yes |
| • Protection level: Complete protection | Yes |

Cycle time monitoring

- | | |
|---------------|-------------------------------|
| • lower limit | adjustable minimum cycle time |
| • upper limit | adjustable maximum cycle time |

Dimensions

Width	70 mm
Height	147 mm
Depth	129 mm

Weights

Weight, approx.	845 g
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