



SIMATIC S7-1500 Compact CPU CPU 1512C-1 PN, central processing unit with working memory 250 KB for program and 1 MB for data, 32 digital inputs, 32 digital outputs, 5 analog inputs, 2 analog outputs, 6 high speed counters, 4 high speed outputs for PTO/PWM/frequency output 1. interface: PROFINET IRT with 2 port switch, 48 NS bit-performance, incl. front connector push-in, SIMATIC memory card necessary

General information	
Product type designation	CPU 1512C-1 PN
HW functional status	FS03
Firmware version	V2.9
Product function	
<ul style="list-style-type: none"> I&M data 	Yes; I&M0 to I&M3
<ul style="list-style-type: none"> Isochronous mode 	Yes; With minimum OB 6x cycle of 625 μs (distributed)
Engineering with	
<ul style="list-style-type: none"> STEP 7 TIA Portal configurable/integrated from version 	V17 (FW V2.9) / V15 (FW V2.5) or higher; with older TIA Portal versions configurable as 6ES7512-1CK00-0AB0
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	3.45 cm
Control elements	
Number of keys	8
Mode buttons	2
Supply voltage	
Rated value (DC)	24 V
permissible range, lower limit (DC)	19.2 V; 20.4 V DC, for supplying the digital inputs/outputs
permissible range, upper limit (DC)	28.8 V
Reverse polarity protection	Yes
Mains buffering	
<ul style="list-style-type: none"> Mains/voltage failure stored energy time 	5 ms; Refers to the power supply on the CPU section
<ul style="list-style-type: none"> Repeat rate, min. 	1/s
Input current	
Current consumption (rated value)	0.8 A; Without load; 18.8 A: CPU + load
Current consumption, max.	1 A; Without load; 19 A: CPU + load
Inrush current, max.	1.9 A; Rated value
I ² t	0.34 A ² ·s
Digital inputs	
<ul style="list-style-type: none"> from load voltage L+ (without load), max. 	20 mA; per group
Digital outputs	
<ul style="list-style-type: none"> from load voltage L+, max. 	30 mA; Per group, without load
output voltage / header	
Rated value (DC)	24 V
Encoder supply	
Number of outputs	2; One common 24 V encoder supply per 16 digital inputs
24 V encoder supply	

<ul style="list-style-type: none"> • 24 V • Short-circuit protection • Output current, max. 	Yes; L+ (-0.8 V) Yes 1 A
Power	
Infeed power to the backplane bus	10 W
Power consumption from the backplane bus (balanced)	9 W
Power loss	
Power loss, typ.	15.2 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
<ul style="list-style-type: none"> • integrated (for program) • integrated (for data) 	250 kbyte 1 Mbyte
Load memory	
<ul style="list-style-type: none"> • Plug-in (SIMATIC Memory Card), max. 	32 Gbyte
Backup	
<ul style="list-style-type: none"> • maintenance-free 	Yes
CPU processing times	
for bit operations, typ.	48 ns
for word operations, typ.	58 ns
for fixed point arithmetic, typ.	77 ns
for floating point arithmetic, typ.	307 ns
CPU-blocks	
Number of elements (total)	4 000; Blocks (OB, FB, FC, DB) and UDTs
DB	
<ul style="list-style-type: none"> • Number range • Size, max. 	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 1 Mbyte; For DBs with absolute addressing, the max. size is 64 KB
FB	
<ul style="list-style-type: none"> • Number range • Size, max. 	0 ... 65 535 250 kbyte
FC	
<ul style="list-style-type: none"> • Number range • Size, max. 	0 ... 65 535 250 kbyte
OB	
<ul style="list-style-type: none"> • Size, max. • Number of free cycle OBs • Number of time alarm OBs • Number of delay alarm OBs • Number of cyclic interrupt OBs • Number of process alarm OBs • Number of DPV1 alarm OBs • Number of isochronous mode OBs • Number of technology synchronous alarm OBs • Number of startup OBs • Number of asynchronous error OBs • Number of synchronous error OBs • Number of diagnostic alarm OBs 	250 kbyte 100 20 20 20; With minimum OB 3x cycle of 500 µs 50 3 1 2 100 4 2 1
Nesting depth	
<ul style="list-style-type: none"> • per priority class 	24
Counters, timers and their retentivity	
S7 counter	
<ul style="list-style-type: none"> • Number 	2 048
Retentivity	
— adjustable	Yes
IEC counter	
<ul style="list-style-type: none"> • 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	
Retentive data area (incl. timers, counters, flags), max.	128 kbyte; In total; available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 88 KB
Extended retentive data area (incl. timers, counters, flags), max.	1 Mbyte; When using PS 6 0W 24/48/60 V DC HF
Flag	
• Size, max.	16 kbyte
• Number of clock memories	8; 8 clock memory bit, 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	2 048; 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	32; A distributed I/O system is characterized not only by the integration of distributed I/O via PROFINET or PROFIBUS communication modules, but also by the connection of I/O via AS-i master modules or links (e.g. IE/PB-Link)
Number of DP masters	
• Via CM	6; A maximum of 6 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
Number of IO Controllers	
• integrated	1
• Via CM	6; A maximum of 6 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	

<ul style="list-style-type: none"> supported 	Yes
<ul style="list-style-type: none"> in AS, master 	Yes
<ul style="list-style-type: none"> in AS, slave 	Yes
<ul style="list-style-type: none"> on Ethernet via NTP 	Yes
Digital inputs	
integrated channels (DI)	32
Digital inputs, parameterizable	Yes
Source/sink input	P-reading
Input characteristic curve in accordance with IEC 61131, type 3	Yes
Digital input functions, parameterizable	
<ul style="list-style-type: none"> Gate start/stop 	Yes
<ul style="list-style-type: none"> Capture 	Yes
<ul style="list-style-type: none"> Synchronization 	Yes
Input voltage	
<ul style="list-style-type: none"> Type of input voltage 	DC
<ul style="list-style-type: none"> Rated value (DC) 	24 V
<ul style="list-style-type: none"> for signal "0" 	-3 to +5V
<ul style="list-style-type: none"> for signal "1" 	+11 to +30V
Input current	
<ul style="list-style-type: none"> for signal "1", typ. 	2.5 mA
Input delay (for rated value of input voltage)	
for standard inputs	
— parameterizable	Yes; none / 0.05 / 0.1 / 0.4 / 1.6 / 3.2 / 12.8 / 20 ms
— at "0" to "1", min.	4 µs; for parameterization "none"
— at "0" to "1", max.	20 ms
— at "1" to "0", min.	4 µs; for parameterization "none"
— at "1" to "0", max.	20 ms
for interrupt inputs	
— parameterizable	Yes; Same as for standard inputs
for technological functions	
— parameterizable	Yes; Same as for standard inputs
Cable length	
<ul style="list-style-type: none"> shielded, max. 	1 000 m; 600 m for technological functions; depending on input frequency, encoder and cable quality; max. 50 m at 100 kHz
<ul style="list-style-type: none"> unshielded, max. 	600 m; for technological functions: No
Digital outputs	
Type of digital output	Transistor
integrated channels (DO)	32
Current-sourcing	Yes; Push-pull output
Short-circuit protection	Yes; electronic/thermal
<ul style="list-style-type: none"> Response threshold, typ. 	1.6 A with standard output, 0.5 A with high-speed output; see manual for details
Limitation of inductive shutdown voltage to	Connector X11: -0.8 V; connector X12: L+ (-53 V)
Controlling a digital input	Yes
Accuracy of pulse duration	Up to ±100 ppm ±2 µs at high-speed output; see manual for details
minimum pulse duration	2 µs; With High Speed output
Digital output functions, parameterizable	
<ul style="list-style-type: none"> Switching tripped by comparison values 	Yes; As output signal of a high-speed counter
<ul style="list-style-type: none"> PWM output 	Yes
— Number, max.	4
— Cycle duration, parameterizable	Yes
— ON period, min.	0 %
— ON period, max.	100 %
— Resolution of the duty cycle	0.0036 %; For S7 analog format, min. 40 ns
<ul style="list-style-type: none"> Frequency output 	Yes
Switching capacity of the outputs	
<ul style="list-style-type: none"> with resistive load, max. 	0.5 A; 0.1 A with high-speed output, i.e. when using a high-speed output; see manual for details
<ul style="list-style-type: none"> on lamp load, max. 	5 W; 1 W with high-speed output, i.e. when using a high-speed output; see manual for details

Load resistance range	
<ul style="list-style-type: none"> • lower limit • upper limit 	48 Ω; 240 ohms with high-speed output, i.e. when using a high-speed output; see manual for details 12 kΩ
Output voltage	
<ul style="list-style-type: none"> • Type of output voltage • for signal "0", max. • for signal "1", min. 	DC 1 V; With high-speed output, i.e. when using a high-speed output; see manual for details 23.2 V; L+ (-0.8 V)
Output current	
<ul style="list-style-type: none"> • for signal "1" rated value • for signal "1" permissible range, min. • for signal "1" permissible range, max. • for signal "0" residual current, max. 	0.5 A; 0.1 A with high-speed output, i.e. when using a high-speed output, observe derating; see manual for details 2 mA 0.6 A; 0.12 A with high-speed output, i.e. when using a high-speed output, observe derating; see manual for details 0.5 mA
Output delay with resistive load	
<ul style="list-style-type: none"> • "0" to "1", max. • "1" to "0", max. 	200 μs 500 μs; Load-dependent
for technological functions	
— "0" to "1", max.	5 μs; Depending on the output used, see additional description in manual
— "1" to "0", max.	5 μs; Depending on the output used, see additional description in manual
Parallel switching of two outputs	
<ul style="list-style-type: none"> • for logic links • for uprating • for redundant control of a load 	Yes; for technological functions: No No Yes; for technological functions: No
Switching frequency	
<ul style="list-style-type: none"> • with resistive load, max. • with inductive load, max. • on lamp load, max. 	100 kHz; For high-speed output, 100 Hz for standard output 0.5 Hz; Acc. to IEC 60947-5-1, DC-13; observe derating curve 10 Hz
Total current of the outputs	
<ul style="list-style-type: none"> • Current per channel, max. • Current per group, max. • Current per power supply, max. 	0.5 A; see additional description in the manual 8 A; see additional description in the manual 4 A; 2 power supplies for each group, current per power supply max. 4 A, see additional description in manual
for technological functions	
— Current per channel, max.	0.5 A; see additional description in the manual
Relay outputs	
• Number of relay outputs	0
Cable length	
<ul style="list-style-type: none"> • shielded, max. • unshielded, max. 	1 000 m; 600 m for technological functions; depending on output frequency, load, and cable quality; max. 50 m at 100 kHz 600 m; for technological functions: No
Analog inputs	
Number of analog inputs <ul style="list-style-type: none"> • For current measurement • For voltage measurement • For resistance/resistance thermometer measurement 	5; 4x for U/I, 1x for R/RTD 4; max. 4; max. 1
permissible input voltage for voltage input (destruction limit), max.	28.8 V
permissible input current for current input (destruction limit), max.	40 mA
Cycle time (all channels), min.	1 ms; Dependent on the parameterized interference frequency suppression; for details, see conversion procedure in manual
Technical unit for temperature measurement adjustable	Yes; °C/°F/K
Input ranges (rated values), voltages	
<ul style="list-style-type: none"> • 0 to +10 V <ul style="list-style-type: none"> — Input resistance (0 to 10 V) • 1 V to 5 V <ul style="list-style-type: none"> — Input resistance (1 V to 5 V) 	Yes; Physical measuring range: ± 10 V 100 kΩ Yes; Physical measuring range: ± 10 V 100 kΩ

<ul style="list-style-type: none"> • -10 V to +10 V <ul style="list-style-type: none"> — Input resistance (-10 V to +10 V) • -5 V to +5 V <ul style="list-style-type: none"> — Input resistance (-5 V to +5 V) 	<p>Yes</p> <p>100 kΩ</p> <p>Yes; Physical measuring range: ± 10 V</p> <p>100 kΩ</p>
Input ranges (rated values), currents	
<ul style="list-style-type: none"> • 0 to 20 mA <ul style="list-style-type: none"> — Input resistance (0 to 20 mA) • -20 mA to +20 mA <ul style="list-style-type: none"> — Input resistance (-20 mA to +20 mA) • 4 mA to 20 mA <ul style="list-style-type: none"> — Input resistance (4 mA to 20 mA) 	<p>Yes; Physical measuring range: ± 20 mA</p> <p>50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC</p> <p>Yes</p> <p>50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC</p> <p>Yes; Physical measuring range: ± 20 mA</p> <p>50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC</p>
Input ranges (rated values), resistance thermometer	
<ul style="list-style-type: none"> • Ni 100 <ul style="list-style-type: none"> — Input resistance (Ni 100) • Pt 100 <ul style="list-style-type: none"> — Input resistance (Pt 100) 	<p>Yes; Standard/climate</p> <p>10 MΩ</p> <p>Yes; Standard/climate</p> <p>10 MΩ</p>
Input ranges (rated values), resistors	
<ul style="list-style-type: none"> • 0 to 150 ohms <ul style="list-style-type: none"> — Input resistance (0 to 150 ohms) • 0 to 300 ohms <ul style="list-style-type: none"> — Input resistance (0 to 300 ohms) • 0 to 600 ohms <ul style="list-style-type: none"> — Input resistance (0 to 600 ohms) 	<p>Yes; Physical measuring range: 0 ... 600 ohms</p> <p>10 MΩ</p> <p>Yes; Physical measuring range: 0 ... 600 ohms</p> <p>10 MΩ</p> <p>Yes</p> <p>10 MΩ</p>
Cable length	
<ul style="list-style-type: none"> • shielded, max. 	800 m; for U/I, 200 m for R/RTD
Analog outputs	
integrated channels (AO)	2
Voltage output, short-circuit protection	Yes
Cycle time (all channels), min.	1 ms; Dependent on the parameterized interference frequency suppression; for details, see conversion procedure in manual
Output ranges, voltage	
<ul style="list-style-type: none"> • 0 to 10 V • 1 V to 5 V • -10 V to +10 V 	<p>Yes</p> <p>Yes</p> <p>Yes</p>
Output ranges, current	
<ul style="list-style-type: none"> • 0 to 20 mA • -20 mA to +20 mA • 4 mA to 20 mA 	<p>Yes</p> <p>Yes</p> <p>Yes</p>
Load impedance (in rated range of output)	
<ul style="list-style-type: none"> • with voltage outputs, min. • with voltage outputs, capacitive load, max. • with current outputs, max. • with current outputs, inductive load, max. 	<p>1 kΩ</p> <p>100 nF</p> <p>500 Ω</p> <p>1 mH</p>
Cable length	
<ul style="list-style-type: none"> • shielded, max. 	200 m
Analog value generation for the inputs	
Integration and conversion time/resolution per channel	
<ul style="list-style-type: none"> • Resolution with overrange (bit including sign), max. • Integration time, parameterizable • Interference voltage suppression for interference frequency f1 in Hz 	<p>16 bit</p> <p>Yes; 2.5 / 16.67 / 20 / 100 ms, acts on all channels</p> <p>400 / 60 / 50 / 10</p>
Smoothing of measured values	
<ul style="list-style-type: none"> • parameterizable • Step: None • Step: low • Step: Medium • Step: High 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>
Analog value generation for the outputs	
Integration and conversion time/resolution per channel	
<ul style="list-style-type: none"> • Resolution with overrange (bit including sign), max. 	16 bit

Settling time	
<ul style="list-style-type: none"> • for resistive load 	1.5 ms
<ul style="list-style-type: none"> • for capacitive load 	2.5 ms
<ul style="list-style-type: none"> • for inductive load 	2.5 ms
Encoder	
Connection of signal encoders	
<ul style="list-style-type: none"> • for voltage measurement 	Yes
<ul style="list-style-type: none"> • for current measurement as 4-wire transducer 	Yes
<ul style="list-style-type: none"> • for resistance measurement with two-wire connection 	Yes
<ul style="list-style-type: none"> • for resistance measurement with three-wire connection 	Yes
<ul style="list-style-type: none"> • for resistance measurement with four-wire connection 	Yes
Connectable encoders	
<ul style="list-style-type: none"> • 2-wire sensor 	Yes
<ul style="list-style-type: none"> — permissible quiescent current (2-wire sensor), max. 	1.5 mA
Encoder signals, incremental encoder (asymmetrical)	
<ul style="list-style-type: none"> • Input voltage 	24 V
<ul style="list-style-type: none"> • Input frequency, max. 	100 kHz
<ul style="list-style-type: none"> • Counting frequency, max. 	400 kHz; with quadruple evaluation
<ul style="list-style-type: none"> • Signal filter, parameterizable 	Yes
<ul style="list-style-type: none"> • Incremental encoder with A/B tracks, 90° phase offset 	Yes
<ul style="list-style-type: none"> • Incremental encoder with A/B tracks, 90° phase offset and zero track 	Yes
<ul style="list-style-type: none"> • pulse encoder 	Yes
<ul style="list-style-type: none"> • pulse encoder with direction 	Yes
<ul style="list-style-type: none"> • pulse encoder with one impulse signal per count direction 	Yes
Errors/accuracies	
Linearity error (relative to input range), (+/-)	0.1 %
Temperature error (relative to input range), (+/-)	0.005 %/K
Crosstalk between the inputs, max.	-60 dB
Repeat accuracy in steady state at 25 °C (relative to input range), (+/-)	0.05 %
Output ripple (relative to output range, bandwidth 0 to 50 kHz), (+/-)	0.02 %
Linearity error (relative to output range), (+/-)	0.15 %
Temperature error (relative to output range), (+/-)	0.005 %/K
Crosstalk between the outputs, max.	-80 dB
Repeat accuracy in steady state at 25 °C (relative to output range), (+/-)	0.05 %
Operational error limit in overall temperature range	
<ul style="list-style-type: none"> • Voltage, relative to input range, (+/-) 	0.3 %
<ul style="list-style-type: none"> • Current, relative to input range, (+/-) 	0.3 %
<ul style="list-style-type: none"> • Resistance, relative to input range, (+/-) 	0.3 %
<ul style="list-style-type: none"> • Resistance thermometer, relative to input range, (+/-) 	Pt100 Standard: ±2 K, Pt100 Climate: ±1 K, Ni100 Standard: ±1.2 K, Ni100 Climate: ±1 K
<ul style="list-style-type: none"> • Voltage, relative to output range, (+/-) 	0.3 %
<ul style="list-style-type: none"> • Current, relative to output range, (+/-) 	0.3 %
Basic error limit (operational limit at 25 °C)	
<ul style="list-style-type: none"> • Voltage, relative to input range, (+/-) 	0.2 %
<ul style="list-style-type: none"> • Current, relative to input range, (+/-) 	0.2 %
<ul style="list-style-type: none"> • Resistance, relative to input range, (+/-) 	0.2 %
<ul style="list-style-type: none"> • Resistance thermometer, relative to input range, (+/-) 	Pt100 Standard: ±1 K, Pt100 Climate: ±0.5 K, Ni100 Standard: ±0.6 K, Ni100 Climate: ±0.5 K
<ul style="list-style-type: none"> • Voltage, relative to output range, (+/-) 	0.2 %
<ul style="list-style-type: none"> • Current, relative to output range, (+/-) 	0.2 %
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, $f_1 =$ interference frequency	
<ul style="list-style-type: none"> • Series mode interference (peak value of interference < rated value of input range), min. 	30 dB

- Common mode voltage, max. 10 V
- Common mode interference, min. 60 dB; at 400 Hz: 50 dB

Interfaces

Number of PROFINET interfaces 1

1. Interface

Interface types

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

Protocols

- IP protocol Yes; IPv4
- PROFINET IO Controller Yes
- PROFINET IO Device Yes
- SIMATIC communication Yes
- Open IE communication Yes; Optionally also encrypted
- Web server Yes
- Media redundancy Yes

PROFINET IO Controller

Services

- PG/OP communication Yes
- Isochronous mode Yes
- Direct data exchange Yes; Requirement: IRT and isochronous mode (MRPD optional)
- IRT Yes
- PROFlenergy Yes; per user program
- Prioritized startup Yes; Max. 32 PROFINET devices
- Number of connectable IO Devices, max. 128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
- Of which IO devices with IRT, max. 64
- Number of connectable IO Devices for RT, max. 128
- of which in line, max. 128
- Number of IO Devices that can be simultaneously activated/deactivated, max. 8; in total across all interfaces
- 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 625 μ s of the isochronous OB is decisive
- for send cycle of 500 μ s 500 μ s to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 μ s of the isochronous OB is decisive
- 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 μ s: 375 μ s, 625 μ s ... 3 875 μ s)

Update time for RT

- for send cycle of 250 μ s 250 μ s to 128 ms
- for send cycle of 500 μ s 500 μ s 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
- Isochronous mode No
- IRT Yes
- PROFlenergy Yes; per user program
- Shared device Yes
- Number of IO Controllers with shared device, max. 4

— activation/deactivation of I-devices	Yes; per user program
— Asset management record	Yes; per user program

Interface types

RJ 45 (Ethernet)	
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes
• Industrial Ethernet status LED	Yes

Protocols

Number of connections	
• Number of connections, max.	128; 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	88
• Number of S7 routing paths	16
Redundancy mode	
• H-Sync forwarding	Yes
Media redundancy	
— Media redundancy	only via 1st interface (X1)
— MRP	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0, MRP Manager; MRP Client
— MRP interconnection, supported	Yes; as MRP ring node according to IEC 62439-2 Edition 3.0
— MRPD	Yes; Requirement: IRT
— Switchover time on line break, typ.	200 ms; For MRP, bumpless for MRPD
— Number of stations in the ring, max.	50
SIMATIC communication	
• PG/OP communication	Yes; encryption with TLS V1.3 pre-selected
• S7 routing	Yes
• 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.	2 kbyte; 1 472 bytes for UDP broadcast
— UDP multicast	Yes; Max. 5 multicast circuits
• DHCP	Yes
• DNS	Yes
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
• Encryption	Yes; Optional
Web server	
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
OPC UA	
• Runtime license required	Yes; "Small" license required
• OPC UA Client	Yes
— Application authentication	Yes
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	"anonymous" or by user name & password
— Number of connections, max.	4
— Number of nodes of the client interfaces, max.	1 000
— Number of elements for one call of OPC-UA-NodeGetHandleList/OPC-UA-ReadList/C max.	300

— Number of elements for one call of OPC-UA_NameSpaceGetIndexList, max.	20
— Number of elements for one call of OPC-UA_MethodGetHandleList, max.	100
— Number of simultaneous calls of the client instructions per connection (except OPC-UA_ReadList, OPC-UA_WriteList, OPC-UA_M max.	1
— Number of simultaneous calls of the client instructions OPC-UA_ReadList, OPC-UA_WriteList and OPC-UA_MethodCall, max.	5
— Number of registerable nodes, max.	5 000
— Number of registerable method calls of OPC-UA_MethodCall, max.	100
— Number of inputs/outputs when calling OPC-UA_MethodCall, max.	20
● OPC UA Server	Yes; Data access (read, write, subscribe), method call, custom address space
— Application authentication	Yes
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256
— User authentication	"anonymous" or by user name & password
— GDS support (certificate management)	Yes
— Number of sessions, max.	32
— Number of accessible variables, max.	50 000
— Number of registerable nodes, max.	10 000
— Number of subscriptions per session, max.	20
— Sampling interval, min.	100 ms
— Publishing interval, min.	500 ms
— Number of server methods, max.	20
— Number of inputs/outputs per server method, max.	20
— Number of monitored items, max.	1 000; for 1 s sampling interval and 1 s send interval
— Number of server interfaces, max.	10 of each "Server interfaces" / "Companion specification" type and 20 of the type "Reference namespace"
— Number of nodes for user-defined server interfaces, max.	1 000
● Alarms and Conditions	Yes
— Number of program alarms	100
— Number of alarms for system diagnostics	50
Further protocols	
● MODBUS	Yes; MODBUS TCP
Isochronous mode	
Equidistance	Yes
S7 message functions	
Number of login stations for message functions, max.	32
Program alarms	Yes
Number of configurable program messages, max.	5 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH
Number of loadable program messages in RUN, max.	2 500
Number of simultaneously active program alarms	
● Number of program alarms	600
● Number of alarms for system diagnostics	100
● Number of alarms for motion technology objects	80
Test commissioning functions	
Joint commission (Team Engineering)	Yes; Parallel online access possible for up to 5 engineering systems
Status block	Yes; Up to 8 simultaneously (in total across all ES clients)
Single step	No
Number of breakpoints	8
Status/control	
● Status/control variable	Yes
● Variables	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters

<ul style="list-style-type: none"> • Number of variables, max. <ul style="list-style-type: none"> — of which status variables, max. — of which control variables, max. 	<p>200; per job</p> <p>200; per job</p>
Forcing	
<ul style="list-style-type: none"> • Forcing • Forcing, variables • Number of variables, max. 	<p>Yes</p> <p>Peripheral inputs/outputs</p> <p>200</p>
Diagnostic buffer	
<ul style="list-style-type: none"> • present • Number of entries, max. <ul style="list-style-type: none"> — of which powerfail-proof 	<p>Yes</p> <p>1 000</p> <p>500</p>
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	
Alarms	
<ul style="list-style-type: none"> • Diagnostic alarm • Hardware interrupt 	<p>Yes</p> <p>Yes</p>
Diagnoses	
<ul style="list-style-type: none"> • Monitoring the supply voltage • Wire-break • Short-circuit • A/B transition error at incremental encoder 	<p>Yes</p> <p>Yes; for analog inputs/outputs, see description in manual</p> <p>Yes; for analog outputs, see description in manual</p> <p>Yes</p>
Diagnostics indication LED	
<ul style="list-style-type: none"> • RUN/STOP LED • ERROR LED • MAINT LED • STOP ACTIVE LED • Monitoring of the supply voltage (PWR-LED) • Channel status display <ul style="list-style-type: none"> — for channel diagnostics • Connection display LINK TX/RX 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes; For analog inputs/outputs</p> <p>Yes</p>
Supported technology objects	
<p>Motion Control</p> <ul style="list-style-type: none"> • Number of available Motion Control resources for technology objects • Required Motion Control resources <ul style="list-style-type: none"> — per speed-controlled axis — per positioning axis — per synchronous axis — per external encoder — per output cam — per cam track — per probe • Positioning axis <ul style="list-style-type: none"> — Number of positioning axes at motion control cycle of 4 ms (typical value) — Number of positioning axes at motion control cycle of 8 ms (typical value) 	<p>Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool</p> <p>800</p> <p>40</p> <p>80</p> <p>160</p> <p>80</p> <p>20</p> <p>160</p> <p>40</p> <p>5</p> <p>10</p>
<p>Controller</p> <ul style="list-style-type: none"> • PID_Compact • PID_3Step • PID-Temp 	<p>Yes; Universal PID controller with integrated optimization</p> <p>Yes; PID controller with integrated optimization for valves</p> <p>Yes; PID controller with integrated optimization for temperature</p>
<p>Counting and measuring</p> <ul style="list-style-type: none"> • High-speed counter 	Yes
Integrated Functions	
Counting functions	
<ul style="list-style-type: none"> • Continuous counting • Counter response parameterizable • Hardware gate via digital input • Software gate 	<p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p>

• Event-controlled stop	Yes
• Synchronization via digital input	Yes
• Counting range, parameterizable	Yes
Comparator	
— Number of comparators	2; per count channel; see manual for details
— Direction dependency	Yes
— Can be changed from user program	Yes
Position detection	
• Incremental acquisition	Yes
• Suitable for S7-1500 Motion Control	Yes
Measuring functions	
• Measuring time, parameterizable	Yes
• Dynamic measurement period adjustment	Yes
• Number of thresholds, parameterizable	2
Measuring range	
— Frequency measurement, min.	0.04 Hz
— Frequency measurement, max.	400 kHz; with quadruple evaluation
— Cycle duration measurement, min.	2.5 µs
— Cycle duration measurement, max.	25 s
Accuracy	
— Frequency measurement	100 ppm; depending on measuring interval and signal evaluation
— Cycle duration measurement	100 ppm; depending on measuring interval and signal evaluation
— Velocity measurement	100 ppm; depending on measuring interval and signal evaluation
Potential separation	
Potential separation digital inputs	
• between the channels	No
• between the channels, in groups of	16
Potential separation digital outputs	
• between the channels	No
• between the channels, in groups of	16
Potential separation channels	
• between the channels and backplane bus	Yes
• Between the channels and load voltage L+	No
Isolation	
Isolation tested with	707 V DC (type test)
Ambient conditions	
Ambient temperature during operation	
• horizontal installation, min.	-25 °C; No condensation
• horizontal installation, max.	60 °C; note derating data for onboard I/O in the manual. Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off
• vertical installation, min.	-25 °C; No condensation
• vertical installation, max.	40 °C; note derating data for onboard I/O in the manual. Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off
Ambient temperature during storage/transportation	
• min.	-40 °C
• max.	70 °C
Altitude during operation relating to sea level	
• Installation altitude above sea level, max.	5 000 m; Restrictions for installation altitudes > 2 000 m, see manual
configuration / header	
configuration / programming / header	
Programming language	
— LAD	Yes
— FBD	Yes
— STL	Yes
— SCL	Yes
— GRAPH	Yes
Know-how protection	
• User program protection/password protection	Yes
• Copy protection	Yes
• Block protection	Yes

Access protection	
• protection of confidential configuration data	Yes
• Password for display	Yes
• Protection level: Write protection	Yes
• Protection level: Read/write protection	Yes
• Protection level: Complete protection	Yes
programming / cycle time monitoring / header	
• lower limit	adjustable minimum cycle time
• upper limit	adjustable maximum cycle time
Dimensions	
Width	110 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	1 360 g
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