

SIMATIC S7-1500 Compact CPU CPU 1511C-1PN, central processing unit with working memory 175 KB for program and 1 MB for data, 16 digital inputs, 16 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, 60 NS bit-performance, incl. front connector push-in, SIMATIC memory card necessary



General information	
Product type designation	CPU 1511C-1 PN
HW functional status	FS03
Firmware version	V2.8
Product function	
• I&M data	Yes; I&M0 to I&M3
• Isochronous mode	Yes; With minimum OB 6x cycle of 625 µs (distributed)
Engineering with	
• STEP 7 TIA Portal configurable/integrated from version	V16 (FW V2.8) / V15 (FW V2.5) or higher; with older TIA Portal versions configurable as 6ES7511-1CK00-0AB0
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	3.45 cm
Control elements	
Number of keys	8
Mode buttons	2

Supply voltage	
Type of supply voltage	24 V DC
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 Repeat rate, min. 	5 ms; Refers to the power supply on the CPU section 1/s
Input current	
Current consumption (rated value)	0.8 A; Without load; 9.8 A: CPU + load
Current consumption, max.	1 A; Without load; 10 A: CPU + load
Inrush current, max.	1.9 A; Rated value
I^2t	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	
Rated value (DC)	24 V
Encoder supply	
Number of outputs	1; One common 24 V encoder supply
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)	8.5 W
Power loss	
Power loss, typ.	11.8 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) 	175 kbyte 1 Mbyte
Load memory	
<ul style="list-style-type: none"> Plug-in (SIMATIC Memory Card), max. 	32 Gbyte
Backup	

• maintenance-free	Yes
CPU processing times	
for bit operations, typ.	60 ns
for word operations, typ.	72 ns
for fixed point arithmetic, typ.	96 ns
for floating point arithmetic, typ.	384 ns
CPU-blocks	
Number of elements (total)	2 000; 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.	1 Mbyte; For DBs with absolute addressing, the max. size is 64 KB
FB	
• Number range	0 ... 65 535
• Size, max.	175 kbyte
FC	
• Number range	0 ... 65 535
• Size, max.	175 kbyte
OB	
• Size, max.	175 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; With minimum OB 3x cycle of 500 µs
• Number of process alarm OBs	50
• Number of DPV1 alarm OBs	3
• Number of isochronous mode OBs	1
• 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
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	
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	
• Number, 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	1 024; 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	4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
Number of IO Controllers	
• integrated	1
• Via CM	4; A maximum of 4 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
• in AS, master	Yes
• in AS, slave	Yes
• on Ethernet via NTP	Yes
Digital inputs	
integrated channels (DI)	16
Digital inputs, parameterizable	Yes
Source/sink input	P-reading
Input characteristic curve in accordance with IEC 61131, type 3	Yes
Digital input functions, parameterizable	
• Gate start/stop	Yes
• Capture	Yes
• Synchronization	Yes
Input voltage	
• Type of input voltage	DC
• Rated value (DC)	24 V
• for signal "0"	-3 to +5V

• for signal "1"	+11 to +30V
Input current	
• 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	
• shielded, max.	1 000 m; 600 m for technological functions; depending on input frequency, encoder and cable quality; max. 50 m at 100 kHz
• unshielded, max.	600 m; for technological functions: No
Digital outputs	
Type of digital output	Transistor
integrated channels (DO)	16
Current-sourcing	Yes; Push-pull output
Short-circuit protection	Yes; electronic/thermal
• 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	-0.8 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	
• Switching tripped by comparison values	Yes; As output signal of a high-speed counter
• 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
• Frequency output	Yes
Switching capacity of the outputs	
• 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 	48 Ω; 240 ohms with high-speed output, i.e. when using a high-speed output; see manual for details
<ul style="list-style-type: none"> • upper limit 	12 kΩ
Output voltage	
<ul style="list-style-type: none"> • Type of output voltage 	DC
<ul style="list-style-type: none"> • for signal "0", max. 	1 V; With high-speed output, i.e. when using a high-speed output; see manual for details
<ul style="list-style-type: none"> • for signal "1", min. 	23.2 V; L+ (-0.8 V)
Output current	
<ul style="list-style-type: none"> • for signal "1" rated value 	0.5 A; 0.1 A with high-speed output, i.e. when using a high-speed output, observe derating; see manual for details
<ul style="list-style-type: none"> • for signal "1" permissible range, min. 	2 mA
<ul style="list-style-type: none"> • for signal "1" permissible range, max. 	0.6 A; 0.12 A with high-speed output, i.e. when using a high-speed output, observe derating; see manual for details
<ul style="list-style-type: none"> • for signal "0" residual current, max. 	0.5 mA
Output delay with resistive load	
<ul style="list-style-type: none"> • "0" to "1", max. 	200 μs
<ul style="list-style-type: none"> • "1" to "0", max. 	500 μs; Load-dependent
for technological functions	
<ul style="list-style-type: none"> — "0" to "1", max. 	5 μs; Depending on the output used, see additional description in manual
<ul style="list-style-type: none"> — "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 	Yes; for technological functions: No
<ul style="list-style-type: none"> • for uprating 	No
<ul style="list-style-type: none"> • for redundant control of a load 	Yes; for technological functions: No
Switching frequency	
<ul style="list-style-type: none"> • with resistive load, max. 	100 kHz; For high-speed output, 100 Hz for standard output
<ul style="list-style-type: none"> • with inductive load, max. 	0.5 Hz; Acc. to IEC 60947-5-1, DC-13; observe derating curve
<ul style="list-style-type: none"> • on lamp load, max. 	10 Hz
Total current of the outputs	
<ul style="list-style-type: none"> • Current per channel, max. 	0.5 A; see additional description in the manual
<ul style="list-style-type: none"> • Current per group, max. 	8 A; see additional description in the manual
<ul style="list-style-type: none"> • Current per power supply, max. 	4 A; 2 power supplies for each group, current per power supply max. 4 A, see additional description in manual
for technological functions	
<ul style="list-style-type: none"> — Current per channel, max. 	0.5 A; see additional description in the manual
Relay outputs	
<ul style="list-style-type: none"> • Number of relay outputs 	0
Cable length	

- 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	5; 4x for U/I, 1x for R/RTD
<ul style="list-style-type: none"> • For current measurement • For voltage measurement • For resistance/resistance thermometer measurement 	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) • -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) 	Yes; Physical measuring range: ± 10 V 100 kΩ Yes; Physical measuring range: ± 10 V 100 kΩ Yes 100 kΩ Yes; Physical measuring range: ± 10 V 100 kΩ
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) 	Yes; Physical measuring range: ± 20 mA 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC Yes 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC Yes; Physical measuring range: ± 20 mA 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC
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) 	Yes; Standard/climate 10 MΩ Yes; Standard/climate 10 MΩ
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 	Yes; Physical measuring range: 0 ... 600 ohms 10 MΩ Yes; Physical measuring range: 0 ... 600 ohms

— Input resistance (0 to 300 ohms)	10 M Ω
• 0 to 600 ohms	Yes
— Input resistance (0 to 600 ohms)	10 M Ω
Cable length	
• 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

• 0 to 10 V	Yes
• 1 V to 5 V	Yes
• -10 V to +10 V	Yes

Output ranges, current

• 0 to 20 mA	Yes
• -20 mA to +20 mA	Yes
• 4 mA to 20 mA	Yes

Load impedance (in rated range of output)

• with voltage outputs, min.	1 k Ω
• with voltage outputs, capacitive load, max.	100 nF
• with current outputs, max.	500 Ω
• with current outputs, inductive load, max.	1 mH

Cable length

• shielded, max.	200 m
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Analog value generation for the inputs

Integration and conversion time/resolution per channel	
• Resolution with overrange (bit including sign), max.	16 bit
• Integration time, parameterizable	Yes; 2.5 / 16.67 / 20 / 100 ms, acts on all channels
• Interference voltage suppression for interference frequency f1 in Hz	400 / 60 / 50 / 10

Smoothing of measured values

• parameterizable	Yes
• Step: None	Yes
• Step: low	Yes
• Step: Medium	Yes
• Step: High	Yes

Analog value generation for the outputs

Integration and conversion time/resolution per channel	
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<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	
• Voltage, relative to input range, (+/-)	0.3 %
• Current, relative to input range, (+/-)	0.3 %
• Resistance, relative to input range, (+/-)	0.3 %
• Resistance thermometer, relative to input range, (+/-)	Pt100 Standard: ±2 K, Pt100 Climate: ±1 K, Ni100 Standard: ±1.2 K, Ni100 Climate: ±1 K
• Voltage, relative to output range, (+/-)	0.3 %
• Current, relative to output range, (+/-)	0.3 %
Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input range, (+/-)	0.2 %
• Current, relative to input range, (+/-)	0.2 %
• Resistance, relative to input range, (+/-)	0.2 %
• 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
• Voltage, relative to output range, (+/-)	0.2 %
• Current, relative to output range, (+/-)	0.2 %
Interference voltage suppression for $f = n \times (f_1 \pm 1 \%)$, f_1 = interference frequency	
• 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
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1. Interface

Interface types	
• Number of ports	2
• integrated switch	Yes
• RJ 45 (Ethernet)	Yes; X1
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

— S7 routing	Yes
— Isochronous mode	Yes
— Direct data exchange	Yes; Requirement: IRT and isochronous mode (MRPD optional)
— IRT	Yes
— MRP	Yes; MRP Automanager acc. to IEC 62439-2 Edition 2.0; MRP Manager; MRP Client; max. number of devices in the ring: 50
— MRPD	Yes; Requirement: IRT
— PROFINergy	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
— S7 routing	Yes

— Isochronous mode	No
— IRT	Yes
— MRP	Yes; MRP Automanager acc. to IEC 62439-2 Edition 2.0; MRP Manager; MRP Client; max. number of devices in the ring: 50
— MRPD	Yes; Requirement: IRT
— PROFinergy	Yes; per user program
— Shared device	Yes
— Number of IO Controllers with shared device, max.	4
— Asset management record	Yes; per user program

Interface types

RJ 45 (Ethernet)	
• 100 Mbps	Yes
• Autonegotiation	Yes
• Autocrossing	Yes

Protocols

Number of connections	
• Number of connections, max.	96; 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	64
• Number of S7 routing paths	16

Redundancy mode	
• H-Sync forwarding	Yes

Media redundancy	
— Switchover time on line break, typ.	200 ms; For MRP, bumpless for MRPD
— Number of stations in the ring, max.	50

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.	2 kbyte; 1 472 bytes for UDP broadcast
— UDP multicast	Yes; Max. 5 multicast circuits

• DHCP	No
• SNMP	Yes
• DCP	Yes
• LLDP	Yes
Web server	
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
OPC UA	
• Runtime license required	Yes
• 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/OPC-UA-WriteList, 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-MethodCall), 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
— 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; or 20, depending on type of server interface
— Number of nodes for user-defined server interfaces, max.	1 000

Further protocols

• MODBUS	Yes; MODBUS TCP
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Isochronous mode

Equidistance	Yes
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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
• 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 1 000 500
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	
Alarms	
<ul style="list-style-type: none"> • Diagnostic alarm • Hardware interrupt 	Yes Yes
Diagnoses	
<ul style="list-style-type: none"> • Monitoring the supply voltage • Wire-break • Short-circuit • A/B transition error at incremental encoder 	Yes Yes; for analog inputs/outputs, see description in manual Yes; for analog outputs, see description in manual Yes
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 • for channel diagnostics • Connection display LINK TX/RX 	Yes Yes Yes Yes Yes Yes Yes; For analog inputs/outputs Yes
Supported technology objects	
<ul style="list-style-type: none"> • Motion Control <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 	Yes; Note: The number of axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool or SIZER 800 40 80 160 80 20 160 40

— Number of positioning axes at motion control cycle of 4 ms (typical value)	5
— Number of positioning axes at motion control cycle of 8 ms (typical value)	10
Controller	
• PID_Compact	Yes; Universal PID controller with integrated optimization
• PID_3Step	Yes; PID controller with integrated optimization for valves
• PID-Temp	Yes; PID controller with integrated optimization for temperature
Counting and measuring	
• High-speed counter	Yes
Integrated Functions	
Number of counters	6; Of which max. 4x A/B/N
Counting frequency (counter) max.	400 kHz; with quadruple evaluation
Counting functions	
• Continuous counting	Yes
• Counter response parameterizable	Yes
• Hardware gate via digital input	Yes
• Software gate	Yes
• 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 μ s
— 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	
Programming	
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	
• 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	85 mm
Height	147 mm
Depth	129 mm

Weights

Weight, approx.	1 050 g
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last modified: 09/03/2020