SIEMENS

## Data sheet 6ES7511-1CK01-0AB0

Figure similar

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

| | |
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| **General information** | |
| Product type designation | CPU 1511C-1 PN |
| HW functional status | FS03 |
| Firmware version | V2.9 |
| 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 | V17 (FW V2.9) / 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** | |
| 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 | |
| ● Mains/voltage failure stored energy time | 5 ms; Refers to the power supply on the CPU section |
| ● Repeat rate, min. | 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 $A^2 \cdot s$ |
| Digital inputs | |
| ● from load voltage L+ (without load), max. | 20 mA; per group |
| Digital outputs | |
| ● from load voltage L+, max. | 30 mA; Per group, without load |
| **Encoder supply** | |
| Number of outputs | 1; One common 24 V encoder supply |
| 24 V encoder supply | |
| ● 24 V | Yes; L+ (-0.8 V) |


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| ● Short-circuit protection | Yes |
| ● Output current, max. | 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 |
| **Storage** | |
| Number of slots for SIMATIC memory card | 1 |
| SIMATIC memory card required | Yes |
| Work memory | |
| ● integrated (for program) | 175 kbyte |
| ● integrated (for data) | 1 Mbyte |
| Load memory | |
| ● 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) | 4 000; 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 | |
| — can be set | Yes |
| IEC counter | |
| ● Number | Any (only limited by the main memory) |
| Retentivity | |
| — can be set | Yes |


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|---|---|
| S7 timer | |
| ● 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 | 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 |


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| ● in AS, device | Yes |
| ● on Ethernet via NTP | Yes |
| **Digital inputs** | |
| integrated channels (DI) | 16 |
| Digital inputs, parameterizable | Yes |
| Sourcing/sinking 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 |
| ● 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 | |
| ● lower limit | 48 Ω; 240 ohms with high-speed output, i.e. when using a high-speed output; see manual for details |


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| ● upper limit | 12 kΩ |
| Output voltage | |
| ● Type of output voltage | DC |
| ● for signal "0", max. | 1 V; With high-speed output, i.e. when using a high-speed output; see manual for details |
| ● for signal "1", min. | 23.2 V; L+ (-0.8 V) |
| Output current | |
| ● 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 |
| ● for signal "1" permissible range, min. | 2 mA |
| ● 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 |
| ● for signal "0" residual current, max. | 0.5 mA |
| Output delay with resistive load | |
| ● "0" to "1", max. | 200 µs |
| ● "1" to "0", max. | 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 | |
| ● for logic links | Yes; for technological functions: No |
| ● for uprating | No |
| ● for redundant control of a load | Yes; for technological functions: No |
| Switching frequency | |
| ● with resistive load, max. | 100 kHz; For high-speed output, 100 Hz for standard output |
| ● with inductive load, max. | 0.5 Hz; Acc. to IEC 60947-5-1, DC-13; observe derating curve |
| ● on lamp load, max. | 10 Hz |
| Total current of the outputs | |
| ● Current per channel, max. | 0.5 A; see additional description in the manual |
| ● Current per group, max. | 8 A; see additional description in the manual |
| ● 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 | |
| — Current per channel, max. | 0.5 A; see additional description in the manual |
| Relay outputs | |
| ● Number of relay outputs | 0 |
| Cable length | |
| ● shielded, max. | 1 000 m; 600 m for technological functions; depending on output frequency, load, and cable quality; max. 50 m at 100 kHz |
| ● unshielded, max. | 600 m; for technological functions: No |
| **Analog inputs** | |
| Number of analog inputs | 5; 4x for U/I, 1x for R/RTD |
| ● For current measurement | 4; max. |
| ● For voltage measurement | 4; max. |
| ● For resistance/resistance thermometer measurement | 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 | |
| ● 0 to +10 V | Yes; Physical measuring range: ± 10 V |
| — Input resistance (0 to 10 V) | 100 kΩ |
| ● 1 V to 5 V | Yes; Physical measuring range: ± 10 V |
| — Input resistance (1 V to 5 V) | 100 kΩ |
| ● -10 V to +10 V | Yes |
| — Input resistance (-10 V to +10 V) | 100 kΩ |
| ● -5 V to +5 V | Yes; Physical measuring range: ± 10 V |
| — Input resistance (-5 V to +5 V) | 100 kΩ |


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| Input ranges (rated values), currents | |
| ● 0 to 20 mA | Yes; Physical measuring range: ± 20 mA |
| — Input resistance (0 to 20 mA) | 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC |
| ● -20 mA to +20 mA | Yes |
| — Input resistance (-20 mA to +20 mA) | 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC |
| ● 4 mA to 20 mA | Yes; Physical measuring range: ± 20 mA |
| — Input resistance (4 mA to 20 mA) | 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC |
| Input ranges (rated values), resistance thermometer | |
| ● Ni 100 | Yes; Standard/climate |
| — Input resistance (Ni 100) | 10 MΩ |
| ● Pt 100 | Yes; Standard/climate |
| — Input resistance (Pt 100) | 10 MΩ |
| Input ranges (rated values), resistors | |
| ● 0 to 150 ohms | Yes; Physical measuring range: 0 ... 600 ohms |
| — Input resistance (0 to 150 ohms) | 10 MΩ |
| ● 0 to 300 ohms | Yes; Physical measuring range: 0 ... 600 ohms |
| — Input resistance (0 to 300 ohms) | 10 MΩ |
| ● 0 to 600 ohms | Yes |
| — Input resistance (0 to 600 ohms) | 10 MΩ |
| 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 kΩ |
| ● 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 |
| **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 | |
| ● Resolution with overrange (bit including sign), max. | 16 bit |
| Settling time | |
| ● for resistive load | 1.5 ms |
| ● for capacitive load | 2.5 ms |


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| ● for inductive load | 2.5 ms |
| **Encoder** | |
| Connection of signal encoders | |
| ● for voltage measurement | Yes |
| ● for current measurement as 4-wire transducer | Yes |
| ● for resistance measurement with two-wire connection | Yes |
| ● for resistance measurement with three-wire connection | Yes |
| ● for resistance measurement with four-wire connection | Yes |
| Connectable encoders | |
| ● 2-wire sensor | Yes |
| — permissible quiescent current (2-wire sensor), max. | 1.5 mA |
| Encoder signals, incremental encoder (asymmetrical) | |
| ● Input voltage | 24 V |
| ● Input frequency, max. | 100 kHz |
| ● Counting frequency, max. | 400 kHz; with quadruple evaluation |
| ● Signal filter, parameterizable | Yes |
| ● Incremental encoder with A/B tracks, 90° phase offset | Yes |
| ● Incremental encoder with A/B tracks, 90° phase offset and zero track | Yes |
| ● pulse encoder | Yes |
| ● pulse encoder with direction | Yes |
| ● 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 x (f1 +/- 1 %), f1 = 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 |
| **1. Interface** | |
| Interface types | |
| ● RJ 45 (Ethernet) | Yes; X1 |


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|---|---|
| ● 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 |
| — Dynamic Frame Packing (DFP) | Yes |
| — PROFIenergy | 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 µs | 250 µs to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive |
| — for send cycle of 500 µs | 500 µs to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs 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 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 |
| — Isochronous mode | No |
| — IRT | Yes |
| — Dynamic Frame Packing (DFP) | No |
| — PROFIenergy | Yes; per user program |
| — Prioritized startup | Yes |
| — 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 |


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|---|---|
| ● Autonegotiation | Yes |
| ● Autocrossing | Yes |
| ● Industrial Ethernet status LED | 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 | |
| ● PROFINET system redundancy (S2) | No |
| ● PROFINET system redundancy (R1) | No |
| ● 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, recommended max. | 1 000 |
| — Number of elements for one call of OPC_UA_NodeGetHandleList/OPC_UA_ReadList/OPC_U max. | 300 |
| — Number of elements for one call of OPC_UA_NameSpaceGetIndexList, max. | 20 |
| — Number of elements for one call of | 100 |


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| | |
|---|---|
| OPC_UA_MethodGetHandleList, max. | |
| — Number of simultaneous calls of the client instructions for session management, per connection, max. | 1 |
| — Number of simultaneous calls of the client instructions for data access, per connection, 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, recommended 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 |
| ● Number of variables, max. | |
| — of which status variables, max. | 200; per job |
| — of which control variables, max. | 200; per job |
| Forcing | |
| ● Forcing | Yes |
| ● Forcing, variables | Peripheral inputs/outputs |


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| | |
|---|---|
| ● Number of variables, max. | 200 |
| Diagnostic buffer | |
| ● present | Yes |
| ● Number of entries, max. | 1 000 |
| — of which powerfail-proof | 500 |
| Traces | |
| ● Number of configurable Traces | 4; Up to 512 KB of data per trace are possible |
| **Interrupts/diagnostics/status information** | |
| Alarms | |
| ● Diagnostic alarm | Yes |
| ● Hardware interrupt | Yes |
| Diagnoses | |
| ● Monitoring the supply voltage | Yes |
| ● Wire break | Yes; for analog inputs/outputs, see description in manual |
| ● Short-circuit | Yes; for analog outputs, see description in manual |
| ● A/B transition error at incremental encoder | Yes |
| Diagnostics indication LED | |
| ● RUN/STOP LED | Yes |
| ● ERROR LED | Yes |
| ● MAINT LED | Yes |
| ● STOP ACTIVE LED | Yes |
| ● Monitoring of the supply voltage (PWR-LED) | Yes |
| ● Channel status display | Yes |
| ● for channel diagnostics | Yes; For analog inputs/outputs |
| ● Connection display LINK TX/RX | Yes |
| **Supported technology objects** | |
| Motion Control | Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool |
| ● Number of available Motion Control resources for technology objects | 800 |
| ● Required Motion Control resources | |
| — per speed-controlled axis | 40 |
| — per positioning axis | 80 |
| — per synchronous axis | 160 |
| — per external encoder | 80 |
| — per output cam | 20 |
| — per cam track | 160 |
| — per probe | 40 |
| ● Positioning axis | |
| — 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** | |
| Counter | |
| ● Number of counters | 6; Of which max. 4x A/B/N |
| ● Counting frequency, 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 |


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| | |
|---|---|
| ● 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) |
| **Standards, approvals, certificates** | |
| Recycler Guide available | Yes |
| Ecological footprint | |
| ● environmental product declaration | Yes |
| Global warming potential | |
| — global warming potential, (total) [CO2 eq] | 183 kg |
| — global warming potential, (during production) [CO2 eq] | 54.9 kg |
| — global warming potential, (during operation) [CO2 eq] | 133 kg |
| — global warming potential, (after end of life cycle) [CO2 eq] | -5.5 kg |
| **Security** | |
| PROFINET Security Class | 1 |
| **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 |


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| 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 | |
| ● 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 |
| 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 |

**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**

| | | | | | |
|---|---|---|---|---|---|
| CE EG-Konf. | UKCA | Miscellaneous | Manufacturer Declaration | UL | Miscellaneous |

| General Product Approval | For use in hazardous locations |
|---|---|


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| | | | | | |
|---|---|---|---|---|---|
| RCM | EAC | China RoHS | Manufacturer Declaration | UL | FM |

| For use in hazardous locations | | | | | |
|---|---|---|---|---|---|
| CCC-Ex | IECEx | ATEX | Type Examination Certificate | Miscellaneous | CCC-Ex |

| Maritime application | | | | | |
|---|---|---|---|---|---|
| ABS | BUREAU VERITAS | DNV | LRS | NK / Nippon Kaiji Kyokai | RINA |

| Maritime application | | | other | Environment | Industrial Communication |
|---|---|---|---|---|---|
| RMRS | CCS (China Classification Society) | KR (Korean Register of Shipping) | PROFINET | EPD | PROFINET |

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