



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 | FS01 |
| Firmware version | V2.5 |
| Engineering with | |
| <ul style="list-style-type: none"> STEP 7 TIA Portal configurable/integrated as of version | V15 |
| 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 | |
| <ul style="list-style-type: none"> • 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

| | |
|--|---|
| <ul style="list-style-type: none"> • 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 |
| <ul style="list-style-type: none"> • Size, max. | 1 Mbyte; For non-optimized block accesses, the max. size of the DB is 64 KB |

FB

| | |
|--|--------------|
| <ul style="list-style-type: none"> • Number range | 0 ... 65 535 |
| <ul style="list-style-type: none"> • Size, max. | 175 kbyte |

FC

| | |
|--|--------------|
| <ul style="list-style-type: none"> • Number range | 0 ... 65 535 |
| <ul style="list-style-type: none"> • Size, max. | 175 kbyte |

OB

| | |
|--|--|
| <ul style="list-style-type: none"> • Size, max. | 175 kbyte |
| <ul style="list-style-type: none"> • Number of free cycle OBs | 100 |
| <ul style="list-style-type: none"> • Number of time alarm OBs | 20 |
| <ul style="list-style-type: none"> • Number of delay alarm OBs | 20 |
| <ul style="list-style-type: none"> • Number of cyclic interrupt OBs | 20; With minimum OB 3x cycle of 500 µs |
| <ul style="list-style-type: none"> • Number of process alarm OBs | 50 |
| <ul style="list-style-type: none"> • Number of DPV1 alarm OBs | 3 |
| <ul style="list-style-type: none"> • Number of isochronous mode OBs | 1 |
| <ul style="list-style-type: none"> • Number of technology synchronous alarm OBs | 2 |
| <ul style="list-style-type: none"> • Number of startup OBs | 100 |
| <ul style="list-style-type: none"> • Number of asynchronous error OBs | 4 |
| <ul style="list-style-type: none"> • Number of synchronous error OBs | 2 |
| <ul style="list-style-type: none"> • Number of diagnostic alarm OBs | 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 60W 24/48/60V 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 | |
| <ul style="list-style-type: none"> integrated Via CM | <p>1</p> <p>4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total</p> |
| Rack | |
| <ul style="list-style-type: none"> Modules per rack, max. Number of lines, max. | <p>32; CPU + 31 modules</p> <p>1</p> |
| PtP CM | |
| <ul style="list-style-type: none"> Number of PtP CMs | the number of connectable PtP CMs is only limited by the number of available slots |
| Time of day | |
| Clock | |
| <ul style="list-style-type: none"> Type Backup time Deviation per day, max. | <p>Hardware clock</p> <p>6 wk; At 40 °C ambient temperature, typically</p> <p>10 s; Typ.: 2 s</p> |
| Operating hours counter | |
| <ul style="list-style-type: none"> Number | 16 |
| Clock synchronization | |
| <ul style="list-style-type: none"> supported in AS, master in AS, slave on Ethernet via NTP | <p>Yes</p> <p>Yes</p> <p>Yes</p> <p>Yes</p> |
| 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 | |
| <ul style="list-style-type: none"> Gate start/stop Capture Synchronization | <p>Yes</p> <p>Yes</p> <p>Yes</p> |
| Input voltage | |
| <ul style="list-style-type: none"> Type of input voltage Rated value (DC) for signal "0" for signal "1" | <p>DC</p> <p>24 V</p> <p>-3 to +5V</p> <p>+11 to +30V</p> |
| 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 | |
| • 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 |
| • Pulse train | Yes; also for pulse/direction interface |
| 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 |
| • 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 |
| Cable length | |
| <ul style="list-style-type: none"> shielded, max. | 1 000 m; 600 m for technological functions; depending on output frequency, load, and cable quality; max. 50 m at 100 kHz |
| <ul style="list-style-type: none"> unshielded, max. | 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 | 4; max. |
| <ul style="list-style-type: none"> For voltage measurement | 4; max. |

| | |
|---|--|
| <ul style="list-style-type: none"> • 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 | |
| <ul style="list-style-type: none"> • 0 to +10 V | Yes; Physical measuring range: ± 10 V |
| <ul style="list-style-type: none"> • Input resistance (0 to 10 V) | 100 kΩ |
| <ul style="list-style-type: none"> • 1 V to 5 V | Yes; Physical measuring range: ± 10 V |
| <ul style="list-style-type: none"> • Input resistance (1 V to 5 V) | 100 kΩ |
| <ul style="list-style-type: none"> • -10 V to +10 V | Yes |
| <ul style="list-style-type: none"> • Input resistance (-10 V to +10 V) | 100 kΩ |
| <ul style="list-style-type: none"> • -5 V to +5 V | Yes; Physical measuring range: ± 10 V |
| <ul style="list-style-type: none"> • Input resistance (-5 V to +5 V) | 100 kΩ |
| Input ranges (rated values), currents | |
| <ul style="list-style-type: none"> • 0 to 20 mA | Yes; Physical measuring range: ± 20 mA |
| <ul style="list-style-type: none"> • Input resistance (0 to 20 mA) | 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC |
| <ul style="list-style-type: none"> • -20 mA to +20 mA | Yes |
| <ul style="list-style-type: none"> • Input resistance (-20 mA to +20 mA) | 50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC |
| <ul style="list-style-type: none"> • 4 mA to 20 mA | Yes; Physical measuring range: ± 20 mA |
| <ul style="list-style-type: none"> • Input resistance (4 mA to 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 | Yes; Standard/climate |
| <ul style="list-style-type: none"> • Input resistance (Ni 100) | 10 MΩ |
| <ul style="list-style-type: none"> • Pt 100 | Yes; Standard/climate |
| <ul style="list-style-type: none"> • Input resistance (Pt 100) | 10 MΩ |
| Input ranges (rated values), resistors | |
| <ul style="list-style-type: none"> • 0 to 150 ohms | Yes; Physical measuring range: 0 ... 600 ohms |
| <ul style="list-style-type: none"> • Input resistance (0 to 150 ohms) | 10 MΩ |
| <ul style="list-style-type: none"> • 0 to 300 ohms | Yes; Physical measuring range: 0 ... 600 ohms |
| <ul style="list-style-type: none"> • Input resistance (0 to 300 ohms) | 10 MΩ |
| <ul style="list-style-type: none"> • 0 to 600 ohms | Yes |
| <ul style="list-style-type: none"> • Input resistance (0 to 600 ohms) | 10 MΩ |
| 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 | |
| • 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 |

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 |
| • 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 % |

| | |
|--|---|
| <ul style="list-style-type: none"> • Resistance thermometer, relative to input range, (+/-) • Voltage, relative to output range, (+/-) • Current, relative to output range, (+/-) | Pt100 Standard: ± 2 K, Pt100 Climate: ± 1 K, Ni100 Standard: ± 1.2 K, Ni100 Climate: ± 1 K 0.3 % 0.3 % |
| Basic error limit (operational limit at 25 °C) | |
| <ul style="list-style-type: none"> • Voltage, relative to input range, (+/-) • Current, relative to input range, (+/-) • Resistance, relative to input range, (+/-) • Resistance thermometer, relative to input range, (+/-) • Voltage, relative to output range, (+/-) • Current, relative to output range, (+/-) | 0.2 % 0.2 % 0.2 % Pt100 Standard: ± 1 K, Pt100 Climate: ± 0.5 K, Ni100 Standard: ± 0.6 K, Ni100 Climate: ± 0.5 K 0.2 % 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. • Common mode voltage, max. • Common mode interference, min. | 30 dB 10 V 60 dB; at 400 Hz: 50 dB |
| Interfaces | |
| Number of PROFINET interfaces | 1 |
| 1. Interface | |
| Interface types | |
| <ul style="list-style-type: none"> • Number of ports • integrated switch • RJ 45 (Ethernet) | 2 Yes Yes; X1 |
| Protocols | |
| <ul style="list-style-type: none"> • IP protocol • PROFINET IO Controller • PROFINET IO Device • SIMATIC communication • Open IE communication • Web server • Media redundancy | Yes; IPv4 Yes Yes Yes Yes Yes Yes; MRP Automanager according to IEC 62439-2 Edition 2.0 |
| PROFINET IO Controller | |
| Services | |
| <ul style="list-style-type: none"> — PG/OP communication — S7 routing — Isochronous mode — Open IE communication — IRT — MRP | Yes Yes Yes Yes Yes Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 |

| | |
|---|--|
| — MRPD | Yes; Requirement: IRT |
| — PROFINergy | Yes |
| — 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 |
| — Open IE communication | Yes |
| — IRT | Yes |
| — MRP | Yes |
| — MRPD | Yes; Requirement: IRT |
| — PROFINergy | Yes |

| | |
|---|-----------------------|
| — 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 |
| • 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 |

PROFINET IO Controller

| | |
|---|--|
| Services | |
| — PG/OP communication | Yes |
| — S7 routing | Yes |
| — Isochronous mode | Yes |
| — Open IE communication | Yes |
| — IRT | Yes |
| — PROFinergy | Yes |
| — 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 |

Redundancy mode

| | |
|-------|--|
| — MRP | Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 |
|-------|--|

| | |
|--|---|
| — MRPD | Yes; Requirement: IRT |
| 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 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 |
| — Subscriptions per session, max. | 20 |
| — Sampling time, min. | 100 ms |
| — Send time, 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 |

| | |
|---|--|
| — Number of nodes for user-defined server interfaces, max. | 1 000 |
| Further protocols | |
| • MODBUS | Yes; MODBUS TCP |
| Media redundancy | |
| • Switchover time on line break, typ. | 200 ms; For MRP, bumpless for MRPD |
| • Number of stations in the ring, max. | 50 |
| Isochronous mode | |
| Isochronous operation (application synchronized up to terminal) | Yes; With minimum OB 6x cycle of 625 µs |
| Equidistance | Yes |
| S7 message functions | |
| Number of login stations for message functions, max. | 32 |
| Program alarms | Yes |
| Number of configurable program alarms | 5 000 |
| Number of simultaneously active program alarms | |
| • Number of program alarms | 300 |
| • 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, variables | Peripheral inputs/outputs |
| • 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 |
| Diagnostic messages | |
| • 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 axes affects the cycle time of the PLC program; selection guide via the TIA Selection Tool or SIZER |
| • Number of available Motion Control resources for technology objects (except cam disks) | 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 | |
|--|--|
| 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 | |
| <ul style="list-style-type: none"> horizontal installation, min. horizontal installation, max. vertical installation, min. vertical installation, max. | 0 °C 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 0 °C 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 | |
| <ul style="list-style-type: none"> min. max. | -40 °C 70 °C |
| Configuration | |
| Programming | |
| Programming language | |
| — LAD | Yes |
| — FBD | Yes |
| — STL | Yes |
| — SCL | Yes |
| — GRAPH | Yes |
| Know-how protection | |
| <ul style="list-style-type: none"> User program protection/password protection Copy protection Block protection | Yes Yes Yes |
| Access protection | |
| <ul style="list-style-type: none"> Password for display Protection level: Write protection Protection level: Read/write protection Protection level: Complete protection | Yes Yes Yes Yes |
| Cycle time monitoring | |
| <ul style="list-style-type: none"> lower limit upper limit | adjustable minimum cycle time adjustable maximum cycle time |
| Dimensions | |
| Width | 85 mm |
| Height | 147 mm |
| Depth | 129 mm |
| Weights | |
| Weight, approx. | 1 050 g |

last modified:

07/13/2018