SIEMENS

## Data sheet 6ES7313-5BG04-0AB0


SIMATIC S7-300, CPU 313C, COMPACT CPU WITH MPI, 24 DI/16 DO, 4AI, 2AO 1 PT100, 3 FAST COUNTERS (30 KHZ), INTEGRATED 24V DC POWER SUPPLY, 128 KBYTE WORKING MEMORY, FRONT CONNECTOR (2 X 40PIN) AND MICRO MEMORY CARD REQUIRED

| General information | |
|---|---|
| Hardware product version | 01 |
| Firmware version | V3.3 |
| Engineering with | |
| • Programming package | STEP 7 V5.5 + SP1 or higher or STEP 7 V5.3 + SP2 or higher with HSP 203 |

| Supply voltage | |
|---|---|
| Rated value (DC) | |
| • 24 V DC | Yes |
| permissible range, lower limit (DC) | 19.2 V |
| permissible range, upper limit (DC) | 28.8 V |
| external protection for power supply lines (recommendation) | Miniature circuit breaker, type C; min. 2 A; miniature circuit breaker type B, min. 4 A |
| Mains buffering | |
| • Mains/voltage failure stored energy time | 5 ms |
| • Repeat rate, min. | 1 s |
| Digital inputs | |
| Load voltage L+ | |
| — Rated value (DC) | 24 V |

| | |
|---|---|
| — Reverse polarity protection | Yes |
| Digital outputs | |
| Load voltage L+ | |
| — Rated value (DC) | 24 V |
| — Reverse polarity protection | No |
| **Input current** | |
| Current consumption (rated value) | 650 mA |
| Current consumption (in no-load operation), typ. | 150 mA |
| Inrush current, typ. | 5 A |
| $I^2t$ | 0.7 $A^2 \cdot s$ |
| Digital inputs | |
| • from load voltage L+ (without load), max. | 80 mA |
| Digital outputs | |
| • from load voltage L+, max. | 50 mA |
| **Power loss** | |
| Power loss, typ. | 12 W |
| **Memory** | |
| Work memory | |
| • integrated | 128 kbyte |
| • expandable | No |
| • Size of retentive memory for retentive data blocks | 64 kbyte |
| Load memory | |
| • Plug-in (MMC) | Yes |
| • Plug-in (MMC), max. | 8 Mbyte |
| • Data management on MMC (after last programming), min. | 10 y |
| Backup | |
| • present | Yes; Guaranteed by MMC (maintenance-free) |
| • without battery | Yes; Program and data |
| **CPU processing times** | |
| for bit operations, typ. | 0.07 µs |
| for word operations, typ. | 0.15 µs |
| for fixed point arithmetic, typ. | 0.2 µs |
| for floating point arithmetic, typ. | 0.72 µs |
| **CPU-blocks** | |
| Number of blocks (total) | 1 024; (DBs, FCs, FBs); the maximum number of loadable blocks can be reduced by the MMC used. |
| DB | |
| • Number, max. | 1 024; Number range: 1 to 16000 |
| • Size, max. | 64 kbyte |

| | |
|---|---|
| FB | |
| • Number, max. | 1 024; Number range: 0 to 7999 |
| • Size, max. | 64 kbyte |
| FC | |
| • Number, max. | 1 024; Number range: 0 to 7999 |
| • Size, max. | 64 kbyte |
| OB | |
| • Description | see instruction list |
| • Size, max. | 64 kbyte |
| • Number of free cycle OBs | 1; OB 1 |
| • Number of time alarm OBs | 1; OB 10 |
| • Number of delay alarm OBs | 2; OB 20, 21 |
| • Number of cyclic interrupt OBs | 4; OB 32, 33, 34, 35 |
| • Number of process alarm OBs | 1; OB 40 |
| • Number of startup OBs | 1; OB 100 |
| • Number of asynchronous error OBs | 4; OB 80, 82, 85, 87 |
| • Number of synchronous error OBs | 2; OB 121, 122 |
| Nesting depth | |
| • per priority class | 16 |
| • additional within an error OB | 4 |

| Counters, timers and their retentivity | |
|---|---|
| S7 counter | |
| • Number | 256 |
| Retentivity | |
| — adjustable | Yes |
| — lower limit | 0 |
| — upper limit | 255 |
| — preset | Z 0 to Z 7 |
| Counting range | |
| — lower limit | 0 |
| — upper limit | 999 |
| IEC counter | |
| • present | Yes |
| • Type | SFB |
| • Number | Unlimited (limited only by RAM capacity) |
| S7 times | |
| • Number | 256 |
| Retentivity | |
| — adjustable | Yes |
| — lower limit | 0 |
| — upper limit | 255 |

| | |
|---|---|
| — preset | No retentivity |
| Time range | |
| — lower limit | 10 ms |
| — upper limit | 9 990 s |
| IEC timer | |
| • present | Yes |
| • Type | SFB |
| • Number | Unlimited (limited only by RAM capacity) |

| Data areas and their retentivity | |
|---|---|
| retentive data area in total | All, max. 64 KB |
| Flag | |
| • Number, max. | 256 byte |
| • Retentivity available | Yes; MB 0 to MB 255 |
| • Retentivity preset | MB 0 to MB 15 |
| • Number of clock memories | 8; 1 memory byte |
| Data blocks | |
| • Number, max. | 1 024; Number range: 1 to 16000 |
| • Size, max. | 64 kbyte |
| • Retentivity adjustable | Yes; via non-retain property on DB |
| • Retentivity preset | Yes |
| Local data | |
| • per priority class, max. | 32 kbyte; Max. 2048 bytes per block |

| Address area | |
|---|---|
| I/O address area | |
| • Inputs | 1 024 byte |
| • Outputs | 1 024 byte |
| of which distributed | |
| — Inputs | none |
| — Outputs | none |
| Process image | |
| • Inputs | 1 024 byte |
| • Outputs | 1 024 byte |
| • Inputs, adjustable | 1 024 byte |
| • Outputs, adjustable | 1 024 byte |
| • Inputs, default | 128 byte |
| • Outputs, default | 128 byte |
| Default addresses of the integrated channels | |
| — Digital inputs | 124.0 to 126.7 |
| — Digital outputs | 124.0 to 125.7 |
| — Analog inputs | 752 to 761 |
| — Analog outputs | 752 to 755 |

| | |
|---|---|
| Digital channels | |
| • Inputs | 1 016 |
| — of which central | 1 016 |
| • Outputs | 1 008 |
| — of which central | 1 008 |
| Analog channels | |
| • Inputs | 253 |
| — of which central | 253 |
| • Outputs | 250 |
| — of which central | 250 |

| Hardware configuration | |
|---|---|
| Number of expansion units, max. | 3 |
| Number of DP masters | |
| • integrated | none |
| • via CP | 4 |
| Number of operable FMs and CPs (recommended) | |
| • FM | 8 |
| • CP, PtP | 8 |
| • CP, LAN | 6 |
| Rack | |
| • Racks, max. | 4 |
| • Modules per rack, max. | 8; In rack 3 max. 7 |

| Time of day | |
|---|---|
| Clock | |
| • Hardware clock (real-time) | Yes |
| • retentive and synchronizable | Yes |
| • Backup time | 6 wk; At 40 °C ambient temperature |
| • Deviation per day, max. | 10 s; Typ.: 2 s |
| • Behavior of the clock following POWER-ON | Clock continues running after POWER OFF |
| • Behavior of the clock following expiry of backup period | Clock continues to run with the time at which the power failure occurred |
| Operating hours counter | |
| • Number | 1 |
| • Number/Number range | 0 |
| • Range of values | 0 to 2^31 hours (when using SFC 101) |
| • Granularity | 1 hour |
| • retentive | Yes; Must be restarted at each restart |
| Clock synchronization | |
| • supported | Yes |
| • to MPI, master | Yes |
| • to MPI, slave | Yes |

| | |
|---|---|
| • in AS, master | Yes |
| • in AS, slave | No |
| **Digital inputs** | |
| Number of digital inputs | 24 |
| • of which inputs usable for technological functions | 12 |
| integrated channels (DI) | 24 |
| Input characteristic curve in accordance with IEC 61131, type 1 | Yes |
| Number of simultaneously controllable inputs | |
| horizontal installation | |
| — up to 40 °C, max. | 24 |
| — up to 60 °C, max. | 12 |
| vertical installation | |
| — up to 40 °C, max. | 12 |
| Input voltage | |
| • Rated value (DC) | 24 V |
| • for signal "0" | -3 to +5V |
| • for signal "1" | +15 to +30V |
| Input current | |
| • for signal "1", typ. | 8 mA |
| Input delay (for rated value of input voltage) | |
| for standard inputs | |
| — parameterizable | Yes; 0.1 / 0.3 / 3 / 15 ms (You can reconfigure the input delay of the standard inputs during program runtime. Please note that under certain circumstances your newly set filter time may not be effective until the next filter cycle.) |
| — Rated value | 3 ms |
| for counter/technological functions | |
| — at "0" to "1", max. | 16 µs; Minimum pulse width/minimum pause between pulses at maximum counting frequency |
| Cable length | |
| • shielded, max. | 1 000 m; 100 m for technological functions |
| • unshielded, max. | 600 m; For technological functions: No |
| for technological functions | |
| — shielded, max. | 100 m; at maximum count frequency |
| — unshielded, max. | not allowed |
| **Digital outputs** | |
| Number of digital outputs | 16 |
| • of which high-speed outputs | 4; Notice: You cannot connect the fast outputs of your CPU in parallel |
| integrated channels (DO) | 16 |

| | |
|---|---|
| Short-circuit protection | Yes; Clocked electronically |
| • Response threshold, typ. | 1 A |
| Limitation of inductive shutdown voltage to | L+ (-48 V) |
| Controlling a digital input | Yes |
| Switching capacity of the outputs | |
| • on lamp load, max. | 5 W |
| Load resistance range | |
| • lower limit | 48 Ω |
| • upper limit | 4 kΩ |
| Output voltage | |
| • for signal "1", min. | L+ (-0.8 V) |
| Output current | |
| • for signal "1" rated value | 500 mA |
| • for signal "1" permissible range, min. | 5 mA |
| • for signal "1" permissible range, max. | 0.6 A |
| • for signal "1" minimum load current | 5 mA |
| • for signal "0" residual current, max. | 0.5 mA |
| Parallel switching of two outputs | |
| • for uprating | No |
| • for redundant control of a load | Yes |
| Switching frequency | |
| • with resistive load, max. | 100 Hz |
| • with inductive load, max. | 0.5 Hz |
| • on lamp load, max. | 100 Hz |
| • of the pulse outputs, with resistive load, max. | 2.5 kHz |
| Total current of the outputs (per group) | |
| horizontal installation | |
| — up to 40 °C, max. | 3 A |
| — up to 60 °C, max. | 2 A |
| vertical installation | |
| — up to 40 °C, max. | 2 A |
| Cable length | |
| • shielded, max. | 1 000 m |
| • unshielded, max. | 600 m |

| Analog inputs | |
|---|---|
| Number of analog inputs | 4 |
| • For voltage/current measurement | 4 |
| • For resistance/resistance thermometer measurement | 1 |
| integrated channels (AI) | 5; 4 x current/voltage, 1 x resistance |
| permissible input voltage for current input (destruction limit), max. | 5 V; Permanent |

| | |
|---|---|
| permissible input voltage for voltage input (destruction limit), max. | 30 V; Permanent |
| permissible input current for voltage input (destruction limit), max. | 0.5 mA; Permanent |
| permissible input current for current input (destruction limit), max. | 50 mA; Permanent |
| Technical unit for temperature measurement adjustable | Yes; Degrees Celsius / degrees Fahrenheit / Kelvin |
| Input ranges | |
| • Voltage | Yes; ±10 V / 100 kΩ; 0 V to 10 V / 100 kΩ |
| • Current | Yes; ±20 mA / 100 Ω; 0 mA to 20 mA / 100 Ω; 4 mA to 20 mA / 100 Ω |
| • Resistance thermometer | Yes; Pt 100 / 10 MΩ |
| • Resistance | Yes; 0 Ω to 600 Ω / 10 MΩ |
| Input ranges (rated values), voltages | |
| • 0 to +10 V | Yes |
| • Input resistance (0 to 10 V) | 100 kΩ |
| Input ranges (rated values), currents | |
| • 0 to 20 mA | Yes |
| • Input resistance (0 to 20 mA) | 100 Ω |
| • -20 mA to +20 mA | Yes |
| • Input resistance (-20 mA to +20 mA) | 100 Ω |
| • 4 mA to 20 mA | Yes |
| • Input resistance (4 mA to 20 mA) | 100 Ω |
| Input ranges (rated values), resistance thermometer | |
| • Pt 100 | Yes |
| • Input resistance (Pt 100) | 10 MΩ |
| Input ranges (rated values), resistors | |
| • No-load voltage, typ. | 3.3 V |
| • Measuring current, typ. | 1,25 mA |
| • 0 to 600 ohms | Yes |
| • Input resistance (0 to 600 ohms) | 10 MΩ |
| Thermocouple (TC) | |
| Temperature compensation | |
| — parameterizable | No |
| Characteristic linearization | |
| • parameterizable | Yes; by software |
| — for resistance thermometer | Pt 100 |
| Cable length | |
| • shielded, max. | 100 m |
| **Analog outputs** | |
| Number of analog outputs | 2 |

| | |
|---|---|
| integrated channels (AO) | 2 |
| Voltage output, short-circuit protection | Yes |
| Voltage output, short-circuit current, max. | 55 mA |
| Current output, no-load voltage, max. | 14 V |
| Output ranges, voltage | |
| • 0 to 10 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 |
| Connection of actuators | |
| • for voltage output two-wire connection | Yes; Without compensation of the line resistances |
| • for voltage output four-wire connection | No |
| • for current output two-wire connection | Yes |
| Load impedance (in rated range of output) | |
| • with voltage outputs, min. | 1 kΩ |
| • with voltage outputs, capacitive load, max. | 0.1 µF |
| • with current outputs, max. | 300 Ω |
| • with current outputs, inductive load, max. | 0.1 mH |
| Destruction limits against externally applied voltages and currents | |
| • Voltages at the outputs towards MANA | 16 V; Permanent |
| • Current, max. | 50 mA; Permanent |
| Cable length | |
| • shielded, max. | 200 m |

| Analog value generation for the inputs | |
|---|---|
| Measurement principle | Actual value encryption (successive approximation) |
| Integration and conversion time/resolution per channel | |
| • Resolution with overrange (bit including sign), max. | 12 bit |
| • Integration time, parameterizable | Yes; 16.6 / 20 ms |
| • Interference voltage suppression for interference frequency f1 in Hz | 50 / 60 Hz |
| • permissible input frequency, max. | 400 Hz |
| • Time constant of the input filter | 0.38 ms |
| • Basic execution time of the module (all channels released) | 1 ms |

| Analog value generation for the outputs | |
|---|---|
| Integration and conversion time/resolution per channel | |
| • Resolution with overrange (bit including sign), max. | 12 bit |
| • Conversion time (per channel) | 1 ms |

| | |
|---|---|
| Settling time | |
| • for resistive load | 0.6 ms |
| • for capacitive load | 1 ms |
| • for inductive load | 0.5 ms |
| **Encoder** | |
| Connection of signal encoders | |
| • for voltage measurement | Yes |
| • for current measurement as 2-wire transducer | Yes; with external supply |
| • for current measurement as 4-wire transducer | Yes |
| • for resistance measurement with two-wire connection | Yes; Without compensation of the line resistances |
| • for resistance measurement with three-wire connection | No |
| • for resistance measurement with four-wire connection | No |
| Connectable encoders | |
| • 2-wire sensor | Yes |
| — permissible quiescent current (2-wire sensor), max. | 1.5 mA |
| **Errors/accuracies** | |
| Temperature error (relative to input range), (+/-) | 0.006 %/K |
| Crosstalk between the inputs, min. | 60 dB |
| Repeat accuracy in steady state at 25 °C (relative to input range), (+/-) | 0.06 % |
| Output ripple (relative to output range, bandwidth 0 to 50 kHz), (+/-) | 0.1 % |
| Linearity error (relative to output range), (+/-) | 0.15 % |
| Temperature error (relative to output range), (+/-) | 0.01 %/K |
| Crosstalk between the outputs, min. | 60 dB |
| Repeat accuracy in steady state at 25 °C (relative to output range), (+/-) | 0.06 % |
| Operational error limit in overall temperature range | |
| • Voltage, relative to input range, (+/-) | 1 % |
| • Current, relative to input range, (+/-) | 1 % |
| • Resistance, relative to input range, (+/-) | 1 % |
| • Voltage, relative to output range, (+/-) | 1 % |
| • Current, relative to output range, (+/-) | 1 % |
| Basic error limit (operational limit at 25 °C) | |
| • Voltage, relative to input range, (+/-) | 0.8 %; Linearity error +/- 0.06 % |
| • Current, relative to input range, (+/-) | 0.8 %; Linearity error +/- 0.06 % |
| • Resistance, relative to input range, (+/-) | 0.8 %; Linearity error +/- 0.2% |
| • Resistance thermometer, relative to input range, (+/-) | 0.8 % |

| | |
|---|---|
| • Voltage, relative to output range, (+/-) | 0.8 % |
| • Current, relative to output range, (+/-) | 0.8 % |
| 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 interference, min. | 40 dB |

| Interfaces | |
|---|---|
| Number of industrial Ethernet interfaces | 0 |
| Number of RS 485 interfaces | 1; MPI |
| Number of RS 422 interfaces | 0 |

| 1. Interface | |
|---|---|
| Interface type | Integrated RS 485 interface |
| Physics | RS 485 |
| Isolated | No |
| Power supply to interface (15 to 30 V DC), max. | 200 mA |
| Functionality | |
| • MPI | Yes |
| • PROFIBUS DP master | No |
| • PROFIBUS DP slave | No |
| • Point-to-point connection | No |
| MPI | |
| • Transmission rate, max. | 187.5 kbit/s |
| Services | |
| — PG/OP communication | Yes |
| — Routing | No |
| — Global data communication | Yes |
| — S7 basic communication | Yes |
| — S7 communication | Yes; Only server, configured on one side |
| — S7 communication, as client | No; but via CP and loadable FB |
| — S7 communication, as server | Yes |

| Communication functions | |
|---|---|
| PG/OP communication | Yes |
| Data record routing | No |
| Global data communication | |
| • supported | Yes |
| • Number of GD loops, max. | 8 |
| • Number of GD packets, max. | 8 |
| • Number of GD packets, transmitter, max. | 8 |
| • Number of GD packets, receiver, max. | 8 |
| • Size of GD packets, max. | 22 byte |
| • Size of GD packet (of which consistent), max. | 22 byte |

| | |
|---|---|
| S7 basic communication | |
| • supported | Yes |
| • User data per job, max. | 76 byte |
| • User data per job (of which consistent), max. | 76 byte; 76 bytes (with X_SEND or X_RCV); 64 bytes (with X_PUT or X_GET as server) |
| S7 communication | |
| • supported | Yes |
| • as server | Yes |
| • as client | Yes; Via CP and loadable FB |
| • User data per job, max. | 180 byte; With PUT/GET |
| • User data per job (of which consistent), max. | 240 byte; as server |
| S5 compatible communication | |
| • supported | Yes; via CP and loadable FC |
| Number of connections | |
| • overall | 8 |
| • usable for PG communication | 7 |
| — reserved for PG communication | 1 |
| — adjustable for PG communication, min. | 1 |
| — adjustable for PG communication, max. | 7 |
| • usable for OP communication | 7 |
| — reserved for OP communication | 1 |
| — adjustable for OP communication, min. | 1 |
| — adjustable for OP communication, max. | 7 |
| • usable for S7 basic communication | 4 |
| — reserved for S7 basic communication | 0 |
| — adjustable for S7 basic communication, min. | 0 |
| — adjustable for S7 basic communication, max. | 4 |

| S7 message functions | |
|---|---|
| Number of login stations for message functions, max. | 8; Depending on the configured connections for PG/OP and S7 basic communication |
| Process diagnostic messages | Yes |
| simultaneously active Alarm-S blocks, max. | 300 |

| Test commissioning functions | |
|---|---|
| Status block | Yes; Up to 2 simultaneously |
| Single step | Yes |
| Number of breakpoints | 4 |
| Status/control | |
| • Status/control variable | Yes |
| • Variables | Inputs, outputs, memory bits, DB, times, counters |
| • Number of variables, max. | 30 |

| | |
|---|---|
| — of which status variables, max. | 30 |
| — of which control variables, max. | 14 |
| **Forcing** | |
| • Forcing | Yes |
| • Forcing, variables | Inputs, outputs |
| • Number of variables, max. | 10 |
| **Diagnostic buffer** | |
| • present | Yes |
| • Number of entries, max. | 500 |
| — adjustable | No |
| — of which powerfail-proof | 100; Only the last 100 entries are retained |
| • Number of entries readable in RUN, max. | 499 |
| — can be set | Yes; From 10 to 499 |
| — preset | 10 |
| **Service data** | |
| • can be read out | Yes |

| | |
|---|---|
| **Interrupts/diagnostics/status information** | |
| **Diagnostics indication LED** | |
| • Status indicator digital input (green) | Yes |
| • Status indicator digital output (green) | Yes |

| | |
|---|---|
| **Integrated Functions** | |
| Number of counters | 3; See "Technological Functions" manual |
| Counting frequency (counter) max. | 30 kHz |
| Frequency measurement | Yes |
| Number of frequency meters | 3; up to 30 kHz (see "Technological Functions" manual) |
| controlled positioning | No |
| integrated function blocks (closed-loop control) | Yes; PID controller (see "Technological Functions" manual) |
| PID controller | Yes |
| Number of pulse outputs | 3; Pulse width modulation up to 2.5 kHz (see "Technological Functions" Manual) |
| Limit frequency (pulse) | 2.5 kHz |

| | |
|---|---|
| **Potential separation** | |
| **Potential separation digital inputs** | |
| • Potential separation digital inputs | Yes |
| • between the channels | No |
| • between the channels and backplane bus | Yes |
| **Potential separation digital outputs** | |
| • Potential separation digital outputs | Yes |
| • between the channels | Yes |
| • between the channels, in groups of | 8 |
| • between the channels and backplane bus | Yes |

| | |
|---|---|
| Potential separation analog inputs | |
| • Potential separation analog inputs | Yes; common for analog I/O |
| • between the channels | No |
| • between the channels and backplane bus | Yes |
| Potential separation analog outputs | |
| • Potential separation analog outputs | Yes; common for analog I/O |
| • between the channels | No |
| • between the channels and backplane bus | Yes |

| Permissible potential difference | |
|---|---|
| Between the inputs and MANA (UCM) | 8 V DC |

| Isolation | |
|---|---|
| Isolation tested with | 600 V DC |

| Ambient conditions | |
|---|---|
| Ambient temperature during operation | |
| • min. | 0 °C |
| • max. | 60 °C |

| Configuration | |
|---|---|
| Configuration software | |
| • STEP 7 | Yes; STEP 7 V5.5 + SP1 or higher or STEP 7 V5.3 + SP2 or higher with HSP 203 |
| • STEP 7 Lite | No |
| Programming | |
| • Command set | see instruction list |
| • Nesting levels | 8 |
| • System functions (SFC) | see instruction list |
| • System function blocks (SFB) | see instruction list |
| Programming language | |
| — LAD | Yes |
| — FBD | Yes |
| — STL | Yes |
| — SCL | Yes |
| — CFC | Yes |
| — GRAPH | Yes |
| — HiGraph® | Yes |
| Know-how protection | |
| • User program protection/password protection | Yes |
| • Block encryption | Yes; With S7 block Privacy |

| Dimensions | |
|---|---|
| Width | 120 mm |
| Height | 125 mm |

| | |
|---|---|
| Depth | 130 mm |

| Weights | |
|---|---|
| Weight, approx. | 660 g |

**last modified:** 03/23/2017