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Data sheet 6ES7313-5BG04-0AB0



spare part SIMATIC S7-300, CPU 313C, compact CPU with MPI, 24 DI/16 DO, 4 AI, 2 AO, 1 Pt100, 3 high-speed counters (30 kHz), integrated power supply 24 V DC, work memory 128 KB, front connector (2x 40-pole) and Micro Memory Card required

General information	
Product type designation	CPU 313C
HW functional status	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
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
Load voltage L+	
Digital inputs	
— Rated value (DC)	24 V
— Reverse polarity protection	Yes
Digital outputs	
— 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
Storage	
Work memory	
● integrated	128 kbyte
● expandable	No
Load memory	
● Plug-in (MMC)	Yes

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● Plug-in (MMC), max.	8 Mbyte
● Data management on MMC (after last programming), min.	10 a
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 elements (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	
● Number, max.	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
— 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 timer	
● Number	256
Retentivity	
— adjustable	Yes
— preset	No retentivity
Time range	
— lower limit	10 ms
— upper limit	9 990 s
IEC timer	

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● present	Yes
● Type	SFB
● Number	Unlimited (limited only by RAM capacity)
Data areas and their retentivity	
Retentive data area (incl. timers, counters, flags), max.	64 kbyte
Flag	
● Size, 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	
● 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
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	the clock continues at the time of day it had when power was switched off

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Operating hours counter	
● Number	1
● Number/Number range	0
● Range of values	0 to 2^31 hours (when using SFC 101)
● Granularity	1 h
● retentive	Yes; Must be restarted at each restart
Clock synchronization	
● supported	Yes
● to MPI, master	Yes
● on MPI, device	Yes
● in AS, master	Yes
● in AS, device	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 +30 V
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 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	

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● 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; 4x current/voltage, 1x 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
Electrical input frequency, max.	400 Hz
No-load voltage for resistance-type transmitter, typ.	3.3 V
Constant measurement current for resistance-type transmitter, typ.	1.25 mA
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	
● 0 to 600 ohms	Yes

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— 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	
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
● 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

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● 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 PROFINET interfaces	0
Number of RS 485 interfaces	1; MPI
Number of RS 422 interfaces	0
1. Interface	
Interface type	Integrated RS 485 interface
Isolated	No
Interface types	
● RS 485	Yes
● Output current of the interface, max.	200 mA
Protocols	
● MPI	Yes
● PROFIBUS DP master	No
● PROFIBUS DP device	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
Protocols	

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PROFIsafe	No
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	

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● present	Yes
● Number of entries, max.	500
— can be set	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	
Counter	
● Number of counters	3; See "Technological Functions" manual
● Counting frequency, 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
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

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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

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

Miscellaneous | Manufacturer Declaration | Metrological Approval

General Product Approval				EMV	For use in hazardous locations
RCM	EAC	China RoHS	Manufacturer Declaration	RCM	ATEX

For use in hazardous locations

FM	UL	IECEx	ATEX	Miscellaneous	CCC-Ex

Maritime application

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Maritime application

CCS (China Classification Society)

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