SIEMENS

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

Product type designation

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 supply cables (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

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— 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
I²t	0.7 A²·s

Digital inputs

• from load voltage L+ (without load), max.	80 mA

Digital outputs

• from load voltage L+, max.	50 mA

Power losses

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

• pluggable (MMC)	Yes
• pluggable (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 time 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	
— can be set	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	
— can be set	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	
Total retentive data area	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
— Inputs, of which central	1 016
● Outputs	1 008

— Outputs, of which central	1 008

Analog channels	
• Inputs	253
— Inputs, of which central	253
• Outputs	250
— Outputs, of which central	250

Hardware configuration

Expansion devices, max.	3

Number of DP masters	
• Integrated	none
• Via CP	4

Number of operable FMs and CPs (recommended)	
• FM	8
• CP, point-to-point	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 clock)	Yes
• battery-backed and synchronizable	Yes
• Deviation per day, max.	10 s; Typ.: 2 s
• Backup time	6 wk; At 40 °C ambient temperature
• 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
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
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.)
— nominal	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
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 2 outputs	
• for increased power	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
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	5
• For voltage/current measurement	4
• For resistance/resistance thermometer measurement	1
Integrated channels (AI)	5; 4 x current/voltage, 1 x resistance
permissible input frequency 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
● Measured 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 creation	
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
● permissible input frequency, max.	400 Hz
● Conversion time (per channel)	1 ms
● Time constant of the input filter	0.38 ms
● Basic execution time of the module (all channels released)	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 area), (+/-)	0.06 %
Output ripple (based on output area, 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 area), (+/-)	0.06 %

Operational limit in overall temperature range	
• Voltage, relative to input area, (+/-)	1 %
• Current, relative to input area, (+/-)	1 %
• Resistance, relative to input area, (+/-)	1 %
• Voltage, relative to output area, (+/-)	1 %
• Current, relative to output area, (+/-)	1 %

Basic error limit (operational limit at 25 °C)	
• Voltage, relative to input area, (+/-)	0.8 %; Linearity error +/- 0.06 %
• Current, relative to input area, (+/-)	0.8 %; Linearity error +/- 0.06 %
• Resistance, relative to input area, (+/-)	0.8 %; Linearity error +/- 0.2%
• Resistance thermometer, relative to input area, (+/-)	0.8 %
• Voltage, relative to output area, (+/-)	0.8 %
• Current, relative to output area, (+/-)	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 USB interfaces	0
Number of 20 mA interfaces (TTY)	0
Number of RS 232 interfaces	0
Number of RS 422 interfaces	0
Number of parallel interfaces	0
Number of other interfaces	0

1st 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
• DP master	No
• 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
• Force, variables	Inputs, outputs
• Number of variables, max.	10

Diagnostic buffer

• 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
Diagnostics indication LED	
• Status indicator digital output (green)	Yes
• Status indicator digital input (green)	Yes

Integrated Functions

Number of counters	3; See "Technological Functions" manual
Counter 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

Galvanic isolation

Galvanic isolation digital inputs	
• Galvanic isolation digital inputs	Yes
• between the channels	No
• between the channels and the backplane bus	Yes
Galvanic isolation digital outputs	
• Galvanic isolation digital outputs	Yes
• between the channels	Yes
• between the channels, in groups of	8
• between the channels and the backplane bus	Yes
Galvanic isolation analog inputs	
• Galvanic isolation analog inputs	Yes; common for analog I/O
• between the channels	No
• between the channels and the backplane bus	Yes
Galvanic isolation analog outputs	
• Galvanic isolation analog outputs	Yes; common for analog I/O
• between the channels	No
• between the channels and the backplane bus	Yes

Permissible potential difference

between different circuits	75V DC/60V AC
between inputs and MANA (UCM)	8 V DC
between MANA and M internally (UISO)	75V DC/60V AC

Isolation	
Isolation checked with	600 V DC

Ambient conditions	
Ambient temperature in 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

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