



SIPLUS S7-300 CPU313C WITH CONFORMAL COATING ACCORDING EN50155 T1 CAT 1 CL A BASED ON 6ES7313-5BG04-0AB0 . 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

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 buffering 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 ·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	
Type of memory	other
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 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 blocks (total)	1024 ; (DBs, FCs, FBs); the maximum number of loadable blocks can be reduced by the MMC used.
DB	
Number, max.	1024 ; Number range: 1 to 16000

Size, max.	64 kbyte
FB	
Number, max.	1024 ; Number range: 0 to 7999
Size, max.	64 kbyte
FC	
Number, max.	1024 ; 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	
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	9990 s
IEC timer	
present	Yes
Type	SFB
Number	Unlimited (limited only by RAM capacity)
Data areas and their retentivity	
retentive data area, 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.	1024 ; 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	1024 byte
Outputs	1024 byte
of which distributed	
Inputs	none
Outputs	none
Process image	
Inputs	1024 byte
Outputs	1024 byte
Inputs, adjustable	1024 byte
Outputs, adjustable	1024 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	1016
Outputs	1008
Inputs, of which central	1016
Outputs, of which central	1008
Analog channels	
Inputs	253
Outputs	250
Inputs, of which central	253
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
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 "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 counter/technological functions	
at "0" to "1", max.	16 µs ; Minimum pulse width/minimum pause between pulses at maximum counting frequency
Cable length	
Cable length, shielded, max.	1000 m ; 100 m for technological functions
Cable length unshielded, max.	600 m ; For technological functions: No

Technological functions	
shielded, max.	100 m ; at maximum count frequency
unshielded, max.	not allowed
Standard DI	
shielded, max.	1000 m
unshielded, max.	600 m
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	
Lamp load, max.	5 W
Load resistance range	
lower limit	48 Ω
upper limit	4 k Ω
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 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	
Cable length, shielded, max.	1000 m
Cable length unshielded, max.	600 m
Analog inputs	
integrated channels (AI)	5 ; 4 x current/voltage, 1 x resistance
Number of analog inputs for voltage/current measurement	4
Number of analog inputs for resistance/resistance thermometer measurement	1
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 k Ω ; 0 V to 10 V / 100 k Ω
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 M Ω
Resistance	Yes ; 0 Ω to 600 Ω / 10 M Ω
Input ranges (rated values), voltages	
0 to +10 V	Yes
Input resistance (0 to 10 V)	100 k Ω
Input ranges (rated values), currents	
0 to 20 mA	Yes
Input resistance (0 to 20 mA)	100 Ω
-20 to +20 mA	Yes
Input resistance (-20 to +20 mA)	100 Ω
4 to 20 mA	Yes
Input resistance (4 to 20 mA)	100 Ω
Input ranges (rated values), resistance thermometers	
Pt 100	Yes
Input resistance (Pt 100)	10 M Ω
Input ranges (rated values), resistors	
No-load voltage, typ.	3.3 V
Measuring current, typ.	1,25 mA
0 to 600 Ohm	Yes

Input resistance (0 to 600 Ohm)	10 MΩ
Thermocouple (TC)	
Temperature compensation	
parameterizable	No
Resistance thermometer (RTD)	
Characteristic linearization	
for resistance thermometer	Pt 100
Characteristic linearization	
parameterizable	Yes ; by software
Cable length	
Cable length, shielded, max.	100 m
Analog outputs	
integrated channels (AO)	2
Number of analog outputs	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 to +10 V	Yes
Output ranges, current	
0 to 20 mA	Yes
-20 to +20 mA	Yes
4 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	
Cable length, shielded, max.	200 m

Analog value generation	
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
Interference voltage suppression for interference frequency f1 in Hz	60 / 50 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), (+/-)	0.0060 %/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 error 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 $f = n \times (f_1 \pm 1 \%)$, f_1 = 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 parallel interfaces	0
Number of 20 mA interfaces (TTY)	0
Number of RS 232 interfaces	0
Number of RS 422 interfaces	0
Number of other 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
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
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
adjustable	Yes ; From 10 to 499
preset	10
Service data	
can be read out	Yes
Interrupts/diagnostics/status information	
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
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
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	75 VDC / 60 VAC
between inputs and MANA (UCM)	8 V DC
between MANA and M internally (UIISO)	75 VDC / 60 VAC
Isolation	
Isolation tested with	500V AC for 1 minute
Standards, approvals, certificates	
CE mark	Yes
EN 50155	Yes ; T1 Cat. 1 Cl. A/B horizontal mounting position
Ambient conditions	
Operating temperature	
min.	-25 °C ; = Tmin
max.	60 °C ; = Tmax; the rated temperature range of -25 ... +55 °C (T1) applies for the use on railway vehicles according to EN50155

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
Status	Jul 21, 2014