CPUs - CPU 315-2 PN/DP

Overview

- The CPU with a medium program memory and quantity framework
- High processing performance in binary and floating-point arithmetic
- Used as a central controller on production lines with central and distributed I/O
- Integral PROFINET interface
- Combined MPI / PROFIBUS DP-master/slave interface
- Component Based Automation (CBA) on PROFINET
- PROFInet proxy for intelligent devices on PROFIBUS DP in Component Based Automation (CBA)
- PROFINET IO Controller for operating distributed I/O on PROFINET

Micro Memory Card required for operation of CPU.

Application

The CPU 315-2 PN/DP is a CPU with a medium-sized program memory. It is used in installations which have distributed automation structures in addition to a centralized I/O. It can be used as a PROFINET IO Controller and as a standard PROFIBUS DP master in the SIMATIC S7-300. The 315-2 PN/DP CPU can also be used as distributed intelligence (DP slave).

The CPU 315-2 PN/DP is an ideal platform for simple technology tasks implemented in software, e.g.:

- Controlling motion with Easy Motion Control.
- Solving closed-loop control tasks with STEP 7 blocks or the runtime software Standard PID Control/Modular PID Control

Extended process diagnostics are possible using SIMATIC S7-PDIAG.

The integrated combination possibilities of the CPU allow networked automation solutions to be implemented without the need for additional components.

Design

The CPU 315-2 PN/DP is equipped with the following:

- Microprocessor;
  the processor achieves an execution time of approximately 100 ns per binary instruction and 3 µs per floating-point operation.
- 128 KB RAM (corresponds to approx. 43 K statements);
  the extensive working memory for execution-related program sections offers sufficient space for user programs. Micro memory cards (8 MB max.) as load memory for the program also allow the project to be stored in the CPU (complete with symbols and comments) which can be used for data archiving and recipe management.
- Flexible expansion;
  up to 32 modules (four-tier configuration).
- Combined MPI/DP interface;
  the first integrated MPI/DP interface can establish up to 16 simultaneous connections to S7-300/400PGs, PCs and OPs. Among these connections, one is always reserved for PG and another for OP.
  A simple network with up to 32 CPUs can be configured with the MPI by means of "global data communications".
  This interface can be reconfigured from an MPI to a DP interface. The DP interface can be used as a DP master or as a DP slave.
  PROFIBUS DP interface:
  the PROFIBUS DP V1 standard is fully supported. This increases the scope of DP V1 standard slaves in terms of diagnostics and parameterization capability.
- Ethernet interface;
  the second integrated interface of the CPU 315-2 PN/DP is a PROFInet interface based on Ethernet TCP/IP.
  It supports the following protocols:
  - S7 communication for data communication between SIMATIC controllers;
  - PG/OP communication for programming, start-up and diagnostics through STEP 7;
  - PG/OP communication for interfacing to HMI and SCADA;
  - Open TCP/IP communication over PROFInet and SIMATIC NET OPC server for communication with other controllers and I/O devices with a separate CPU

Function

- Password protection;
  a password concept also protects the user program from unauthorized access
- Diagnostics buffer;
  the last 100 errors and interrupt events are saved in a buffer for diagnostics purposes
- Maintenance-free data backup;
  the CPU automatically saves all data in case of power failure, so that it remains available unchanged when the power is turned on again.

Programmable features

STEP 7 can be used to parameterize both S7 configurations and the properties and responses of the CPUs:

- Interface with multipoint capability (MPI);
  definition of station addresses.
- Restart/cycle performance characteristics;
  definition of maximum cycle time and cycle loading.
- Clock bit memory;
  address settings.
- Protection level;
  setting of the access privileges for program and data.
- System diagnostics;
  setting of handling and scope of diagnostic messages.
- Time interrupts;
  setting of periodic occurrence.
- Time-of-day interrupts;
  start date, start time and periodicity settings.
- PROFIBUS DP master/slave interface;
  free assignment of addresses for distributed I/O.

Display and information functions

- Status and error displays;
  LEDs indicate hardware, programming, time or I/O errors or bus errors and RUN/STOP modes, restart, and the like.
- Testing functions;
  the PG can be used to display signal states in program execution, modify process tags irrespective of the user program, and read out the contents of stack memories.
- Information functions;
  by means of the PG, the user can obtain information about the memory capacity and operating mode of the CPU, the current workload of the working and load memories, current scan cycle times and diagnostic buffer contents in plaintext.

Integrated communications functions

- PG/OP communication
- Global data communication
- S7 standard communication
- S7 communication
- Open communication over TCP/IP
- PROFInet CBA

System functions

The CPU offers a wide range of system functions for diagnosis, parameterization, synchronization, alarm signaling, time measurement, etc.

For further details, see manual.

Technical specifications

	6ES7 315-2EG10-0AB0
Supply voltages	
Rated value	
– 24 V DC	Yes
– Permitted range, lower limit (DC)	20.4 V
– permissible range, upper limit (DC)	28.8 V
Current consumption	
• Inrush current, typ.	2.5 A
• I^2t	1 A^2s
• Current consumption (idling), type	100 mA
• Power dissipation, typical	3.5 W
Memory	
• Working memory	
– integral	128 KByte
– expandable	No
• Load memory	
– pluggable (MMC)	Yes
– pluggable (MMC), max.	8 MByte
Backup	
– available	Yes
CPU/blocks	
DB	
– Number, max.	1,023
– Size, max.	16 KByte
FB	
– Number, max.	2,048
– Size, max.	16 KByte
FC	
– Number, max.	2,048
– Size, max.	16 KByte
OB	

– Size, max.	16 KByte
Nesting depth	
– per priority class	8
– additional levels within an error OB	4
CPU/processing times	
• for bit instruction, min.	0.1 µs
• for word instruction, min.	0.2 µs
• for integer math, min.	2 µs
• for floating-point math, min.	3 µs
Timers/counters and their retentive characteristics	
S7 counter	
– Number	256
• of which retentive without battery	
– adjustable	Yes
• Retentivity	
– adjustable	Yes
• Counting range	
– adjustable	Yes
– lower limit	0
– upper limit	999
IEC counter	
– available	Yes
S7 times	
– Number	256
• Retentivity	
– adjustable	Yes
• Timing range	
– lower limit	10 ms
– upper limit	9,990 s
IEC timer	
– available	Yes
Data areas and their retentive characteristics	
Flags	
– Number	2,048 Byte
– Retentivity	Yes
– Number of clock memories	8
Data blocks	
– Number, max.	1,023
– Size, max.	16 KByte
Local data	
– per priority class, max.	1,024 Byte
Address area	
I/O address area	
– Inputs	2,048 Byte
– Outputs	2,048 Byte
• of which distributed	
– Inputs	2 KByte
– Outputs	2 KByte
Process image	
– Inputs	128 Byte
– Outputs	128 Byte
Digital channels	
– Inputs	16,384
– Outputs	16,384
– Inputs, of which central	1,024
– Outputs, of which central	1,024
Analog channels	
– Inputs	1,024
– Outputs	1,024
– Inputs, of which central	256
– Outputs, of which central	256
Configuration	

• Racks, max.	4
• Modules per rack, max.	8
Number of DP masters	
– integral	1
– via CP	4
Number of FMs and CPs that can be operated (recommendation)	
– FM	8
– CP, point-to-point	8
– CP, LAN	10
Time	
– Hardware clock (realtime clock)	Yes
– Battery backed and synchronized	Yes
– Deviation per day, max	10 s
Run-time meter	
– Quantity	1
– retentive	Yes
Time synchronization	
– supported	Yes
– on MPI, master	Yes
– on MPI, slave	Yes
– in AS, master	Yes
– in AS, slave	Yes
S7 message functions	
• Number of stations that can log on for message functions, max.	16
• Process diagnostic messages	Yes
• simultaneously active Alarm-S blocks, max.	40
Test and startup functions	
Status/modify	
– Variable	Yes
– Number of variables, max.	30
– of which status variables, max.	30
– of which modify variables, max.	14
Forcing	
– Forcing	Yes
– Forcing, number of variables, max.	10
• Status block	Yes
• Single step	Yes
• Number of breakpoints	2
Diagnostic buffer	
– available	Yes
– Number of inputs, max.	100
– adjustable	No
Communication functions	
• PG/OP communication	Yes
• Routing	Yes
Global data communication	
– supported	Yes
– Size of GD packets, max.	22 Byte
S7 basic communication	
– supported	Yes
S7 communication	
– supported	Yes
S5 compatible communication	
– supported	Yes
Open IE Communication	
– TCP/IP	Yes
– Number of connections, max.	8
– Data length, max.	1,460 Byte
Number of connections	
– overall	16
– usable for PG communication	15
– usable for OP communication	15

– usable for S7 basic communication	14
1st interface	
● Isolated	Yes
● Power supply to interface (15 to 30 V DC), max.	200 mA
Functionality	
– MPI	Yes
– DP master	Yes
– DP slave	Yes
– Point-to-point connection	No
MPI	
– Number of connections	16
● Services	
– PG/OP communication	Yes
– Routing	Yes
– Global data communication	Yes
– S7 basic communication	Yes
– S7 communication	Yes
– S7 communication, as client	Yes
– S7 communication, as server	Yes
– Transmission rates, max.	12 Mbit/s
DP master	
● Services	
– PG/OP communication	Yes
– Routing	Yes
– Global data communication	No
– S7 basic communication	No
– S7 communication	No
– Equidistance support	Yes
– SYNC/FREEZE	Yes
– DPV1	Yes
– Transmission rates, max.	12 Mbit/s
– Number of DP slaves, max.	124
DP slave	
● Services	
– Routing	Yes
– Global data communication	No
– S7 Basic communication	No
– S7 communication	No
– Direct data exchange (lateral communication)	Yes
– DPV1	No
– Transmission rates, max.	12 Mbit/s
● Intermediate memory	
– Inputs	244 Byte
– Outputs	244 Byte
– Address areas, max.	32
2nd interface	
● Isolated	Yes
● Power supply to interface (15 to 30 V DC), max.	0 mA
● Automatic transmission speed detection	Yes
Functionality	
– MPI	No
– DP master	No
– DP slave	No
– Point-to-point connection	No
– PROFINET CBA	Yes
– PROFINET IO-Controller	Yes
PROFINET CBA	
– acyclic transmission	Yes
– cyclic transmission	Yes
PROFINET IO-Controller	
● Services	
– PG/OP communication	Yes

– Routing	Yes
– S7 communication	Yes
– Open IE Communication	Yes
– Transmission rates, max.	100 Mbit/s
– Number connectable IO devices, max.	128
• Address area	
– Inputs, max.	8 KByte
– Outputs, max.	8 KByte
– User data consistency, max.	256 Byte
3rd interface	
CPU/ programming	
Programming language	
– STEP 7	Yes
– KOP	Yes
– FUP	Yes
– AWL	Yes
– SCL	Yes
– CFC	Yes
– GRAPH	Yes
– HiGraph®	Yes
Software library	
• Bracket levels	8
• User program protection/password protection	Yes
Dimensions and weight	
• Width	80 mm
• Height	125 mm
• Depth	130 mm
• Weight, approx.	460 g