

## SIMATIC

### PLC S7-300, CPU Specifications CPU 312 IFM to CPU 318-2 DP

#### Reference Manual

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This documentation can **no longer** be ordered under  
the given number!

This manual is part of the documentation  
package with the order number  
**6ES7398-8FA10-8BA0**

**Edition 10/2001**

A5E00111190-01

## Scope of the Manual

The manual covers the following CPUs and Hardware/Software versions:

| CPU          | Order No.                                  | As of Version |          |
|--------------|--------------------------------------------|---------------|----------|
|              |                                            | Firmware      | Hardware |
| CPU 312 IFM  | 6ES7 312-5AC02-0AB0<br>6ES7 312-5AC82-0AB0 | 1.1.0         | 01       |
| CPU 313      | 6ES7 313-1AD03-0AB0                        | 1.1.0         | 01       |
| CPU 314      | 6ES7 314-1AE04-0AB0<br>6ES7 314-1AE84-0AB0 | 1.1.0         | 01       |
| CPU 314 IFM  | 6ES7 314-5AE03-0AB0<br>6ES7 314-5AE83-0AB0 | 1.1.0         | 01       |
| CPU 314 IFM  | 6ES7 314-5AE10-0AB0                        | 1.1.0         | 01       |
| CPU 315      | 6ES7 315-1AF03-0AB0                        | 1.1.0         | 01       |
| CPU 315-2 DP | 6ES7 315-2AF03-0AB0<br>6ES7 315-2AF83-0AB0 | 1.1.0         | 01       |
| CPU 316-2 DP | 6ES7 316-2AG00-0AB0                        | 1.1.0         | 01       |
| CPU 318-2    | 6ES7 318-2AJ00-0AB0                        | V3.0.0        | 03       |

This manual describes all modules that are valid at the time the manual is released. We reserve the right to release product information for new modules or new module versions.

## Alterations from Previous Version

The following changes were made in the *Structuring, CPU Data* Manual, Order no. 6ES7398-8AA03-8BA0, Edition 2:

- Now, this manual only contains the CPU description. For information on the S7-300 structure and installation refer to the *Installation Manual*.
- CPU 318-2 DP as of Firmware Version V3.0.0 behaves as DP Master according to PROFIBUS DPV1.

## Agreement for CPU 314IFM

The CPU 314IFM is available in 2 versions:

- with slot for Memory Card (6ES7314-5EA10-0AB0)
- without slot for Memory Card (6ES7314-5EA0x-0AB0)

All details in this chapter apply to both versions of CPU 314IFM, unless explicit reference is made to differences between them.

## 1.4.8 CPU 318-2

### Special Features

- 4 accumulators
- The configuration of MPI interfaces can be changed: MPI or PROFIBUS DP (DP Master).
- Configurable data areas (Process image, local data)

Information on differences between CPU 318-2 and other CPUs is found in Chapter 4.1.

### DP master or DP slave

You can operate the CPU 318-2 DP as DP Master or DP Slave in a PROFIBUS-DP network. However, note that only one of the interfaces can be a DP Slave. For details on PROFIBUS-DP characteristics of CPU 318-2 DP refer to Chapter 2.

### Definable Data Areas and Occupied Working Memory

In your CPU 318-2 configuration, you can change the size of the I/O process image and the local data areas.

Increasing default values for the process image and local data requires additional memory that would otherwise be available for user programs.

Take following dimensions into account:

- Input process image: 1 byte PII occupies  
12 Byte in memory
- Output process image: 1 Byte PIO occupies  
12 bytes in memory
- Example:  
256 bytes in PII occupy 3072 bytes,  
2047 byte in PIO already occupy 24564 bytes in memory.
- Local data 1 local data byte occupies  
1 byte in memory  
256 byte is default, depending on the priority class. With 14 priority classes there are therefore 3584 bytes occupied in the working memory. With a maximum size of 8192 bytes you can still allocate 4608 bytes, which are then no longer available for the user program in the working memory.

### Communication

You can transform the first CPU interface from MPI to DP interface operation. You can operate the CPU as DP Master or DP Slave on this DP interface. Routing reduces the maximum possible number of connections for each one of the two interfaces by one connection per active PG/OP communication used by the CPU 318-2 as network node.

**FM 353/354, distributed**

If you implement the CPU 318-2 as DP Master, you can operate FM 353 as of 6ES7 353-1AH01-0AE0, firmware version 3.4/03 and FM 354 as of 6ES7 354-1AH01-0AE0, firmware version 3.4/03 in distributed mode with an ET 200M.

**You cannot operate the following modules in an S7-300 equipped with a 318-2 CPU**

**FM 357** up to 6ES7 357-4\_H02-3AE\_, firmware version 2.1;

**FM NC** up to 6FC5 250-3AX00-7AH0, firmware version 3.7 + Toolbox 6FC5 252-3AX2Z-6AB0, Software Version 3.6;

**SM 338** up to 6ES7 338-7UH00-0AC0, version 07;

**SIXWAREX M** up to 7MH4 553-1AA41, firmware version 0119;

**SINAUT ST7 TIM**, 6NH7 800-\_A\_\_0 (Tip: Use a TIM module as stand alone node)

**Peripheral access in CPU 318-2 is not permitted**

for T PAW operations on centrally inserted peripheral modules with corresponding address bytes assigned to different peripheral modules.

## CPU 318-2, Technical Data

| CPU and Product Version                             |                                | Data areas and their retentive characteristics                |                                                                 |
|-----------------------------------------------------|--------------------------------|---------------------------------------------------------------|-----------------------------------------------------------------|
| MLFB                                                | 6ES7 318-2AJ00-0AB0            | Retentive data area as a whole (inc. flags, timers, counters) | max. 11 KB                                                      |
| • Hardware version                                  | 03                             | Bit memories                                                  | 8192                                                            |
| • Firmware version                                  | V 3.0                          | • Adjustable retentivity                                      | MB 0 to MB 1023                                                 |
| • Matching programming package                      | STEP 7 V 5.1 + Service Pack 02 | • Preset                                                      | MB 0 to MB 15                                                   |
| Memory                                              |                                | Clock memories                                                | 8 (1 memory byte)                                               |
| Work memory                                         |                                | Data blocks                                                   | 2047 (DB 0 reserved)KB                                          |
| • integral                                          | 256 KB data/<br>256 KB code    | • Size                                                        | max. 64 KB                                                      |
| • Expandable                                        | no                             | • Adjustable retentivity                                      | max. 8 DB, max. 8192 data bytes                                 |
| Load memory                                         |                                | • Preset                                                      | No retentivity                                                  |
| • integral                                          | 64 KB                          | Local data (alterable)                                        | max. 8192 bytes                                                 |
| • Expandable FEPRM                                  | Up to 4 MB                     | • Preset                                                      | 3584 bytes                                                      |
| • Expandable RAM                                    | Up to 2 MB                     | • Per priority class                                          | 256 bytes (expandable to 8192 bytes)                            |
| Backup                                              | Yes                            | Blocks                                                        |                                                                 |
| • With battery                                      | All data                       | OBS                                                           | See Instruction List                                            |
| • Without battery                                   | max. 11 KB                     | • Size                                                        | max. 64 KB                                                      |
| Processing times                                    |                                | Nesting depth                                                 |                                                                 |
| Processing times for                                |                                | • Per priority class                                          | 16                                                              |
| • Bit instructions                                  | 0.1 µs minimum                 | • additional levels within an error OB                        | 3                                                               |
| • Word instructions                                 | 0.1 µs minimum                 | FBs                                                           | max. 1024                                                       |
| • Double integer arithmetic                         | 0.1 µs minimum                 | • Size                                                        | max. 64 KB                                                      |
| • Floating-point arithmetic                         | 0.6 µs minimum                 | FCs                                                           | max. 1024                                                       |
| Timers/Counters and their retentive characteristics |                                | • Size                                                        | max. 64 KB                                                      |
| S7 counters                                         | 512                            | Address areas (I/O)                                           |                                                                 |
| • Adjustable retentivity                            | from C 0 to C 511              | Peripheral address area, digital/analog                       | max. 8 KB/8 KB (freely addressable)                             |
| • Preset                                            | from C 0 to C 7                | • Distributed                                                 |                                                                 |
| • Counting range                                    | 0 to 999                       | – MPI/DP Interface                                            | max. 2 KB/2 KB                                                  |
| IEC Counters                                        | Yes                            | – DP interface                                                | max. 8 KB/8 KB                                                  |
| • Type                                              | SFB                            | Process image (configurable)                                  | 2048/2048 bytes                                                 |
| S7 timers                                           | 512                            | • Preset                                                      | 256/256 bytes                                                   |
| • Adjustable retentivity                            | from T 0 to T 511              | Digital channels                                              | max. 65536 (minus 1 byte diagnostic address per DP slave)/65536 |
| • Preset                                            | No retentive times             | • Centralized                                                 | max. 1024/1024                                                  |
| • Timing range                                      | 10 ms to 9990 s                | Analog channels                                               | max. 4096/4096                                                  |
| IEC Timers                                          | Yes                            | • Centralized                                                 | max. 256/128                                                    |
| • Type                                              | SFB                            |                                                               |                                                                 |

|                                            |                                                               |  |
|--------------------------------------------|---------------------------------------------------------------|--|
| <b>Configuration</b>                       |                                                               |  |
| Rack                                       | max. 4                                                        |  |
| Modules per module rack                    | max. 8                                                        |  |
| Number of DP masters                       |                                                               |  |
| • integral                                 | 2                                                             |  |
| • via CP                                   | 2                                                             |  |
| <b>S7 message functions</b>                |                                                               |  |
| Simultaneously active                      |                                                               |  |
| Interrupt S function blocks and            | max. 100                                                      |  |
| Interrupt D function blocks                |                                                               |  |
| <b>Time</b>                                |                                                               |  |
| Real-time clock                            | Yes                                                           |  |
| • Backed-up                                | Yes                                                           |  |
| • Accuracy                                 | See Section 1.1.6                                             |  |
| Operating hours counter                    | 8                                                             |  |
| • Number                                   | 0 to 7                                                        |  |
| • Value range                              | 0 to 32767 hours                                              |  |
| • Selectivity                              | 1 hour                                                        |  |
| • Retentive                                | Yes                                                           |  |
| Clock synchronisation                      | Yes                                                           |  |
| • On PLC                                   | Master/Slave                                                  |  |
| • via MPI                                  | Master/Slave                                                  |  |
| • via DP                                   | Master/Slave                                                  |  |
| <b>Testing and commissioning functions</b> |                                                               |  |
| Status/Modify Variables                    | Yes                                                           |  |
| • Variable                                 | Inputs, outputs, flags, DBs, timers, counters                 |  |
| • Number                                   | max. 70                                                       |  |
| Force                                      | Yes                                                           |  |
| • Variable                                 | Inputs, outputs, flags, peripheral inputs, peripheral outputs |  |
| • Number                                   | max. 256                                                      |  |
| Monitor block                              | Yes                                                           |  |
| Single sequence                            | Yes                                                           |  |
| Breakpoint                                 | 4                                                             |  |
| Diagnostic buffer                          |                                                               |  |
| • Number of entries (non-alterable)        | 100                                                           |  |
| <b>Communication functions</b>             |                                                               |  |
| PD/OP communication                        | Yes                                                           |  |
| Global data communication                  | Yes                                                           |  |
| • Number of GD packets                     |                                                               |  |
| – Sender                                   | 1                                                             |  |
| – Receiver                                 | 2                                                             |  |
| • Size of GD packets                       | 54 bytes                                                      |  |
| – Number of which consistent               | 32 bytes                                                      |  |
| S7 basic communication                     | Yes                                                           |  |
| • User data per job                        | max. 76 bytes                                                 |  |
| – Number of which consistent               | 76 bytes                                                      |  |
| S7 communication                           | Yes (server)                                                  |  |
| • User data per job                        | max. 160 bytes                                                |  |
| – Number of which consistent               | Byte, Word, Double word                                       |  |
| S7-compatible communication                | Yes (via CP and loadable FC)                                  |  |
| • User data per job                        | Dependent on CP                                               |  |
| – Number of which consistent               | Dependent on CP                                               |  |
| Standard communication                     | Yes (via CP and loadable FC)                                  |  |
| • User data per job                        | Dependent on CP                                               |  |
| – Number of which consistent               | Dependent on CP                                               |  |
| <b>Interfaces</b>                          |                                                               |  |
| <b>1. Interface</b>                        |                                                               |  |
| <b>Functionality</b>                       |                                                               |  |
| • MPI                                      | Yes                                                           |  |
| • DP Master                                | Yes                                                           |  |
| • DP Slave                                 | Yes                                                           |  |
| • Direct data exchange                     | Yes                                                           |  |
| • Default setting                          | MPI                                                           |  |
| • Electrically isolated                    | Yes                                                           |  |
| Number of connections                      | max. 32;                                                      |  |
| – Of these, the following are reserved:    | 1 PD connection<br>1 OP connection                            |  |
| <b>MPI</b>                                 |                                                               |  |
| • Services                                 |                                                               |  |
| – PD/OP communication                      | Yes                                                           |  |
| – Global data communication                | Yes                                                           |  |
| – S7 basic communication                   | Yes                                                           |  |
| – S7 communication                         | Yes (server)                                                  |  |
| • Transmission rates                       | Up to 12 Mbps                                                 |  |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>DP Master</b> <ul style="list-style-type: none"> <li>Services <ul style="list-style-type: none"> <li>Equidistance Yes</li> <li>SYNC/FREEZE Yes</li> <li>Activation/deactivation of DP slaves Yes</li> </ul> </li> <li>Transmission rates Up to 12 Mbps</li> <li>Address area max. 2 KB I/2 KB O</li> <li>User data per DP slave max. 244 bytes I and 244 bytes O</li> </ul>                                                                                                                                    | <b>DP Slave</b> <ul style="list-style-type: none"> <li>Services <ul style="list-style-type: none"> <li>Status/Modify; Program; Routing Yes, can be activated</li> </ul> </li> <li>GSD file siem807f.gsg</li> <li>Transmission speed Up to 12 Mbps</li> <li>Transfer memory 244 bytes I/244 bytes O</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <b>DP Slave</b> <ul style="list-style-type: none"> <li>Services <ul style="list-style-type: none"> <li>Status/Modify; Program; Routing Yes, can be activated</li> </ul> </li> <li>Device master file siem807f.gsg</li> <li>Transmission rate Up to 12 Mbps</li> <li>Transfer memory 244 bytes I/244 bytes O</li> </ul>                                                                                                                                                                                            | <b>Dimensions</b> <ul style="list-style-type: none"> <li>Assembly dimension B × H × T (mm) 160 × 125 × 130</li> <li>Weight Approx. 0.93 kg</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>2. Interface</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Programming</b> <ul style="list-style-type: none"> <li>Programming language STEP 7</li> <li>Stored instructions See Instruction List</li> <li>Nesting levels 16</li> <li>System functions (SFCs) See Instruction List</li> <li>System function blocks (SFBs) See Instruction List</li> <li>User program security Password protection</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Functionality</b> <ul style="list-style-type: none"> <li>DP Master Yes</li> <li>DP Slave Yes <ul style="list-style-type: none"> <li>Status/Modify; Program; Routing Yes, can be activated</li> </ul> </li> <li>Direct data exchange Yes</li> <li>PtP Connection No</li> <li>Default setting None</li> <li>Galvanically isolated Yes</li> <li>Number of connections max. 16 <ul style="list-style-type: none"> <li>Of these, the following are reserved: 1 PD connection 1 OP connection</li> </ul> </li> </ul> | <b>Voltages, Currents</b> <ul style="list-style-type: none"> <li>Power supply 24V DC <ul style="list-style-type: none"> <li>Permissible range 20.4 V to 28.8 V</li> </ul> </li> <li>Current consumption (idle) typical 1.2 A</li> <li>Inrush current typical 8A</li> <li><math>I^2 t</math> 0.4 A<sup>2</sup>s</li> <li>External fusing for supply lines (recommendation) Circuit breaker; 2 A, Type B or C</li> <li>PD supply at MPI (15 to 30V DC) max. 200 mA</li> <li>Power losses typical 12 W</li> <li>Battery Yes <ul style="list-style-type: none"> <li>Backup margin at 25° C and continuous CPU buffering min. 1 year</li> <li>Battery shelf life at 25° C approx. 5 years</li> </ul> </li> <li>Accumulator Yes <ul style="list-style-type: none"> <li>Clock back-up period <ul style="list-style-type: none"> <li>at 0 to 25° C Approx. 4 weeks</li> <li>at 40° C Approx. 3 weeks</li> <li>at 60° C Approx. 1 week</li> </ul> </li> <li>Battery charging time Approx. 1 hour</li> </ul> </li> </ul> |
| <b>DP Master</b> <ul style="list-style-type: none"> <li>Services <ul style="list-style-type: none"> <li>PD/OP communication Yes</li> <li>Equidistance Yes</li> <li>SYNC/FREEZE Yes</li> <li>Activation/deactivation of DP slaves Yes</li> </ul> </li> <li>Transmission rates Up to 12 Mbps</li> <li>Number of DP slaves max. 125</li> <li>Address area max. 8 KB I/8 KB O</li> <li>User data per DP slave max. 244 bytes I and 244 bytes O</li> </ul>                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |



**CPU 318-2**

Figure B-3 shows the dimensioned drawing of the CPU 318-2, front view. The side view is illustrated in Figure B-2

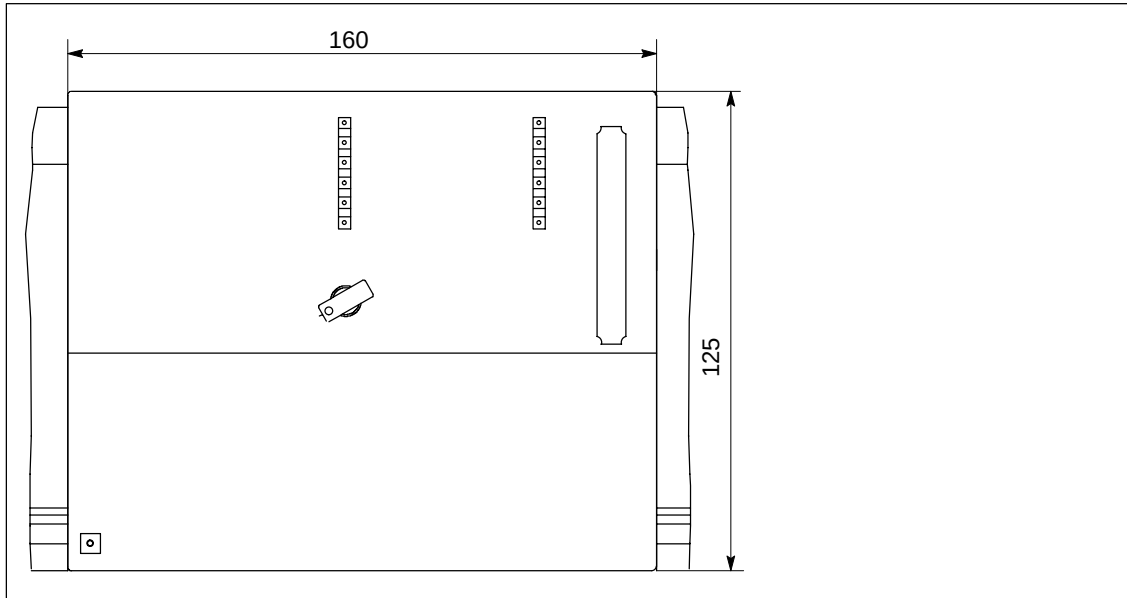


Figure B-3 Dimensioned Drawing of the CPU 318-2