

OFFICIAL DOCUMENT PACKAGE

# Manufacturer's Manual

Amikon cover with selected official Siemens technical pages

SIEMENS SIMATIC S7-1500T

## 6ES7511-1TK01-0AB0

SIMATIC S7-1500T CPU 1511T-1 PN

Selected official pages retain the original technical tables, ratings, notes and pagination.

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Siemens equipment manual A5E36270833-AC, 05/2021; S7-1500 system manual

Equipment manual pages 24, 31-32 and 38-50

This technical extract does not replace the complete equipment and system manuals. Check the installed hardware and project before use.

| Function                                     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Additional information                                                                                                                                                  |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Integrated technology</b>                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                         |
| Motion Control                               | <p><b>All CPUs</b> support the S7-1500 Motion Control functions via the technology objects speed axes, positioning axes, synchronized axes, external encoders, cams, cam tracks and measuring inputs.</p> <ul style="list-style-type: none"> <li>• Speed-controlled axis for controlling a drive with speed specification</li> <li>• Positioning axis for position-controlled positioning of a drive</li> <li>• Synchronous axis to interconnect with a master value. The axis is synchronized to the master axis position.</li> <li>• External encoder for detecting the actual position of an encoder and its use as a master value for synchronous operation</li> <li>• Cams, cam track for position-dependent generation of switching signals</li> <li>• Measuring input for fast, accurate and event-dependent sensing of actual positions</li> </ul> <p>You program the technology objects with Motion Control instructions according to PLCOpen.</p> | Motion Control topic page                                                                                                                                               |
| Extended Motion Control functions            | <p><b>The technology CPUs</b> of the SIMATIC S7-1500 also support extended Motion Control functions with the additional technology objects cam, leading axis proxy and kinematics:</p> <ul style="list-style-type: none"> <li>• Advanced synchronization functions <ul style="list-style-type: none"> <li>– Synchronization with specification of the synchronous position</li> <li>– Actual value coupling</li> <li>– Leading value or following value shift in gearing or camming</li> <li>– Camming</li> <li>– Synchronization to specified positions</li> <li>– Cross-PLC synchronous operation</li> </ul> </li> <li>• Up to 4 encoders or measuring systems as actual position for position control</li> <li>• Controlling of kinematics, such as <ul style="list-style-type: none"> <li>– Cartesian portals</li> <li>– Roller pickers</li> <li>– Delta pickers</li> <li>– SCARA</li> </ul> </li> </ul>                                                | Motion Control topic page                                                                                                                                               |
| Integrated closed-loop control functionality | <ul style="list-style-type: none"> <li>• PID Compact (continuous PID controller)</li> <li>• PID 3Step (step controller for integrating actuators)</li> <li>• PID Temp (temperature controller for heating and cooling with two separate actuators)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | PID control function manual ( <a href="https://support.industry.siemens.com/cs/ww/en/view/108210036">https://support.industry.siemens.com/cs/ww/en/view/108210036</a> ) |

## Wiring

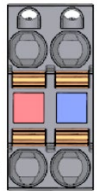
This section provides information on the pin assignment of the individual interfaces and the block diagram of the CPU 1511T-1 PN.

### 24 V DC supply voltage (X80)

The connector for the power supply is plugged in when the CPU ships from the factory.

The following table shows the signal names and the descriptions of the pin assignment of the 24 V DC supply voltage.

Table 3- 1 Pin assignment 24 V DC supply voltage

| View                                                                               | Signal name <sup>1)</sup> |     | Description                                                    |
|------------------------------------------------------------------------------------|---------------------------|-----|----------------------------------------------------------------|
| Connector                                                                          |                           |     |                                                                |
|  | 1                         | 1L+ | + 24 V DC of the supply voltage                                |
|                                                                                    | 2                         | 1M  | Ground of the supply voltage                                   |
|                                                                                    | 3                         | 2M  | Ground of the supply voltage for loop-through <sup>2)</sup>    |
|                                                                                    | 4                         | 2L+ | + 24 V DC of the supply voltage for loop-through <sup>2)</sup> |

<sup>1)</sup> 1L+ and 2L+ as well as 1M and 2M are bridged internally

<sup>2)</sup> Maximum 10 A permitted

If the CPU is supplied by a system power supply, it is not necessary to connect the 24 V supply.

## PROFINET interface X1 with 2-port switch (X1 P1 R and X1 P2 R)

The assignment corresponds to the Ethernet standard for an RJ45 plug.

- When autonegotiation is deactivated, the RJ45 socket is allocated as a switch (MDI-X).
- When autonegotiation is activated, autocrossing is in effect and the RJ45 socket is allocated either as data terminal equipment (MDI) or a switch (MDI-X).

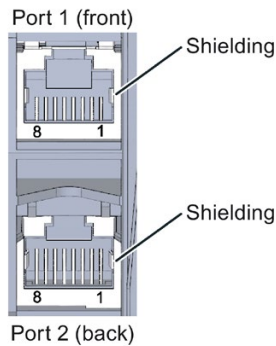


Figure 3-1 PROFINET ports

## Reference

You can find additional information on the topics of "Connecting the CPU" and "Accessories/spare parts" in the S7-1500, ET 200MP (<https://support.automation.siemens.com/WW/view/en/59191792>) system manual.

## Assignment of the MAC addresses

The CPU 1511T-1 PN has a PROFINET interface with two ports. The PROFINET interface itself has a MAC address, and each of the two PROFINET ports has its own MAC address. The CPU 1511T-1 PN therefore has three MAC addresses in total.

The MAC addresses of the PROFINET ports are needed for the LLDP protocol, for example for the neighborhood discovery function.

The number range of the MAC addresses is sequential. The first and last MAC addresses are lasered on the rating plate on the right side of each CPU 1511T-1 PN.

## Technical specifications

The following table shows the technical specifications as of 12/2017. You can find a data sheet including daily updated technical specifications on the Internet (<https://support.industry.siemens.com/cs/ww/en/pv/6ES7511-1TK01-0AB0/td?dl=en>).

|                                                          |                                                                                                   |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| <b>Article number</b>                                    | <b>6ES7511-1TK01-0AB0</b>                                                                         |
| <b>General information</b>                               |                                                                                                   |
| Product type designation                                 | CPU 1511T-1 PN                                                                                    |
| HW functional status                                     | FS04                                                                                              |
| Firmware version                                         | V2.9                                                                                              |
| <b>Product function</b>                                  |                                                                                                   |
| • I&M data                                               | Yes; I&M0 to I&M3                                                                                 |
| • Isochronous mode                                       | Yes; Distributed and central; with minimum OB 6x cycle of 625 µs (distributed) and 1 ms (central) |
| <b>Engineering with</b>                                  |                                                                                                   |
| • STEP 7 TIA Portal configurable/integrated from version | V17 (FW V2.9) / V14 (FW V2.0) or higher                                                           |
| <b>Configuration control</b>                             |                                                                                                   |
| via dataset                                              | Yes                                                                                               |
| <b>Display</b>                                           |                                                                                                   |
| Screen diagonal [cm]                                     | 3.45 cm                                                                                           |
| <b>Control elements</b>                                  |                                                                                                   |
| Number of keys                                           | 6                                                                                                 |
| Mode selector switch                                     | 1                                                                                                 |
| <b>Supply voltage</b>                                    |                                                                                                   |
| Type of supply voltage                                   | 24 V DC                                                                                           |
| permissible range, lower limit (DC)                      | 19.2 V                                                                                            |
| permissible range, upper limit (DC)                      | 28.8 V                                                                                            |
| Reverse polarity protection                              | Yes                                                                                               |
| <b>Mains buffering</b>                                   |                                                                                                   |
| • Mains/voltage failure stored energy time               | 5 ms                                                                                              |
| • Repeat rate, min.                                      | 1/s                                                                                               |
| <b>Input current</b>                                     |                                                                                                   |
| Current consumption (rated value)                        | 0.7 A                                                                                             |
| Inrush current, max.                                     | 1.9 A; Rated value                                                                                |
| I <sup>2</sup> t                                         | 0.02 A <sup>2</sup> ·s                                                                            |
| <b>Power</b>                                             |                                                                                                   |
| Infeed power to the backplane bus                        | 10 W                                                                                              |
| Power consumption from the backplane bus (balanced)      | 5.5 W                                                                                             |
| <b>Power loss</b>                                        |                                                                                                   |
| Power loss, typ.                                         | 5.7 W                                                                                             |

|                                         |                                                                                                                                                       |
|-----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Article number</b>                   | <b>6ES7511-1TK01-0AB0</b>                                                                                                                             |
| <b>Memory</b>                           |                                                                                                                                                       |
| Number of slots for SIMATIC memory card | 1                                                                                                                                                     |
| SIMATIC memory card required            | Yes                                                                                                                                                   |
| <b>Work memory</b>                      |                                                                                                                                                       |
| • integrated (for program)              | 225 kbyte                                                                                                                                             |
| • integrated (for data)                 | 1 Mbyte                                                                                                                                               |
| <b>Load memory</b>                      |                                                                                                                                                       |
| • Plug-in (SIMATIC Memory Card), max.   | 32 Gbyte                                                                                                                                              |
| <b>Backup</b>                           |                                                                                                                                                       |
| • maintenance-free                      | Yes                                                                                                                                                   |
| <b>CPU processing times</b>             |                                                                                                                                                       |
| for bit operations, typ.                | 60 ns                                                                                                                                                 |
| for word operations, typ.               | 72 ns                                                                                                                                                 |
| for fixed point arithmetic, typ.        | 96 ns                                                                                                                                                 |
| for floating point arithmetic, typ.     | 384 ns                                                                                                                                                |
| <b>CPU-blocks</b>                       |                                                                                                                                                       |
| Number of elements (total)              | 4 000; Blocks (OB, FB, FC, DB) and UDTs                                                                                                               |
| <b>DB</b>                               |                                                                                                                                                       |
| • Number range                          | 1 ... 60 999; subdivided into: number range that can be used by the user: 1 ... 59 999, and number range of DBs created via SFC 86: 60 000 ... 60 999 |
| • Size, max.                            | 1 Mbyte; For DBs with absolute addressing, the max. size is 64 KB                                                                                     |
| <b>FB</b>                               |                                                                                                                                                       |
| • Number range                          | 0 ... 65 535                                                                                                                                          |
| • Size, max.                            | 150 kbyte                                                                                                                                             |
| <b>FC</b>                               |                                                                                                                                                       |
| • Number range                          | 0 ... 65 535                                                                                                                                          |
| • Size, max.                            | 150 kbyte                                                                                                                                             |

|                                                                    |                                                                                                                            |
|--------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Article number</b>                                              | <b>6ES7511-1TK01-0AB0</b>                                                                                                  |
| <b>OB</b>                                                          |                                                                                                                            |
| • Size, max.                                                       | 150 kbyte                                                                                                                  |
| • Number of free cycle OBs                                         | 100                                                                                                                        |
| • Number of time alarm OBs                                         | 20                                                                                                                         |
| • Number of delay alarm OBs                                        | 20                                                                                                                         |
| • Number of cyclic interrupt OBs                                   | 20; With minimum OB 3x cycle of 500 µs                                                                                     |
| • Number of process alarm OBs                                      | 50                                                                                                                         |
| • Number of DPV1 alarm OBs                                         | 3                                                                                                                          |
| • Number of isochronous mode OBs                                   | 2                                                                                                                          |
| • Number of technology synchronous alarm OBs                       | 2                                                                                                                          |
| • Number of startup OBs                                            | 100                                                                                                                        |
| • Number of asynchronous error OBs                                 | 4                                                                                                                          |
| • Number of synchronous error OBs                                  | 2                                                                                                                          |
| • Number of diagnostic alarm OBs                                   | 1                                                                                                                          |
| <b>Nesting depth</b>                                               |                                                                                                                            |
| • per priority class                                               | 24                                                                                                                         |
| <b>Counters, timers and their retentivity</b>                      |                                                                                                                            |
| <b>S7 counter</b>                                                  |                                                                                                                            |
| • Number                                                           | 2 048                                                                                                                      |
| <b>Retentivity</b>                                                 |                                                                                                                            |
| – adjustable                                                       | Yes                                                                                                                        |
| <b>IEC counter</b>                                                 |                                                                                                                            |
| • Number                                                           | Any (only limited by the main memory)                                                                                      |
| <b>Retentivity</b>                                                 |                                                                                                                            |
| – adjustable                                                       | Yes                                                                                                                        |
| <b>S7 times</b>                                                    |                                                                                                                            |
| • Number                                                           | 2 048                                                                                                                      |
| <b>Retentivity</b>                                                 |                                                                                                                            |
| – adjustable                                                       | Yes                                                                                                                        |
| <b>IEC timer</b>                                                   |                                                                                                                            |
| • Number                                                           | Any (only limited by the main memory)                                                                                      |
| <b>Retentivity</b>                                                 |                                                                                                                            |
| – adjustable                                                       | Yes                                                                                                                        |
| <b>Data areas and their retentivity</b>                            |                                                                                                                            |
| Retentive data area (incl. timers, counters, flags), max.          | 128 kbyte; In total; available retentive memory for bit memories, timers, counters, DBs, and technology data (axes): 88 KB |
| Extended retentive data area (incl. timers, counters, flags), max. | 1 Mbyte; When using PS 6 0W 24/48/60 V DC HF                                                                               |

|                                     |                                                                                                                                                                                                                                   |
|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Article number</b>               | <b>6ES7511-1TK01-0AB0</b>                                                                                                                                                                                                         |
| <b>Flag</b>                         |                                                                                                                                                                                                                                   |
| • Size, max.                        | 16 kbyte                                                                                                                                                                                                                          |
| • Number of clock memories          | 8; 8 clock memory bit, grouped into one clock memory byte                                                                                                                                                                         |
| <b>Data blocks</b>                  |                                                                                                                                                                                                                                   |
| • Retentivity adjustable            | Yes                                                                                                                                                                                                                               |
| • Retentivity preset                | No                                                                                                                                                                                                                                |
| <b>Local data</b>                   |                                                                                                                                                                                                                                   |
| • per priority class, max.          | 64 kbyte; max. 16 KB per block                                                                                                                                                                                                    |
| <b>Address area</b>                 |                                                                                                                                                                                                                                   |
| Number of IO modules                | 1 024; max. number of modules / submodules                                                                                                                                                                                        |
| <b>I/O address area</b>             |                                                                                                                                                                                                                                   |
| • Inputs                            | 32 kbyte; All inputs are in the process image                                                                                                                                                                                     |
| • Outputs                           | 32 kbyte; All outputs are in the process image                                                                                                                                                                                    |
| <b>per integrated IO subsystem</b>  |                                                                                                                                                                                                                                   |
| – Inputs (volume)                   | 8 kbyte                                                                                                                                                                                                                           |
| – Outputs (volume)                  | 8 kbyte                                                                                                                                                                                                                           |
| <b>per CM/CP</b>                    |                                                                                                                                                                                                                                   |
| – Inputs (volume)                   | 8 kbyte                                                                                                                                                                                                                           |
| – Outputs (volume)                  | 8 kbyte                                                                                                                                                                                                                           |
| <b>Subprocess images</b>            |                                                                                                                                                                                                                                   |
| • Number of subprocess images, max. | 32                                                                                                                                                                                                                                |
| <b>Hardware configuration</b>       |                                                                                                                                                                                                                                   |
| Number of distributed IO systems    | 32; A distributed I/O system is characterized not only by the integration of distributed I/O via PROFINET or PROFIBUS communication modules, but also by the connection of I/O via AS-i master modules or links (e.g. IE/PB-Link) |
| <b>Number of DP masters</b>         |                                                                                                                                                                                                                                   |
| • Via CM                            | 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total                                                                                                                                                 |
| <b>Number of IO Controllers</b>     |                                                                                                                                                                                                                                   |
| • integrated                        | 1                                                                                                                                                                                                                                 |
| • Via CM                            | 4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total                                                                                                                                                 |
| <b>Rack</b>                         |                                                                                                                                                                                                                                   |
| • Modules per rack, max.            | 32; CPU + 31 modules                                                                                                                                                                                                              |
| • Number of lines, max.             | 1                                                                                                                                                                                                                                 |
| <b>PtP CM</b>                       |                                                                                                                                                                                                                                   |
| • Number of PtP CMs                 | the number of connectable PtP CMs is only limited by the number of available slots                                                                                                                                                |

|                                                                           |                                               |
|---------------------------------------------------------------------------|-----------------------------------------------|
| <b>Article number</b>                                                     | <b>6ES7511-1TK01-0AB0</b>                     |
| <b>Time of day</b>                                                        |                                               |
| <b>Clock</b>                                                              |                                               |
| <ul style="list-style-type: none"> <li>Type</li> </ul>                    | Hardware clock                                |
| <ul style="list-style-type: none"> <li>Backup time</li> </ul>             | 6 wk; At 40 °C ambient temperature, typically |
| <ul style="list-style-type: none"> <li>Deviation per day, max.</li> </ul> | 10 s; Typ.: 2 s                               |
| <b>Operating hours counter</b>                                            |                                               |
| <ul style="list-style-type: none"> <li>Number</li> </ul>                  | 16                                            |
| <b>Clock synchronization</b>                                              |                                               |
| <ul style="list-style-type: none"> <li>supported</li> </ul>               | Yes                                           |
| <ul style="list-style-type: none"> <li>in AS, master</li> </ul>           | Yes                                           |
| <ul style="list-style-type: none"> <li>in AS, slave</li> </ul>            | Yes                                           |
| <ul style="list-style-type: none"> <li>on Ethernet via NTP</li> </ul>     | Yes                                           |
| <b>Interfaces</b>                                                         |                                               |
| Number of PROFINET interfaces                                             | 1                                             |
| <b>1. Interface</b>                                                       |                                               |
| <b>Interface types</b>                                                    |                                               |
| <ul style="list-style-type: none"> <li>RJ 45 (Ethernet)</li> </ul>        | Yes; X1                                       |
| <ul style="list-style-type: none"> <li>Number of ports</li> </ul>         | 2                                             |
| <ul style="list-style-type: none"> <li>integrated switch</li> </ul>       | Yes                                           |
| <b>Protocols</b>                                                          |                                               |
| <ul style="list-style-type: none"> <li>IP protocol</li> </ul>             | Yes; IPv4                                     |
| <ul style="list-style-type: none"> <li>PROFINET IO Controller</li> </ul>  | Yes                                           |
| <ul style="list-style-type: none"> <li>PROFINET IO Device</li> </ul>      | Yes                                           |
| <ul style="list-style-type: none"> <li>SIMATIC communication</li> </ul>   | Yes                                           |
| <ul style="list-style-type: none"> <li>Open IE communication</li> </ul>   | Yes; Optionally also encrypted                |
| <ul style="list-style-type: none"> <li>Web server</li> </ul>              | Yes                                           |
| <ul style="list-style-type: none"> <li>Media redundancy</li> </ul>        | Yes                                           |

| Article number                                                                | 6ES7511-1TK01-0AB0                                                                                                                                                     |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>PROFINET IO Controller</b>                                                 |                                                                                                                                                                        |
| <b>Services</b>                                                               |                                                                                                                                                                        |
| – PG/OP communication                                                         | Yes                                                                                                                                                                    |
| – Isochronous mode                                                            | Yes                                                                                                                                                                    |
| – Direct data exchange                                                        | Yes; Requirement: IRT and isochronous mode (MRPD optional)                                                                                                             |
| – IRT                                                                         | Yes                                                                                                                                                                    |
| – PROFIenergy                                                                 | Yes; per user program                                                                                                                                                  |
| – Prioritized startup                                                         | Yes; Max. 32 PROFINET devices                                                                                                                                          |
| – Number of connectable IO Devices, max.                                      | 128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET                                                                       |
| – Of which IO devices with IRT, max.                                          | 64                                                                                                                                                                     |
| – Number of connectable IO Devices for RT, max.                               | 128                                                                                                                                                                    |
| – of which in line, max.                                                      | 128                                                                                                                                                                    |
| – Number of IO Devices that can be simultaneously activated/deactivated, max. | 8; in total across all interfaces                                                                                                                                      |
| – Number of IO Devices per tool, max.                                         | 8                                                                                                                                                                      |
| – Updating times                                                              | The minimum value of the update time also depends on communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data |
| <b>Update time for IRT</b>                                                    |                                                                                                                                                                        |
| – for send cycle of 250 µs                                                    | 250 µs to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive                                    |
| – for send cycle of 500 µs                                                    | 500 µs to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 µs of the isochronous OB is decisive                                    |
| – for send cycle of 1 ms                                                      | 1 ms to 16 ms                                                                                                                                                          |
| – for send cycle of 2 ms                                                      | 2 ms to 32 ms                                                                                                                                                          |
| – for send cycle of 4 ms                                                      | 4 ms to 64 ms                                                                                                                                                          |
| – With IRT and parameterization of "odd" send cycles                          | Update time = set "odd" send clock (any multiple of 125 µs: 375 µs, 625 µs ... 3 875 µs)                                                                               |
| <b>Update time for RT</b>                                                     |                                                                                                                                                                        |
| – for send cycle of 250 µs                                                    | 250 µs to 128 ms                                                                                                                                                       |
| – for send cycle of 500 µs                                                    | 500 µs to 256 ms                                                                                                                                                       |
| – for send cycle of 1 ms                                                      | 1 ms to 512 ms                                                                                                                                                         |
| – for send cycle of 2 ms                                                      | 2 ms to 512 ms                                                                                                                                                         |
| – for send cycle of 4 ms                                                      | 4 ms to 512 ms                                                                                                                                                         |

|                                                     |                                                                                    |
|-----------------------------------------------------|------------------------------------------------------------------------------------|
| <b>Article number</b>                               | <b>6ES7511-1TK01-0AB0</b>                                                          |
| <b>PROFINET IO Device</b>                           |                                                                                    |
| <b>Services</b>                                     |                                                                                    |
| – PG/OP communication                               | Yes                                                                                |
| – Isochronous mode                                  | No                                                                                 |
| – IRT                                               | Yes                                                                                |
| – PROFINergy                                        | Yes; per user program                                                              |
| – Shared device                                     | Yes                                                                                |
| – Number of IO Controllers with shared device, max. | 4                                                                                  |
| – activation/deactivation of I-devices              | Yes; per user program                                                              |
| – Asset management record                           | Yes; per user program                                                              |
| <b>Interface types</b>                              |                                                                                    |
| <b>RJ 45 (Ethernet)</b>                             |                                                                                    |
| • 100 Mbps                                          | Yes                                                                                |
| • Autonegotiation                                   | Yes                                                                                |
| • Autocrossing                                      | Yes                                                                                |
| • Industrial Ethernet status LED                    | Yes                                                                                |
| <b>Protocols</b>                                    |                                                                                    |
| <b>Number of connections</b>                        |                                                                                    |
| • Number of connections, max.                       | 96; via integrated interfaces of the CPU and connected CPs / CMs                   |
| • Number of connections reserved for ES/HMI/web     | 10                                                                                 |
| • Number of connections via integrated interfaces   | 64                                                                                 |
| • Number of S7 routing paths                        | 16                                                                                 |
| <b>Redundancy mode</b>                              |                                                                                    |
| • H-Sync forwarding                                 | Yes                                                                                |
| <b>Media redundancy</b>                             |                                                                                    |
| – Media redundancy                                  | only via 1st interface (X1)                                                        |
| – MRP                                               | Yes; MRP Automanager according to IEC 62439-2 Edition 2.0, MRP Manager; MRP Client |
| – MRP interconnection, supported                    | Yes; as MRP ring node according to IEC 62439-2 Edition 3.0                         |
| – MRPD                                              | Yes; Requirement: IRT                                                              |
| – Switchover time on line break, typ.               | 200 ms; For MRP, bumpless for MRPD                                                 |
| – Number of stations in the ring, max.              | 50                                                                                 |

|                                                   |                                                    |
|---------------------------------------------------|----------------------------------------------------|
| <b>Article number</b>                             | <b>6ES7511-1TK01-0AB0</b>                          |
| <b>SIMATIC communication</b>                      |                                                    |
| • PG/OP communication                             | Yes; encryption with TLS V1.3 pre-selected         |
| • S7 routing                                      | Yes                                                |
| • S7 communication, as server                     | Yes                                                |
| • S7 communication, as client                     | Yes                                                |
| • User data per job, max.                         | See online help (S7 communication, user data size) |
| <b>Open IE communication</b>                      |                                                    |
| • TCP/IP                                          | Yes                                                |
| – Data length, max.                               | 64 kbyte                                           |
| – several passive connections per port, supported | Yes                                                |
| • ISO-on-TCP (RFC1006)                            | Yes                                                |
| – Data length, max.                               | 64 kbyte                                           |
| • UDP                                             | Yes                                                |
| – Data length, max.                               | 2 kbyte; 1 472 bytes for UDP broadcast             |
| – UDP multicast                                   | Yes; Max. 5 multicast circuits                     |
| • DHCP                                            | Yes                                                |
| • DNS                                             | Yes                                                |
| • SNMP                                            | Yes                                                |
| • DCP                                             | Yes                                                |
| • LLDP                                            | Yes                                                |
| • Encryption                                      | Yes; Optional                                      |
| <b>Web server</b>                                 |                                                    |
| • HTTP                                            | Yes; Standard and user pages                       |
| • HTTPS                                           | Yes; Standard and user pages                       |

| Article number                                                                                                                               | 6ES7511-1TK01-0AB0                                                              |
|----------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------|
| <b>OPC UA</b>                                                                                                                                |                                                                                 |
| • Runtime license required                                                                                                                   | Yes; "Small" license required                                                   |
| • OPC UA Client                                                                                                                              | Yes                                                                             |
| – Application authentication                                                                                                                 | Yes                                                                             |
| – Security policies                                                                                                                          | Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256 |
| – User authentication                                                                                                                        | "anonymous" or by user name & password                                          |
| – Number of connections, max.                                                                                                                | 4                                                                               |
| – Number of nodes of the client interfaces, max.                                                                                             | 1 000                                                                           |
| – Number of elements for one call of OPC-UA_NodeGetHandleList/OPC-UA_ReadList/OPC-UA_WriteList, max.                                         | 300                                                                             |
| – Number of elements for one call of OPC-UA_NameSpaceGetIndexList, max.                                                                      | 20                                                                              |
| – Number of elements for one call of OPC-UA_MethodGetHandleList, max.                                                                        | 100                                                                             |
| – Number of simultaneous calls of the client instructions per connection (except OPC-UA_ReadList, OPC-UA_WriteList, OPC-UA_MethodCall), max. | 1                                                                               |
| – Number of simultaneous calls of the client instructions OPC-UA_ReadList, OPC-UA_WriteList and OPC-UA_MethodCall, max.                      | 5                                                                               |
| – Number of registerable nodes, max.                                                                                                         | 5 000                                                                           |
| – Number of registerable method calls of OPC-UA_MethodCall, max.                                                                             | 100                                                                             |
| – Number of inputs/outputs when calling OPC-UA_MethodCall, max.                                                                              | 20                                                                              |
| • OPC UA Server                                                                                                                              | Yes; Data access (read, write, subscribe), method call, custom address space    |
| – Application authentication                                                                                                                 | Yes                                                                             |
| – Security policies                                                                                                                          | Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256 |
| – User authentication                                                                                                                        | "anonymous" or by user name & password                                          |
| – GDS support (certificate management)                                                                                                       | Yes                                                                             |
| – Number of sessions, max.                                                                                                                   | 32                                                                              |
| – Number of accessible variables, max.                                                                                                       | 50 000                                                                          |
| – Number of registerable nodes, max.                                                                                                         | 10 000                                                                          |
| – Number of subscriptions per session, max.                                                                                                  | 20                                                                              |
| – Sampling interval, min.                                                                                                                    | 100 ms                                                                          |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                    |
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| <b>Article number</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>6ES7511-1TK01-0AB0</b>                                                                                                          |
| <ul style="list-style-type: none"> <li>– Publishing interval, min.</li> <li>– Number of server methods, max.</li> <li>– Number of inputs/outputs per server method, max.</li> <li>– Number of monitored items, max.</li> <li>– Number of nodes for user-defined server interfaces, max.</li> <li>• Alarms and Conditions <ul style="list-style-type: none"> <li>– Number of program alarms</li> <li>– Number of alarms for system diagnostics</li> </ul> </li> </ul> | 500 ms<br>20<br>20<br>1 000; for 1 s sampling interval and 1 s send interval<br>1 000<br>Yes<br>100<br>50                          |
| <b>Further protocols</b>                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                    |
| <ul style="list-style-type: none"> <li>• MODBUS</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                           | Yes; MODBUS TCP                                                                                                                    |
| <b>Isochronous mode</b>                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                    |
| Equidistance                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes                                                                                                                                |
| <b>S7 message functions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                    |
| Number of login stations for message functions, max.<br>Program alarms<br>Number of configurable program messages, max.<br>Number of loadable program messages in RUN, max.<br>Number of simultaneously active program alarms<br><ul style="list-style-type: none"> <li>• Number of program alarms</li> <li>• Number of alarms for system diagnostics</li> <li>• Number of alarms for motion technology objects</li> </ul>                                           | 32<br>Yes<br>5 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH<br>2 500<br><br>600<br>100<br>80 |
| <b>Test commissioning functions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                    |
| Joint commission (Team Engineering)                                                                                                                                                                                                                                                                                                                                                                                                                                  | Yes; Parallel online access possible for up to 5 engineering systems                                                               |
| Status block                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Yes; Up to 8 simultaneously (in total across all ES clients)                                                                       |
| Single step                                                                                                                                                                                                                                                                                                                                                                                                                                                          | No                                                                                                                                 |
| Number of breakpoints                                                                                                                                                                                                                                                                                                                                                                                                                                                | 8                                                                                                                                  |
| <b>Status/control</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                    |
| <ul style="list-style-type: none"> <li>• Status/control variable</li> <li>• Variables</li> <li>• Number of variables, max. <ul style="list-style-type: none"> <li>– of which status variables, max.</li> <li>– of which control variables, max.</li> </ul> </li> </ul>                                                                                                                                                                                               | Yes<br>Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters<br><br>200; per job<br>200; per job                    |

|                                                                                |                                                                                                                                   |
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| <b>Article number</b>                                                          | <b>6ES7511-1TK01-0AB0</b>                                                                                                         |
| <b>Forcing</b>                                                                 |                                                                                                                                   |
| • Forcing                                                                      | Yes                                                                                                                               |
| • Forcing, variables                                                           | Peripheral inputs/outputs                                                                                                         |
| • Number of variables, max.                                                    | 200                                                                                                                               |
| <b>Diagnostic buffer</b>                                                       |                                                                                                                                   |
| • present                                                                      | Yes                                                                                                                               |
| • Number of entries, max.                                                      | 1 000                                                                                                                             |
| – of which powerfail-proof                                                     | 500                                                                                                                               |
| <b>Traces</b>                                                                  |                                                                                                                                   |
| • Number of configurable Traces                                                | 4; Up to 512 KB of data per trace are possible                                                                                    |
| <b>Interrupts/diagnostics/status information</b>                               |                                                                                                                                   |
| <b>Diagnostics indication LED</b>                                              |                                                                                                                                   |
| • RUN/STOP LED                                                                 | Yes                                                                                                                               |
| • ERROR LED                                                                    | Yes                                                                                                                               |
| • MAINT LED                                                                    | Yes                                                                                                                               |
| • Connection display LINK TX/RX                                                | Yes                                                                                                                               |
| <b>Supported technology objects</b>                                            |                                                                                                                                   |
| Motion Control                                                                 | Yes; Note: The number of technology objects affects the cycle time of the PLC program; selection guide via the TIA Selection Tool |
| • Number of available Motion Control resources for technology objects          | 800                                                                                                                               |
| • Required Motion Control resources                                            |                                                                                                                                   |
| – per speed-controlled axis                                                    | 40                                                                                                                                |
| – per positioning axis                                                         | 80                                                                                                                                |
| – per synchronous axis                                                         | 160                                                                                                                               |
| – per external encoder                                                         | 80                                                                                                                                |
| – per output cam                                                               | 20                                                                                                                                |
| – per cam track                                                                | 160                                                                                                                               |
| – per probe                                                                    | 40                                                                                                                                |
| • Number of available Extended Motion Control resources for technology objects | 40                                                                                                                                |
| • Required Extended Motion Control resources                                   |                                                                                                                                   |
| – per cam (1 000 points and 50 segments)                                       | 2                                                                                                                                 |
| – per cam (10 000 points and 50 segments)                                      | 20                                                                                                                                |
| – for each set of kinematics                                                   | 30                                                                                                                                |

|                                                                                                                                |                                                                                                    |
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| <b>Article number</b>                                                                                                          | <b>6ES7511-1TK01-0AB0</b>                                                                          |
| <ul style="list-style-type: none"> <li>– Per leading axis proxy</li> </ul>                                                     | 3                                                                                                  |
| <ul style="list-style-type: none"> <li>• Positioning axis</li> </ul>                                                           |                                                                                                    |
| <ul style="list-style-type: none"> <li>– Number of positioning axes at motion control cycle of 4 ms (typical value)</li> </ul> | 5                                                                                                  |
| <ul style="list-style-type: none"> <li>– Number of positioning axes at motion control cycle of 8 ms (typical value)</li> </ul> | 10                                                                                                 |
| Controller                                                                                                                     |                                                                                                    |
| <ul style="list-style-type: none"> <li>• PID_Compact</li> </ul>                                                                | Yes; Universal PID controller with integrated optimization                                         |
| <ul style="list-style-type: none"> <li>• PID_3Step</li> </ul>                                                                  | Yes; PID controller with integrated optimization for valves                                        |
| <ul style="list-style-type: none"> <li>• PID-Temp</li> </ul>                                                                   | Yes; PID controller with integrated optimization for temperature                                   |
| Counting and measuring                                                                                                         |                                                                                                    |
| <ul style="list-style-type: none"> <li>• High-speed counter</li> </ul>                                                         | Yes                                                                                                |
| <b>Standards, approvals, certificates</b>                                                                                      |                                                                                                    |
| Suitable for safety functions                                                                                                  | No                                                                                                 |
| <b>Ambient conditions</b>                                                                                                      |                                                                                                    |
| <b>Ambient temperature during operation</b>                                                                                    |                                                                                                    |
| <ul style="list-style-type: none"> <li>• horizontal installation, min.</li> </ul>                                              | 0 °C                                                                                               |
| <ul style="list-style-type: none"> <li>• horizontal installation, max.</li> </ul>                                              | 60 °C; Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off |
| <ul style="list-style-type: none"> <li>• vertical installation, min.</li> </ul>                                                | 0 °C                                                                                               |
| <ul style="list-style-type: none"> <li>• vertical installation, max.</li> </ul>                                                | 40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off |
| <b>Ambient temperature during storage/transportation</b>                                                                       |                                                                                                    |
| <ul style="list-style-type: none"> <li>• min.</li> </ul>                                                                       | -40 °C                                                                                             |
| <ul style="list-style-type: none"> <li>• max.</li> </ul>                                                                       | 70 °C                                                                                              |
| <b>Altitude during operation relating to sea level</b>                                                                         |                                                                                                    |
| <ul style="list-style-type: none"> <li>• Installation altitude above sea level, max.</li> </ul>                                | 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual                             |
| <b>Configuration</b>                                                                                                           |                                                                                                    |
| <b>Programming</b>                                                                                                             |                                                                                                    |
| <b>Programming language</b>                                                                                                    |                                                                                                    |
| <ul style="list-style-type: none"> <li>– LAD</li> </ul>                                                                        | Yes                                                                                                |
| <ul style="list-style-type: none"> <li>– FBD</li> </ul>                                                                        | Yes                                                                                                |
| <ul style="list-style-type: none"> <li>– STL</li> </ul>                                                                        | Yes                                                                                                |
| <ul style="list-style-type: none"> <li>– SCL</li> </ul>                                                                        | Yes                                                                                                |
| <ul style="list-style-type: none"> <li>– GRAPH</li> </ul>                                                                      | Yes                                                                                                |

|                                                 |                               |
|-------------------------------------------------|-------------------------------|
| <b>Article number</b>                           | <b>6ES7511-1TK01-0AB0</b>     |
| <b>Know-how protection</b>                      |                               |
| • User program protection/password protection   | Yes                           |
| • Copy protection                               | Yes                           |
| • Block protection                              | Yes                           |
| <b>Access protection</b>                        |                               |
| • protection of confidential configuration data | Yes                           |
| • Password for display                          | Yes                           |
| • Protection level: Write protection            | Yes                           |
| • Protection level: Read/write protection       | Yes                           |
| • Protection level: Complete protection         | Yes                           |
| <b>Cycle time monitoring</b>                    |                               |
| • lower limit                                   | adjustable minimum cycle time |
| • upper limit                                   | adjustable maximum cycle time |
| <b>Dimensions</b>                               |                               |
| Width                                           | 35 mm                         |
| Height                                          | 147 mm                        |
| Depth                                           | 129 mm                        |
| <b>Weights</b>                                  |                               |
| Weight, approx.                                 | 430 g                         |

## General technical specifications

You can find information on the general technical specifications, such as standards and approvals, electromagnetic compatibility, protection class, etc., in the S7-1500, ET 200MP System Manual (<https://support.automation.siemens.com/WW/view/en/59191792>).