



SIMATIC S7-1500 Compact CPU CPU 1512C-1 PN, central processing unit with working memory 250 KB for program and 1 MB for data, 32 digital inputs, 32 digital outputs, 5 analog inputs, 2 analog outputs, 6 high speed counters, 4 high speed outputs for PTO/PWM/frequency output 1. interface: PROFINET IRT with 2 port switch, 48 NS bit-performance, incl. front connector push-in, SIMATIC memory card necessary

| General information                                      |                                                                                                            |
|----------------------------------------------------------|------------------------------------------------------------------------------------------------------------|
| Product type designation                                 | CPU 1512C-1 PN                                                                                             |
| HW functional status                                     | FS03                                                                                                       |
| Firmware version                                         | V2.9                                                                                                       |
| Product function                                         |                                                                                                            |
| • I&M data                                               | Yes; I&M0 to I&M3                                                                                          |
| • Isochronous mode                                       | Yes; With minimum OB 6x cycle of 625 µs (distributed)                                                      |
| Engineering with                                         |                                                                                                            |
| • STEP 7 TIA Portal configurable/integrated from version | V17 (FW V2.9) / V15 (FW V2.5) or higher; with older TIA Portal versions configurable as 6ES7512-1CK00-0AB0 |
| Configuration control                                    |                                                                                                            |
| via dataset                                              | Yes                                                                                                        |
| Display                                                  |                                                                                                            |
| Screen diagonal [cm]                                     | 3.45 cm                                                                                                    |
| Control elements                                         |                                                                                                            |
| Number of keys                                           | 8                                                                                                          |
| Mode buttons                                             | 2                                                                                                          |
| Supply voltage                                           |                                                                                                            |
| Rated value (DC)                                         | 24 V                                                                                                       |
| permissible range, lower limit (DC)                      | 19.2 V; 20.4 V DC, for supplying the digital inputs/outputs                                                |
| permissible range, upper limit (DC)                      | 28.8 V                                                                                                     |
| Reverse polarity protection                              | Yes                                                                                                        |
| Mains buffering                                          |                                                                                                            |
| • Mains/voltage failure stored energy time               | 5 ms; Refers to the power supply on the CPU section                                                        |
| • Repeat rate, min.                                      | 1/s                                                                                                        |
| Input current                                            |                                                                                                            |
| Current consumption (rated value)                        | 0.8 A; Without load; 18.8 A: CPU + load                                                                    |
| Current consumption, max.                                | 1 A; Without load; 19 A: CPU + load                                                                        |
| Inrush current, max.                                     | 1.9 A; Rated value                                                                                         |
| I <sub>t</sub>                                           | 0.34 A <sup>2</sup> ·s                                                                                     |
| Digital inputs                                           |                                                                                                            |
| • from load voltage L+ (without load), max.              | 20 mA; per group                                                                                           |
| Digital outputs                                          |                                                                                                            |
| • from load voltage L+, max.                             | 30 mA; Per group, without load                                                                             |
| output voltage / header                                  |                                                                                                            |
| Rated value (DC)                                         | 24 V                                                                                                       |
| Encoder supply                                           |                                                                                                            |
| Number of outputs                                        | 2; One common 24 V encoder supply per 16 digital inputs                                                    |
| 24 V encoder supply                                      |                                                                                                            |
| • 24 V                                                   | Yes; L+ (-0.8 V)                                                                                           |

|                                                     |                                                                                                                                                       |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| • Short-circuit protection                          | Yes                                                                                                                                                   |
| • Output current, max.                              | 1 A                                                                                                                                                   |
| <b>Power</b>                                        |                                                                                                                                                       |
| Infeed power to the backplane bus                   | 10 W                                                                                                                                                  |
| Power consumption from the backplane bus (balanced) | 9 W                                                                                                                                                   |
| <b>Power loss</b>                                   |                                                                                                                                                       |
| Power loss, typ.                                    | 15.2 W                                                                                                                                                |
| <b>Memory</b>                                       |                                                                                                                                                       |
| Number of slots for SIMATIC memory card             | 1                                                                                                                                                     |
| SIMATIC memory card required                        | Yes                                                                                                                                                   |
| <b>Work memory</b>                                  |                                                                                                                                                       |
| • integrated (for program)                          | 250 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.                            | 48 ns                                                                                                                                                 |
| for word operations, typ.                           | 58 ns                                                                                                                                                 |
| for fixed point arithmetic, typ.                    | 77 ns                                                                                                                                                 |
| for floating point arithmetic, typ.                 | 307 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.                                        | 250 kbyte                                                                                                                                             |
| <b>FC</b>                                           |                                                                                                                                                       |
| • Number range                                      | 0 ... 65 535                                                                                                                                          |
| • Size, max.                                        | 250 kbyte                                                                                                                                             |
| <b>OB</b>                                           |                                                                                                                                                       |
| • Size, max.                                        | 250 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                    | 1                                                                                                                                                     |
| • 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                                                                                                                                                 |

|                                                                    |                                                                                                                                                                                                                                   |
|--------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Retentivity                                                        |                                                                                                                                                                                                                                   |
| — adjustable                                                       | Yes                                                                                                                                                                                                                               |
| IEC timer                                                          |                                                                                                                                                                                                                                   |
| • Number                                                           | Any (only limited by the main memory)                                                                                                                                                                                             |
| Retentivity                                                        |                                                                                                                                                                                                                                   |
| — 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                                                                                                                                                                                      |
| Flag                                                               |                                                                                                                                                                                                                                   |
| • Size, max.                                                       | 16 kbyte                                                                                                                                                                                                                          |
| • Number of clock memories                                         | 8; 8 clock memory bit, grouped into one clock memory byte                                                                                                                                                                         |
| Data blocks                                                        |                                                                                                                                                                                                                                   |
| • Retentivity adjustable                                           | Yes                                                                                                                                                                                                                               |
| • Retentivity preset                                               | No                                                                                                                                                                                                                                |
| Local data                                                         |                                                                                                                                                                                                                                   |
| • per priority class, max.                                         | 64 kbyte; max. 16 KB per block                                                                                                                                                                                                    |
| <b>Address area</b>                                                |                                                                                                                                                                                                                                   |
| Number of IO modules                                               | 2 048; max. number of modules / submodules                                                                                                                                                                                        |
| I/O address area                                                   |                                                                                                                                                                                                                                   |
| • Inputs                                                           | 32 kbyte; All inputs are in the process image                                                                                                                                                                                     |
| • Outputs                                                          | 32 kbyte; All outputs are in the process image                                                                                                                                                                                    |
| per integrated IO subsystem                                        |                                                                                                                                                                                                                                   |
| — Inputs (volume)                                                  | 8 kbyte                                                                                                                                                                                                                           |
| — Outputs (volume)                                                 | 8 kbyte                                                                                                                                                                                                                           |
| per CM/CP                                                          |                                                                                                                                                                                                                                   |
| — Inputs (volume)                                                  | 8 kbyte                                                                                                                                                                                                                           |
| — Outputs (volume)                                                 | 8 kbyte                                                                                                                                                                                                                           |
| Subprocess images                                                  |                                                                                                                                                                                                                                   |
| • 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) |
| Number of DP masters                                               |                                                                                                                                                                                                                                   |
| • Via CM                                                           | 6; A maximum of 6 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total                                                                                                                                                 |
| Number of IO Controllers                                           |                                                                                                                                                                                                                                   |
| • integrated                                                       | 1                                                                                                                                                                                                                                 |
| • Via CM                                                           | 6; A maximum of 6 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total                                                                                                                                                 |
| Rack                                                               |                                                                                                                                                                                                                                   |
| • Modules per rack, max.                                           | 32; CPU + 31 modules                                                                                                                                                                                                              |
| • Number of lines, max.                                            | 1                                                                                                                                                                                                                                 |
| PtP CM                                                             |                                                                                                                                                                                                                                   |
| • Number of PtP CMs                                                | the number of connectable PtP CMs is only limited by the number of available slots                                                                                                                                                |
| <b>Time of day</b>                                                 |                                                                                                                                                                                                                                   |
| Clock                                                              |                                                                                                                                                                                                                                   |
| • Type                                                             | Hardware clock                                                                                                                                                                                                                    |
| • Backup time                                                      | 6 wk; At 40 °C ambient temperature, typically                                                                                                                                                                                     |
| • Deviation per day, max.                                          | 10 s; Typ.: 2 s                                                                                                                                                                                                                   |
| Operating hours counter                                            |                                                                                                                                                                                                                                   |
| • Number                                                           | 16                                                                                                                                                                                                                                |
| Clock synchronization                                              |                                                                                                                                                                                                                                   |
| • supported                                                        | Yes                                                                                                                                                                                                                               |
| • in AS, master                                                    | Yes                                                                                                                                                                                                                               |
| • in AS, slave                                                     | Yes                                                                                                                                                                                                                               |
| • on Ethernet via NTP                                              | Yes                                                                                                                                                                                                                               |
| <b>Digital inputs</b>                                              |                                                                                                                                                                                                                                   |
| integrated channels (DI)                                           | 32                                                                                                                                                                                                                                |

|                                                                 |                                                                                                                           |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| Digital inputs, parameterizable                                 | Yes                                                                                                                       |
| Source/sink input                                               | P-reading                                                                                                                 |
| Input characteristic curve in accordance with IEC 61131, type 3 | Yes                                                                                                                       |
| Digital input functions, parameterizable                        |                                                                                                                           |
| • Gate start/stop                                               | Yes                                                                                                                       |
| • Capture                                                       | Yes                                                                                                                       |
| • Synchronization                                               | Yes                                                                                                                       |
| Input voltage                                                   |                                                                                                                           |
| • Type of input voltage                                         | DC                                                                                                                        |
| • Rated value (DC)                                              | 24 V                                                                                                                      |
| • for signal "0"                                                | -3 to +5V                                                                                                                 |
| • for signal "1"                                                | +11 to +30V                                                                                                               |
| Input current                                                   |                                                                                                                           |
| • for signal "1", typ.                                          | 2.5 mA                                                                                                                    |
| Input delay (for rated value of input voltage)                  |                                                                                                                           |
| for standard inputs                                             |                                                                                                                           |
| — parameterizable                                               | Yes; none / 0.05 / 0.1 / 0.4 / 1.6 / 3.2 / 12.8 / 20 ms                                                                   |
| — at "0" to "1", min.                                           | 4 µs; for parameterization "none"                                                                                         |
| — at "0" to "1", max.                                           | 20 ms                                                                                                                     |
| — at "1" to "0", min.                                           | 4 µs; for parameterization "none"                                                                                         |
| — at "1" to "0", max.                                           | 20 ms                                                                                                                     |
| for interrupt inputs                                            |                                                                                                                           |
| — parameterizable                                               | Yes; Same as for standard inputs                                                                                          |
| for technological functions                                     |                                                                                                                           |
| — parameterizable                                               | Yes; Same as for standard inputs                                                                                          |
| Cable length                                                    |                                                                                                                           |
| • shielded, max.                                                | 1 000 m; 600 m for technological functions; depending on input frequency, encoder and cable quality; max. 50 m at 100 kHz |
| • unshielded, max.                                              | 600 m; for technological functions: No                                                                                    |
| Digital outputs                                                 |                                                                                                                           |
| Type of digital output                                          | Transistor                                                                                                                |
| integrated channels (DO)                                        | 32                                                                                                                        |
| Current-sourcing                                                | Yes; Push-pull output                                                                                                     |
| Short-circuiting protection                                     | Yes; electronic/thermal                                                                                                   |
| • Response threshold, typ.                                      | 1.6 A with standard output, 0.5 A with high-speed output; see manual for details                                          |
| Limitation of inductive shutdown voltage to                     | Connector X11: -0.8 V; connector X12: L+ (-53 V)                                                                          |
| Controlling a digital input                                     | Yes                                                                                                                       |
| Accuracy of pulse duration                                      | Up to ±100 ppm ±2 µs at high-speed output; see manual for details                                                         |
| minimum pulse duration                                          | 2 µs; With High Speed output                                                                                              |
| Digital output functions, parameterizable                       |                                                                                                                           |
| • Switching tripped by comparison values                        | Yes; As output signal of a high-speed counter                                                                             |
| • PWM output                                                    | Yes                                                                                                                       |
| — Number, max.                                                  | 4                                                                                                                         |
| — Cycle duration, parameterizable                               | Yes                                                                                                                       |
| — ON period, min.                                               | 0 %                                                                                                                       |
| — ON period, max.                                               | 100 %                                                                                                                     |
| — Resolution of the duty cycle                                  | 0.0036 %; For S7 analog format, min. 40 ns                                                                                |
| • Frequency output                                              | Yes                                                                                                                       |
| Switching capacity of the outputs                               |                                                                                                                           |
| • with resistive load, max.                                     | 0.5 A; 0.1 A with high-speed output, i.e. when using a high-speed output; see manual for details                          |
| • on lamp load, max.                                            | 5 W; 1 W with high-speed output, i.e. when using a high-speed output; see manual for details                              |
| Load resistance range                                           |                                                                                                                           |
| • lower limit                                                   | 48 Ω; 240 ohms with high-speed output, i.e. when using a high-speed output; see manual for details                        |
| • upper limit                                                   | 12 kΩ                                                                                                                     |
| Output voltage                                                  |                                                                                                                           |
| • Type of output voltage                                        | DC                                                                                                                        |
| • for signal "0", max.                                          | 1 V; With high-speed output, i.e. when using a high-speed output; see manual for details                                  |
| • for signal "1", min.                                          | 23.2 V; L+ (-0.8 V)                                                                                                       |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                      |
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| <b>Output current</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• for signal "1" rated value</li> <li>• for signal "1" permissible range, min.</li> <li>• for signal "1" permissible range, max.</li> <li>• for signal "0" residual current, max.</li> </ul>                                                                                                                                                                                                                                                                                                             | 0.5 A; 0.1 A with high-speed output, i.e. when using a high-speed output, observe derating; see manual for details<br>2 mA<br>0.6 A; 0.12 A with high-speed output, i.e. when using a high-speed output, observe derating; see manual for details<br>0.5 mA                          |
| <b>Output delay with resistive load</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• "0" to "1", max.</li> <li>• "1" to "0", max.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                | 200 µs<br>500 µs; Load-dependent                                                                                                                                                                                                                                                     |
| <b>for technological functions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                      |
| — "0" to "1", max.<br>— "1" to "0", max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 5 µs; Depending on the output used, see additional description in manual<br>5 µs; Depending on the output used, see additional description in manual                                                                                                                                 |
| <b>Parallel switching of two outputs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• for logic links</li> <li>• for uprating</li> <li>• for redundant control of a load</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                          | Yes; for technological functions: No<br>No<br>Yes; for technological functions: No                                                                                                                                                                                                   |
| <b>Switching frequency</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• with resistive load, max.</li> <li>• with inductive load, max.</li> <li>• on lamp load, max.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                | 100 kHz; For high-speed output, 100 Hz for standard output<br>0.5 Hz; Acc. to IEC 60947-5-1, DC-13; observe derating curve<br>10 Hz                                                                                                                                                  |
| <b>Total current of the outputs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• Current per channel, max.</li> <li>• Current per group, max.</li> <li>• Current per power supply, max.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                      | 0.5 A; see additional description in the manual<br>8 A; see additional description in the manual<br>4 A; 2 power supplies for each group, current per power supply max. 4 A, see additional description in manual                                                                    |
| <b>for technological functions</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                      |
| — Current per channel, max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0.5 A; see additional description in the manual                                                                                                                                                                                                                                      |
| <b>Relay outputs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• Number of relay outputs</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 0                                                                                                                                                                                                                                                                                    |
| <b>Cable length</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• shielded, max.</li> <li>• unshielded, max.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 1 000 m; 600 m for technological functions; depending on output frequency, load, and cable quality; max. 50 m at 100 kHz<br>600 m; for technological functions: No                                                                                                                   |
| <b>Analog inputs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                      |
| Number of analog inputs <ul style="list-style-type: none"> <li>• For current measurement</li> <li>• For voltage measurement</li> <li>• For resistance/resistance thermometer measurement</li> </ul>                                                                                                                                                                                                                                                                                                                                             | 5; 4x for U/I, 1x for R/RTD<br>4; max.<br>4; max.<br>1                                                                                                                                                                                                                               |
| permissible input voltage for voltage input (destruction limit), max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 28.8 V                                                                                                                                                                                                                                                                               |
| permissible input current for current input (destruction limit), max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 40 mA                                                                                                                                                                                                                                                                                |
| Cycle time (all channels), min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 ms; Dependent on the parameterized interference frequency suppression; for details, see conversion procedure in manual                                                                                                                                                             |
| Technical unit for temperature measurement adjustable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Yes; °C/°F/K                                                                                                                                                                                                                                                                         |
| <b>Input ranges (rated values), voltages</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• 0 to +10 V               <ul style="list-style-type: none"> <li>— Input resistance (0 to 10 V)</li> </ul> </li> <li>• 1 V to 5 V               <ul style="list-style-type: none"> <li>— Input resistance (1 V to 5 V)</li> </ul> </li> <li>• -10 V to +10 V               <ul style="list-style-type: none"> <li>— Input resistance (-10 V to +10 V)</li> </ul> </li> <li>• -5 V to +5 V               <ul style="list-style-type: none"> <li>— Input resistance (-5 V to +5 V)</li> </ul> </li> </ul> | Yes; Physical measuring range: ± 10 V<br>100 kΩ<br>Yes; Physical measuring range: ± 10 V<br>100 kΩ<br>Yes<br>100 kΩ<br>Yes; Physical measuring range: ± 10 V<br>100 kΩ                                                                                                               |
| <b>Input ranges (rated values), currents</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                      |
| <ul style="list-style-type: none"> <li>• 0 to 20 mA               <ul style="list-style-type: none"> <li>— Input resistance (0 to 20 mA)</li> </ul> </li> <li>• -20 mA to +20 mA               <ul style="list-style-type: none"> <li>— Input resistance (-20 mA to +20 mA)</li> </ul> </li> <li>• 4 mA to 20 mA               <ul style="list-style-type: none"> <li>— Input resistance (4 mA to 20 mA)</li> </ul> </li> </ul>                                                                                                                 | Yes; Physical measuring range: ± 20 mA<br>50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC<br>Yes<br>50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC<br>Yes; Physical measuring range: ± 20 mA<br>50 Ω; Plus approx. 55 ohm for overvoltage protection by PTC |
| <b>Input ranges (rated values), resistance thermometer</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                      |

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| <ul style="list-style-type: none"> <li>• Ni 100 <ul style="list-style-type: none"> <li>— Input resistance (Ni 100)</li> </ul> </li> <li>• Pt 100 <ul style="list-style-type: none"> <li>— Input resistance (Pt 100)</li> </ul> </li> </ul>                                                                                                                                            | Yes; Standard/climate<br>10 MΩ<br>Yes; Standard/climate<br>10 MΩ                                                                 |
| <b>Input ranges (rated values), resistors</b>                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• 0 to 150 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 150 ohms)</li> </ul> </li> <li>• 0 to 300 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 300 ohms)</li> </ul> </li> <li>• 0 to 600 ohms <ul style="list-style-type: none"> <li>— Input resistance (0 to 600 ohms)</li> </ul> </li> </ul> | Yes; Physical measuring range: 0 ... 600 ohms<br>10 MΩ<br>Yes; Physical measuring range: 0 ... 600 ohms<br>10 MΩ<br>Yes<br>10 MΩ |
| <b>Cable length</b>                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• shielded, max.</li> </ul>                                                                                                                                                                                                                                                                                                                    | 800 m; for U/I, 200 m for R/RTD                                                                                                  |
| <b>Analog outputs</b>                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                  |
| integrated channels (AO)                                                                                                                                                                                                                                                                                                                                                              | 2                                                                                                                                |
| Voltage output, short-circuit protection                                                                                                                                                                                                                                                                                                                                              | Yes                                                                                                                              |
| Cycle time (all channels), min.                                                                                                                                                                                                                                                                                                                                                       | 1 ms; Dependent on the parameterized interference frequency suppression; for details, see conversion procedure in manual         |
| <b>Output ranges, voltage</b>                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• 0 to 10 V</li> <li>• 1 V to 5 V</li> <li>• -10 V to +10 V</li> </ul>                                                                                                                                                                                                                                                                         | Yes<br>Yes<br>Yes                                                                                                                |
| <b>Output ranges, current</b>                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• 0 to 20 mA</li> <li>• -20 mA to +20 mA</li> <li>• 4 mA to 20 mA</li> </ul>                                                                                                                                                                                                                                                                   | Yes<br>Yes<br>Yes                                                                                                                |
| <b>Load impedance (in rated range of output)</b>                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• with voltage outputs, min.</li> <li>• with voltage outputs, capacitive load, max.</li> <li>• with current outputs, max.</li> <li>• with current outputs, inductive load, max.</li> </ul>                                                                                                                                                     | 1 kΩ<br>100 nF<br>500 Ω<br>1 mH                                                                                                  |
| <b>Cable length</b>                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• shielded, max.</li> </ul>                                                                                                                                                                                                                                                                                                                    | 200 m                                                                                                                            |
| <b>Analog value generation for the inputs</b>                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                  |
| <b>Integration and conversion time/resolution per channel</b>                                                                                                                                                                                                                                                                                                                         |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• Resolution with overrange (bit including sign), max.</li> <li>• Integration time, parameterizable</li> <li>• Interference voltage suppression for interference frequency f1 in Hz</li> </ul>                                                                                                                                                 | 16 bit<br>Yes; 2.5 / 16.67 / 20 / 100 ms, acts on all channels<br>400 / 60 / 50 / 10                                             |
| <b>Smoothing of measured values</b>                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• parameterizable</li> <li>• Step: None</li> <li>• Step: low</li> <li>• Step: Medium</li> <li>• Step: High</li> </ul>                                                                                                                                                                                                                          | Yes<br>Yes<br>Yes<br>Yes<br>Yes                                                                                                  |
| <b>Analog value generation for the outputs</b>                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                  |
| <b>Integration and conversion time/resolution per channel</b>                                                                                                                                                                                                                                                                                                                         |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• Resolution with overrange (bit including sign), max.</li> </ul>                                                                                                                                                                                                                                                                              | 16 bit                                                                                                                           |
| <b>Settling time</b>                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• for resistive load</li> <li>• for capacitive load</li> <li>• for inductive load</li> </ul>                                                                                                                                                                                                                                                   | 1.5 ms<br>2.5 ms<br>2.5 ms                                                                                                       |
| <b>Encoder</b>                                                                                                                                                                                                                                                                                                                                                                        |                                                                                                                                  |
| <b>Connection of signal encoders</b>                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• for voltage measurement</li> <li>• for current measurement as 4-wire transducer</li> <li>• for resistance measurement with two-wire connection</li> <li>• for resistance measurement with three-wire connection</li> <li>• for resistance measurement with four-wire connection</li> </ul>                                                   | Yes<br>Yes<br>Yes<br>Yes<br>Yes                                                                                                  |
| <b>Connectable encoders</b>                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• 2-wire sensor</li> </ul>                                                                                                                                                                                                                                                                                                                     | Yes                                                                                                                              |

|                                                                                                                                 |                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| — permissible quiescent current (2-wire sensor), max.                                                                           | 1.5 mA                                                                                     |
| <b>Encoder signals, incremental encoder (asymmetrical)</b>                                                                      |                                                                                            |
| • Input voltage                                                                                                                 | 24 V                                                                                       |
| • Input frequency, max.                                                                                                         | 100 kHz                                                                                    |
| • Counting frequency, max.                                                                                                      | 400 kHz; with quadruple evaluation                                                         |
| • Signal filter, parameterizable                                                                                                | Yes                                                                                        |
| • Incremental encoder with A/B tracks, 90° phase offset                                                                         | Yes                                                                                        |
| • Incremental encoder with A/B tracks, 90° phase offset and zero track                                                          | Yes                                                                                        |
| • pulse encoder                                                                                                                 | Yes                                                                                        |
| • pulse encoder with direction                                                                                                  | Yes                                                                                        |
| • pulse encoder with one impulse signal per count direction                                                                     | Yes                                                                                        |
| <b>Errors/accuracies</b>                                                                                                        |                                                                                            |
| Linearity error (relative to input range), (+/-)                                                                                | 0.1 %                                                                                      |
| Temperature error (relative to input range), (+/-)                                                                              | 0.005 %/K                                                                                  |
| Crosstalk between the inputs, max.                                                                                              | -60 dB                                                                                     |
| Repeat accuracy in steady state at 25 °C (relative to input range), (+/-)                                                       | 0.05 %                                                                                     |
| Output ripple (relative to output range, bandwidth 0 to 50 kHz), (+/-)                                                          | 0.02 %                                                                                     |
| Linearity error (relative to output range), (+/-)                                                                               | 0.15 %                                                                                     |
| Temperature error (relative to output range), (+/-)                                                                             | 0.005 %/K                                                                                  |
| Crosstalk between the outputs, max.                                                                                             | -80 dB                                                                                     |
| Repeat accuracy in steady state at 25 °C (relative to output range), (+/-)                                                      | 0.05 %                                                                                     |
| <b>Operational error limit in overall temperature range</b>                                                                     |                                                                                            |
| • Voltage, relative to input range, (+/-)                                                                                       | 0.3 %                                                                                      |
| • Current, relative to input range, (+/-)                                                                                       | 0.3 %                                                                                      |
| • Resistance, relative to input range, (+/-)                                                                                    | 0.3 %                                                                                      |
| • Resistance thermometer, relative to input range, (+/-)                                                                        | Pt100 Standard: ±2 K, Pt100 Climate: ±1 K, Ni100 Standard: ±1.2 K, Ni100 Climate: ±1 K     |
| • Voltage, relative to output range, (+/-)                                                                                      | 0.3 %                                                                                      |
| • Current, relative to output range, (+/-)                                                                                      | 0.3 %                                                                                      |
| <b>Basic error limit (operational limit at 25 °C)</b>                                                                           |                                                                                            |
| • Voltage, relative to input range, (+/-)                                                                                       | 0.2 %                                                                                      |
| • Current, relative to input range, (+/-)                                                                                       | 0.2 %                                                                                      |
| • Resistance, relative to input range, (+/-)                                                                                    | 0.2 %                                                                                      |
| • Resistance thermometer, relative to input range, (+/-)                                                                        | Pt100 Standard: ±1 K, Pt100 Climate: ±0.5 K, Ni100 Standard: ±0.6 K, Ni100 Climate: ±0.5 K |
| • Voltage, relative to output range, (+/-)                                                                                      | 0.2 %                                                                                      |
| • Current, relative to output range, (+/-)                                                                                      | 0.2 %                                                                                      |
| <b>Interference voltage suppression for <math>f = n \times (f_1 \pm 1 \%)</math>, <math>f_1</math> = interference frequency</b> |                                                                                            |
| • Series mode interference (peak value of interference < rated value of input range), min.                                      | 30 dB                                                                                      |
| • Common mode voltage, max.                                                                                                     | 10 V                                                                                       |
| • Common mode interference, min.                                                                                                | 60 dB; at 400 Hz: 50 dB                                                                    |
| <b>Interfaces</b>                                                                                                               |                                                                                            |
| Number of PROFINET interfaces                                                                                                   | 1                                                                                          |
| <b>1. Interface</b>                                                                                                             |                                                                                            |
| <b>Interface types</b>                                                                                                          |                                                                                            |
| • RJ 45 (Ethernet)                                                                                                              | Yes; X1                                                                                    |
| • Number of ports                                                                                                               | 2                                                                                          |
| • integrated switch                                                                                                             | Yes                                                                                        |
| <b>Protocols</b>                                                                                                                |                                                                                            |
| • IP protocol                                                                                                                   | Yes; IPv4                                                                                  |
| • PROFINET IO Controller                                                                                                        | Yes                                                                                        |
| • PROFINET IO Device                                                                                                            | Yes                                                                                        |
| • SIMATIC communication                                                                                                         | Yes                                                                                        |
| • Open IE communication                                                                                                         | Yes; Optionally also encrypted                                                             |
| • Web server                                                                                                                    | Yes                                                                                        |
| • Media redundancy                                                                                                              | Yes                                                                                        |
| <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                                                                                                                                                                    |
| — PROFINergy                                                                  | 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>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.                                                 | 128; 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                             | 88                                                                                                                                                                     |
| • 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>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                                                    |
| <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, recommended 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 for session management, per connection, max. | 1                                                                               |
| — Number of simultaneous calls of the client instructions for data access, per connection, 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                                                                          |

|                                                            |                                                                                                          |
|------------------------------------------------------------|----------------------------------------------------------------------------------------------------------|
| — Publishing interval, min.                                | 500 ms                                                                                                   |
| — Number of server methods, max.                           | 20                                                                                                       |
| — Number of inputs/outputs per server method, max.         | 20                                                                                                       |
| — Number of monitored items, recommended max.              | 1 000; for 1 s sampling interval and 1 s send interval                                                   |
| — Number of server interfaces, max.                        | 10 of each "Server interfaces" / "Companion specification" type and 20 of the type "Reference namespace" |
| — Number of nodes for user-defined server interfaces, max. | 1 000                                                                                                    |
| • Alarms and Conditions                                    | Yes                                                                                                      |
| — Number of program alarms                                 | 100                                                                                                      |
| — Number of alarms for system diagnostics                  | 50                                                                                                       |
| <b>Further protocols</b>                                   |                                                                                                          |
| • MODBUS                                                   | Yes; MODBUS TCP                                                                                          |
| <b>Isochronous mode</b>                                    |                                                                                                          |
| Equidistance                                               | Yes                                                                                                      |
| <b>S7 message functions</b>                                |                                                                                                          |
| Number of login stations for message functions, max.       | 32                                                                                                       |
| Program alarms                                             | Yes                                                                                                      |
| Number of configurable program messages, max.              | 5 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH                     |
| Number of loadable program messages in RUN, max.           | 2 500                                                                                                    |
| Number of simultaneously active program alarms             |                                                                                                          |
| • Number of program alarms                                 | 600                                                                                                      |
| • Number of alarms for system diagnostics                  | 100                                                                                                      |
| • Number of alarms for motion technology objects           | 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>                                      |                                                                                                          |
| • Status/control variable                                  | Yes                                                                                                      |
| • Variables                                                | Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters                                     |
| • Number of variables, max.                                |                                                                                                          |
| — of which status variables, max.                          | 200; per job                                                                                             |
| — of which control variables, max.                         | 200; per job                                                                                             |
| <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>Alarms</b>                                              |                                                                                                          |
| • Diagnostic alarm                                         | Yes                                                                                                      |
| • Hardware interrupt                                       | Yes                                                                                                      |
| <b>Diagnoses</b>                                           |                                                                                                          |
| • Monitoring the supply voltage                            | Yes                                                                                                      |
| • Wire-break                                               | Yes; for analog inputs/outputs, see description in manual                                                |
| • Short-circuit                                            | Yes; for analog outputs, see description in manual                                                       |
| • A/B transition error at incremental encoder              | Yes                                                                                                      |
| <b>Diagnostics indication LED</b>                          |                                                                                                          |
| • RUN/STOP LED                                             | Yes                                                                                                      |
| • ERROR LED                                                | Yes                                                                                                      |
| • MAINT LED                                                | Yes                                                                                                      |
| • STOP ACTIVE LED                                          | Yes                                                                                                      |
| • Monitoring of the supply voltage (PWR-LED)               | Yes                                                                                                      |

|                                                                                                                                                                                                      |                                                                                                                                   |
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| <ul style="list-style-type: none"> <li>• Channel status display</li> </ul>                                                                                                                           | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• for channel diagnostics</li> </ul>                                                                                                                          | Yes; For analog inputs/outputs                                                                                                    |
| <ul style="list-style-type: none"> <li>• Connection display LINK TX/RX</li> </ul>                                                                                                                    | 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 |
| <ul style="list-style-type: none"> <li>• Number of available Motion Control resources for technology objects</li> </ul>                                                                              | 800                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Required Motion Control resources <ul style="list-style-type: none"> <li>— per speed-controlled axis</li> </ul> </li> </ul>                                 | 40                                                                                                                                |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— per positioning axis</li> </ul> </li> </ul>                                                                         | 80                                                                                                                                |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— per synchronous axis</li> </ul> </li> </ul>                                                                         | 160                                                                                                                               |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— per external encoder</li> </ul> </li> </ul>                                                                         | 80                                                                                                                                |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— per output cam</li> </ul> </li> </ul>                                                                               | 20                                                                                                                                |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— per cam track</li> </ul> </li> </ul>                                                                                | 160                                                                                                                               |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— per probe</li> </ul> </li> </ul>                                                                                    | 40                                                                                                                                |
| <ul style="list-style-type: none"> <li>• Positioning axis <ul style="list-style-type: none"> <li>— Number of positioning axes at motion control cycle of 4 ms (typical value)</li> </ul> </li> </ul> | 5                                                                                                                                 |
| <ul style="list-style-type: none"> <li> <ul style="list-style-type: none"> <li>— Number of positioning axes at motion control cycle of 8 ms (typical value)</li> </ul> </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>Integrated Functions</b>                                                                                                                                                                          |                                                                                                                                   |
| Counter                                                                                                                                                                                              |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Number of counters</li> </ul>                                                                                                                               | 6                                                                                                                                 |
| <ul style="list-style-type: none"> <li>• Counting frequency, max.</li> </ul>                                                                                                                         | 400 kHz; with quadruple evaluation                                                                                                |
| <b>Counting functions</b>                                                                                                                                                                            |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Continuous counting</li> </ul>                                                                                                                              | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Counter response parameterizable</li> </ul>                                                                                                                 | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Hardware gate via digital input</li> </ul>                                                                                                                  | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Software gate</li> </ul>                                                                                                                                    | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Event-controlled stop</li> </ul>                                                                                                                            | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Synchronization via digital input</li> </ul>                                                                                                                | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Counting range, parameterizable</li> </ul>                                                                                                                  | Yes                                                                                                                               |
| <b>Comparator</b>                                                                                                                                                                                    |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>— Number of comparators</li> </ul>                                                                                                                            | 2; per count channel; see manual for details                                                                                      |
| <ul style="list-style-type: none"> <li>— Direction dependency</li> </ul>                                                                                                                             | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>— Can be changed from user program</li> </ul>                                                                                                                 | Yes                                                                                                                               |
| <b>Position detection</b>                                                                                                                                                                            |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Incremental acquisition</li> </ul>                                                                                                                          | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Suitable for S7-1500 Motion Control</li> </ul>                                                                                                              | Yes                                                                                                                               |
| <b>Measuring functions</b>                                                                                                                                                                           |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• Measuring time, parameterizable</li> </ul>                                                                                                                  | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Dynamic measurement period adjustment</li> </ul>                                                                                                            | Yes                                                                                                                               |
| <ul style="list-style-type: none"> <li>• Number of thresholds, parameterizable</li> </ul>                                                                                                            | 2                                                                                                                                 |
| <b>Measuring range</b>                                                                                                                                                                               |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>— Frequency measurement, min.</li> </ul>                                                                                                                      | 0.04 Hz                                                                                                                           |
| <ul style="list-style-type: none"> <li>— Frequency measurement, max.</li> </ul>                                                                                                                      | 400 kHz; with quadruple evaluation                                                                                                |
| <ul style="list-style-type: none"> <li>— Cycle duration measurement, min.</li> </ul>                                                                                                                 | 2.5 µs                                                                                                                            |
| <ul style="list-style-type: none"> <li>— Cycle duration measurement, max.</li> </ul>                                                                                                                 | 25 s                                                                                                                              |
| <b>Accuracy</b>                                                                                                                                                                                      |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>— Frequency measurement</li> </ul>                                                                                                                            | 100 ppm; depending on measuring interval and signal evaluation                                                                    |
| <ul style="list-style-type: none"> <li>— Cycle duration measurement</li> </ul>                                                                                                                       | 100 ppm; depending on measuring interval and signal evaluation                                                                    |
| <ul style="list-style-type: none"> <li>— Velocity measurement</li> </ul>                                                                                                                             | 100 ppm; depending on measuring interval and signal evaluation                                                                    |
| <b>Potential separation</b>                                                                                                                                                                          |                                                                                                                                   |
| <b>Potential separation digital inputs</b>                                                                                                                                                           |                                                                                                                                   |
| <ul style="list-style-type: none"> <li>• between the channels</li> </ul>                                                                                                                             | No                                                                                                                                |

|                                                   |                                                                                                                                                      |
|---------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| • between the channels, in groups of              | 16                                                                                                                                                   |
| Potential separation digital outputs              |                                                                                                                                                      |
| • between the channels                            | No                                                                                                                                                   |
| • between the channels, in groups of              | 16                                                                                                                                                   |
| Potential separation channels                     |                                                                                                                                                      |
| • between the channels and backplane bus          | Yes                                                                                                                                                  |
| • Between the channels and load voltage L+        | No                                                                                                                                                   |
| Isolation                                         |                                                                                                                                                      |
| Isolation tested with                             | 707 V DC (type test)                                                                                                                                 |
| Ambient conditions                                |                                                                                                                                                      |
| Ambient temperature during operation              |                                                                                                                                                      |
| • horizontal installation, min.                   | -25 °C; No condensation                                                                                                                              |
| • horizontal installation, max.                   | 60 °C; note derating data for onboard I/O in the manual. Display: 50 °C, at an operating temperature of typically 50 °C, the display is switched off |
| • vertical installation, min.                     | -25 °C; No condensation                                                                                                                              |
| • vertical installation, max.                     | 40 °C; note derating data for onboard I/O in the manual. Display: 40 °C, at an operating temperature of typically 40 °C, the display is switched off |
| Ambient temperature during storage/transportation |                                                                                                                                                      |
| • min.                                            | -40 °C                                                                                                                                               |
| • max.                                            | 70 °C                                                                                                                                                |
| Altitude during operation relating to sea level   |                                                                                                                                                      |
| • Installation altitude above sea level, max.     | 5 000 m; Restrictions for installation altitudes > 2 000 m, see manual                                                                               |
| configuration / header                            |                                                                                                                                                      |
| configuration / programming / header              |                                                                                                                                                      |
| Programming language                              |                                                                                                                                                      |
| — LAD                                             | Yes                                                                                                                                                  |
| — FBD                                             | Yes                                                                                                                                                  |
| — STL                                             | Yes                                                                                                                                                  |
| — SCL                                             | Yes                                                                                                                                                  |
| — GRAPH                                           | Yes                                                                                                                                                  |
| Know-how protection                               |                                                                                                                                                      |
| • User program protection/password protection     | Yes                                                                                                                                                  |
| • Copy protection                                 | Yes                                                                                                                                                  |
| • Block protection                                | Yes                                                                                                                                                  |
| Access protection                                 |                                                                                                                                                      |
| • 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                                                                                                                                                  |
| programming / cycle time monitoring / header      |                                                                                                                                                      |
| • lower limit                                     | adjustable minimum cycle time                                                                                                                        |
| • upper limit                                     | adjustable maximum cycle time                                                                                                                        |
| Dimensions                                        |                                                                                                                                                      |
| Width                                             | 110 mm                                                                                                                                               |
| Height                                            | 147 mm                                                                                                                                               |
| Depth                                             | 129 mm                                                                                                                                               |
| Weights                                           |                                                                                                                                                      |
| Weight, approx.                                   | 1 360 g                                                                                                                                              |

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