# **SIEMENS**

## Data sheet

6ES7511-1FK02-0AB0

SIMATIC S7-1500F, CPU 1511F-1 PN, CENTRAL PROCESSING UNIT WITH WORKING MEMORY 225 KB FOR PROGRAM AND 1 MB FOR DATA, 1. INTERFACE: PROFINET IRT WITH 2 PORT SWITCH, 60 NS BIT-PERFORMANCE, SIMATIC MEMORY CARD NECESSARY



General information	
Product type designation	CPU 1511F-1 PN
HW functional status	FS01
Firmware version	V2.6
Product function	
● I&M data	Yes; I&M0 to I&M3
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	3.45 cm
Control elements	
Number of keys	8
Mode buttons	2
Supply voltage	
Type of supply voltage	24 V DC
permissible range, lower limit (DC)	19.2 V
permissible range, upper limit (DC)	28.8 V

Reverse polarity protection	Yes
Mains buffering	
Mains/voltage failure stored energy time	5 ms
• Repeat rate, min.	1 s
Input current	
Current consumption (rated value)	0.7 A
Current consumption, max.	0.95 A
Inrush current, max.	1.9 A; Rated value
²t	0.02 A²·s
D	
Power Infeed power to the backplane bus	10 W
Power consumption from the backplane bus	5.5 W
(balanced)	3.3 W
Power loss	5.71
Power loss, typ.	5.7 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes
Work memory	
• integrated (for program)	225 kbyte
• integrated (for data)	1 Mbyte
Load memory	
Plug-in (SIMATIC Memory Card), max.	32 Gbyte
Backup	
maintenance-free	Yes
CPU processing times	
for bit operations, typ.	60 ns
for word operations, typ.	72 ns
for fixed point arithmetic, typ.	96 ns
for floating point arithmetic, typ.	384 ns
CPU-blocks	
Number of elements (total)	2 000; Blocks (OB, FB, FC, DB) and UDTs
DB	2 000, Blooks (05, 15, 10, B5) and 05 10
Number range	1 60 999; subdivided into: number range that can be used by
- Number range	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
FB	
Number range	0 65 535
• Size, max.	150 kbyte

FC		
Number range	0 65 535	
• Size, max.	150 kbyte	
ОВ		
• Size, max.	150 kbyte	
Number of free cycle OBs	100	
Number of time alarm OBs	20	
Number of delay alarm OBs	20	
<ul> <li>Number of cyclic interrupt OBs</li> </ul>	20; With minimum OB 3x cycle of 500 μs	
<ul> <li>Number of process alarm OBs</li> </ul>	50	
<ul> <li>Number of DPV1 alarm OBs</li> </ul>	3	
<ul> <li>Number of isochronous mode OBs</li> </ul>	2	
<ul> <li>Number of technology synchronous alarm OBs</li> </ul>	2	
<ul><li>Number of startup OBs</li></ul>	100	
<ul> <li>Number of asynchronous error OBs</li> </ul>	4	
<ul> <li>Number of synchronous error OBs</li> </ul>	2	
<ul> <li>Number of diagnostic alarm OBs</li> </ul>	1	
Nesting depth		
• per priority class	24; Up to 8 possible for F-blocks	
Counters, timers and their retentivity		
S7 counter		
• Number	2 048	
Retentivity		
— adjustable	Yes	
IEC counter		
• Number	Any (only limited by the main memory)	
Retentivity		
— adjustable	Yes	
S7 times		
• Number	2 048	
Retentivity		
— adjustable	Yes	
IEC timer		
• Number	Any (only limited by the main memory)	
Retentivity		
— adjustable	Yes	
Data areas and their retentivity		
Retentive data area (incl. timers, counters, flags),	128 kbyte; In total; available retentive memory for bit memories,	
max.	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	4011
<ul><li>Number, max.</li></ul>	16 kbyte
Number of clock memories	8; 8 clock memory bit, grouped into one clock memory byte
Data blocks	
<ul> <li>Retentivity adjustable</li> </ul>	Yes
<ul><li>Retentivity preset</li></ul>	No
Local data	
• per priority class, max.	64 kbyte; max. 16 KB per block
Address area	
Number of IO modules	1 024; max. number of modules / submodules
I/O address area	
<ul><li>Inputs</li></ul>	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
Hardware configuration	
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	4; A maximum of 4 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
Number of IO Controllers	
• integrated	1
● Via CM	4; A maximum of 4 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
Time of day	
Clock	
• Туре	Hardware clock

• Number of controller     • Number of ports     • Number of protocol     • PROFINET IO Controller     • PROFINET IO Controller     • Sevices     • PROFINET IO Controller     • Sevices     • POID Communication     • Yes     • In Ag. Rater     • Number of PROFINET interfaces     • Number of prots     • Interface Uses     • Number of prots     • Ru 45 (Ethernet)     • PROFINET IO Controller     • PROFINET IO Device     • PROFINET IO Device     • SiMATIC communication     • Ves ever     • Wed is redundancy     • Yes     • Nedia redundancy     • Yes     • PROFINET IO Controller     • Yes     • Nerice according to IEC 62439-2 Edition 2.0  PROFINET IO Controller     • Yes     • Web server     • Nedia redundancy     • Yes (Fig. 1)     • Yes (Fig. 2)     • PROFINET IO Controller     • Yes     • Web server     • Media redundancy     • Yes, Yes     • Media redundancy     • Yes, Yes     • Media redundancy     • Yes, Yes     • Media redundancy     • Yes, Yes, Yes     • Media redundancy     • Yes, Yes, Was Predundancy was per according to IEC 62439-2 Edition 2.0  PROFINET IO Controller     • Yes     • Requirement: IRT     • Yes     • Requirement: IRT     • MRP     • MRP     • MRP     • Yes, As MRP redundancy manager and/or MRP client; max.     • number of devices in the ring: 50     • Yes, Max. 32 PROFINET devices     • PROFINET devices     • Requirement: IRT     • PROFINED of the ring: 50     • Yes, Max. 32 PROFINET devices     • Number of connectable IO Devices, max.     • Number of connectable IO Devices, max.     • Number of connectable IO Devices for RT, max.     • Number of connectable IO Devices for RT, max.	Backup time	6 wk; At 40 °C ambient temperature, typically	
Operating hours counter  Number Clock synchronization  Supported In AS, master AS, slave Interfaces  Interface Interfaces  Number of PROFINET interfaces  Number of PROFINET interfaces  PROFINET IO Controller  Nes Similar Communication  PROFINET IO Controller  Services  PG/OP communication PROFINET IO Controller  Services  PG/OP communication PROFINET IO Controller  Services  PROFINET IO Controller  Yes  Services  PROFINET IO Controller  Yes  Services  PROFINET IO Controller  Services  PROFINET IO Controller  Services  PROFINET IO Controller  Services  PROFINET IO Controller  Yes  Services  PROFINET IO Controller  PROFINET IO Controller  Services  PROFINET IO Controller  PROFINET IO Controller  PROFINET IO Contr			
Number   16  Clock synchronization  supported   Yes	· · ·		
* supported     * in AS, master     * in AS, slave     * on Ethernet via NTP     * Ves     * Interfaces  Number of PROFINET interfaces  1 1. Interface  Interface types      * Number of ports     * Ves     * Number of ports     * Pes     * Number of ports     * Pes     * Number of ports     * Pes     * Number of ports     * PROFINET interfaces      * IP protocol     * PROFINET in Controller     * PROFINET IO Controller     * PROFINET IO Device     * PROFINET IO Device     * SIMATIC communication     * Yes     * SIMATIC communication     * Yes     * Web server     * Media redundancy     * Yes MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  Services  - PG/OP communication     * Yes     - Open IE communication     * PROFINET IO Controller  Services  - PG/OP communication     * Yes     - Open IE communication     * Yes     - Number of connectable IO Devices, max.     * Number of connectable IO Devices, max.     * Ves; Max. 32 PROFINET devices     - Of which IO devices with IRT, max.     - Number of connectable IO Devices for RT,     * 128		16	
* supported     * in AS, master     * in AS, slave     * on Ethernet via NTP     * Ves     * Interfaces  Number of PROFINET interfaces  1 1. Interface  Interface types      * Number of ports     * Ves     * Number of ports     * Pes     * Number of ports     * Pes     * Number of ports     * Pes     * Number of ports     * PROFINET interfaces      * IP protocol     * PROFINET in Controller     * PROFINET IO Controller     * PROFINET IO Device     * PROFINET IO Device     * SIMATIC communication     * Yes     * SIMATIC communication     * Yes     * Web server     * Media redundancy     * Yes MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  Services  - PG/OP communication     * Yes     - Open IE communication     * PROFINET IO Controller  Services  - PG/OP communication     * Yes     - Open IE communication     * Yes     - Number of connectable IO Devices, max.     * Number of connectable IO Devices, max.     * Ves; Max. 32 PROFINET devices     - Of which IO devices with IRT, max.     - Number of connectable IO Devices for RT,     * 128	Clock synchronization		
in AS, slave in AS, slave ves von Ethernet via NTP  Yes  Number of PROFINET interfaces  1  1. Interface  Interface types  Number of ports integrated switch RJ 45 (Ethernet)  Protocols  PROFINET IO Controller PROFINET IO Device SIMATIC communication PROFINET IO Controller PROFINET IO Controller Yes SIMATIC communication Yes Web server Media redundancy Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  PROFINET IO Controller  Yes Media redundancy Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  Services  PG/OP communication Yes — PG/OP communic		Yes	
interfaces  Number of PROFINET interfaces  1  Interface  Interface types  Number of ports Integrated switch RI 45 (Ethernet) PROFINET IO Controller PROFINET IO Controller PROFINET IO Communication Web server Media redundancy PROFINET IO Controller PROFINET IO Controller PROFINET IO Communication PROFINET IO Communication PROFINET IO Controller PROFINET IO Controller  Services PROFINET IO Controller  Yes: As MRP redundancy manager and/or MRP client: max. number of devices in the ring: 50  Yes: Requirement: IRT PROFINET I devices PROFINET I devices PROFINET I devices PROFINET I devices can be connected via As-i, PROFINET I devices PROFINET I devices can be connected via As-i, PROFINET I devices PROFINET I devices can be connected via As-i, PROFINET I devices PROFINET I devices can be connected via As-i, PROFINET I devices PROFINET I devices can be connected via As-i, PROFINET I devices		Yes	
• on Ethernet via NTP  Interfaces  Number of PROFINET interfaces  1  1. Interface  Interface types  • Number of ports • integrated switch • RJ 45 (Ethernet)  Protocols  • IP protocol • PROFINET IO Controller • PROFINET IO Device • PROFINET IO Device • SIMATIC communication • Web server • Media redundancy • Media redundancy  PROFINET IO Controller  Services  - PG/OP communication - S7 routing - Isochronous mode - Open IE communication - RT - MRP - MRP - MRP - Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 - MRPD - PROFINET Wes - Prioritized startup - Number of connectable IO Devices, max Of which IO devices with IRT, max Number of connectable IO Devices for RT.  128	● in AS, slave	Yes	
Number of PROFINET interfaces   1		Yes	
Number of PROFINET interfaces   1	Interfaces		
Interface types  Number of ports Integrated switch RJ 45 (Ethernet) Protocols  Protocols  Profine Ti O Controller PROFINET IO Device SilMATIC communication Open IE communication Wes Media redundancy PROFINET IO Controller  Services  PROFOP communication Yes PROFONE Ti O Controller  Services  PROFINE Ti O Controller  Services  PROFOR communication Yes  Nes Copen IE communication Yes  PROFOR is communication Yes  Nery  PROFOR in the ring: 50  Yes; Requirement: IRT  PROFILE ring: 50  Yes; Requirement: IRT  PROFILE startup Proritized startup 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. Number of connectable IO Devices for RT, 128		1	
Number of ports  integrated switch  RJ 45 (Ethernet)  Protoccols  IP protoccol  PROFINET IO Controller  Services  PROFINET IO Controller  Yes  Nes  Nes  Nes  Nes  Nes  Nes  Nes	1. Interface		
<ul> <li>integrated switch</li> <li>RJ 45 (Ethernet)</li> <li>Yes; X1</li> </ul> Protocols <ul> <li>IP protocol</li> <li>Yes; IPv4</li> <li>PROFINET IO Controller</li> <li>PROFINET IO Device</li> <li>SIMATIC communication</li> <li>Yes</li> <li>Open IE communication</li> <li>Yes</li> <li>Web server</li> <li>Media redundancy</li> <li>Yes; MRP Automanager according to IEC 62439-2 Edition 2.0</li> </ul> PROFINET IO Controller Services <ul> <li>PG/OP communication</li> <li>Yes</li> <li>Services</li> </ul> PGFOP in Elempton in the properties of t	Interface types		
RJ 45 (Ethernet) Protocols  IP protocol PROFINET IO Controller PROFINET IO Device SIMATIC communication Open IE communication Web server Media redundancy PROFINET IO Controller Services  PG/OP communication Yes PS routing Pes PG/OP communication Yes Popen IE communication Yes Popen IE communication Yes Popen IE communication Yes Popen IE communication Yes Profile communication Yes Profile communication Yes Pes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 Yes; Requirement: IRT PROFIenergy Yes Prioritized startup Prioritized startup Yes; Max. 32 PROFINET devices Italian total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET  Of which IO devices with IRT, max. Plumber of connectable IO Devices for RT,	Number of ports	2	
Protocols  IP protocol PROFINET IO Controller PROFINET IO Device SIMATIC communication Open IE communication Web server Media redundancy PROFINET IO Controller Services  PG/OP communication Yes PST routing Pes PG/OP communication Yes Popen IE communication Yes Profile Formunication Yes Pes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 Yes; Requirement: IRT PROFlenergy Profilized startup Profilized startup Number of connectable IO Devices, max. Popen IE of which IO devices with IRT, max. Popen IE of Number of connectable IO Devices for RT, PROFIBUS or PROFINET	• integrated switch	Yes	
PROFINET IO Controller PROFINET IO Device PROFINET IO Device SIMATIC communication Pes Media redundancy Pes; MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  Services  PG/OP communication Yes PG/OP communication Yes Popen IE communication Yes PROFINET IO Controller  Services  PG/OP communication Yes Popen IE communication Yes Pictic Yes Pictic Yes Pictic Yes Profitized startup Profitized startup Prioritized startup Number of connectable IO Devices, max. Popen IEC Of which IO devices with IRT, max. Popen IEC Of which IO devices with IRT, max. Popen IEC Of which IO devices for RT, PROFIBUS or PROFINET	• RJ 45 (Ethernet)	Yes; X1	
PROFINET IO Controller PROFINET IO Device SIMATIC communication Open IE communication Web server Media redundancy PROFINET IO Controller  Services  PG/OP communication Yes PGS/OP communication Yes PGS/OP communication Yes Services  PG/OP commu	Protocols		
PROFINET IO Device SIMATIC communication Yes Open IE communication Yes Web server Media redundancy Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  Services  PRO/OP communication Yes Services  PRO/OP communication Yes Isochronous mode Yes Open IE communication Yes NRP Ves; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50  MRPD PROFIenergy Prioritized startup 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. Number of connectable IO Devices for RT, 128	IP protocol	Yes; IPv4	
SIMATIC communication Open IE communication Yes Web server Media redundancy Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  PROFINET IO Controller  Services  — PG/OP communication — S7 routing — Isochronous mode — Open IE communication — IRT — MRP — MRP — Wes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 — Yes; Requirement: IRT — PROFIenergy — Prioritized startup — Number of connectable IO Devices, max. — Number of connectable IO Devices for RT, — MRP IVES  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. — Number of connectable IO Devices for RT,  128	<ul> <li>PROFINET IO Controller</li> </ul>	Yes	
Open IE communication  Web server  Media redundancy  PROFINET IO Controller  Services  PG/OP communication  Yes  Stroiting  Isochronous mode  Open IE communication  Yes  Open IE communication  Yes  IRT  MRP  MRP  Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50  Yes; Requirement: IRT  PROFIenergy  Prioritized startup  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  A Number of connectable IO Devices for RT, 128	<ul> <li>PROFINET IO Device</li> </ul>	Yes	
Web server  Media redundancy  PROFINET IO Controller  Services  — PG/OP communication — S7 routing — Isochronous mode — Open IE communication — IRT — MRP — MRP — MRP — Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 — MRPD — PROFlenergy — Prioritized startup — Number of connectable IO Devices, max. — Number of connectable IO Devices for RT,  128  Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  Yes  Yes  Yes  Yes  Yes  Yes  Yes  Ye	<ul> <li>SIMATIC communication</li> </ul>	Yes	
● Media redundancy  PROFINET IO Controller  Services  - PG/OP communication - S7 routing - Isochronous mode - Open IE communication - IRT - MRP - MRP - MRP - MRP - MRPD - PROFIenergy - Prioritized startup - Number of connectable IO Devices for RT, - Of which IO devices with IRT, max Number of connectable IO Devices for RT, - MRP - MRP - MRP MRP Automanager according to IEC 62439-2 Edition 2.0  Yes; MRP Automanager according to IEC 62439-2 Edition 2.0  Yes - Yes - Yes - Yes - Yes - Yes - Numbar of controller - Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 - Yes; Requirement: IRT - Yes - Yes; Max. 32 PROFINET devices - 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 Number of connectable IO Devices for RT, 128	<ul> <li>Open IE communication</li> </ul>	Yes	
PROFINET IO Controller  Services  - PG/OP communication Yes - S7 routing Yes - Isochronous mode Yes - Open IE communication Yes - IRT Yes - MRP Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 - MRPD Yes; Requirement: IRT - PROFlenergy Yes - 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 Number of connectable IO Devices for RT, 128	• Web server	Yes	
Services  - PG/OP communication Yes - S7 routing Yes - Isochronous mode Yes - Open IE communication Yes - IRT Yes - MRP Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 - MRPD Yes; Requirement: IRT - PROFlenergy Yes - 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 Number of connectable IO Devices for RT, - 128	Media redundancy	Yes; MRP Automanager according to IEC 62439-2 Edition 2.0	
<ul> <li>— PG/OP communication</li> <li>— S7 routing</li> <li>— Isochronous mode</li> <li>— Open IE communication</li> <li>— IRT</li> <li>— MRP</li> <li>— MRP</li> <li>— Wes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50</li> <li>— MRPD</li> <li>— PROFlenergy</li> <li>— Prioritized startup</li> <li>— Number of connectable IO Devices, max.</li> <li>— 128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</li> <li>— Of which IO devices with IRT, max.</li> <li>— Number of connectable IO Devices for RT,</li> <li>— 128</li> </ul>	PROFINET IO Controller		
<ul> <li>S7 routing</li> <li>Isochronous mode</li> <li>Open IE communication</li> <li>IRT</li> <li>MRP</li> <li>MRP</li> <li>MRPD</li> <li>Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50</li> <li>MRPD</li> <li>Yes; Requirement: IRT</li> <li>PROFlenergy</li> <li>Prioritized startup</li> <li>Number of connectable IO Devices, max.</li> <li>— Of which IO devices with IRT, max.</li> <li>Number of connectable IO Devices for RT,</li> <li>128</li> </ul>	Services		
- Isochronous mode - Open IE communication - IRT - MRP - MRP - MRP - MRP - Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50 - MRPD - Yes; Requirement: IRT - PROFlenergy - Prioritized startup - Number of connectable IO Devices, max Number of connectable IO Devices for RT, - Number of connectable IO Devices for RT, - 128	— PG/OP communication	Yes	
<ul> <li>Open IE communication</li> <li>IRT</li> <li>MRP</li> <li>MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50</li> <li>MRPD</li> <li>Yes; Requirement: IRT</li> <li>PROFlenergy</li> <li>Prioritized startup</li> <li>Number of connectable IO Devices, max.</li> <li>128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</li> <li>Of which IO devices with IRT, max.</li> <li>Number of connectable IO Devices for RT,</li> <li>128</li> </ul>	— S7 routing	Yes	
— IRT  — MRP  — MRP  — Wes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50  — MRPD  — PROFlenergy  — Prioritized startup  — Number of connectable IO Devices, max.  — Number of connectable IO Devices for RT,  Yes  Yes; Requirement: IRT  Yes; Max. 32 PROFINET devices  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,	<ul><li>— Isochronous mode</li></ul>	Yes	
<ul> <li>MRP</li> <li>Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50</li> <li>MRPD</li> <li>Yes; Requirement: IRT</li> <li>PROFlenergy</li> <li>Prioritized startup</li> <li>Number of connectable IO Devices, max.</li> <li>128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</li> <li>Of which IO devices with IRT, max.</li> <li>Number of connectable IO Devices for RT,</li> <li>128</li> </ul>	<ul> <li>Open IE communication</li> </ul>	Yes	
number of devices in the ring: 50  - MRPD Yes; Requirement: IRT  - PROFlenergy Yes  - 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, 128	— IRT	Yes	
<ul> <li>PROFlenergy</li> <li>Prioritized startup</li> <li>Number of connectable IO Devices, max.</li> <li>Of which IO devices with IRT, max.</li> <li>Number of connectable IO Devices for RT,</li> <li>Yes</li> <li>Yes; Max. 32 PROFINET devices</li> <li>128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</li> <li>Of which IO devices with IRT, max.</li> <li>128</li> </ul>	— MRP		
<ul> <li>Prioritized startup</li> <li>Number of connectable IO Devices, max.</li> <li>128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</li> <li>Of which IO devices with IRT, max.</li> <li>Number of connectable IO Devices for RT,</li> <li>128</li> </ul>	— MRPD	Yes; Requirement: IRT	
<ul> <li>Number of connectable IO Devices, max.</li> <li>128; In total, up to 256 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET</li> <li>Of which IO devices with IRT, max.</li> <li>Number of connectable IO Devices for RT,</li> <li>128</li> </ul>	— PROFlenergy	Yes	
via AS-i, PROFIBUS or PROFINET  — Of which IO devices with IRT, max.  — Number of connectable IO Devices for RT,  128	— Prioritized startup	Yes; Max. 32 PROFINET devices	
— Number of connectable IO Devices for RT, 128	— Number of connectable IO Devices, max.		
,	— Of which IO devices with IRT, max.	64	
max.	<ul> <li>Number of connectable IO Devices for RT,</li> </ul>	128	
	max.		

— of which in line, max.	128
Number of IO Devices that can be	8; in total across all interfaces
simultaneously activated/deactivated, max.	,
<ul> <li>Number of IO Devices per tool, max.</li> </ul>	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
Update time for IRT	
— for send cycle of 250 μs	$250~\mu s$ to 4 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 $\mu s$ of the isochronous OB is decisive
— for send cycle of 500 μs	500 $\mu s$ to 8 ms; Note: In the case of IRT with isochronous mode, the minimum update time of 625 $\mu s$ 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
<ul><li>— With IRT and parameterization of "odd" send cycles</li></ul>	Update time = set "odd" send clock (any multiple of 125 $\mu$ s: 375 $\mu$ s, 625 $\mu$ s 3 875 $\mu$ s)
Update time for RT	
— 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
PROFINET IO Device	
Services	
— PG/OP communication	Yes
— S7 routing	Yes
— Isochronous mode	No
<ul><li>Open IE communication</li></ul>	Yes
— IRT	Yes
— MRP	Yes; As MRP redundancy manager and/or MRP client; max. number of devices in the ring: 50
— MRPD	Yes; Requirement: IRT
— PROFlenergy	Yes
— Shared device	Yes
<ul> <li>Number of IO Controllers with shared device, max.</li> </ul>	4
<ul> <li>Asset management record</li> </ul>	Yes; Per user program
Interface types	
RJ 45 (Ethernet)	
• 100 Mbps	Yes

<ul> <li>Autonegotiation</li> </ul>	Yes
<ul> <li>Autocrossing</li> </ul>	Yes
• Industrial Ethernet status LED	Yes

#### **Protocols** Number of connections 96; via integrated interfaces of the CPU and connected CPs / CMs • Number of connections, max. • Number of connections reserved for 10 ES/HMI/web 64 • Number of connections via integrated interfaces • Number of S7 routing paths 16 PROFINET IO Controller Services - PG/OP communication Yes Yes — S7 routing Yes - Isochronous mode Yes — Open IE communication - IRT Yes - PROFlenergy Yes - Prioritized startup Yes; Max. 32 PROFINET devices 128; In total, up to 512 distributed I/O devices can be connected - Number of connectable IO Devices, max. via AS-i, PROFIBUS or PROFINET 64 - Of which IO devices with IRT, max. 128 - Number of connectable IO Devices for RT, max. - of which in line, max. 128 - Number of IO Devices that can be 8; in total across all interfaces simultaneously activated/deactivated, max. 8 - Number of IO Devices per tool, max. The minimum value of the update time also depends on - Updating times communication share set for PROFINET IO, on the number of IO devices, and on the quantity of configured user data Redundancy mode Yes; As MRP redundancy manager and/or MRP client; max. • MRP number of devices in the ring: 50 • MRPD Yes; Requirement: IRT H-Sync forwarding Yes SIMATIC communication Yes • S7 communication, as server Yes • S7 communication, as client See online help (S7 communication, user data size) • User data per job, max. Open IE communication • TCP/IP Yes

— Data length, max.	64 kbyte	
— bata length, max.  — several passive connections per port,	Yes	
supported	165	
• 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	No	
• SNMP	Yes	
• DCP	Yes	
• LLDP	Yes	
Web server		
• HTTP	Yes; Standard and user pages	
• HTTPS	Yes; Standard and user pages	
OPC UA		
Runtime license required	Yes	
OPC UA client	Yes	
<ul> <li>Application authentication</li> </ul>	Yes	
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256	
<ul> <li>User authentication</li> </ul>	"anonymous" or by user name & password	
<ul><li>Number of connections, max.</li></ul>	4	
<ul> <li>Number of nodes of the client interfaces, max.</li> </ul>	1 000	
<ul> <li>Number of elements for one call of OPC_UA_NodeGetHandleList/OPC_UA_Rea dList/OPC_UA_WriteList, max.</li> </ul>	300	
<ul> <li>Number of elements for one call of OPC_UA_NameSpaceGetIndexList, max.</li> </ul>	20	
<ul> <li>Number of elements for one call of OPC_UA_MethodGetHandleList, max.</li> </ul>	100	
<ul> <li>Number of simultaneous calls of the client instructions per connection (except OPC_UA_ReadList,OPC_UA_WriteList,OPC_ UA_MethodCall), max.</li> </ul>	1	
<ul> <li>Number of simultaneous calls of the client instructions</li> <li>OPC_UA_ReadList,OPC_UA_WriteList and OPC_UA_MethodCall, max.</li> </ul>	5	
<ul> <li>Number of registerable nodes, max.</li> </ul>	5 000	
<ul><li>— Number of registerable method calls of OPC_UA_MethodCall, max.</li></ul>	100	

<ul><li>— Number of inputs/outputs when calling OPC_UA_MethodCall, max.</li></ul>	20	
OPC UA server	Yes; Data access (read, write, subscribe), method call, custom address space	
<ul> <li>Application authentication</li> </ul>	Yes	
— Security policies	Available security policies: None, Basic128Rsa15, Basic256Rsa15, Basic256Sha256	
<ul><li>User authentication</li></ul>	"anonymous" or by user name & password	
— Number of sessions, max.	32	
<ul> <li>Number of accessible variables, max.</li> </ul>	50 000	
<ul> <li>Number of registerable nodes, max.</li> </ul>	10 000	
<ul> <li>Number of subscriptions per session, max.</li> </ul>	20	
— Sampling time, min.	100 ms	
— Send time, min.	500 ms	
<ul> <li>Number of server methods, max.</li> </ul>	20	
<ul> <li>Number of inputs/outputs per server method, max.</li> </ul>	20	
<ul> <li>Number of monitored items, max.</li> </ul>	1 000; For 1 s sampling interval and 1 s send interval	
<ul> <li>Number of server interfaces, max.</li> </ul>	10	
<ul> <li>Number of nodes for user-defined server interfaces, max.</li> </ul>	1 000	
Further protocols		
• MODBUS	Yes; MODBUS TCP	
Media redundancy		
<ul> <li>Switchover time on line break, typ.</li> </ul>	200 ms; For MRP, bumpless for MRPD	
<ul> <li>Number of stations in the ring, max.</li> </ul>	50	
Isochronous mode		
Isochronous operation (application synchronized up to terminal)	Yes; Distributed and central; with minimum OB $6x$ cycle of $625~\mu s$ (distributed) and 1 ms (central)	
Equidistance	Yes	
S7 message functions		
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		
<ul> <li>Number of program alarms</li> </ul>	300	
<ul> <li>Number of alarms for system diagnostics</li> </ul>	100	
<ul> <li>Number of alarms for motion technology objects</li> </ul>	80	

Test commissioning functions		
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	
Status/control		
Status/control variable	Yes	
<ul><li>Variables</li></ul>	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters	
<ul> <li>Number of variables, max.</li> </ul>		
<ul><li>of which status variables, max.</li></ul>	200; per job	
<ul><li>of which control variables, max.</li></ul>	200; per job	
Forcing		
Forcing, variables	Peripheral inputs/outputs	
<ul><li>Number of variables, max.</li></ul>	200	
Diagnostic buffer		
• present	Yes	
<ul><li>Number of entries, max.</li></ul>	1 000	
— of which powerfail-proof	500	
Traces		
Number of configurable Traces	4; Up to 512 KB of data per trace are possible	
Interrupts/diagnostics/status information		
Diagnostics indication LED		
RUN/STOP LED	Yes	
• ERROR LED	Yes	
MAINT LED	Yes	
STOP ACTIVE LED	Yes	
<ul> <li>Connection display LINK TX/RX</li> </ul>	Yes	
Supported technology objects		
Motion Control	Yes; Note: The number of axes affects the cycle time of the PLC	
	program; selection guide via the TIA Selection Tool or SIZER	
<ul> <li>Number of available Motion Control resources</li> </ul>	800	
for technology objects (except cam disks)		
<ul> <li>Required Motion Control resources</li> </ul>		
<ul><li>per speed-controlled axis</li></ul>	40	
<ul><li>per positioning axis</li></ul>	80	
— per synchronous axis	160	
— per external encoder	80	
— per output cam	20	
— per cam track	160	
— per probe	40	
• •		

<ul> <li>Positioning axis</li> </ul>	
<ul> <li>Number of positioning axes at motion control cycle of 4 ms (typical value)</li> </ul>	5
<ul> <li>Number of positioning axes at motion control cycle of 8 ms (typical value)</li> </ul>	10
Controller	
<ul><li>PID_Compact</li></ul>	Yes; Universal PID controller with integrated optimization
• PID_3Step	Yes; PID controller with integrated optimization for valves
• PID-Temp	Yes; PID controller with integrated optimization for temperature
Counting and measuring	
High-speed counter	Yes

Standards,	approvais,	, certificates
Highest sa	fety class ac	chievable in sa

afety mode

• Performance level according to ISO 13849-1 PLe

• SIL acc. to IEC 61508 SIL 3

Probability of failure (for service life of 20 years and repair time of 100 hours)

- Low demand mode: PFDavg in

accordance with SIL3

- High demand/continuous mode: PFH in

accordance with SIL3

< 1.00E-09

< 2.00E-05

#### Ambient temperature during operation

0°C • horizontal installation, min.

60 °C; Display: 50 °C, at an operating temperature of typically 50 • horizontal installation, max.

°C, the display is switched off

• vertical installation, min.

40 °C; Display: 40 °C, at an operating temperature of typically 40 • vertical installation, max.

°C, the display is switched off

#### Ambient temperature during storage/transportation

-40 °C • min.

70 °C • max.

# Configuration

### Programming

#### Programming language

- LAD Yes; incl. failsafe

— FBD Yes; incl. failsafe

Yes - STL

Yes -SCL- GRAPH Yes

#### Know-how protection

Yes • User program protection/password protection

• Copy protection

Yes

Block protection	Yes
Access protection	
Password for display	Yes
<ul> <li>Protection level: Write protection</li> </ul>	Yes; Specific write protection both for Standard and for Failsafe
<ul> <li>Protection level: Read/write protection</li> </ul>	Yes
<ul> <li>Protection level: Complete protection</li> </ul>	Yes
Cycle time monitoring	
• lower limit	adjustable minimum cycle time
• upper limit	adjustable maximum cycle time
Dimensions	
Width	35 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	430 g
last modified:	10/18/2018