6ES7516-3AN02-0AB0

Data sheet



SIMATIC S7-1500, CPU 1516-3 PN/DP, central processing unit with 1 MB work memory for program and 5 MB for data, 1st interface: PROFINET IRT with 2-port switch, 2nd interface: PROFINET RT, 3rd interface: PROFIBUS, 10 ns bit performance, SIMATIC Memory Card required

General information	
Product type designation	CPU 1516-3 PN/DP
HW functional status	FS01
Firmware version	V2.9
Product function	
 I&M data 	Yes; I&M0 to I&M3
• Isochronous mode	Yes; Distributed and central; with minimum OB 6x cycle of 375 μs (distributed) and 1 ms (central)
Engineering with	
 STEP 7 TIA Portal configurable/integrated from version 	V17 (FW V2.9) / V16 (FW V2.8) or higher; with older TIA Portal versions configurable as 6ES7516-3AN01-0AB0
Configuration control	
via dataset	Yes
Display	
Screen diagonal [cm]	6.1 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
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)	0.85 A
Current consumption, max.	1.1 A
Inrush current, max.	2.4 A; Rated value
l²t	0.02 A ² ·s
Power	
Infeed power to the backplane bus	12 W
Power consumption from the backplane bus (balanced)	6.7 W
Power loss	
Power loss, typ.	7 W
Memory	
Number of slots for SIMATIC memory card	1
SIMATIC memory card required	Yes

# integrated for programy	Wednesday	
Murber (for data)	· · · · · · · · · · · · · · · · · · ·	4 Mb do
Load memory * Plug in (SIMATIC Memory Card), max. Backup * maintenance-free * Yes * Maintenance-free * Number of elements (total) * Size, max. * Maintenance-free * Number range * Size, max. * May the size of th		
■ Plug-in (SIMATIC Memory Card), max ■ maintenance-free Processing times For word operations, typ. 10 ns for word operations, typ. 11 ns for fixed point arithmetic, typ. 20 ns For bit operations, typ. 30 ns For bit operations, typ. 30 ns For bit operations, typ. 40 ns For bit operations, typ. 50 ns For bit operations, typ. 51 ns For bit operations, typ. 52 ns For bit operations, typ. 52 ns For bit operations, typ. 52 ns For bit operations, typ. 53 ns For bit operations, typ. 54 ns For bit operations, typ. 55 ns For priority class 57 counter F		5 Mbyte
# naintenance free Possible processing times for bit operations, typ. for fixed point arithmetic, typ. possible process and a pr	•	00 Ob. 4-
maintenance-free		32 Gbyte
CPU processing times 10 ns for bit operations, typ. 12 ns for fixed point arithmetic, typ. 16 ns CPU-blocks 8 8000; Blocks (OB, FB, FC, DB) and UDTs Number of elements (lotal) 8 8000; Blocks (OB, FB, FC, DB) and UDTs DB * Number range 1 60 999; subdivided into; number range that can be used by the user 1 95 999, and number range at DBs created via SFC 86; 60 000 66 535 FB • Number range 0 65 535 • Size, max. 1 Mbyte FC • Number range 0 65 535 • Size, max. 1 Mbyte FC • Number range 0 65 535 • Size, max. 1 Mbyte FC • Number arange 0 65 535 • Size, max. 1 Mbyte FC • Number arange 0 65 535 • Size, max. 1 Mbyte • Number of delay alarm OBs 100 • Number of feet cycle OBs 100 • Number of redelay alarm OBs 20 • Number of redelay alarm OBs 20 • Number of technology synchronous arror OBs 3 <	·	Van
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for fixed point arithmetic, typ. 64 ns		
Mumber of elegand by the company of the company o		
CPU-blocks Number of elements (total) 8 000; Blocks (OB, FB, FC, DB) and UDTs 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. 5 Mbyte; For DBs with absolute addressing, the max. size is 64 KB FB • Number range • Size, max. 1 Mbyte OB 8 Size, max. 1 Mbyte OB 8 Size, max. 1 Mbyte OB 9 Size, max. 1 Mbyte OB 1 Mumber of free cycle OBs • Number of time alarm OBs • Number of viae lairm OBs • Number of cyclic interrupt OBs • Number of process alarm OBs • Number of process alarm OBs • Number of process alarm OBs • Number of bechnology synchronous alarm OBs • Number of technology synchronous alarm OBs • Number of startup CBs • Number o		
Number of elements (total) 8 000; Blocks (OB, FB, FC, DB) and UDTs 8 Number range • Number range • Size, max. • Size, max. • Number range • Size, max. • Number range • Size, max. • Size, max. • Number range • Size, max. • Number of leady alarm OBs • Number of time alarm OBs • Number of process alarm OBs • Number of socknonous mode OBs • Number of socknonous error OBs • Number of asynchronous error OBs • Number of alagnostic alarm OBs • Number of alagnostic alarm OBs • Number of socknonous mode OBs • Number of socknonous mode OBs • Number of synchronous error OBs • Number of alagnostic alarm OBs • Number of alagnostic alarm OBs • Number of synchronous error OBs • Number of synchronous error OBs • Number of synchronous error OBs • Number of alagnostic alarm OBs • Number of synchronous error OBs • Number of		64 NS
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Number range		8 000; Blocks (OB, FB, FC, DB) and UD1s
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Number range 0 65 535	Number range	user: 1 59 999, and number range of DBs created via SFC 86: 60 000
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• Size, max. 1 Mbyte FC • Number range • Size, max. 1 Mbyte • Size, max. 100 • 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 250 µs • Number of process alarm OBs 50 • Number of process alarm OBs 3 • Number of IbrV1 alarm OBs 3 • Number of technology synchronous alarm OBs 2 • Number of startup OBs 100 • Number of startup OBs 100 • Number of synchronous error OBs 4 • Number of synchronous error OBs 2 • Number of diagnostic alarm OBs 1 • Number of synchronous error OBs 2 • Number 0 (and in their retentivity — adjustable Yes FC counter • Number 2 048 Retentivity — adjustable Yes FI times • Number 2 048 Retentivity — adjustable Yes FE Climer • Number 2 048 Retentivity — adjustable Yes FE Climer • Number 3 (and your jumited by the main memory) Retentivity — adjustable Yes	FB	
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Number of isochronous mode OBs Number of technology synchronous alarm OBs Number of startup OBs Number of saynchronous error OBs Number of synchronous error OBs Number of diagnostic alarm OBs Number of diagnostic alarm OBs Nesting depth per priority class Counters, timers and their retentivity Tounter Number Number Number Any (only limited by the main memory) Retentivity — adjustable Number Number Any (only limited by the main memory) Retentivity — adjustable Yes File Cimer Number Any (only limited by the main memory) Retentivity — adjustable Yes Times Any (only limited by the main memory) Retentivity — adjustable Yes File Cimer Number Any (only limited by the main memory) Retentivity — adjustable Yes	 Number of process alarm OBs 	50
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Number of diagnostic alarm OBs Nesting depth	 Number of asynchronous error OBs 	4
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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 IEC timer • Number Any (only limited by the main memory) Retentivity — adjustable Yes Data areas and their retentivity	Counters, timers and their retentivity	
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Retentivity — adjustable Yes Data areas and their retentivity	IEC timer	
— adjustable Yes Data areas and their retentivity		Any (only limited by the main memory)
Data areas and their retentivity	•	
		Yes
Retentive data area (incl. timers, counters, flags), max 512 kbyte. In total, available retentive memory for bit memories, timers	Data areas and their retentivity	
7.2 m2/10, m. com, m.	Retentive data area (incl. timers, counters, flags), max.	512 kbyte; In total; available retentive memory for bit memories, timers,

	counters, DBs, and technology data (axes): 472 KB
Extended retentive data area (incl. timers, counters, flags), max.	5 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
Address area	
Number of IO modules	8 192; max. number of modules / submodules
I/O address area	o 102, max. namber of modulos / sasmodulos
• Inputs	32 kbyte; All inputs are in the process image
• Outputs	32 kbyte; All outputs are in the process image
•	32 kbyte, All outputs are in the process image
per integrated IO subsystem	0 khyto
— Inputs (volume)	8 kbyte
— Outputs (volume)	8 kbyte
per CM/CP	0.1-1
— Inputs (volume)	8 kbyte
— Outputs (volume)	8 kbyte
Subprocess images	
Number of subprocess images, max.	32
Hardware configuration	
Number of distributed IO systems	64; 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	
integrated	1
• Via CM	8; A maximum of 8 CMs/CPs (PROFIBUS, PROFINET, Ethernet) can be inserted in total
Number of IO Controllers	
integrated	2
• Via CM	8; A maximum of 8 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	
• 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	· · · JF ·
Number	16
Clock synchronization	10
• supported	Yes
to DP, master	Yes
	Yes
• in AS, master	
• in AS, slave	Yes
on Ethernet via NTP	Yes
Interfaces	
Number of PROFINET interfaces	2
Number of PROFIBUS interfaces	1
1. Interface	
Interface types	

DI 45 (5th arm al)	V V4
• RJ 45 (Ethernet)	Yes; X1
Number of ports integrated quiteb	2 Voa
• integrated switch	Yes
Protocols • 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
PROFINET IO Controller	
Services	
— PG/OP communication	Yes
— Isochronous mode	Yes
 Direct data exchange 	Yes; Requirement: IRT and isochronous mode (MRPD optional)
— IRT	Yes
— PROFlenergy	Yes; per user program
 Prioritized startup 	Yes; Max. 32 PROFINET devices
 Number of connectable IO Devices, max. 	256; In total, up to 1 000 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. 	256
— of which in line, max.	256
 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
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 375 μs of the isochronous OB is decisive
— for send cycle of 500 μs	500 μs to 8 ms
— 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 μ s: 375 μ s, 625 μ s 3 875 μ 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	Voc
— PG/OP communication	Yes
— Isochronous mode	No Voc
— IRT	Yes Vec: per user program
PROFlenergy Shared device	Yes; per user program 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
2. Interface	Too, por door program
Interface types	
• RJ 45 (Ethernet)	Yes; X2
Number of ports	1
integrated switch	No
- integrated switch	No

Protocols	
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	No
PROFINET IO Controller	No
Services	
— PG/OP communication	Yes
— Isochronous mode	No
Direct data exchange	No
— IRT	No
— PROFlenergy	Yes; per user program
	No
— Prioritized startup— Number of connectable IO Devices, max.	
	32; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
 Number of connectable IO Devices for RT, max. 	32
— of which in line, max.	32
 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
Update time for RT	
— for send cycle of 1 ms	1 ms to 512 ms
PROFINET IO Device	
Services	
— PG/OP communication	Yes
 Isochronous mode 	No
— IRT	No
— PROFlenergy	Yes; per user program
 Prioritized startup 	No
— 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
3. Interface	
Interface types	
• RS 485	Yes; X3
Number of ports	1
Protocols	
PROFIBUS DP master	Yes
PROFIBUS DP slave	No
SIMATIC communication	Yes
PROFIBUS DP master	
Number of connections, max.	
	48; for the integrated PROFIBUS DP interface
 Number of DP slaves, max. 	48; for the integrated PROFIBUS DP interface 125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
Number of DP slaves, max. Services	125; In total, up to 1 000 distributed I/O devices can be connected via
	125; In total, up to 1 000 distributed I/O devices can be connected via
Services	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET
Services — PG/OP communication	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET Yes
Services — PG/OP communication — Equidistance	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET Yes Yes
Services — PG/OP communication — Equidistance — Isochronous mode — Activation/deactivation of DP slaves	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET Yes Yes Yes
Services — PG/OP communication — Equidistance — Isochronous mode — Activation/deactivation of DP slaves Interface types	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET Yes Yes Yes
Services — PG/OP communication — Equidistance — Isochronous mode — Activation/deactivation of DP slaves	125; In total, up to 1 000 distributed I/O devices can be connected via AS-i, PROFIBUS or PROFINET Yes Yes Yes

Autonomatical a	Voc
Autoregotiation Autorogoing	Yes
 Autocrossing Industrial Ethernet status LED 	Yes
RS 485	Yes
Transmission rate, max.	12 Mbit/s
Protocols	12 Inibio
PROFIsafe	No
Number of connections	110
Number of connections, max.	256; 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 	128
Number of S7 routing paths	16
Redundancy mode	
H-Sync forwarding	Yes
Media redundancy	
 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. SIMATIC communication	50
PG/OP communication	Yes; encryption with TLS V1.3 pre-selected
S7 routing	Yes
Data record 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)
Open IE communication	
• TCP/IP	Yes
— Data length, max.	64 kbyte
 several passive connections per port, 	Yes
supported	
• 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 SNMP	Yes Yes
SNMP DCP	Yes
• LLDP	Yes
• Encryption	Yes; Optional
Web server	. 55, 5 phonai
• HTTP	Yes; Standard and user pages
• HTTPS	Yes; Standard and user pages
OPC UA	
Runtime license required	Yes; "Medium" 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.	10
Number of nodes of the client interfaces, max.	2 000
 Number of elements for one call of OPC_UA_NodeGetHandleList/OPC_UA_ReadList/Omax. 	300
 Number of elements for one call of 	20

OPC_UA_NameSpaceGetIndexList, max.	
 Number of elements for one call of OPC_UA_MethodGetHandleList, max. 	100
 Number of simultaneous calls of the client 	1
instructions per connection (except OPC_UA_ReadList,OPC_UA_WriteList,OPC_UA_M max.	
Number of simultaneous calls of the client	5
instructions OPC_UA_ReadList,OPC_UA_WriteList and OPC_UA_MethodCall, max.	
 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.	48
 Number of accessible variables, max. 	100 000
 Number of registerable nodes, max. 	20 000
 Number of subscriptions per session, max. 	20
— Sampling interval, min.	100 ms
— Publishing interval, min.	200 ms
 Number of server methods, max. 	50
 Number of inputs/outputs per server method, max. 	20
 Number of monitored items, max. 	2 000; 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. 	5 000
 Alarms and Conditions 	Yes
 Number of program alarms 	200
Number of alarms for system diagnostics	100
Further protocols	
• MODBUS	Yes; MODBUS TCP
Isochronous mode	
Equidistance	Yes
S7 message functions	
Number of login stations for message functions, max.	64
Program alarms	Yes
Number of configurable program messages, max.	10 000; Program messages are generated by the "Program_Alarm" block, ProDiag or GRAPH
Number of loadable program messages in RUN, max.	5 000
Number of simultaneously active program alarms	
 Number of program alarms 	1 000
 Number of alarms for system diagnostics 	200
 Number of alarms for motion technology objects 	160
Test commissioning functions	
Joint commission (Team Engineering)	Yes; Parallel online access possible for up to 8 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
 Variables 	Inputs/outputs, memory bits, DBs, distributed I/Os, timers, counters
 Number of variables, max. 	

of which status variables, may	200: pariah
— of which status variables, max.	200; per job
— of which control variables, max.	200; per job
Forcing	Yes
Forcing Forcing variables	
Forcing, variables Number of variables, may	Peripheral inputs/outputs
Number of variables, max. Diagnostic buffer.	200
Diagnostic buffer	V
• present	Yes
 Number of entries, max. 	3 200
— 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
 Connection display LINK TX/RX 	Yes
Supported technology objects	
Motion Control	Yes; Note: The number of technology objects affects the cycle time of
	the PLC program; selection guide via the TIA Selection Tool
 Number of available Motion Control resources for technology objects 	2 400
Required Motion Control resources	
per speed-controlled axis	40
— per positioning axis	80
— per synchronous axis	160
— per external encoder	80
— per output cam	20
— per cam track	160
•	40
— per probe	40
Positioning axis	7
 Number of positioning axes at motion control cycle of 4 ms (typical value) 	7
 Number of positioning axes at motion control cycle of 8 ms (typical value) 	14
Controller	
PID_Compact	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
Ambient conditions	
Ambient temperature during operation	
horizontal installation, min.	-25 °C; No condensation
horizontal installation, max.	60 °C; 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, min. vertical installation, max.	40 °C; Display: 40 °C, at an operating temperature of typically 40 °C, the
	display is switched off
Ambient temperature during storage/transportation	40.00
• 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	70 mm
Height	147 mm
Depth	129 mm
Weights	
Weight, approx.	845 g

last modified:

11/3/2021