2

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
System clocks			
PROFIBUS cycle	SIMOTION D: For integrated drives and drives on connected CX32-2: 0.5 ... 8 ms [1]	1 ... 8 ms (in 0.125 ms steps)	1 ... 8 ms (in 0.125 ms steps)
PROFINET cycle	D455-2 DP/PN: min. 0.125 ms (only with SCOUT TIA) Please observe the notes about usage in the SIMOTION D4x5-2 manuals.	D410-2 DP/PN: 0.25 ... 4 ms (in 0.125 ms steps)	D4x5-2 DP/PN: 0.25 ... 4 ms [4] (in 0.125 ms steps)
Position control and interpolation cycle			
• Minimum position control cycle	The position control cycle (SERVO) includes the position controller, the actual-value and setpoint system and the axis monitoring functions.	1/0.5 ms [3]	0.5 ms As of D435-2 (DP/PN only): 0.25 ms [4]
• Position control cycle to PROFIBUS cycle		1:1 ... 8:1	1:1 ... 8:1
• Position control cycle to PROFINET cycle		1:1 ... 16:1	1:1 ... 16:1 (1:1) [2]
• Interpolation cycle 1 (IPO) to Position control cycle	The axis motion control functions are performed in the interpolation cycle. The position control cycle and the interpolation cycle are a multiple of the PROFINET/PROFIBUS cycle. The transformation ratios are adjustable.	1:1 ... 6:1	1:1 ... 6:1 (1:1 ... 4:1) [2]
• Interpolation cycle 2 (IPO2) to interpolation cycle 1 (IPO1)		2:1 ... 64:1	2:1 ... 64:1
• Fast position control cycle (SERVO_Fast) to PROFINET cycle	Values with SERVO_Fast and IPO_Fast activated for D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN (for details, see SIMOTION D4x5-2 manuals)	–	1:1
• Fast interpolation cycle (IPO_Fast) to fast position control cycle (SERVO_Fast)		–	1:1 ... 4:1

Notes:

Communication via PROFINET and PROFIBUS

The availability of a PROFINET or PROFIBUS interface depends on the controller variant implemented.
The SIMOTION controllers are equipped with PROFINET and/or PROFIBUS as standard.
This must be considered for connection options and functions via PROFINET and PROFIBUS.

SIZER for Siemens Drives engineering tool (integrated in the TIA Selection Tool)

The performance requirements for a SIMOTION application can be estimated using the engineering tool SIZER for Siemens Drives (integrated in the TIA Selection Tool). For more information about SIZER for Siemens Drives (integrated in the TIA Selection Tool), refer to section Drive Technology/Selection and engineering tools/SIZER for Siemens Drives engineering tool (integrated in the TIA Selection Tool) in the Industry Mall, and chapter Lifecycle Services in Catalog PM 21.

[1] D435-2 DP/PN, D445-2 DP/PN, D455-2 DP/PN: from 0.25 ms onwards
[2] Values in brackets with SERVO_Fast and IPO_Fast activated (for details, see SIMOTION D4x5-2 manuals).
[3] 1 ms when using the TO axis and the integrated drive control
[4] D435-2 DP/PN, D445-2 DP/PN, D455-2 DP/PN: 0.25 ms; D455-2 DP/PN: 0.125 ms (only with ET 200SP, SCOUT TIA and SERVO_Fast)
   You will find detailed information on the cycle clock settings, particularly for cycle clocks ≤ 0.25 ms, in the SIMOTION D4x5-2 manuals.

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Dynamic Servo Control (DSC)			
• With Dynamic Servo Control (DSC) the control loop of the position controller is located in the drive (with cycles of 125 µs or higher).	With SINAMICS S120 drives	●	●
Memory for system data			
• Storage media (externally pluggable)	CF: CompactFlash card	CF 2 GB	CF 2 GB
• Retentive memory (for retentive user data/ retain variables)		108 KB	D425-2/ D435-2: 364 KB D445-2/ D455-2: 512 KB
• Persistent memory (for user data/data storage on exchangeable memory medium)		1.5 GB	1.5 GB
• RAM disk (Load memory for user data/ for download of the configuration and programs)		60 MB	D425-2: 38 MB D435-2: 50 MB D445-2: 68 MB D455-2: 90 MB
• RAM (user memory for code and data)	D410-2 and D4x5-2: additional 20 MB for Java applications	122 MB	D425-2: 78 MB D435-2: 109 MB D445-2: 196 MB D455-2: 388 MB
Address ranges			
• Logical I/O address space in KB		16	16
• Physical I/O address space in KB - PROFIBUS: max. per ext. subnet each for inputs and outputs	When PROFIBUS and PROFINET are used, the total address space applies D4x5-2 DP/PN: If CBE30-2 is used as a second PROFINET interface, 2 × 6 KB physical address space is available.	1	1
- PROFINET: max. for inputs and outputs (each)		6	6
• Permanent process image for BackgroundTask (I/O variables) in bytes		64	64
• Additional configurable process image for each cyclic task (I/O variables)		●	●
• Address space for each PROFIBUS DP station		244 bytes	244 bytes
• Address space for each PROFINET device		1400 bytes	1400 bytes

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Drives on SIMOTION			
Maximum number of axes	Higher number of axes possible using multiple synchronized devices	8 axes (typ. 2 to 3 axes)	D425-2: 16 axes D435-2: 32 axes D445-2: 64 axes D455-2: 128 axes
Integrated drive control The drive control integrated in SIMOTION D is based on SINAMICS S120 Control Units: • With SIMOTION D410-2 on the CU310-2 Control Unit, firmware version V4.x/V5.x • With SIMOTION D4x5-2/CX32-2 on the CU320-2 Control Unit, firmware version V4.x/V5.x The BOP20 Basic Operator Panel and the basic positioner EPos are not supported by the integrated drive control.	SIMOTION D4x5-2: CX32-2 Controller Extension can be used to provide additional drive controls: D425-2: max. 3 CX32-2 [1] D435-2: max. 5 CX32-2 [1] D445-2: max. 5 CX32-2 [1] D455-2: max. 5 CX32-2 [1] Per CX32-2: Servo: 1..6 Vector: 1..6 *V/f:* 1..12 (alternatively)	Servo: 1 Vector: 1 *V/f:* 1 (alternatively)	Servo: 1..6 Vector: 1..6 *V/f:* 1..12 (alternatively)
Speed-controlled axis over PROFIBUS DP • SINAMICS S/SINAMICS G (servo/vector control) • Drives with speed profile in accordance with standard message frames (PROFIdrive profile 1-6)	SIMOTION D: SINAMICS as the standard drive technology	●	●
Position-controlled axis over PROFIBUS DP with PROFIdrive • SINAMICS S110 (blocksize format) - Servo control • SINAMICS S120 (blocksize, booksize and chassis formats) - Servo control - Vector control • Certified servo/vector/stepper drives in acc. with standard message frames (PROFIdrive profile 1-6)	SIMOTION D: SINAMICS as the standard drive technology Also linear motor [2] With external encoder (limited dynamic response)	●	●

[1] In principle, a 4th or 6th CX32-2 Controller Extension can also be connected, e.g. for implementing modular machine concepts. In this case, no drives/drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2. All drives must then be operated via the Controller Extensions.

[2] See chapter SIMOTICS linear and torque motors in Catalog D 21.4 and Motors for Motion Control/SIMOTICS L linear motors and .../SIMOTICS T torque motors in the Industry Mall.

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Drives on SIMOTION (continued)			
Speed and position-controlled axis over PROFINET IO with IRT (PROFIdrive)	SIMOTION D: SINAMICS as the standard drive technology	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
• SINAMICS S110 (blocksize format)			
- Servo control			
• SINAMICS S120 (blocksize, booksize and chassis formats)			
- Servo control	Also linear motor [1]		
- Vector control	With external encoder (limited dynamic response)		
• Certified servo/vector/stepper drives in acc. with standard message frames (PROFIdrive profile 1-6)			
Distributed servo drive (SINAMICS S120M)	SIMOTION D: Via CU320-2 D4x5-2: On integrated drive control	●	●
Drives with analog ±10 V setpoint interface			
• Via onboard drive interface	Configuration either as analog or stepper drive	–	–
• Via ADI 4 (Analog Drive Interface for 4 Axes)	See SIMOTION system components→ I/O components in Catalog PM 21.	●	●
• Via IM 174 (Interface Module for 4 Axes)		●	●
Hydraulic drives over ±10 V setpoint interface			
• Via onboard drive interface		–	–
• Via ADI 4 (Analog Drive Interface for 4 Axes)		●	●
• Via IM 174 (Interface Module for 4 Axes)		●	●
• Analog outputs through I/O		●	●
• Encoders through I/O		●	●
Stepper drives	Configuration either as analog or stepper drive		
• Onboard pulse direction interface for stepper drives		–	–
• Via IM 174 (Interface Module for 4 Axes)		●	●

[1] See chapter SIMOTICS linear and torque motors in Catalog D 21.4 and Motors for Motion Control/SIMOTICS L linear motors and .../SIMOTICS T torque motors in the Industry Mall.

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Encoders on SIMOTION			
Measuring systems that can be connected over integrated interface	See Measuring systems in Catalog D 21.4.		
• Qty.	SIMOTION D/CX32-2: Encoder connection via DRIVE-CLiQ	1	–
• Absolute encoder with SSI interface		●	–
• Incremental measuring systems		●	–
Measuring systems that can be connected over bus			
• Resolver, absolute encoder (SSI and EnDat), incremental encoder (TTL and sin/cos), etc.	Motor encoder on drive or encoder on ADI 4/IM 174 or PROFINET and PROFIBUS encoder	●	●
Connection options for direct measuring systems (2nd to 8th encoders and external encoder)			
• Via onboard interfaces		●	–
• Via SINAMICS S110/S120	SIMOTION D/CX32-2: Encoder connection via DRIVE-CLiQ	●	●
• Isochronous PROFIBUS encoder	See Measuring systems in Catalog D 21.4.	●	●
• PROFINET encoder with IRT	See Measuring systems in Catalog D 21.4.	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
• Encoder on ADI 4 (Analog Drive Interface for 4 Axes)	At least one electric or hydraulic axis must be configured on ADI 4/IM 174.	●	●
• Encoder on IM 174 (Interface Module for 4 Axes)		●	●
Measuring inputs			
Onboard measuring inputs			
• Qty.		8	16
• Reproducibility		Typ. 5 μs	5 μs
Measuring inputs on the drives			
• SINAMICS S110 (CU305)		2/closed-loop control	2/closed-loop control
• SINAMICS S120 (CU310-2)		8/closed-loop control	8/closed-loop control
• SINAMICS S120 (CU320-2)		8/closed-loop control	8/closed-loop control
• SIMOTION CX32-2	D425-2: max. 3 CX32-2 [1] D435-2: max. 5 CX32-2 [1] D445-2: max. 5 CX32-2 [1] D455-2: max. 5 CX32-2 [1]	–	4/closed-loop control

[1] In principle, a 4th or 6th CX32-2 Controller Extension can also be connected, e.g. for implementing modular machine concepts.
In this case, no drives/drive components can be connected any longer to the integrated drive control of the SIMOTION D4x5-2.
All drives must then be operated via the Controller Extensions.

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Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Measuring inputs (continued)			
Measuring inputs on the drives (continued)			
• Over TM15 Terminal Module on SINAMICS S120 or SIMOTION D/CX32-2	See SIMOTION system components→ I/O components in Catalog PM 21.		
- Number of measuring inputs per Terminal Module, max.		24	24
- Reproducibility		125 µs	125 µs
• Via ET 200MP TM Timer DIDQ 16×24V	Can only be used with SCOUT TIA; Standard or High Feature interface module required.	8	8
- Number of measuring inputs per Technology Module, max.			
- Reproducibility		2 µs	2 µs
• Via ET 200SP TM Timer DIDQ 10×24V	Can be used with SCOUT and SCOUT TIA; High Feature interface module required.	4	4
- Number of measuring inputs per Technology Module, max.			
- Reproducibility		5 µs	5 µs
Cam outputs			
High-speed output cams (hardware-supported output cams with higher resolution)			
• Onboard cam outputs		●	●
- Number of cam outputs, max.		8	8
- Reproducibility		Typ. 125 µs	10 µs
• Over TM15 Terminal Module to SINAMICS S120 or SIMOTION D/CX32-2	See SIMOTION system components→ I/O components in Catalog PM 21.		
- Number of cam outputs per Terminal Module, max.		24	24
- Reproducibility		125 µs	125 µs
• Via ET 200MP TM Timer DIDQ 16×24 V	Can only be used with SCOUT TIA; Standard or High Feature interface module required.	16	16
- Number of cam outputs per Technology Module, max.			
- Reproducibility		2 µs	2 µs
• Via ET 200SP TM Timer DIDQ 10×24V	Can be used with SCOUT and SCOUT TIA; High Feature interface module required.	6	6
- Number of cam outputs per Technology Module, max.			
- Reproducibility		5 µs	5 µs

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Cam outputs (continued)			
Standard output cams (updated in position controller cycle or IPO cycle, reproducibility of the output cam depends on the implemented I/O)			
• Onboard cam outputs		●	●
• Over TM15 Terminal Module to SINAMICS S120 or SIMOTION D/CX32-2	See SIMOTION system components→ I/O components in Catalog PM 21.	●	●
• Over PROFIBUS DP		●	●
• Over PROFINET IO		– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN
• Output to internal system variable		●	●
Integrated I/O interfaces			
Programmable digital inputs/outputs (can be parameterized individually as either input or output)	Further inputs/outputs can be implemented for output cam or measuring inputs via the TM15 and ET 200SP/MP TM Timer DIDQ.	8	16
• of which for output cam, max.		8	8
• of which as measuring inputs, max.		8	16
Digital inputs (fixed inputs, cannot be parameterized)	D410-2: The 3 F-DI can also be used as 6 DI.	5 + 6 (3 F-DI)	12
• of which inputs with specific functions			
- Measuring inputs, max.		–	–
- External zero mark signal for referencing, max.		–	–
- Fail-safe digital inputs (F-DI)		3	–
Digital outputs (fixed outputs, cannot be parameterized)	D410-2: The F-DO can also used as DO.	1 (1 F-DO)	–
• of which for outputs with specific functions			
- High-speed cam outputs, max.		–	–
- Fail-safe digital outputs (F-DO)		1	–
Relay outputs with specific functions			
• Controller enable		–	–
• Ready		–	–
Analog inputs SIMOTION D: D410-2: Also over TM31 D4x5-2: Over TM31 or TB30	TM31 see Catalog D 21.4	1 (onboard) ○ (TM31)	○

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Integrated I/O interfaces (continued)			
Analog outputs D410-2: Over TM31 D4x5-2: Over TM31 or TB30	TM31 see Catalog D 21.4	○	○
Connectable distributed I/O modules			
Distributed I/Os (over PROFIBUS DP) • SIMATIC ET 200S, ET 200SP • SIMATIC ET 200pro • SIMATIC ET 200M, ET 200MP [1] • SIMATIC ET 200eco • SIMATIC ET 200AL • ADI 4 (Analog Drive Interface for 4 Axes) • IM 174 (Interface Module for 4 Axes) • All certified standard slaves (DP-V0, DP-V1, DP-V2)	See SIMOTION system components→ I/O components in Catalog PM 21. Isochronous: SIMATIC ET 200S SIMATIC ET 200M ADI 4 IM 174	●	●
Distributed I/Os (over PROFINET IO) • SIMATIC ET 200S, ET 200SP • SIMATIC ET 200M, ET 200MP [1] • SIMATIC ET 200pro • SIMATIC ET 200eco PN • SIMATIC ET 200AL • All certified PROFINET devices	Isochronous: SIMATIC ET 200S, SIMATIC ET 200SP, SIMATIC ET 200MP	– D410-2 DP ● D410-2 DP/PN	– D4x5-2 DP ● D4x5-2 DP/PN

[1] ET 200MP only with SCOUT TIA.

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Connectable distributed I/O modules (continued)			
SINAMICS drive I/O (over DRIVE-CLiQ)			
• Over TM15, TM31, TM41, TM54F Terminal Modules		●	●
• Via TB30 Terminal Board	Plug-in card for SIMOTION D4x5-2 and SINAMICS CU320-2	●	●
SIMATIC HMI devices			
Configuration with TIA WinCC Basic/Comfort/Advanced		●	●
• SIMATIC HMI Comfort Panels			
- Touch panels TP			
- Key panels KP			
- Key and Touch Panels KTP			
• SIMATIC HMI Basic Panels (2nd generation)			
• SIMATIC HMI Mobile Panels (2nd generation)			
HMI software for SIMOTION			
• WinCC (SCADA system, V7.0 and higher)		○	○
• TIA WinCC Basic/Comfort/Advanced/Professional		○	○
Software for extended communication with SIMOTION			
• SIMATIC NET OPC server	See SIMOTION runtime software in Catalog PM 21.	○	○
• SIMOTION IT OPC XML-DA (via Ethernet)		●	●
- Open communication over TCP/IP and SOAP standard protocols			
- Clients on any hardware with various operating systems (Windows, Linux, etc.)			
- According to OPC Foundation standard OPC XML-DA V1.01			
• SIMOTION OPC UA (Unified Architecture)		●	●
- Open communication via Ethernet TCP/IP			
- OPC UA server in SIMOTION runtime according to specification of OPC Foundation			
- Support for Data Access			
• SIMOTION MIIF: Multipurpose Information Interface		○	○
- Symbolic access to SIMOTION data via Ethernet			
- SIMOTION as server, e.g. operator panels as clients			

[1] Subject to license for SIMOTION Kernel versions earlier than V4.2.

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Communication			
Ethernet interfaces			
• Number and transmission rates		1 × 10/100 Mbit/s	D4x5-2 DP: 3× 10/100/1000 Mbit/s D4x5-2 DP/PN: 2× 10/100/1000 Mbit/s
PROFIBUS DP interfaces			
• Onboard/support isochronous communication		D410-2 DP: 2/2 D410-2 DP/PN: 1/1	2/2
• Onboard CP5621	For PG/PC and HMI	–	–
• Transmission rates in Mbit/s		1.5 / 3 / 6 /12	1.5 / 3 / 6 /12
• Number of PROFIBUS DP slaves	Per PROFIBUS DP subnet	64	64
PROFINET interfaces			
• Onboard ports		D410-2 DP: – D410-2 DP/PN: 2	D4x5-2 DP: – D4x5-2 DP/PN: 3
• Number of PROFINET devices (provided that PROFINET interface is onboard or optionally retrofitted)	D4x5-2: CBE30-2 can be implemented as second PROFINET interface for D4x5-2 DP/PN. Per PROFINET interface	64	64
• Media redundancy (MRP and MRPD)		●	●
Further communication interfaces			
• Serial interfaces		–	–
• USB interfaces	D4x5-2: for upgrading from D4x5-2 Control Units using a USB memory stick	–	2
• DRIVE-CLiQ interfaces		1	D425-2: 4 D435-2: 6 D445-2: 6 D455-2: 6
Connections over PROFIBUS DP and Ethernet/PROFINET			
• PROFIBUS DP		●	●
• Ethernet/PROFINET		D410-2 DP: ●/– D410-2 DP/PN: ●/●	D4x5-2 DP: ●/– D4x5-2 DP/PN: ●/●

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Communication (continued)			
Online connections, max.	The connection resources can be assigned as required, over PROFIBUS DP or Ethernet.	16	16
• SIMOTION SCOUT engineering system (SCOUT occupies up to 3 online connections)		2	2
• HMI		5	5
• OPC		●	●
• Basic communication Xsend / Xreceive (not via Ethernet)		5	5
• Standard TCP/IP connections		45	75
• SIMOTION IT		●	●
Communication functions over PROFIBUS between:	Basic version from SIMOTION viewpoint	●	●
• SIMOTION – SIMATIC HMI/WinCC			
- HMI data exchange: Support from the SIMOTION operating system			
- Plant-wide access to process data and displays			
- Interrupt mechanism: Alarms are event-driven			
• SIMOTION – SIMOTION			
- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables (symbolic)			
- XSND/XRCV, max. 200 bytes			
• SIMOTION – SIMATIC S7			
- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables			
- XSND/XRCV, max. 76 bytes			
• SIMOTION – SIMATIC NET OPC			
• SIMOTION – PG/PCs with STEP 7 and SCOUT			
• PROFIBUS DP slave-to-slave communication [1]			

[1] For SIMOTION in the TIA Portal (SCOUT TIA) only "I-Slave to DP-Slave" or "I-Slave to I-Slave".

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Communication (continued)			
Communication functions over PROFINET IO between:	Basic version with regard to SIMOTION		
• SIMOTION – SIMOTION		●	●
- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables (symbolic)			
• SIMOTION – SIMATIC S7		●	●
- Distributed I/O mechanisms Process image, e.g. (% I1.3) I/O variables			
- For SIMATIC – SIMOTION: SIMOTION as I-Device			
- For SIMOTION – SIMATIC: SIMATIC as I-Device			
• Slave-to-slave communication between SIMOTION controllers		●	●
Communication functions over Ethernet/PROFINET between:			
• SIMOTION – SIMATIC HMI/WinCC		●	●
- HMI data exchange: Support from the SIMOTION operating system			
- Plant-wide access to process data and displays			
- Interrupt mechanism: Alarms are event-driven			
• SIMOTION – SIMATIC NET OPC		●	●
• SIMOTION OPC UA (Unified Architecture)		●	●
- Open communication via Ethernet TCP/IP			
- OPC UA server in SIMOTION runtime according to specification of OPC Foundation			
- Support for Data Access			
• SIMOTION IT OPC XML-DA		●	●
- Open communication over TCP/IP and SOAP standard protocols			
- Clients on any hardware with various operating systems (Windows, Linux, etc.)			
- According to OPC Foundation standard OPC XML-DA V1.01			
• SIMOTION MIIF: Multipurpose Information Interface		○	○
- Symbolic access to SIMOTION data via Ethernet			
- SIMOTION as server, e.g. operator panels as clients			
• SIMOTION – PG/PCs with STEP 7 and SCOUT		●	●
• S7 routing Ethernet/PROFIBUS DP		●	●

[1] Subject to license for SIMOTION Kernel versions earlier than V4.2.

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Communication (continued)			
UDP and TCP/IP communication functions over Ethernet/PROFINET between: • SIMOTION – SIMOTION • SIMOTION – SIMATIC • SIMOTION – PC		●	●
Serial communication over point-to-point link • CP 340, CP 341, CM PtP communication modules	Basic version from SIMOTION viewpoint	●	●
• 1SI communication module (connected over ET 200S)		●	●
Communication via AS-Interface • CP 343-2 P communication module	Basic version from SIMOTION viewpoint	●	●
• DP/AS-Interface Link 20E/ Link Advanced		●	●
• IE/AS-Interface link PN IO		●	●
Connectable network couplers • DP/DP coupler for connecting two PROFIBUS DP networks	Basic version from SIMOTION viewpoint	●	●
• PN/PN coupler for connecting two PROFINET IO networks		●	●
PROFIsafe drives on SIMOTION			
Max. number of PROFIsafe drives on SIMOTION with SINAMICS S120 drive system: • Via PROFIBUS with PROFIsafe - with 1 PROFIBUS interface	SIMOTION as I-Slave on SIMATIC F-CPU over PROFIBUS [1]	8	16
- with 2 PROFIBUS interfaces		8	32
• Via PROFINET with PROFIsafe	SIMOTION as I-Device on SIMATIC F-CPU over PROFINET Configuration: A higher-level SIMATIC F-CPU controls the safety functions of the SINAMICS S120 drives that are assigned to SIMOTION via the I-Slave/I-Device interface of the SIMOTION controller. SIMOTION routes the safety message frames through to the drives.	D410-2 DP: –D410-2: DP/PN: 8	D425-2: 16 axes D435-2: 32 axes D445-2: 64 axes D455-2: 128 axes
- SIMOTION as Shared I-Device over PROFIsafe on PROFINET	SIMOTION as Shared I-Device to higher-level S7 F-CPU and second CPU (S7 or SIMOTION D)	●	●

[1] Not for SIMOTION in the TIA Portal (SCOUT TIA).

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
SIMOTION Kernel			
Execution system			
• System tasks for Motion Control		●	●
- SERVO (position control cycle)			
- IPO (interpolation cycle)			
- SERVO$_{Fast}$	SERVO$_{Fast}$ and IPO$_{Fast}$ allow axes with differing dynamic responses to be assigned to a slow bus system and a fast bus system, as well as especially fast I/O processing. High-speed PROFINET I/O modules are used for this purpose.	–	D425-2 DP: – D425-2 DP/PN: – D435-2 DP: – D435-2 DP/PN: ● D445-2 DP/PN: ● D455-2 DP/PN: ●
- IPO$_{Fast}$			
- MotionTasks (sequential)		32	32
- ServoSynchronousTask (cyclic, synchronous with the position control cycle)		1	1 (2) [1]
• Task structure/program execution			
- BackgroundTask (cyclic)	Adjustable monitoring time	1	1
- TimerInterruptTasks (time-controlled down to 1 ms)		5	5
- IPOSynchronousTask (cyclic, synchronous with the interpolation cycle)		2	2 (3) [1]
- InterruptTasks (for user) (event-controlled)		2	2
- TControlTasks (temperature control)		5	5
- StartupTask (for transition from STOP to RUN)		1	1
- ShutdownTask (for transition from RUN to STOP)		1	1
• Task structure/error processing (SystemInterruptTasks)	Central troubleshooting is possible		
- ExecutionFaultTask (starts in the event of an error when executing a program)		1	1
- TechnologicalFaultTask (starts in the event of an error on a technology object)		1	1
- PeripheralFaultTask (starts in the event of an error on the I/O)		1	1
- TimeFaultTask (starts in the event of a TimerInterruptTask timeout)		1	1
- TimeFaultBackgroundTask (starts in the event of a BackgroundTask timeout)		1	1

[1] Values in brackets with SERVO$_{Fast}$ and IPO$_{Fast}$ activated for D435-2 DP/PN, D445-2 DP/PN and D455-2 DP/PN

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
SIMOTION Kernel (continued)			
Execution system (continued)			
• Program organization		●	●
- Units (source program) - Programs - Function blocks (FBs) - Functions (FCs) - Classes - Methods - System functions (SFs) - Libraries			
PLC command set (according to IEC 61131-3; optionally expandable by technology functions)		●	●
System functions, e.g. for		●	●
• Interrupt and error handling			
• Copying data			
• Clock functions			
• Diagnostic functions			
• Module parameterization			
• Operating mode transitions, Run/Stop			
• Reading and writing of data blocks from the user program from and to an exchangeable memory medium			
• DPV1 communication to DP slaves/ PROFINETdevices			
• Read/write drive parameters			
• DP slaves/PROFINET devices can be connected to and disconnected from application			
• DP slave, IP address and NameOfStation can be adjusted via user program			
• DP station diagnostics			
• Activate/deactivate technology objects			
• Counter (IEC commands)			
• Timer (IEC commands)			
• Real-time clock, format [DATE_AND_TIME]			
• Text files on memory card			

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Motion Control technology package			
Technology functions			
• Motion Control Basic	No license required	●	●
• POS – Positioning	Use of the functions during runtime is subject to license. SIMOTION D410-2 already contains the technology functions for precisely one axis.	●¹⁾	●¹⁾
• GEAR – Synchronous operation		●¹⁾	●¹⁾
• CAM – Cam		●¹⁾	●¹⁾
• PATH - Path interpolation		●¹⁾	●¹⁾
The technology package functions are accessed via language commands, system variables and through function blocks in accordance with PLCopen.			
Axis types			
• Electrical/hydraulic/stepper motor axes		●	●
• Drive axis		●	●
• Positioning axis	Included with POS license or higher	●¹⁾	●¹⁾
- Rotary axis			
- Linear axis			
- Modulo for linear and rotary axes			
- Force/pressure-controlled axis			
- Force/pressure-limited axis			
• Synchronous axis	Included with GEAR license or higher	●¹⁾	●¹⁾
• Path axis	Included with GEAR license or higher	●¹⁾	●¹⁾
• Synchronous axis with curve synchronization	Included with CAM license or higher	●¹⁾	●¹⁾
• Virtual axis		●	●
• Simulation axis		●	●
Systems of units			
• Metric (mm, m, Nm, Pa, ...)		●	●
• US (inch, feet, PSI, lb, ...)		●	●
Axis monitoring functions			
The activated monitoring functions are executed cyclically.		●	●
• Watchdog			
• Hardware and software limit switches			
• Position/zero-speed monitoring			
• Dynamic following error monitoring			
• Encoder monitoring, cable break			
• Force/pressure monitoring			
• Setpoint			
• Data exchange plausibility			

¹⁾ Use of the functions during runtime is subject to license. Exception: SIMOTION D410-2 already contains the Motion Control technology functions for just one axis.

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Other technology packages			
TControl technology package • With technology functions for temperature control	Technology package integrated in SCOUT	● [1]	● [1]
Drive Control Chart (DCC) technology package [3] • With technology functions for Drive Control Chart	Technology package integrated in SCOUT [3]	●	●
Multipurpose Information Interface (MIIF) technology package • With multi-functional communication functions	Technology package can be purchased via your Siemens contact	○ [1]	○ [1]
Vibration Extinction (VIBX) technology package • Vibration damping of axes		○ [1]	○ [1]
OACAMGEN technology package • Motion profiles for servo presses		○ [1]	○ [1]
SIMOTION IT			
SIMOTION IT DIAG Integrated web server on the SIMOTION controller • Service and diagnostic functions provided via commonly used standard web browsers with extensive information functions (hardware/software version display, process utilization, memory usage, diagnostic buffer, task runtimes, user logbook, operating state, time of day, etc.) • Access to all variables on the control system using variable browser functions • Watch tables (control variable diagnostics in freely configurable status and control tables. Variables of multiple SIMOTION controllers can be accessed simultaneously in a combined watch table) • Trace (control variable tracing for one controller or several synchronously) • Generation of diagnostic data (diagnostic buffer, alarms, states of variables, ...) • Project update • Firmware update • Password-protected access • Remote access to SIMOTION file system • User-defined service and diagnostic pages		●	●

[1] Use of the functions during runtime is subject to license.

[2] Subject to license for SIMOTION Kernel versions earlier than V4.2.

[3] Not for SIMOTION in the TIA Portal (SCOUT TIA).

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
SIMOTION IT (continued)			
SIMOTION IT OPC XML-DA Integrated OPC XML-DA server on the SIMOTION controller • Read/write variables • Browse variables • Subscriptions • Trace interface via SOAP • Password-protected access		●	●
SIMOTION OPC UA Integrated on the SIMOTION controller • Read/write variables • Browse variables • Subscriptions • User authentication and encryption		●	●
SIMOTION IT Virtual Machine (integrated Java runtime environment on the SIMOTION controller) • Read and write access to the SIMOTION variables • Read and write access to the non-volatile memory (NVRAM) • Use of system functions (functions of technology objects) • Use of standard Java classes in the device (file access, network functions, string functions, etc.) • Creation of servlets for the purpose of integrating user-specific web server functions	Licensing through SIMOTION IT Virtual Machine Note: For SIMOTION Kernel < V4.2, can be used as combined license for SIMOTION IT DIAG, OPC XML-DA and Virtual Machine.	●	●
SIMOTION SCOUT engineering system			
SIMOTION SCOUT basic functions • SCOUT Workbench • STARTER Drive commissioning/ Parameter assignment • Hardware and network configuration • Diagnostics for testing and commissioning • Axis control panel • Program editors/ Programming languages (command set in accordance with IEC 61131-3) - Structured Text (ST) - Ladder Diagram (LAD) - Function Block Diagram (FBD) - Motion Control Chart (MCC) • Creation of cams (basic) • Creation of technology objects • Technology tools (function generator) • Operator interface, online help and documentation in English, French, German and Italian		●	●

[1] Subject to license for SIMOTION Kernel versions earlier than V4.2.

● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
SIMOTION SCOUT engineering system (continued)			
SIMOTION SCOUT optional packages			
• CamTool (graphical cam editor)		○	○
• DCC Editor (graphical editor for Drive Control Chart)		○ [1]	○ [1]
Testing and diagnostics with SIMOTION SCOUT			
Information functions		●	●
• Hardware/software version			
• Processor utilization			
• Memory utilization			
• Diagnostic buffer			
• Task runtimes			
• User logbook			
• Operating state			
• Time			
Comparison functions for projects		●	●
• Comparison of objects in projects: -between offline projects -between online and offline projects			
• Detailed comparison: Shows differences between objects in detail			
• Matching: Projects and objects can be merged			
Program test functions		●	●
• Control/status variables			
• Watch tables			
• Status program/FB/FC (with specification of the call point)			
• Single-step MCC			
• Breakpoints in all languages (ST, MCC, LAD/FBD)			
• Tracer for MCC (for fast program sequences)			
• Trace technology object (recording of all technology object commands)			

[1] Not for SIMOTION in the TIA Portal (SCOUT TIA).

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● Basic version (function or license is purchased with the device or SCOUT) ○ Option (must be acquired as software/hardware) – Not possible	Notes	SIMOTION D410-2	SIMOTION D4x5-2
Testing and diagnostics with SIMOTION SCOUT (continued)			
Trace		●	●
• Recording of I/O, system and program variables (on one controller as well as over several synchronously)			
• Recording from position control cycle onwards (n × position control cycle)			
• Trigger: Instantaneous, rising/falling edge, at code point system variable			
• Measuring functions for optimizing the speed/position controller (step response, ramp, frequency curve)			
• Automatic setting of the speed controller/position controller			
• Bode diagram, FFT analysis, function generator, mathematical functions			
• Endless trace			
• Recording over defined measuring period			
• Parameterization and trace data in non-volatile memory on memory card (optional)			
Further diagnostic functions			
• Module diagnostics		●	●
- Centralized			
- Distributed (e.g. ET 200)			
• PROFIBUS DP station diagnostics		●	●
• PROFINET station diagnostics		●	●
• Diagnostic buffer	On SIMOTION D, one diagnostic buffer is provided for SIMOTION and another for the integrated SINAMICS drive.		
- No. of entries, max.		2 × 100	2 × 200
• Process fault diagnostics (Alarm_S)			
- Messages from user program		●	●
- No. of entries, max.		40	40
Engineering drives			
STARTER (integrated in SCOUT) Drive/commissioning software for SINAMICS S/SINAMICS G	With SIMOTION in the TIA Portal (SCOUT TIA), only "SIMOTION Drives" are supported. These are SINAMICS S120 drives of versions V4.5, V4.7, V4.8, V5.1 and V5.2, which are networked with the SIMOTION CPU on the basis of PROFIBUS or PROFINET.	●	●