

## Nokia 7210 Service Access Switch

Release 11

The Nokia 7210 Service Access Switch (SAS) product family provides service providers with Carrier Ethernet demarcation, access, and aggregation for mobile backhaul, business, and residential service delivery. For enterprise and mission-critical network operators, the 7210 SAS addresses stringent requirements for high network resiliency, deterministic network performance, and scalability

As a member of the Service Router (SR) product portfolio, the 7210 SAS leverages the proven Nokia Service Router Operating System (SR OS) and the Nokia Network Services Platform (NSP) for service and operational consistency across the network. The 7210 SAS is compliant with the Metro Ethernet Forum (MEF) Carrier Ethernet (CE) 2.0 specification, and with Hierarchical Quality of Service (H-QoS) and comprehensive operation, administration, and maintenance (OAM). The 7210 SAS provides deployment flexibility, service richness, and operational simplicity to extend IP/MPLS and Carrier Ethernet services throughout the network.

### Benefits

#### Support for differentiated services

Service providers want to unlock new revenue streams. Enterprise and mission-critical network operators need to fulfil the specific requirements of each of their various applications. To meet these needs, the 7210 SAS offers differentiated services, including Carrier Ethernet, IP VPN, and enhanced internet services coupled with per-service QoS, and bandwidth guarantees. Service providers can create tiered service models with flexible billing options, tailoring service packages based on the performance and availability requirements of



7210 SAS-R12



7210 SAS-R6



7210 SAS-T



7210 SAS-MXP



7210 SAS-D



7210 SAS-Dxp



7210 SAS-S 1/10GE



7210 SAS-Sx 1/10GE



7210 SAS-Sx 10/100GE



7210 SAS-K30 ETR



7210 SAS-K12 ETR



7210 SAS-K12



7210 SAS-K5

their customers. Enterprise and mission-critical network operators can provide customized QoS and traffic profiles to assure the delivery of individual applications and essential business communications.

## **Customer satisfaction and application delivery assurance**

The plug-and-play capabilities of the 7210 SAS along with the NSP deliver rapid service turn-up without truck rolls, expediting in-service deadlines and time-to-revenue while minimizing the chance of operator error. The ability to continuously monitor and measure traffic from end to end and troubleshoot proactively enables network problems to be found and resolved before they affect end users.

Monitoring, performance measurement of service metrics, prediction of threshold violations, reporting of test results and accurate billing provide a superior level of service to end users. These features also increase the reliability of mission-critical applications.

For service providers, self-service customer portals with customized on-demand management capabilities improve the overall quality of experience for their customers.

## **Cost reduction through operational simplicity**

Cost savings can be realized by transitioning from separate legacy networks onto a single platform where multiple services are converged onto one uplink and each application can be supported by a full range of Carrier Ethernet and IP/MPLS services. With a variety of compact form factors and features, the 7210 SAS cost effectively scales to support current and future customer and application requirements. It provides savings through advanced QoS, end-to-end OAM, optical integration, streamlined network upgrades, reduced training, testing cycles and operations support system (OSS) integration costs.

## Software features

Each product model supports, but is not limited to, a variation of the following features:

### **Services**

- Layer-2 virtual private network (VPN) services – virtual leased line (VLL) and virtual private LAN service (VPLS)
- IP VPN services (IPv4 and IPv6)
- Internet Enhanced Service (IPv4 and IPv6)
- Routed VPLS with IES and virtual private routed network (VPRN) IPv4 and IPv6 interfaces
- IPv4 multicast
- IPv4 VPN multicast (Next-generation multicast VPN)

### **Network protocols**

- IEEE 802.1Q (VLAN) and 802.1ad (QinQ)
- Provider Backbone Bridging (PBB), Backbone Edge Bridge (BEB) and Backbone Core Bridge (BCB) as defined in IEEE 802.1ah
- Segment routing
  - Intermediate System-to-Intermediate System (IS-IS) and Open Shortest Path First (OSPF)
  - Loop-free alternate (LFA) and remote LFA (RLFA)
- Path Computation Element Protocol (PCEP)
  - Resource Reservation Protocol (RSVP)
- MPLS Label Edge Router (LER) and Label Switch Router (LSR).
  - MPLS point to multi-point (P2MP) LSPs for NG-MVPN multicast.
  - MPLS-TP (based on IETF standards)
  - Label Distribution Protocol (LDP), LDP over RSVP, and Targeted LDP (T-LDP)
  - Resource Reservation Protocol — Traffic Engineering (RSVP-TE)

- IP routing
  - Intermediate System-to-Intermediate System (IS-IS) (IPv4 and IPv6), including traffic engineering (TE) support for IPv4
  - Open Shortest Path First (OSPFv2 and OSPFv3) with TE support for IPv4
  - IPv4 unnumbered with MPLS
  - Routing Information Protocol (RIP)
  - Border Gateway Protocol (BGP)
    - BGP label unicast routes as defined in RFC 3107 with next-hop-self and Accumulated Interior Gateway Protocol (AIGP) support.
    - BGP-AD for VPLS auto-discovery
    - BGP pseudowire routing for multi-segment pseudowires
    - BGP route-reflector server for VPRN IPv4 and IPv6 routes
    - BGP intra-AS option B for VPRN IPv4 and IPv6 routes
- Protocol Independent Multicast (PIM) – Sparse mode (SM), Source Specific Multicast (SSM) and IGMPv1/2/3
- IGMPv1/2/3 snooping

## Load balancing and resiliency

- IEEE 802.3.ad Link Aggregation Group (LAG) and multi-chassis (MC) LAG
- Pseudowire redundancy
- Primary and Secondary LSPs
- Control plane redundancy
- BGP Prefix Independent Convergence (PIC)
- Fast reroute (FRR)
  - LDP with loop-free alternate (LFA) policies
  - RSVP
  - Segment routing with LFA and RLFA
- Equal-cost multi-path (ECMP) load balancing for LDP LSR, IPv4 and L3 VPN tunnels

- Virtual Router Redundancy Protocol and VRRPv3 for IPv6
- Multi-chassis ITU-T G.8032v2
- IEEE Spanning Tree Protocol (STP)/Rapid Spanning Tree Protocol (RSTP)/Multiple Spanning Tree Protocol (MSTP)
- Bidirectional fault detection (BFD) along with micro-BFD support for LAG with 10ms timer
- Shared Risk Link Group (SRLG) recovery
- Entropy (pseudowire hash) label
- Virtual chassis (stacking)
- Nonstop routing, nonstop services
- In-service software upgrade (ISSU)

## Quality of Service

- Service ingress packet classification based on MAC and IP criteria (IPv4 and IPv6), MPLS EXP on network ingress.
- Service ingress packet classification based on IP DSCP and Dot1p with a large meter pool for higher SAP/service scaling.
- Hierarchical per-service ingress and egress policing, queuing, and shaping
- Deep buffering
- RED slope
- Self-generated traffic marking

## OAM

- IEEE 802.3ah Ethernet in the first mile with Dying Gasp support
- IEEE 802.1ag Ethernet OAM and ITU-T Y.1731 for fault and performance management
- MPLS OAM for in-service performance management (delay, jitter, and packet loss) and fault management
- MPLS-TP OAM
- Service mirroring (local/remote)
- Two-Way Active Measurement Protocol (TWAMP), TWAMP light

- ITU-T Y.1564 test head with multiple streams (with EMIX/IMIX frame-size) and service performance measurement
- Per-port and per-service loopback with MAC-swap
- Link Layer Discovery Protocol (LLDP)
- NETCONF/YANG
- SNMPv1, v2c, v3
- IPv6 for management
- Ethernet and IP tools for performance monitoring with MEF 35-based binning and availability
- PTP-based timestamps for service level agreement measurements
- Remote SR OS upgrade
- Auto-configuration (plug-and-play)
- Configuration roll-back

## **Security**

- Secure Shell (SSH) v4 and v6 for management
- IEEE 802.1x on access ports, MAC and VLAN authentication.
- Control plane security
- Management access filters
- Remote Authentication Dial-In User Service (RADIUS) client
- Terminal Access Concentrator Access Control Server Plus (TACACS+)
- User profile management
- VPLS security
- Access control lists
- Per-port MAC security (MACsec)
- Strict unicast Reverse Path Forwarding (uRPF)

## Hardware overview

Table 1. Chassis models

The 7210 SAS-R12 and R6 routers provide up to 100GE line-rate throughput per module slot with 1.92 and 0.96 Tb/s switch fabric capacity respectively. They have redundant control planes and feature non-stop routing and services along with in-service software upgradability.

	7210 SAS-R12	7210 SAS-R6
Switch fabric throughput Half duplex per Switch Fabric/Control Processing Module (SF/CPM) card (fully redundant), IMIX traffic	1.92 Tb/s	960 Gb/s
Network transport	IP/MPLS/Ethernet	IP/MPLS/Ethernet
Integrated Media Module (IMM) slots	12 (see Table 2 for IMM options)	6 (see Table 2 for IMM options)
Timing and synchronization	<ul style="list-style-type: none"> <li>• ITU-T SyncE with Ethernet Synchronization Messaging Channel (ESMC)</li> <li>• IEEE 1588v2               <ul style="list-style-type: none"> <li>– Boundary Clock (BC), Ordinary Clock (OC) - slave</li> <li>– User Datagram Protocol (UDP)/IP and Ethernet encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1 and G.8275.1<sup>1</sup></li> </ul> </li> <li>• 1 x BITS, 1PPS out, 10 MHz out</li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2               <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP and Ethernet encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1 and G.8275.1<sup>1</sup></li> </ul> </li> <li>• 1 x BITS; 1PPS out, 10 MHz out</li> </ul>
Extended buffering and shaping (on IMM-b cards)	Egress 192 MB buffer	Egress 192 MB buffer
Optical 1830 Versatile WDM Module (VWM) Passive filter management support	Yes (using the OMC interface)	Yes (using the OMC interface)
Optical Management Connection (OMC)	Yes	Yes
Control plane and switch fabric redundancy	Yes, with nonstop routing and nonstop services	Yes, with nonstop routing and nonstop services
Hot-swappable modules	<ul style="list-style-type: none"> <li>• SF/CPM, IMM</li> <li>• Power supplies, fan tray, fan filter</li> </ul>	<ul style="list-style-type: none"> <li>• SF/CPM, IMM</li> <li>• Power supplies, fan tray, fan filter</li> </ul>
Dimensions	<ul style="list-style-type: none"> <li>• Height: 40.0 cm (15.75 in) 9RU</li> <li>• Width: 48.3 cm (19 in)</li> <li>• Depth: 24.0 cm (9.45 in)</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 13.3 cm (5.25 in) 3RU</li> <li>• Width: 36.8 cm (14.5 in)</li> <li>• Depth: 24.0 cm (9.45 in)</li> </ul>
Power supply options	<ul style="list-style-type: none"> <li>• Two feeds. Modular DC power supplies</li> <li>• AC power requires an external rectifier</li> </ul>	<ul style="list-style-type: none"> <li>• Two feeds. Modular DC power supplies</li> <li>• AC power requires an external rectifier</li> </ul>
Power requirements	DC input: -40 V DC to -72 V DC	DC input: -40 V DC to -72 V DC
Cooling	<ul style="list-style-type: none"> <li>• Fan cooled with front-to-back or front to side airflow</li> <li>• Hot-swappable fan tray</li> </ul>	<ul style="list-style-type: none"> <li>• Fan cooled with right to left air flow</li> <li>• Hot-swappable fan tray</li> </ul>
Temperature operating range	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)

<sup>1</sup> On IMM-b cards. Future software deliverable on IMM-c cards.

Table 2. Nokia 7210 SAS-R6 and 7210 SAS-R12 Integrated Media Modules (IMMs)<sup>1</sup>

7210 SAS-R line cards support both high-throughput up to 100GE and high 100/1000 Mb/s port density. IMM-c cards have 5 MB of buffer space; IMM-b cards have 192 MB for excellent buffering of bursty customer traffic.

Card name	Interfaces	Throughput per slot (full duplex IMIX, non-redundant)
1-port CFP4 100GE IMM-c <sup>1</sup>	1 x CFP4	Up to 100 Gb/s
1-port QSFP28 100GE IMM-c <sup>1</sup>	1 x QSFP28	Up to 100 Gb/s
4-port 10GE IMM-b	4 x SFP+ 10GE	Up to 26 Gb/s
2-port 10GE IMM-b	2 x SFP+ 10GE	Up to 20 Gb/s
11/22-port GE IMM-b	<ul style="list-style-type: none"> <li>• 11 x SFP 100/1000 Mb/s</li> <li>• 22 x cSFP 100/1000 Mb/s (mix of optical SFPs and cSFPs is supported, limited to 11 ports when using copper SFPs)</li> </ul>	Up to 22 Gb/s
16-port GE IMM-b	16 x RJ.5 10/100/1000 Mb/s	Up to 16 Gb/s
1-port 10GE, 10-port GE IMM-b	<ul style="list-style-type: none"> <li>• 1 x SFP+ 10GE</li> <li>• 10 x SFP 100/1000 Mb/s</li> </ul>	Up to 20 Gb/s

<sup>1</sup> 7210 SAS-R12 supports twelve 100GE cards. 7210 SAS-R6 supports two 100GE cards.

Table 3. 7210 SAS-Mxp, SAS-T

The 7210 SAS-Mxp and SAS-T are multi-purpose access and aggregation routers. The SAS-Mxp provides deep buffering and enhanced service scale. The SAS-T is a cost effective model with support for PBB and MPLS-TP.

	<b>7210 SAS-Mxp (3 variants: normal, extended temperature range (ETR), and conformal coated -48 V DC ETR)</b>	<b>7210 SAS-T (2 variants: normal and ETR)</b>
System throughput Half duplex IMIX traffic	128 Gb/s wire speed	124 Gb/s wire speed
Network transport	IP/MPLS/segment routing/Ethernet	IP/MPLS/Ethernet
Interfaces (excluding modules)	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 22 x SFP 100/1000 Mb/s</li> <li>• 2 x Combo SFP or RJ.5 100/1000 Mb/s</li> </ul>	<ul style="list-style-type: none"> <li>• 4 x XFP 10GE</li> <li>• 12 x SFP 100/1000 Mb/s</li> <li>• 10 x RJ-45 10/100/1000 Mb/s</li> </ul>
Timing and synchronization	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2                             <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP and Ethernet encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1 and G.8275.1</li> </ul> </li> <li>• 2 x BITS/ToD<sup>1</sup>, 1PPS out, 10 MHz out</li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2                             <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1</li> </ul> </li> <li>• 2 x BITS/ToD<sup>1</sup>, 1PPS out, 10 MHz out</li> </ul>
POE/PoE+	ETR variant: 2 ports with 60 W of power maximum	ETR variant: 4 ports with 60 W of power maximum
Extended buffering and shaping	Egress 192 MB buffer	Egress 2 MB buffer
Optical 1830 VWM Passive filter management support	Yes (using the OMC port)	Yes (using the OMC port)
Optical Management Connection (OMC)	Yes	Yes
Dimensions	<ul style="list-style-type: none"> <li>• Height: 6.7 cm (2.64 in) 1.5RU</li> <li>• Width: 43.6 cm (17.17 in)</li> <li>• Depth: 25.3 cm (9.96 in)</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 6.7 cm (2.64 in) 1.5RU</li> <li>• Width: 43.6 cm (17.17 in)</li> <li>• Depth: 25.3 cm (9.96 in)</li> </ul>
Power supply options	<ul style="list-style-type: none"> <li>• Two feeds. Modular AC and DC power supplies</li> <li>• Supports concurrent use of AC and DC power supplies</li> <li>• Conformal coated ETR variant uses -48 V DC power on both feeds</li> </ul>	<ul style="list-style-type: none"> <li>• Two feeds. Modular AC and DC power supplies</li> <li>• Supports concurrent use of AC and DC power supplies</li> </ul>
Power requirements	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz; (ETR and non-ETR rated variants available)</li> <li>• DC input: -36 V DC to -72 V DC; (ETR and non-ETR rated variants available)</li> <li>• DC input: +20 V DC to +28 V DC; (ETR rated)</li> <li>• ETR variant requires a 200 W power supply</li> </ul>	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz; (ETR and non-ETR rated variants available)</li> <li>• DC input: -36 V DC to -72 V DC; (ETR and non-ETR rated variants available)</li> <li>• DC input: +20 V DC to +28 V DC; (ETR rated)</li> <li>• ETR variant requires a 200 W power supply</li> </ul>
Cooling	<ul style="list-style-type: none"> <li>• Fan cooled with right-to-left air flow</li> <li>• Hot-swappable fan tray</li> </ul>	<ul style="list-style-type: none"> <li>• Fan cooled with right-to-left air flow</li> <li>• Hot-swappable fan tray</li> </ul>
Temperature operating range	<ul style="list-style-type: none"> <li>• Normal: 0°C to 50°C (32°F to 122°F)</li> <li>• ETR: -40°C to 65°C (-40°F to 149°F)</li> </ul>	<ul style="list-style-type: none"> <li>• Normal: 0°C to 50°C (32°F to 122°F)</li> <li>• ETR: -40°C to 65°C (-40°F to 149°F)</li> </ul>

<sup>1</sup> ToD is a future software deliverable

Table 4. SAS-S series models

The 7210 SAS-S series IP/MPLS platforms may be used in standalone mode to function the same as other 7210 SAS models. Alternatively, they can be used in satellite mode as port extenders for the 7750 Service Router, 7450 Ethernet Service Switch (ESS) and 7950 Extensible Routing System (XRS) series products. For more information on their satellite capabilities, please see the Nokia 7210 SAS-S series satellite datasheet.

The 7210 SAS Sx 1/10 GE model is similar to the 7210 SAS S but it is fully NEBS compliant with side-to-back airflow. It has two modular power supplies, supporting DC and AC at the same time, and has additional timing capabilities.

The 7210 Sx/S 1/10GE models use stacking ports to provide a virtual chassis capability. This provides a cost-effective solution for modular growth and redundant control.

	<b>7210 SAS-S 1/10GE (10 variants based on interfaces, PoE, and power supply)</b>	<b>7210 SAS-Sx 1/10GE (6 variants based on interfaces and PoE)</b>	<b>7210 SAS-Sx 10/100GE (2 variants based on interface)</b>
System throughput Half duplex IMIX traffic	<ul style="list-style-type: none"> <li>• 176 Gb/s on 48-port variants</li> <li>• 128 Gb/s on 24-port variants wire speed</li> </ul>	<ul style="list-style-type: none"> <li>• 176 Gb/s on 48-port variants</li> <li>• 128 Gb/s on 24-port variants wire speed</li> </ul>	2.08 Tb/s wire speed
Network transport	IP/MPLS/Ethernet	IP/MPLS/Ethernet	IP/MPLS/Ethernet
Interfaces	See table 5 for details on SAS-S series variants.		
Timing and synchronization	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2 Transparent Clock (TC)<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2                             <ul style="list-style-type: none"> <li>- BC, OC-slave, TC</li> <li>- UDP/IP encapsulation</li> <li>- Profiles: IEEE 1588v2 default, ITU-T G.8265.1</li> </ul> </li> <li>• 1PPS</li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2                             <ul style="list-style-type: none"> <li>- BC<sup>1</sup>, OC-Slave<sup>1</sup>, TC</li> </ul> </li> <li>• 1PPS<sup>1</sup></li> </ul>
Stacking ports	2	2	2 <sup>1</sup>
POE/PoE+	See table 5 for details on SAS-S series variants.		
Dimensions	<ul style="list-style-type: none"> <li>• Height: 4.32 cm (1.7 in) 1RU</li> <li>• Width: 44 cm (17.3 in)</li> <li>• Depth: 38.7 cm (15.2 in)</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 4.37 cm (1.72 in) 1RU</li> <li>• Width: 43.94 cm (17.3 in)</li> <li>• Depth: 40.61 cm (15.99 in)</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 6.6 cm (2.6 in) 1.5RU</li> <li>• Width: 44 cm (17.3 in)</li> <li>• Depth: 45 cm (17.7 in)</li> </ul>
Power supply options	<ul style="list-style-type: none"> <li>• Two feeds. One fixed internal supply and one optional modular supply</li> <li>• Supports concurrent use of AC and DC power supplies</li> <li>• Hot swappable</li> </ul>	<ul style="list-style-type: none"> <li>• Two feeds. Modular AC and DC power supplies</li> <li>• Supports concurrent use of AC and DC power supplies</li> <li>• Hot-swappable</li> </ul>	<ul style="list-style-type: none"> <li>• Two feeds. Modular AC and DC power supplies</li> <li>• Supports concurrent use of AC and DC power supplies</li> <li>• Hot-swappable</li> </ul>
Power requirements	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -40 V DC to -72 V DC</li> </ul>	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -36 V DC to -72 V DC</li> </ul>	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -40 V DC to -72 V DC</li> </ul>
Cooling	Fan cooled with front-to-back airflow	<ul style="list-style-type: none"> <li>• Fan cooled with side-to-back airflow</li> <li>• Air filters on both sides of the chassis</li> </ul>	<ul style="list-style-type: none"> <li>• Fan cooled with side-to-back airflow</li> <li>• Air filters on both sides of the chassis</li> </ul>
Temperature operating range	0°C to 40°C (32°F to 104°F)	0°C to 50°C (32°F to 122°F)	0°C to 50°C (32°F to 122°F)

<sup>1</sup> Future software deliverable



Table 5. SAS-S series variants

The interface specifications and other orderable features for each SAS-S series variant are listed below.

Identifier	Interface	PoE
7210 SAS-S 1/10GE 48-port fiber AC	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 48 x SFP 100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 48-port fiber DC	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 48 x SFP 100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 24-port fiber AC	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 24 x SFP 100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 24-port fiber DC	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 24 x SFP 100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 48-port copper AC	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE<sup>1</sup></li> <li>• 48 x RJ-45 10/100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 48-port copper AC PoE	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 48 x RJ-45 10/100/1000 Mb/s</li> </ul>	720 W maximum
7210 SAS-S 1/10GE 48-port copper DC	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 48 x RJ-45 10/100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 24-port copper AC	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 24 x RJ-45 10/100/1000 Mb/s</li> </ul>	
7210 SAS-S 1/10GE 24-port copper AC PoE	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 24 x RJ-45 10/100/1000 Mb/s</li> </ul>	720 W maximum
7210 SAS-S 1/10GE 24-port copper DC	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 24 x RJ-45 10/100/1000 Mb/s</li> </ul>	
7210 SAS-Sx 1/10GE 48-port fiber	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 46 x SFP 100/1000 Mb/s</li> <li>• 2 x combo SFP or RJ-45 10/100/1000 Mb/s</li> </ul>	60 W maximum on combo RJ-45 ports
7210 SAS-Sx 1/10GE 24-port fiber	<ul style="list-style-type: none"> <li>• 4 x SFP+ 10GE</li> <li>• 22 x SFP 100/1000 Mb/s</li> <li>• 2 x combo SFP or RJ-45 10/100/1000 Mb/s</li> </ul>	60 W maximum on combo RJ-45 ports
7210 SAS-Sx 1/10GE 48-port copper	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE<sup>1</sup></li> <li>• 48 x RJ-45 10/100/1000 Mb/s</li> </ul>	
7210 SAS-Sx 1/10GE 48-port copper PoE <sup>2</sup>	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 48 x RJ-45 10/100/1000 Mb/s</li> </ul>	720 W maximum
7210 SAS-Sx 1/10GE 24-port copper	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 24 x RJ-45 10/100/1000 Mb/s</li> </ul>	
7210 SAS-Sx 1/10GE 24-port copper PoE <sup>2</sup>	<ul style="list-style-type: none"> <li>• 4 x SFP+ GE or 10GE</li> <li>• 24 x RJ-45 10/100/1000 Mb/s</li> </ul>	720 W maximum
7210 SAS-Sx 10/100GE QSFP28	<ul style="list-style-type: none"> <li>• 4 x QSFP28<sup>3</sup></li> <li>• 64 x SFP+ GE or 10GE</li> </ul>	

<sup>1</sup> GE support on SFP+ ports is available only in standalone mode.

<sup>2</sup> 7210 SAS-S and SAS-Sx 1/10GE 48-port and 24-port copper PoE variants must use AC power supplies.

<sup>3</sup> Currently 1 x 100GE port is supported without the breakout option.

Table 6. 7210 SAS-K series models

The 7210 SAS-K uses Nokia silicon for programmability, industry-leading features and deep buffering. Programmability extends network longevity. Buffering of bursty customer traffic at demarcation and first aggregation sites enhances network throughput and customer experience.

	SAS-K30 ETR	7210 SAS-K12 (2 variants: normal and ETR)	7210 SAS-K5 (2 variants: normal and ETR)
System throughput Half duplex, IMIX traffic	60 Gb/s wire speed	18 Gb/s wire speed	10 Gb/s wire speed
Network transport	IP/MPLS/segment routing/Ethernet	IP/MPLS/segment routing/Ethernet	Ethernet
Interfaces	<ul style="list-style-type: none"> <li>• 3 x SFP+ 10GE</li> <li>• 8 x Combo SFP/RJ-45 10/100/1000 Mb/s</li> </ul>	<ul style="list-style-type: none"> <li>• 2 x SFP 100/1000 Mb/s</li> <li>• 4 x RJ-45 10/100/1000 Mb/s</li> <li>• 6 x Combo SFP or RJ-45 10/100/1000 Mb/s</li> </ul>	<ul style="list-style-type: none"> <li>• 2 x SFP 100/1000 Mb/s</li> <li>• 2 x RJ-45 10/100/1000 Mb/s</li> <li>• 1 x Combo SFP or RJ-45 10/100/1000 Mb/s</li> </ul>
Timing and synchronization	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2               <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP and Ethernet encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1, G.8275.1</li> </ul> </li> <li>• 1PPS</li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2               <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP and Ethernet encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1, G.8275.1</li> </ul> </li> <li>• 1PPS on ETR variant</li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2               <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1</li> </ul> </li> </ul>
Port-based MACsec	Yes	ETR variant	No
Extended buffering and shaping	Ingress, egress 512 MB buffer	Ingress, egress 64 MB buffer	Ingress, egress 64 MB buffer
IP rating	IP20	7210 SAS-K12: IP50 7210 SAS-K12 ETR: IP20	IP50 (both variants)
Dimensions	<ul style="list-style-type: none"> <li>• Height: 8.8 cm (3.5 in) 2RU</li> <li>• Width: 43.8 cm (17.2 in)</li> <li>• Depth: 25.2 cm (9.9 in)</li> </ul>	7210 SAS-K12: <ul style="list-style-type: none"> <li>• Height: 3.5 cm (1.4 in) 1RU</li> <li>• Width: 29.5 cm (11.6 in)</li> <li>• Depth: 21.8 cm (8.6 in)</li> </ul> 7210 SAS-K12 ETR: <ul style="list-style-type: none"> <li>• Height: 6.6cm (2.6 in) 1.5RU</li> <li>• Width: 33.9cm (13.35in)</li> <li>• Depth: 24.0cm (9.45in - ETSI)</li> </ul>	7210 SAS-K5: <ul style="list-style-type: none"> <li>• Height: 3.5 cm (1.4 in) 1RU</li> <li>• Width: 18.4 cm (7.2 in)</li> <li>• Depth: 21.8 cm (8.6 in)</li> </ul> 7210 SAS-K5 (ETR): <ul style="list-style-type: none"> <li>• Height: 4.1 cm (1.6 in) 1RU</li> <li>• Width: 18.4 cm (7.2 in)</li> <li>• Depth: 21.8 cm (8.6 in)</li> </ul>
Power supply options	<ul style="list-style-type: none"> <li>• Two feeds. Two fixed internal AC power supplies and one fixed internal DC power supply.</li> </ul>	<ul style="list-style-type: none"> <li>• 7210 SAS-K12: One feed. External AC or DC power supply</li> <li>• 7210 SAS-K12 (ETR): Two feeds. External AC or DC power supplies. Supports concurrent use of AC and DC power</li> <li>• AC, -48 V DC and +24 V DC power supplies are available</li> </ul>	<ul style="list-style-type: none"> <li>• 7210 SAS-K5: One feed. External AC or DC power supply</li> <li>• 7210 SAS-K5 (ETR): Two feeds. External AC or DC power supplies. Supports concurrent use of AC and DC power supplies</li> <li>• AC, -48 V DC and +24 V DC power supplies are available for both variants.</li> </ul>
Power requirements	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -18 V DC to -72 V DC</li> </ul>	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -36 V DC to -72 V DC</li> </ul>	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -36 V DC to -72 V DC</li> <li>• DC input: +20 V DC to +28 V DC</li> </ul>
Cooling	Passive cooling	Passive cooling	Passive cooling
Temperature operating range	-40°C to +65°C (-40°F to +149°F)	<ul style="list-style-type: none"> <li>• 7210 SAS-K12: 0°C to 40°C (32°F to 104°F)</li> <li>• 7210 SAS-K12 (ETR): -40°C to +65°C (-40°F to +149°F)</li> </ul>	<ul style="list-style-type: none"> <li>• 7210 SAS-K: 0°C to 40°C (32°F to 104°F)</li> <li>• 7210 SAS-K (ETR): -40°C to +65°C (-40°F to +149°F)</li> </ul>

Table 7. 7210 SAS-D-series models

The 7210 SAS-D-series models are cost-effective CE2.0-compliant, Ethernet access devices used for demarcation, business and wholesale services.

	7210 SAS-Dxp (2 variants: normal and ETR)	7210 SAS-D (2 variants: normal and ETR)
System throughput Half duplex, IMIX traffic	60 Gb/s wire speed	20 Gb/s wire speed
Network transport	Ethernet	Ethernet
Interfaces	<ul style="list-style-type: none"> <li>• 2 x SFP+ 1/10GE</li> <li>• 4 x SFP 100/1000 Mb/s</li> <li>• 6 x RJ-45 10/100/1000 Mb/s</li> </ul>	<ul style="list-style-type: none"> <li>• 6 x SFP 100/1000 Mb/s</li> <li>• 4 x RJ-45 10/100/1000 Mb/s</li> </ul>
Timing and synchronization are available on ETR variants	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC<sup>1</sup></li> <li>• IEEE 1588v2<sup>1</sup></li> </ul>	<ul style="list-style-type: none"> <li>• ITU-T SyncE with ESMC</li> <li>• IEEE 1588v2                             <ul style="list-style-type: none"> <li>– BC, OC-slave</li> <li>– UDP/IP encapsulation</li> <li>– Profiles: IEEE 1588v2 default, ITU-T G.8265.1</li> </ul> </li> </ul>
IP rating	IP50	IP20
Dimensions	<ul style="list-style-type: none"> <li>• Height: 4.32 cm (1.70 in.) 1RU</li> <li>• Width: 26 cm (10.23 in.)</li> <li>• Depth: 23.5 cm (9.25 in.)</li> </ul>	<ul style="list-style-type: none"> <li>• Height: 4.28 cm (1.69 in) 1RU</li> <li>• Width: 26.5 cm (10.43 in)</li> <li>• Depth: 17.5 cm (6.89 in)</li> </ul>
Power supply options	<ul style="list-style-type: none"> <li>• 7210 SAS-Dxp: One feed. Fixed internal AC or DC power supply.</li> <li>• 7210 SAS-Dxp (ETR): Two feeds. One fixed internal AC or DC power supply and one external AC or DC power supply</li> </ul>	<ul style="list-style-type: none"> <li>• 7210 SAS-D: One feed. Fixed internal AC or DC power supply</li> <li>• 7210 SAS-D (ETR): Two feeds. One fixed internal AC or DC power supply and one external AC or DC power supply</li> </ul>
Power requirements	<ul style="list-style-type: none"> <li>• AC input: 100 V to 250 V, 50 Hz to 60 Hz</li> <li>• DC input: -36 V DC to -72 V DC</li> <li>• Redundant DC input: +12 V DC (ETR variant only)</li> </ul>	<ul style="list-style-type: none"> <li>• AC input: 100 V to 240 V, 50 Hz to 60 Hz</li> <li>• DC input: -36 V DC to -72 V DC</li> <li>• DC input: +20 V DC to +28 V DC (ETR variant only)</li> </ul>
Cooling	Fanless	<ul style="list-style-type: none"> <li>• Internal fan for air temperature regulation, not cooling</li> <li>• Default is off</li> </ul>
Temperature operating range	<ul style="list-style-type: none"> <li>• 7210 SAS-Dxp: 0°C to 40°C (32°F to 104°F)</li> <li>• 7210 SAS-Dxp (ETR): -40°C to 65°C (-40°F to 149°F)</li> </ul>	<ul style="list-style-type: none"> <li>• 7210 SAS-D: 0°C to 40°C (32°F to 104°F)</li> <li>• 7210 SAS-D (ETR): -40°C to 65°C (-40°F to 149°F)</li> </ul>

<sup>1</sup> Future software capability

## Technical specifications<sup>1</sup>

### Environmental specifications

- ATT-TP-76200
- ETSI EN 300 019-2-1 Storage
- ETSI EN 300 019-2-2 Transportation
- ETSI EN 300 019-2-3 Operational
- ETSI EN 300 753 Acoustic Noise
- GR-63-CORE
- VZ.TPR.9205
- RoHS 6/6 design

### Safety

- IEC/EN 60825-1
- IEC/EN 60825-2
- AS/NZS 60950-1
- IEC/EN/UL/CSA 60950-1 Ed2
- AS/NZS 62368-1 (7210 SAS-K12[ETR])
- IEC/EN/UL/CSA 62368-1 Ed2 (7210 SAS-K12[ETR])

### Electromagnetic compatibility

- AS/NZS CISPR 22 Class A (7210 SAS-T and 7210 SAS-D)
- AS/NZS CISPR 32 Class A
- BSMI CNS13438 Class A
- BT GS-7
- EN 55022
- EN 55024
- EN 55032 Class A
- ETSI EN 300 132-2 (LVDC)
- ETSI EN 300 132-3 (AC) (7210 SAS-S series, SAS-K series, SAS-Dxp)
- ETSI EN 300 386
- ETSI ES 201 468

- FCC Part 15 Class A
- GR-1089-CORE
- ICES-003 Class A
- IEC CISPR 22
- IEC CISPR 24
- IEC CISPR 32 Class A
- IEC/EN 61000-3-2 Power line harmonics
- IEC/EN 61000-3-3 Voltage fluctuations
- IEC/EN 61000-4-2 ESD
- IEC/EN 61000-4-3 Radiated Immunity
- IEC/EN 61000-4-4 EFT
- IEC/EN 61000-4-5 Surge
- IEC/EN 61000-4-6 Conducted Immunity
- IEC/EN 61000-4-11 Voltage Interruptions
- IEC/EN 61000-6-2 Industrial
- IEC/EN 61000-6-4
- KCC Korea-Emission & Immunity (in accordance with KN32/KN35)
- VCCI Class A

### Wireless

- (7210 SAS-Sx 1/10GE, SAS-Sx 10/100GE)
- ETSI EN 301 489-1
  - ETSI EN 301 489-17 (Bluetooth)
  - KN 301 489-1
  - KN 301 489-17 (Bluetooth)

### Power utility substations

- IEC 61850-3
- IEEE 1613

### Railway

- EN 50121-4
- IEC 62236-4

<sup>1</sup> System design intent is according to the listed standards. Certifications vary on different models. Certifications applicable to only one or two models are noted. Refer to product documentation for detailed compliance status.



## Directives, regional approvals and certifications

- DIRECTIVE 2011/65/EU RoHS
- DIRECTIVE 2012/19/EU WEEE
- DIRECTIVE 2014/30/EU EMC
- DIRECTIVE 2014/35/EU LVD
- DIRECTIVE 2014/53/EU RED  
(7210 SAS-Sx 1/10GE, SAS-Sx 10/100GE)
- NEBS Level 3
- Australia - RCM Mark
- China RoHS – CRoHS
- Europe – CE Mark
- Japan – VCCI Mark
- South Korea – KC Mark

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