Nokia 7250 IXR-6e/IXR-10e Interconnect Routers for SR Linux

Release 22

As part of the Nokia Data Center Fabric solution, the Nokia 7250 IXR-6e/IXR-10e Interconnect Routers for SR Linux are differentiated, modular platforms designed for data center spine and WAN deployments. These platforms deliver massive scalability, flexibility and operations simplicity for webscale, communications service provider, enterprise data center and cloud environments.

Overview

The Nokia Data Center platforms include the Nokia 7250 IXR-6e/IXR-10e, the Nokia 7250 IXR-6/IXR-10, the Nokia 7220 IXR-H series and the Nokia 7220 IXR-D series Interconnect Routers. All of these platforms run the Nokia Service Router Linux (SR Linux) network operating system (NOS). This data sheet discusses the 7250 IXR-6e and 7250 IXR-10e, referred to collectively as the 7250 IXR-6e/10e hereafter.

Data centers require highly scalable, modular, reliable platforms that are designed to support high-speed interfaces for current and future data center network buildouts. These platforms must also support a comprehensive set of features that enable flexible interconnectivity within and across data centers.

The Nokia 7250 IXR-6e/10e is a high-performance, high-density, modular platform designed for data center spine and WAN deployments. It offers hardware support for 400GE, 100GE, 40GE, 25GE and 10GE interfaces for intra-fabric and server connectivity.

The 7250 IXR-6e/10e delivers a robust and comprehensive set of capabilities, including IP routing, Layer 2 Ethernet, QoS, MPLS, segment routing, router security, scalable telemetry and model-driven programmability. Flexible traffic management includes big buffering, per-port queuing and shaping.
The 7250 IXR-6e is a four-line card-slot platform supporting a system capacity up to 115.2 Tb/s with current-generation line cards. The 7250 IXR-10e is an eight-line card-slot platform supporting a system capacity up to 230.4 Tb/s with current-generation line cards.

Current-generation line cards are based on the current generation of application-specific integrated circuits (ASICs).

**Features and benefits**

The Nokia 7250 IXR-6e/10e delivers massive scalability, very high performance and flexibility, enabling rapid deployment and easy adaptation to evolving data center and cloud environments.

In addition to supporting fully redundant control, fabric, fan and power configurations, these platforms support industry-leading and unique hardware design innovations and capabilities, including:

- High-quality, midplane-less, orthogonal direct cross-connect—a critical design element to successfully move to future faster SERDES speeds and beyond
- Capacity expandable to future silicon, achieved via a focus on the latest high-capacity merchant silicon
- Fabric-optimized design, ensuring upgradability for tomorrow balanced with superior efficiency today
- Power- and cooling-optimized design
- Support for 400GE ZR (extended reach) optics in all pluggable optics positions without compromise.

These leading hardware design attributes combined with a full suite of SR Linux software features and the Nokia Fabric Services System operations and automation toolkit help data center and cloud teams to achieve their high availability design and operations efficiency goals.

**Nokia Service Router Linux**

Nokia Service Router Linux (SR Linux) is a Linux®-based open, extensible and consumable NOS that enables scalability, flexibility and efficiency in data center and cloud environments. The Nokia 7250 IXR-6e/10e platforms implement Nokia SR Linux.

SR Linux is a key component of the Nokia Data Center Fabric solution, which also includes the Nokia Fabric Services System and the Nokia Data Center platforms.

**Ground-up, model-driven architecture delivers extensibility**

In cloud-scale data center networks, the primary challenges are scalability and ease of operations. SR Linux is designed, from the ground up, with a management architecture that meets the demands of a model-driven world where visibility—and the scalability and granularity of that visibility—are paramount.

SR Linux features a completely model-driven architecture for flexible and simplified management and operations. An extensible and open infrastructure allows applications to define and declare their own schemas, enabling the retrieval of fine-grained system state and setting of configuration.

**Modular, state-sharing architecture**

SR Linux uses an unmodified Linux kernel as the foundation on which applications share state via a publish/subscribe (pub/sub) architecture. The Nokia pub/sub architecture is implemented using generalized Remote Procedure Call (gRPC), protocol buffers (protobufs) and the Nokia Impart Database (IDB).

The Nokia IDB is a lightweight database that is optimized to handle high volumes of messages while protecting against any one application slowing down the whole system.

**Field-proven protocol stacks**

SR Linux leverages field-proven protocol stacks from the Nokia Service Router Operating System (SR OS), which has a strong pedigree in IP routing.
Webscale, service provider and enterprise data centers are increasingly adopting leaf-spine fabric designs using enhanced IP routing with Multiprotocol-Border Gateway Protocol (MP-BGP), Ethernet VPN (EVPN) and Virtual Extensible LAN (VXLAN) protocols. By using field-proven protocol stacks, data center operators can immediately benefit from the stability, scalability and interoperability of a resilient NOS.

**Superior CLI programmability and integration of third-party applications**

Operators can leverage command line interface (CLI) plugins to completely customize the way the CLI operates, plugging in Linux commands or pulling the state/configuration from various locations, combining them with system state/configuration to allow advanced logic.

SR Linux allows third-party applications to be fully integrated into the system and given all the same benefits as Nokia applications. This includes consistent configuration via YANG, telemetry support, life cycle management and visibility of system resources.

SR Linux offers a state-of-the-art NetOps Development Kit (NDK) for data center teams to develop new applications and operational tools in the language of their choice with deep programmatic access to, and control of, the entire system.

**Nokia Fabric Services System**

The Nokia Fabric Services System offers a comprehensive operations and automation toolkit that delivers agile and scalable network operations for data center and cloud environments.

**Scalable automation for all phases of data center fabric operations**

The Fabric Services System implements intent-based approaches to simplify all phases of data center fabric operations, including Day 0 design, Day 1 deployment and Day 2+ configuration, operation, measurement and analysis.

The system uses the Kubernetes framework and benefits from an established open platform instead of reinventing key platform components. All fabric services use a distributed microservices approach, allowing Nokia to deliver a true cloud-native platform for automation and operations.

**Digital Sandbox**

The Fabric Services System delivers a cloud-native Digital Sandbox that is a true emulation of a single data center router as a containerized SR Linux (cSR Linux) instance and a fabric of multiple cSR Linux instances. The Digital Sandbox as an operational tool is capable of emulating a data center fabric, application workloads and external BGP speakers.

**Setting up the data center fabric with intent-based approaches**

The Fabric Services System allows operators to represent the design and configuration of the data center fabric in an intent-based declarative way. This approach provides a strong NetOps foundation that leverages DevOps principles and fits into the bigger movement toward infrastructure as code (IaC).

Design intent, fabric intent and workload intent can be validated on the Fabric Services System Digital Sandbox, allowing operations teams to manage the risk of a change confidently and quickly. The Digital Sandbox allows the operator to first try out the changes on the virtual platform, where detailed validations can be performed, and then apply the changes to the production network.

**Fabric operations**

After the data center fabric is designed and deployed, the Day 2+ operations phase begins. Because new workloads can still be created during this phase, workload intent can also be leveraged here. Other types of intent are also supported in this phase, including design intent, maintenance intent, topology intent and deviation intent. These intents allow the network operator to define, in an abstract manner, the desired end state of the fabric.

The Fabric Services System combines design intent with all the telemetry data collected from the fabric and presents the data in a context relevant to the
operational task. These contextual views combined with the Digital Sandbox enable the operations team to deliver agility with confidence and removes the barriers between cross-functional teams.

**Fabric integrations**
The Fabric Services System enables a flexible, cloud-native approach for external integrations, resulting in faster, customized integration in customer environments. The system can be integrated with compute virtualization, storage solutions, in-house operational tools and cloud environments.

The cloud-native integration model enables data center teams to develop their integrations in a loosely coupled manner that fits into a standard Kubernetes framework.

**Software features**
The 7250 IXR-6e/10e supports, but is not limited to, the following SR Linux software features.

For additional details about SR Linux, including NOS architecture and differentiators, see the Nokia Service Router Linux data sheet.

**Open Linux support**
- Support for unmodified Linux kernel
- Access to Linux tools, patching and packaging
- Containerized SR Linux
- Linux control groups (cgroupsv2)
- Dynamic TCAM table allocation

**Layer 2 features**
- Dot1q and untagged sub-interfaces
- Ethernet IEEE 802.1Q (VLAN) with support for jumbo frames
- Link aggregation: Link Aggregation Group (LAG) and Link Aggregation Control Protocol (LACP)
- Link Layer Discovery Protocol (LLDP) on all interfaces

**Layer 3 features**
- IPv4/v6 routing
- BGP with iBGP/eBGP: Support for IPv4/v6, including:
  - Core Prefix Independent Convergence (PIC)
  - 4-byte autonomous system number
  - Route reflector
  - Dynamic BGP
  - BGP unnumbered
  - eBGP multi-hop
- IS-IS v4/v6
- Open Shortest Path First (OSPFv2 and OSPFv3)
- Static routes for IPv4/v6
- Equal cost multi-path (ECMP) with consistent and resilient hashing and configurable hash fields
- IPv6 flow label hashing
- VRF: Multiple VRF support
- Maintenance modes
- Bidirectional forwarding detection (BFD), micro BFD (mBFD)
- Interfaces: Loopback interfaces
- Routing policy:
  - Structured rules for accepting, rejecting and modifying routes that are learned and advertised to routing peers
  - Routes can be matched based on prefix lists, autonomous system (AS) path regular expressions, BGP communities, Address Family Indicator/Subsequent Address Family Indicator (AFI/SAFI) protocol, etc.
- Layer 3/Layer 4 access control lists (ACLs) with validation; accept, reject and log actions
**MPLS and segment routing (SR)**
- Interface LDP over IPv4
- SR-ISIS over IPv4/v6
- BGP shortcuts over LDP
- BGP shortcuts over SR-ISIS
- MPLS QoS via EXP to forwarding class mapping
- MPLS ACL filters
- ICMP tunneling
- ICMP extensions for MPLS

**QoS**
- Intelligent packet classification, including IPv4 and IPv6 match-criteria-based classification
- Queuing/scheduling:
  - Strict priority
  - Weighted round robin (WRR)
  - Weighted Random Early Detection (WRED)
  - Explicit Congestion Notification (ECN)
- QoS classification and marking based on DiffServ Code Point (DSCP)

**System management and automation**
- Native model-driven architecture, configuration candidates, exclusive mode, checkpoints and rollbacks
  - Support for SR Linux and OpenConfig data models
- Management interfaces: gNMI, JSON-RPC, CLI (transactional, Python CLI, CLI plugins)
- gRPC network operations interface (gNOI)
- P4 runtime packet extraction and injection
- Per-user configurable options for CLI
- Local Authentication, Authorization and Accounting (AAA) with Role Based Access Control (RBAC)
- Terminal Access Controller Access Control System (TACACS+) AAA
- Password complexity policies and lockout management
- Access to common Linux utilities: Bash, cron and Python
- Telemetry
  - Subscription-based telemetry for modeled data structures, either on change or sampled
  - sFlow
  - Logging infrastructure
- Telemetry-driven event management
- Python-based Zero Touch Provisioning (ZTP)
- Address management: Dynamic Host Configuration Protocol (DHCP) v4/v6 relay
- DHCP v4/v6 server with static allocations
- Interactive mirroring
- NetOps Development Kit (NDK):
  - gRPC and protobuf-based interface for tight integration
  - Leverages SR Linux model-driven architecture
  - Direct access to other application functionality, e.g., forwarding information base (FIB), LLDP and BFD
  - Native support for streaming telemetry

**Resiliency**
- Support for redundant fan and power configurations in data center hardware platforms
- Support for hot-swappable, redundant control and fabric modules

**Security**
- Distributed and aggregated ACLs and policers for control and management plane
- IPv6 router advertisements guard
- MAC security (MACsec)\(^1\)

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\(^1\) Future software release
Hardware overview
The Nokia 7250 IXR-6e/10e platform delivers massive scalability, openness, aggregation and inter-connectivity for data center and cloud environments.

Modular and high-availability platforms
The 7250 IXR-6e and IXR-10e share common control processor modules (CPMs), integrated media module (IMM) cards and power supply units (PSUs).
The 7250 IXR-6e/10e sets the benchmark for high availability, supporting a full suite of 1+1 control, 7+1 fabric, redundant fan and redundant power configurations.

Each chassis uses an orthogonal direct cross-connect architecture without a midplane or series of midplane connectors, which can permanently limit a chassis to a single generation of ASICs. The lack of a backplane, midplane or midplane connector system provides a compact chassis design, optimal cooling and easy capacity upgrades.

The system configuration allows for IMMs connecting in front and switch fabrics and fans connecting at the rear. Fans and switch fabrics are decoupled to ensure that fan failures never result in packet loss if a fan fails and needs replacement.

The system uses a complete Faraday Cage design for EMI containment, a critical requirement for evolution to next-generation ASICs. This design is realized via a unique mesh air intake and exhaust system that mitigates against EMI and also provides vastly superior faceplate openness, allowing for more air in and out of a system compared to classic holes punched in bent metal. This design creates a unique cooling advantage for the 7250 IXR-6e/10e compared to classic data center cooling.

An eight-switch fabric module (SFM) design instead of a six-SFM design reduces overall power consumption because an eight-SFM design uses fewer fabric ASICs. Overall trace length is equally reduced and resiliency is improved. This design provides an upgradable path to future-generation ASICs.

The 7250 IXR-6e/10e platforms support two SFM configurations to flexibly address 100GE and 400GE needs in the most power-efficient way possible.

Switch Fabric Module (SFM1)
The SFM1 is optimized for high-density 100GE data center leaf-spine designs. Using an 8+0 switch fabric design with graceful degradation for the IXR-10e only, the system supports line rate 100GE line cards in all slots and line rate 400GE line cards in the top two slots of the 7250 IXR-10e chassis. This configuration delivers ultimate power efficiency for 100G aggregation in ways that a six-SFM configuration cannot approach.

Switch Fabric Module (SFM2)
The SFM2 is optimized for high-density 400GE data center leaf-spine designs. For both the IXR-6e and IXR-10e, the SFM2 supports a 7+1 switch fabric configuration for full fabric redundancy with graceful degradation. The SFM2 supports line rate 400GE and 100GE line cards in all slots.

Control Processor Module (CPM4)
The CPM4 features a multi-core x86e CPU that delivers control plane scalability and performance—a key requirement for data center leaf-spine designs.

The 7250 IXR-6e/10e supports dual-redundant CPMs and a fully distributed control infrastructure with dedicated CPUs per line card. Compared to single monolithic control plane systems, this distributed architecture provides optimized control plane processing without any detrimental impacts to the central CPM during system maintenance, IMM commissioning and heavy traffic loads. The distributed architecture also improves system security.

The CPM4 supports an integrated 120G SSD, a discrete trusted platform module and is designed to meet all demanding performance benchmarks.
Integrated Media Module (IMM)

IMMs are line cards providing integrated processing and physical interfaces on a single module. IMMs are hot-swappable and provide high-capacity Ethernet interfaces with full duplex (FD) per-slot performance up to 14.4 Tb/s.

All IMMs natively support line rate MACsec and IPsec in hardware without the need to purchase specific part numbers, which complicates deployments and sparing.

With support for a 36-port QSFP-DD 400GE IMM and a 60-port QSFP28 100GE IMM, a full range of densities are available. Hardware breakout on the 60-port 100GE IMM is also industry leading without the same trade-offs that come with lower density 100GE competitor line cards.

Power Supply Units (PSUs)

The 7250 IXR-6e and IXR-10e platforms support up to nine and twelve PSUs respectively, allowing for full N+N power supply redundancy along with full power feed redundancy. In contrast to systems with fewer power supplies, the 7250 IXR-6e/10e provides added room for power growth to support system enhancements with next-generation ASICs.

Two PSU variants are available: a 3KW DC PSU and a 3KW AC PSU. The PSUs are fully interchangeable between the chassis variants. Each individual PSU supports dual-feed inputs.

Learn more

To learn more about the Data Center Fabric solution, see the web page.

Technical specifications

Table 1. 7250 IXR-6e/IXR-10e specifications

<table>
<thead>
<tr>
<th>Feature</th>
<th>7250 IXR-6e</th>
<th>7250 IXR-10e</th>
</tr>
</thead>
<tbody>
<tr>
<td>System throughput: Half duplex (HD)</td>
<td>Up to 115.2 Tb/s with current-generation cards</td>
<td>230.4 Tb/s with current-generation cards</td>
</tr>
<tr>
<td>Switch fabric capabilities</td>
<td>• Single-stage fabric with graceful degradation</td>
<td></td>
</tr>
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<td></td>
<td>• Separate fan module from switch fabric</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Orthogonal direct cross-connect</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Design that minimizes trace length</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Ultra-efficient configuration focused on upgradability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• 8-SFM design for enhanced resiliency</td>
<td></td>
</tr>
<tr>
<td>Maximum IMM throughput per slot (FD)</td>
<td>14.4 Tb/s with current-generation IMMs</td>
<td>14.4 Tb/s with current-generation IMMs</td>
</tr>
<tr>
<td>IMM slots</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Fabric slots</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>PSU slots</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Control interfaces</td>
<td>Console, management, Bluetooth, USB, SD slot</td>
<td>Console, management, Bluetooth, USB, SD slot</td>
</tr>
<tr>
<td>Memory buffer size</td>
<td>Per card (see Table 2)</td>
<td>Per card (see Table 2)</td>
</tr>
<tr>
<td>Redundant hardware</td>
<td>• Dual redundant CPMs</td>
<td>• Dual redundant CPMs</td>
</tr>
<tr>
<td></td>
<td>• Switch fabric redundancy (7+1)</td>
<td>• Switch fabric redundancy (8+0/7+1)</td>
</tr>
<tr>
<td></td>
<td>• Power redundancy (N+N)</td>
<td>• Power redundancy (N+N)</td>
</tr>
<tr>
<td></td>
<td>• Fan redundancy (N+1)</td>
<td>• Fan redundancy (N+1)</td>
</tr>
<tr>
<td>Dimensions</td>
<td>• Height: 44.50 cm (17.5 in); 10 RU</td>
<td>• Height: 71.00 cm (28.0 in); 16 RU</td>
</tr>
<tr>
<td></td>
<td>• Width: 48.30 cm (19.0 in)</td>
<td>• Width: 48.50 cm (19.0 in)</td>
</tr>
<tr>
<td></td>
<td>• Depth: 92.20 cm (36.3 in)</td>
<td>• Depth: 92.20 cm (36.3 in)</td>
</tr>
<tr>
<td></td>
<td>• Fits in standard 19-in rack</td>
<td>• Fits in standard 19-in rack</td>
</tr>
</tbody>
</table>
## Feature | 7250 IXR-6e | 7250 IXR-10e
--- | --- | ---
**Power** | • 9 PSUs with N+N redundancy | • 12 PSUs with N+N redundancy
 | DC (dual feed): -40 V DC to -72 V DC | DC (dual feed): -40 V DC to -72 V DC
 | AC (dual feed): 200 V AC to 240 V AC, 50 Hz to 60 Hz | AC (dual feed): 200 V AC to 240 V AC, 50 Hz to 60 Hz
 | Front-bottom PSUs and power cabling | Front-bottom PSUs and power cabling

**Cooling** | • 4 trays of 3 ultra-quiet fans | • 4 trays of 6 ultra-quiet fans
 | Fan trays separate from switch fabric | Fan trays separate from switch fabric
 | Mesh air intakes and exhaust for superior air entry and exit | Mesh air intakes and exhaust for superior air entry and exit
 | Safety electronic breaks on removal | Safety electronic breaks on removal
 | Front-to-back airflow | Front-to-back airflow
 | Fan filter door kit (optional) | Fan filter door kit (optional)

| Normal operating temperature range | 0°C to +40°C (32°F to +104°F) sustained | 0°C to +40°C (32°F to +104°F) sustained

| Shipping and storage temperature | -40°C to 70°C (-40°F to 158°F) | -40°C to 70°C (-40°F to 158°F)

| Normal humidity | 5% to 95%, non-condensing | 5% to 95%, non-condensing

Table 2. 7250 IXR-6e/IXR-10e IMM cards

### CPM/IMM Details

<table>
<thead>
<tr>
<th>CPM/IMM</th>
<th>Details</th>
</tr>
</thead>
</table>
| CPM4 | • 8-core x86 at 2.5 GHz CPU  
 | • 2 threads per core  
 | • 32 GB DRAM  
 | • 120 GB SSD  
 | • Bluetooth |

| 36-port 400GE | • 36 x 400GE QSFP56-DD  
 | Native hardware support for 400GE, 100GE and 40GE  
 | Hardware breakout* options for 4 x 100GE, 2 x 100GE, 8 x 50GE, 2 x 50GE, 4 x 25GE and 4 x 10GE  
 | 16 GB packet buffer  
 | 60 GB SSD  
 | 4-core x86 at 2.5 GHz, 16 GB DRAM  
 | Dedicated separate thumb screws and ejectors  
 | Mesh air intakes for superior cooling |

| 60-port 100GE | • 60 x 100GE QSFP28  
 | Native hardware support for 100GE and 40GE  
 | Hardware breakout options* for 2 x 50GE, 4 x 25GE and 4 x 10GE  
 | 8 GB packet buffer  
 | 60 GB SSD  
 | 4-core x86 at 2.5 GHz, 16 GB DRAM  
 | Dedicated separate thumb screws and ejectors  
 | Mesh air intakes for superior cooling |

* Some breakout options require future software support and specific DAC cables.
Table 3. 7250 IXR-6e/IXR-10e maximum chassis density

<table>
<thead>
<tr>
<th>Ethernet speed</th>
<th>7250 IXR-6e</th>
<th>7250 IXR-10e</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GE*</td>
<td>576</td>
<td>1,152</td>
</tr>
<tr>
<td>25GE*</td>
<td>576</td>
<td>1,152</td>
</tr>
<tr>
<td>40GE*</td>
<td>240</td>
<td>480</td>
</tr>
<tr>
<td>50GE*</td>
<td>1,152</td>
<td>2,304</td>
</tr>
<tr>
<td>100GE</td>
<td>576</td>
<td>1,152</td>
</tr>
<tr>
<td>400GE</td>
<td>144</td>
<td>288</td>
</tr>
</tbody>
</table>

* Future software support

Table 4. 7250 IXR-6e/10e IMM scale*

<table>
<thead>
<tr>
<th>IMM scale</th>
<th>60-port QSFP28 IMM</th>
<th>36-port QSFP-DD IMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>10GE</td>
<td>144</td>
<td>144</td>
</tr>
<tr>
<td>25GE</td>
<td>144</td>
<td>144</td>
</tr>
<tr>
<td>40GE</td>
<td>60</td>
<td>36</td>
</tr>
<tr>
<td>50GE</td>
<td>120</td>
<td>288</td>
</tr>
<tr>
<td>100GE</td>
<td>60</td>
<td>144</td>
</tr>
<tr>
<td>400GE</td>
<td>Not applicable</td>
<td>36</td>
</tr>
</tbody>
</table>

| IPsec      | All ports          | All ports           |
| MACsec     | All ports          | All ports           |
| Packet buffer | 8 GB               | 16 GB               |

* The port type and densities listed are dependent on software support.

Standards compliance

**Environmental**
- ATIS-0600015.03
- ATT-TP-76200
- ETSI EN 300 019-2-1; Storage Tests (Class 1.2)
- ETSI EN 300 019-2-2; Transportation Tests (Class 2.3)
- ETSI EN 300 019-2-3; Operational Tests (Class 3.2)
- ETSI EN 300 753 Acoustic Noise (Class 3.2)
- GR-63-CORE
- GR-3160-CORE
- VZ.TPR.9203 (CO)
- VZ.TPR.9205

**Safety**
- AS/NZS 62368.1
- IEC 60529 IP20
- IEC/EN 60825-1
- IEC/EN 60825-2
- IEC/EN/UL/CSA 62368-1 Ed2

**Electromagnetic compatibility**
- AS/NZS CISPR 32 (Class A)
- BSMI CNS13438 (Class A)
- BT GS-7
- EN 300 386
- EN 301 489-1
- EN 301 489-17 (Bluetooth)
- EN 55032 (Class A)
- EN 55035
- ES 201 468
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With our commitment to innovation and technology leadership, driven by the award-winning Nokia Bell Labs, we deliver networks at the limits of science across mobile, infrastructure, cloud, and enabling technologies.

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Document code: 251403 (August) CID212673

• ETSI EN 300 132-1 (AC)
• ETSI EN 300 132-2 (LVDC)
• FCC Part 15 (Class A)
• GR-1089-CORE
• ICES-003 (Class A)
• IEC 61000-3-2
• IEC 61000-3-3
• IEC 61000-6-2
• IEC 61000-6-4
• IEC CISPR 32 (Class A)
• IEC CISPR 35
• 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
• KN 301 489-1
• KN 301 489-17 (Bluetooth)
• KS C 9832 (2019) formerly KN 32
• KS C 9835 (2019) formerly KN 35
• VCCI (Class A)

Radio

• EN 300 328 (Bluetooth)
• FCC Part 15.247 (Bluetooth)
• RSS-GEN
• RSS-247 (Bluetooth)

Directives and regional approvals

• Directive 2012/19/EU WEEE
• Directive 2014/30/EU EMC
• Directive 2014/35/EU LVD
• Directive 2014/53/EU RED
• BSMI Mark: Taiwan
• CE Mark: Europe
• CRoHS: China RoHS
• KC Mark: South Korea
• NEBS Level 3
• RCM Mark: Australia
• VCCI Mark: Japan
• UKCA: United Kingdom