

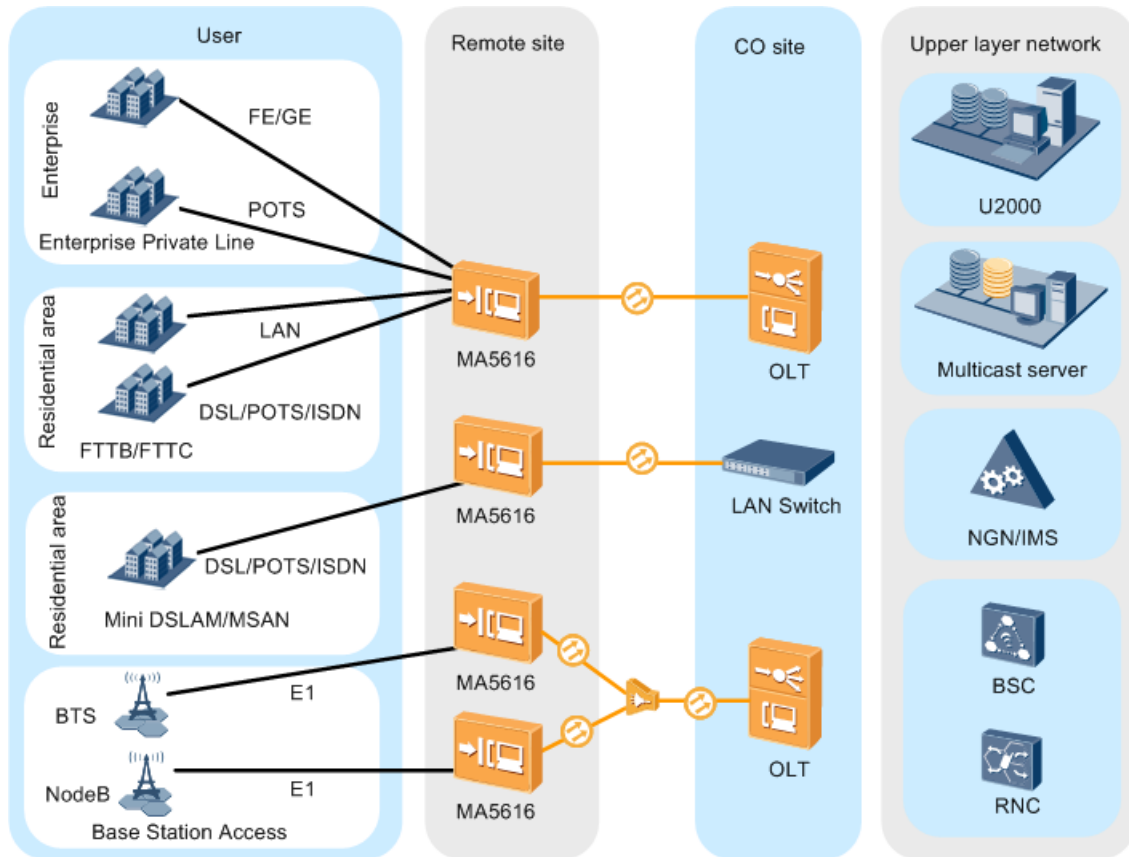
# SmartAX MA5616 Multi-Service Access Module V800R015C00

## Product Overview

The SmartAX MA5616 Multi-service Access Module (MA5616) is a 2-U high and 19-inch wide board-pluggable box-shaped device. It provides ultra-high bandwidths and flexible capacity expansion capabilities. The MA5616:

- Provides the following user ports: ADSL2+, VDSL2, SHDSL, POTS, ISDN, and FE/GE ports.
- Supports GPON/10G GPON/GE upstream transmission modes. It can be used in fiber to the building (FTTB), fiber to the curb (FTTC), and dedicated line access scenarios.
- Can be used as a mini digital subscriber line access multiplexer (DSLAM) or a multiservice access node (MSAN) to provide traditional voice, data, and video services.
- Supports enterprise private line access. Functioning as a single business unit (SBU), the MA5616 provides broadband and POTS services. The CCUB control board does not support the network of this type because it does not support FE or GE access.
- Can connect to 2G or 3G base stations using E1 ports and transmit service data to the OLT in SAToP mode. In base station access scenarios, GPON is used for carrying mobile service data, which meets mobile carriers' requirements for a high bandwidth and high-density coverage of base stations.

One MA5616 or multiple cascaded MA5616s can form a tree network suiting various service requirements. They can also form a Multiple Spanning Tree Protocol (MSTP) network to protect services.



## Product Highlights

### Broadband Rate Increasing Using VDSL2 Vectoring

Broadband rate increasing using vectoring enables the MA5616 to:

- Increase the rate of a multi-pair VDSL2 line by 50% to 90% and therefore increase revenue from each VDSL2 user.
- Provide more service types, such as high definition (HD) TVs, for users, improving user experience.

### 10G GPON Upstream Transmission

- 10G GPON provides a high bandwidth to meet service requirements.
- The 10G GPON transmission complies with ITU-T Recommendation G.987 and ITU-T Recommendation G.988, and provides asymmetric transmission rates of 2.5 Gbit/s in the upstream direction and 10 Gbit/s in the downstream direction.
- 10G GPON networks can coexist with the current GPON networks to fully use the existing optical distribution network (ODN) resources.

### Combo Boards and P2P Board

The combo design enables the MA5616 to support a high user density. Combo boards require less deployment space, wiring workload, and time spent on the main distribution frame (MDF), thereby reducing carriers' construction and maintenance costs.

## Operational Video Service

The MA5616 uses Internet Group Management Protocol version 2 (IGMPv2) or IGMPv3 to provide IPTV, HDTV, and video conferencing services.

## IPv6

The IPv6 feature relieves IP address shortages and is simple to deploy, facilitating smooth service migration from IPv4 networks to IPv6 networks. In addition, IPv6 networks are compatible with IPv4 networks.

## Various Voice Services

- Supports the POTS, fax, modem, ISDN, and R2 services.
- Supports virtual access gateways (VAGs), meeting the requirements of wholesale services or user group-based service management. In addition, the VAGs resolve capacity expansion issues caused by IMS or softswitch capacity limitations.
- Provides the complete SIP ISDN solution, which supports BRA, PRA, R2, and enterprise private line services, basic ISDN call, fax, and data services, and ISDN value-added services.
- Uses the voice quality enhanced (VQE) technology to improve the voice quality, improving user experience.
- Supports dual homing and self-switching, improving voice service reliability.
- Supports TDM G.SHDSL access, which enables new networks to support existing services without replacing user terminals and changing user experience.

## Highly Effective Manageability and Maintainability

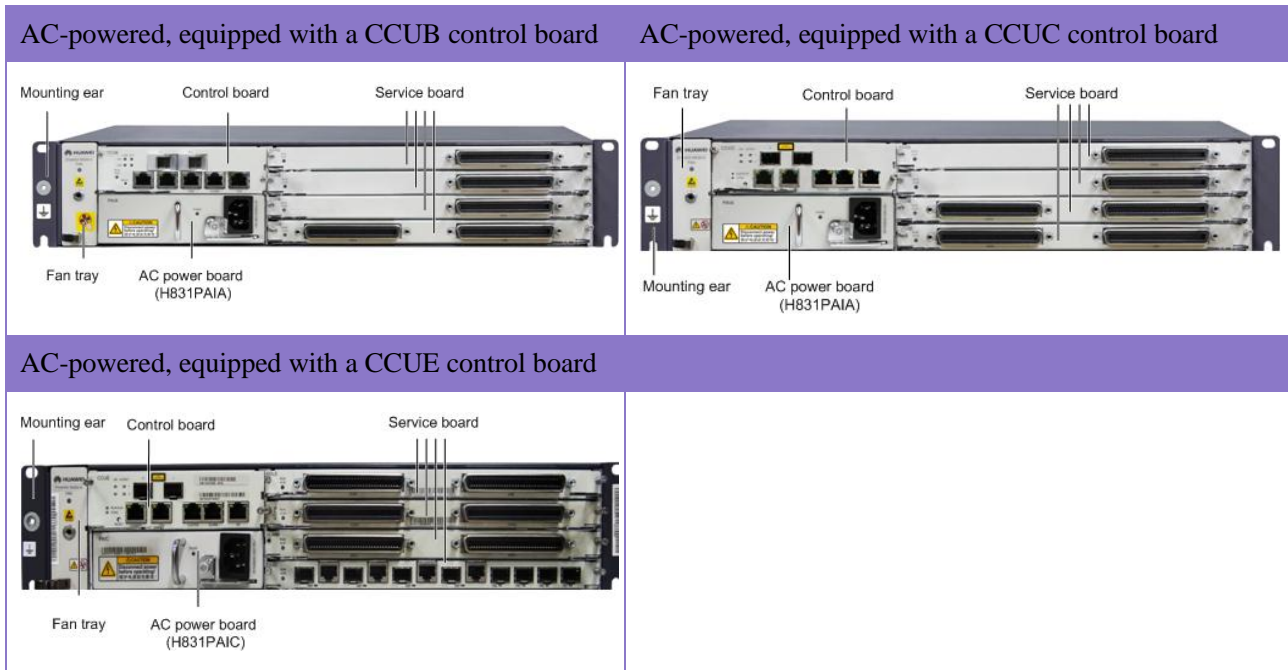
- Is plug and play and supports offline deployment and remote software commissioning.
- Supports remote fault locating, troubleshooting, and batch upgrades.

## Carrier-Class Reliability Design

- Complies with carrier-class reliability specifications.
- Passes the electrostatic discharge (ESD) test.
- Protects user ports, 4 kV in both common and differential modes for DSL, POTS, and ISDN ports.
- Protects power ports:
  - For DC power input: 4 kV in common mode and 2 kV in differential mode
  - For AC power input: 6 kV in both common and differential modes

## Appearance

The MA5616 chassis consists of six board slots and a fan tray. Two mounting ears are equipped for fixing the MA5616 in a cabinet or rack. The preceding figure uses the CCUC control board as an example to show the appearance of the MA5616.



## Hardware Configuration

The MA5616 supports concurrent working of multiple types of service boards. Numbers of various ports are configured flexibly according to actual requirements, increasing the loading rate and meeting diversified customer demands.

Board Type	Abbreviated Name	Function
Control boards	CCUB	Supports the following ports for upstream transmission using the GP1A or GE1A upstream daughter board: <ul style="list-style-type: none"> <li>• GPON port</li> <li>• GE port</li> <li>• One GE cascading port (either optical or electrical)</li> </ul> NOTE "either optical or electrical" means that users can use either the GE0 optical port provided on the daughter board or a GE0 electrical port on the panel for upstream transmission.
	CCUC or CCUE	Supports the following ports for upstream transmission using the UP2A or UP2C upstream daughter board: <ul style="list-style-type: none"> <li>• GPON port</li> <li>• GE port</li> <li>• One GE cascading port (either optical or electrical)</li> </ul>

Board Type	Abbreviated Name	Function
		NOTE "either optical or electrical" indicates that: <ul style="list-style-type: none"> <li>Port 0 and port 1 provided by the daughter board support either GE optical module or electrical module and therefore can function as GE optical or electrical ports.</li> <li>Port 0 provided by the daughter board is an alternative to the GE electrical port on the front panel of the H831CCUC board. Either of the ports can be used each time.</li> </ul> Supports the XP1A upstream daughter board, providing one 10G GPON uplink port.
Service boards	ASRB	Supports VoIP and POTS services.
	ASPB	Supports VoIP and POTS services.
	DSL D	Provides 8 channels for the ISDN service. Four ISDN ports can connect to one base transceiver station (BTS), and each DSL D board can connect to two BTSs.
	ADLE	Provides 32 channels for the ADSL2+ over POTS service and is equipped with a built-in splitter.
	CALE	Provides 32 channels for the ADSL2+ and POTS services.
	CVLC	Provides 32 channels for the VDSL2 and POTS services.
	CCME	Provides 48 channels for the VDSL2 and POTS services.
	EIUA	Provides 16 channels for the FE service.
	EIUD	A P2P Ethernet access board and provides 4 channels for GE and FE services. The four GE ports are combo ports supports optical and electrical autonegotiation. NOTE The CCUB control board cannot be used with the EIUD board.
	VDGE	Provides 16 channels for the VDSL2 over POTS service and supports the following frequency spectrum profiles: 8a, 8c, 8d, 12a, 12b, 17a, and 30a.
	VDSH	Provides 24 channels for the VDSL2 over POTS service and supports the following frequency spectrum profiles: 8a, 8b, 8c, 8d, 12a, 12b, and 17a.
	VDTH	Provides 24 channels for the VDSL2 over ISDN service and supports the following frequency spectrum profiles: 8a, 8b, 8c, 8d, 12a, 12b, and 17a.
	VDSE	Provides 24 channels for the VDSL2 over POTS service, is equipped with a built-in splitter, and supports the following frequency spectrum profiles: 8a, 8b, 8c, 8d, 12a, 12b, and 17a.
VCLE	Provides 32 channels for the VDSL2 over POTS service and is equipped with a built-in 600-ohm pure impedance splitter. This board supports vectoring.	

Board Type	Abbreviated Name	Function
	VCLF	Provides 32 channels for the VDSL2 over POTS service and supports vectoring.
	VDLE	Provides 32 channels for the VDSL2 over POTS service, is equipped with a built-in splitter, and supports the following frequency spectrum profiles: 8a, 8c, 8d, 12a, 12b, and 17a.
	VCPE	Provides 64 channels for the VDSL2 over POTS service, is equipped with a built-in splitter, and supports the following frequency spectrum profiles: 8a, 8c, 8d, 12a, 12b, and 17a.
	VDLF	Provides 32 channels for the VDSL2 service and supports the following frequency spectrum profiles: 8a, 8c, 8d, 12a, 12b, and 17a.
	VDMM	Provides 48 channels for the VDSL2 over POTS service, supports metallic loop tests (MELTs) and the following frequency spectrum profiles: 8a, 8b, 8c, 8d, 12a, 12b, and 17a. NOTE The VDMM board can be used only when a DC power board or an AC power board PAIC is configured on the MA5616.
	VCMM	Provides 48 channels for the VDSL2 over POTS service, supports vectoring, MELT tests, and the following frequency spectrum profiles: 8a, 8b, 8c, 8d, 12a, 12b, and 17a. NOTE The VCMM board can be used only when the PDVAA DC power board is configured on the MA5616.
	SHLH	Provides 16 channels for the SHDSL service and supports SHDSL access in ATM or EFM mode.
	EDTB	Provides 8 channels for the G.SHDSL and E1 services, respectively.
Power boards	PAIA	<ul style="list-style-type: none"> <li>Converts the AC input to –48 V DC, +12 V DC, and +3.3 V DC.</li> <li>Supports a total output power of 200 W.</li> <li>Does not support batteries.</li> </ul>
	PAIC	<ul style="list-style-type: none"> <li>Converts the AC input to –48 V DC, +12 V DC, and +3.3 V DC.</li> <li>Supports a total output power of 400 W.</li> <li>Does not support batteries.</li> </ul>
	PAIB	<ul style="list-style-type: none"> <li>Converts the AC input to –48 V DC, +12 V DC, and +3.3 V DC.</li> <li>Supports batteries.</li> </ul>
	PDIA	Available in two models: H831PDIA and H832PDIA. <ul style="list-style-type: none"> <li>The H831PDIA board supports the conversion of one –48 V DC input.</li> <li>The H832PDIA board supports the conversion of two –48 V DC inputs.</li> </ul> Both the power boards meet –48 V DC, +12 V DC, and +3.3 V DC power supply requirements of the MA5616.

Board Type	Abbreviated Name	Function
	PDVA	Converts dual channels of –48 V DC input into –48 V DC, +12 V DC, and +3.3 V DC to meet the power supply requirements of the MA5616.
	PDVAA	<ul style="list-style-type: none"> <li>• Supports one –48 V DC input.</li> <li>• Supports a total output power of 400 W.</li> <li>• Supports system-level vectoring.</li> </ul>
Fan tray	FCBB	Provides an electronic label to record board manufacturing information. The MA5616 can control and monitor fans and supports soft start of the fan tray.

## Primary Product Features

<p><b>Layer 2 management</b></p> <ul style="list-style-type: none"> <li>✓ MAC address and VLAN management</li> <li>✓ MAC address management</li> <li>✓ VLAN management</li> <li>✓ Flow bundle</li> <li>✓ Layer 2 isolation and bridging</li> <li>✓ Transparent transmission of protocol packets</li> <li>✓ 1:1 VMAC</li> </ul> <p>N:1 VMAC</p> <p><b>Quality of service (QoS)</b></p> <ul style="list-style-type: none"> <li>✓ Priority processing</li> <li>✓ Traffic management</li> <li>✓ Early drop</li> <li>✓ Traffic policing</li> <li>✓ Queue scheduling</li> <li>✓ Queue buffer</li> <li>✓ Traffic shaping</li> <li>✓ Access control list (ACL) policies</li> </ul> <p><b>Layer 3 management</b></p> <ul style="list-style-type: none"> <li>✓ DHCP client</li> <li>✓ ARP</li> <li>✓ DNS client</li> <li>✓ Static routing</li> </ul> <p><b>Emulation service</b></p> <ul style="list-style-type: none"> <li>✓ PPPoE dialup emulation</li> <li>✓ Dynamic Host Configuration Protocol (DHCP) dialup emulation</li> </ul>	<p><b>User security</b></p> <ul style="list-style-type: none"> <li>✓ Policy Information Transfer Protocol (PITP)</li> <li>✓ DHCP Option 82</li> <li>✓ MAC address anti-flapping</li> <li>✓ MAC/IP address anti-spoofing</li> <li>✓ Access user isolation</li> <li>✓ Ring check</li> <li>✓ 802.1x authentication*</li> <li>✓ IPv6*</li> <li>✓ IPv6 traffic classification</li> <li>✓ IPv6 ACL</li> <li>✓ DHCPv6 Layer 2</li> <li>✓ IPv6 ND</li> <li>✓ IPv6 MLD</li> </ul> <p><b>System security</b></p> <ul style="list-style-type: none"> <li>✓ Destination IP address filtering</li> <li>✓ Source/Destination MAC address filtering</li> <li>✓ DoS anti-attack</li> <li>✓ IP/Internet Control Message Protocol (ICMP) packet anti-attack</li> <li>✓ Source route filtering</li> <li>✓ Firewall</li> <li>✓ Blacklist</li> </ul> <p><b>O&amp;M security</b></p> <ul style="list-style-type: none"> <li>✓ Simple Network Management Protocol v3 (SNMPv3)</li> <li>✓ Security shell version 2 (SSHv2)</li> </ul> <p><b>O&amp;M</b></p> <ul style="list-style-type: none"> <li>✓ Ethernet OAM, including CFM and EFM</li> </ul>
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<ul style="list-style-type: none"> <li>✓ Voice call emulation</li> <li>✓ Multicast emulation</li> <li>✓ Clock features</li> <li>✓ Network time synchronization</li> <li>✓ Line clock recovered from the uplink port</li> <li>✓ Synchronous Ethernet/E1 clock/SSM source selection</li> </ul> <p><b>Networking features</b></p> <ul style="list-style-type: none"> <li>✓ Multiple Spanning Tree Protocol (MSTP)</li> <li>✓ Link Aggregation Control Protocol (LACP)</li> <li>✓ L2VPN</li> </ul>	<ul style="list-style-type: none"> <li>✓ ANCP</li> <li>✓ SELT</li> <li>✓ MELT**</li> <li>✓ DLM bulk performance statistics</li> <li>✓ DHCP-based remote software commissioning using GE upstream transmission</li> <li>✓ NAC-based remote software commissioning using GE upstream transmission</li> </ul> <p><b>Environment monitoring</b></p> <ul style="list-style-type: none"> <li>✓ MiniESC</li> <li>✓ Fan monitoring</li> </ul>
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\*The MA5616 equipped with a CCUB control board does not support 802.1x authentication and IPv6.

\*\*Only VDMM service boards support MELT tests.

## Technical Specifications

Physical Dimensions			
Weight	Height	Width	Depth
Empty chassis ≤ 4.8 kg	442 mm (without mounting brackets)	245 mm (without mounting brackets)	88.1 mm
Fully configured chassis ≤ 9.1 kg	482.6 mm (with mounting brackets)	245 mm (with mounting brackets)	
Operating Environment			
Ambient Temperature	Ambient Humidity	Atmospheric Pressure	Altitude
−40°C to +65°C*	5% RH to 95% RH	70 kPa to 106 kPa	< 4000m**
<p>*The MA5616 can start up at −25°C and run at −40°C. Temperature 65°C is the highest temperature measured at the air intake vent.</p> <p>**The air density varies with the altitude, which affects the heat dissipation of a device. Therefore, the working environment temperature of the MA5616 varies with the altitude.</p>			
Power Parameters			
Power supply mode	<ul style="list-style-type: none"> <li>• DC power supply: −38.4 V to −72 V</li> <li>• AC power supply: 90 V to 264 V</li> <li>• AC power supply+backup power:                             <ul style="list-style-type: none"> <li>– AC power supply: 90 V to 264 V</li> <li>– backup power: −43.2 V to −52 V</li> </ul> </li> </ul>		
Maximum input current	<ul style="list-style-type: none"> <li>• DC power supply: 14 A</li> </ul>		



	<ul style="list-style-type: none"> <li>• AC power supply: 6 A</li> <li>• AC power supply+backup power:                             <ul style="list-style-type: none"> <li>– AC power supply: 3 A</li> <li>– Backup power: 5 A</li> </ul> </li> </ul>
Power consumption	Power consumption is obtained for the control board, service boards, or integrated device. For details, the <i>MA5616 Hardware Description</i> .

## Ports Specifications

Port Type	Transmission Rate (Unit: Gbit/s)	Port Mode	Connector Type	Maximum Transmission Distance (Unit: km)	Standards Compliance	Center Wavelength (Unit: nm)	Transmit Optical Power (Unit: dBm)	Extinction Ratio (Unit: dB)	Maximum Receiver Sensitivity (Unit: dBm)	Overload Optical Power (Unit: dBm)
EPON	1.25	Single-mode	SC/PC (UPC)	20	IEEE 802.3ah, PX20+	TX: 1310 RX: 1490	0 to 4	> 6	-27	-3
GPON	TX: 1.244 RX: 2.488	Single-mode	SC/PC (UPC)	20	ITU-T G.984.2, Class B+	TX: 1310 RX: 1490	0.5 to 5.0	> 10	-27	-8
GE electrical port	1	N/A	RJ45	0.1	IEEE 802.3i IEEE 802.3u	N/A	N/A	N/A	N/A	N/A
Multi-mode GE optical port	1.25	N/A	LC	0.5	IEEE 802.3z	850	-9.5 to 0	9.0	-17	N/A
Single-mode GE optical port	1.25	N/A	LC	10	IEEE 802.3z	1310	-11.5 to -3.0	9.0	-19	N/A
	1.25	N/A	LC	40	IEEE 802.3z	1310	-5 to 0	9.0	-23	N/A
	1.25	N/A	LC	10	IEEE 802.3z	TX: 1310 RX: 1490	-9.0 to -3.0	6.0	-19.5	N/A
	1.25	N/A	LC	10	IEEE 802.3z	TX: 1490 RX: 1310	-9.0 to -3.0	6.0	-19.5	N/A
FE electrical port	0.01 or 0.1 (10 Mbit/s or 100)	N/A	RJ45	0.1	IEEE 802.3i IEEE 802.3u	N/A	N/A	N/A	N/A	N/A



	Mbit/s)								
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## Standards Compliance

### Environment standards

ETSI EN 300 019-1-1  
 ETSI EN 300 019-1-2  
 ETSI EN 300 019-1-3  
 ETSI EN 300 019-2-1  
 ETSI EN 300 019-2-2  
 ETSI EN 300 019-2-3  
 ETSI EN 300753  
 IEC 60068-2-1  
 IEC 60068-2-2  
 IEC 60068-2-6  
 IEC 60068-2-14  
 IEC 60068-2-27  
 IEC 60068-2-30  
 IEC 60068-2-31  
 IEC 60068-2-64  
 IEC 60068-2-78  
 ISTA 2A  
 ISO 7779

### EMC standards

EN 55022  
 EN 55024  
 CISPR 22  
 CAN/CSA-CISPR 22  
 AS/NZS CISPR 22  
 CISPR 24  
 ITU-T K.21  
 ITU-T K.45  
 ETSI EN 300 386  
 IEC 61000-3-2  
 IEC 61000-3-3  
 IEC 61000 part 4-2 ~ part 4-6  
 IEC 61000-4-11  
 IEC 61000-4-29  
 EN 61000-3-2  
 EN 61000-3-3  
 ETSI EN 300 132-2

VCCI V-3

ICES-003

### Security standards

EN 60950-1  
 EN 60825-1  
 EN 60825-2  
 IEC 60825-1  
 IEC 60825-2  
 IEC 60950-1  
 UL 60950-1

### Other standards

ETSI 300 119  
 ETSI EN 300 132-1  
 MIL-HDBK-217F  
 BELLCORE TR-332  
 SR-332

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