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RELIABLE SECURE CONNECTIVITY

XRG9500 Series

IEC61850-3 Certified Managed Modular PTP/PRP Gigabit Switch

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IEEE 1588 IEC 61850 CE FC RoHS COMPLIANT

FEATURE HIGHLIGHTS

- Supports HSR (IEC 62439-3), PRP (IEC 62439-4) for high-availability
- IEC 61850-3 and IEEE 1613 DNV.GL certification (pending)
- Integrated IEEE 1588v2 hardware-based BC and TC (-BC/SB version)
- Maximum 128Gbps switching capacity, 95.24Mpps throughput
- Rugged industrial design for harsh environments between -40~85°C
- Flexible modular configuration; 3 Module-dedicated slots
- Up to 24 Gigabit ports, and 4x10 Gigabit SFP Uplink slots, 1PPS BNC
- ITU-T G.8032 ERPS Ring, RSTP, or MRP (client) redundancy
- Advanced management features such as QoS and VLAN
- Supports Synchronous Ethernet for Telecom Applications (-SB version)

PRODUCT DESCRIPTION

Flexibility: AGATEL's high-density XRG9528 Rack-mounted managed switch provides the flexibility needed for your application demands. You can choose from among six different Core versions: based on power supply, uplink port configurations and embedded Hardware-Assisted Boundary Clock feature. And you can choose from six different 4- or 8-Port modules to customize your device in a very simple way.

Designed for Substations: XRG9528 supports up to 24 Gigabit ports in any 8-port multiple configurations. Specifically designed for IEC61850 substation backbone use, it is fully certified to meet all IEC61850-3 hardware requirements – such as EMC Level 3, 4 and 5 requirements, Wide temperature range and High availability. AGATEL is proud to be applying for DNV.GL certification, the most prestigious one in Power Utilities.

Award-winning Performance: XRG9528's IEEE1588v2 Hardware-PTP version received recognition for nanosecond-level accuracy, high-performance and an astonishing holdover performance of less than 1 Microsecond/hour. This makes XRG9528 one of the most reliable GMC backups. And being embedded with Synchronous Ethernet and with full support for PTP profiles, XRG9528 is also ideal for Telecom applications.

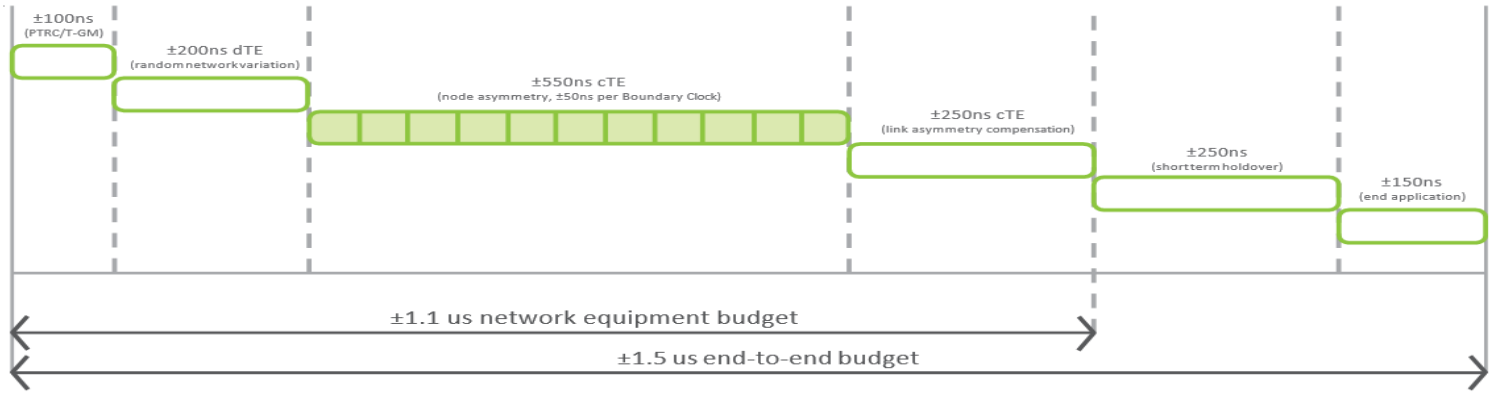
High-availability, versatility and power: When equipped with High-Availability HSR/PRP modules, XRG9528 complies with the most stringent redundancy requirements, ensuring no packet loss and guaranteeing GOOSE packets arrive at their respective destinations. XRG9528's high performance provides a network redundant self-recovery mechanism of under 20ms on full load. This enables you to build a reliable network through almost any redundant ring topology. XRG9528 supports ITU-T G.8032 ERPS Ring, IEEE802.1D-2004 RSTP, STP, MSTP, MRP (Client), iA-Ring, iA-Chain and many other compatible ring protocols for network redundancy. With a Multifunctional web dashboard, its offers intelligent features such as Quality of service (QoS), IGMP, port mirroring, and security.

It is available in two power input variants: one for low-DC voltage (redundant 24~48VDC input) and one for the more popular High- Voltage applications in the distribution grid (redundant 90~264VAC, 24~120VDC or 120~370VDC input). Additional 4 x 10 Gigabit uplink SFP slots

BOUNDARY CLOCK APPLICATION

High accuracy delivered, even in holdover mode

A boundary clock, mainly used in Telecom applications, is normally a switch that doesn't act transparently to the slaves in the network. Directly connected to the Grandmaster, large networks with thousands of slaves would overload the Grandmaster. So the need for a device that acts as a slave towards the master and as a master towards slaves is achieved with a boundary clock. AGATEL's XRG9528 Boundary clock, once synchronized, achieves the 50ns precision set forth in the ITU-T G.8271.1 recommendation. And it is equipped with a high-precision OCXO to guarantee that precision in the event of a link or device failure, with a maximum time-drift of 250ns per from from GNSS time. All this can guarantee a maximum 1.5us end-to-end time deviation budget from the GNSS to the end-application, up to 10 BC hierarchies.



Application Example

The network diagram shows the use of AGATEL's XTS7500 Grandmaster Clock and XRG9528 Boundary clock in a telecommunication application.

XRG9528 can easily function as a both Access/Aggregation switch with up to 4x1/10Gbps SFP slots and as a PTP bound- ary clock. Up to 28 ports can be individually configured to run different instances of IEEE1588v2. For example, the switches shown on the left hand-side will work on an L2 ITU-T G.8275.1 multicast End- to-End configuration, while the Boundary Clocks shown on the right hand-side work on IPv4 Unicast Negotiation End-to-End configuration that is fully compatible with ITU-T G.8275.2 Telecom Profile.

A wide variety of settings are allowed within profiles – such as the Power, Telecoms, and Enterprise profiles. XRG9528-BS supports Synchronous Eth- ernet, allowing the transport of time and frequency, which is important for legacy networks such as SDH-SONET.

GPS or other
GNSS System
Primary Time
Ref. Clock

DATA FLOW
- Copper - 10/100/1000 Mbps
- Fiber - 100/1000 Mbps SFP
- Fiber - 10 GbE Backbone

TELECOM NETWORK HQ

Primary Time Reference Clock Signal

GNSS Antenna

10:32:25 U TC

XTS7500-PTP
Grandmaster Clock

Sync & Follow_Up (2-step only)

Delay_Resp/ PDelay_Resp (1 or 2 step)

Delay_Req or PDelay_Req

TELECOM BACKBONE

XRG9528-BC-410GS
IEC61850-3 certified, Telecom-Grade, Managed Modular Ethernet Switch with IEEE1588v2 Boundary Clock or IEEE1588v2 Transparent Clock

XRG9528-BC-410GS
IEC61850-3 certified, Telecom-Grade, Managed Modular Ethernet Switch with IEEE1588 2 Boundary Clock or IEEE1588v2 Transparent Clock

XRG9528 can guarantee the accuracy requirements in ITU-T G.8275.2 for up to 10 layers of Boundary Clocks

BC BC BC BC BC BC BC BC BC BC BC BC

METRO / ACCESS LEVEL

Micro Cell 1588v2 slav e
Micro Cell 1588v2 slav e
Base Station 1588v2 slav e
Micro Cell 1588v2 slav e
Base Station 1588v2 slav e
Base Station 1588v2 slav e

Layer-2 Multicast domain

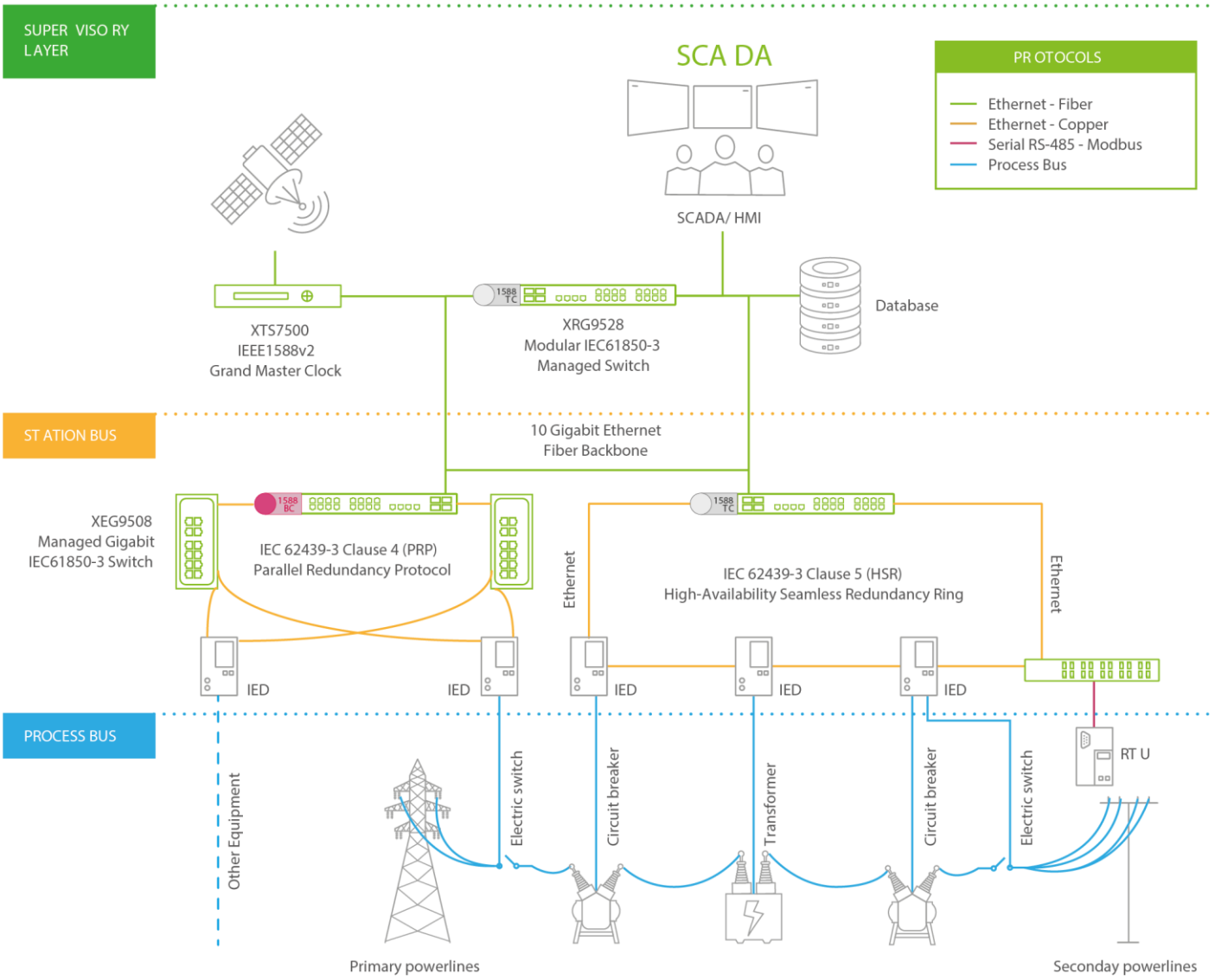
IPv4 Unicast Negotiation domain

HIGH AVAILABILITY APPLICATION

Zero packet loss, on multiple ports

Install a 4-port Gigabit RJ45 or SFP High-Availability module in any of the module slots in XRG9528 CPU board, and you're good to go. Congratulations: your network is now fully compliant with IEC62439-3 Clause 4- 2016 (PRP) and IEC62439-3 Clause 5-2016 (HSR). Simultaneously. Though this 4-port module, You'll have a powerful quadbox at Your disposal: you can use 4 ports in HSR mode, in PRP mode or have 2 Ports working in an HSR Ring while other 2 working in PRP. This will provide you flexibility when integrating the switch in a complex topology.

Through HSR/PRP technology, Agatel's device will replicate the packet through 2 redundant paths and the end-application will have the risks to lose a packet almost zeroed. This is an example of a mixed HSR/PRP network, where XRG9528 is used flexibly as a Transparent or a Boundary Clock and as an HSR/PRP manager.



IEEE1588v2 PTP, IEC61850-9-3 Power Profile and HSR/PRP

XRG9528 is an advanced and flexible platform. It embeds high-bandwidth Switching fabric, Accurate hardware-based Boundary Clock or Transparent Clock, IEC61850-3 compliant hardware, and fully supports IEC/IEEE61850-9-3 - 2016 Power Profile. Also on HSR/PRP ports. When properly configured, our Switch can seamlessly provide Peer-to-Peer transparent clock and Boundary Clock on all ports, HSR/PRP ports included.

CONFIGURATION EXAMPLE

XRG9528-410GS-SB-HV
Main unit, with 4x 10 Gigabit SFP uplink slots, 1PPS BNC, 120~370VDC, HW PTP BC/TC and SyncE

XRG9X28-M1
8-port Gigabit RJ45 module supporting IEEE1588v2 Hardware BC/TC.

XRG9X28-M5
4-port 10/100/1000Mbps RJ45 High-Avail. module, supporting HSR/PRP.

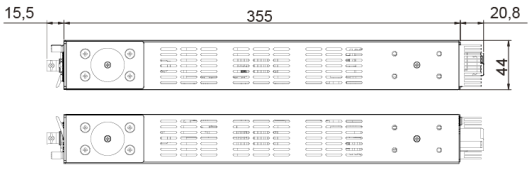
XRG9X28-M2
8-port Gigabit SFP module supporting IEEE1588v2 Hardware BC/TC.

IEC61850-3 certified Layer-2
Managed Switch, with 8 Gigabit ports, 4 10/100/1000 High-Availability HSR/PRP ports, 8 Gigabit SFP slots, one PPS output BNC (F) plug, and 4 x 10 Gigabit SFP uplinks, supporting IEEE1588v2 HW BC and Synchronous Ethernet.

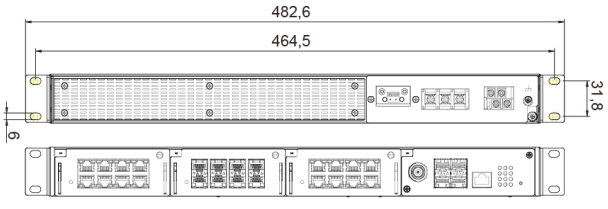
DIMENSIONS & LAYOUT

Switch Core

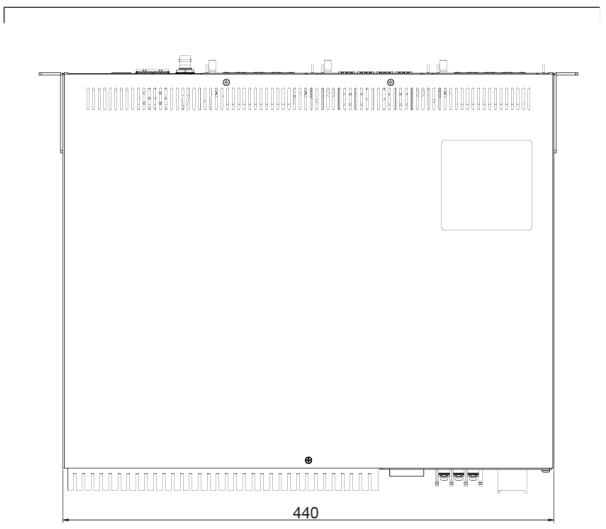
Side View



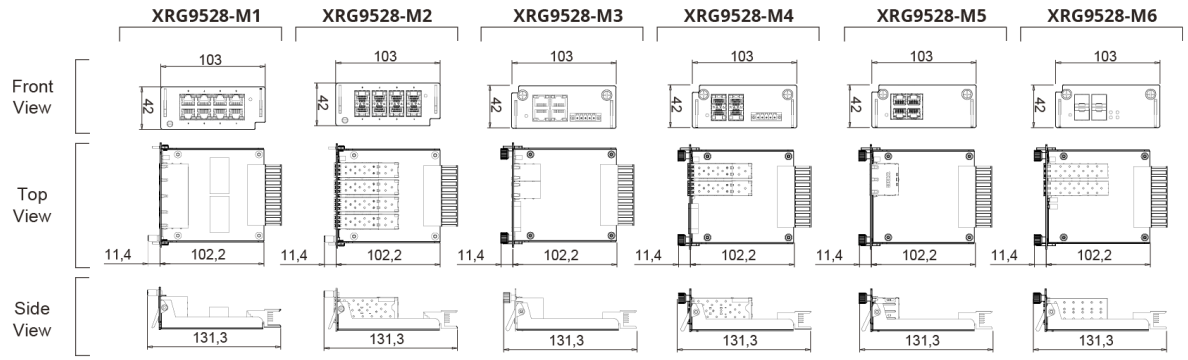
Front View



Top View



XRG9X28-M1
XRG9X28-M2
XRG9X28-M3
XRG9X28-M4
XRG9X28-M5
XRG9X28-M6



SPECIFICATIONS

Switch core	
Model Name	XRG9528

Switch Properties	
Priority Queues	8
VLAN Table	512
MAC-Based VLAN	512
VLAN ID Range	VID 1 to 4094
Trunk Group	8
Static IGMP Groups	128
Dynamic IGMP Groups	256
MAC Table Size	16k
Packet Buffer Size	1.5 MB
Jumbo Frame	9216 Byte
Switching Fabric Capacity	128 Gbps
Maximum throughput	95.24 Mpps

Switch Properties	
Standards	IEEE 802.3 for 10BASE-T IEEE 802.3u for 100BASE-T(X) IEEE 802.3u for 100BASE-FX IEEE 802.3ab for 1000BASE-T(X) IEEE 802.3z for 1000BASE-X IEEE 802.3ae For 10 Gigabit Ethernet Fiber IEEE 802.3x for Flow Control, backpressure control IEEE 802.1D-2004 for Rapid Spanning Tree Protocol IEEE 802.1s for Multiple Spanning Tree Protocol IEEE 802.1Q for VLAN Tagging IEEE 802.1p for Class of Service IEEE 8021X for Authentication IEEE 802.1AB Link Layer Discovery Protocol (LLDP) IEEE 802.1Q VLAN. IEEE 802.3ad for Port Trunk with LACP IEC-62439-3 PRP (Parallel Redundancy Protocol) IEEE1588v2 PTP (Hardware-based) - (-SB version only) ITU-T G.8261 Synchronous Ethernet
Protocols	IPv4, IPv6, IGMPv1/v2/v3, GMRP, GVRP, SNMPv1/v2c/v3, SNMP Inform, ICMP,Telnet, SSH, DHCP Server/Relay/Client, DHCP Option 66/67/82, BootP, TFTP, NTP Server/Client, SNTP, SMTP, RMON, HTTP, HTTPS, Telnet, yslog, MRP, ERPS, LLDP, IEEE 1588 PTP V2(Hw-based), 802.1x, RADIUS, ACACS+, SyncE, HSR, PRP

Redundancy	IEC62439-3 High-Avail-Seamless-Redundancy(HSR) only XRG9528-M5/6 IEC62439-4 Parallel-Redundancy-Protocol (PRP) - only with XRG9528-M5/6 ITU-T G.8032 ERPS, STP, RSTP, MSTP, MRP, Compatible Ring/Chain, U-Ring
Automation Profiles	Modbus TCP
MIB	MIB II, IF-MIB, SNMPv2 MIB, BRIDGE-MIB, RMON MIB Group 1,2,3,9

Precision Timing

Time Synchronization	

Network Time	NTP Server/Client, SNTP	
Precision Time Protocol	Std Version	IEEE1588v1 BC (SW) IEEE1588v2 BC (SW) IEEE1588v2 TC (HW)-ns accuracy
	PTP (-SB) Version	IEEE1588v2 BC (HW)-ns accuracy IEEE1588v2 TC (HW)-ns accuracy Synchronous Ethernet
Holdover Accuracy	Boundary Clock/ SyncE (-SB)	<30 ns/s (IEEE61850-9-3 compliant)
PTP Mode (all versions)	Layer-2: Multicast, E2E/P2P, one or two- Layer-3 (IPv4):Multicast,Unicast,Unicast Neg. (E2E/P2P)	
Supported Profiles (-SB version)	C37.238 -2017 Power Profile IEC/ IEEE61850-9-3 Power Profile(2016)	
Additional Interfaces	XRG9528-410GSFP-BC/SB-XX support hardware-assisted BC/TC also on 4x1G or 4x10G SFP uplink slots. 1PPS square pulse issued from a 1PPS output BNC(F)	

Power

Input Voltage	DC version: redundant 24~120 VDC AC version: redundant 90~264 VAC HV version: redundant 120~370 VDC
Input Current (Max)	0.25A(240VAC) 0.6A(90VAC) 0.5A(125VDC) 2.16A(30VDC)
Power	< 70W (85°C).
Reverse polarity Protection	Yes
Relay Output	1 Relay Output (24V/1A)
Connectors	AC: Barrier Terminal Block 4pin 9.52mm DC: Barrier Terminal Block 3Pin 13mm

Physical Characteristics

Housing	IP30 SPCC metal housing
Dimension (W x H x D) Weight	440 x 44x 355 mm (not including screws, terminal blocks and rack-mount kit) 5Kg (not including module but module cover only)
Installation	1U Rack-mount, Rack-mount kit included
Housing	IP30 SPCC metal housing

Environmental Limits

Operating Temperature	-40°C~85°C (-40°F~185°F)
Storage Temperature	-40°C~85°C (-40°F~185°F)
Ambient Relative Humidity	5%~95%, 55°C (Non-condensing)

Switch Modules

Technical Specifications				
Description	8-Port RJ45 module	8-Port SFP module	4-Port RJ45 HSR/PRP module	4-Port SFP HSR/PRP module
Model Name	XRG9528-M1	XRG9528-M2	XRG9528-M5	XRG9528-M6
Properties				
Port speed	10/100/1000 Mbps	100/1000 Mbps	10/100/1000 Mbps	100/1000 Mbps
Interface	RJ45	SFP Slot	RJ45	SFP Slot
HW PTP IEEE1588v2	TC/BC (with -BC core) SyncE (with -SB core)	TC/BC (with -BC core) SyncE (with -SB core)	TC/BC (with -BC core)	TC/BC (with -BC core)
HSR/PRP	No	No	2 Groups	2 Groups
Dimensions	102 x 120 x 42 mm	102 x 120 x 42 mm	102 x 120 x 42 mm	102 x 120 x 42 mm
Weight	550 g	500 g	550 g	500 g
Fixing	2 x quick-release screws (included)	2 x quick-release screws (included)	2 x quick-release screws (included)	2 x quick-release screws (included)

Switch Modules

Technical Specifications		
Description	4-Port RJ45 with IRIG-B module	4-port SFP with IRIG-B module
Model Name	XRG9X28-M3	XRG9X28-M4
Properties		
Port speed	10/100/1000 Mbps	100/1000 Mbps
Interface	RJ45	SFP Slot
HW PTP IEEE1588v2	TC/BC (with -BC core) SyncE (with -SB core)	TC/BC (with -BC core) SyncE (with -SB core)
IRIG-B	Yes, Terminal Block	Yes, Terminal Block
Dimensions	102 x 120 x 42 mm	102 x 120 x 42 mm
Weight	550 g	500 g
Fixing	2 x quick-release screws (included)	2 x quick-release screws (included)

REGULATORY APPROVALS

Regulatory Approvals					
Safety	UL/EN/IEC(CB) 60950/62368				
EMC	FCC Part 15, Subpart B, Class A, EN 55032, EN 55024, EN 61000-6-4:2007+A1 2011, EN 61000-3-2, EN 61000-3-3, EN 61000-6-2:2005				
Power Automation	IEC61850-3, IEEE 1613 (DNV.GL - Pending)				
Test	**Item**			**Value**	**Level**
IEC 61000-4-2	ESD	Contact Discharge Air Discharge		±8KV ±15KV	4 4
IEC 61000-4-3	RS	Enclosure Port		10(V/m), 80-1000MHz, 80% AM, 1~3GHz	3
IEC 61000-4-4	EFT	AC Power Port DC Power Port Signal Port		±4.0kV @2.5kHz ±4.0kV @2.5kHz ±2.0KV @2.5kHz	4 4 4
IEC 61000-4-5	Surge	AC Power Port AC Power Port DC Power Port DC Power Port Signal Port		Line-to Line±2.0kV Line-to Earth±4.0kV Line-to Line±1.0kV Line-to Earth±2.0kV Line-to Earth±4.0kV	4 4 3 3 4
IEC 61000-4-6	CS	AC Power Port DC Power Port Signal Port		10V rms 0.15-80MHz, 80% AM 10V rms 0.15-80MHz, 80% AM 10V rms 0.15-80MHz, 80% AM	3 3 3
IEC 61000-4-8	PFMF	(Enclosure)		100A/m continuous, 1000A/m (3s)	5
IEC 61000-4-10	Damped Osc. Magnetic Field	(Enclosure)		100A/m, 100kHz, 1MHz	5
IEC 61000-4-11	DIP	AC Power Port		Drop 70% 3 times/s (1period) Drop 40% 3 times/1ms (50 period) Drop 100% 3 times/50m(5-50per.)	-
IEC 61000-4-12	Damped Oscillatory	AC Power Port Signal Port		2.5kV common,1kV diff.mode 2.5kV common,1kV diff.mode	3 3
Shock Drop Vibration	MIL-STD-810G Method 516.5 MIL-STD-810F Method 516.5 MIL-STD-810F Method 514.5 C-1 & C-2				
RoHS2	Yes				
MTBF	TBD				
Warranty	5 years				

ORDERING INFORMATION

Main Core Switch Ordering Information

Model Name	Slots	Uplink ports	HW PTP	SyncE	Power supply
XRG9528-410GS-DC	3	4x 10G SFP			Dual 24~120VDC
XRG9528-410GS-AC	3	4x 10G SFP			Dual 90~264VAC
XRG9528-410GS-HV	3	4x 10G SFP			Dual 120~370VDC
XRG9528-410GS-SB-DC	3	4x 10G SFP	•	•	Dual 24~120VDC
XRG9528-410GS-SB-AC	3	4x 10G SFP	•	•	Dual 90~264VAC
XRG9528-410GS-SB-HV	3	4x 10G SFP	•	•	Dual 120~370VDC

Modules Ordering Information

Model Name	10/100/1000 RJ45 ports	100/1000 SFP slots	IEEE1588v2 (HW)	High- Availability
XRG9528-M1	8	-	TC/BC	-
XRG9528-M2	-	8	TC/BC	-
XRG9528-M3	4	-	TC/BC	IRIG-B (TB)
XRG9528-M4	-	4	TC/BC	IRIG-B (TB)
XRG9528-M5	4	-	TC/BC	HSR/PRP
XRG9528-M6	-	4	TC/BC	HSR/PRP

Optional Accessories

Model Name	Description
XDP-75-24	DIN RAIL POWER SUPPLY / T;AC 88~264V to 24VDC 3.2A;75W
XTR-38-FM-2K	SFP Transceiver, 155Mbps, 1310nmFP, Multi-mode, 2km, 3.3V, -40~85°C
XTR-38-FS-30K	SFP Transceiver, 155Mbps, 1310nmFP, Single-mode, 30km, 3.3V, -40~85°C
XTR-28-SX-550M	SFP Transceiver, 1250Mbps, 850nmVCSEL, Multi-mode, 550m, 3.3V, -20~85°C
XTR-38-SX-2K	SFP Transceiver, 1250Mbps, 1310nmFP, Multi-mode, 2km, 3.3V, -40~85°C
XTR-38-LX-10K	SFP Transceiver, 1250Mbps, 1310nmFP, Single-mode, 10km, 3.3V, -40~85°C
XTR-38-LX-30K	SFP Transceiver, 1250Mbps, 1310nmDFB, Single-mode, 30km, 3.3V, -40~85°C
XTR-28-10G-SR	SFP Transceiver, 10.3Gbps, 850nmFP, Multi-mode, 33M(OM1 Fiber)/82M(OM2 Fiber)/300M(OM3 Fiber), 3.3V, -10~85°C

WHO WE ARE

Built on 20 years of experience in designing and manufacturing industrial networking products, **Agatel** was established from the UK to serve the infrastructure and industrial sectors in EMEA markets with reliable connectivity for mission-critical systems in demanding environments.

Experienced in hardware and software design and integration, we produce high-quality yet cost-effective industrial networking and communication products with great customization capabilities and robust implementations, equipping our customers for reliable secure industrial networks.

WHAT WE OFFER

The needs of our customers' industry are different from those of corporate IT environments – industrial operating environments are tough and the impact of failure in the field can lead to business threatening situations, hence our products will have lifetimes in excess of 20 years.

From entry-level to high-performance industry-certified hardware, **Agatel** offers a full solution spectrum to suit our customers' budgets and application requirements, with features such as industrial-grade reliability, integrated security, network redundancy, and advanced performance.

Our product solution profile includes industrial Ethernet switches, network time servers, media converters, industrial wireless devices, and serial device servers, covering a wide array of mission-critical applications such as automation, security, transport, water, oil and gas, and power grids.

WHY CHOOSE US

We help our customers reduce downtime and operational costs of their industrial applications in harsh environments. Leading system integrators in EMEA rely on our niche technical expertise and product quality to increase their applications' robustness, revenues, and competitive differentiation.

Agatel ruggedized high-quality solutions are designed to deliver zero-network-downtime for harsh project demands, allowing for reliable connectivity to keep people and assets safe and secure in harsh and hazardous environments, and allowing customers to focus on growing their business.

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