Product Highlights

IEC 61850/1613 compliance ensures your application will stay running in the toughest applications

KEMA tested and approved which includes some of the toughest industrial requirements for EMI, RFI, ESD temperature, shock, vibrations and more

Enterprise-class networking and security to future-proof your network

Powerful management and monitoring to simplify deployment and fault isolation

Extreme port flexibility allows for easy field configuration and upgrade

Up to 26 fiber optic ports offer the ultimate in noise immunity

Universal mounting (patent pending) simplifies ordering and deployment

Introduction

The Sixnet EL228 is a 28 port (24 + 4G) industrial Ethernet managed switch designed to meet the extreme requirements of power substations, traffic control, railway and other harsh environments. It combines the high performance and security of an enterprise-class switch with rugged packaging and protected circuitry to meet the needs of the most demanding applications.

24 fast Ethernet SFP ports for fiber or copper links can be mixed and matched on the fly to provide the ultimate in port flexibility. Sixnet's universal mounting features LEDs, power/ground connections, console ports and bracket positions on both the front and back of the switch for quick and easy ordering and deployment. By combining all of these features in one hardened package, the EL228 provides users with the lowest total cost of ownership of any industrial Ethernet switch in its class.

Features and Benefits

Rugged and Reliable Operation

Supports deployment in extreme environments
Meets high availability and EMI/RFI/ESD resistance

- KEMA approved for IEC 61850 & IEEE 1613
- Superior EMC performance and EMI immunity
- -40 to +85 °C operating temperature (no fans)
- Rugged corrosion-resistant metal enclosure
- Sealed IP50 protects against dust, dirt and debris
- UL/CSA (pending), FCC and CE compliant
- Dual-redundant AC or DC power supplies inside

Advanced Networking and Redundancy

Ensures fast recovery from faults
Prioritizes handling of mission-critical data

- Real-Time-Ring™ for ultra-fast redundant rings
- RSTP (Rapid Spanning Tree) for complex redundancy
- MSTP (Multiple Spanning Tree) per-VLAN redundancy
- VLAN (GVRP, Q-in-Q) for convenient traffic segregation
- LACP (Link Aggregation) for increased bandwidth
- IGMP for multicast filtering (snooping & querying)
- QoS/CoS/DS for real-time message prioritization
- Jumbo frame support on Gigabit ports
- Virtual stacking for up to 36 EL228 switches

Typical Power Application
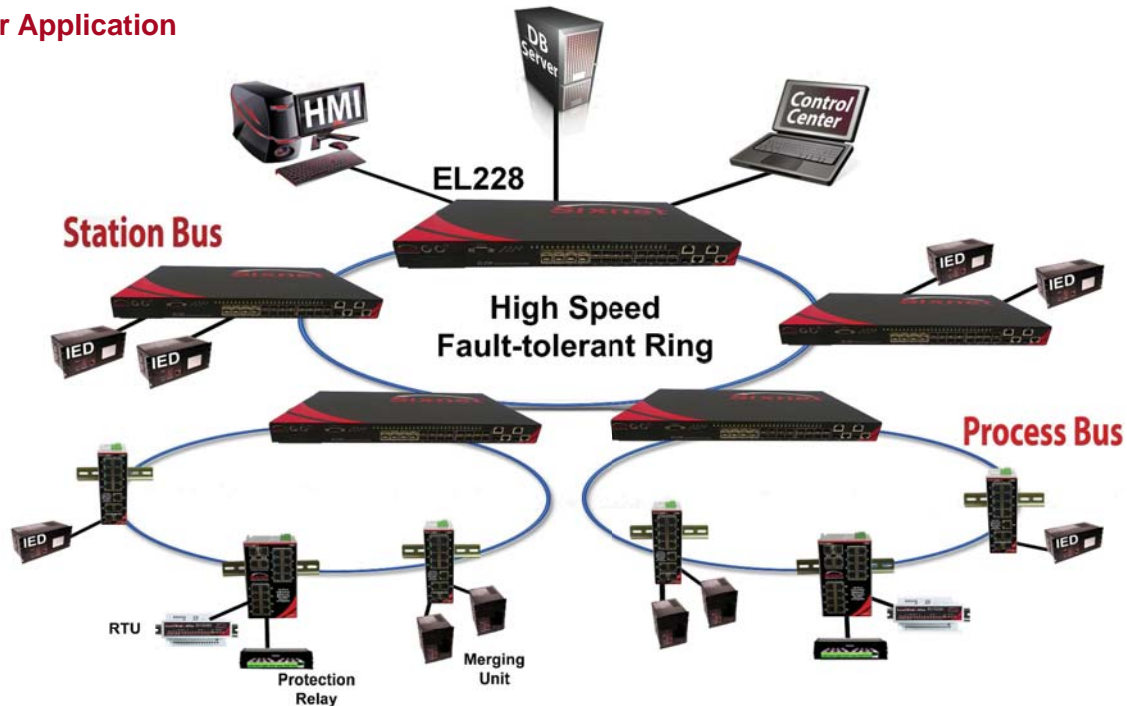
Advanced Cyber Security

Prevents against unauthorized access

Protects from unwanted intrusion

- Static and dynamic port security
- Authentication - SNMPv3, 802.1x, RADIUS, TACACS+ AAA/3.0, Web and MAC
- Encryption - MD5, TLS, TTLS, TACACS+ AAA/3.0
- Access Control List (ACL) per IP/MAC/VLAN/TCP/UDP
- Secure Web (HTTPS/SSL) and Telnet (SSH)
- Rate limiting and multicast storm protection
- IP Source Guard, DHCP Snooping and Option 82

Universal Mounting

Lowers overall cost of ownership

One model does it all

- Universal mounting supports both front and reverse wiring
- Status LEDs on front and back of switch for easy viewing
- Console RS232 port on front and back of switch for local management
- Space efficient 1U rack-mount design fits into EIA, WECO and ETSI racks from 19" to 24"

Powerful Management and Monitoring

Simplifies configuration and management

Provides fast and easy troubleshooting

- Easy configuration via Web or CLI
- SNMPv1, v2, v3 network management
- LLDP for universal network identification
- sFlow for network-level monitoring
- RMON & port mirroring for advanced diagnostics
- Event/Error/System logging and system monitoring
- UPnP, OAM and Banner support
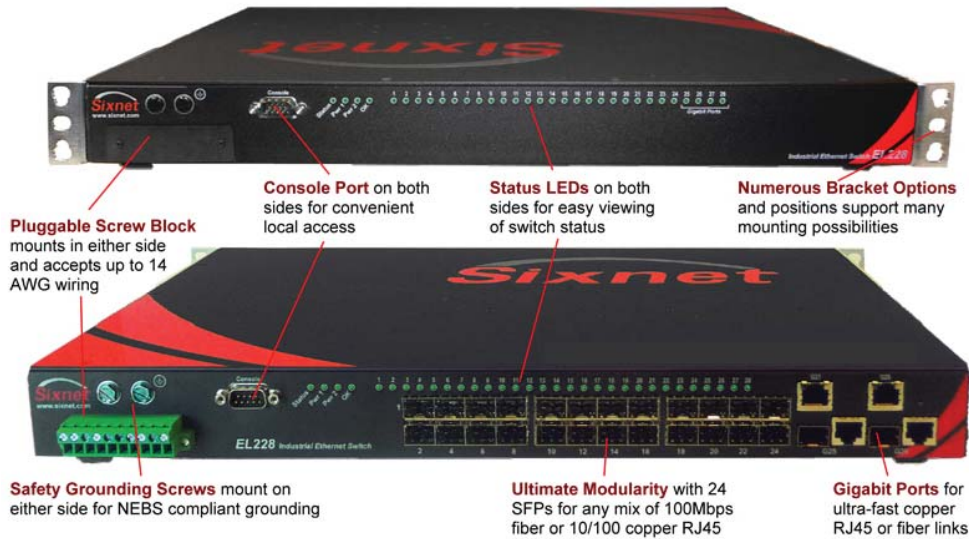- Dual firmware upgrade system
- Relay output contact to signal alarms

Ultimate Port Flexibility

Simplifies on-site configuration

- 28 total Ethernet ports (24 + 4G)
  - 2 Gig RJ45 ports support auto 10/100/1000 Mbps
  - 2 Gig RJ45/SFP combo ports for copper or fiber links
  - 24 fast SFP ports - mix 100M fiber or 10/100 copper
- Fiber transceivers support multimode, singlemode, bi-directional single-strand and long haul up to120km
- Up to 26 total noise-immune fiber optic ports

Pluggable Screw Block mounts in either side and accepts up to 14 AWG wiring

Console Port on both sides for convenient local access

Status LEDs on both sides for easy viewing of switch status

Numerous Bracket Options and positions support many mounting possibilities

Safety Grounding Screws mount on either side for NEBS compliant grounding

Ultimate Modularity with 24 SFPs for any mix of 100Mbps fiber or 10/100 copper RJ45

Gigabit Ports for ultra-fast copper RJ45 or fiber links

Ordering Guide

EL228 Part #	Description
EL228-A0-1	single universal VAC/VDC power input
EL228-AA-1	dual universal VAC/VDC power supplies built-in
EL228-D0-1*	single 24/48/60 VDC power input
EL228-DD-1*	dual 24/48/60 VDC power supplies built-in
* Check for availability	

Accessories Part #	Description
EK1-BRCKT-19	Set (2) of 1U 19" brackets (one set included with each switch)
EK1-BRCKT-23	Set (2) of 1U 23" EIA/WECO
EK1-BRCKT-2324	Set (2) of 1U 23/24" EIA/WECO
EK1-BRCKT-ETSI	Set (2) of 1U 536 mm ETSI brackets
EK1-BRCKT-WALL	Set (2) of wall brackets

SFP Fiber Tranceivers Part #	Speed	Mode	Nom. Max. Distance	EL228 Port Compatibility
FCOPPER-SFP-100*	10/100 Mbps	Copper RJ45	100 meters	Ports 1 thru 24
FMFIBER-SFP-4K	100 Mbps	Multimode	4 km	Ports 1 thru 24
FSFIBER-SFP-30K	100 Mbps	Singlemode	30 km	Ports 1 thru 24,25,26
FSFIBER-SFP-60K	100 Mbps	Singlemode	60 km	Ports 1 thru 24,25,26
FSFIBER-SFP-100	100 Mbps	Singlemode	100 km	Ports 1 thru 24,25,26
GMFIBER-SFP-500	Gigabit	Multimode	550 meters	Ports 25 and 26
GMFIBER-SFP-2K	Gigabit	Multimode	2 km	Ports 25 and 26
GSFIBER-SFP-10K	Gigabit	Singlemode	10 km	Ports 25 and 26
GSFIBER-SFP-30K	Gigabit	Singlemode	30 km	Ports 25 and 26
GSFIBER-SFP-50K	Gigabit	Singlemode	50 km	Ports 25 and 26
GSFIBER-SFP-80K	Gigabit	Singlemode	80 km	Ports 25 and 26

Note: Special application (such as Bi-Di) or extra long haul (up to 120 km) transceivers are available special order.

Ethernet Performance

- 28 total Ethernet ports (24 + 4G)
- 24 SFP ports for 100M fiber or 10/100 copper
- 4 Gigabit with 2 10/100/1000 RJ45 ports and 2 RJ45/SFP combo ports
- RJ45 ports: auto-negotiation (speed/duplex) and auto-crossover
- Non-blocking, store and forward, wire-speed
- Switching capacity and forwarding rate: 12.8 Gbps / 9.5 Mpps
- Jumbo frame: 10K on Gigabit ports
- Ethernet isolation: 1500 Vrms 1 minute

Switching Features

- Flow control: IEEE 802.3x (Full Duplex) & Back-Pressure (Half Duplex)
- Spanning Tree Protocol (STP per IEEE 802.1D) plus
  - IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  - IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
  - BPDU forwarding and filtering
- Real-Time-Ring™ for high speed fault-tolerant rings
  - Link loss recovery: 5ms/hop
  - Switches in ring: <50 for best performance
  - Multiple rings are supported
- Virtual Local Area Networks (VLANs)
  - 802.1Q tag-based with 256 VLANs and 4K VLAN ID
  - 802.1v protocol and port-based VLAN
  - Voice and Private VLAN
  - QVRP and Q-in-Q (double tagging)
- Link Aggregation Control Protcol (LACP per IEEE 802.3ad)
  - Static trunk (8 trunks and up to 8 ports per trunk)
  - Traffic load balancing
- Internet Group Management Protocol (IGMP)
  - IGMP v1, v2 and v3 with up to 255 multicast groups
  - IGMP snooping and querying
  - Immediate leave and leave proxy
  - Throttling and filtering
- Multicast VLAN Registration (MVR)
- IEEE 802.1ab Link layer Discovery Protocol (LLDP)
- Quality of Service (QoS) with 4 priority queues
  - Scheduling schemes: WRR and Strict priority
  - CoS per IEEE 802.1p and IP DSCP-based
  - DiffServ (DS): ingress, egress and remarking
- Rate limiting (ingress and egress)
  - 64Kbps to 100/1000 Mbps
  - Per port CoS

Power Input and Alarm Output

- Dual-redundant internal power supplies
- 10-pole screw block can be positioned in front or back
- Power input options: (absolute min-max)
  - +/-18-75 VDC (D option)
  - 90-300 VDC or 85-264 VAC (A option)
- Power consumption: 45 Watts typ. w/ all ports linked
- Protection: current overload and reverse polarity
- Alarm output: form-C relay (NO and NC contacts)
  - Max. voltage: 250 VAC, 30 VDC
  - Max. current: 2A @ 30 VDC or 250 VAC

Mechanical

- Universal mounting: (Sixnet exclusive feature – patent pending)
  - Front or rear/reverse wiring with power in front or back
  - 1U rack mount (19" brackets included)
  - Optional 23", 24", EIA, WECO, ETSI and wall brackets available
- Ingress protection: IP50 sealed from dust and contaminants
- Heavy-gauge corrosion-resistant metal enclosure
- Dimensions (HxWxD): 1.75(1U)x17.3x12" (45x439x305mm)
- Weight (typical): 9.5 lbs (4.3 kg)

Security

- Enable/disable ports
- Port security (MAC-based): static and dynamic
- DHCP Snooping and Option 82
- IP Source Guard
- IEEE 802.1X Network Access Control
  - Port-based with single or multiple host mode
  - Authentication: EAP-MD5, PEAP, TLS, TTLS
  - MAC and web authentication
  - Guest VLAN and Auto VLAN assignment
- RADIUS and TACACS+AAA
  - Authentication, Accounting and Authorization
  - 5 servers for RADIUS, 1 server for TACACS+
  - Encryption: MD5, TLS, TTLS, TACACS+AAA/3.0
- Access Control List (ACL)
  - IP and MAC-based
  - VLAN and TCP/UDP port
- Storm Control for broadcast and multicast messages
- HTTPS/SSL for secure Web access
- SSH v1.5/2.0 for secure Telnet access
- SNMPv3 authentication and encryption
- Username and password authentication
- Management access filtering

Management and Monitoring

- IP Address assignment: Static, DHCP and BOOTP
- CLI (Command Line Interface) via console or Telnet
- Web interface (HTTP/HTTPS/SSL)
- SNMP v1, v2, v3 (Simple Network Management Protocol)
- SNMP Traps for event notification
- RMON (Remote Monitoring): Groups 1, 2, 3 and 9
  - RMON I Groups 1, 2, 3 and 9
- sFlow network-wide traffic monitoring
- Dual firmware update system
- Configuration download and upload
- Software upgrade via TFTP
- Port mirroring
- Event/Error/System log
  - Local flash
  - Remote server via system log (Syslog RFC 3164)
  - SMTP (RFC 821) email alarming
- Network Time Protocol for time synchronization
  - SNTP (RFC 2030) and NTP (RFC 1305)
- DNS (Domain Name Server) client
- Universal Plug and Play (UPnP)
- IEEE 802.3ah OAM (Operational Administration Maintenance)
- Banner commands

Environmental

- Operating/storage temperature: -40 to +85˚C per IEC 60068-2-1/2
- Humidity: 5 to 95% RH (non-condensing) per IEC 60068-2-78
- Vibration: 2g @ 1 to 200 Hz per IEC 60255-21-1
- Shock: 30g @ 11ms per IEC 60255-21-2

EMC and Standards Compliance

- KEMA approved for substation: IEC 61850-3/IEEE 1613
- EMC immunity: IEEE c37.90.1/2/3; IEC/TS 61000-6-5, IEC 60870-2-1, IEC 61000-4-2/3/4/5/6/8/10/11/12/16/17/18/29, IEC 60255-5, CE
- EMC emissions: FCC Part 15; EN 55022 (CISPR22), CE
- Safety: UL508/CSA C22.2/14 (Pending); EN60950-1, CE
- RoHS, WEEE and CE compliant
- ISO9001:2000 certified company
- Warranty: 5 years on design and manufacturing defects

All specifications are subject to change. Consult factory for latest info.