Electrical Substation-Rated Managed Ethernet Switch, with (7) 10/100T(X) + (3) Configurable 10/100/1000T(X)/100/1000FX Ports

CNGE3FE7MS4

IEC 61850-3 IEEE 1613 SUBSTATION	DIN RAIL	85° -40° HARDENED	SFP FLEXIBILITY	GIGABIT ETHERNET 3	10/100 ETHERNET 7

The ComNet™ CNGE3FE7MS4 is a substation-rated and industrially hardened fully managed layer 2 gigabit Ethernet switch. Fully compliant with the requirements of IEC 61850-3, IEEE 1613 Class 2, UL 508 Class 1/ Division 2 (Groups A, B, C, & D for hazardous environments), EN50155, and NEMA TS-1/TS-2, it is designed for deployment in environments where high levels of electromagnetic noise and interference (EMI) and severe voltage transients and surges are routinely encountered, such as electrical utility substations and switchyards, heavy manufacturing facilities, trackside and roadside electronic equipment, and other difficult out-of-plant applications. Providing (7) 10/100 BASE-TX ports, the (3) 10/100/1000TX or 100/1000BASE-FX user-configurable combo gigabit uplink ports support conventional CAT-5e/CAT-6 copper or optical transmission media by selection of the appropriate ComNet SFP module. Featuring an internal/self-contained 85-264 VAC/88-373 VDC power supply, the CNGE3FE7MS4 is DIN-rail or wall-mountable, and is ideal for mission-critical applications where very high levels of reliability and network availability are of the utmost importance. Utilizing exclusive ComNet C-Ring technology, the fastest recovery redundant ring available, network recovery time of <10 ms is provided for protection from network faults or temporary interruptions. ComChain permits additional redundant network rings of different redundancy protocols to function together as a larger and more robust network topology. eConsole, a Windows-based utility, is included for centralized/remote management and configuration of all functions of the CNGE3FE7MS4.

FEATURES

› Fully compliant with the requirements of IEC 61850-3 and IEEE 1613 Class 2 for electrical utility substations, EN50155 for railway applications, and NEMA TS-1/TS-2 for traffic signal control equipment

› Compliant with EN60950-1 and UL 508 Class 1, Division 2 (Groups A, B, C & D) for use in Hazardous Locations

› Environmentally hardened for deployment in difficult unconditioned out-of-plant and roadside installations

› Extended ambient operating temperature range of -40˚ C to +85˚ C, for use in virtually any environment. Conformally coated for humidity with condensation or airborne particulate matter conditions

› Supports Modbus/TCP Protocol

› Supports IEC 62439-2 MRP Media Redundancy Protocol

› PTP Client for precision time protocol clock synchronization

› Rugged metal housing. DIN-rail or panel-mountable, & rated for IP-30 ingress protection

› Internal/self-contained universal high-voltage power supply: 85-264 VAC/88-373 VDC operating range. Redundant power supply capability significantly reduces the possibility of a single-point-of-failure for the highest possible system and network reliability

› No fans or forced-air cooling; cooling via natural convection eliminates unreliable and troublesome fans/moving parts

› Utilizes C-Ring, the fastest redundant Ethernet ring available; Recovery time <10 ms with 250 units within a ring. Fully compatible and interoperable with the Moxa Turbo Ring topology using ComRing technology, and ComNet X-Ring, Dual-Homing, Couple Ring, and Dual-Ring Topologies

› Supports ComChain, the ComNet-exclusive technology that provides add-on network redundancy topology to any backbone network. ComChain allows multiple redundant network rings of different redundancy protocols to join and function together as a larger and more robust compound network topology, while maximizing fault-recovery speed, flexibility, compatibility, ease of use, and cost-effectiveness.

› eConsole-based Windows Utility for centralized switch and network management

› Fault/event notification provided through Syslog, e-Mail, SNMP trap, or relay alarm output

› DDM (Digital Diagnostic Monitoring) remotely ascertains the status of the operating voltage, current, and operating temperature of the SFP modules

› 10/100 BASE-T(X), 10/100/1000T(X), and 100/1000 BASE-FX compatible

› Flexible optics configuration via SFP plug-in modules provides multimode, or single mode operation up to 120 km transmission distance between nodes, or single-fiber/bi-directional communications

› IGMP Snooping V1/V2/V3 for multicast filtering, and IGMP Query V1/V2

› Port based VLAN (IEEE 802.1Q)

› Fully configurable through web-based or SNMP network management

› Lifetime Warranty

APPLICATIONS

› Electrical substation automation & SCADA networks, protective relaying systems

› Power transmission & distribution systems, remote wind farm, hydroelectric, and solar/photovoltaic power generation facilities, and other electrical utility-specific applications

› Perimeter security, surveillance monitoring, and controlled access to electrical substations and power generating facilities, and other high-value, mission-critical sites

› Industrial/Factory Automation & Process Control SCADA Networks: Supports Modbus/TCP protocol

› Chemical and petrochemical refining and processing facilities, oil and gas pipelines/transmission systems, and mining installations

› Food processing operations

› Wastewater treatment plants

› ITS/Transportation Traffic Signalization & Surveillance/Incident Detection Networks

› Railway/trackside control and monitoring systems

› Integrated IP-Video, VOIP, and Data Transmission Networks

› Cellular telephony and wireless backhaul networks

* Small Form-Factor Pluggable Module. Sold separately.

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FEATURES

Network Redundancy

C-Ring is ComNet's exclusive and proprietary redundant ring technology with extremely rapid recovery time, making it ideal for mission critical applications where network interruptions and temporary malfunctions cannot be tolerated.

Provides full network redundancy/ backup
Network recovery time: <10ms, with 250 switches configured within a ring
Supports, STP, RSTP, & MSTP per IEEE 802.1D/w/s
Supports Moxa® Turbo Ring, ComNet X-Ring, Dual-Homing, Couple Ring, and Dual-Ring topologies are also supported.
Supports MRP. MRP (Media Redundancy Protocol) is a data network protocol standardized by IEC 62439-2. It allows multiple rings of Ethernet switches to overcome any single failure, with recovery times that are much faster than can be achieved with spanning tree protocol (STP).

Switch Properties

Switching Latency	7 µS
Switching Bandwidth	7.4 Gbps
Port Rate Limiting	User-Defined

VLAN

Port Based
IEEE802.1Q Tag VLAN (256 entries)/ VLAN ID (UP to 4K, can be assigned from 1 to 4096) GVRP (256 Groups)
Maximum VLANs Available   4096
MVR (Multicast VLAN Registration) support

QoS (Quality of Service)

Supports IEEE 802.1p Class of Service for real-time traffic
Per port provides 4 priority queues
Port Base, Tag Base and Type of Service Priority

Port Mirroring: Monitors traffic in switched networks

TX packet only
RX packet only
Both TX and RX packets

Network Security

Enable/Disable ports, MAC address-based security (entries and filter) Port Security: MAC address entries/filter
IP Security: IP address security management to prevent unauthorized intrusion
Login Security: Radius password management per IEEE802.1X
Supports Cisco TACACS+
Port-based network access control, per IEEE 802.1x
VLAN per IEEE 802.1q, to segregate and secure network traffic
Supports Q-in-Q VLAN for performance, & security to expand the VLAN space
SNMP v1/v2c/V3 encrypted authentication & access security

Windows Utility

eConsole-based. Supports centralized network management.
Configurable via web-based or Telnet/console port/CLI

IGMP

Number of IGMP Multicast Groups supported: 1024
Query mode (v1 & v2) for Multi-Media Application
Multicast snooping: v1, v2, and v3, with multicast filtering

Spanning Tree

Supports IEEE802.1D Spanning Tree
Supports IEEE802.1w Rapid Spanning Tree
Supports IEEE 802.1s Multiple Spanning Tree

Clock Synchronization

SNTP for synchronizing clocks over the network
PTP (Precision Time Control) Client

Bandwidth Control

Supports rate-based and priority-based rate limiting
Broadcast/Multicast Packet Filter Control

System Fault/Alarm Event Notification

System (Syslog) Log Server/Client
SMTP trap
e-Mail Alert
Relay Alarm Output. Relay contacts are configured as normally-open

TFTP Firmware Update / System Configure Restore & Backup

Supports TFTP firmware update, Firmware Update /System Configure Backup & Restore

SOFTWARE FEATURES

Network Management	SNMP v1, v2c, v3/ Web/Telnet/CLI/NS-View Management
SNMP MIB	RFC 1215 Trap, RFC 1213 MIBII, RFC 1157 SNMP MIB, RFC 1493 Bridge MIB, RFC 2674 VLAN MIB, RFC 1643, RFC 1757, RSTP MIB, Private MIB
Port Trunk w/ LACP	LACP Port Trunk: 4 Trunk groups/ Maximum 4 Trunk members
LLDP	Supports LLDP to allow the switch to advise its identification and capability on the LAN
Port Security	Supports 1000 entries of MAC address for static MAC and another 100 addresses for MAC filtering/ MAC binding
Port/Trunk	Supports Port configuration, status, statistics, and monitoring
IP Security	Supports 10 IP addresses that have permission to access the switch management and to prevent unauthorized intrusion.
Login Security	Supports IEEE802.1X Authentication/RADIUS
Bandwidth Control	Supports ingress packet filter and egress packet limit. The egress rate control all of the packet types and the limit rates are 100K-250Mbps. Ingress filter packet type combination rules are Broadcast/Multicast/Unknown Unicast packet, Broadcast/Multicast packet, Broadcast packet only, and all of packets. The packet filter rate can be set from 100K-250Mbps.
Flow Control	Supports Flow Control for Full-duplex and Back Pressure from Half-duplex
System Log	Supports System log record and remote system log server
SMTP	Supports SMTP Server and 6 e-mail accounts for receiving event alerts

SOFTWARE FEATURES (CONT'D)

SNMP Trap
Up to 3 Trap stations. Indications are provided for:
- Device cold start
- Port link up
- Port link down
- Authentication Failure
- Private Trap for power status
- Port Alarm configuration
- Fault alarm
- C-Ring network ring topology change or fault

DHCP
Provides DHCP Client/ DHCP Server and IP Relay

DNS
Provides DNS client feature and support Primary and Secondary DNS server

TOS/Diffserv support

If Alias
Each port allows importing 128 bit of alphabetic string of words on SNMP and CLI interface.

Ethernet Standards Compliance

IEEE802.3	10Base-T Ethernet
IEEE802.3u	100Base-TX & 100Base-FX
IEEE802.3ab	1000Base-T
IEEE802.3z	1000Base-FX Gigabit fiber
IEEE802.3x	Flow Control and Back Pressure
IEEE802.3ad	Port trunk with LACP
IEEE802.3as	LACP Link Aggregation Control Protocol)
IEEE802.1D	STP (Spanning Tree Protocol)
IEEE802.1p	COS (Class of Service)
IEEE802.1Q	VLAN Tagging
IEEE802.1s	MSTP (Multiple Spanning Tree Protocol)
IEEE802.1w	RSTP (Rapid Spanning Tree Protocol)
IEEE802.1x	User Authentication (Radius)
IEEE802.1AB	LLDP (Link Layer Discovery Protocol)

HARDWARE SPECIFICATIONS

System Interface/Performance

RJ45 port supports auto MDI/MDI-X functions
SFP supports 100/1000 Mbps Dual Mode
Store-and-Forward Switching Architecture
Back-plane (Switching Fabric/bandwidth): 7.4Gbps
1Mbit Packet Buffer
8K MAC Address Table

Switch Architecture	Back-plane (switching fabric): 7.4 Gbps. Packet throughput ability (full duplex): 11 Mbps @ 64 bytes
Transfer Rate	14,880pps for Ethernet port. 148,800pps for Fast Ethernet port. 1,488,000pps for Gigabit Fiber Ethernet port
Packet Buffer	1 Mbit
MAC Table	8192 MAC Addresses
Flash ROM	4Mbytes
DRAM	32Mbytes

Console/TELNET Port

Protocol	RS-232 serial data
Bandwidth	9600 bps
Connector type	RJ-45

Network Cabling Compatibility

10Base-T: 2-pair UTP/STP Cat. 3, 4, or 5 cable.
EIA/TIA-568 100-ohm (100m) 100Base-TX: 2-pair UTP/STP Cat. 5/5E cable.
EIA/TIA-568 100-ohm (100m) 1000Base-TX: 2-pair UTP/STP Cat. 5e or 6 cable.
EIA/TIA-568 100-ohm (100m)

Optical Fiber Compatibility

Multimode	50/125µm - 62.5/125µm
Single Mode	9/125µm
Connector Type	Dependent on user-selection of sold-separately SFP Modules. See ComNet data sheet "SFP Small Form-Factor Pluggable Modules" for model number and description of applicable SFP modules.
Protocol	CSMA/CD

Local & Remote Monitoring Capability

Status Indicating LEDs	10/100TX: Link/Activity (Green)
	Full Duplex/Collision (Yellow)
	Gigabit Copper: Link/Activity (Green)
	Speed: 1000Mbps (Green)
	SFP: Link/Activity (Green)
	Power (Green), Power 1 (Green), Power 2 (Green)
	System Summary Fault (Red)
	Ring Master (Green)
DDM	(Digital Diagnostic Monitoring) Remotely ascertains the status of the operating voltage, current, and operating temperature of the SFP modules
Relay Alarm	Alarm relay output for port breakdown or power failure indication. Relay contact rating: 1A @ 24V DC, resistive. Contacts are normally open (NO)

Internal Power Supply/Operating Power

Input Voltage Range	85-264 VAC or 88-373 VDC
Power Consumption	12 W
AC Power Line Frequency	47 to 63 Hz
Redundancy	Redundant AC/DC power supply capability is included to reduce the possibility of a single-point-of-failure, for the highest possible switch and network reliability

Reverse polarity protection for the 88-373 VDC input
Overload Current Protection

Mechanical

Housing	Aluminum
Mounting	Standard DIN-Rail or Panel Mount (Panel mount adapter included)
Ingress Protection Rating	IP-30
Cooling	Natural convection.
Housing Dimensions	5.85 × 3.79 × 6.06 in (14.85 × 9.64 × 15.4 cm)
Weight, Unpacked	4.26 lb / 1.935 kg

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HARDWARE SPECIFICATIONS (CONT'D)

Connectors

10/100T(X)	7 RJ-45
Combo/Uplink Ports	10/100/1000T(X): 3 RJ-45
	100/1000FX: 3 SFP[1]
RS232 Console Port	RJ-45
Power	6-position screw-terminal block
Alarm Contacts	Screw terminals

Environmental

MTBF	>250,000 hours
Operating Temperature Range	-40°C to 85°C
Storage Temperature Range	-40°C – 85°C
Humidity	5% to 95%

Unit is conformally coated for humidity with condensation or airborne particulate matter conditions

AGENCY COMPLIANCE

PART 15 COMPLIANT   E322911   RoHS COMPLIANT   N24621

Agency Standards Approval & Compliance

EMI	FCC Class A, CE EN61000-4-2 (ESD), CE EN61000-4-3 (RS), CE EN61000-4-4 (EFT), CE EN61000-4-5 (Surge), CE EN55022, CE EN61000-4-6 (CS), CE EN61000-4-8, CE EN61000-6-2, CE EN61000-6-4
IETF RFC Compliance	RFC768-UDP, RFC783-TFTP, RFC791-IPRFC792-ICMP, RFC793-TCP, RFC827-ARP,RFC854-Telnet, RFC894-IP over Ethernet,RFC1112-IGMP v1, RFC1519-CIDR, RFC1541-DHCP (client), RFC2030-SNTP, RFC2068-HTTP, RFC2236-IGMP v2,RFC2475-Differentiated Services,RFC2865-Radius, RFC3414-SNMPv3-USM, RFC3415-SNMPv3-VACM
IETF SNMP MIBS	RFC1493-BRIDGE-MIB, RFC1907-SNMPv2-MIB, RFC2012-TCP-MIB, RFC2013-UDP-MIB, RFC2578-SNMPv2-SMI, RFC2579-SNMPv2-TC, RFC2819-RMON-MIB, RFC2863-IF-MIB, draft-ietf-bridge-rstppmib-03-BRIDGE-MIB, draft-ietf-bridge-bridgemib-smiv2-03-RSTP-MIB, IANAifType-MIB
Safety	UL, cUL, CE/EN60950-1; UL 508 Class 1, Division 2, (Groups A, B, C and D) for Hazardous Locations
Stability Testing	IEC60068-2-32 (Free fall), IEC60068-2-27 (Shock), IEC60068-2-6 (Vibration)

[1] Multimode fiber needs to meet or exceed fiber standard ITU-T G.651.
Single mode fiber needs to meet or exceed fiber standard ITU-T G.652

ORDERING INFORMATION

Part Number	Description
CNGE3FE7MS4	Substation-Rated Managed Ethernet Switch with (7) 10/100BASE-T(X) / (3) 10/100/1000BASE-T(X) or 100/1000BASE-FX SFP Ports

Complies with FDA Performance Standard for Laser Products, Title 21, Code of Federal Regulations, Subchapter J. In a continuing effort to improve and advance technology, product specifications are subject to change without notice.

Low Power Consumption

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ENVIRONMENTAL TYPE TESTS

Test	Description		Test Levls	Severity Levels
IEC 60068-2-1	Cold Temperature	Test Ad	-40°C, 16 Hours	N/A
IEC 60068-2-2	Dry Heat	Test Bd	+85°C, 16 Hours	N/A
IEC 60068-2-30	Humidity (Damp Heat, Cyclic)	Test Db	95% (non-condensing), 55°C, 6 Cycles	N/A
IEC 60255-21-1	Vibration	Tests Fc	2g @ (10 - 150) Hz	Class 2
IEC 60255-21-2	Shock	Tests Ea	30g @ 11ms	Class 2

IEC 61850-3 EMI TYPE TESTS

Test	Description		Test Levls	Severity Levels
IEC 61000-4-2	ESD	Enclosure Contact	+/- 8kV	4
		Enclosure Air	+/- 15kV	4
IEC 61000-4-3	Radiated RFI	Enclosure Ports	20 V/m	x
		Signal Ports	+/- 4kV @ 2.5kHz	x
IEC 61000-4-4	Burst (Fast Transient)	DC Power Ports	+/- 4kV	4
		AC Power Ports	+/- 4kV	4
		Earth Ground Ports	+/- 4kV	4
		Signal Ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
IEC 61000-4-5	Surge	DC Power Ports	+/- 2kV line-to-earth, +/- 1kV line-to-line	3
		AC Power Ports	+/- 4kV line-to-earth, +/- 2kV line-to-line	4
		Signal Ports	10V	3
IEC 61000-4-6	Induced (Conducted) RFI	DC Power Ports	10V	3
		AC Power Ports	10V	3
		Signal Ports	10V	3
IEC 61000-4-8	Magnetic Field	Enclosure Ports	40 A/m continuous, 1000 A/m for 1 s	N/A
IEC 61000-4-29	Voltage Dips & Interrupts	DC Power Ports	30% for 0.1s, 60% for 0.1s, 100% for 0.05s	N/A
IEC 61000-4-11		AC Power Ports	30% for 1 period, 60% for 50 periods	N/A
			100% for 1 period, 60% for 50 periods	N/A
IEC 61000-4-12	Damped Oscillatory	Signal Ports	2.5kV common, 1kV diff. mode @ 1 MHz	3
		DC Power Ports	2.5kV common, 1kV diff. mode @ 1 MHz	3
		AC Power Ports	2.5kV common, 1kV diff. mode @ 1 MHz	3
IEC 61000-4-16	Mains Frequency Voltage	Signal Ports	30V Continuous, 300V for 1s	4
		DC Power Ports	30V Continuous, 300V for 1s	4
IEC 61000-4-17	Ripple on DC Power Supply	DC Power Ports	10%	3
IEC 60255-5	Dielectric Strength	Signal Ports	2kV AC (Fail-Safe Relay Output)	N/A
		DC Power Ports	1.5kV DC	N/A
		AC Power Ports	2kV AC	N/A
IEC 60255-5	H V Impulse	Signal Ports	5kV (Fail-Safe Relay Output)	N/A
		DC Power Ports	5kV	N/A
		AC Power Ports	5kV	N/A

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IEEE 1613 (C37.90.X) EMI IMMUNITY TYPE TESTS

Test	Description		Test Levls	Severity Levels
IEEE C37.90.3	ESD	Enclosure Contact	+/- 8kV	N/A
		Enclosure Air	+/- 15kV	N/A
IEEE C37.90.	Radiated RFI	Enclosure Ports	35 V/m	N/A
		Signal Ports	+/- 4kV @ 2.5kHz	N/A
IEEE C37.90.1	Fast Transient	DC Power Ports	+/- 4kV	N/A
		AC Power Ports	+/- 4kV	N/A
		Earth Ground Ports	+/- 4kV	N/A
		Signal Ports	2.5kV common mode @ 1MHz	N/A
IEEE C37.90.1	Oscillatory	DC Power Ports	2.5kV common, 1kV diff. mode @ 1MHz	N/A
		AC Power Ports	2.5kV common, 1kV diff. mode @ 1MHz	N/A
		Signal Ports	5kV (Fail-Safe Relay Output)	N/A
IEEE C37.90	H V Impulse	DC Power Ports	5kV	N/A
		AC Power Ports	5kV	N/A
		Signal Ports	2kV AC	N/A
IEEE C37.90.	Dielectric Strength	DC Power Ports	1.5kV DC	N/A
		AC Power Ports	2kV AC	N/A

OUTLINE AND INSTALLATION DRAWING

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