



EXCLUSIVE



SUBSTATION



DIN RAIL



-40° TO +85° C



FLEXIBILITY



3



7



ComNet product series RLGE3FE7MS4 is a substation-rated and industrially hardened managed layer 2 Ethernet switch. Fully compliant with the requirements of IEC 61850-3, IEEE 1613 Class 2, EN50155, Class1/ Division 2 (Groups A, B, C, & D for hazardous environments), and NEMA TS-1/TS-2, the DIN-rail mountable RLGE3FE7MS4 is intended 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, track-side electronic equipment, and other severe out-of-plant installations.

The RLGE3FE7MS4 provides 7 10/100BASE-TX communications ports, with 3 user-configurable 10/100/1000BASE-TX or 100/1000BASE-FX gigabit combo uplink ports. The use of SFPs for the three (3) gigabit uplink ports provides a truly future-proof platform, where the uplink optics may be changed in the field at any time, to support changes in the user's networking or cable plant requirements as they arise.

The internal/self-contained 12 to 60 VDC or 85 to 264 VAC/88 to 370 VDC power supply features redundant power inputs, for the highest possible reliability in those installations where network availability is of the utmost importance.

The RLGE3FE7MS4 supports multiple Ethernet redundancy protocols, including ComNet C-Ring (recovery time < 30ms, with >250 switches integrated within the ring), and MSTP with RSTP/STP compatibility. With its extremely fast recovery time, the most mission-critical applications are fully protected from network interruptions or temporary malfunctions due to possible short or long-term faults or outages within the network.

## 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
- › 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
- › Provided HTTPS/SSH protocol enhances network security
- › PTP Client for precision time protocol clock synchronization
- › Rugged metal housing. DIN-rail or panel-mountable, & rated for IP-30 ingress protection
- › Redundant power supply inputs significantly reduce the possibility of a single-point-of-failure, for the highest system and network reliability. Multiple AC and DC operating voltages available.
- › 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 SCADA and distribution automation networks; protective relaying systems; power transmission & distribution systems; remote/unattended wind farm, hydroelectric, and solar/photovoltaic power generation facilities; and other electrical utility-specific applications
- › NERC-CIP-014 compliance for perimeter security, surveillance monitoring, and controlled access to electrical substations and power generating facilities, and other critical infrastructure/high value, mission-critical sites and assets
- › 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
- › 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.

## ORDERING INFORMATION

Part Number	Description
RLGE3FE7MS4/LV	(7) 10/100BASE-T(X) / (3) 10/100/1000BASE-T(X) or 100/1000BASE-FX SFP Ports, Dual/redundant power inputs (12 to 60 VDC)
RLGE3FE7MS4/HV	(7) 10/100BASE-T(X) / (3) 10/100/1000BASE-T(X) or 100/1000BASE-FX SFP Ports, Dual/redundant power inputs (85 to 264 VAC/88 to 370 VDC)

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.

## 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 C-Ring topologies are also supported.

### 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

### 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
- HTTP / SSH enhance network 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

### TFTP Firmware Update / System Configure Restore & Backup

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

**SOFTWARE FEATURES**

<b>Network Management</b>	SNMP v1, v2c, v3/ Web/Telnet/CLI/NS-View Management	<b>System Log</b>	Supports System log record and remote system log server
<b>SNMP MIB</b>	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	<b>SMTP</b>	Supports SMTP Server and 6 e-mail accounts for receiving event alerts
<b>Port Trunk w/ LACP</b>	LACP Port Trunk: 4 Trunk groups/ Maximum 4 Trunk members	<b>SNMP Trap</b>	Up to 3 Trap stations. Indications are provided for: <ul style="list-style-type: none"> <li>- Device cold start</li> <li>- Port link up</li> <li>- Port link down</li> <li>- Authentication Failure</li> <li>- Private Trap for power status</li> <li>- Port Alarm configuration</li> <li>- Fault alarm</li> <li>- C-Ring network ring topology change or fault</li> </ul>
<b>LLDP</b>	Supports LLDP to allow the switch to advise its identification and capability on the LAN	<b>DHCP</b>	Provides DHCP Client/ DHCP Server and IP Relay
<b>Port Security</b>	Supports 1000 entries of MAC address for static MAC and another 100 addresses for MAC filtering/ MAC binding	<b>DNS</b>	Provides DNS client feature and support Primary and Secondary DNS server
<b>Port/Trunk</b>	Supports Port configuration, status, statistics, and monitoring	<b>Ethernet Standards Compliance</b>	
<b>IP Security</b>	Supports 10 IP addresses that have permission to access the switch management and to prevent unauthorized intrusion.	IEEE802.3	10Base-T Ethernet
<b>Login Security</b>	Supports HTTPS/SSH and IEEE802.1X Authentication/RADIUS	IEEE802.3u	100Base-TX & 100Base-FX
<b>Bandwidth Control</b>	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.	IEEE802.3ab	1000Base-T
<b>Flow Control</b>	Supports Flow Control for Full-duplex and Back Pressure from Half-duplex	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	
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	10/100T(X): 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)

### Connectors

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

### Input Power

LV Model	Dual/redundant power inputs: 12 to 60 VDC
HV Model	Dual/redundant power inputs: 85 to 264 VAC/88 to 370 VDC
DC inputs are isolated from ground, for use with either + or - inputs	
Power Consumption	12 W, typical
AC Line Frequency	47 to 63 Hz
Current Protection	Overload Current Protected

### Mechanical

Housing	Aluminum
Mounting	Standard DIN-Rail (35mm track) 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

### 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 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-IPRPF792-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
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



## ENVIRONMENTAL TYPE TESTS

Test	Description		Test Levels	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 Levels	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
AC Power Ports		30% for 1 period, 60% for 50 periods	N/A	
IEC 61000-4-11			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

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

Test	Description		Test Levels	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

