ATTACHMENT #3 - Radio System Switches

SIEMENS

Rugged Communication

RUGGEDCOM Compact Switches

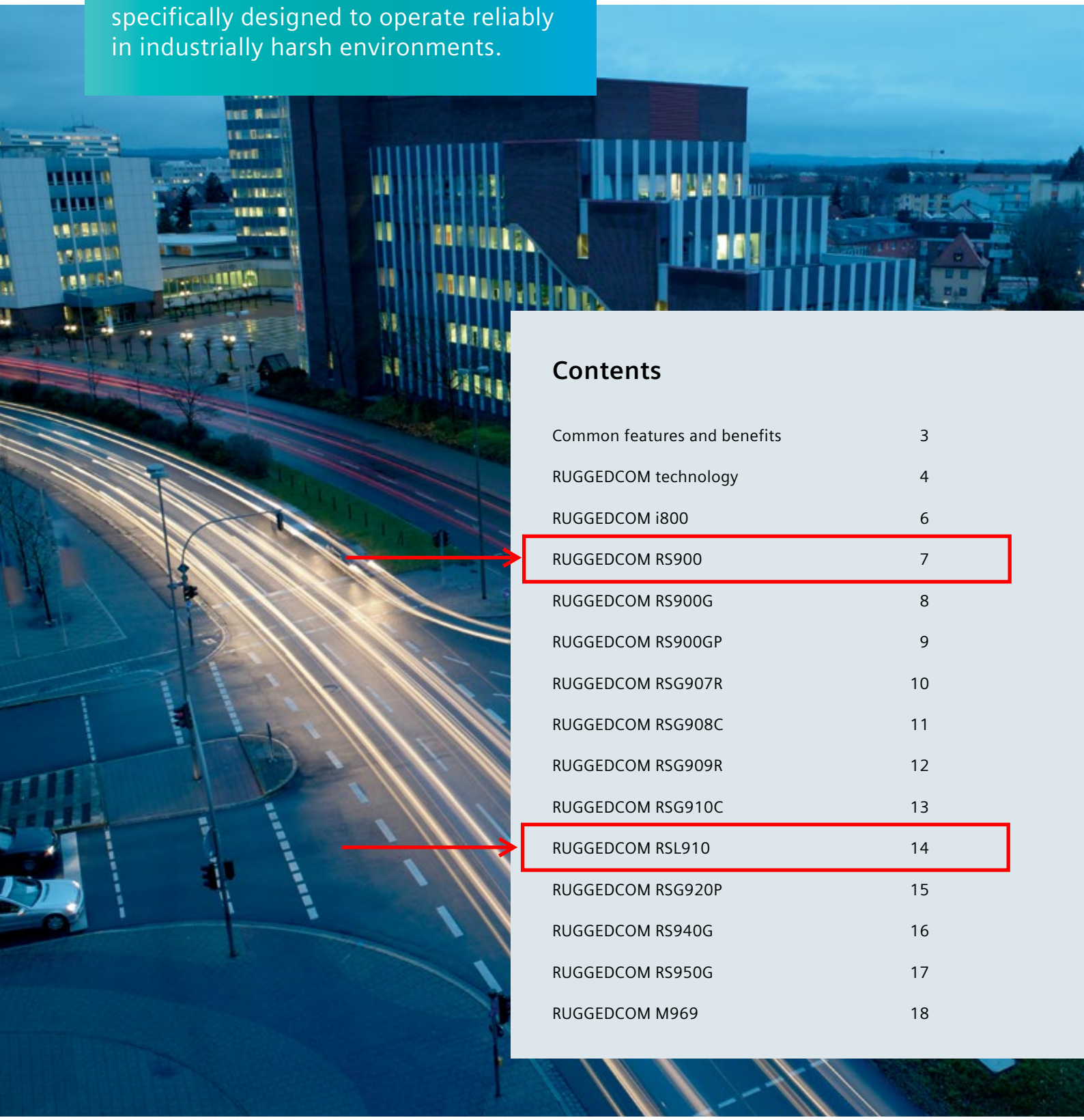
Layer 2 Ethernet Switches

Brochure

Edition 09/2018

siemens.com/ruggedcom

RUGGEDCOM Ethernet switches are specifically designed to operate reliably in industrially harsh environments.



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Common features and benefits

All RUGGEDCOM switches meet and exceed recognized industry standards (e.g. IEC 61850-3, IEEE 1613, NEMA TS 2) for ruggedness and communications performance. They are ideally suited for mission critical real-time control applications requiring high levels of reliability and availability.

Common features

- Rugged Rated for reliability in harsh environments
- Many different fiber port options available
- Long haul fiber support
- High immunity to EMI and heavy electrical surges
- -40 °C to +85 °C operating temperature (no fans)
- Fully integrated power supply (no external adaptors)
- Universal high-voltage range supporting all nominal voltages

RUGGEDCOM technology

RUGGEDCOM products have been specifically designed and tested to withstand the demands of harsh environments.

Rugged Rated

Highly Accelerated Life Testing (HALT) is being used in the early stages of product development – to detect any design and performance issues. Siemens performs Highly Accelerated Stress Screening (HASS) on all RUGGEDCOM products, in order to ensure that customers get their orders free of manufacturing errors and random defects.

RUGGEDCOM products provide reliable and error-free operation in harsh electrical installations with high EMI.

Operation in industrial temperature range
- -40° C to +85° C normal operation
- Passive cooling – no fans

High availability
- Integrated single or redundant power supplies
- Universal high-voltage range: 88–300 VDC or 85–264 VAC
- Low voltage DC: 12 VDC, 24 VDC or 48 VDC

Durable installations
- Full metal enclosure
- Heavy duty mounting
- Industrial terminal blocks for power and I/O connection

Zero Packet Loss

The proliferation of IP networking technology from the office to industrial environments, for use in real-time, mission critical, control applications requires a level of immunity to electromagnetic interference (EMI) well beyond what is currently delivered by commercial grade networking products. In fact, even the EMI immunity requirements prescribed by IEC 61000-6-2 (generic standards – immunity for industrial environments) are inadequate for many environments.

One such environment is the electric utility substation, where EMI levels can be significantly higher than those of the generic industrial environment defined in IEC 61000-6-2. In order to address this risk, both the IEC and IEEE have developed and issued standards addressing EMI immunity requirements for communications networking equipment in electric utility substations.

In response to these requirements, RUGGEDCOM technology withstands all of the EMI type tests required by IEC 61850-3 without experiencing any communications loss or delays. Products featuring this technology also qualify as IEEE 1613 class 2 error-free devices. This innovation is known as Zero Packet Loss technology and it is designed to provide the same level of EMI immunity, and reliability as protective relaying devices.

IEC 61850

IEC 61850 standard for communications in substations is composed of ten parts, which outlines a complete framework for substation automation, including EMI (electromagnetic interference), immunity and environmental requirements (IEC 61850-3) for communications networks in substations.

The EMI immunity requirements of IEC 61850-3 are derived from IEC 61000-6-5 (Immunity for Power Station and Substation Environments), which defines a set of potentially destructive EMI type tests designed to simulate both continuous and transient EMI phenomena in the substation.

This standard has a minimum requirement that the networking equipment operates without any physical damage, reset or latch-up during the application of a variety of destructive EMI immunity type tests.

IEEE 1613

IEEE 1613 specifies ratings, environmental performance and testing requirements for communications networking devices installed in electric power substations.

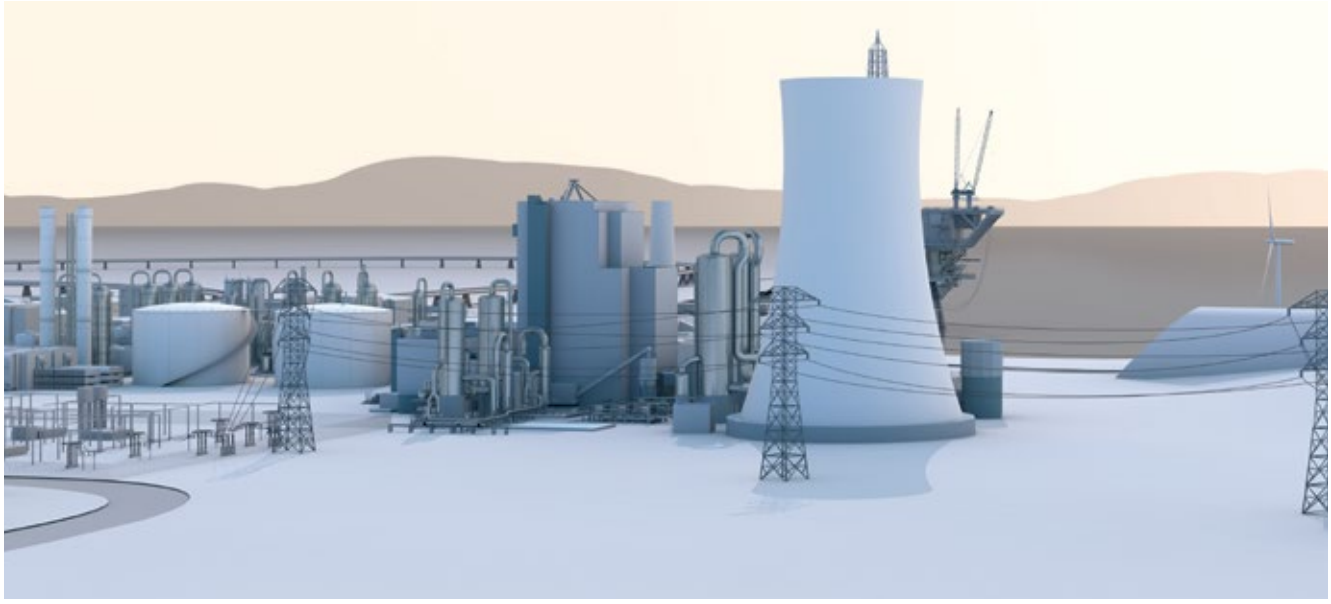
Within the standard, two classes of devices are defined, based on the outcome of a specific set of potentially destructive EMI type tests (EMI stress) designed to simulate EMI phenomena in the substation. These type tests are derived from the same type tests applied to mission critical protective relays (i.e. C37.90.).

Class 1 — these devices are allowed to experience data errors, loss, or delays when exposed to EMI stress.

Class 2 — these devices must provide error-free (i.e. no data errors, delays or loss) operation when exposed to EMI stress.

Neither class of device must experience any permanent damage under EMI stress.

The RUGGEDCOM family qualifies as IEEE 1613 Class 2 error-free devices, putting these products in a class of their own.



RUGGEDCOM i800

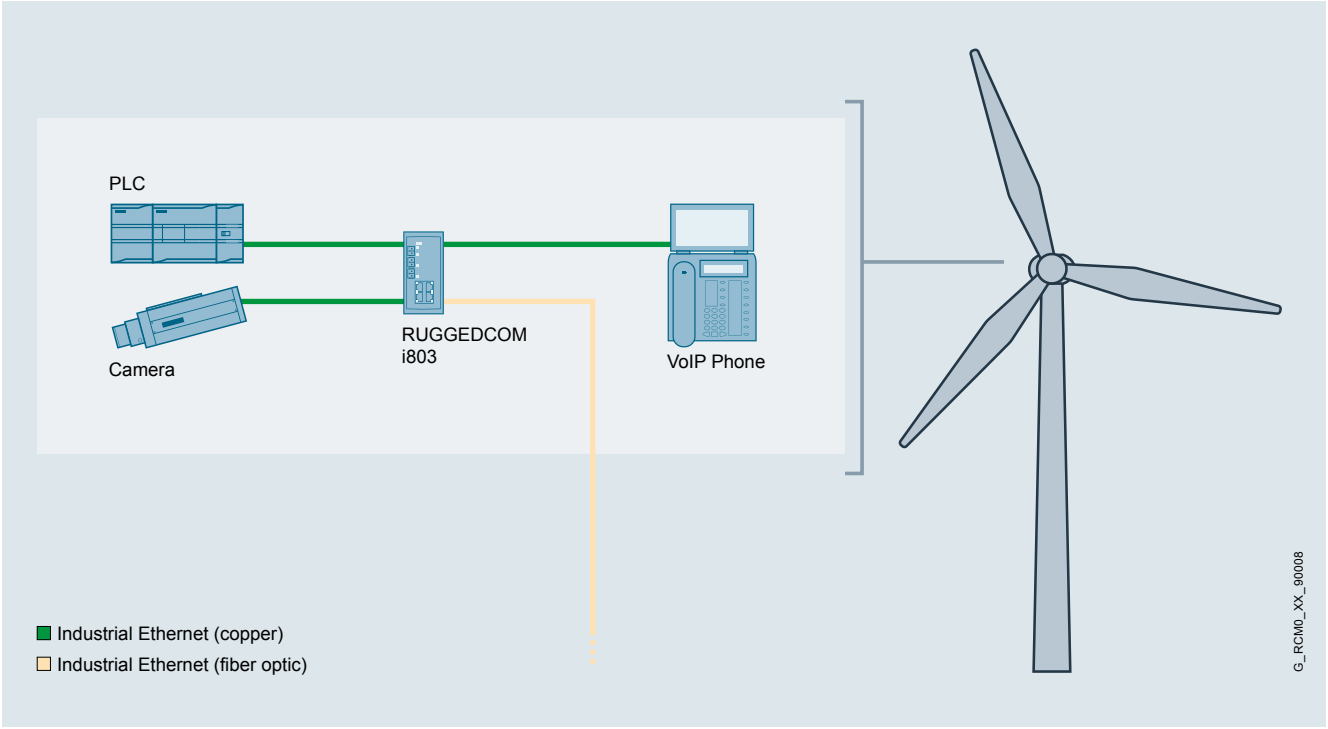
The RUGGEDCOM i800 family are compact Ethernet switches that allow users to choose from managed or unmanaged, regular or extended temperature, fiber-optic or copper interfaces, and Fast or Gigabit Ethernet.

i800 Ethernet ports
- 8 x 10/100BASE-TX
- Fixed configuration

i801 Ethernet ports
- 8 x 10/100BASE-TX + 1 x 1000BASE-X or 1 x 10/100/1000BASE-T
- Industry standard LC fiber-optic connectors
- Multimode and single-mode optical transceivers

i802 Ethernet ports
- 6 x 10/100BASE-TX + 1 x 100BASE-FX or 2 x 100BASE-FX or 2 x 1000BASE-X or 2 x 10/100/1000BASE-T
- Industry standard LC fiber-optic connectors
- Multimode and single-mode optical transceivers

i803 Ethernet ports
- 4 x 10/100BASE-TX + 1 x 100BASE-FX + (2 x 1000BASE-X or 2 x 100BASE-FX)
- Industry standard LC fiber-optic connectors
- Multimode and single-mode optical transceivers



Inside the nacelle of a wind mill the RUGGEDCOM i802 enables connectivity to up to 6 Ethernet devices over copper and a backhaul over fiber-optic.

RUGGEDCOM RS900

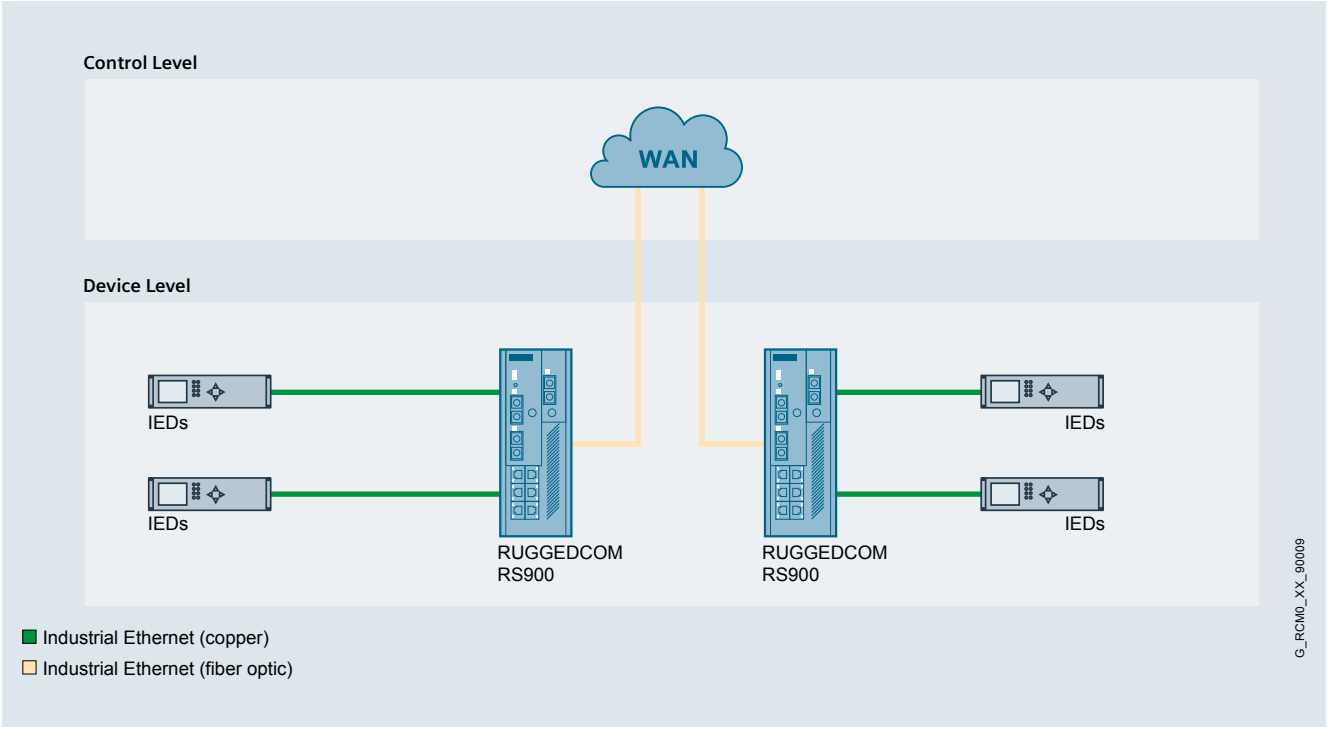
The RUGGEDCOM RS900 is a 9-port utility-grade, fully managed Ethernet switch, specifically designed to operate reliably in electrically harsh and climatically demanding environments.

Ethernet ports

- Up to 9 ports: 6 x 10/100BASE-TX ports with 3 optional fiber or copper ports
- Industry standard fiber-optic connectors: LC, SC, ST, MTRJ
- Multimode and single-mode optical transceivers
- Long-haul optics allow distances up to 90 kms

Universal power supply options

- Fully integrated power supply
- Universal high-voltage input: 120 VAC/VDC and 230 VAC/VDC
- Dual low-voltage DC inputs: 12 VDC, 24 VDC, 48 VDC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85 °C



The RUGGEDCOM RS900 makes it possible to remotely monitor field data using multiple types of communications.

RUGGEDCOM RS900G

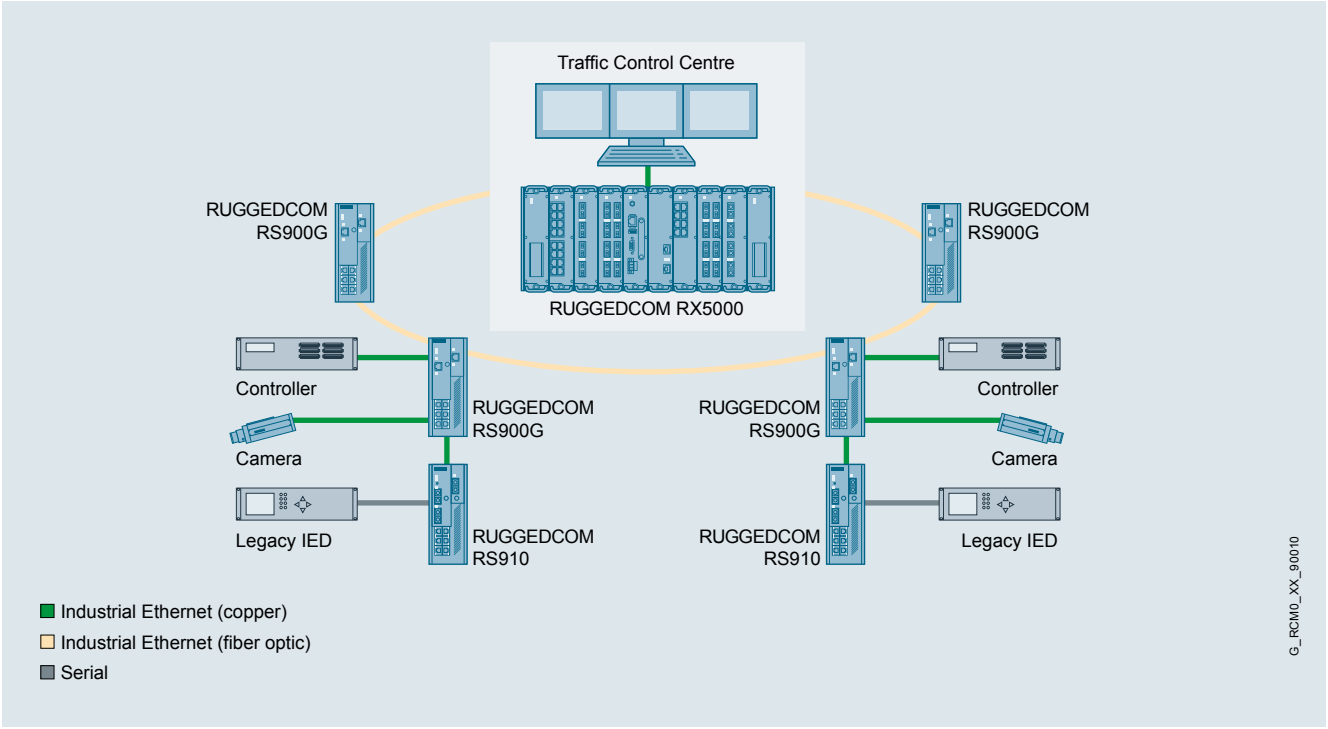
The RUGGEDCOM RS900G is a 10-port utility-grade, fully managed Ethernet switch, providing two fiber-optic Gigabit Ethernet ports and eight Fast Ethernet copper ports.

Ethernet ports

- 2 x fiber-optic Gigabit Ethernet ports (1000BASE-X)
- 8 x Fast Ethernet ports (10/100BASE-TX)
- Multiple fiber options (LC, SC, SFP pluggable optics)
- Long-haul optics allow Gigabit distances of up to 70 km

Universal power supply options

- Fully integrated power supply
- Universal high-voltage input: 120 VAC/VDC and 230 VAC/VDC
- Dual low-voltage DC inputs: 12 VDC, 24 VDC, 48 VDC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85° C



A reliable eRSTP ring network with Gigabit bandwidths can be achieved with the RUGGEDCOM RS900G.

RUGGEDCOM RS900GP

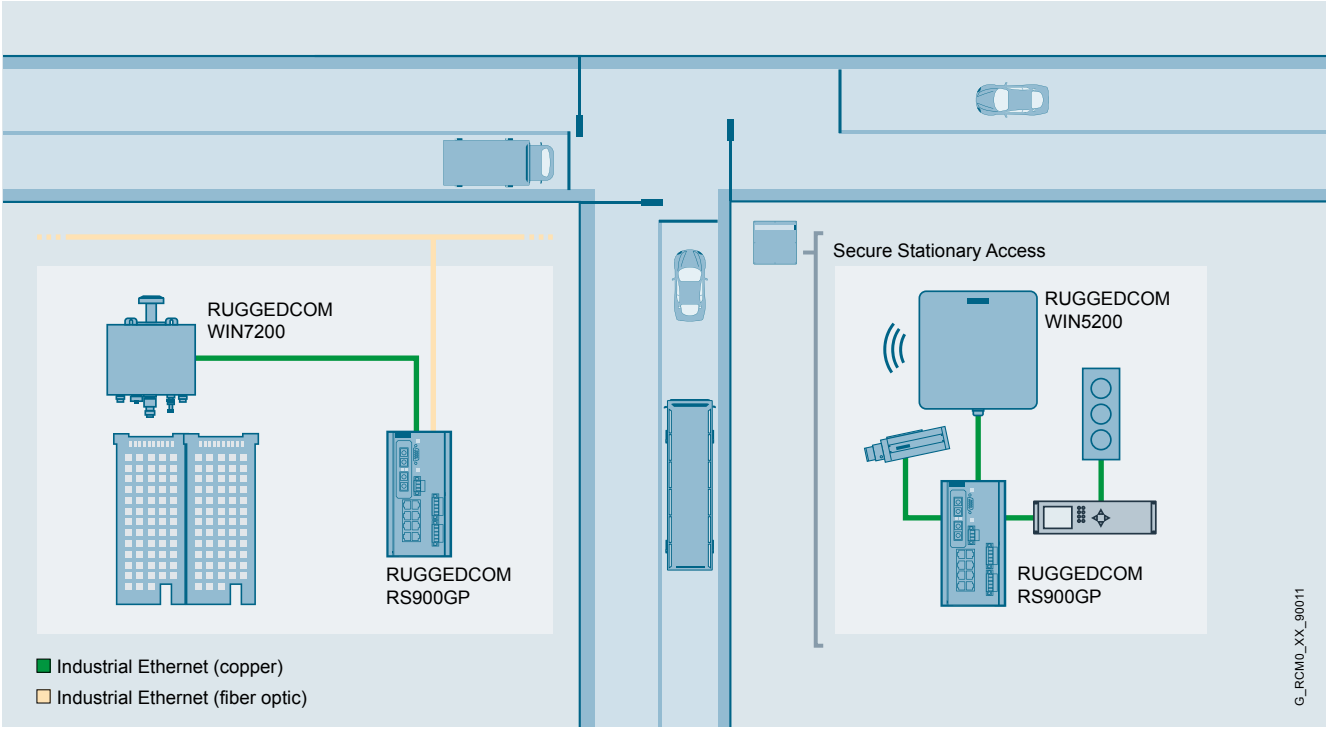
The RUGGEDCOM RS900GP is a 10-port utility-grade, fully managed Ethernet switch, providing two fiber-optic or copper Gigabit Ethernet ports and eight Fast Ethernet copper ports, each capable of supplying high power 802.3at compliant power over Ethernet.

Ethernet ports

- 8 x Fast Ethernet ports (10/100BASE-TX), all external 802.3af / 802.3at-compliant PoE
- Up to 2 fiber-optic Gigabit Ethernet ports (100BASE-FX/1000BASE-X)
- Up to 2 x 10/100/1000BASE-T copper ports
- Multiple fiber connector types (LC, SC, SFP pluggable optics)
- Long-haul optics allow Gigabit distances up to 70 km

Power-Over-Ethernet (PoE)

- 8 x 10/100BASE-TX 802.3af / 802.3at-compliant ports
- Data and power over a single Ethernet cable
- Auto-sensing ports provide power only to PoE end devices
- Compatible with RUGGEDCOM WIN products



Multiple Power-over-Ethernet devices are powered by the RUGGEDCOM RS900GP in the field.

RUGGEDCOM RSG907R New

The RUGGEDCOM RSG907R is a compact Gigabit IEEE 1588 compatible Ethernet switch supporting High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP) according to IEC 62439-3.

Ethernet ports

- 3 x RNA (Redundant Network Access) and coupler Ethernet ports according to IEC 62439-3 (1000BASE-X)
- 4 x SAN (Single Attached Node) fiber optic ports (100BASE-FX)
- Multiple fiber connector types (SFP, LC)

Universal power supply options

- Fully integrated redundant power supply
- Universal high-voltage input:
  HI (100 – 240 VAC / 100 – 300 VDC)
- Dual low-voltage DC inputs: 12/24/48 VDC (10 – 60 VDC)
- Terminal blocks for reliable, maintenance-free connections

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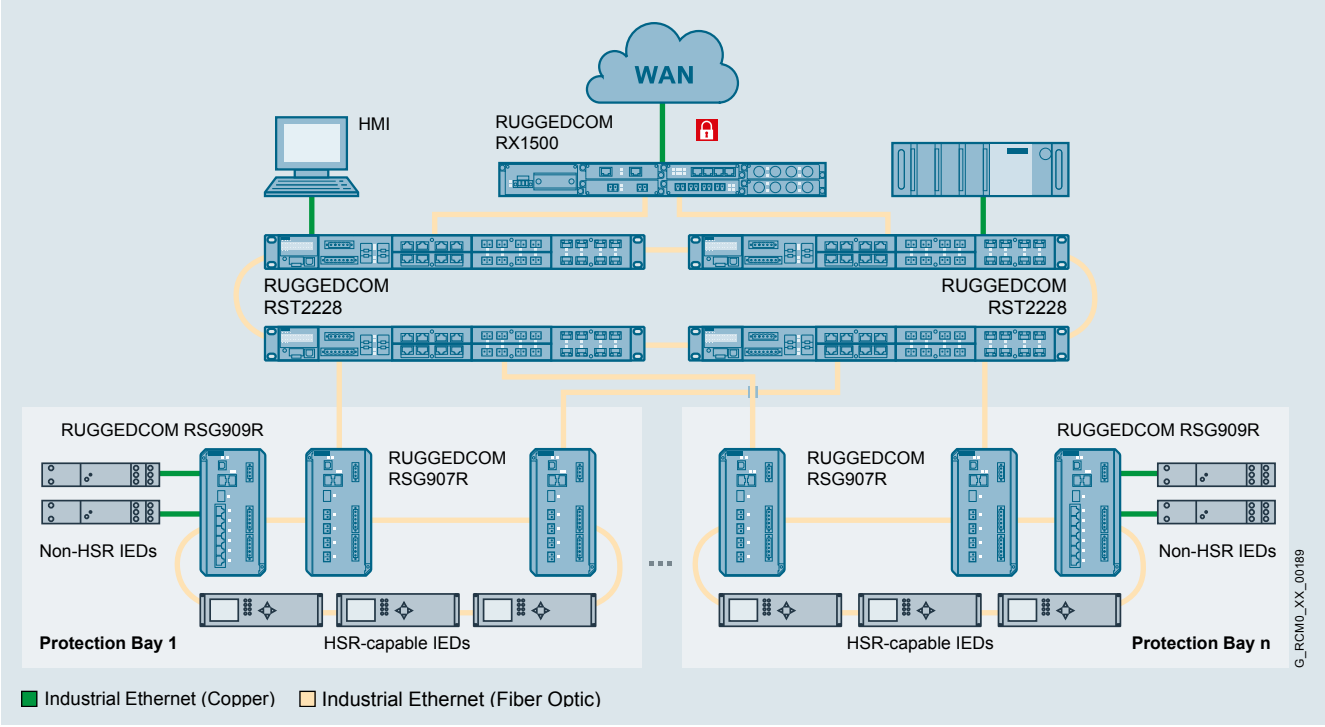

RUGGEDCOM RSG907R / RSG909R switches terminating each HSR ring can be directly connected to RSTP network via their coupling ports.

RUGGEDCOM RSG908C New

The RUGGEDCOM RSG908C is an IEEE 1588 compatible Ethernet switch, providing 4 Gigabit SFP ports and 4 Fast Ethernet fiber ports.

Ethernet ports
- 4 x Gigabit SFP ports (1000BASE-X)
- 4 x fiber optic ports (100BASE-FX)
- Multiple fiber connector types (SFP, LC)

Universal power supply options
- Fully integrated redundant power supply
- Universal high-voltage input: HI (100 – 240 VAC / 100 – 300 VDC)
- Dual low-voltage DC inputs: 12/24/48 VDC (10 – 60 VDC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85° C

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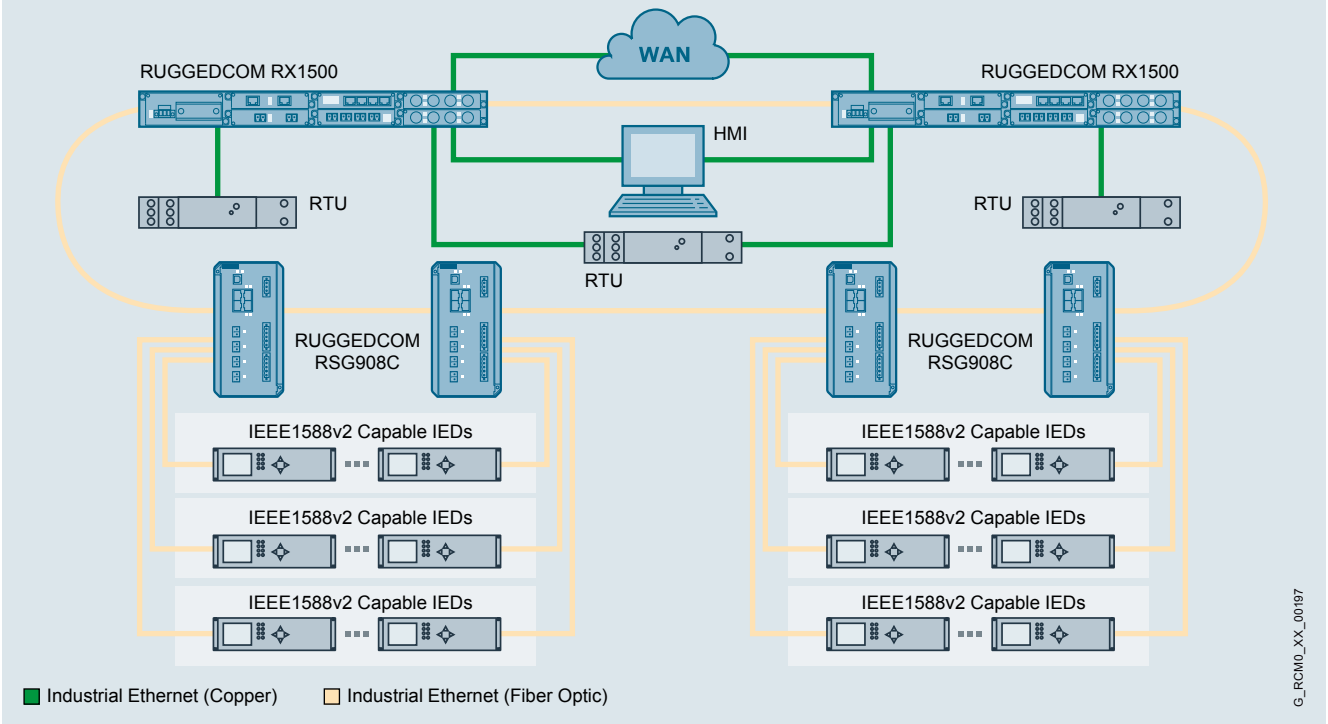

The RUGGEDCOM RSG908C allows the aggregation of large fiber optic 100BASE-FX subrings of IEDs at protection bays into 1 Gbit/s fiber optic rings while providing IEEE1588 timing.

RUGGEDCOM RSG909R New

The RUGGEDCOM RSG909R is a compact Gigabit IEEE 1588 compatible Ethernet switch supporting High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP) according to IEC 62439-3.

Ethernet ports

- 3 x RNA (Redundant Network Access) and coupler Ethernet ports according to IEC 62439-3 (1000BASE-X)
- 6 x SAN (Single Attached Node) copper ports (10/100/1000BASE-TX)
- Industry standard connectors: SFP, RJ45

Universal power supply options

- Fully integrated redundant power supply
- Universal high-voltage input: HI (100 – 240 VAC / 100 – 300 VDC)
- Dual low-voltage DC inputs: 12/24/48 VDC (10 – 60 VDC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85° C

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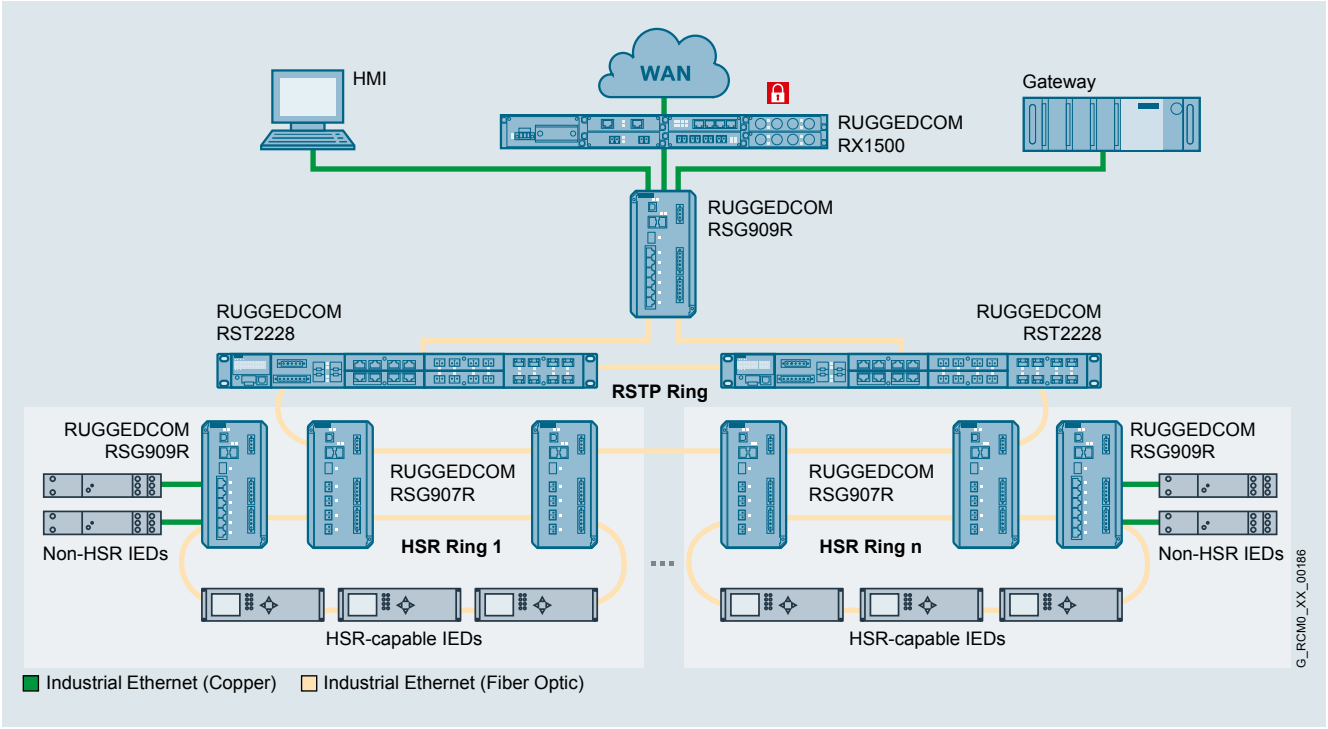

Two RUGGEDCOM RSG907R / RSG909R are used in each HSR bay ring for redundant coupling with PRP station level LANs.

RUGGEDCOM RSG910C New

The RUGGEDCOM RSG910C is an IEEE 1588 compatible Gigabit Ethernet switch, providing 4 Gigabit SFP ports and 4 Gigabit copper ports.

Ethernet ports
- 4 x Gigabit SFP ports (1000BASE-X)
- 6 x copper ports (10/100/1000BASE-TX)
- Multiple fiber connector types (SFP, LC)

Universal power supply options
- Fully integrated redundant power supply
- Universal high-voltage input:
  HI (100 – 240 VAC / 100 – 300 VDC)
- Dual low-voltage DC inputs: 12/24/48 VDC (10 – 60 VDC)
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85° C

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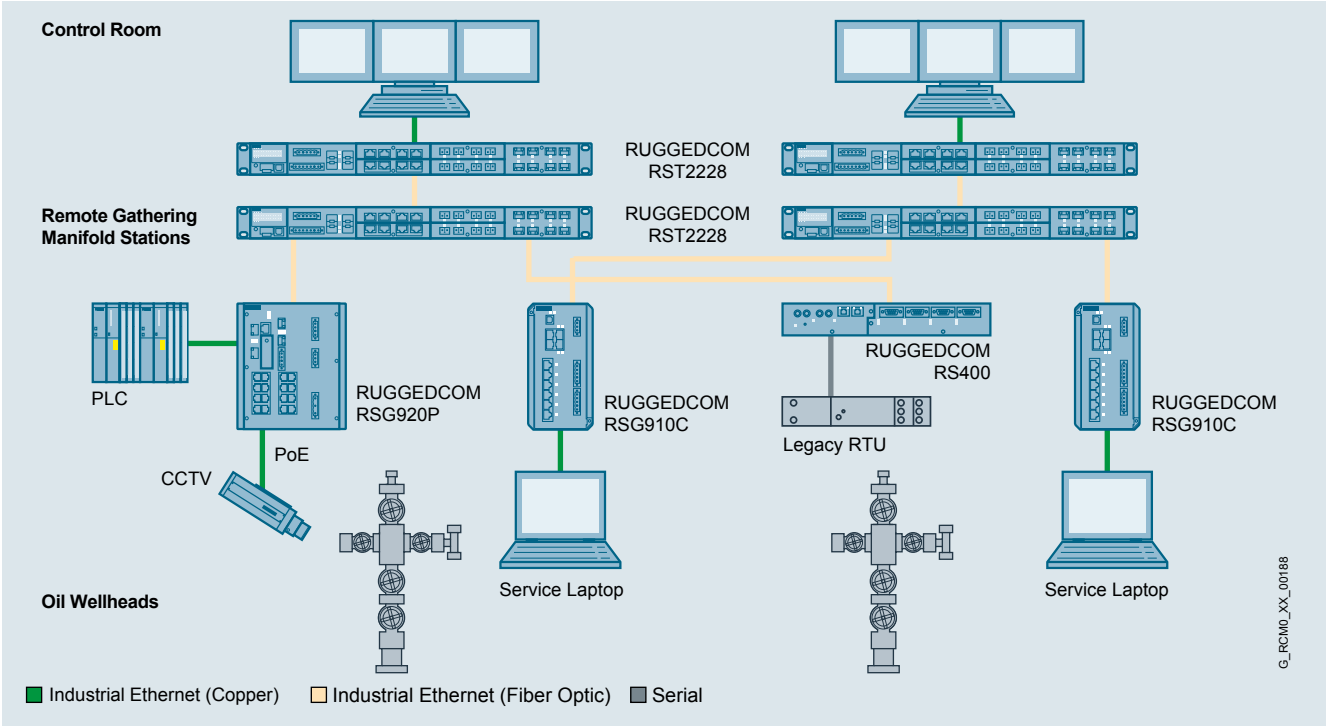


Wellhead monitoring in onshore oil&gas production with the RUGGEDCOM RSG910C.

RUGGEDCOM RSL910

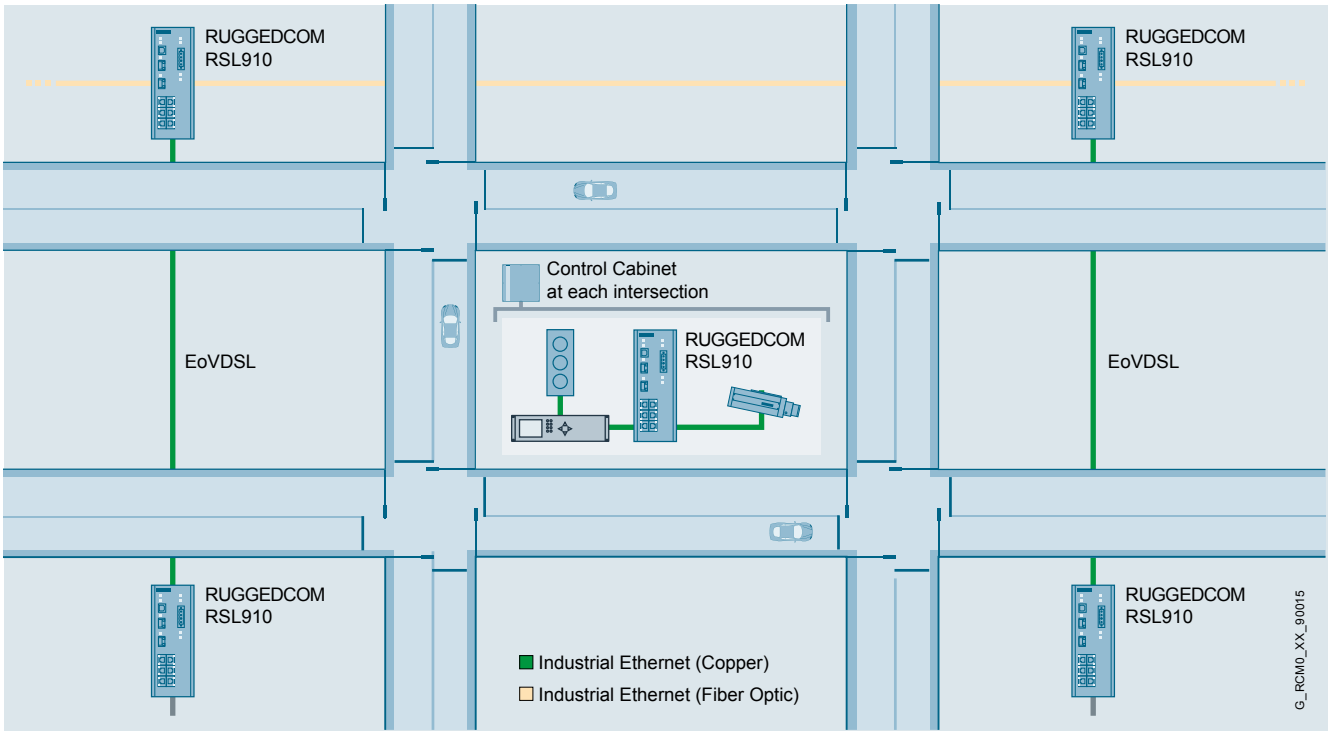
The RUGGEDCOM RSL910 is a compact form factor rugged Ethernet switch with two EoVDSL2 uplinks and two SFP uplinks providing the flexibility to use legacy copper or optical infrastructure in harsh environments.

Ethernet ports

- 2 x SFP uplink ports, supporting Fast Ethernet and Gigabit
- 6 x Fast Ethernet copper device ports

Ethernet over VDSL port characteristics

- 2 x EoVDSL2 uplink ports with terminal blocks
- Integrated power 24 VDC, 48 VDC or HI voltage power supply
- RS232 console port and failsafe relay output



Traffic signal connectivity between intersections using a combination of existing copper cabling and fiber-optic backbone.

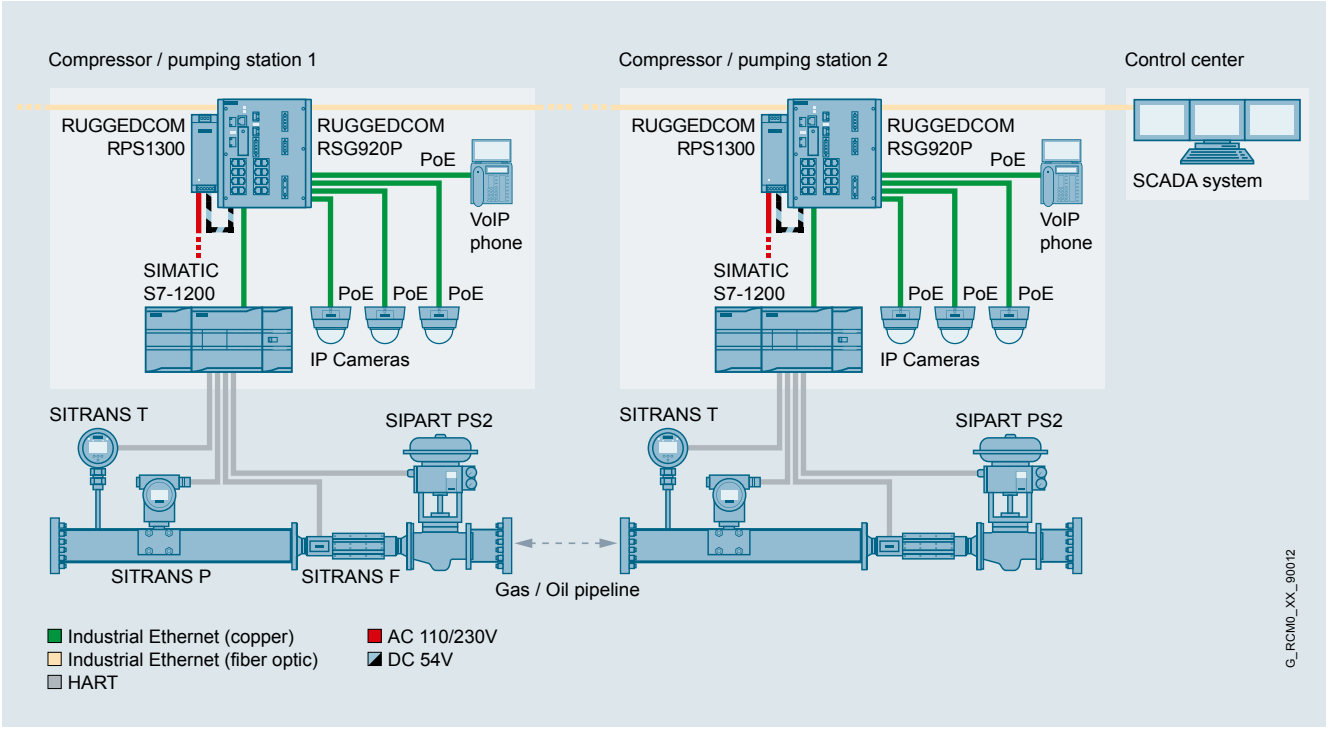
RUGGEDCOM RSG920P

The RUGGEDCOM RSG920P is a rugged, high density, small form factor Layer 2 switch with Power-over-Ethernet (PoE) capability designed for space limited cabinets with high bandwidth requirements.

Ethernet ports
- RJ45: 16 x 10/100/1000BASE-T ports
- SFP: 4 x 100/1000 SFP ports

Power-Over-Ethernet (PoE)
- 4 x 10/100/1000BASE-T ports
- Data and power over a single Ethernet cable
- Supports IEEE 802.3af, IEEE 802.3at
- 44–57 VDC (IEEE 802.3af), 50–57 (IEEE 802.3at)
- 30 W per port power output

Power supply characteristics
- Support for various nominal voltages: 12 VDC, 24 VDC, 48 VDC, 120 VAC/VDC, 230 VAC/VDC
- 27 W maximum power consumption



The RUGGEDCOM RSG920P is ideal for the field level where growing demands for Ethernet connectivty exist.

RUGGEDCOM RS940G

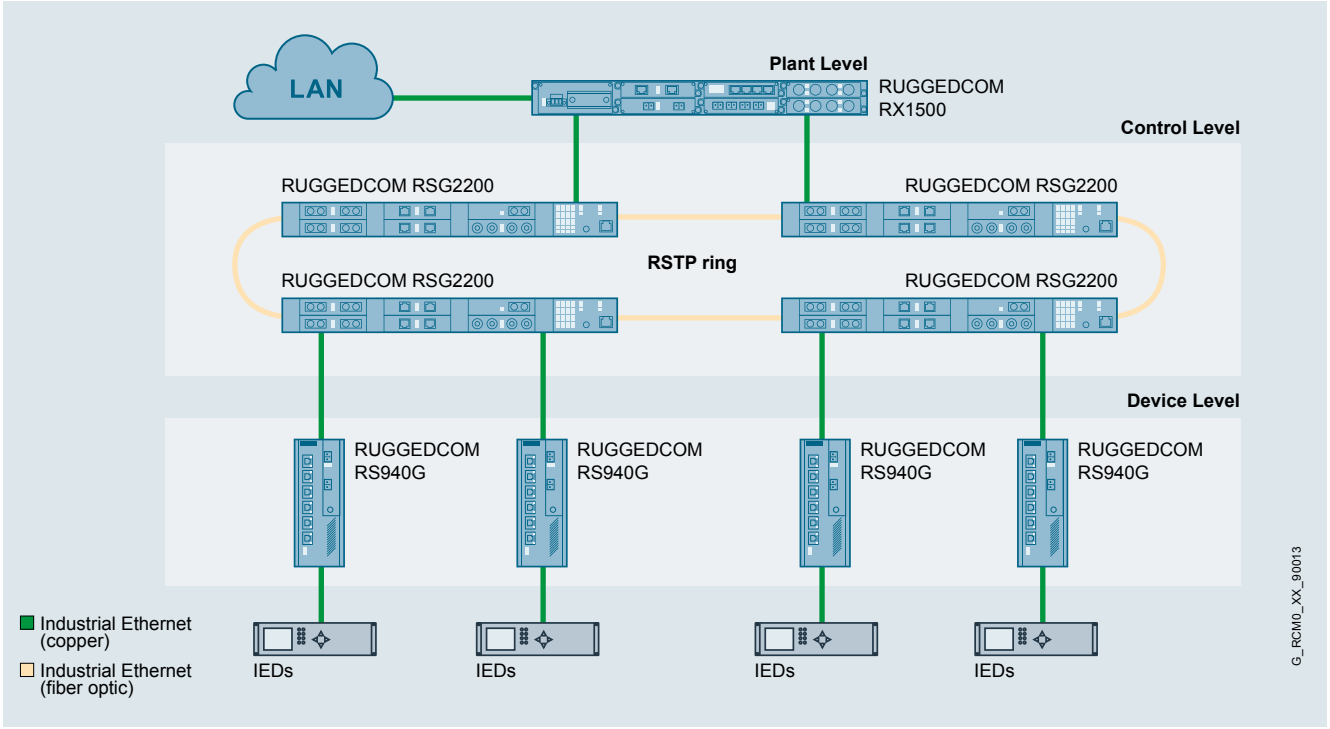
The RUGGEDCOM RS940G is a utility-grade, fully managed Ethernet switch, providing up to eight Gigabit Ethernet ports. Six 10/100/1000BASE-T triple speed copper ports are standard. An additional two Gigabit fiber or copper ports can be added.

Ethernet ports

- 6 x 10/100/1000BASE-T triple-speed copper ports
- 2 optional copper or fiber Gigabit Ethernet ports
- Multiple fiber options (LC, SC, SFP pluggable optics)
- Long-haul optics allow Gigabit distances up to 70 km

Universal power supply options

- Fully integrated power supply
- Universal high-voltage input: 120 VAC/VDC and 230 VAC/DC
- Dual low-voltage DC inputs: 12 VDC, 24 VDC, 48 VDC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85 °C



The RUGGEDCOM RS940G can connect up to 8 devices with Gigabit speeds on the device level.

RUGGEDCOM RS950G

RUGGEDCOM RS950G is an IEC 62439-3 Redundancy Box (RedBox), supporting both High Availability Seamless Redundancy (HSR) and Parallel Redundancy Protocol (PRP).

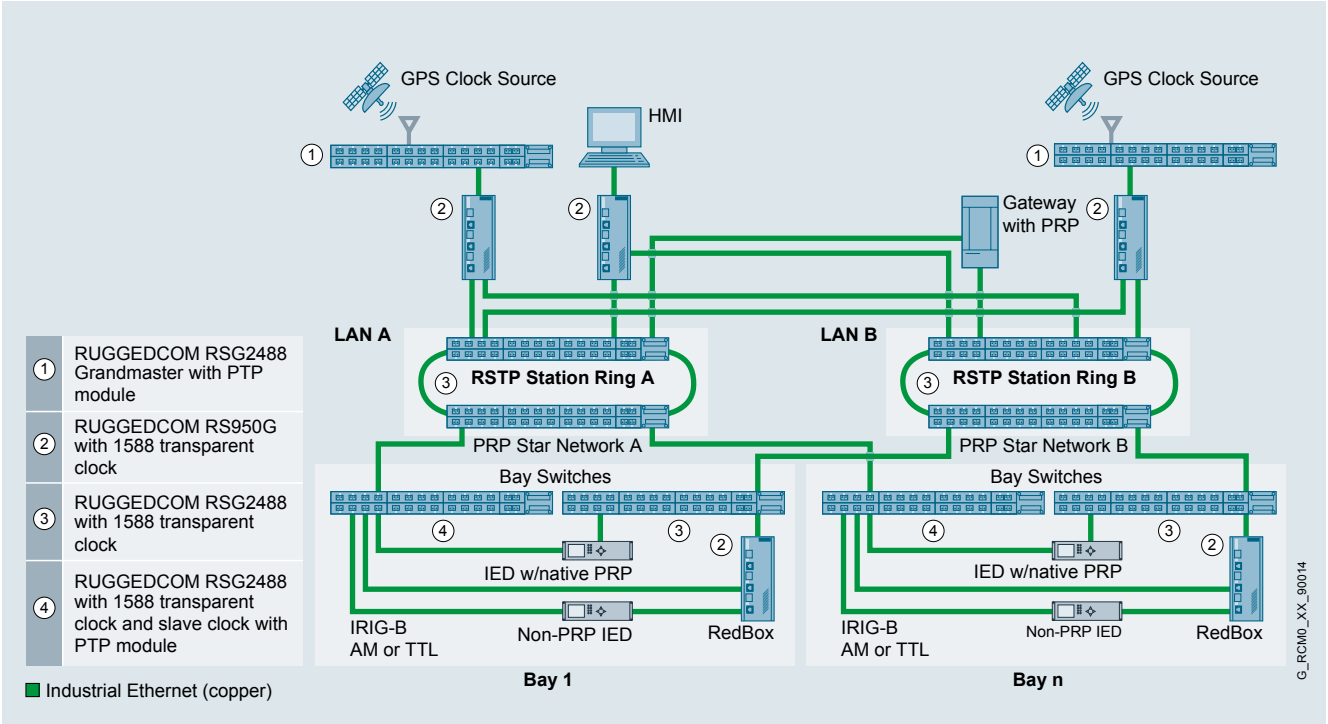
The RUGGEDCOM RS950G provides the ultimate in network reliability by simultaneously transmitting duplicate packets on independent routes through the network to provide complete path redundancy at the data link layer.

Ethernet ports

- 3 configurable copper or fiber ports
- 2 IEC 62439-3 Ethernet ports (HSR or PRP)
- 1 local access port for standard IEEE 802.3 Ethernet devices
- SFP transceiver with 100BASE-FX or 1000BASE-X options

Precision timing

- IEEE 1588 v2 with hardware time stamping on all ports
- Transparent clock operation for high precision on switched networks
  - 1-step operation in HSR mode
  - 1-step or 2-step operation in PRP mode



The RUGGEDCOM RS950G RedBox helps creating the most reliable redundant networks while maintaining Gigabit speeds throughout.

RUGGEDCOM M969

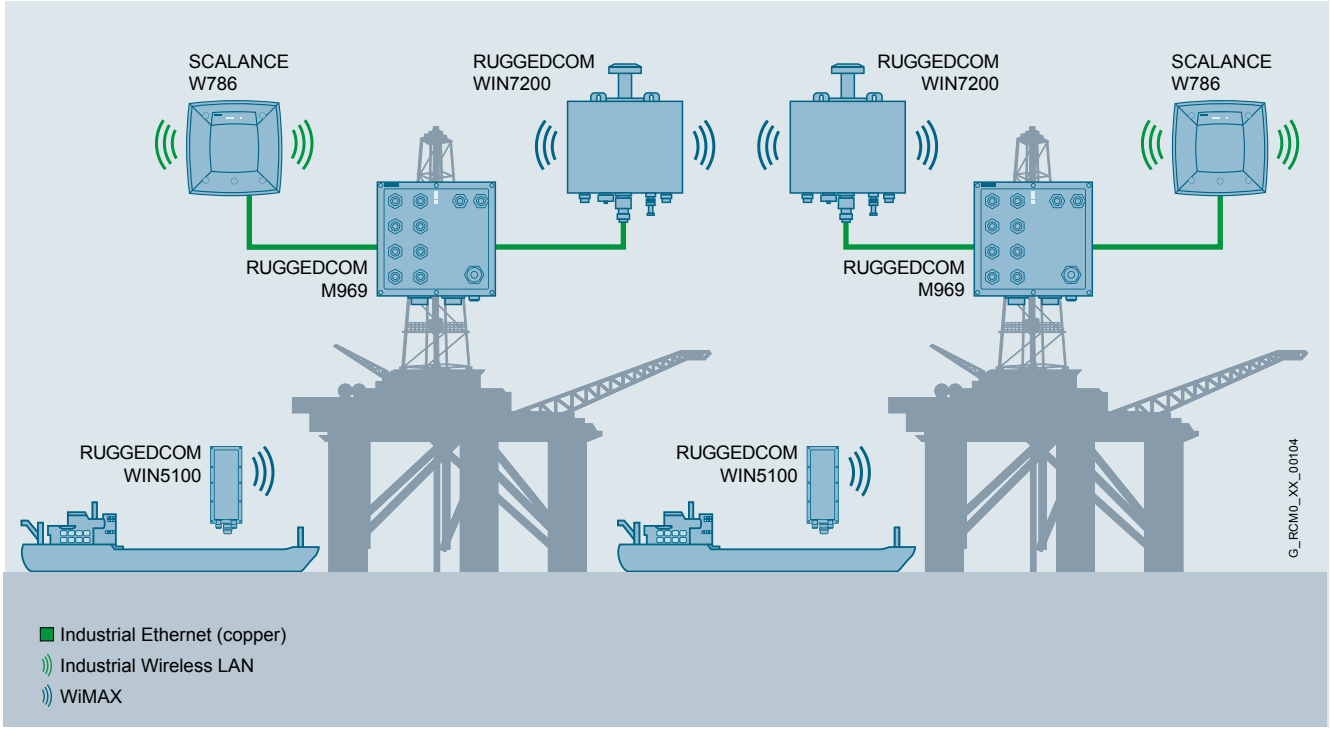
The RUGGEDCOM M969 is a MIL-STD 10-port, fully managed Ethernet switch, providing dual fiber optical Ethernet ports and eight Fast Ethernet copper ports in an IP66/IP67 rated package for protection against strong jets of water (IP66) or temporary immersion in water (IP67).

Ethernet ports

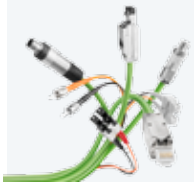
- 8 x FastEthernet ports (10/100Base-TX) with IP66/IP67-rated M12 D-code connectors or shrouded RJ45-style connectors
- 2 optional Fiber optic Ethernet ports (100BASE-FX and 1000BASE-X) with IP66/IP67-rated LC fiber connectors
- Short haul and long haul fiber options

Universal power supply options

- Fully integrated redundant (optional) power supplies
- Universal high-voltage input: 120 VAC/VDC and 230 VAC/VDC
- Dual low-voltage DC inputs: 12 VDC, 24 VDC, 48 VDC
- Terminal blocks for reliable, maintenance-free connections
- CSA/UL 60950 safety approved to +85 °C
- 2 optional Fiber optic Ethernet ports (100BASE-FX and 1000BASE-X) with IP66/IP67-rated LC fiber connectors
- Short haul and long haul fiber options



The RUGGEDCOM RS969 enables you to use Ethernet everywhere without limiting your connectivity options.



FastConnect Cabling System

Stringent demands are placed on the installation of cables in an industrial environment. Siemens offers FastConnect, a system that fulfills all these requirements: on-site assembly – quick, easy and error-free. For more information, visit: **siemens.com/fastconnect**

With the RUGGEDCOM Selector you can transfer the order number to the Siemens Industry Mall and order your products.

To use the RUGGEDCOM Selector for the selection and configuration of RUGGEDCOM products, visit: **siemens.com/ruggedcom-selector**

For more information on wireless approvals, visit: **siemens.com/wireless-approvals**

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Security information

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art industrial security concept. Siemens' products and solutions only form one element of such a concept.

Customer is responsible to prevent unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the enterprise network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about industrial security, please visit:
siemens.com/industrialsecurity

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed under:
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