

Switchgear Ring Main Unit Working Principle

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Zheng Ji

Senior Electrical Engineer at PINEELE

Zheng Ji has over 18 years experience designing medium and high voltage equipment

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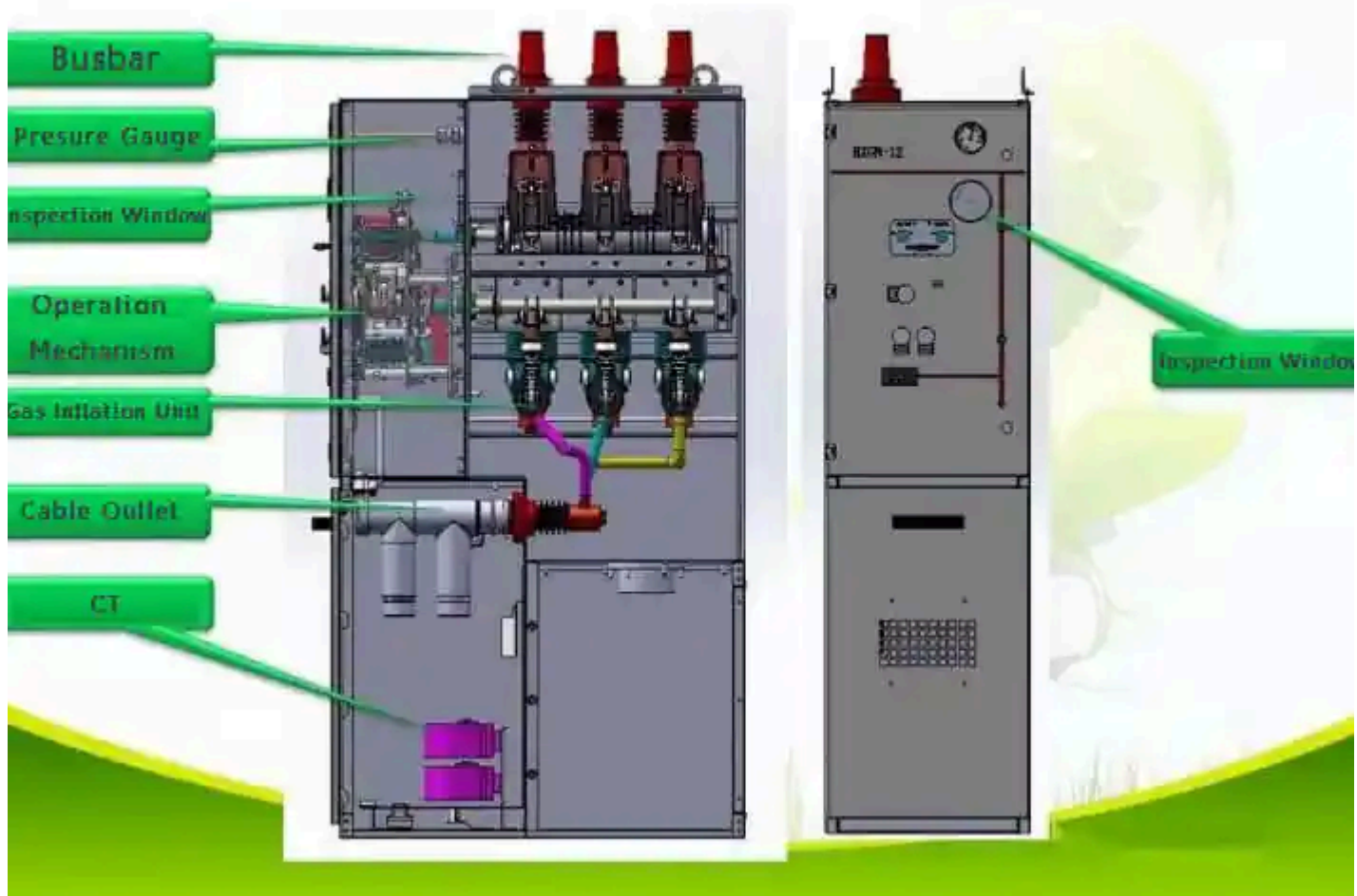
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Introduction to Ring Main Unit (RMU)

A **Ring Main Unit (RMU)** is a compact, sealed switchgear assembly used in medium voltage (MV) power distribution networks. It plays a crucial role in ensuring uninterrupted power delivery and offers multiple configuration options for managing feeders and transformers. RMUs are commonly found in secondary distribution substations, especially in urban environments where space is limited.





Core Working Principle of Switchgear RMU

The **working principle of an RMU** revolves around the **looped network configuration**. In this setup, the incoming and outgoing feeders form a “ring,” allowing electricity to flow from two directions. This topology ensures redundancy—if one side of the loop fails or requires maintenance, the other continues supplying power, minimizing outages.



At the heart of the RMU are **switches** and **circuit breakers** housed within **gas-insulated** or **air-insulated** enclosures. The most common type uses **SF₆ gas insulation** for its high dielectric strength and compact size.

Key Operating Elements:

- **Load Break Switches:** Interrupt current under load.
- **Circuit Breakers:** Protect against short circuits and overloads.
- **Earthing Switches:** Safely ground disconnected lines.
- **Isolators:** Visibly isolate parts of the circuit for maintenance.

Application Fields

Ring Main Units are widely used in:

-  Electrical distribution networks
-  Renewable energy systems (wind, solar)
- Industrial facilities

- Hospitals, malls, and commercial complexes
- Underground cable systems

Their **modular structure**, **enhanced safety**, and **low maintenance** make them ideal for modern power distribution.

Market Trends and Background

According to IEEE and market intelligence by IEEMA, the global demand for **compact MV switchgear** like RMUs is rising due to:

- Rapid **urbanization** and need for space-saving electrical solutions
- Growth in **renewable energy** integration
- Emphasis on **grid reliability and resilience**

The transition to **smart grids** and **automated substations** is also driving innovation in RMU technology, with features like **remote control**, **SCADA integration**, and **self-diagnostic systems** becoming common.

Technical Parameters (Typical RMU Specification)

PARAMETER	VALUE
Rated Voltage	12kV – 24kV
Rated Current	630A – 1250A
Short Circuit Breaking Capacity	Up to 25kA for 3 seconds
Insulation Medium	SF ₆ gas / Air / Solid
Degree of Protection	IP4X / IP65 (gas tank)
Operating Temperature	-25°C to +55°C
Mechanical Endurance	≥ 10,000 operations
Standards Compliance	IEC 62271-200, IEC 60265

Comparison with Conventional Switchgear

FEATURE	RMU	CONVENTIONAL MV SWITCHGEAR
Size	Compact	Bulky
Insulation Type	SF ₆ / Solid	Air / Oil
Maintenance	Minimal	Regular
Installation Type	Indoor/Outdoor	Typically Indoor
Key Elements	Load Break + Circuit Breaker	Mostly Circuit Breaker

RMUs are especially advantageous in locations with space constraints and require less frequent servicing compared to air-insulated switchgear.

Selection and Purchasing Guide

When selecting an RMU, consider the following:

- Voltage and current ratings
- Type of insulation (SF₆, solid, or air)
- Number of feeders required
- Protection mechanism (fuse or circuit breaker)
- Installation environment (indoor or outdoor)
- Remote control requirements (for smart grid compatibility)

Top manufacturers include **ABB**, **Schneider Electric**, **Siemens**, and **Eaton**, offering a wide range of configurable RMU solutions.

Authority References

- IEEE Xplore: MV Switchgear and Distribution
- Wikipedia: Ring Main Unit
- Schneider Electric RMU Brochure
- ABB Medium Voltage Distribution Catalog

Frequently Asked Questions (FAQ)

Q1: What is the purpose of using a Ring Main Unit in power distribution?

A1: The RMU ensures uninterrupted power by allowing looped connections. Even if one feeder fails, the other keeps supplying electricity.

Q2: Is SF₆ gas in RMUs harmful to the environment?

A2: SF₆ is a potent greenhouse gas, but RMUs are sealed and designed to prevent leakage. Modern alternatives include solid-insulated RMUs to reduce environmental impact.

Q3: Can RMUs be used in smart grid systems?

A3: Yes, many RMUs support SCADA integration, remote switching, and real-time monitoring, making them suitable for automated and intelligent grid systems.

Conclusion

The **Ring Main Unit (RMU)** is a key component in modern medium voltage power networks, offering flexibility, safety, and space efficiency. Understanding its **working principle**, **technical specifications**, and **application scenarios** helps engineers and buyers make informed decisions. As smart grids and renewables grow, RMUs will continue to play a central role in reliable power distribution.



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