October 20th, 2025

Standard and Flexible Rogowski Coils in Smart Meter and Smart Grid Applications

Introduction

YAGEO Group is a leading global provider of passive electronic components, specializing in advanced technology, innovative design, and high-quality manufacturing.
Its broad product portfolio includes power and networking magnetics, current sensing solutions, cable harnesses, power supplies, antennas, connectors, and inductors. Additionally, YAGEO Group offers a complete range of power transformers, RF components, and Ethernet transformers. With both standard catalog products and custom design capabilities, YAGEO Group serves as a trusted, one-stop partner for OEMs and CEMs worldwide.

YAGEO Group began developing Rogowski coils as early as the 1990s, primarily for use as current sensors in circuit breakers.
Over the years, advancements in winding technology and sensor performance have significantly enhanced their capabilities. As a result, Rogowski coils have evolved beyond their original use and are now widely adopted in modern applications such as smart metering and smart grid systems.

The Future of Modern Electrical Grids: Why Smart Meters and Rogowski Coil Sensors Are Essential
As of late 2023, smart electricity meters were installed in 47% of households across Europe, with countries like France, Spain, Italy, the Netherlands, and Scandinavian nation's leading the way. Germany, despite having over 50 million electricity metering points, had deployed smart meters in less than 10% of these points. However, recent legislative efforts aim to accelerate this adoption, targeting a 95% rollout by 2030 for residential and small business consumers 1.

Globally, the number of smart meters is projected to double from 1.7 billion in 2023 to 3.4 billion by 2033, with smart electricity meters continuing to dominate the market. This growth is anticipated to generate annual revenues of USD 40 billion by 2033 2.

At the heart of this technology lies a critical component—**the current sensor**. Smart metering systems primarily rely on one of three types of current sensing technologies:

1. **Electromechanical (legacy) meters** – once the standard, these are now outdated and lack digital compatibility.
2. **Current transformers (CTs)** – still common, but can be bulky, less accurate at low currents, and sensitive to saturation.
3. **Rogowski coils** – lightweight, flexible, highly accurate, and ideal for modern, digital energy systems.

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Rogowski Coils for Precision Current Sensing

A Rogowski coil is a toroidal-like coil of conductive wire that encircles a current-carrying conductor. The current passing through the surrounding conductor induces a voltage in the Rogowski coil. The induced voltage is a function of both the current in the conductor and the AC frequency of the current. Using a simple equation, $V=k\ \partial i/\partial t$, where k is the constant derived from the coil's physical characteristics (length of winding, number of turns, loop size, etc.), we see that the voltage in the coil is dependent on the time-varying current. Using simple electronics that convert the induced voltage in the coil to a linear and frequency-independent output voltage, the output voltage can be used along with a calibrated scaling factor to derive the current carried by the primary conductor.

Since traditional systems, such as mechanical meters and current transformers (CTs), are no longer sufficient to meet the accuracy, responsiveness, and scalability demands of today's grids, Rogowski coil sensors bring a host of benefits that align perfectly with the demands of smart grid and smart metering

- High accuracy across a broad current range
- Non-intrusive and safe installation
- Compact and flexible form factor
- Resiliente to electromagnetic interference
- Ideal for measuring complex waveforms from renewable sources

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Introducing YAGEO Group's Standard Rogowski Coil Portfolio

Product Families:

1. RC01 - Rogowski Coil suitable for PCB



2. RC03 - Non-PCB Rogowski Coil



3. RC05 - Non-PCB Rogowski Coil with Mounting Fixture



4. FLRC - Flex Rogowski Coil (Extra High Current Application)



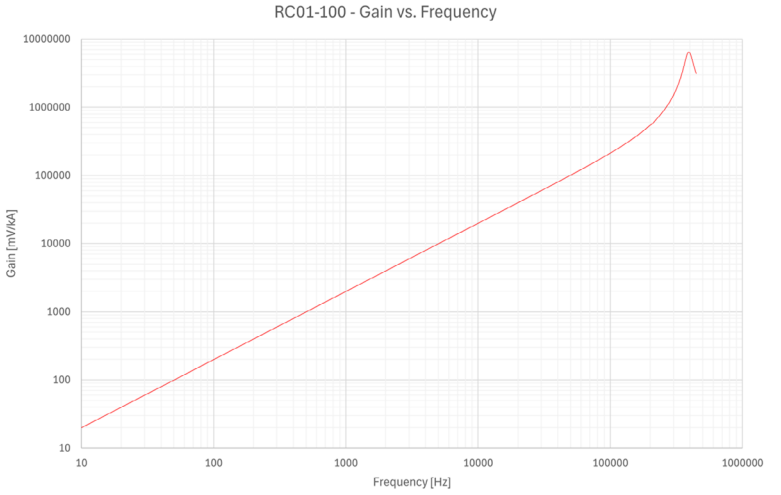
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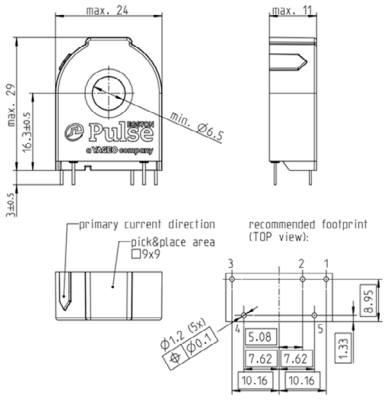
Rogowski Coils Type RC01

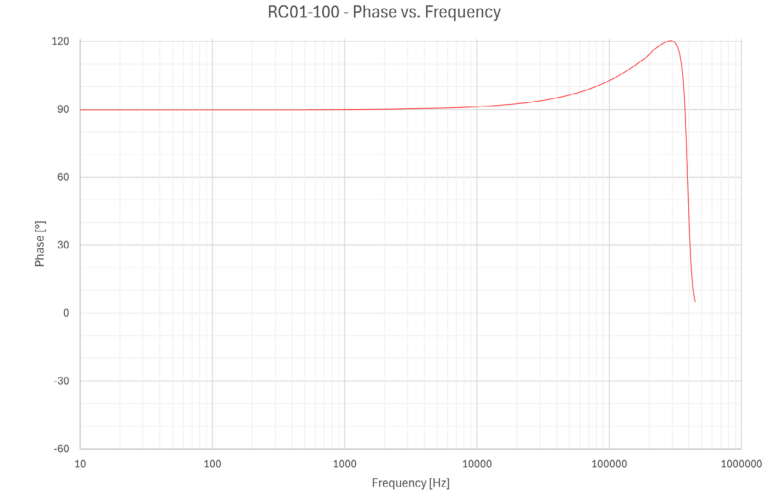
- Sensitivity: up to 300mV/kA (50Hz) and 360mV/kA (60Hz)
- Sensitivity Tolerance: 1%
- Typical Resonance Frequency: up to 370kHz
- Typical Temperature coefficient: up to 30ppm/K
- Influence of External electromagnetic field: 0.2%
- Shielding: optional
- Mounting type: THT

- Example Bode characteristics (Gain and Phase vs frequency)









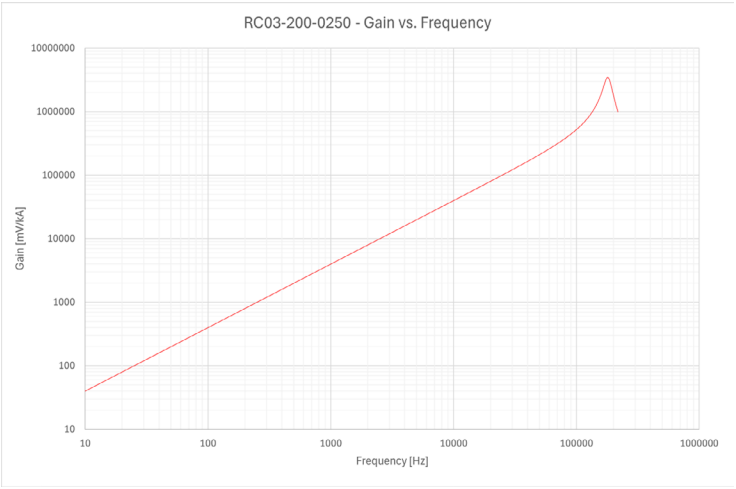
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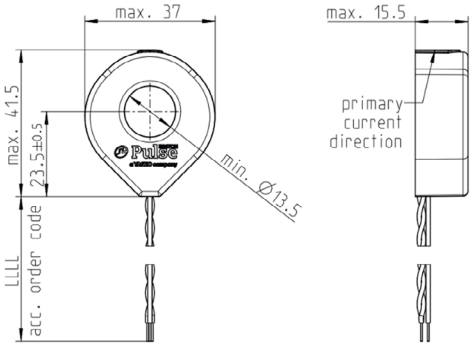
Rogowski Coils Type RC03

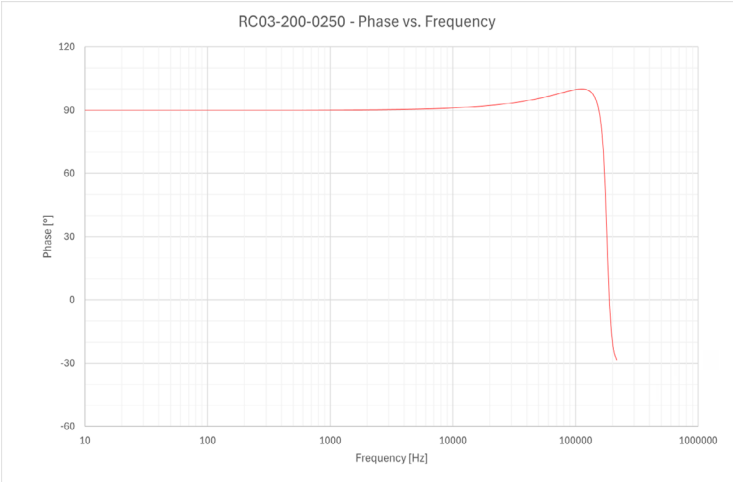
- Sensitivity: up to 600mV/kA (50Hz) and 720mV/kA (60Hz)
- Sensitivity Tolerance: 1%
- Typical Resonance Frequency: up to 170kHz
- Typical Temperature coefficient: up to 25ppm/K
- Influence of External electromagnetic field: 0.2%
- Shielding: optional
- Mounting type: flexible positioning.
- Connection type: wired. Typical length 250mm. Custom optional

- Example Bode characteristics (Gain and Phase vs frequency)







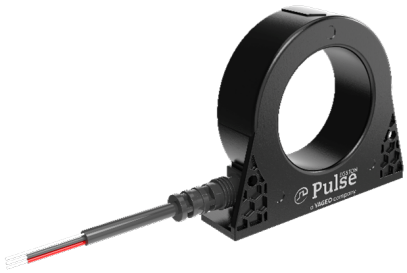


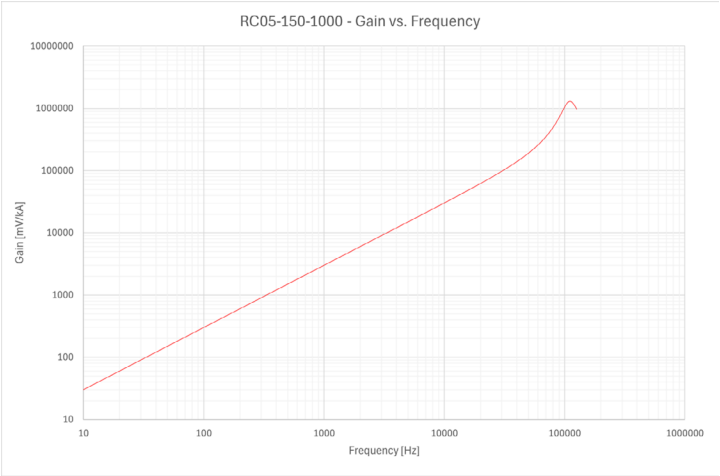
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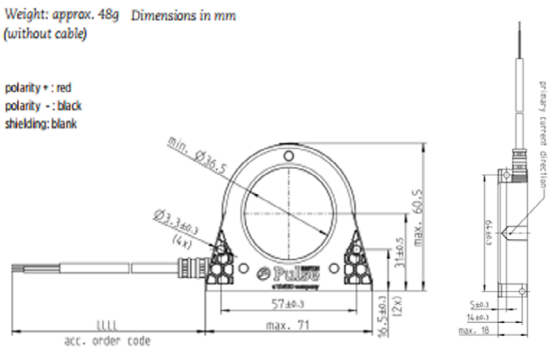
Rogowski Coils Type RC05

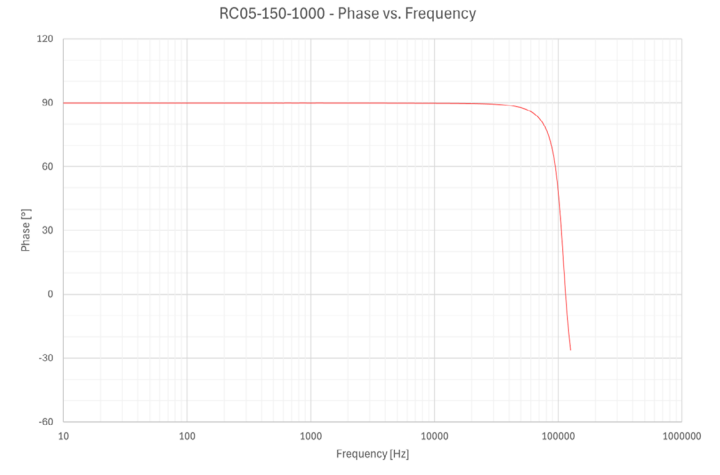
- Sensitivity: up to 450mV/kA (50Hz) and 540mV/kA (60Hz)
- Sensitivity Tolerance: 1%
- Typical Resonance Frequency: up to 110kHz
- Typical Temperature coefficient: up to 28ppm/K
- Influence of External electromagnetic field: 0.2%
- Shielding: optional
- Mounting type: fixture
- Connection type: wired. Typical length 1m. Custom optional.

- Example Bode characteristics (Gain and Phase vs frequency)









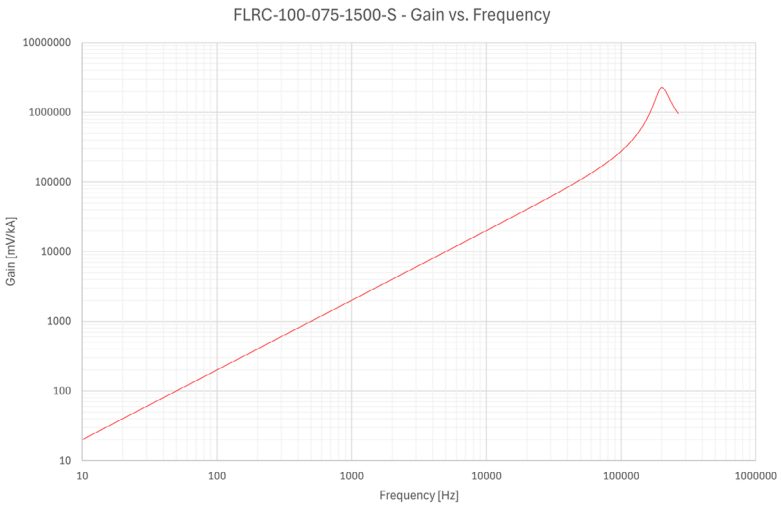
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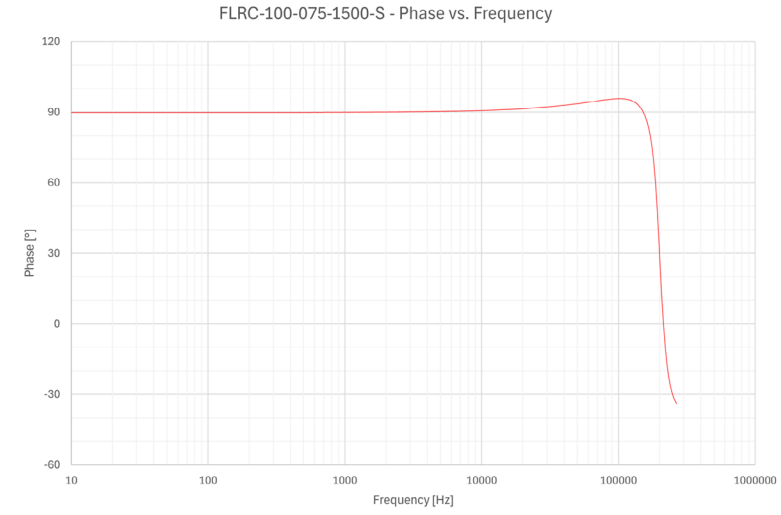
Rogowski Coils Type FLRC

- Sensitivity: up to 500mV/kA
- Sensitivity Tolerance: 2%
- Typical Resonance Frequency: up to 210kHz
- Typical Temperature Coefficient: up to 15ppm/K
- Influence of External Electromagnetic Field: 1.0%
- Mounting type: flexible plastic connector
- Connection type: wired. Typical length 0.5m, 1m or 1.5m. Custom wire length is possible.
- Under-load installation possible

- Example Bode characteristics (Gain and Phase vs frequency)







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YAGEO Group's Customized Rogowski Coils

In addition to our standard range of YAGEO Group Rogowski coils, we are happy to develop customized solutions tailored to your specific needs. This includes cable harnesses and connectors for various indoor and outdoor applications, suitable for single-phase, two-phase, or three-phase systems.

Real-World Success Stories

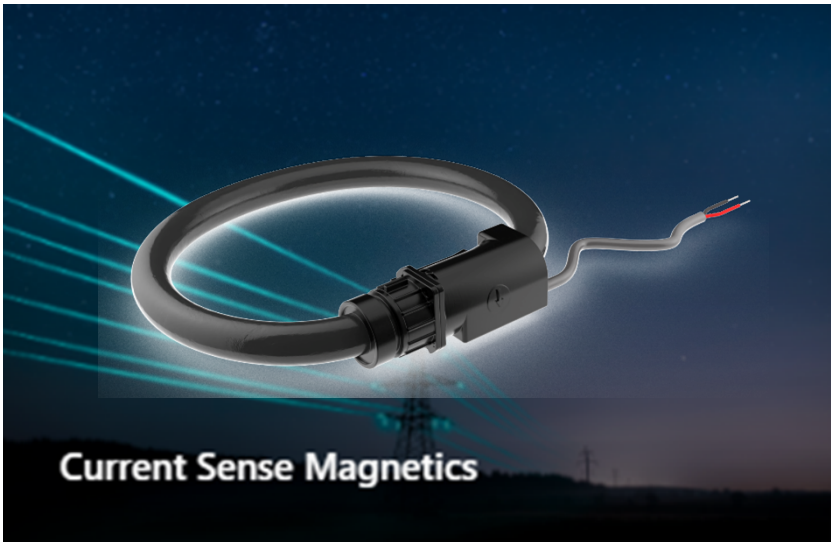
Distribution Transformer Monitoring
Boost Grid Reliability and Cut Costs with Real-Time Monitoring and AI Analytics
Our system uses high-precision Rogowski coils to continuously monitor primary and secondary current. This real-time data feeds into an AI-driven analytics platform that delivers deep operational insights.

Core Capabilities:
- Early detection of load and phase imbalance
- Identification of winding faults and short circuits
- Power theft detection
- AI-powered fault prediction and health monitoring

Operational Benefits:
- Lower O&M costs through predictive, condition-based maintenance
- Improve transformer performance and lifespan
- Reduce truck rolls with remote diagnostics
- Streamline inventory and asset management
- Ensure grid reliability and regulatory compliance

Smart Monitoring. Proactive maintenance. A more efficient, resilient grid.





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Why Rogowski Coils Are the Future

In conclusion, Rogowski coils represent the future of current sensing technology due to their unmatched flexibility, safety, and precision. Their lightweight design, ease of installation, and ability to accurately measure high-frequency and large currents without saturation make them ideal for modern electrical systems.

As utilities continue to modernize their infrastructure, the Rogowski coil is becoming the go-to sensor technology for smart meters enabling not just better measurement, but smarter, more resilient grids.

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Sources

1. iotbusinessnews.com
2. iotbusinessnews.com+1Transforma Insights+1

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