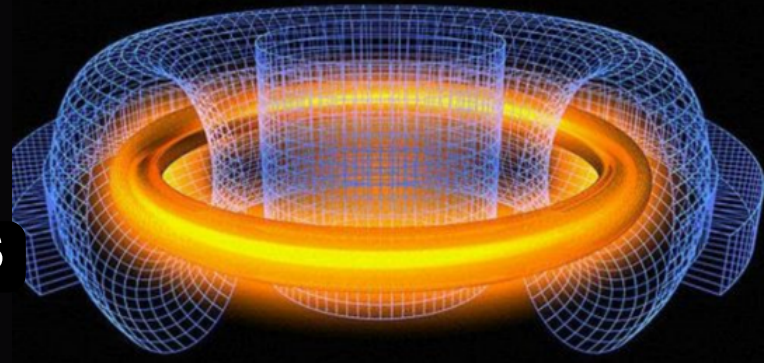




FUSION TOKOMAK DEVICE METAL SEALING SOLUTIONS



Sonkit Industry · Reliable Sealing

EXECUTIVE SUMMARY

In 2024, Sonkit, in partnership with the Institute of Plasma Physics, Chinese Academy of Sciences, developed the "CIPP-type Dual-stage metal sealing" solution to address challenges in sealing nuclear fusion tokamak devices, including high temperatures, ultra-vacuum, and particle beam radiation.

Rigorous testing confirmed that the solution exceeded sealing performance expectations while significantly reducing installation complexity, offering a robust answer to key challenges in nuclear fusion technology.

APPLICATION

Requirements and Parameters



1E-10mbar*l/s
Leak Rate Requirement



**Ultra high vacuum
to 10MPa**
system Pressure



-270°C ~ 350°C
Operating temperature



**High
Radiation**

❖
Clean New Energy

❖
Nuclear Fusion

❖
Tokamak Device



CHALLENGE



The primary objective of a fusion tokamak device is to achieve controlled nuclear fusion for commercial power generation. However, the unique demands of nuclear fusion present significant sealing challenges, including:

- **Extreme Operating Temperatures:** Sealing components must maintain integrity across a wide temperature range, from -270°C to 350°C.
- **Plasma Confinement:** Seals must perform reliably in strong magnetic fields to ensure plasma confinement.
- **Neutron Radiation:** The sealing system needs to withstand prolonged exposure to neutron radiation while preventing leakage.
- **Vacuum Environments:** Seals must retain performance in Ultra High Vacuum conditions over extended periods.
- **Complex Structure:** The intricate design of tokamak devices requires highly specialized and precise sealing solutions.



SOLUTION



In response to these challenges, Sonkit's engineering team collaborated with ASIPP to develop the **CIPP Type Dual-Stage Metal Seal**. This innovative solution features a dual-stage, multi-layer metal composite structure that ensures reliable and effective sealing in extreme environments, including high temperatures, ultra-vacuum, and high-energy particle beam radiation.

The seal incorporates a proprietary knife-edge design that compensates for flange flatness, significantly improving ease of installation and ensuring a secure fit. This advanced design not only enhances sealing performance but also simplifies the installation process, making it more efficient and reliable.



BENEFITS



• Sealing Performance Exceeds Expectations

After testing, the system's leakage rate was reduced to 1E-11 mbar*l/s using Sonkit's sealing solution, significantly surpassing the original design requirement of 1E-10 mbar*l/s.

• Significantly Lower Installation Difficulty

Traditional seals require flange surface roughness (Ra) between 0.2-0.4. With Sonkit's solution, Ra values as high as 0.8-1.6 can still achieve an effective seal. Additionally, the knife-edge design of the seal greatly reduces the need for pre-tightening force on the screws.



ABOUT SONKIT

Empowering Industries Worldwide with Innovative Metal Sealing Solutions.
Metal Seal Manufacturer based in Shanghai, Supplies Globally

For more information about the applications of metal sealing rings, please visit our website:

- Website: www.SonkitSealing.com



DUAL-STAGE METAL SEALING RING

SONKIT SEALING SOLUTION

