Triple Sealing Centerring Study

THE CHALLENGE

Using the right sealing products in the subfab exhaust areas has became one of the most critical aspects of the engineering process, not only for optimizing the performance when being exposed to high temperatures or harsh NF3/O2 environments, but also for ensuring safety when it comes to unpredictable gas leaks.

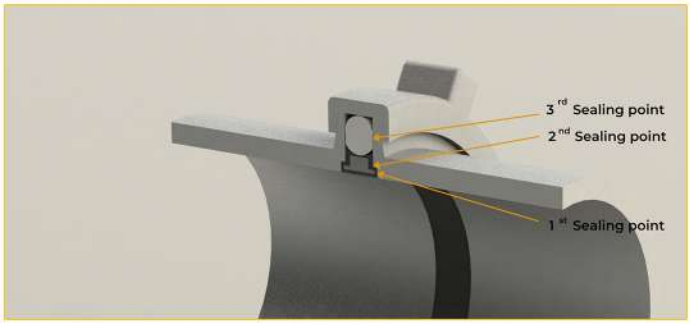
The configuration of a safe and reliable subfab environment is essential and requires careful attention when it comes to its design, as workers are continuously exposed to **toxic or dangerous chemicals**.

Conventional centerring seals are good to join together two flanges and easily handled. Nevertheless, with toxic gases always flowing, the escape of flammable compounds can create a **fire risk** or unnecessary safety risks for the workers.

For this reason, the weak points were carefully studied and as a result, the Triple-Sealing Centerrings were developed.

OUR SOLUTION

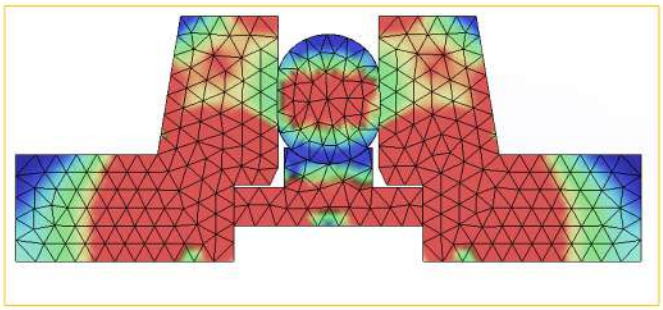
SPM TS-Centerring is one of latest sealing solutions developed for the exhaust line. The rubber reinforcement around the inner metal plate and FKM/FFKM outer O-ring improves the resistivity towards harsh NF3 or O2 plasma and high temperatures, being able to withstand up to 325C.



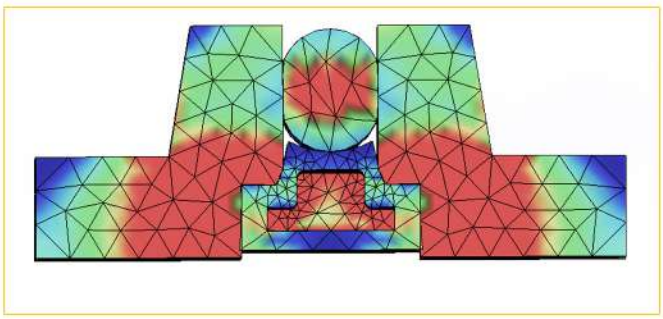
THE BENEFITS

- **Safety measurement in order to prevent the leakage of toxic gas,** thanks to the additional sealing point compared to the standard centerring version
- **Minimized particle generation** by chemical attack of O2/NF3
- **Applicable for standard ISO-KF flanges** : KF16 – KF200
- **Reusable** after O-ring replacement
- **Continuous operating temperature up to 325C** depending on the material
- **Powder clogging prevention** on the inner walls

Standard Metal Centerring:



SPM Triple Sealing Centerring:



Scan the QR code below with your phone to see the SPM Triple Sealing Centerring solution working.

SUCCESS STORIES

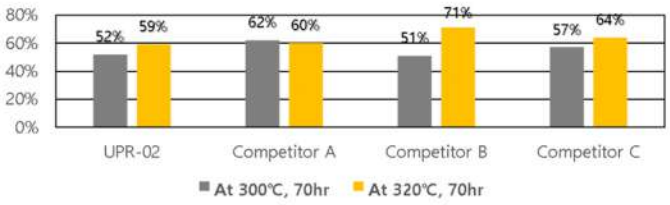
One of our customers had **old semiconductor tools**, where hazardous gasses could leak into surroundings without being noticed. Changing the tools usually means very high costs, therefore switching to TS-Centerrings ensured a safer environment and less worries.

Another one of our customers managed to **increase the PM cycle and save time**, as he was continuously replacing the centerrings due to aggresive NF3 conditions, causing the premature failure of the part. Not only did **lifetime increase**, but also the **cost of ownership was reduced** thanks to the reusability of the TS-Centerring.

SPM MATERIAL CHOICE

UPR-02 was developed especially for subfab and exhaust line applications, to meet engineer's expectations: **superior performance** in harsh O2 and NF3 environments, **minimising particle generation** when close to the chamber, **resistant to high temperatures**, as well as **competitively priced**.

Compression test for different compounds:



Compression set tests are crytical in order to define the permanent deformation that occurs when a material is compressed for a specific amount of time, at a specific temperature. The lower the percentage, the better the material resists permanent deformation.

SPM SEAL RECOMMENDATION

Given that the ISO-KF centerrings are installed in locations where process conditions differ, one can **consult with SPM experts on the suitable solution**.

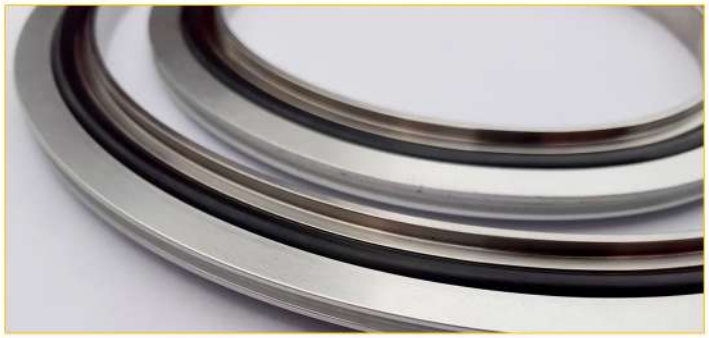
For toxic, corrosive and flamable environments, it is strongly recommended to use FFKM TS-Centerring;

For non-critical positions, FKM TS-Centerring is recommended for higher safety, but metal centerrings can also be used.

*Depending on the size, an outer ring might be needed.

UPR-02 Material Data Sheet	
Hardness(Shore A)	72
100% Modulus (MPa)	8.2
Tensile Strength at Break(MPa)	12.82
Elongation (%)	149
Maximum Service Temperature(℃)	325
Compression Set @ 70hr at 204℃ (%)	15
Compression Set @ 70hr at 300℃ (%)	52
Compression Set @ 70hr at 320℃ (%)	59

Iso-KF metal centerring and outer ring:



On the top, SPM TS-Centerrings and on the bottom, Iso-KF metal centerings:

Gas	Gas name	Hazard	Recommended type of material	Recommended type of centerring
3MS	Trimethylsilan $C_3H_{10}Si$	Flammable	FFKM	Standard / Bonded
BCl_3	Boron Trichloride	Toxic, Corrosive	FKM (~180°C) / FFKM (180°C~)	Bonded
C_4F_6	Hexafluorobutadiene 1,3	Toxic, Flammable	FKM (~180°C) / FFKM (180°C~)	Bonded
C_4F_8	Octafluorobutane	Inert	FKM (~180°C) / FFKM (180°C~)	Standard / Bonded
C_5F_8	Octacyclopentanene	Toxic	FKM (~180°C) / FFKM (180°C~)	Standard / Bonded
ClF_3	Chlorine Trifluoride	Corrosive	FKM (~180°C) / FFKM (180°C~)	Bonded
DMA	Dimethylamine	Toxic, Flammable	FKM (~180°C) / FFKM (180°C~)	Standard / Bonded
HF	Hydrogen Fluoride	Toxic, Corrosive	FFKM	Bonded
Si_2H_6	Disilane	Pyrophoric	FFKM	Standard / Bonded
$SiCl_4$	Silicon Tetrachloride	Toxic, Corrosive	FFKM	Bonded
SiH_2Cl_2	Dichlorosilane	Toxic, Corrosive, Flammable	FFKM	Bonded
SiH_3Cl	Monochlorosilane	Toxic, Corrosive, Flammable	FFKM	Bonded
SO_2	Sulfur Dioxide	Toxic, Corrosive	FFKM	Bonded
$TiCl_4$	Titanium Chloride	Toxic, Corrosive	FFKM	Bonded
TSA	Trisilylamine	Flammable		
WF_6	Tungsten Hexafluoride	Toxic, Corrosive	FFKM	Bonded

Sealing product	Sizes	Material	Reusability	Safety	When to use?
Iso-KF metal centerring	KF10 – KF200	SUS + FKM	No	+	Non-critical locations
		SUS + FFKM		++	
Iso-KF metal centerring + outer ring	KF16 – KF80 (non-spring type) KF100 – KF400 (spring type)	SUS + FKM + Al	No	++	Higher pressures
		SUS + FFKM + Al		++	
TS-centerring	KF10 – KF100	FKM + SUS + FKM	Yes	+++	As a safer solutions where conventional centering is used
		FKM + SUS + FFKM		+++	High temperature Corrosive, toxic and flammable chemicals

Get in touch with our team of specialists to discuss your solution today.