



## Comparison: Metal-to-Metal Seal vs. O-Ring Seal

Historically, the HVAC industry has seen two types of sealing methods used for sealing refrigerant pipes to equipment systems: metal- to-metal seals and o-ring seals.

SmartLock fittings uses an innovative metal-to-metal sealing technology that is able to achieve the following benefits over o-ring seals:

- Highest possible pressure testing and rating
- Highest vacuum pressure
- Compatibility with all refrigerants
- Compatibility with all compressor oils
- High temperature and low temperature stability
- Zero annual leakage rate
- Lifetime reliability/warranty
- Compatibility with Copper and Aluminum tubes

Metal-to-metal sealing technology provides the highest integrity sealing solutions for today's DHP (copper tube made from Alloy C12200) and unitary equipment installations. The elastomeric rings that are placed inside Smart Lock fittings DO NOT make the seal. They are placed for vibration dampening and keeping environmental elements outside. SmartLock fittings submitted for UL certification did not have any elastomeric rings. All internal tests are conducted without the elastomeric rings to uphold SmartLock's commitment and integrity of metal to metal sealing technology.



## Metal to Metal Seal vs. O-Ring Seal

Description	Sealing Method		
	Metal to Metal	O-Ring	
		Compress Type	Clip Type
High Pressure	1/4": 9700psig to 7/8": 4800psig	2,100psig	2,100psig
Working Pressure	1/4": 1700psig to 7/8": 960psig	700 psig	653 psi to 870psi
High Degree Vacuum	1 micron	20 micron	30 micron
Refrigerant Gas	All Gases	Limit	Limit
R-717 (Ammonia)	Yes	No	No
R-410A (R-32 50%, R-125 50%)	Yes	Yes	Yes
R-22 (Chlorodifluoroethane)	Yes	No	Yes
R-134a (1,1,1,2 -Tetrafluoroethane)	Yes	Yes	Yes
R-744 (Carbon Dioxide)	Yes	No	No
R-600a (Isobutane)	Yes	Yes	Yes
Compressor Oil	All Oils	Limit	Limit
Temperature Range	-40°F to 392°F	-40°F to 300°F	-40°F to 250°F
Working Temperature	-40°F to 302°F	250°F	250°F
Annual Leakage Rate (Ratio)	0 ounce	0.1 ounce	0.2 ounce
Warranty	10 years	5 years	5 years
Deburring	Not Required	Required	Required
Special Tool	No	Yes	No
Permittable for Unrounded Tube	Yes	No	No
Scratched Tube	Yes	No	No
Larger Sizes (1 1/8" to 1 5/8")	Yes	Yes	No
Connecting Flare Valve	Simple Installation No Leakage	Complicated Installation Possible Leakage	Simple Installation Possible Leakage
Connecting Swage Valve	Yes	No	No
Aluminum Tube	Yes	No	Coated aluminum only

\*The comparison chart was compiled based on the information found in the ZoomLock *Flame-Free Refrigerant Fittings Catalog K-1, Engineering Submittal, January 2020* and Rectorseal *Pro-Fit Quick Connection PowerPoint*.

From SmartLock's perspective, the issues with elastomeric sealing are the following:

1. Refrigerant Gas and Compressor Oil Compatibility

The sealing capability of an o-ring is determined by the chemical composition that make up the o-ring. More importantly, the sealing ability of an o-ring is wholly based on the compatibility between an o-ring's chemical composition and the refrigerant gas, as well as the compressor oil.

The chemical composition of an o-ring is not compatible with all types of refrigerant gases. Even in cases where the o-ring is compatible with certain types of refrigerant gases, the added mixture of various types of compressor oils can alter the chemical makeup of the o-ring, potentially effecting the sealing ability of the o-ring.

2. Aging

Natural rubber and elastomers deteriorate and age as a result of heat, light, oxygen, and ozone. The aging process for elastomers naturally starts even in nonoxidative thermal environments, but with rapid changes to heat and exposure to environmental elements, such as ozone and light, accelerate the aging process.

Applying this fundamental understanding of elastomers to the extreme conditions of HVAC units and cooling systems, the o-rings that act as the main sealing agent can become problematic with time. As the o-rings begin to age with time, gas begin to leak over time. This is why all of the companies with o-ring sealing fittings state an "annual permissible leakage ratio."