



**Application Engineering Bulletin**  
**AE-1297-R3**

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**LIQUID LINE FILTER-DRIERS**

The Refrigeration Industry has for many years used a variety of liquid line filter-driers of three basic types:

- Solid Core
- Compressed Bead
- Loose Fill

These filter-driers were blended with varying amounts of molecular sieve for moisture removal, alumina for acid removal and activated carbon for removal of paraffin. Filter-drier manufacturers usually offer more than one type depending on the application. For example, in new uncontaminated equipment a drier with high molecular sieve content might be specified by an OEM; whereas, in the aftermarket on an older, more contaminated system, a drier with an appropriate amount of alumina is preferable.

With the advent of HFC refrigerants and polyol ester lubricants we must reconsider the application of the filter-drier and its proper design to accomplish the intended purpose.

Polyol esters differ from mineral oils in four basic ways:

- They are extremely hygroscopic, absorbing moisture much more rapidly than mineral oils
- They are "polar" in nature, meaning particulate matter (such as wear materials) will not settle but will instead remain in suspension and be circulated throughout the refrigeration system
- They will hydrolyze in the presence of water, thereby creating acids
- They possess unique additive packages designed to enhance their performance

A filter-drier specifically designed for use with polyol esters will therefore have characteristics to accommodate these differences. It should have excellent moisture removal properties with capacity greater than the filter-driers used in mineral oil systems. Its filtration ability should be increased so as to remove any particulate matter without causing unacceptably high pressure drops. It should have reasonable acid removal capacity but minimal lubricant additive stripping ability. And lastly, it must be so constructed so as to minimize "attrition" caused by molecular sieve particles rubbing together when not tightly packed.

Copeland engineering lab tests have found that existing filter-driers although compatible with the new refrigerants and lubricants, are not optimized for use with polyol ester oils.

As a result Copeland recommends the use of the Alco EKP (Extra Klean for POE) line of filter driers specifically suited for use in Polyol Ester and HFC systems. These filter driers marketed under the ALCO Extra Klean trademark have the following features.

- 20 micron filter rating
- Maximum of 25% Alumina content
- Increased water capacity
- Tightly packed beads to prevent attrition

See table 1 for specifications for the ALCO Extra Klean line of filter driers.

Due to the superiority of this type filter drier to adequately protect the compressor, Copeland recommends its use on any system employing polyol ester lubricants.

Desiccant Volume  cu. in.	Water Capacity As Shipped*														Minimum Acid Capacity mg	Minimum Filtration Capacity grams
	Drops**															
	R-12		R-22		R-502		R-134a		R-404A/507A		R-407C		R-410A***			
75	125	75	125	75	125	75	125	75	125	75	125	75	125			
3	44	38	37	31	38	33	40	37	38	37	28	25	21	19	170	1
5	105	91	90	76	93	82	116	106	109	106	82	76	64	58	324	16
8	162	141	138	117	144	127	186	171	175	170	132	122	103	93	497	16
16	337	294	289	245	300	266	371	341	350	340	264	244	206	186	1002	16
30	500	435	427	363	444	393	664	611	627	608	476	440	374	339	1510	30
41	793	692	679	579	707	627	938	854	876	850	665	616	524	475	2378	41
75	1738	1504	1468	1247	1530	1353	2320	2137	2194	2128	1670	1548	1321	1199	5730	41

\* Water Capacities are based on the following Equilibrium Point Dryness values.

R-12 15 ppm

R-22 60 ppm

R-502 30 ppm

R-134a, R-404A/507A, R-407C, F 50 ppm

\*\* 20 drops of water = 1 gram or 1 cc

\*\*\* Recommend oversizing driers for R-410A by 1 size