

ALCO FDB is a hermetic filter-drier in compacted bead style for use on liquid line.

Features

- Compacted bead style (spring loaded)
- Hermetic design
- Rugged steel shells
- Corrosion resistant epoxy paint
- Solder connection made from copper for easy soldering
- Cushioned flow for non-turbulent performance
- High water adsorption capacity
- High acid adsorption capacity
- High filtration capacity / efficiency
- Filtration first for more effective use of surface area of desiccant
- Compatibility with all new refrigerants / lubricants
- No CE marking according art. 3.3 PED 97/23 EC
- HP marking according to German Pressorized Vessel Directive
- Max. working pressure PS: 45 bar



**FDB
Filter Drier**

Introduction

Liquid line filter-driers are often referred to as system protectors because they remove harmful elements from the circulating refrigerants and lubricants before serious damage results.

No matter how many precautions are taken during assembly and installation or servicing of a system, contaminants can find (generate) their way into the system. These contaminants can be solid, such as metal swarf, flux, dust and dirt. Other equally menacing contaminants are soluble, such as water, acid and wax.

Construction

The active drying material is in the form of beads or pellets. No binding material is used to hold beads together, but rather compacting is performed through some type of mechanical pressure e.g. spring. On the upstream side of the compacted beads is a filter network which cushions flow and traps the solid contaminants.

ALCO FDB filter-driers incorporate a desiccant specially formulated and blended from molecular sieves and activated alumina for maximum moisture and acid removal capability.

Moisture removal capability

The most popular and effective desiccant in use today for removal of moisture from refrigerants and lubricants is molecular sieves which can hold three to four times the water of other commercial adsorbents. Molecular Sieves are synthetically produced Crystalline metal Alumina-Silicates. The extreme high porous adsorbents have strong affinity for water. In contrast to the other adsorbents, the pores of any particular type of Molecular Sieves are precisely uniform in size.

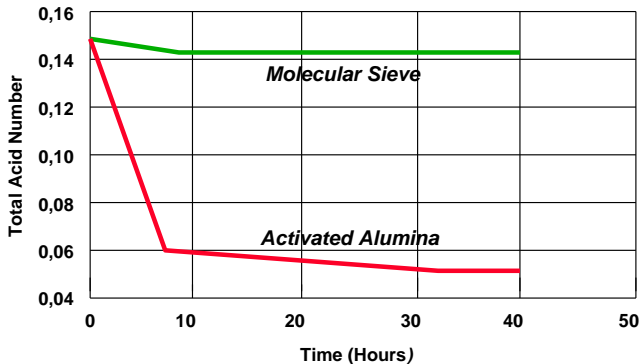
Molecular Sieves with 3 Angstrom pore size are used in FDB. These Molecular Sieves are compatible with CFCs, HCFCs, HFCs, mineral, Alkylbenze and ester lubricants as well as with small size of molecules of R22.

Acid pick-up capability

The various organic acids generation is due to the decomposition, chemical reaction and hydrolysis of the refrigerants, lubricants and foreign substances in refrigeration system. The major factor which can accelerate the process of acid generation are the excessive temperatures. It is important that any generated acid in a system is adsorbed as soon as it is formed.

It is known, that POE lubricants that are being used with HFC refrigerants are susceptible to hydrolysis in the presence of moisture and heat. The reaction products of this hydrolysis include organic acids with low molecular weight, which may corrode metals. The other resultant effect is the produced solid salt which is harmful for moving parts of a compressor such as bearing and shaft.

Activated Alumina is the best desiccant to adsorb organic acids. Other commercial adsorbents do not remove organic acids.



There are different types of Activated Alumina. The application of these adsorbents are dependent on the manufacturing process, binding material and style such as block or compacted beads. Alco FDB incorporated a type of Activated Alumina with very high organic acid adsorption capacity.

Polyol ester lubricants and filter-drier selection

The introduction of new HFC refrigerants which are not miscible with traditional mineral oil and Alkylbenzene lubricants has created the requirements for polyol ester (POE) lubricants. POEs have some inherent characteristics that require special attention when using the lubricant. These two characteristics, lubricant decomposition and hygroscopicity, are interactive in nature under certain conditions and the conditions for this interaction are not difficult to obtain in field installed refrigerant systems.

POE is made from a reaction between ester acids and alcohol. The net product is POE lubricant and water. The water is driven off and what remains is the POE lubricant that ends up in the cans. The key point to remember about this reaction is that it can be reversible, in other words, combining POE lubricant and water in a contaminated system can create acids and small amounts of alcohol.

From laboratory testing, we know that moisture levels as low as 75 ppm can allow acid to form.

The higher the moisture content of the POE the greater is the chance of acid formation.

This situation described above is aggravated by the POE's affinity for moisture. In field piped systems where it is extremely difficult to prevent moisture infiltration into piping and components, POEs have the opportunity to adsorb moisture creating the condition for acid formation.

High moisture capacity driers can remove moisture from a system and the POE but several important points must be kept in mind:

- A 100% molecular sieve drier has no capacity to adsorb acids formed by POE decomposition.
- At water levels above 75 ppm it is possible for POE to break down into acids.
- A drier that is saturated with moisture allows the remaining free moisture to react with the POE thus forming acids.
- A drier does not remove moisture in a single pass therefore it is possible to form acids even before the drier has a chance to remove moisture.

Based on these points, the selection of a drier for use with POE lubricants must be based on the ability to remove a high degree of moisture as well as some capacity for removing generated acids.

Filtration capability

The presence of various contaminants in refrigeration systems has been one of major concern to equipment manufacturers, installers and design engineers. The source of contaminants are typically from manufacturing, installation and by-products during operation from wear process and various chemical reactions. Typical contaminants include pure copper, copper oxides, iron, iron oxides, brazing flux, filings, aluminium, zinc, chromium and dirt among others. In addition, due to the solvent nature of the POE lubricants, which result of the cleaning of refrigeration circuit, the filtration capability of filter driers becomes more important.

The filter drier must be able to hold most of particles whereas maintaining flow capacity at reasonable pressure drops. ALCO FDB filter-driers are designed to trap and hold large quantities of solid particles or semi-solids such as sludge circulating in a system while maintaining acceptable flow rates during their service life.

Selection

Given the proper liquid line size and style connection, select filter-drier as follow:

1. Determine the correction factor (next page) based on type of refrigerant, liquid and evaporating temperature
2. Multiply the correction factor by cooling capacity
3. Select the filter drier according to determined capacity corresponding to flow capacity at 0.07 bar pressure drop.

Example: A cooling system with 1/2" liquid line, refrigerant R22, cooling capacity 12 kW at +5°C/55°C

- Correction factor in cooling mode: 1.24
 - Required capacity: 12x1.24 = 14.9 kW
- Select FDB-084 having 28.8 kW flow capacity at 0.07 bar pressure drop.

Selection Chart

Type	Part Code Nr.	Connection size & type*	Unit size	Flow capacity* in kW pressure drop 0.07 bar					Flow capacity in kW pressure drop 0.14 bar				
				Refrigerant									
				R134a	R22	R407C	R404A R507	R410A	R134a	R22	R407C	R404A R507	R410A
FDB-032	059 305	1/4"(6mm) SAE	3	6,3	6,9	6,6	4,5	6,8	8,9	9,7	9,3	6,3	9,6
FDB-032S	059 306	1/4" ODF		9,7	10,6	10,1	6,9	10,5	13,7	15,0	14,3	9,8	14,8
FDB-052	059 307	1/4"(6mm) SAE	5	6,5	7,1	6,8	4,6	7,0	9,3	10,2	9,7	6,7	10,1
FDB-052S	059 309	1/4" ODF		9,7	10,6	10,1	6,9	10,5	13,7	15,0	14,3	9,8	14,8
FDB-053	059 308	3/8"(10mm) SAE	5	15,5	16,9	16,1	11,0	16,7	22,2	24,2	23,1	15,8	23,9
FDB-053S	059 310	3/8" ODF		19,3	21,1	20,1	13,8	20,8	27,6	30,1	28,7	19,6	29,7
FDB-082	059 311	1/4"(6mm) SAE	8	6,8	7,4	7,1	4,8	7,3	9,8	10,7	10,2	7,0	10,6
FDB-082S	059 314	1/4" ODF		9,9	10,8	10,3	7,0	10,7	14,2	15,5	14,8	10,1	15,3
FDB-083	059 312	3/8"(10mm) SAE	8	15,8	17,2	16,4	11,2	17,0	22,6	24,7	23,6	16,1	24,4
FDB-083S	059 315	3/8" ODF		19,8	21,6	20,6	14,1	21,3	28,4	31,0	29,6	20,2	30,6
FDB-084	059 313	1/2"(12mm) SAE	8	26,4	28,8	27,5	18,8	28,4	37,7	41,2	39,3	26,9	40,7
FDB-084S	059 316	1/2" ODF		28,3	30,9	29,5	20,1	30,5	40,4	44,1	42,1	28,8	43,5
FDB-162	059 317	1/4"(6mm) SAE	16	6,8	7,4	7,1	4,8	7,3	9,8	10,7	10,2	7,0	10,6
FDB-163	059 318	3/8"(10mm) SAE		16,2	17,7	16,9	11,5	17,5	23,1	25,2	24,0	16,4	24,9
FDB-163S	059 321	3/8" ODF	23,0	25,1	23,9	16,4	24,8	32,9	35,9	34,2	23,4	35,4	
FDB-164	059 319	1/2"(12mm) SAE	16	27,9	30,5	29,1	19,9	30,1	39,9	43,6	41,6	28,4	43,0
FDB-164S	059 322	1/2" ODF		36,0	39,3	37,5	25,6	38,8	51,5	56,2	53,6	36,6	55,5
FDB-165	059 320	5/8"(16mm) SAE	16	36,6	40,0	38,2	26,1	39,5	52,4	57,2	54,6	37,3	56,5
FDB-165S	059 323	5/8" ODF		48,8	53,3	50,8	34,8	52,6	69,7	76,1	72,6	49,6	75,1
FDB-303	059 324	3/8"(10mm) SAE	30	18,0	19,7	18,8	12,8	19,4	25,7	28,1	26,8	18,3	27,7
FDB-304	059 325	1/2"(12mm) SAE		31,8	34,7	33,1	22,6	34,2	45,3	49,5	47,2	32,3	48,9
FDB-304S	003 667	1/2" ODF	30	38,0	41,5	39,6	27,1	41,0	54,2	59,2	56,5	38,6	58,4
FDB-305	059 326	5/8"(16mm) SAE		40,3	44,0	42,0	28,7	43,4	57,7	63,0	60,1	41,1	62,2
FDB-305S	059 327	5/8" ODF	53,8	58,7	56,0	38,3	57,9	76,9	83,9	80,0	54,7	82,8	
FDB-307S	059 328	7/8" ODF	41	60,5	66,1	63,1	43,1	65,2	86,6	94,5	90,2	61,6	93,3
FDB-415	059 329	5/8"(16mm) SAE		49,7	54,3	51,8	35,4	53,6	71,1	77,6	74,0	50,6	76,6
FDB-417S	059 330	7/8" ODF	77,2	84,3	80,4	55,0	83,2	110,3	120,4	114,9	78,5	118,8	

SAE = Flare, ODF = Solder female

Note: Preferred products are marked with bold letters. They are available from stock

*) All flow capacities are in accordance with ARI standard 710-86 and DIN 8949 at 0.07 bar pressure drop, +30°C liquid temperature and -15°C evaporating temperature.

Flow rates: 0.0068 kg/kW/sec. for R134a
0.0062 kg/kW/sec. for R22
0.0063 kg/kW/sec. for R407C
0.0088 kg/kW/sec. for R404A and R507
0.0059 kg/kW/sec. for R410A

D A T A S H E E T

Correction factors

Refrigerant	Liquid temperature °C	Evaporating temperature °C									
		15	10	5	0	-5	-10	-15	-20	-25	-30
R 22	60	1.29	1.30	1.32	1.34	1.36	1.38	1.40	1.42	1.45	1.48
	55	1.21	1.23	1.24	1.26	1.27	1.29	1.31	1.33	1.35	1.38
	50	1.14	1.16	1.17	1.18	1.20	1.22	1.23	1.25	1.27	1.29
	45	1.08	1.09	1.11	1.12	1.13	1.15	1.16	1.18	1.20	1.22
	40	1.03	1.04	1.05	1.06	1.08	1.09	1.10	1.12	1.14	1.15
	35	0.98	0.99	1.00	1.01	1.02	1.04	1.05	1.06	1.08	1.09
	30	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.03	1.04
	25	0.90	0.91	0.91	0.92	0.93	0.94	0.95	0.97	0.98	0.99
R 407C	60	1.42	1.45	1.49	1.52	1.56	1.61	1.65	1.70	1.76	1.82
	55	1.29	1.32	1.35	1.38	1.41	1.44	1.48	1.52	1.57	1.61
	50	1.19	1.21	1.23	1.26	1.28	1.31	1.35	1.38	1.42	1.46
	45	1.10	1.12	1.14	1.16	1.18	1.21	1.24	1.26	1.30	1.33
	40	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.17	1.20	1.22
	35	0.96	0.98	0.99	1.01	1.03	1.05	1.07	1.09	1.11	1.14
	30	0.91	0.92	0.93	0.95	0.96	0.98	1.00	1.02	1.04	1.06
	25	0.86	0.87	0.88	0.90	0.91	0.93	0.94	0.96	0.98	1.00
R 410A	60	1.64	1.66	1.68	1.70	1.73	1.76	1.80	1.83	1.87	1.92
	55	1.43	1.44	1.46	1.48	1.50	1.53	1.55	1.58	1.61	1.64
	50	1.28	1.29	1.31	1.32	1.34	1.36	1.38	1.40	1.43	1.45
	45	1.17	1.18	1.19	1.20	1.22	1.24	1.25	1.27	1.29	1.31
	40	1.08	1.09	1.10	1.11	1.12	1.14	1.15	1.17	1.18	1.20
	35	1.01	1.01	1.02	1.03	1.04	1.06	1.07	1.08	1.10	1.11
	30	0.94	0.95	0.96	0.97	0.98	0.99	1.00	1.01	1.03	1.04
	25	0.89	0.90	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.98
R 134a	60	1.32	1.35	1.39	1.42	1.46	1.50	1.55	1.59	1.65	1.70
	55	1.22	1.25	1.28	1.31	1.34	1.38	1.41	1.45	1.50	1.54
	50	1.14	1.16	1.19	1.21	1.24	1.27	1.30	1.34	1.38	1.42
	45	1.06	1.09	1.11	1.13	1.16	1.18	1.21	1.24	1.27	1.31
	40	1.00	1.02	1.04	1.06	1.08	1.11	1.13	1.16	1.19	1.22
	35	0.94	0.96	0.98	1.00	1.02	1.04	1.06	1.08	1.11	1.14
	30	0.90	0.91	0.93	0.94	0.96	0.98	1.00	1.02	1.04	1.07
	25	0.85	0.86	0.88	0.89	0.91	0.93	0.95	0.96	0.98	1.01
R 404A R 507	60	1.83	1.90	1.97	2.06	2.16	2.27	2.39	2.54	2.70	2.89
	55	1.52	1.56	1.62	1.67	1.74	1.81	1.90	1.99	2.09	2.21
	50	1.31	1.34	1.38	1.43	1.47	1.53	1.59	1.65	1.73	1.81
	45	1.16	1.18	1.21	1.25	1.29	1.33	1.38	1.43	1.48	1.54
	40	1.04	1.06	1.09	1.12	1.15	1.18	1.22	1.26	1.30	1.35
	35	0.95	0.97	0.99	1.01	1.04	1.07	1.10	1.13	1.17	1.20
	30	0.87	0.89	0.91	0.93	0.95	0.97	1.00	1.03	1.06	1.09
	25	0.81	0.83	0.84	0.86	0.88	0.90	0.92	0.94	0.97	1.00

D A T A S H E E T

Technical data

Max. working pressure PS	45 bar
Test pressure PT	47.3 bar
Medium Temperature TS	-45 to +65°C
Ambient Temperature	-45 to +65°C
Compatibility	CFC, HCFC, HFC, mineral and ester lubricants *
Fluid group	II
Solder connections	Copper, ODF
Flare connections	Burnished, SAE

Shell	Steel
Paint	Epoxy powder paint
Protection	500+ Hours salt spray test
Package	Individual packaged
Installation location	FDB may be installed in any position within the liquid line.
Approvals	UL
HP marking according to German pressurised vessel	HP, CE marking not necessary

*) ALCO FDB is not released for use with caustic, poisonous or flammable substances.

Water adsorption capacity

Type	Unit size	25°C liquid refrigerant					52°C liquid refrigerant				
		Water adsorption capacity (net) in grams									
		R410A	R134a	R22	R407C	R404A R507	R410A	R134a	R22	R407C	R404A R507
FDB-03...	3	1.6	1,9	2,0	1,7	1,9	1.3	1,8	1,7	1,6	1,9
FDB-05...	5	4.4	5,5	5,8	5,0	5,5	3.3	5,2	4,9	4,5	5,3
FDB-08...	8	7.1	8,8	9,3	8,0	8,8	5.4	8,4	7,9	7,2	8,5
FDB-16...	16	14.2	17,7	18,5	15,9	17,6	10.8	16,8	15,7	14,5	17,1
FDB-30...	30	25.0	31,7	33,0	28,5	31,6	19.0	30,1	28,2	26,0	30,5
FDB-41...	41	35.0	44,2	46,2	39,9	44,1	26.6	42,1	39,4	36,3	42,7

The water capacities are according to ARI-Standard 710 for R-22 and are based on a equilibrium point dryness (EPD) of 60 PPM water in refrigerant. ARI-standard does not refer to new alternative refrigerants.

The water capacities for new alternative refrigerants are based on the following equilibrium point dryness (EPD):

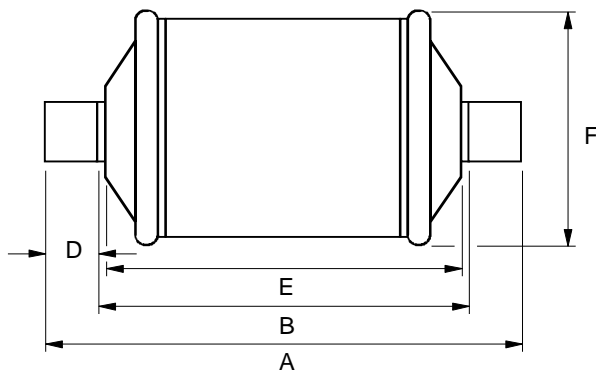
<u>Refrigerant</u>	<u>EPD</u>
R 134a	60 PPM
R 407C	60 PPM
R 404A	50 PPM
R 507	50 PPM
R 410A	50 PPM

D A T A S H E E T

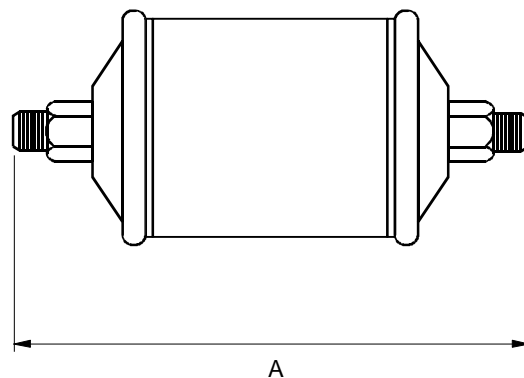
Dimensions, shipping weights and standard pack quantities

Type	Connection size & type	Roughing in dimensions mm					Shipping weight kg	Standard Pack Quantity
		A	B	D	E	F		
FDB-032	1/4"(6mm) SAE	111	-	-	65	41	0.25	25
FDB-032	1/4" ODF	98	79	10				
FDB-052	1/4"(6mm) SAE	122	-	-	76	67	0.43	
FDB-052	1/4" ODF	113	94	10				
FDB-053	3/8"(10mm) SAE	130	-	-				
FDB-053	3/8" ODF	114	92	11				
FDB-082	1/4"(6mm) SAE	143	-	-	97	67	0.63	
FDB-082	1/4" ODF	133	114	10				
FDB-083	3/8"(10mm) SAE	151	-	-				
FDB-083	3/8" ODF	135	113	11				
FDB-084	1/2"(12mm) SAE	157	-	-				
FDB-084	1/2" ODF	137	111	13				
FDB-162	1/4"(6mm) SAE	167	-	-	121	67	0.75	
FDB-163	3/8"(10mm) SAE	175	-	-				
FDB-163	3/8" ODF	159	137	11				
FDB-164	1/2"(12mm) SAE	179	-	-				
FDB-164	1/2" ODF	160	135	13				
FDB-165	5/8"(16mm) SAE	191	-	-				
FDB-165	5/8" ODF	167	135	16				
FDB-303	3/8"(10mm) SAE	244	-	-	191	78	1.88	10
FDB-304	1/2"(12mm) SAE	251	-	-				
FDB-305	5/8"(16mm) SAE	262	-	-				
FDB-305	5/8" ODF	237	205	16				
FDB-307	7/8" ODF	251	213	19				
FDB-415	5/8"(16mm) SAE	265	-	-	194	94	2.38	
FDB-417	7/8" ODF	254	216	19				

Solder connection



Flare connection



D A T A S H E E T

EMERSON is not to be held responsible for erroneous literature regarding capacities, dimensions, applications, etc. stated herein. Products, specifications and data in this literature are subject to change without notice. The information given herein is based on technical data and tests which EMERSON believes to be reliable and which are in compliance with technical knowledge of today. It is intended only for

use by persons having the appropriate technical knowledge and skills, at their own discretion and risk. Our products are designed and adapted for fixed locations. For mobile applications failures may occur. The suitability for this has to be assured from the plant manufacturer which may include making appropriate tests.

This document replaces all earlier versions.

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