EMERSON
Climate Technologies

ADK
Filter Drier

Alco Controls

D A T A S H E E T

ALCO ADK is a hermetic filter-drier with internal solid block for use on liquid line.

Features

- Solid block
- 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 y
- 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: 43 bar

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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 solid block. The binding material is used to hold desiccants 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 ADK 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.

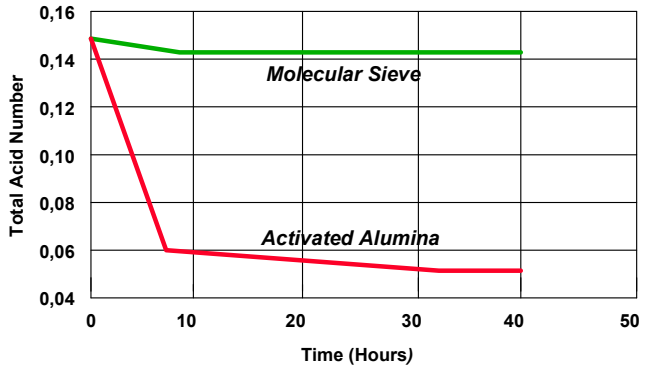
Molecular Sieves with 3 Angstrom pore size are used in ADK. These Molecular Sieves are compatible with CFCs, HCFCs, HFCs, mineral, Alkylbenze and ester lubricants as well as with small size of molecules of R22.

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 ADK 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 dirts 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 ADK 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.

Filtration Capability according to ASHRAE standard 63.2-1996 (RA2006)

Type	Average filtration efficiency	Holding capacity range of mix particles in grams
ADK-03XX	90%	2.6 to 2.8
ADK-05XX	94%	3.5 to 4.9
ADK-08XX	94%	4 to 9.2
ADK-16XX	93%	10.7 to 27.5
ADK-30XX	93%	17.7 to 45.2

Standard does not specify the pressure drops level for rating. The above data are based on a final pressure drops of 0.27 bar. Higher pressure drops will lead to higher values.

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 ADK-084 having 25.7 kW flow capacity at 0.07 bar pressure drop.

Selection Chart

		Flow capacity* in kW pressure drop 0.07 bar						Flow capacity in kW pressure drop 0.14 bar					
Type	Part Code Nr.	R134a	R22	R407C	R404A R507	R410A	R744	R134a	R22	R407C	R404A R507	R410A	R744
ADK-032	003 595	7,3	6,7	4,8	7	7,2	10,6	10,6	9,7	6,9	10,1	10,5	15,4
ADK-032S	003 596	8,8	8,1	5,7	8,4	8,7	12,8	12,9	11,8	8,4	12,3	12,7	18,8
ADK-036MMS	003 597	8	7,3	5,2	7,6	7,9	11,6	12	11	7,8	11,4	11,8	17,4
ADK-052	003 598	7,6	6,9	4,9	7,2	7,5	11	11	10,1	7,2	10,5	10,9	16
ADK-052S	003 599	10,8	9,9	7	10,3	10,7	15,7	17,1	15,6	11,1	16,3	16,9	24,8
ADK-056MMS	003 600	10	9,2	6,5	9,5	9,9	14,5	15	13,7	9,8	14,3	14,8	21,8
ADK-053	003 601	14,2	13	9,2	13,5	14	20,6	21,3	19,5	13,9	20,3	21	31
ADK-053S	003 602	16,4	15	10,7	15,6	16,1	23,8	24,1	22,1	15,7	23	23,8	35,1
ADK-0510MMS	003 603	16,4	15	10,7	15,6	16,1	23,8	24,1	22,1	15,7	23	23,8	35,1
ADK-082	003 604	7,8	7,1	5,1	7,4	7,7	11,3	11,3	10,4	7,4	10,8	11,2	16,4
ADK-082S	003 605	11,9	10,9	7,8	11,4	11,8	17,4	17,3	15,9	11,3	16,5	17,1	25,2
ADK-086MMS	003 606	10,7	9,8	7	10,2	10,5	15,5	16	14,7	10,4	15,3	15,8	23,3
ADK-083	003 607	16,4	15	10,7	15,6	16,2	23,8	23,9	21,9	15,6	22,8	23,6	34,8
ADK-083S	003 608	16,4	15	10,7	15,7	16,2	23,9	24,1	22,1	15,7	23	23,8	35,1
ADK-0810MMS	003 609	16,4	15	10,7	15,6	16,2	23,8	24,1	22,1	15,7	23	23,8	35
ADK-084	003 610	25,7	23,5	16,7	24,5	25,3	37,3	39,1	35,8	25,5	37,3	38,6	56,9
ADK-084S	003 611	26,8	24,5	17,5	25,6	26,4	39	40,4	37	26,3	38,5	39,8	58,7
ADK-0812MMS	003 612	26,3	24,1	17,2	25,1	26	38,3	39,5	36,2	25,8	37,7	39	57,4
ADK-162	003 613	8	7,3	5,2	7,6	7,8	11,6	11,5	10,5	7,5	10,9	11,3	16,7
ADK-163	003 614	16,8	15,4	10,9	16	16,5	24,4	24,1	22,1	15,7	23	23,8	35,1
ADK-163S	003 615	18,7	17,2	12,2	17,9	18,5	27,2	26,8	24,5	17,5	25,6	26,5	39
ADK-1610MMS	003 616	18,7	17,1	12,2	17,8	18,5	27,2	26,8	24,5	17,5	25,6	26,5	39
ADK-164	003 617	31,3	28,7	20,4	29,9	30,9	45,5	47,1	43,2	30,7	45	46,5	68,6
ADK-164S	003 618	36	33	23,5	34,3	35,5	52,3	49,9	45,7	32,6	47,6	49,3	72,6
ADK-1612MMS	003 619	32,3	29,6	21,1	30,8	31,9	47	48,5	44,4	31,6	46,3	47,9	70,5
ADK-165	003 620	44,8	41,1	29,2	42,8	44,3	65,2	66,5	60,9	43,4	63,5	65,7	96,7
ADK-165S	003 621	49,7	45,6	32,4	47,4	49,1	72,3	72,4	66,3	47,2	69,1	71,5	105,3
ADK-303	003 622	17,7	16,2	11,5	16,9	17,5	25,7	25,4	23,2	16,5	24,2	25	36,9
ADK-304	003 623	31,3	28,7	20,4	29,9	30,9	45,5	47,1	43,2	30,7	45	46,5	68,6
ADK-304S	003 624	36	33	23,5	34,4	35,6	52,4	51,6	47,2	33,6	49,2	50,9	75
ADK-305	003 626	52,6	48,2	34,3	50,2	52	76,6	72,1	66	47	68,7	71,1	104,8
ADK-305S	003 627	52,8	48,4	34,4	50,4	52,1	76,8	72,9	66,8	47,6	69,6	72	106,1
ADK-307S	003 628	66,3	60,7	43,2	63,2	65,4	96,4	104,6	95,8	68,2	99,8	103,2	152,1
ADK-414	003 629	36,8	33,7	24	35,1	36,3	53,5	55,2	50,6	36	52,7	54,5	80,3
ADK-415	003 632	58,6	53,7	38,2	55,9	57,8	85,2	87,9	80,5	57,3	83,9	86,8	127,8
ADK-415S	003 633	63	57,7	41,1	60,1	62,2	91,6	94,5	86,6	61,6	90,2	93,3	137,4
ADK-417S	003 634	77,9	71,4	50,8	74,3	76,9	113,3	116,9	107,1	76,2	111,5	115,4	170
ADK-757S	003 635	105,5	96,7	68,8	100,7	104,2	153,5	158,3	145	103,2	151	156,2	230,2
ADK-759S	003 636	117,2	107,4	76,4	111,8	115,7	170,4	175,8	161	114,6	167,7	173,5	255,6

Flow capacities are in accordance with ARI710-86 and DIN8949. R744 is not specified by standard.

Refrigerant	Evaporating temperature	Liquid temperature	Flow rate kg/kW/sec.
R22	-15°C	+30°C	0.0062
R134a			0.0068
R404A/R507			0.0088
R407C			0.0063
R410A			0.0059
R744	-40°C	-10°C	0.0039

For other operating conditions, use the correction factors.

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	148	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

Correction Factors

Refrigerant	Liquid temperature °C	Evaporating temperature °C									
		15	10	5	0	-5	-10	-15	-20	-25	-30
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

Refrigerant	Liquid temperature °C	Evaporating temperature °C											
		5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45	-50
R 744	10	1,37	1,35	1,33	1,32	1,31	1,31	1,31	1,31	1,31	1,32	1,33	1,34
	5		1,24	1,23	1,22	1,21	1,21	1,21	1,21	1,21	1,22	1,22	1,23
	0			1,14	1,13	1,13	1,12	1,12	1,13	1,13	1,13	1,14	1,15
	-5				1,06	1,06	1,05	1,05	1,05	1,06	1,06	1,07	1,07
	-10					1	0,99	0,99	0,99	1	1	1	1,01
	-15						0,94	0,94	0,94	0,94	0,95	0,95	0,96
	-20							0,89	0,89	0,9	0,9	0,9	0,91
	-25								0,85	0,85	0,86	0,86	0,87
	-30									0,82	0,82	0,82	0,83
	-35										0,78	0,79	0,79
	-40											0,76	0,76
	-45												0,73

Maximum working pressure, PS:45 bar

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	HCFC, HFC, mineral and ester lubricants *
CE marking	No CE marking according to art. 3.3 PED 97/23EC
Fluid group	II
Solder connections	Copper, ODF

Shell	Steel
Paint	Epoxy powder paint
Protection	500+ Hours salt spray test
Package	Individual packaged
Installation location	ADK may be installed in any position within the liquid line.
Approvals	UL
HP marking according to	HP,
Flare connections	Burnished, SAE

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

Water-and Acid Adsorption Capacity

	Water adsorption capacity (gram)										Acid
Type / Size	Liquid Temperature 24°C					Liquid Temperature 52°C					Adsorption
	R 134a	**R 22**	**R 404A/ R 507**	**R 407C**	**R 410A**	**R 134a**	**R 22**	**R 404A/ R 507**	**R 407C**	**R 410A**	Capacity (gram)
ADK-03	4,9	4,5	4,9	3,4	2,8	4,4	4	4,6	2,9	2,4	0,8
ADK-05	11,8	10,8	11,8	8,2	6,8	10,6	9,6	10,9	7	5,8	2,3
ADK-08	17,9	16,4	18	12,4	10,3	16,2	14,6	16,6	10,7	8,8	3,3
ADK-16	23	21	23,1	16	13,2	20,8	18,8	21,3	13,8	11,4	4,5
ADK-30	51,8	48,6	53,5	36,9	30,6	47,4	43,3	49,3	31,8	26,3	11,3
ADK-41	81,7	76,6	84,3	58,2	48,3	74,8	68,3	77,8	50,2	41,4	16,8
ADK-75	143,5	134,5	148,1	102,1	84,8	131,4	120	136,6	88,1	72,8	29,9

The water capacities are according to ARI-Standard 710 and DIN 8948.

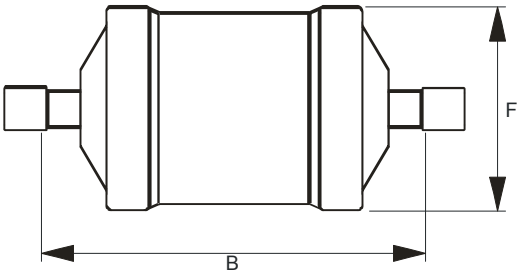
Refrigerant	EPD
R 22	60 PPM
R 134a	50 PPM
R 407C	50 PPM
R 404A/R507	50 PPM
R 410A	50 PPM

Dimensions, shipping weights and standard pack quantities

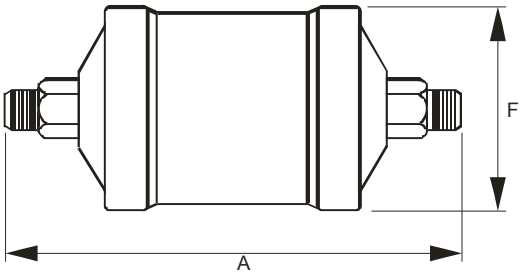
Type	Code Nr.	Connection size & type	Roughing in dimensions mm			Shipping weight kg	Standard Pack Quantity
			A	B	F		
ADK-032	003 595	1/4"(6mm) SAE	111	-	44	0,23	25
ADK-032S	003 596	1/4" ODF	-	70	44	0,23	25
ADK-036MMS	003 597	6mm ODF	-	70	44	0,23	25
ADK-052	003 598	1/4"(6mm) SAE	122	-	64	0,57	25
ADK-052S	003 599	1/4" ODF	-	82	64	0,57	25
ADK-056MMS	003 600	6mm ODF	-	82	64	0,57	25
ADK-053	003 601	3/8"(10mm) SAE	130	-	64	0,57	25
ADK-053S	003 602	3/8" ODF	-	82	64	0,57	25
ADK-0510MMS	003 603	10mm ODF	-	82	64	0,57	25
ADK-082	003 604	1/4"(6mm) SAE	143	-	64	0,7	25
ADK-082S	003 605	1/4" ODF	-	103	64	0,7	25
ADK-086MMS	003 606	6mm ODF	-	103	64	0,7	25
ADK-083	003 607	3/8"(10mm) SAE	151	-	64	0,7	25
ADK-083S	003 608	3/8" ODF	-	102	64	0,7	25
ADK-0810MMS	003 609	10mm ODF	-	102	64	0,7	25
ADK-084	003 610	1/2"(12mm) SAE	156	-	64	0,7	25
ADK-084S	003 611	1/2" ODF	-	103	64	0,7	25
ADK-0812MMS	003 612	12mm ODF	-	103	64	0,7	25
ADK-162	003 613	1/4"(6mm) SAE	167	-	64	0,8	25
ADK-163	003 614	3/8"(10mm) SAE	175	-	64	0,8	25
ADK-163S	003 615	3/8" ODF	-	127	64	0,8	25
ADK-1610MMS	003 616	10mm ODF	-	127	64	0,8	25
ADK-164	003 617	1/2"(12mm) SAE	181	-	64	0,8	25
ADK-164S	003 618	1/2" ODF	-	127	64	0,8	25
ADK-1612MMS	003 619	12mm ODF	-	127	64	0,8	25
ADK-165	003 620	5/8"(16mm) SAE	192	-	64	0,8	25
ADK-165S	003 621	5/8"(16mm) ODF	-	128	64	0,8	25
ADK-303	003 622	3/8"(10mm) SAE	242	-	76	1,6	12
ADK-304	003 623	1/2"(12mm) SAE	247	-	76	1,6	12
ADK-304S	003 624	1/2" ODF	-	194	76	1,6	12
ADK-305	003 626	5/8"(16mm) SAE	259	-	76	1,6	12
ADK-305S	003 627	5/8"(16mm) ODF	-	194	76	1,6	12
ADK-307S	003 628	7/8"(22mm) ODF	-	194	76	1,6	12
ADK-414	003 629	1/2"(12mm) SAE	253	-	89	2,4	12
ADK-415	003 632	5/8"(16mm) SAE	264	-	89	2,4	12
ADK-415S	003 633	5/8"(16mm) ODF	-	200	89	2,4	12
ADK-417S	003 634	7/8"(22mm) ODF	-	199	89	2,4	12
ADK-757S	003 635	7/8"(22mm) ODF	-	337	91	3,6	9
ADK-759S	003 636	1-1/8" ODF	-	351	91	3,6	9

SAE = Flare, ODF = Solder female

Solder connection



Flare connection



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This document replaces all earlier versions.

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